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Skills and the Future of Work

Strategies for inclusive growth in Asia and the Pacific

Editors: Akiko SAKAMOTO
Johnny SUNG

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Contributors

BAMBER Penny Bamber, Senior Research Associate, Duke University Center on Globalization, Governance and Competitiveness, United States

BHULA-OR Ruttiya, Lecturer, Colleges of Population Studies, Chulalongkorn University, Thailand

BUCHANAN John, Chair of Discipline, Business Analytics, University of Sydney Business School, Australia

DAHLQUIST Matilda, Technical Consultant, ILO Decent Work Technical Support Team for East and Southeast Asia and the Pacific, Bangkok, Thailand

EL ACHKAR HILAL Souleima, Economist and Labour Market Information Specialist, Greece

FERNANDEZ-STARK Karina, Senior Research Analyst, Duke University Center on Globalization, **Governance and Competitiveness,** Santiago, United States

HATIER Jean-Hugues, Principal Consultant, MLS Consultancy, Samoa Islands

HUYNH Phu, Labour Economist and Specialist on Employment, ILO Decent Work Technical Support Team for East and Southeast Asia and the Pacific, Bangkok, Thailand

KO Helen, Beyond Age and Singapore University of Social Sciences, Singapore

MATSUMOTO Makiko, Specialist on Employment, ILO Decent Work Technical Support Team for East and Southeast Asia and the Pacific, Bangkok, Thailand

MEHROTRA Santosh, Professor of Economics, Jawaharlal Nehru University and Chairperson Centre for Informal Sector and Labour Studies, New Delhi, India

PARK Haiwoong, Vice President of External Affairs, University of Technology and Education, Korea

PARK Jonghwi, Programme Specialist in ICT in Education, Asia-Pacific Regional Bureau for Education, United Nations Educational, Scientific and Cultural Organization, Bangkok, Thailand

SAKAMOTO Akiko, Senior Skills and Employability Specialist, ILO Decent Work Technical Support Team for East and Southeast Asia and the Pacific, Bangkok, Thailand

SMITH Erica, Vice Chair, International Network of Innovative Apprenticeship, Federation University, Australia

SUNG Johnny, Director, Centre for Skills Performance and Productivity, Institute for Adult Learning, Singapore

THANG Theresa Tze Yian, Divisional Director/Educational Design and Technology Division, Institute of Technical Education, Singapore

WHEELAHAN Leesa, Chair, Centre for the Study of Canadian and International Higher Education, Ontario Institute for Studies, University of Toronto, Canada

YAMAZAKI Ken, Senior Researcher, International Affairs Department, Institute for Labour Policy and Training, Japan

YU Serena, Senior Research Fellow, Centre for Health Economics Research and Evaluation, University of Technology Sydney, Australia

ZHANG Lixin, Director of Labour and Legal Research Division, Industrial Relations Research Center, All-China Federation of Trade Unions, China

Preface

The global community is in profound discussions on the far-reaching implications of the fast, deep and wide changes taking place in the world of work. This book makes a valuable contribution to the skills development aspect of those discussions. It is also appearing as the International Labour Organization (ILO) prepares for the 100th anniversary of its founding, in 1919. The future of work is a prominent feature of the ILO centenary celebrations.

The various discussions reaffirm, over and again, the critical importance of investment in skills development for individuals, enterprises and countries as a way to mitigate the unintended negative effects and to seize the positive opportunities that the future of work will bring.

The Asia and the Pacific region is an economic success story on the global scene. Over the past two decades, the region has halved poverty and brought more people to middle-class status faster than any other region at any other time. And yet, poverty continues to have a firm grip. A large informal economy, rural-urban disparities and poor job quality remain among the unfortunate features that characterize the region. Inequality is widening. As countries strive to move up from low- to middle-income status, then onto high-income status, the fair sharing by all persons of the benefits from economic development – as called for by the 2030 Agenda for Sustainable Development – remains a challenge and aspiration of the region. This book argues that investment in skills development has a key role to play in making that aspiration a reality.

The book builds on the outcomes from several key debates and forums that the ILO has facilitated on skills development and the future of work since 2016. When we organized the first such forum in Seoul, Republic of Korea, the issue of skills in the context of the future of work was only a topic of discussion among advanced economies. Now in November 2018, the topic is a major item of discussion across the region.

The book brings together 15 chapters that span the range of critical issues concerning skills development, examined in the context of the future of work. The chapters provide front-line research, initiatives and perspectives in and from the region. They aim to assist ILO partners, practitioners, researchers and other stakeholders as they face the challenge of future skills. The many discussions intend to help them consider how best their skills development policies and systems can prepare individuals and enterprises in the evolving world of work, thus contributing towards building an inclusive and productive society in the future. The book highlights that a future skills strategy needs to address not only “what skills” and “who gets access to training” but also whether and how these skills are having an impact on creating better employment and business outcomes. This requires greater appreciation of the demand side of skills and addressing skills issues in the context of, or in conjunction with, the evolving context of work and the strategies that a society forges in response to the changes and disruptions.

The book is a contribution from Asia and the Pacific and from the field of skills development to the ILO centenary initiatives. I want to thank the editors, Akiko Sakamoto and Johnny Sung, for taking up the challenge of putting the volume together and publishing this stimulating and timely book. I would also like to thank all the authors of the chapters for being part of this important work. I wish the readers an insightful read.

Tomoko Nishimoto
Assistant Director-General and
Regional Director for Asia and the Pacific
International Labour Organization

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The views expressed in the book are those of the individual authors and do not necessarily reflect the views of the ILO, its Governing Body, its member states or constituents. The conclusions drawn from the contributed chapters remain those of the editors.

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Abbreviations

ABAP	Advanced Business Application Programming
ACFTU	All-China Federation of Trade Unions
ADB	Asian Development Bank
ADDIE	Analysis-Design-Development-Implementation-Evaluation
ASEAN	Association of South East Asian Nations
AI	artificial intelligence
AR	Augmented Reality
ATM	automated teller machines
BCG	Boston Consulting Group
BPM	business processing management
CEDEFOP	European Centre for the Development of Vocational Training
CHED	Commission of Higher Education
CRF	Center for Research and Facility
CTA-NUS	Technical Centre for Agricultural and Rural Cooperation-National University of Samoa
DAR	Department of Agrarian Reform
DCTC	Department of Textile and Clothing Technology
DESA	Department of Economic and Social Affairs, Population Division
DFKI	German Research Center for Artificial Intelligence
ESCAP	Economic and Social Commission for Asia and the Pacific
ESSSA	Employment and Skills Strategies in Southeast Asia
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investment
FLAG	Flexible Learning Advisory Group
G20	Group of Twenty
GBO	Green Business Options
GDP	gross domestic product
GSP	Generalized System of Preferences
GVC	global value chain
HRD	human resource development
HRDI	Human Resources Development Institute
ICF	International Classification of Functioning
ICT	information and communication technology
IFR	International Federation of Robotics

ILO	International Labour Organization
IoT	Internet of Things
IPP	Industry Professional Practice
ISCED	International Standard Classification of Education
ISCO	International Standard Classification of Occupations
IT	Information Technology
ITU	International Telecommunication Union
ITE	Institute of Technical Education
IREA	International Renewable Energy Agency
JAAF	Joint Apparel Association Forum
K-MOOC	Korean-Massive Open Online Courses
KOREATECH	Korea University of Technology and Education
KOLAS	Korea Laboratory Accreditation Scheme
ME	Micro enterprises
MELSEC PLC	Mitsubishi Electric FA Programmable Logic Controller
MOEL	Ministry of Employment and Labour
MOE	Ministry of Education
MRSD	Manpower Research and Statistics Department
NCS	National Competency Standards
NGO	non-governmental organization
NSS	National Sample Survey
OCEAN	Openness, conscientiousness, extraversion, agreeableness, neuroticism
OECD	Organisation for Economic Co-operation and Development
Off-JT	off-the-job training
OJT	on-the-job training
OLEI	Online Lifelong Education Institute
OPL	Online Practice Lab
PERMA	Positive emotion, engagement, relationship, meaning and accomplishment
PIAAC	Programme for the International Assessment of Adult Competencies
PILNA	Pacific islands literacy and numeracy assessment
PISA	Programme for International Student Assessment
PLC I/O	Programmable Logic Controller Input/output
POSCO	Pohang Iron and Steel Company
R&D	research and development
SAP	System Applications Products
SII	Skills Intensity Index

SME	small and medium-sized enterprise
SPC	Secretariat of the Pacific Community
SSG	SkillsFuture Singapore
STEM	science, technology, engineering and mathematics
TAFE	Technical and Further Education
TAFEP	Tripartite Alliance for Fair and Progressive Employment Practices
TDRI	Thailand Development Research Institute
TESDA	Technical Education and Skills Development Authority
TVET	technical vocational education and training
UBS	Union Bank of Switzerland
UN	United Nations
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNEP	United Nations Environment Programme
UNEVOC	International Centre for Technical and Vocational Education and Training
UNSD	United Nations Statistics Division
VER	vulnerable employment rate
VET	Vocational education and training
VR	Virtual reality
VT	Virtual Training
WB	World Bank
WDI	World development indicator
WEF	World Economic Forum

Introduction

Building an inclusive future through skills development: An agenda for Asia and the Pacific

Akiko Sakamoto
Johnny Sung

The world of work is changing rapidly, providing new opportunities and challenges. Technological advancement is facilitating new business models and new ways that workers engage in work. Increased automation and computerization, however, are causing major disruption and, in some cases, a replacement of tasks leading to job loss. Technological advancement is not the only driving force of change. The International Labour Organization (ILO) and others have identified parallel megatrends, such as demographic transition, environmental change and globalization, that are also rapidly redefining the nature of work and jobs (ILO, 2016). In Asia and the Pacific, these megatrends interact with recurrent features of the labour market, including large informal and rural economies, that will continue to shape the labour market, at least in the short to medium terms.

The skills that workers and enterprises require depend on the evolving nature of work and jobs. While the exact impact of technology and other megatrends continue to be debated, envisioning the future of work has spurred debate on what skills are needed in the future, how those skills should be acquired and how training providers need to adjust.

The challenge of skills development in light of the future of work does not stop there. Realizing inclusive growth and shared prosperity is a key theme of the Sustainable Development Goals, and skills are expected to assume a major role in realizing this aspiration.[1] Although the region's strong economic performance is well known in the global context, persistent poverty, a large informal economy and major rural-urban disparities continue to characterize the low- and middle-income economies. Widening inequality is a major concern, and finding a path of economic development that is strong yet inclusive is a major challenge. The question remains: How can skills contribute to this process of achieving both competitiveness and social inclusion?

The pursuit of inclusive growth and examining the role of skills in that process have important policy implications. If skills development is to have a significant impact on

1 The importance of skills development is articulated especially through SDG 4, while at the same time promoting skills is a key element in achieving the other goals, such as decent work (SDG 8), eliminating poverty (SDG 1) and achieving gender equality (SDG 5).

achieving inclusive growth, we need to address not just “who gets access to training” but also pay greater attention to how skills, supplied by the skills development system, are used and how they help create better employment and business outcomes. There is a big assumption that having relevant skills naturally leads to better jobs with improved wages and working conditions or, similarly, that having employees with the right skill sets leads to improved productivity. The impact of skills on these employment and business outcomes are not automatic. What is missing is a perspective that skills do not exist in a vacuum and that the impact of skills is mediated by the context or conditions of work. For example, skills will have little influence towards improving wages if the nature of the job is such that it does not require higher skills to begin with. Or, if an enterprise is operating on a low-cost, low-price, low-skills and high-volume basis, there might not be much room for skills to have impact. In addition, it may be because there are no structures, mechanisms or social agreements that link improved skills with better working status and conditions.

These issues suggest that if skills development is to have a significant impact on achieving inclusive growth, addressing skills issues only from the supply side is insufficient. Greater understanding of the demand side of skills and the structures that influence the impact of skills is needed so that investment in skills development can indeed contribute to inclusive growth.

Most publications that examine skills policy tend to focus on the systems of training and how to provide “better” skills development. By connecting the themes of “skills”, “the future of work” and “inclusive growth”, this book pushes the boundaries beyond the conventional areas of policy discussion. Throughout the 15 chapters within this volume, we ask policy questions that are seldom discussed. In particular, we want to examine how skills policy can be relevant not only to the rapidly changing world of work but also to the need for social inclusion. This has led to some of the chapters in the book focusing on how the future of work context creates a greater need for policy discussion around the demand for skills and the contexts and conditions of work that influence the impacts of skills.

To inspire new thinking in policy-making, the 15 chapters of this volume therefore broadly cover the following four themes:

1. While most skills policy discussions cover how to supply skills, have we really accepted the need to understand not only how the world of work is changing but also what generates the demand for skills in the first place?
2. We always want to know about the future skills, but seldom do we ask: Will the future demand for skills present an opportunity to promote the inclusive policy agenda? If so, how?
3. Technology, new forms of business and work, the transition to a green economy and other factors are highly significant in determining future work and skill demands. Thus, to what extent and in what ways are our skills and technical and vocational education and training (TVET) provision making appropriate responses to this challenge?

4. If we are doing well in making a response to the changing demand for skills, what else is important in skills policy? Have we ever asked whether job quality and the conditions of work can considerably influence the level of skills utilization and impact how skills can help create better employment and business outcomes and ultimately build an inclusive society, which is a fundamental goal of skills policy?

Asia and the Pacific region is a vast and diverse region that is currently subject to rapid and tremendous change in its economies and the work that people do. We have therefore compiled a wide-ranging set of discussions, analyses and perspectives to provoke fundamental policy re-thinking. The task of the reader is to consider these various contrasting ideas in conjunction with the complex challenges for future skills policy. We hope that by so doing, we can make real progress in developing skills strategies that support both the competitive and the inclusion agendas of the future.

The following sections discuss why we selected these four basic themes.

1. The challenge of future skills

There are a several important issues concerning the relationship between skills policy and the demand for skills. We will deal with these in turn. First, while we cannot predict what may happen in the future 10 or 15 years from now, there are a number of trends that are already obvious in our current effort to deal with future skills.

The emerging characteristics of future labour markets are more fluid (rapid change), unforeseeable, less secure and technology-driven. This does not mean that traditional jobs will disappear altogether. Providing a “human touch” will continue to be valued and demanded. Appreciation of workers who are highly specialized and have a mastery of trades and crafts is likely to remain. The range of tasks that can be handled by technology will expand, however. Notwithstanding the diversity in the economies of the region and the difference in the speed of technology adoption, mass production will no longer necessarily mean mass employment. There will be greater expectation that humans are able to work with ever-advancing technologies, adjusting themselves and upskilling or reskilling, if necessary. Or they will focus on the job roles or tasks that only humans can do or, at least, are hard to handle by technology. Those workers who can use the new technologies may remain employed, but the number of jobs will be fewer. New forms of business will provide new employment opportunities but also new challenges, such as leaving some workers isolated from the existing framework of labour protection. Managing the transition to a green economy well is another issue, so that the burden of the transition does not affect disproportionally workers whose employment is at risk as a result of the transition (ITUC, 2017). In this evolving future of work, what are the implications for the types of skills that will be needed?

The need to shift towards higher, broader and multiple skills

As a general trend of technological advancement, demand is increasing for higher-level skills and education. Skills that enable workers to undertake multiple tasks or broader tasks that often involve more complex and sometimes high-order skills, such as emotional skills, are also in high demand. The pace of employment growth in high-skills categories is fastest in most countries in the region due to the general level of growth and the emerging trend of job polarization (see El Achkar's Chapter 7). The general evidence seems to suggest that skills-biased technological advancement is taking place in the region.

The greater use of technology in the workplace seems to have increased the demand for persons who can operate and work with technologies, including problem-solving and maintenance. In Chapter 7, the author shows that, while significant job losses for crafts and related trade workers were reported in Indonesia and the Philippines in 2001–08, a fewer but considerable number of jobs were created in 2010 –15 in plant and machine operator and assembler categories (Chapter 7).[2] Many forward-looking business process management enterprises in the Philippines are restructuring their services to be more knowledge oriented and high value added.[3] Thus, jobs are becoming more highly skilled. Working with technologies has also led to a shift from handling a single task to taking on additional and multiple tasks, hence, broadening job and skills requirements. Customer service in the business process management sector in the Philippines, for example, is now expected to not only respond to what a customer initially wanted to order but also to advise a best option by sourcing and analysing different information.[4]

El Achkar's chapter shows that these trends are pushing the demand for formal and higher levels of education and training, as opposed to acquiring skills informally on the job. The author argues that to work effectively with technology, one needs to understand what technology can do and how it helps doing the job. This requires not only operational and practical skills but also a stronger theoretical base and a higher level of research and analytical skills.

In low-income (and lower-middle-income) countries in the region, the level of education of the workforce remains low,[5] and a considerable proportion of jobs are held by persons who do not have the education deemed necessary for the job (ILO, 2014). In Chapter 11, Matsumoto and Bhula-or argue that, in these Asian countries, obtaining a higher and formal qualification seems to make sense, and the skills and TVET systems need to strive to improve access and develop an approach in which workers can move up from one level of qualification to the next. For these countries, creating a system that facilitates many persons to obtain a progressively higher level of education and training qualifications is critical.

2 This includes the data on job growth in high skills categories.

3 For example, fraud analytics, data integration, project management, R&D, mergers and acquisitions valuation and medical image analysis.

4 According to a representative of the IT-BPM sector association at a consultation in July 2018.

5 A significant proportion of the workforce has secondary or less education. ILO: *Key Indicators of the Labour Market,* Ninth edition (Geneva, 2015).

The picture of middle-income countries in the region is more complex. Even though the demand for higher skills is increasing as a general trend, there is reportedly little difference in remuneration for workers who enter the workforce with a higher qualification and workers without such a qualification. This casts doubt on whether, despite an increased demand for higher qualifications, many of the existing nature of jobs are such that do not require higher levels of skills and therefore it is not worthwhile for businesses to pay higher remuneration. It seems that the pace of creating higher-level jobs is slower than the flow of workers coming out of the education and training system with higher qualifications. This is demoralizing for persons investing in skills upgrading. In some cases, this encourages workers to seek better employment outside their country.

The rising demand for STEM skills and emotional intelligence

The demand for skills related to science, technology, engineering and mathematics (STEM) is growing fast across the Asia-Pacific region (see Chapter 10 by Dahlquist and Chapter 7 by El Achkar). Some of the growth is the direct consequence of technology advancement, increased automation and computerization, while it also arises from the growth of the research and development sector, which has been one of the fastest-growing sectors in middle-income countries of the Association of Southeast Asian Nations (ASEAN) sub-region.

Despite the growing demand, the supply of such skilled workers remains stagnant, resulting in a general shortage of STEM skills in the region (UNESCO, 2016; Manpower Group, 2015). STEM-related jobs are viewed as jobs of the future, yet, gender disparity in taking up these jobs is a major concern. Dahlquist's analysis (in Chapter 10 and ILO, 2018b) of the workplace context indicates that it is not just about encouraging women to take up STEM subjects, but it is also about addressing the widespread conscious and unconscious bias against women's employment and career progression in what are considered to be male-dominant occupations. The author also finds that, in some Asian countries, women's take up of STEM subjects is quite high but the proportion of women pursuing careers in STEM fields is smaller. This may suggest that skills and training to improve gender equality is only a part of the solution. Policy needs to also address systemic factors.

There is an increased demand for educators and health and care workers (ILO, 2018a). These jobs are considered to require a high level of emotional skill and are hard to be replaced by technology. A high risk of labour substitution has so far been much reported on for manual and/or repetitive tasks that are easily codifiable or for jobs that require relatively low cognitive skills. The jobs and tasks that can be handled by technology seem to know no boundary. Already, it is possible to use artificial intelligence to write a script for a popular movie or novel, undertake a complex surgery and read a bedtime story to children or older persons. Yet, the greater demand for certain skills does not always equate with a high reward for those skills. It is likely that, irrespective of the advancement of technology, skills demand and rewards are also shaped by the values that a society places on work, regardless of whether or to what extent the work should be carried out by humans and/or machines. This is an important point for the inclusive society agenda.

The increased demand for care workers needs careful analysis. On one hand, a demographic shift towards an ageing economy in some countries has increased the demand for these workers and their skills.[6] Care workers, however, are involved in a broad category of work and range from household assistants (domestic workers) who provide care for children and older persons to persons who work at nursing and old-age homes and as assistant nurses to persons in the teaching and medical professions (ILO, 2018a). All of these are skilled occupations, but they require different levels of skills and involve varied working conditions. Poor job quality is a general concern for various types of care workers, but the status and working conditions of domestic workers are of particular problem. Although considerable effort has been made to improve the decent work deficits of this occupation,[7] the increased demand for domestic care workers and their skills needs to be supported by efforts to improve their job quality. There have been some reports that women who previously worked as machine operators in factories have taken jobs as domestic workers because factory redundancies, caused by automation, left them with few other career options (ADB, 2018).

Green skills

Among other factors, this book highlights green jobs as another area of the new demand for skills. Specific data and analyses of the Asia-Pacific region are generally hard to come by.[8] Two chapters in this book examine the issues.

For example, Hatier, in Chapter 14, looks at the imperative for the Pacific islands to increase their resilience to climate change because their economies and national survival are closely linked to the environment. Hatier argues that the impact of green economies will have a transformative effect on the types of jobs in the Pacific islands. These jobs are likely to demand new or high skills. Public policy can take advantage of this new (high-skills) demand because the push for green economies will serve as a vehicle for supporting the inclusion agenda.

To achieve this change, Hatier highlights the importance of having coherent strategies that may cover employment, education and training and the environment, the energy sector and finance for accelerating climate change actions. In other words, Hatier argues that a potential crisis may help transform society for the better. Skills development and entrepreneurship are critical parts of a wider strategy towards greener economies for the Pacific islands.

Away from the Pacific islands, the booming economy of China also faces an urgent need to take on the environmental challenge. In Chapter 15, Zhang highlights the fact that

6 Increased investment in the care economy is expected to result in a total of 475 million jobs by 2030, with the addition of 269 million new jobs, compared with the number of jobs in 2015 (ILO, 2018a)

7 One of the landmark events was the adoption of the international labour standard: ILO Convention on Decent Work for Domestic Workers, 2011 (No. 189). The ILO has placed care work at the centre of the Women at Work and the Future of Work Centenary Initiatives (ILO, 2018a).

8 A new report is expected to be published soon to shed light on the analyses. See ILO: *Environmental sustainability and employment for climate resilience in Asia and the Pacific*, Bangkok, forthcoming.

China's 13th National Five-Year Plan has already incorporated environmental protection, resource conservation and inclusiveness. Zhang argues that the restructuring elements within the national plan can provide the basis for a green(er) economy and a socially more equitable society. In particular, she sees huge potential for skills development and job transition working together to create greater demand for new and higher skills. Given the extensive involvement of the Chinese government in the economy, Zhang also argues for a government-led transformation of state-owned enterprises that are affected by overcapacity and need to redeploy employees elsewhere.

Both cases highlight something in common: There is a high level of consensus among all stakeholders. An environmental threat may not necessarily lead to a crisis. It is a significant opportunity to create positive change. Joined-up public policy, however, is required so as not to leave the responsibility of job transition to individuals whose jobs are threatened as the economy becomes greener.

2. The demand for soft, non-cognitive skills: Learnability and adaptability

The importance of generic and soft skills – such as communication, problem-solving, team work and information and communications technology (ICT) skills – is not new. Their importance, however, has been re-highlighted in the context of a future of work that includes greater uncertainty in the job market and the prospect of multiple careers. Having good soft and non-cognitive skills is increasingly seen to signify workers' adaptability and flexibility and to strengthen their employability. Despite much debate on what these generic soft skills might be for the future (WEF and BCG, 2015), two critical skills are spotlighted in this study. One is "learnability" (the ability to learn), or learning disposition, which is a combination of solid basic education and personal attributes (such as curiosity and perseverance) that provide a basis for an individual to adjust the use of existing skills and to upgrade and add new skills to adapt to new job requirements. The another is "adaptability", which is the ability to navigate an unforeseeable or rapidly changing job market. In the event that technology catches up to replace workers and some existing skills become obsolete, an ability to adjust or learn new skills will become critical in determining whether workers are able to remain employed by taking on new tasks or finding a job elsewhere. High learnability also implies a strong ability to cope with change and to proactively direct one's own career development, rather than being directed by changes in the job market.

In Chapter 5, Buchanan, Wheelahan and Yu extends the discussion of the importance of generic skills to how these skills are best taught. The authors argue that these skills cannot be acquired through short training programmes offered in abstract form. By critically examining the prevailing approach to generic skills training, such as the twenty-first century skills framework, they show how the approach is based on a limited understanding of how human capability is developed. The authors also show that generic skills requirements are different across occupational categories (for example, care work versus engineers) and cannot be acquired out of context. The chapter points to the critical importance of having a solid learning disposition and argues, somewhat paradoxically, that "generic skills are often best acquired in the context of mastering specific disciplinary, trade or professional expertise".

The workplace and skills demand

For a long time, skills policy has been dominated by human capital theory, and the focus has been on education and training investment in individuals. This is essentially a supply-side view of skills policy. It pays little attention to the demand for skills, especially within the workplace context. However, as educational attainment and training incidence reaches a relatively high level, skills policy may face other challenges that go beyond the investment perspective. For example, how will we know if the investment in skills and qualifications gets used? What if the prevailing business models happen to be those that focus on cost-cutting and not value addition? In this book, we have devoted several chapters to these questions.

Skills utilization

The most useful benefit of examining the role of skills from a workplace and job perspective is that skills utilization becomes most critical when we want to know if skills are making a difference. We argue that there is a significant gap in policy when we only focus on supply or skills provision. A recent McKinsey report on US jobs typifies the problems of skills underutilization and mismatch that undermine the intent of supply-focused policy (Mckinsey & Company, 2013):

1. Forty-five per cent of graduates between 2009 and 2012 who obtained a four-year university education were in jobs that did not required a four-year degree.
2. At the same time, the McKinsey report found that 40 per cent of all graduates could not find work in their chosen occupation.
3. Employers and graduates alike were frustrated by the lack of preparation in soft skills. One in three graduates in the McKinsey study reported that they were ill-prepared when they started their job.

Here we see a discrepancy between what a supply-based skills policy intends to do and what actually happens. There can be many reasons why this discrepancy exists – for example, lack of the "right" kinds of jobs, job scope being too narrow, work practices lacking autonomy and so on. The common lesson is that simply supplying skills and qualifications is a good start but the role of skills has more to consider because the individual has to function in a work setting. It means that by not paying appropriate attention to the demand for skills, unintended consequences may work against a skills policy that focuses on provision. In Chapter 1, Sung highlights the urgent need for policy-makers to have a greater understanding of the demand for skills and, in particular, the concept of skills utilization at work. To have a better understanding of skills utilization, Sung also argues that we need to understand other related concepts, such as business models, the competitive environment and job quality.

These related concepts mean that the role of skills in relation to rewards, opportunities and the inclusion agenda, while closely linked, is variable and complex. Much depends on how the other factors, such as business model and job quality, are working towards an inclusive agenda. In Chapter, we explain some of this complexity, the crucial links and how skills policy may take real actions for future progress.

Business models and competitive environment

It is a surprise that the effect of business models is often missing in the discussion of skills and skills policy. Imagine a worker who is in a highly scripted environment with little task autonomy. Skills utilization tends to be low because work has been designed in such a way that the outcome is highly predictable. In the literature, this is sometimes described as “routinized” work that can be automated easily. Thus, Sung, in Chapter 1, highlights that across business units in the same sector, one can find huge variation in terms of skills utilization. For example, one financial services enterprise may aim at a large volume of customers in the personal finance sector with relatively standardized financial products while another may aim at high net-worth customers who are looking for more bespoke services and financial planning. In the former business model, the work (and the product or service) will be highly scripted while in the latter, employees will confront customers who are different every time, which requires more skill and knowledge to deliver the work successfully.

Yamazaki, in Chapter 2, views the business environment as a system of networks that are co-innovations of technology, such as Industry 4.0 and the Internet of Things. It has created structures that give rise to very different conditions, prospects and career ladders to jobs that are located within the structure. Hence, there are differences between core and peripheral (main and subcontracting) business units and even jobs within the same business unit. Subcontracting businesses, especially units further down the line, are likely to have little room for skills development because their margins, resources and options are limited. Skills under these circumstances do not attract the same value. Even though workers may increase their skills, the position of the enterprise in the network is such that it prevents it from improving wages and other working conditions. As a result, skills’ impact on creating an inclusive society is highly variable and subject to the location of the job within the network.

A related theme is found in the form of the network known as the global value chain (GVC). Chapter 3 by Fernandez-Stark and Bamber centres on the benefits of GVCs. The authors argue that a GVC is a highly effective mechanism to create inclusion for developing countries because it is based on the concept that every country has something to contribute. Not only can GVCs bring new jobs but they also raise incomes in most cases. Fernandez-Stark and Bamber argue that, while these effects are beneficial to achieving the inclusion agenda, capturing a position in a GVC is more challenging. Here, they argue that developing countries will have to gear up their human resources and skills development systems to meet the demands of a GVC. The benefits of GVCs are clear. What is less obvious in the chapter is that it would be most beneficial if the transfer and learning effects can enable some of these countries to move up the value chain. In this way, the greater value-added content of jobs would match the expansion of more skilled workers in developing countries. Hence, this is the second but more fundamental challenge of GVCs.

Economic growth, inequality and the role of skills

One of the most important policy questions for every country is: Do we grow for the sake of growth, or do we grow so that all can benefit? The Asia-Pacific region is also facing fast-changing challenges as a result of globalization, technological change and rising expectations. The question is particularly important because growth has been significant in the past two decades in this region (Ra et al., 2015) while inequality and poor employment prospects among disadvantaged groups have hardly improved. This then begs another question: What role can skills (and the jobs that demand the skills) have in bringing about an inclusive society (ILO, 2016).

El Achkar in Chapter 7 sees these challenges in the form of “creative destruction”. Using labour force surveys from Indonesia, the Philippines, Thailand and Viet Nam, the author highlights the massive job changes leading to real wage improvement but with widening inequality as a result of job polarization and skill-biased technology. This means that some workers are benefiting more than others and, in particular, it is of concern that low-skilled workers are at risk of being substituted by automation and, at the same time, face structural barriers to reskill fast enough to take on new opportunities.

On the demand side, however, El Achkar also sees the importance of the future demand for skills, as argued previously. In the context of GVCs being increasingly driven by knowledge-based product and services, the author argues that the low-cost and labour abundance advantage will become less attractive as a basis for future growth. The business process management sector in the Philippines is already moving towards high-value-added business models focusing on fraud analytics, data integration, project management, R&D, mergers and acquisitions valuation and medical image analysis (Chapter 7. These emerging demands are already driving TVET provision in the Philippines.

The implication here is not simply that public policy needs to pay greater attention to these important demand changes and match them with supply. Rather, skills policy can only deliver substantial benefits to individuals and societies if it is integrated into the wider policy structure. In this sense, while the content of TVET is important in terms of future skills, the how, who, where and how it matters also need to be part of the policy consideration.

3. The role of TVET in future skills: How does it matter?

A frequent question for TVET policy-makers in recent times concerns the role of skills and TVET systems in the rapidly changing work context and the demand for skills. This question becomes even more pertinent when many countries in the region are considering TVET reform, which is discussed at regional meetings (such as the ILO Asia and Pacific Regional Meeting in 2016). Some of the key elements highlighted as part of an effective skills strategy include: the importance of anticipating skills demand as the basis for adjusting skills provision in line with labour market needs; greater employer engagement, with industry taking an active role in skills development and TVET; improving quality-assurance mechanisms for qualifications, assessment and certification; and widening access to training for disadvantaged groups (ILO, 2010). While fully addressing these policy areas remains a challenge, especially for low- and middle-income countries, we focus our discussion on important emerging discourses that can help countries adjust their skills provision in light of the future of work.

TVET is more than a one-time provision: Strengthening the role of career

From a life-course perspective, vocational training should be closely related to the nurturing of a career. An important idea is not to see skills training as a one-off preparation for an occupation, but rather as a stepping stone for a series of careers with overlapping or progressive skills. In this context, the idea of job clustering, or vocational stream, may be useful (see Chapter 5 by Buchanan, Wheelahan and Yu). The premise here is that skills training for one occupation can also be relevant for other occupations within the same job cluster (or broad field of practice). In Chapter 5, the authors include an example of watch and clockmakers and their skills connection with medical technicians and tool-making when the clockmakers deepen their capabilities.

Once the concept of job cluster is recognized and supported, it can improve the portability of skills and job mobility across different but related occupations. For example, in the construction sector, workers who can handle multiple job roles, such as bricklaying, plastering and masonry, can adapt better to the changes in demand for any of these occupations. The skills development system can support this effort by identifying the extent to which skills adjacency applies and recognize the transferability of a skills set from one occupation to others.

Once the transferability of a skills set are identified, the approach enables workers to be certified for multiple related jobs, with less additional training than would be required otherwise. In addition, the idea of job clustering can be strengthened by clubbing existing narrower qualifications to create broader qualifications. This can also add value to any training given because of its wider applicability. Buchanan, Wheelahan and Yu argue further that the skills system needs to prepare individuals to better navigate the increasingly unforeseeable and rapidly changing world of work to develop long-term careers, not merely to prepare them for immediate specific jobs. If the future of jobs and skills is not possible to foresee, the skills development system needs to not only generate skilled workers as demanded by the economy but also develop individuals who can take their career development into their own hands.

Outstanding issues of the current approach to TVET provision

The short-term focus of the competency approach to TVET: The importance of learnability and adaptability needed for the future of work highlights the increased importance of taking a holistic approach in training and certification. Chapter 5 contends that one's learning disposition, or potential to successfully navigate a career, requires a holistic approach to human development and cannot be based on a set of limited, often narrowly defined, units of predefined competencies. The proposition therefore provides an opportunity to revisit the currently dominant approach to training and certification, which is the competency-based approach. In the region, the competency-based approach that was initially adopted in Australia and New Zealand more than 20 years ago has been gradually adopted by many other countries. The rationale for adopting the competency-based approach, which focuses on the outcomes of learning that is based on agreed competency standards defined by or with inputs from employers, has varied. But it has been attractive in making training meet labour market needs. It has also enabled the provision of short training and certification for specific skills that immediately serve the short-term employment needs of trainees, such as informal economy workers, who cannot afford to be in a long-term training programme. Although a review of the competency-based approach requires much deeper discussion, one of the agendas for a future skills strategy is to balance the short-term employment needs of some workers with the need for broader skills and a theoretical base to assist trainees' long-term employability.

Solid foundation of education and skills: In the context of lower-middle-income ASEAN countries, the low level of skills and education among the workforce remains a major issue, as mentioned earlier. As examined by Matsumoto and Bullar-or in Chapter 4, much of the skills mismatch in the region relates to the large proportion of jobs performed by workers with less education than their jobs require. This is a concern, given the vital role of early education in building foundation skills and knowledge to take learning further. This is important not only for obtaining higher and more specialized skills and knowledge to develop careers but also for developing an ability to analyse the broad context in which one situates and to decide and then act on a course of action to deal with situations. While an in-depth discussion on how best to develop what is known as learnability or learning disposition is beyond the scope of the book, Buchanan, Wheelahan and You, in Chapter 5, highlight the importance of learning disposition in developing key attributes, such as curiosity, resilience and learning relationships, as vital preparation for the next level of learning.

While the significance of developing solid foundation skills is well accepted, Matsumoto and Bullar-or also highlight in Chapter 4 the limitations of the current statistical base for analysing skills mismatch. That base relies heavily on national household surveys (including Labour Force Surveys) in the region. The authors thus caution that overemphasizing skills mismatch may lead to narrow or unbalanced policy development.

Enhanced importance of workplace learning: The importance of workplace learning has always been recognized, but the likely nature of future labour markets has elevated its importance. The pressures are coming from three fronts. One relates to a greater recognition that enterprises are at the forefront of technological change and are the first to face changing skill requirements. Also, in some industries, the fast pace of change is making it harder for training institutions to keep up with necessary training equipment and changing skill requirements. The second relates to the increased importance of continuous skills upgrading and/or the acquisition of new skills as requirements for changing jobs. As jobs change, workers are expected to learn new tasks. Some of the learning may occur in a formal setting (provided by a training institution), but the bulk of learning will take place in the workplace, either as learning by doing or peer learning. This is not new, but again its significance has increased as the importance of continuous skills upgrading, or lifelong learning, is emphasized in light of the future of work. The third pressure comes from a growing expectation that workplace learning is a means for facilitating youth employment.

Despite the increased ageing of the population, the majority of countries in the region face the recurrent problem of high youth unemployment, which is usually two to three times higher than the adult rate. Pressure is mounting for the economic and social inclusion of youth. The causes of youth unemployment are many, but one of the key bottlenecks for a smooth school-to-work transition is the lack of work experience. The importance of apprenticeship programmes, in which apprentices acquire skills while working, has been re-highlighted in this context. Smith, in Chapter 6, examines this expectation and, based on an analysis of several national programmes, cautions that apprenticeship programmes are caught between the conflicting expectations of providing quality training, on one hand, and responding to the agenda of inclusion on the other. Well-functioning workplace learning, notably apprenticeship programmes, is supported by a social consensus regarding not only shared roles and responsibilities but also shared costs and benefits. The latter is particularly important for making the programmes sustainable, and to link improved skills with better wages and working conditions. While we can appreciate the increased importance of workplace learning, it is important to revisit and solidify the underlying consensus and its supporting mechanisms.

ICT-enhanced training provision for improving quality and access: New technologies are also enabling some training institutions to offer innovative ICT pedagogies to both meet future skill needs and address the inclusion agenda. Based on five case studies, Thang and J. Park, in Chapter 9, and H. Park, in Chapter 8, show how ICT, through virtual reality and augmented reality, enables practical learning in a simulated workplace context – without the purchase of expensive equipment or without incurring possible damage to equipment and physical risk to trainees. Chapter 9 also highlights the benefits of ICT-aided learning for improving not only access to learning but also individualizing learning, for example, to support trainees with learning difficulties. Here, ICT is used to promote an inclusive pedagogy to improve learning outcomes for all. Chapter 8 extends the role of ICT in broadening access to small and medium-sized enterprises to training. The potential of ICT to contribute to an inclusive future of work is therefore significant. What would be more helpful, however, is that the development and adaptation of ICT are more explicitly linked and situated in a broader discussion and initiative to the demand side of skills (the business sector) and the supply (the training sector) as well as to broadening the scope of careers for individuals, as discussed previously.

Revaluing and recognizing skills: For older workers, revaluing their skills is critical. At a time when workplace skills are changing rapidly, retraining is one effort. But to identify what skills are already possessed by workers and are transferable is even more important because these skills represent an important signal to employers in terms of employability. Therefore, identifying skills adjacency can help career change, especially during enterprise restructuring.

In Chapter 12, Mehrotra argues for the need to recognize workers' skills, especially for those working in the informal economy in India (almost 80 per cent of the workforce). One of the arguments here is that inclusion needs to reduce the proportion of informal jobs in the economy. Nearly all of these jobs are of poor quality, and poor-quality jobs are associated with low wages, low skills and a lack of career advancement. The author argues that the recognition of prior learning is part of the effort to reduce the informal economy, while improving the current skills ecosystem is vital for tackling skills mismatch. However, skills alone are not sufficient for promoting the employment of older workers, informal economy workers and other vulnerable groups. This applies to the case of promoting gender equality (see the later discussion on prevailing unconscious bias). Hence, achieving inclusive growth requires broader and concerted support – it needs broader agreements and social dialogue.

4. Going beyond skills demand and supply for inclusive growth

The immediate skills issues tend to relate to the demand and supply of skills. But there are at least three other issues that are important to skills policy and the inclusion agenda. The first concerns job quality. The second concerns the emergence of new forms of employment and the third is the urgent need to improve access to new and especially high-skill work by certain groups in society.

The need to create more quality jobs

In Chapter 1, Sung introduces the importance of the business model in encouraging higher skills intensity and skills utilization. Implicit in the discussion is the connection between the business model and good or bad jobs. It turns out that low-skill work tends to co-exist with a range of other poor job qualities (Green and Mostafa, 2012). Therefore, when a job requires few (or low) skills, it often has little autonomy and it tends to be repetitive, with poor working hours, little career prospects, minimal skills development and poor job security (Lloyd, 2008). Such a job that delivers little value in relation to the end product or service is inevitably associated with low pay.

Here, it is not difficult to see that the connection between skills and pay (taking pay as a simple starting point for improving social inclusion) is far from automatic. What makes a difference is the kinds of job that sits between the two. Job quality can either support the effect of upskilling policy or it may marginalize the upskilling effort. El Achkar, in Chapter

7, talks about the growth of poor-quality jobs as one of the factors that intensify skills polarization, leading to widening inequality. In Chapter 13, Huynh points to the great volume of poor-quality jobs in the rural sector, which is negating efforts in upskilling, despite the positive return of investment in education and training in the rural economy. The chapter emphasizes the potential of modernizing the rural economy for raising the demand for high skills and job quality.

Sung, in Chapter 1, also discusses the use of industrial policy to influence the job quality of new jobs. In 23 economic sectors in Singapore, the Industrial Transformation Policy aims to encourage the emergence of new business models that can expand in overseas markets as well as create high-skill jobs. For many sectors, job quality is also an important policy outcome. In some sectors, the Industry Transformation Map has been used as a means of retaining talent in the sector, in an effort to deepen skills and to increase value addition for further sector growth. In general, each map is designed specifically for the needs of the sector.

As mentioned, this is a key issue for many lower-middle-income countries in creating more quality jobs that are needed to achieve inclusive growth. The most useful insight from the Singapore approach is the need for a highly balanced approach that involves both the demand for higher and new skills as well as the supply to meet the new demand.

New forms of employment

Yamazaki, in Chapter 2, discusses new business models concerning the widespread adoption of subcontracting work and global networks. The chapter explains that jobs embedded in the ever-growing subcontracting system are not the same as those in the "core" sector. The discussion seems to suggest that new business models may bring new types of relationships between skills building and work. In other words, the form of employment matters. Like job quality, the structure of employment can affect the skills outcome and the inclusion agenda.

Similarly, the World Economic Forum (2016) reported a huge increase of own-account workers (a rough measure for independent or gig work) in industrialized countries. These increases are also observed in Asia and other parts of the world. The report cited some obvious benefits of these new forms of work: "Emerging digital platforms have begun to provide previously inactive, unemployed, underemployed and own-account workers with easy access to an online marketplace". The report also reserved any impact judgement while advocating the possibilities for regulation (WEF, 2016, p. 4):

> So is the gig economy good or bad for the future of employment? Like most technologies it is neither inherently good nor bad. Digital work platforms can span a range of both high-skilled, high-paid work and low-skilled, low-paid work. They can be localized or cross borders, not unlike the outsourcing that has occurred between developed and developing economies in the past. They have the potential to create enormous opportunities for the developing and developed world. The data from these platforms can provide the basis for smart regulation and agile safety nets, just as it can be used to sell more services.

To make an assessment on the inclusion agenda, we need good data. Traditional labour market data is inadequate in providing sufficient detail to assess the skills impact of the gig labour market, let alone the inclusion agenda. There is no chapter in this book focusing on the emergence of gig work. But it is important to remind the reader that the emerging forms of employment will matter for the intent of skills policy, even though the "jury is still out" at this point in time.

Managing the process of transition: A call for a holistic approach

The previous discussion suggests that, if we are serious about achieving inclusive growth, there is more than just the demand and supply of skills to deal with. Policy must address the challenges of transition, such as identifying barriers and ensuring steady progress. These challenges mean that adjustments should be treated as societal and institutional and are not just coming from individuals.

Even though the future of work presents new opportunities, the concern for inclusive growth points to the importance of how well we can manage the transition driven by changing work contexts, such as technology advancement, demographic change and the transition to a green economy. The impact of technology on job losses is still debated, and other possible negative impacts, such as mismatch and underemployment, might not be as dramatic as some reports suggest. Persons who have gained a new job are not necessarily those who have lost a job. This underscores the importance of reskilling and continuous skills upgrading for workers. Employment resettlement and career shifts are far from simple, and they often require broader assistance beyond reskilling.

There are aspects that skills policy may need to tackle other than demand and supply. These include the recognition of skills through certification; providing assistance in identifying the relevancy of existing skills to other occupations; and identifying skill gaps and facilitating training to prepare for desirable career shifts. Furthermore, there could be a need to produce better labour market and jobs data. Information regarding emerging job opportunities and the availability of training programmes can be made available in combination with career guidance.

A skills policy that covers the concept of career may make good synergy with active labour market policy in the context of restructuring. Thus, the support of employers becomes critical. A dialogue between employers and workers over enterprise restructuring and/or job re-profiling may enhance upskilling and skills utilization. The dialogue may also help workers to prepare for career shifts and allow them to explore taking up re-profiled jobs within the enterprise, possibly with additional training. In Chapter 15, Zhang shows how useful it is for public policy to support enterprise restructuring in the transition to a green economy in China. The discussion highlights, however, the greater vulnerability to job loss and the difficulty of employment resettlement for older workers and those with limited education.

Thus, a holistic approach to managing policy change and transition is required. The

International Trade Union Confederation emphasizes this point: “The burden of change that benefits everyone will not be placed disproportionately on a few” (Labour Network for Sustainability, 2018).

Access to work, jobs and skills: The impact of prevailing unconscious bias

Some of the chapters in this book remind us that a few of the obstacles to delivering future skills policy are not so obvious. These are related to the values and biases that exist in society. These values and biases underline existing employment conditions and structures that affect how certain groups of workers engage in work. They are often unconscious and opaque within our workplaces, employment systems and society. However, unless we confront or at least acknowledge the potential problems, we are unlikely to make progress with future skills policy and inclusion.

Skills policy and older workers: Responding to the employment needs of older workers is a critical issue in achieving inclusive growth in the face of ageing economies in the region. Despite the demographic shift, the existing framework of employment and the values that govern the framework remain unchanged. This includes the underlying perceptions and values of skills and potential concerning older workers. This prevailing value system, including age structures in the workplace, work design and work arrangements, has been established over time but mostly reflects the demographic profile of the pre-ageing era. Whether conscious or unconscious, this value system acts as a major hindrance for older workers to continue employment or gain re-employment.

Based on experiences in Singapore, Ko, in Chapter 4, examines how a prevailing perception, such as the general decline of skills, abilities and performance among older workers, persists in the current workplace even though evidence suggests the possibility of otherwise. Reskilling and skills upgrading have important roles in equipping older workers to adjust to an increasingly technology-driven workplace, for example. The issue is deeper, as the author argues, because prevailing perceptions govern de facto rules of employment concerning older workers. Ko proposes how the existing “rules”, including age structure, design of the workplace and work arrangements, can be changed to better support employment in the time of, or as a preparation for, an ageing economy.

Taking the issue one step further, revaluing the skills and knowledge of older workers will also remind us of the importance of taking a broader societal perspective in valuing skills – and not only skills and knowledge that are linked with employment. Older workers can bring perspectives and experiences that can be beneficial to social service and the development of local communities, for instance. In this sense, a community that appreciates the skills of older workers, in turn, might be one step closer to realizing an inclusive society.

Skills policy and women: Whether conscious or unconscious, the prevailing value system of the workplace probably affects women’s employment and career progression most. On one hand, the region has made good progress in terms of achieving gender parity in educational attainment. There is gender parity in universal primary education in the majority of countries in the region. While gender parity has not yet been achieved in terms of secondary and tertiary education, the participation of female students increased significantly between 1990 and 2015, especially in China, India, Indonesia and Pakistan (Pande et al., 2016).

Improved gender participation in education, however, has not necessarily translated into improved access to employment. In the future of work discussion, in which STEM skills are seen as one group of future skills, encouraging more women to take up STEM subjects is viewed as a critical initiative not only for boosting women's employment in general but also for reducing the gender gap in occupations that have been traditionally considered male-dominated. Preliminary investigations into women employment and career progression indicate that STEM skills are indeed critical for women to access and remain employed in STEM-related jobs. However, skills seem to offer only a partial solution. As examined in Chapter 10 by Dahlquist, prevailing values and bias continue to be a differentiating factor in STEM-related employment in the region.

What the discussion here implies is that the pursuit of inclusive growth requires major, if not fundamental, change in the underlying values and rules that govern the world of work today. Unless altered, these will continue to support the status quo and will condition how certain social groups are allowed to engage in work. This certainly takes the discussion beyond skills supply. But it is a critical issue because skills are also part of the social make-up (the value system), and the impact of investments in skills in achieving inclusive growth will depend on it.

Conclusion

Our discussion has covered a diverse range of important topics for future skills policy. In this final section, we emphasize five main points.

The rising importance of the demand perspective

To begin, we reiterate the importance of continuously strengthening the system of skills provision – one that is fit for purpose and capable of changing with demand. It is the most important starting point of any good skills policy. We go further in this book. We argue that it is time we also paid attention to the demand for skills, especially from the skills mismatch and skills utilization perspectives. This is important if skills are to make a significant impact on the inclusion agenda through improved employment and business outcomes. Skills do not exist in a vacuum. Skills and the impact of skills are intimately shaped by the business model, job quality and other conditions of work. Furthermore, we argue that because enterprises make choices in adopting or innovating their business model, skills content and job quality are often within their decision-making processes.

Skills policy and system need to be dynamic

One of the fit-for-purpose requirements is that skills policy ought to be sufficiently dynamic to prepare current and future workers for a changing and uncertain labour market in which broader, multiple and deeper learning is important. Dynamic quality is not only about specifically defined competencies but also is about building broader capability to navigate and direct one's own career development. Where appropriate, the concepts of career and job clusters are useful policy devices to strengthen employability and lifelong learning.

"Good jobs" are a necessary component of a good skills system

Efforts to generate a more and better-skilled workforce need to go hand in hand with efforts to create more high-quality and high-skill jobs. Although many countries in the region have experienced considerable job growth, the next challenge is to have an increasing proportion of this job growth contain good jobs. This approach to skills policy will help tackle low skills utilization, transform the informal economy, meet rising social aspirations and improve social and economic inclusion.

Integrated approach to skills policy

The many facets that a skills policy has to tackle are by now obvious. It is clear that we cannot approach skills issues in isolation and need to think beyond skills provision. We need structures or mechanisms that can connect skills provision with jobs or with work that is continuously changing, such as industry transformation, Industry 4.0 and automation. Stakeholders of future skills policy will not only be institutions or people in education and training but all parties relevant to the inclusion agenda.

Future skills policy will need to deal with wider societal issues

If future skills policy is to transform societies, it will have to accept the connections between skills and social objectives. Thus, even within the context of skills policy, the pursuit of inclusive growth must elevate the importance of social dialogue and go beyond treating skills issues as the domain of training practitioners and individual trainees. Policy actions that concern the management of transition, changing workplace norms and tackling social biases will need a societal response and thus will need to place the issues at the heart of social dialogue. Forming new social agreements and building new structures that are linked to investment in skills will become new challenges of future skills policy.

This summary reflects a rather different orientation and trajectory for future skills policy to what we are accustomed. The 15 chapters in this book provide the reader with not just a rich content of various relevant issues. They also provide a range of thoughts and innovative policy ideas. What is needed now is an effort by stakeholders to put some of them – or even better ideas – into action so that societies can make progress with the inclusion agenda and better manage future changes in work and economic and social well-being.

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Section I:

Recognizing new business environment for skills and inclusive growth

1

Business model, skills intensity and job quality for inclusive society

Johnny Sung

Abstract: The chapter examines an enabling work environment for increased skills training and utilization, with a focus on the interface between skills intensity, business model and job quality, on one hand, and skills training and utilization on the other. The chapter analyses the impact of the "work environment" on promoting skills development and utilization and highlights the context that improved workforce skills contribute most to stronger business performance and better jobs. The analysis builds on the researcher's forthcoming working paper for the International Labour Organization (ILO), Skills Utilization, Better Jobs and Inclusive Society: Future Skills Policy in Asia. The chapter supports one of the points highlighted in the ILO Asia-Pacific Regional Meeting discussion on building an inclusive future by creating more rewarding and productive jobs and higher skills and value-added content. Drawing from the forthcoming working paper, the chapter provides unique and front-line thinking and a conceptual discussion on the role of training and skills utilization in striving for an inclusive society.

Introduction

The focus of skills policy is often on the supply side – on increasing the stock of available skills through education and training, migration and activation. However, more skills are not necessarily better skills, and the mere existence of skills does not automatically lead to improved economic performance. Making optimal use of existing skills, preventing waste and attrition of skills due to mismatch or lack of use and encouraging employers to demand higher levels of skill in stagnating regions or sectors are equally important elements of skills policies. (OECD, 2011, p. 19)

Massive economic growth has taken place in the past three decades in the Asia-Pacific region, raising average earnings at a much faster pace than elsewhere in the world. For most of the region's developing countries, much of this progress has come from the cost advantage and a relatively educated workforce (Ra, Chin and Liu, 2015). Moving forward, many questions now hover over that progress (ADB, 2013): How will that growth maintain its momentum? Where will the next source of competitive advantage come from? Will emerging new jobs raise job skills content, compared with the low-skill approach that was prevalent in the early stages of economic development?

At the same time, the massive economic growth also begs a question: Do we grow for growth sake, or do we grow so that all persons can benefit? This is an important question because growth in the past three decades – both in developed and developing countries – has been accompanied by increasing inequality and poor employment prospects among the lowest-earning and disadvantaged groups. Thus, with that concern comes another question on what role new jobs (and skills) can have in bringing about an inclusive society (ILO, 2016).

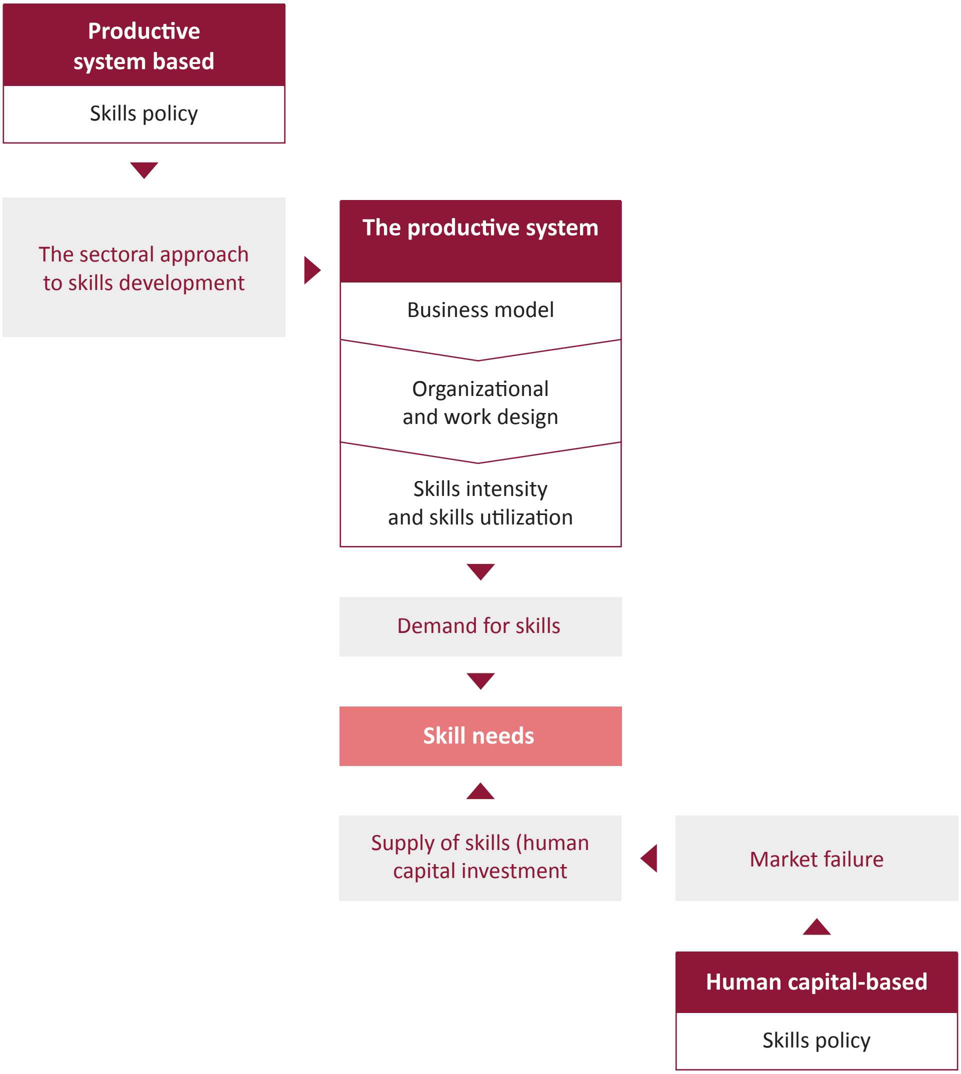
These questions require policy-makers and researchers to examine the impact of skills, not just on jobs but also on society, and to seek new solutions. While the supply of skills remains the most important bedrock of any skills policy, increasing attention is directed to understanding what generates the demand for skills in the workplace and how skills may lead to the greater added value of jobs. This new area of policy is one that focuses on skills intensity as well as skills utilization. This first chapter examines these issues in more detail and how they may affect future policy-making regarding skills.

1.1 Drivers of the demand for skills

Human capital theory, which relies on the concept of market failure (and its presumed connection with the underprovision of training), dominates much of the thinking and approaches to national skills and training policy (Brunello and de Paola, 2009). This theory has at least two contested assumptions: First, there is an assumption that improving the supply of skills will also improve the demand for them because employers will make use of the extra skills. As a result, a human capital-based skills policy focuses almost entirely on the supply side, namely, the provision of skills through qualifications and training. Second, the assumption of employers as “automatic skills adopters” treats the workplace as a “black box”. In this assumption, policies do not need to consider the demand for skills because it will be resolved through the workplace via employers’ systematic adoption of new and higher skills that are made available through public policy and provision.

Figure 1.1 depicts the conventional skills policy (coming from the right-hand side of the diagram) and equates skill needs in the productive system to that of the output of skill-supply policy. This conventional thinking is problematic because skill needs is actually a demand concept, emanating from how a productive system (a workplace, a business or even a charity) is constructed in the first place. A classic example is book retailing. Books can be sold via a high-street shop, which requires much retail-related skills (shopper experience, product knowledge, store management, etc.). But books can also be sold via the Internet, which may have little demand for shop-based retail skills. With this channel, information technology (IT), marketing, big data, warehousing and logistics skills form the backbone of the business model. The point is, both skill sets sell books but context makes the difference. Therefore, a new question must guide skills policy: Does the supply of skills suit the need?

Figure 1.1: Skill supply, skill demand and skill utilization



Source: Author.

Another question is whether the skills supplied are used. There are good reasons to expect that the supply of skills may not equate to skill needs. For example, workplaces are subject to management, leadership, organizational culture or technological considerations that may work independently of the availability of skills. It is easy to forget that businesses are purposive entities that exist for a reason (including non-profit-making ones, such as charities) and that business owners often have a notion of how to operationalize their business ideas, defined by a business model.

This means that, political and theoretical dogmas aside, treating the productive system as a black box reduces the relevance and effectiveness of any skills policy. Indeed, far from being a black box, workplaces are essentially underpinned by a business model, no matter how simple that model may be. The middle section of figure 1.1 depicts how the business model determines what technology may be adopted, how the organization is structured and how work processes and different resources (including human resources) may come together to deliver products or services and the business outcomes. It is here that the business model drives the design of different jobs within a workplace and the skills that are required to deliver those jobs.

For the purpose of this discussion, “skills intensity” is defined as the type and level of skills. “Type” refers broadly to general and specific occupational skills and “level” refers to the general concept of “high and low” skills. Skills utilization refers to both the use of skills as well as the work environment that encourages and supports it (or doing the opposite).

While the extent to which skills supply may be translated into skills utilization remains an empirical question, there is already widespread evidence of qualification and skills mismatching, especially in terms of an overskilled workforce (Quintini, 2014). The incidence of an overskilled workforce may be partly explained by the types of business model that are prevalent in recent times (such as the increasing numbers of people in casualized employment and roles that have been re-designed into simpler and separate processes), the efficiency of the labour market (including mobility issues across geographical locations) or by the time lag associated with changes in new work processes and technology adoption.

Figure 1.1 points to potential new approaches to constructing skills policy. Instead of treating workplaces as a black box, there is need to understand how a work environment is constructed. This chapter argues that skills policy focusing on the demand perspective forms an important complementary role to existing supply-focused policy.

But more importantly, skills policy that pays attention to the demand for skills will create new policy agendas. For example, skills utilization and skills intensity will become the vehicles to tackle a skills mismatch. Broader policy issues, such as productivity and workplace innovation, will become closely connected with skills policy, instead of relying on the black box solely to manage these issues. No longer should the black box approach be sufficient to promote skills policy in a world in which the supply of skills and social aspirations have been steadily rising (Keep, 2016; Sung and Ashton, 2014; Warhurst and Findlay, 2012; Mason, 2005).

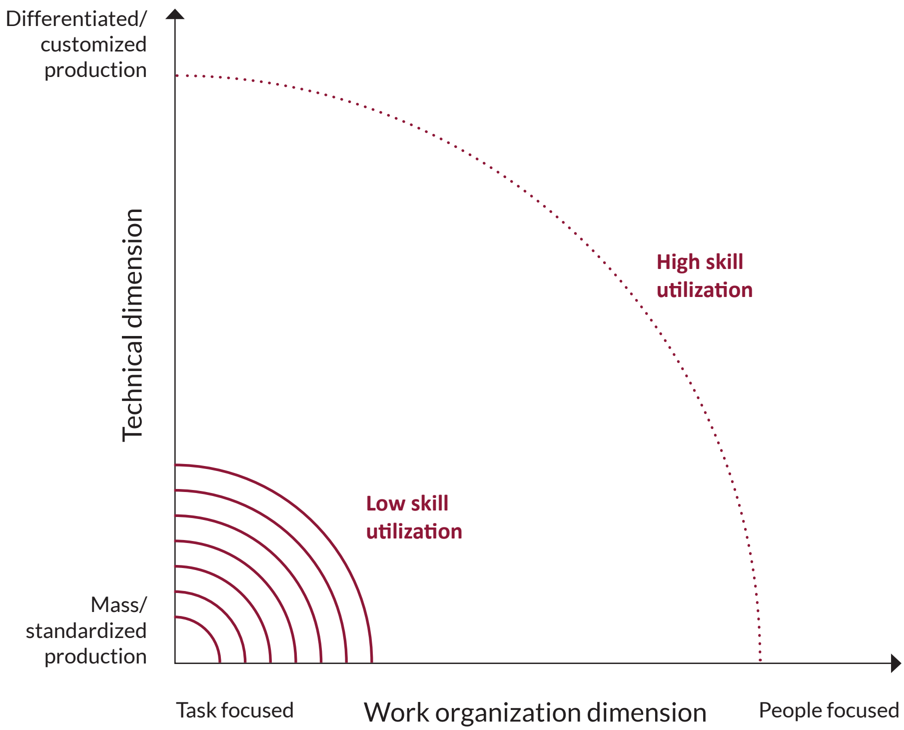
1.2 What is in the black box?

Just how do skills matter within a workplace? The vast research literature on human resource management, performance management, workplace relations and high-performance working emphasizes the importance of skills (Chowhan, 2016; Handel, 2016; Tamkin, 2005; Connor, 2002 and Purcell, 1995). However, this literature does not provide explicit analysis on the connection between skills and the adopted business model. Instead, the published discussions talked of employee engagement, the learning environment and how employees can perform better. The effect of skills in the form of skills utilization and skills intensity is rare. The closest analysis is found in some of the references to high-performance working, but only when the discussion focused on discretionary effort (MacDuffie, 2012; Bailey, 1992).

To understand the black box concept and how skills are directly related, an analytical framework is needed to focus on how productive resources are put together and what competitive strategy is adopted to deliver the organizational objectives.

Using case interviews with businesses over a number of years, Sung and Ashton (2014) developed the strategic skills model, which makes an explicit link between the operation of a business and skills utilization as well as skills intensity. As illustrated in figure 1.2, the strategic skills model translates the middle black box of figure 1.1 into two sets of relationships that can be observed in every workplace. These two sets of relationships together make an explicit link between a business model and skills intensity and skills utilization.

Figure 1.2: Business strategy and impact on skill utilization



Source: Sung and Ashton, 2014, p.63.

The strategic skills model begins with the different ways of approaching a market to produce a particular product or service. Each way has different implications for skills utilization and skills intensity as a result of the different combinations of technology, work processes, management techniques, supply chain and how customers are connected. Take for example, financial services, where a business can be conducted with customers offered identical (or a narrow range of) financial products, such as housing mortgages, lifestyle loans, insurance, banking accounts, credit cards and so on. This business is relatively standardized, treating each customer more or less the same. The opposite approach is to treat each customer as unique, with the service provider devising a bespoke financial service package to suit a customer's needs (such as high-net worth banking). The same standardization-customization spectrum can be observed in manufacturing, such as for automobiles. In figure 1.2, this standardization-customization continuum is depicted along the technical dimension.

On the horizontal axis where we depict work organization, imagine a workplace that enables employees to take part in a range of decisions so that their ideas can be considered and adopted. They have greater discretion in what they do and, even more importantly, they have ownership in the work environment. To achieve this, work and management systems would be constructed to support and encourage employees to apply their skills and involvement in the business in a way that raises their commitment and stakeholding for discretionary effort.[9] It is also viable to build the work system around the tasks, irrespective of the level of skills of the workers involved, provided they meet the minimum requirements needed to carry out the tasks. In this case, the 'task-oriented' workplace would tend to have a highly codified job design, such that work could be closely integrated into a fast workflow and the replacement of workers may cause little disruption to the overall work design. This creates a people-focused or task-focused distinction in the work organization. The work organization dimension in figure 1.2 reflects this people–task focus continuum.[10]

When a highly task-focused workplace is combined with a highly standardized product or service, the workplace and those jobs involved are similar to those under Taylorism (the orange shaded area in figure 1.2). Notice that in the shaded area, low-skill intensity and utilization are inevitable, at least for the majority of the workforce. These workplaces are still viable in many industrial or business sectors. Indeed, there are plenty of them around. And with the rise of casualized work, low-skill utilization workplaces like those are likely to remain.

9 To operationalize these concepts in empirical research, the technical dimension is often proxied by the added value of the product or service, whereas the work organization dimension is proxied by the extent to which management, human resources and work practices are built around and supporting employee involvement, commitment and skills development. In high-performance working terms, these practices are trying to achieve two outcomes: mutual gains that create a strong notion of stakeholding, which in turn leads to discretionary effort.

10 Sung and Ashton (2014) described this as the "interpersonal relation" dimension because its nature tends to be social or interpersonal.

1.3 Policy concerns for low-skill intensity and low-skill utilization

The construction in figure 1.2 suggests two concerns for policy-makers regarding skills: First, if a huge proportion of business units (either in a country or in a particular sector) are located towards the shaded area of figure 1.2, there are thus many low-skill business units (low utilization, low intensity or both), and most of their jobs are likely to require low skills and low utilisation. This situation is not uncommon in the Asia-Pacific region, especially during the take-off stage of development, when job creation (of any job) is a high priority. In the subsequent stages of growth, a country's ability to move from take-off to "maturity" (or from low-income to middle- and high-income groups) require a sufficient number of businesses (and jobs) operating at a higher value chain position. These businesses are likely to be in areas away from the shaded areas of figure 1.2.

The second concern is the potential mismatch of skills qualifications in jobs. This concern is particularly relevant to middle- and high-income countries because they tend to produce more training and education at the intermediate and higher levels. The relationship between education provision and the type of new jobs emerging is always subtle and not obvious until some time lapse occurs. An oversight leading to a significant level of overqualification (and therefore underutilization of skills) may mean that as much as this is a waste of resources, it also creates multiple socioeconomic problems, such as disillusionment with education policy, lack of mobility (which may be linked to inequality), lack of innovation, low productivity and decreasing trust between citizens and government due to "broken promises" (Brown, Lauder and Ashton, 2011). Many of these issues may become structural obstacles to improving inclusion in society.

The most important lesson for skills policy is that, despite good progress in improving education participation in a country, the skills challenge becomes progressively greater when the burden of policy gradually shifts from a supply focus to one that requires a balancing act between the demand for skills and the supply of skills.

1.4 Rising importance of workplaces as a source of skills provision

The demand perspective of skills policy also has a learning dimension. While figure 1.1 emphasizes the demand and supply of skills, it depicts the need for skills acquisition, activation and utilization. The prevailing supply emphasis of skills policy means that only acquisition has made a strong policy connection (especially via education) in most countries. Skills activation is passively encouraged via good practices, although much of the real effort is left to employers to consider and implement. Skills utilization remains a new idea at best and practically unheard of in most countries, developed and developing countries alike. All three – skills acquisition, activation and utilization – will impact the level of skills (intensity) in a job. If a skills policy emphasizes only one of the three, it would not be difficult to see that the policy would likely be suboptimal in affecting skills provision and resource allocation (mismatch and waste) and achieving wider societal goals, such as mobility and inclusion, because it would not connect to the work and skill needs in the workplace.

Workplace learning research shows that much of skills utilization (as well as workplace innovation) occurs at the same time as when employees learn new things while performing their work (Unwin, Felstead and Fuller, 2007). Felstead et al. (2004, p. 2) argued that there is "a complex interconnected relationship between performing everyday work tasks, the utilization of skills and knowledge and learning". Similarly, Engeström (2004) argued that the workplace is an important context for learning and skills utilization – the more employees are enabled with opportunity to take part in activities, the more opportunities there are for learning, skills utilization and innovation.

> People and organizations are all the time learning something that is not stable, not even defined or understood ahead of time. In important transformations of our personal lives and organizational practices, we must learn new forms of activity which are not yet there. They are literally learned as they are being created. (Engeström, 2001, p. 137)

Much of the early workplace learning research emphasized the acquisition of skills via work performance. A later strand of research provided a closer link between skills utilization and workplace learning. In 2004, Fuller and Unwin advocated the promotion of organizations that have an "expansive learning" characteristic. Through an extensive series of case studies two years later, they argued that expansive workplaces have the natural environment for spreading knowledge and skills across job lines and generations of workers.

> [Central to an organization's success is …] a coherent and consistent high involvement organizational culture, [valuing] the contribution of individual workers and teams, alongside its emphasis on continuous performance improvements, the design and development of high-quality products and high levels of cooperation between managers and workers. (Fuller and Unwin, 2006, p. 265)

Fuller and Unwin also described the opposite form of expansive organizations – restrictive organizations, in which learning and skills utilization are essentially transactional. The connection between an organization's skills base, utilization and performance outcome are often subject to chance because the structural expansive mechanism is missing. Compared with previous analyses, this distinction between a transactional (restricted) and expansive organization provides a stronger link between workplace learning and skills utilization.

It is clear from the workplace learning studies that the way organizations organize their work practices and their management systems has huge impact on skills acquisition, activation and utilization in the workplace. In turn, this affects the skills intensity of jobs. One policy implication, especially for middle-income countries in the Asia-Pacific region, is that it would be important to support businesses' ability to develop their business model. This does not have to be intervention from the State but the facilitation to build networks and to understand how to take advantage of the concepts of supply chain, clusters, quality approach, productivity and the connection between skills and value added.

All of these concepts require business owners and managers to pay attention to skills intensity and skills utilization. The recognition of a progressive approach to skills policy is therefore important. All too often, policy-makers make a dedicated attempt to increase education provision while employers are convinced that their business model and work system can continue as is for a long time to come. Ironically, the mix of these two parties doing their best could add to the problem of skills and education mismatch and the underutilization of skills.

Rising aspiration as a result of higher attainment of education may cause problems where the increasing numbers of more highly educated persons feel that they are not getting the type of work that they should be doing, while employers start complaining about not getting any workers as a result. In many middle-income countries, migration from the rural sector may be seen as an "easy" solution to meet the urban demand for workers. This may solve the immediate problems, but it also keeps static the existing business models and the skill level required, while the general level of education continues to rise, and rising fast, especially in urban areas. Meanwhile, the better-educated workforce may start emigrating to other, possibly more advanced countries, where they believe a better return on their education and training exists.

The growth of the industrial sector should not be based upon a replacement model, with skilled workers being substituted by lower-skilled workers. Mobility of workers is not a bad thing. But for a skills policy to succeed, business models (in terms of moving up the value chain) must change to take advantage of the increased supply of skilled workers. In other words, as an economy grows, skills policy needs to address increasingly diversified and higher-skill needs – from both the business and individual perspectives.

1.5 Skills and an inclusive society

There has been little explicit analysis on the relationship between skills and an inclusive society. The distributive aspect of an inclusive society is the main focus here, although there are other aspects, such as opportunities and representation. In terms of distribution, we use Autor's (2014) study to illustrate the relationship between the supply and demand for skills and how they affect income distribution.

By studying college graduate wage premiums, Autor (2014) explained income inequality in terms of the demand and supply of skills at a time when technology made huge advances in the world of work.[11] In particular, the United States labour market data revealed a gradual shift from physical labour to "cognitive labour" in recent decades. This shift raised the demand for analytical skills, writing skills, communication skills and specific technical knowledge. Autor showed that in the United States labour market after 1982 (when the so-called "baby-boomers" began looking for jobs), there was a slowing in the supply of college graduates while the demand for cognitive labour rose. Autor argued that the result was a long period of rising wage premiums for college graduates, compared with the earnings of high school leavers. At the same time, the demand for non-college graduates (or their

11 Also see Goos (2013) for similar analysis adopting a historic labour market and job polarization approach to examine the impact of technology on jobs and employment.

relative low skills) dropped, and their earnings suffered consequently.

Autor's analysis on inequality is essentially a demand and supply thesis with a technological change lens, which he had previously referred to as the "skill-biased technological change" (Autor, 2002). In other words, people benefit from a wage premium if their skills are in short supply. While relying on more conventional economic analysis, Autor also saw room for public policy:

> It would therefore be a vast overstatement to conclude that the rise of US inequality is exclusively due to conventional market forces, or that public policy has not played a role. (Autor, 2014, p. 850)

What, then, are the policy implications for skills? Autor made two suggestions. The first was for public policy to increase the supply of the "right kind" of skills, which he argued would in turn moderate the skill premium and inequality. Second, public policy should help facilitate "a larger fraction of adults to attain high productivity, rewarding jobs and a reasonable standard of living" (Autor, 2014, p. 850).

In practice, there are difficulties in operationalizing some of these ideas. For example, to increase the supply of the "right kind" of skills is inherently difficult to define. If it meant simply producing more graduates (in which conventional economics would prefer to treat the workplace as a black box), there is risk arriving at a situation of oversupply, whereby the surplus graduates would be competing for non-graduate jobs – a situation that some economies are already experiencing (*The Economist*, 2011). Brown, Lauder and Ashton (2011) called it the "global auction" in which graduates in different countries start to see their investment in education bidding down each other's wages (premium) because large employers coordinate the skills supply on a global scale. But it is hard to be precise in gauging what is the right number of graduates in a particular field because of their mobility, the overlapping nature of knowledge, the human resourcing strategy of multinational companies and the ease with which work can be offshored to other countries. In short, to predict the "right kinds" of skills supply is a hazardous venture.

Autor's second suggestion relates to the demand for skills. How can a greater proportion of adult jobs be more rewarding and productive? Presumably, this means that the new jobs should have higher skills and added-value content. Unfortunately, he provides no further details on how this could be achieved.

1.6 Job quality for an inclusive society and career development

As the research on skills, especially on skills utilization and skills intensity, grew over the past 15 years, some unexpected discoveries began to appear. One of them concerned the possible link between job quality and skills utilization. The discovery began with the observation of increasing numbers of "bad jobs" in the West. Then, when researchers started to examine why these jobs were "bad", they also found that low-skill work also co-existed with a range of other poor qualities in a job (Green and Mostafa, 2012). For example, when a job requires few (or low) skills, it often has little autonomy and involves few tasks, poor working hours, little career prospects, minimal skills development and poor job security (Lloyd, 2008; Form, 1987). While a simple job delivers little added value in relation to the wider work processes within an organization, it also offers low pay.

Research on job quality suggests that treating low-wage problems as a pure wage issue is too simplistic and may lead to sterile policy solutions. The advocacy of a national minimum wage is a good example of being too simplistic. While the implementation of a national minimum wage has not caused mass unemployment, as the opponents of it argued, it has not improved inequality either. Emphasis on a living wage has now taken over, which means that the national minimum wage approach has had little impact in terms of lifting the workers who are engaged in low-skill work.

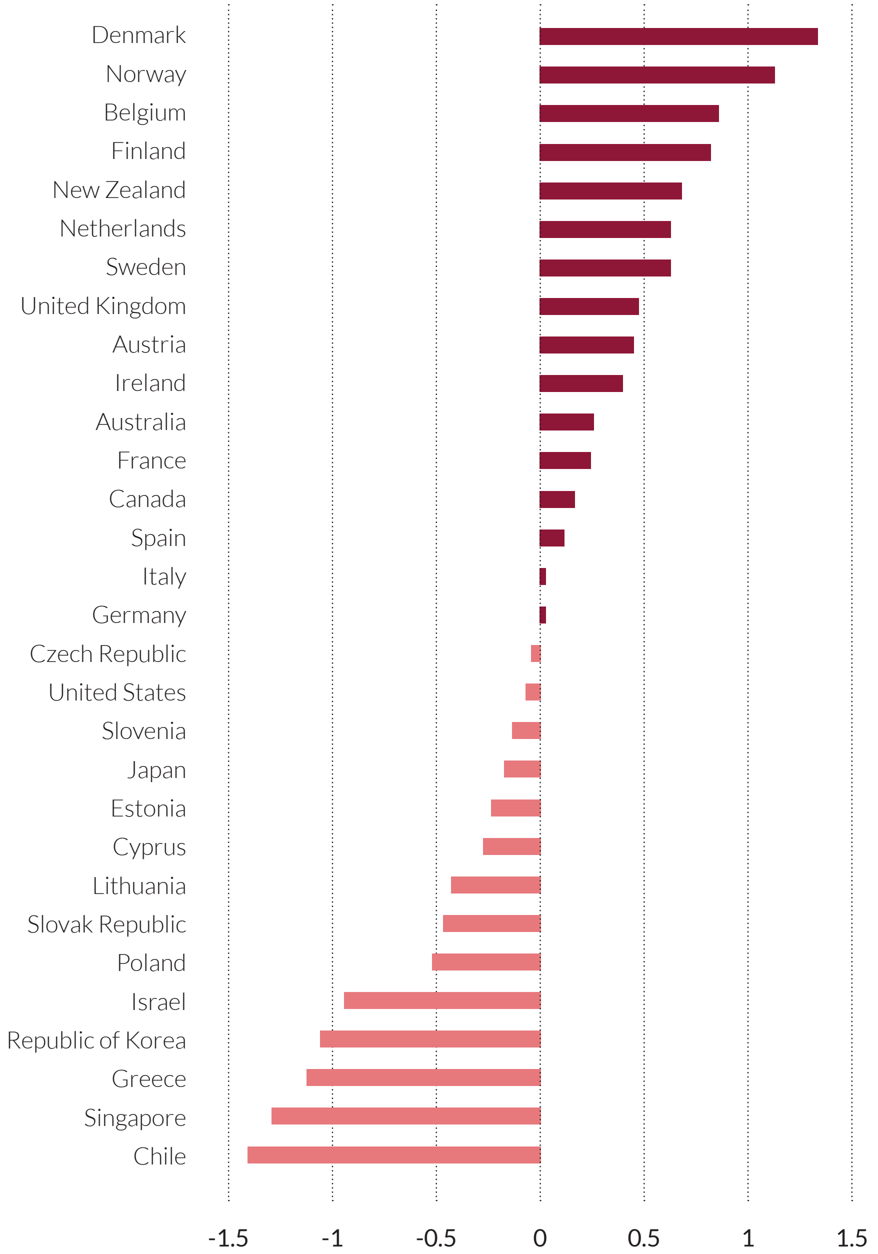
In many countries, the bottom 10 per cent of wage earners have benefited little from general economic growth. The connection between job quality and poor pay gives rise to a new policy option for an inclusive society in which job quality is an essential element. This revelation makes it even more illogical to focus solely on supply-side skills policy (education) when both high-skills intensity and high-skills utilization only exist in good-quality jobs.

On the relationship between skills and job quality, Sung (2016) drew some interesting findings from a skills utilization study in Singapore.[12] By comparing the accommodation and food sector and the financial services and insurance sector – one highlighting a sector with a generally low-skill characteristic and another requiring a greater proportion of workers with tertiary education – he found that the average job quality scores in two industrial sectors differed relatively little in work time quality (long hours, overtime, etc.), job security, well-being and job autonomy. The two areas that the two sectors differed substantially from each other were pay and skills development. The pay difference between the two sectors was expected, with average pay in an accommodation and food sector job at 30 per cent lower than the average job in the financial and insurance sector. However, the biggest job quality difference between the two sectors was in the opportunities for skills development (covering the extent of how long training is involved and training adequacy for the job).

The average skills development opportunities in the financial and insurance sector were twice the level as in the accommodation and food sector. Indeed, a low level of skills development opportunity tends to coincide with low-skill intensity and low-skill utilization. This pattern between job quality and skills development was also observed in other sector comparisons, suggesting that low-quality jobs are also likely to be jobs that have low-skill utilization and low-skill intensity.

12 This unpublished study was carried out by the Institute of Adult Learning in Singapore. The job quality measures had five dimensions with 24 indicators, similar to that discussed in de Bustillo et al. (2009).

Figure 1.3: Comparison of job quality in countries participating in the OECD Programme for the International Assessment of Adult Competencies (standardized scores*), 2013–14



Source: Freebody, 2016. * Note: The scores are unweighted in terms of the sub-dimensions of the JQ in PIAAC

Job quality studies are rare in the countries of the region, with the exception of Singapore. However, using recently published data from the Organisation for Economic Co-operation and Development's (OECD) Programme for the International Assessment of Adult Competencies (PIAAC), Freebody (2016) compared job quality across 33 countries. Figure 1.3 shows that using five indicators (pay, skill level and variety, job autonomy, average work hours and contract-related security), the job quality scores of all three Asian countries are below the average job quality scores of all the PIAAC-participating countries. This suggests that job quality is probably not of top priority among employers in the Asia-Pacific region. However, jobs are still increasing in the region. It would seem useful to be mindful about the types of new jobs coming through – if the inclusive society agenda is to be sincere.

What are the job-quality implications for skills policies, especially skills policy that is relevant to the demand side? There are five prospects:

1. **The use of sector-based development policy to increase the proportion of high skills and high-quality jobs.** For example, in Singapore, the implementation of the Industry Transformation Policy supports the emergence of business models capable of commanding a growing overseas market through innovation. While skills training and education support are part of the policy, it also largely emphasizes adopting innovation-based growth.[13]

2. **Skills deepening via career building.** A distinction between the traditional use of career guidance and the skills concept of career is intended here. In the former, the major concern is the provision of general information, especially to new entrants to the labour market (or to unemployed jobseekers). Job matching is a major focus. The latter refers to a career-building support system that focuses on skills deepening so that individuals can use skills as their scaffolding for advancement and mobility across occupations that make use of similar skills. A good example is the way the concept of career is included as a building block in Singapore's SkillsFuture Policy and its Industry Transformation Policy.[14]

   To support career building, another tool, known as the Skills Framework (a detailed occupational skills referencing system), links specific functions, roles, tasks, qualifications and training to specific occupations.[15] As well as identifying the needed skills base, it reminds employers and other stakeholders that when the skills content of jobs goes up, so will the value of the jobs. Unlike other national qualifications systems that tend to be used as a training and recognition system, the Skills Framework focuses on career building and mobility through skills building. From an individual's perspective, the career approach appears to be a supply-side tool. When promoted in conjunction with other public policies (such as the Industry Transformation Policy in Singapore),

13 More details can be found at www.mti.gov.sg/MTIInsights/Pages/ITM.aspx.

14 For the SkillsFuture Policy, please see www.skillsfuture.sg/ (accessed 5 July 2017).

15 See an example at www.skillsfuture.sg/skills-framework/ for the hotel and accommodation services sector. The Skills Framework does not only support training relevant to the career paths identified, it also carries the typical salary ranges for the different jobs in the career maps.

the Skills Framework becomes a powerful tool to encourage employers to focus on the skills base that the organization has, its work design and its impact on business performance.

3. **Skills policy to promote skill standards or professionalization.** There are a number of ways to promote standards within jobs and occupations. For example, a comprehensive competency-based qualifications framework would cover the majority of jobs in an economy. The lesson to learn is to avoid the minimum threshold approach, which may promote standards but not necessarily high skills or skills utilization. To adopt the competency route, it is also important to consider the previous point – combining the concept of career with a series of competencies. The alternative is to promote "license to practise", especially for technical jobs. However, licence to practice may not cover many jobs in an economy. It would seem possible to have a mixed approach when dealing with different industries. Also, irrespective of which approach is taken, skills policy tends to work better when embedded in a sector policy environment to avoid exit options (thus creating a level playing field) (van Klaveren and Voss-Dahm, 2011).

4. **Policy to promote business excellence or high-performance working.** This refers to policy that promotes best practices in the running of organizations. In the case of business excellence, many of the models focus on business performance via processes, monitoring and compliance (quality standards). They may or may not promote skills intensity and skills utilization. They tend to define a particular outcome, which may be linked to skill levels and skills utilization. High-performance working via the promotion of mutual gains and discretionary effort is often an effective model to increase skills utilization, as demonstrated by the businesses given "best employer" (or "best place to work") awards in countries where such recognition is promoted.[16]

   The drawback of high-performance working is that there are no set templates for practices that lead to mutual gains and discretionary effort. It is contextual to the specific environment and individual factors of the companies. For example, in a low-pay sector, there may be little room to demonstrate mutual gains through pay. Instead, such practices as job autonomy and non-pay benefits can increase employees' commitment and discretionary effort because they are seen as non-pay mutual gains. Unlike qualifications or standards, high-performance working is hard to promote via public policy, as demonstrated by the experience in the United Kingdom, which had little impact.[17] Business excellence and high-performance working models may succeed where there is a clear business model that leverages skills. For example, if a business excellence model works with an outsourcing strategy to impact a simple headcount-to-output productivity ratio, then the impact on skills utilization will tend to be marginal

16 See Sung and Ashton (2005) for examples in the United Kingdom.

17 High-performance working was promoted by the Department of Trade and Industry and the United Kingdom's Commission for Employment and Skills in the 2000s. While it was difficult to formulate policy around high-performance working, the policy lesson in the United Kingdom demonstrated that persuasion was a weak form of policy engagement. The main problem was that employers were unfamiliar with the concept and tended to stay with what they knew. The result was negligible.

or uncertain. But if the strategy targets growth that is based upon innovation, then the skills utilization impact can be significant. The learning point here is that to promote best practices is an incomplete policy exercise. Best practices need to be embedded in a particular business model (especially a high-skill model) for it to work.

5. **Promoting innovation-oriented enterprises.** As demonstrated by the Tekes programme in Finland, promoting innovative enterprises is an excellent way to create high-skill jobs and enhance skills utilization.[18] The challenge tends to be less with the efficacy of the idea or getting businesses to give it a try. The bigger challenge is changing policy-makers' conventional mindset. Imagine if a skills policy is no longer about creating training places or qualifications – many policy-makers then may feel that there is no skills policy at all. Also, in many countries, skills policy is expected within the domain of the education ministry, which needs to demonstrate the throughput in education terms at the very least. For any policy institution, switching to work closely with businesses is a huge challenge in thinking and practice, especially for those whose functions are mostly about education. The implication is that institutional reform may be required if skills intensity and skills utilization are to be addressed. As with Tekes in Finland, governments that are interested in raising skills intensity and utilization may have to set up a new body so that the education ministry can continue to look after adult education in general.

Conclusion

The Asia-Pacific region is characterized by substantial progress and growth, but it also grapples with the significant challenge of uneven progress and growing inequalities. While the skills factor has had an important role in the previous stages of growth, the new challenges for skills must relate to improving the inclusiveness of society.

If skills development is to continue impacting societies in the region, the role of skills must go beyond job creation and relying on increasing educational throughput. In other words, continuing to compete in the same low-skill sector and using the same old business models may do little to deliver the inclusive society agenda. In this respect, job quality should also receive increasing policy attention in the future because low-quality jobs are often also low skill and low value.

Improving skills utilization requires skills to be considered from the demand-side perspective because the traditional (supply-driven) skills policy is limited in terms of its ability to link skills to business operations. This recognition also means that policy-making needs to broaden the scope of existing skills policy and explore new territories, such as sector-based policies, enterprise support for new business models and supporting (career-based) skills deepening and jobs with quality.

18 J. Sung: *Business models, skills intensity and job quality for an inclusive society,* ILO Working Paper, Bangkok, forthcoming.

The recognition of the importance of skills intensity and utilization also changes the ways that employers are engaged. In the past, it was the supply side of skills that attempted to reach out to and signal employers that skills or a high level of skills were available. The demand perspective of skills treats the demand of businesses as also driving and shaping supply policy. It is here that skills policy may create a greater level of engagement because policy is gaining a useful perspective (or at least having a greater understanding) about business needs.

The public investment perspective must address its impact. Such investment is likely to be wasted if employers are slow to take advantage of the increased levels of skill supply, which can lead to widespread skills mismatch. Skills policy needs to recognize that work processes, technology and management practices can be slow to respond because the existing way of working seems to function for businesses (an attractive inertia). As a result, they may stay the same until it becomes clear that the old model does not work anymore. Meanwhile, skills supply – in terms of public provision – races ahead.

The discussion in this chapter scales interesting and previously underexplored policy terrain. For progressive skills policy to work, especially in a broad agenda (such as for an inclusive society), narrowly constructed skills policies alone are unlikely to work effectively. The inclusive society agenda requires skills intensity, skills utilization and job quality to be integrated into mainstream skills policies that overcome the traditional division between education, skills and business strategy. While this is a tall order, the new policy possibilities provide an exciting opportunity for policy innovation and significant societal improvements.

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2

Managing business restructuring, employment adjustments and implications for skills in Japan

Ken Yamazaki

Abstract: To compete in the international marketplace, Japanese, European and American companies are headed in the direction of more horizontal and vertical partnerships that are based on the platform business model utilizing information and communications technology, artificial intelligence or other industrial technologies. In doing so, companies at the core of a network of horizontal and vertical partnerships will require both coordination ability and specialized vocational ability. In the workflow analyses and restructuring of business processes, work will be divided into that which continues to be carried out in-house and that which is outsourced. The ability to identify problems and to coordinate with others will be necessary for what remains in-house.

This chapter analyses how Japanese companies should respond to these big trends and developments. It responds to several questions: What levels of coordination ability and specialized vocational ability will be required of workers in companies that pursue a strategy as the core of a horizontal and vertical partnership network? And, is it possible to eliminate non-core work while maintaining a horizontal hierarchy in the first place? Furthermore, how should the necessary skills development and its evaluation procedures be designed? The chapter draws policy implications for skills and human resources development as a means of boosting competitiveness.

Introduction

When professional skills improve, working conditions tend to improve as well. This is typically the expectation in an apprenticeship system as apprentices become masters and in companies as rank-and-file employees become team leaders and then managers. This career ladder is said to be closely related to the improvement of vocational skills, wages or salaries and other working conditions. The improvement of vocational skills is necessary for rising up the career ladder. But it alone may not be sufficient. Bargaining power, for instance, is necessary to raise wages. Power relationships between employers and employees, self-employed persons and independent contractors, the market and primary contractors are not equal.

Due to the transactional relationships between contractors and subcontractors and among companies, the working conditions of workers employed at weak companies decline in correlation to their weak position. The necessary and sufficient conditions for establishing a career ladder are improvement of vocational skills, underpinned by equal labour-management relations and a social consensus that improved vocational skills should be reflected in better working conditions. In this arena, stakeholders go beyond the industrial relations actors (labour unions and employers) to include the government, local communities, vocational training institutions, schools and international organizations, such as the International Labour Organization (ILO), which works to balance the interests of all actors.

Although new vocational skills will be required for workers to keep pace with the progress of technologies, such as artificial intelligence (AI) and the Internet of things, improving skills alone will no longer be sufficient to improve working conditions and climb a career ladder. Along with understanding technical innovations, it will be necessary to understand the structure of the business model utilizing those innovations for connecting skills and raising wages. Additionally, the balance of interests among stakeholders will need to be restructured, based on this new understanding.

This chapter clarifies the structure of the business model and presents a solution for improving work environments. Drawing on the global company context, and specifically in Japan, the chapter begins with discussion of a business model based on networks of multiple companies and individuals associated with any AI-based or Internet of things-based business. It ends with suggestions on the necessary and sufficient conditions for the formation of skills and a career ladder.

2.1 Progress of network-based business models and issues regarding vocational training

From a micro-level viewpoint, AI and the Internet of things will bring about significant changes in the way each worker performs tasks.[19] AI and the Internet of things, however, do not operate in a vacuum but as part of a business model that utilizes them, and this must be viewed from a macro perspective, which this chapter does in relation to human resources management and vocational training in Japanese companies.

AI and the Internet of things are used to make networks of multiple companies and individuals function as a single organism. Its precursor can be seen in the business models of automakers and steel and machine tool manufacturers, which swept the European and United States markets in the 1980s. Located at the centre of a network is a company that formulates overall strategy and encourages collaboration. In a horizontal direction, companies handling research and development (R&D), sales and logistics participate as partners. In a vertical direction, suppliers participate in the role of secondary and tertiary subcontractors. Fixed-term and contract workers act as buffers to economic fluctuations.

This network aims to realize efficient and effective R&D, based on the improvement of

19 Analysis by Katja et al. (2017) found that the majority of human jobs can be replaced by technology. Frey and Osborne (2013) estimated that 49 per cent of the Japanese workforce could be replaced by AI or robots. Acemoglu and Restrepo (2016) stressed that technology can lead not only to the replacement of workers but also to the creation of new jobs.

quality and productivity, reduction of costs and the accurate grasp of customers' needs. Because the manufacturing industry requires a comparatively long R&D period and complicated manufacturing processes, core companies continue to cooperate with other companies and individuals in the network over the long term. The key to competitiveness is to work closely together as if the network is one organism.

Japanese companies achieved this collaboration through "human networks" – a characteristic of Japanese-style business management. These are built on the promotion of long-term professional competence and learning about the organization, a compensation system that encourages long-term employment and the promotion of communication among employees and departments through labour-management relations and intra-company communication. Skills training, however, consists primarily of in-house training.

"Skills" in this context covers: (i) the ability to execute specific and narrowly defined tasks related to a job (task-oriented skills); and (ii) the ability to perform collaborative work or projects for building and coordinating inter- and intra-company networks, for planning strategies or for controlling progress (talent-oriented skills). The task-oriented skills are for executing jobs that are relatively narrow and limited. Employers evaluate those skills based on job descriptions. Talent-oriented skills have much broader meaning, acquiring multi-task capacity, business administration, coaching, training, organizational development, awareness of reasonable business processes, team building, encouraging other employees and so on. The evaluation of skills is based on a management by objective.

These features are limited, however, to the company at the core of the network and companies that have equal partner relationships with that company. Companies that are involved in subcontracting in the network cannot afford to fund vocational training for employees. As a result, there is a disparity in the capabilities of human resources between the primary contractor and subcontractors. Even if there is no difference in human resource capabilities, subcontractors are generally inferior to the original companies in terms of labour conditions because their role in the network relates to cost reduction.

Fixed-term and contract workers are in the most disadvantaged position in the network in terms of improving careers and working conditions through skills training, regardless of whether they are in the core companies or not. Contract workers thus are excluded from social safety net protections, such as health insurance, pension and unemployment insurance. A network that includes such disparities among workers has been viewed as a precondition for continued international competitiveness. In this environment, the role of government-funded vocational training has only been to satisfy demand from subcontractors and unemployed persons as a supplement to in-house training conducted by companies at the core of the network. This has been the general picture, at least up to now.

Germany's Industry 4.0 emerged as a paradigm for collaboration through mutual communication in person substituting for information and communications technology (ICT) and the Internet of things. In Japan, companies have also undergone a transformation that incorporates advances in science and technology, such as AI and the Internet of things, into their own networks. Industry 4.0 and the networks of Japanese companies have both developed in the context of the manufacturing industry.

A business model based on a network of multiple companies and individuals is growing more prevalent outside the manufacturing industry, mainly in the IT industry. This is known as “platform business”. While the manufacturing industry requires long-term R&D and the integration of information among related companies, the IT industry repeats the cycle of formation and disassembly of networks in a shorter period than the manufacturing industry. Relationships between users and providers of a service are established with Internet terminals, such as smartphones, as an intermediary.

At the core is a company that draws up strategies and connects with other companies and individuals belonging to the network. For example, in the case of taxi services or home care services, the relationship between the user and the service provider in the network will be dissolved within a few minutes to several hours. This is precisely why businesses that do not generate short-term profits are outsourced one after another.[20] Departments known as “cost centres”, such as accounting, payroll calculation, manufacturing assembly, warehouse management and delivery, fall into this category.

Structurally speaking, this outsourcing has the same role as subcontractors in the networks of Japanese companies. Workers responsible for outsourced work occupy the lowest position in the network. In the case of Japanese companies, networks must be maintained for a long period of time. Even on the lowest level of the network, the disparity with the upper level in terms of working conditions will not widen more than necessary. In the case of a platform business, the more short-term and transient the relationship between the service provider and the user is, the less consistent the combination of outsourced labour providers will be. Subcontractors will constantly change if this leads to significant cost reductions. In other words, for the company at the core of the network, there is negligible reason to consider the vocational training and labour conditions of workers employed by outsourcing workers or contractors.

An indication that AI incorporates a network-type business model and outsourcing emerged in Wee et al. (2016), which offered procedures for the introduction of AI into enterprises. They outlined five approaches: (i) limitations on which parts of a business incorporate automation technologies; (ii) solidification of in-house technological infrastructure; (iii) clear division of what should be done in-house and what should be outsourced to other businesses; (iv) establishment of specialized teams; and (v) exploration of new business models.

20 OECD (2016) and Arntz, Gregory and Zierahn (2016) pointed out that technology may take over only part of the work one person is responsible for rather than all of it. They divided duties into those that can be taken over and those that cannot and postulated an analytical framework in which a job is considered replaceable when 70 per cent or more of duties can be taken over. Within this framework, the majority of jobs are not considered replaceable.

While outsourcing is referenced in the third approach, it is not used to introduce AI. Bernhardt (2016) pointed out the utilization of outsourcing in networks: While it is said that the expansion of a platform business brings about an increase in independent workers, in reality, a number of relationships between primary contractors and subcontractors are growing via outsourcing.

Both the network-based business model in the German and Japanese manufacturing industries and the platform business model founded in the IT industry in the United States encompass expansion of the contractor and subcontractor relationships. The network-based business model uses technologies like AI or the Internet of things for making inter- and intra-company networks. In these situations, technologies expand the relationship between contractors and subcontractors.

Assuming that such business models are growing more prevalent, the issues and implications relating to vocational training and the building of worker competencies can be arranged as follows:

- Tasks related to a job (task-oriented skills) are outsourced.
- For subcontractors responsible for outsourced work, there are practically no jobs requiring a high skill level.
- Even if a worker employed as a subcontractor or engaging in outsourced work boosts their skill level, they will not obtain the working conditions that match those skills due to the structural problem of the subcontractor's relationship in the network through the contractor.

These are key challenges related to outsourcing. Table 2.1 outlines these issues with the addition of vocational training for workers employed by the company at the core of the network.

Table 2.1: Worker management in network-based business models

Management pattern	Vocational training by business model		
	Japanese model	Industry 4.0 model	Platform model
1. Employees of companies at the core of networks and partner companies that are in a horizontal partnership (task- and talent-oriented skills)	Provided by the company	Provided by the company	Provided by the company or by external training providers
2. Employees with expertise that is needed continuously for business activities (task-oriented high skills)	Provided by the company	Provided by the company and external training providers	Provided by the company or by external training providers
3. Employees with expertise that is needed for business activities in the short term (task-oriented low skills)	Provided by the company or self-taught	Provided by public vocational training at workers' own initiative	Self-taught
4. Employees of subcontractors carrying out outsourced work (task-oriented low skills)	Provided by subcontractors or self-taught	Provided by public vocational training at workers' own initiative	Self-taught
5. Subcontracted workers carrying out unskilled labour (task-oriented low skills)	Self-taught	Provided by public vocational training at workers' own initiative	Self-taught

Source: Author.

For items 1 and 2 (table 2.1), it is evident that regardless of which model, the vocational training of employees is carried out primarily in-house in companies at the core of networks and in companies that have equal partnership with that company. The required skills are those related to the network-based business model, such as strategy planning and network construction.

But why do they depend on skills training within the company? This question is examined in the next section, based on the results of a survey conducted by the Japan Institute for Labour Policy and Training. It classifies the human resources management-based competitiveness of Japanese companies in four areas: training, jobs, compensation and participation.

Training is conducted so that workers can acquire the necessary knowledge and skills and, at the same time, adapts workers as members of the company. Next, jobs foster collaboration among employees through reassignment, job rotation and work requiring multiple skills and encompass a range of duties. Compensation links promotions and job duties with wages. And participation involves workers through meetings, problem-solving, labour-management discussions and so forth. Connecting these elements leads to the cultivation of workers' knowledge and skills, increased adaptability to job duties and company activities and improved motivation (figure 2.1).

Figure 2.1: Model of competitiveness through human resources management in Japanese companies

Training	Jobs	Compensation	Participation
• In-house • On-the-job training • Off-the-job training • Multi-skill development training	• Broadly defined job categories • Reassignment • Rotation	• Basic wages • Bonuses • Promotions	• Communication - meetings - problem-solving approach • Labour- management relations - Collective bargaining - Labour- management negotiations
• Knowledge & skills • Adaptability		• Adaptability • Motivation	• Knowledge & skills • Adaptability • Motivation

Source: Based on Nikkeiren (The Japan Federation of Employers' Association) International Policy Committee, 1991, p. 63.

In Japanese companies, skills used to execute specific and narrowly defined tasks related to the job (task-oriented skills) and those used to perform jobs by utilizing contextual and often non-cognitive learned ability (talent-oriented jobs) are cultivated in parallel in the four areas of training, jobs, compensation and participation. This approach is linked with the improvement of working conditions. However, not all Japanese companies are equipped with such mechanisms; rather, they are unique to companies with sufficient resources. In relationships between contractors and subcontractors and due to inadequate human resources systems, it is difficult for subcontractors to cultivate workers' latent or potential ability for talent-oriented jobs, even if they are able to cultivate the skills required for task-oriented jobs.

2.2 Japanese companies' networks and compatibility with the social consensus

Japanese company networks

Aoki (2001) remarked that the source of Japanese companies' international competitiveness lies in an organizational structure characterized by "horizontal hierarchy". In contrast, the international competitiveness of United States companies is based on "decentralized hierarchy".

In horizontal hierarchy, development and production are controlled by synchronizing and sharing information and having employees make joint decisions, which requires these employees to exercise "coordination ability". Notable examples of this kind of hierarchy are the Japanese automobile and machine tool industries.

In a decentralized hierarchy, results are produced by individuals or departments with specialized competencies competing within the company. This organization structure has become an engine of international competitiveness within the IT industry.

Japanese companies characterized by horizontal hierarchy are connected horizontally with R&D partners and sales companies and vertically with second-tier and third-tier subcontractors responsible for parts manufacturing and logistics. In manufacturing divisions, in addition to regular employees, there are temporary employees whose number can be increased or decreased according to economic fluctuations. These connections are defined for the purpose of this chapter as horizontal and vertical partnerships. The competitiveness of Japanese companies is based on this horizontal hierarchy with its horizontal and vertical partnerships. Thus, coordination ability is regarded as the most vital professional competency for a company at the centre of the horizontal and vertical partnerships, and training to foster broader knowledge and skills (talent-oriented skills) is carried out exclusively within the company.

Because it is difficult for second- and third-tier subcontractors in a vertical partnership to conduct vocational training independently, they have relied on industry organizations, private vocational training institutions and the like. With this structure, there are hierarchies in terms of supply chains and social standing in Japan, with two separate layers in which wages are low and capital investment and R&D funding are insufficient among the small and mid-sized subcontractors, compared with the contractors that outsource work to them.[21]

Specifically, even if subcontractors are able to cultivate the skills required for task-oriented jobs, it is difficult for them to cultivate workers' broad and in-depth knowledge and skills learned from the experience used for talent-oriented jobs. This is because subcontractors do not have the resources to carry out management that is based on the four areas of training, jobs, compensation and participation described in figure 2.1.

21 The *Economic White Paper* (1957) noted, "In Japan's employment structure, on one side there are large, modern enterprises, and on the opposing side are small businesses, family businesses and agriculture where pre-modern labour relations remain the norm, while enterprises in the middle of the spectrum make up a very small portion of the economy." According to the *White Paper on Small and Medium Enterprises in Japan* (2005), "In recent years, the widening disparity in household income levels is not caused by the above-described size differences between small and medium enterprises and large enterprises, and in that sense, the situation today differs from that of the past." Neither paper raised the development of horizontal and vertical partnerships as a key point.

Spreading of horizontal and vertical partnerships

Japanese companies boosted their international competitiveness in the 1980s, particularly in the fields of automobiles and machine tools. Companies in Western nations gradually caught up with them, with regard to the horizontal and vertical partnerships and the synchronization of information that Japan's competitive edge was based on. However, Western companies' practices differ somewhat from those of their Japanese counterparts. Hence, the approach to cultivating vocational ability is different from that prevailing in Japan. Specifically, Western enterprises build horizontal and vertical partnerships while maintaining a decentralized-hierarchy organization in which workers and departments with specialized competencies compete with one another. The Industry 4.0 paradigm in Germany is such an example.

Industry 4.0 places companies that assemble final products at the top of the pyramid, while ICT, AI and big data are utilized in horizontal partnerships with companies responsible for product design, distribution and sales and in vertical partnerships with subcontractors responsible for parts manufacturing.

In addition to the German Industry 4.0, there are an increasing number of corporate groups using horizontal and vertical partnerships in the United States. Table 2.2 presents a summary of survey results with American employers conducted from 2013 to 2015.

The surveyed companies had close partnerships with other companies in both the horizontal and vertical directions. Corporate strategy, planning, R&D, sales, process management, manufacturing and assembly all involved not only collaborating across departments within a company but also cooperating with partners outside the company on a project-by-project basis. This primarily applied to business-to-business companies, for which partnerships take a leading role in organizing projects.

Within individual companies, there are (i) permanent employees engaged in core tasks who can have an active role globally with specialized expertise and are encouraged to acquire extensive knowledge and experience through work in multiple departments; (ii) employees who continuously build the expertise required for their business activities; (iii) permanent employees supporting the first and second types of employees without change in department or region; (iv) temporary employees hired as needed in response to an uncertain business environment; and (v) limited-term contract workers for pilot projects.

Between organizations there are (vi) acquisition and sale via mergers and acquisitions (vertical partnership); (vii) partner companies related to R&D, etc.; and (viii) outsourcing utilizing staffing companies. Employees with specialized expertise stay within the company on a long-term basis unless there is a change in the company's core business. Otherwise, their tasks are outsourced, as in types iv–viii.

Table 2.2: Model of worker management in horizontal and vertical partnerships

	Management pattern	Period
Within the company	1. Permanent employees engaged in core tasks who can take an active role globally with specialized expertise and are encouraged to acquire extensive knowledge and experience through work in multiple departments	Long term
	2. Employees who continuously build the expertise required for their business activities	Long term
	3. Permanent employees supporting the first and second types of employees without change in department or region	Long term
	4. Temporary employees hired as needed in response to an uncertain business environment	Short term
	5. Limited-term contract workers for implementation of pilot projects	Short term
	6. Acquisition and sale via mergers and acquisitions (vertical partnership)	Short term
Outside the company	7. Partner companies related to research and development, etc. (horizontal partnership)	Depends on business environment
	8. Outsourcing utilizing staffing companies (vertical partnership)	Depends on business environment

Source: Author.

In the network-based business model, companies that are in a horizontal partnership evaluate employees on a range of duties. Personnel changes entail great diversity of duties, experience, potential, teamwork and leadership, on the basis of long-term employment. These companies provide sufficient basic education, training fundamentals and generous employee benefits.

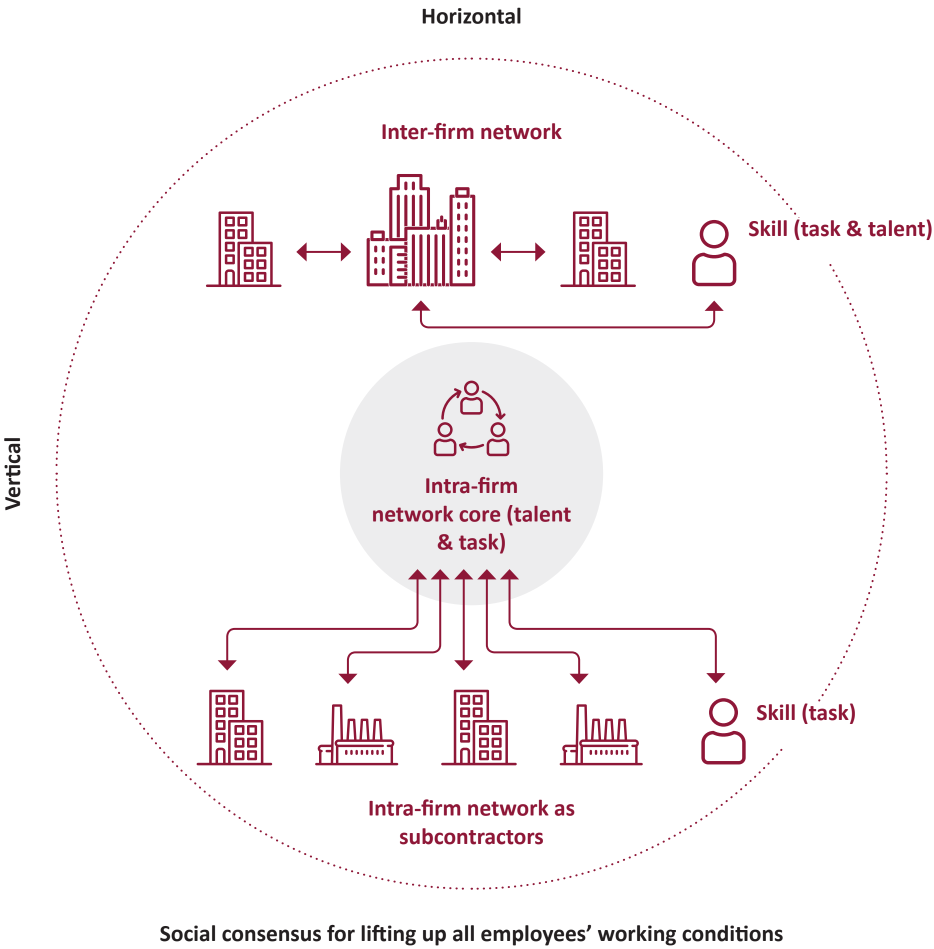
Horizontal and vertical partnerships are also a feature of the platform model currently developing, spearheaded by the American IT industry. The horizontal partnerships are among partner companies and the vertical partnerships are with the users and providers of the service, for the reason that users and providers do not have the right to decide on pricing and the provider of the service not only pays the expenses necessary for the work but also, in some cases, is forced to purchase goods and services in a manner specified by the company that operates the digital platform.

Decline of the consensus-oriented network-based business model

As previously noted, the network-based business model and the cultivation of employees of core companies and their partner companies primarily takes place in-house. This is because the most important skills in this business model are strategic planning and the ability to build networks. But how can the issues related to working conditions be dealt with through the cultivation of vocational skills of workers at the lower or outer edges of the network?

Japanese corporate networks, as noted, have innately been related to the two separate layers of the economy: the unequal relationships between subcontractors and the hierarchical social structure. In the absence of social consensus, workers in subcontracting companies have few opportunities to improve their working conditions and vocational skills, compared with their counterparts in primary contractors. Primary contractors employ more than 1,000 employees and often have company-specific labour unions. Subcontractors are small in terms of number of employees, and most of them are not organized in labour unions. A characteristic of Japanese labour-management relations is that labour unions within large, primary contractor enterprises cooperate with corporate management and also contribute to maximizing the efficiency of Japanese company networks.

Figure 2.2: Network-based business models before the 1980s



Source: Author.

The reason that labour unions, which ought to promote improved working conditions for all workers and not only union members, tolerate an economy with two separate layers lies in the Japanese social consensus as embodied by the Three Principles of Productivity Movement: (i) job security and expansion of employment; (ii) cooperation of labour and management through joint consultation; and (iii) fair distribution of the fruits of productivity.

The limitations of the Three Principles of Productivity Movement started to become evident after the 1985 Plaza Accord, when the Japanese yen appreciated against the dollar. The main reasons for this were the overseas expansion of Japanese companies and the long-term economic downturn from the 1990s to the 2000s. Such industries as motor vehicles, steel and machine tools, which led the resurgence of the Japanese economy, moved production bases from Japan to its largest trading partner, the United States, in the 1980s due to the stronger yen. This enabled companies to manufacture products and expand market share without relying on the cooperation of labour unions in Japan. In other words, the road was paved for Japanese companies to withdraw from the social consensus underpinning the Three Principles of Productivity Movement. Then, due to the persistent stagnation of the Japanese economy that began in the 1990s, Japanese companies actually began departing from this social consensus.

In this period, such catchphrases as “labour conditions are commensurate with the financial strength of each individual company” and “the era of equality is over” became commonplace. Both assertions were made by corporate management. At the same time, company-specific labour unions in industries that propelled the Japanese economy, such as motor vehicles, steel and machine tools, strove for positive industrial relations. In short, individual companies’ business concerns took priority over the social consensus.[22] And with it, there was growing acceptance that there would be a widening gap between the labour conditions of workers with and without the skills to carry out talent-oriented jobs.

The Three Principles of Productivity Movement involved an unspoken consensus on improving quality of life for workers and their families on the lower rungs of Japanese company networks, which are inherently hierarchical due to the contractor-subcontractor relationships. When individual companies’ business interests took priority over the social consensus, maximizing the organizational efficiency of companies in the upper layers of the hierarchy came to be prioritized throughout the network. Thus, companies lower in the hierarchy were relegated to the role of adjustment valves to cope with cost reductions at companies higher in the hierarchy and changes in the business environment. Framing this in terms of the relationship between vocational skills and improvement in working conditions, workers who had a role in maximizing organizational efficiency for companies in the upper layers of the network did not see that the heightening of their vocational skills led to any improvement of their working conditions.[23]

22 These circumstances are discussed in detail in Yamazaki, 2014.

23 Here, “vocational skills” refers to those used for specific task-oriented jobs, which are specialized but relatively limited and narrow in scope.

Corporate networks consisting of horizontal and vertical alliances propelled the competitiveness of Japanese companies, and the model continues to expand to global companies, including those based in Germany and the United States. Today, the companies and individuals that make up these networks are connected across national borders. Under these circumstances and without a social consensus like the Three Principles of Productivity Movement, only workers employed by companies located in the upper reaches of networks are given preferential treatment. It is not possible to improve the standard of living for other workers and their families. Workers at companies on the upper levels of networks have the skills to execute both task-oriented and talent-oriented jobs. Workers at other companies can cultivate the skills to perform task-oriented jobs, but they have no opportunity to acquire the skills to perform talent-oriented jobs and thereby improve their working conditions.

Today, with the advancement of economic globalization, these problems are inescapable in any country. As networks are formed on a global scale, such as through international outsourcing, it is clear that even if there was a social consensus in an individual country, as in the past, it would not be sufficient. A network-based business model is characterized by companies and individuals forming alliances for specific projects. Although the length of the project depends on the characteristics of industries and business models, the manufacturing and pharmaceutical industries generally have relatively long-term projects due to lengthy R&D stages and complex manufacturing processes, while the tech industry has shorter-term projects due to a competitive market environment and highly advanced technologies.

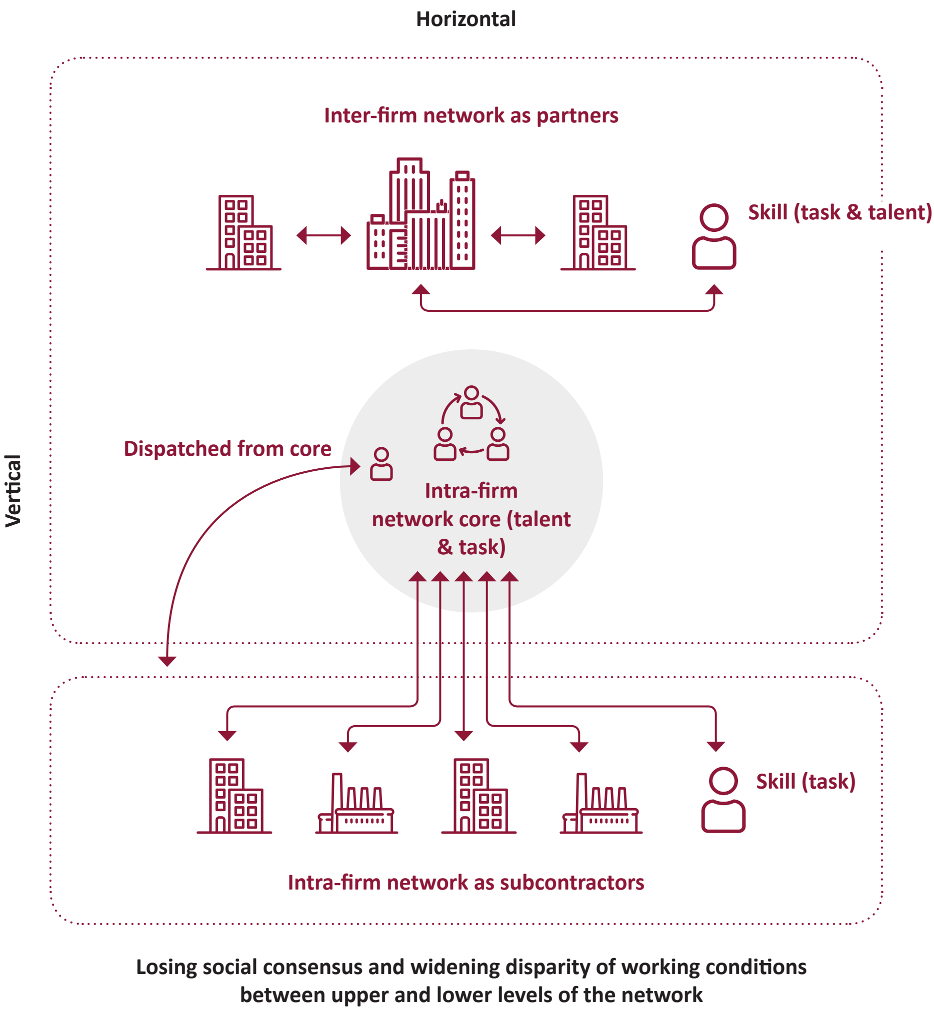
This ought to mean a relatively stable network-based business model in Japan and Germany, which have largely manufacturing-based economies. But as advancing globalization and intensifying market competition leads to the emergence of global-scale networks involving companies and individuals in multiple countries, any social consensus cultivated within one country becomes invalidated.

In Japan’s manufacturing industry, not all of the social consensus has evaporated. A stable framework is maintained within the country, but its survival is seriously threatened. In the United States, with a tech industry-based economy, not only are project periods as short as a few months, projects entail global-scale networks in which it is difficult to form a social consensus.

In every country, such industries as services, retail, fashion and fast food have a low level of social consensus that links skills upgrading to the improvement of working conditions. It has historically been difficult to achieve this because labour costs drive competitiveness in these industries.

So, what kind of social consensus is required to link the improvement of vocational skills used for task-oriented jobs with improvements in working conditions?

Figure 2.3: Network-based business models after the 1980s



Source: Author.

2.3 Towards formation of social consensus at the global level

Discussions on the future of work tend to revolve around how to automate work that human beings have carried out thus far, through the progress of science and technology, such as AI, or how workers can acquire IT literacy. While not denying the importance of these aspects, it is clear that science and technology (such as AI) cannot function without a network-based business model. In such a model, as previously explained, there is a vertical hierarchy with the core companies and their equal business partner companies at the top and subcontractors below them. To build such a framework requires expertise in AI, the Internet of things, ICT and big data. Even more important, however, is to devise business processes that leverage the network for competitiveness and to effectively implement these business processes and cultivate human resources with the coordination abilities to connect multiple companies and individuals constituting the network as if they were one organism.

As employees build experience in specific industries and business situations, their skills for talent-oriented jobs are cultivated within their company over the long term, as discussed in the previous section. Task-oriented jobs are outsourced to reduce costs. Because these abilities improve as workers engage in specific industries and business categories, they have been harboured in-house over the long term.

As well, parts of a company are outsourced when doing so leads to cost reductions. This results in changes to the way workers have performed duties thus far. They either switch to a job category that requires such skills as strategy planning and coordination or they continue to work as usual but are transferred to a subcontractor or become independent workers. If their section is recognized as a "cost centre", workers engaged in that section are positioned at the bottom of the network with the least desirable working conditions. No matter how much expertise and training their jobs require, their working conditions will not be commensurate with their skill level. This is because working conditions are determined by degree of importance in the network rather than by skill level.

Thus, to link increases in skill level and improvement of working conditions in the network-based business model, it is necessary to establish certain restrictions on the structure of companies and individuals constituting the network and in the society outside the network. In other words, it is necessary to establish a social consensus that makes economic activities sustainable. More specifically, regulatory interventions governing intercompany transactions must be considered. Employer responsibility for companies at the core of the network that covers workers throughout the entire network must be introduced.

An inherent problem of the network-based business model is the dysfunction of the so-called career ladder, in which work conditions improve in conjunction with skill level acquired by vocational training. Also, because outsourced work is intended to reduce costs, much of it does not require advanced skills. It actually denies the existence of the career ladder.

To summarize, the network-based business model is implied to make the career ladder dysfunctional for workers located lower in the network and to deny the existence of the career ladder altogether. This means that vocational training will not be successful unless its premise is to create and maintain a career ladder that can be enjoyed by all workers involved in the network-based business model. Workers at the core of the network not only have their career ladder maintained but also do not need public support, such as external training, because most aspects of vocational training are conducted within the company.

The Japanese corporate networks that were a precursor of Industry 4.0 and the platform business model also featured disparities in working conditions between primary contractors and subcontracting companies.

So, why was the business model maintained for such a long time and why did it continue to be globally competitive? It was largely due to the social consensus among the Government, management and labour unions. It was tied to achievement of productivity improvements across the national economy through maintenance and expansion of employment, cooperation and consultation between labour and management and the fair distribution of results. The fruits of improved productivity were not only enjoyed by managers and labour unions in cooperative relationships but were also distributed to the population as a whole by adding workers and consumers outside the manufacturing industry. This social consensus was maintained as long as economic growth continued and improved the labour conditions of workers in subcontractor companies as well as in the core enterprises. Its role was to raise workers' standard of living to a decent level, even if there were differences in the skill levels and roles required of workers. It was to recognize, as a social consensus, the existence of a career ladder that elevates working conditions through vocational training.

There are career ladders in contractors that take into account both skills for task-oriented jobs (assigned jobs that are narrowly defined and limited) and talent-oriented jobs (in which workers are expected to demonstrate their latent or potential abilities). With subcontractors, the career ladder is largely based on skills for task-oriented jobs. Historically, the social consensus served to improve working conditions through both career ladders. As a result, even if there were certain disparities between contractors and subcontractors, the labour conditions of workers employed by both could be improved. But when this social consensus began to fade from view as Japan entered the long-term recession beginning in 1991, only the career ladders of workers employed by primary contractors were considered important.

There is much to learn from the social consensus underlying the productivity movement that Japanese society has experienced so far. The inherent problems are common not only to Japanese companies but also to the Industry 4.0 and platform business models. Today, with networks deployed not only within countries but on a global scale and outsourcing taking place across borders, a social consensus must also cross borders. Under these circumstances, it is desirable that participating actors include regional representatives that counterbalance the global business model, in addition to management, labour and consumers. As coordinators, international organizations, such as the ILO, the World Bank and the Organisation for Economic Co-operation and Development (OECD), have a tremendously important role.

The reason industrial relations systems enjoyed sufficient social consensus in Japan in the past is that workers resisted top prioritization of corporate profits through participation by all workers in the labour movement. The labour movement was one factor that produced social consensus. But the cross-border competition among global companies makes it difficult for this social consensus to survive. Global enterprises compete by maximizing the organizational efficiency of networks involving multiple companies and individuals. This process is founded on technological innovations, such as ICT, the Internet of things, big data and AI. But in these networks, workers on the lower levels are in a state in which improvement of vocational skills is not correlated with improvement in working conditions. For workers to lead decent lives, it is necessary to revive correlations between workers' vocational skills and working conditions through a social consensus within the global corporate networks.

Formation of a social consensus at the global level faces the challenges of numerous and diverse actors and global companies' emphasis on competition. But it is not impossible. A precedent emerged from the International Transport Forum Summit in Leipzig, Germany (31 May to 2 June 2017). The forum is an organization related to the OECD, with 57 members. In Leipzig, the application of automated driving to commercial trucking was discussed: Half of inter-city transport in Europe and the United States could be automated as soon as 2021, which would mean an estimated two million truck drivers lose their jobs and a 20 per cent reduction in lifelong wages in these regions.

Alarmed, the International Transport Workers Federation and business organizations involved in truck transport created a framework of labour unions, business organizations and governments of member countries to formulate a protective response that encompasses: (i) establishment of a transitional advisory committee; (ii) introduction of an authorization system for automated trucks; (iii) establishment of international standards; and (iv) encouragement of various experimentation. These measures can be called the start of the process of a social consensus formation for a "soft landing", thus protecting the livelihoods of workers whose jobs are at risk by slowing down the introduction of technological innovation.

A similar formation of a social consensus is also required in the field of vocational skills. The value of the talent-oriented skills is now increasing while the value of the task-oriented skills is decreasing. Therefore, a career ladder based on the increased vocational skills level and corresponding wage increase is collapsing. There is a need, in some respects, for discussion of workers' acquisition of vocational skills to respond to technological innovations, such as AI, the Internet of things, ICT and big data. But what is even more important is encouraging the kind of business model through which technological innovations, such as AI, the Internet of things, ICT and big data, are used in such a way that improvement in working conditions is commensurate with improvement of vocational skills.

When looking at the improvement of vocational skills and its link with working conditions in the business model progressing at the global level, the existence of glass ceilings at the national or individual levels can no longer be ignored.

Conclusion

This chapter features six important issues:

1. Corporate networks involving contractor-subcontractor relationships act as an obstacle to linking the improvement of vocational skills with improvements in working conditions.
2. Technological innovations, such as AI, the Internet of things, ICT and big data, are progressing at the global level through corporate networks of interlinked contractor-subcontractor relationships.
3. At the core of corporate networks that connect multiple organizations and individuals, emphasis is placed on permanent employees engaged in core tasks who can take an active role globally with specialized expertise and are encouraged to acquire extensive knowledge and experience through work in multiple departments. Workers in the lower tiers of the network, even those with a high degree of vocational skill, are primarily used to maximize organizational efficiency – to contribute to cost reduction.
4. Even when workers have vocational skills related to technological innovations, such as AI, the Internet of things, ICT and big data, if they are low in the hierarchy of the network, they see no improvement in their working conditions.
5. It is irrelevant whether the vocational skill of workers low in the network are related to technological innovation or not.
6. A social consensus at a global level is indispensable for linking the improvement of vocational skills with the improvement of working conditions. As coordinators for that purpose, international organizations, such as the ILO, the World Bank and the OECD, and labour unions have a tremendously important role.

These issues strongly emphasize the urgency of several needed amplifications. First, the actual circumstances of the business model that utilizes corporate networks must be clarified. Specifically, the status of contractor-subcontractor relationships (development of shared-service business), the disparity between vocational skills and working conditions, the actual conditions of human resources management, industrial relations and so forth at companies on the upper and lower tiers of the network on a global scale should be investigated.

Second, which vocational skills are emphasized at the core of the corporate network and which skills are primarily utilized to reduce costs must be clarified.

If these circumstances are articulated, it will be possible to explore the means of arriving at a social consensus to eliminate the negative impact of the current business model on correlation between improvement of vocational skills and improvement in working conditions. In doing so, reference should be made to how the International Transport Forum formed a consensus and how Japan's social consensus formed under the Three Principles of Productivity Movement was lost and what occurred as a result of that loss.

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3

Promoting skills, jobs and competitiveness in global value chains: policies and practices for developing countries

Karina Fernandez-Stark
Penny Bamber

Abstract: By opening up access to higher-value markets, Global Value Chain (GVC) participation has given emerging economies in Asia and the Pacific an opportunity to diversify, drive employment and raise incomes (OECD, 2012b). At the same time, these connections to the global economy serve as a conduit for the transfer of knowledge, technology and organizational management into the region. Capturing these gains from GVC trade, however, has proven challenging.

This chapter explores how a focus on GVC skills development, through the alignment of workforce development initiatives and stakeholders with international labour demands, can orient the export competitiveness of Asian countries to one based on an inclusive and productive agenda. The chapter takes on this task by discussing the role of skills development in GVC upgrading, followed by three case studies of Asian participation in GVCs to illustrate the relationship between skills development and both economic and social upgrading. Subsequently, skills strategies for GVC upgrading are presented, along with a typology of policy recommendations.

Adequately aligning workforce development initiatives and their varied stakeholders to meet the demands of the more globalized economy, however, is challenging. The skills required for GVCs tend to differ from those of the local economy. Thus, workforce development systems in countries seeking to use GVCs as a platform for economic growth must realign these towards global requirements of specific sectors. Due to the complexity of doing so, this requires contributions and coordination from numerous stakeholders in the private, public and education sectors. For success, these stakeholders need to develop a skills strategy based on the economic-upgrading paths that a country can pursue. They need to identify policy approaches related to types of skills required for that upgrading. And they need to articulate the roles of different stakeholders in addressing workforce development gaps.

Introduction

Over the past three decades, the global economy has become increasingly structured around global value chains (GVCs). Today, these account for a dominant share of international trade, global production and employment. As a result, they are fundamental in understanding the nature of work, both current and future, in export-oriented industries. Through these chains, firms, producers and workers from developed and developing countries alike have been integrated into global industries that span multiple borders. These changes began in labour-intensive sectors, such as apparel and electronics (Bair and Gereffi, 2001; Gereffi, 1994 and 1995) and were closely followed by more advanced manufacturing, agriculture and services (UNCTAD, 2013; Sturgeon, Van Biesebroeck and Gereffi, 2007).

By opening up access to higher-value markets, GVC participation has given emerging economies in Asia and the Pacific an opportunity to diversify, drive employment and raise incomes (OECD, 2012b). At the same time, these connections to the global economy serve as a conduit for the transfer of knowledge, technology and organizational management into the region. Capturing these gains from GVC trade, however, has proven challenging. This chapter explores how a focus on GVC skills development, through the alignment of workforce development initiatives and stakeholders with international labour demands, can orient the export competitiveness of Asian countries to one based on an inclusive and productive agenda.

The chapter takes on this task by discussing the role of skills development in GVC upgrading, followed by three case studies of Asian participation in GVCs to illustrate the relationship between skills development and both economic and social upgrading. Subsequently, skills strategies for GVC upgrading are presented, along with a typology of policy recommendations.

Sustainable GVC participation is of growing importance to Asia and the Pacific because the region is increasingly at the centre of many of these chains. Low-cost labour and an expanding industrial base, combined with strong local demand, are concentrating trade and production in the region in many industries (Bamber, Frederick and Gereffi, 2016b). Most countries have a presence in the apparel sector; Viet Nam has become a booming rubber exporter; Thailand hosts a growing automotive hub; the Philippines has entered the aerospace industry; the Republic of Korea has become home to one of the world's most innovative electronics firms; and three Asian countries control 95 per cent of the global shipbuilding sector (Brun and Frederick, 2017; Bamber, Frederick and Gereffi, 2016a; Sturgeon et al., 2016; Bamber and Gereffi, 2013b).

Nonetheless, despite considerable success in integrating into GVCs, much of the region's participation is based on labour-intensive production and assembly stages in low- to medium-tech manufacturing sectors (Nathan, Tewari and Sarkar, 2016; ADB, 2014).

Although there are exceptions,[24] many of the high-value segments of these chains remain in traditional bases in Europe, Japan and the United States.

Although GVCs have been leveraged as a driver of broader economic development in Asia, from the employment perspective, the positioning of the region in these chains has important implications for the quality and type of opportunities available for inclusive growth. Work in low-value chain segments is often characterized by low wages and is more susceptible to poor working conditions (Gereffi, Bamber and Fernandez-Stark, 2016). These stages are highly competitive, and there is continuous pressure on firms and their workforce to reduce costs, to guarantee quality and delivery, and to improve productivity. Experience has shown that this can lead to decent work deficits as firms compete by shifting these burdens onto workers, resorting to such labour strategies as the use of temporary labour, lowering wages, extending working hours, labour subcontracting and minimizing investments in areas of health and safety to get ahead. At the same time, rapid technological advances contributing to increased automation increases the risk of capital substitution of labour and potential future job losses. Thus, while GVCs have undoubtedly contributed to formal job creation in Asia, there are questions regarding the quality, desirability and sustainability of such employment (Nathan, Tewari and Sarkar, 2016; Lee, Gereffi and Barrientos, 2011; Nathan and Sarkar, 2011).

The role, conditions and qualifications of labour, thus, are fast becoming critical elements with respect to defining success in global industries (Bernhardt and Pollak, 2016; Gereffi, Bamber and Fernandez-Stark, 2016; Barrientos, 2013). Improving one's position within the GVC (such as economic upgrading) in terms of quality and productivity as well as moving into higher-value, more knowledge-intensive segments offers a more sustainable path to participation than simply reliance on low-cost advantages. This offers greater gains for workers and for small and medium-sized firms (SMEs) in particular. Higher-value segments are more insulated from global competition; specialized knowledge can lead to better job security, and workers are better positioned to demand appropriate working conditions (Gereffi, Bamber and Fernandez-Stark, 2016). Countries across Asia have launched industrial policies to achieve this upgrading. The Made in China 2025 programme, for instance, has made upgrading into innovation-driven stages of GVCs a core goal of the country's economic policy (Ernst, 2016). In 2016, the Philippine government undertook a multi-GVC study to examine upgrading options in ten export-oriented agricultural and manufacturing sectors. Likewise, the Government of Viet Nam took steps to upgrade into agro-processing operations to serve global markets, from coffee to rubber, having gained considerable world market share in primary products through advances in its agricultural productivity (Daly, Bamber and Gereffi, 2017).[25]

While numerous and varied factors contribute to a country's competitive advantage within

24 Singapore and the Republic of Korea, for example, are home to significant research and development for manufacturing processes. The latter is also particularly strong in product development in the electronics GVC.

25 For example, in 2016, 40 per cent of global robusta coffee (for instant coffee) was sourced from Viet Nam.

different GVCs, labour is the critical element in all sectors;[26] economic upgrading strategies simply cannot be achieved without the appropriate human capital. A skilled workforce is essential for developing new capabilities, adopting new protocols, and ensuring that quality standards are met (Gereffi, Fernandez-Stark and Psilos, 2011a). Adequately aligning workforce development initiatives and their varied stakeholders to meet the demands of the more globalized economy, however, is challenging. The supply-driven system that has dominated education and training in the past often leads to a surplus or undersupply of the required skills in the labour force (OECD, 2012a, p. 83). The Republic of Korea, for example, has excelled at producing science and technology graduates, with some 45 per cent of students pursuing related degrees; yet, workers oriented to services, which is essential for upgrading into lucrative new value chain segments, are lacking.

Fierce competition and rapid technological change in the global economy heighten the sense of urgency with which countries must address shortcomings. To do this, policy-makers need additional tools for orienting scarce resources towards skills development for inclusive, gainful and sustainable GVC employment.

In brief, GVC participation provides both opportunities and challenges for workers around the world to engage with the global economy. Skills development is critical to ensure that GVC participation is inclusive – that is, to ensure it provides a pathway to more and better-quality jobs. Skills development is a key driver of both economic and social upgrading. Economically, it is critical for firms to increase capabilities, improve productivity and ensure quality compliance, while socially, it empowers workers, increases labour mobility and contributes towards accessing higher-paying jobs with better working conditions.

The skills required for GVCs tend to differ from those of the local economy. Thus, workforce development systems in countries seeking to use GVCs as a platform for economic growth must realign these towards global requirements of specific sectors. Due to the complexity of doing so, this requires contributions and coordination from numerous stakeholders in the private, public and education sectors. For success, these stakeholders need to develop a skills strategy based on the economic-upgrading paths that a country can pursue. They need to identify policy approaches related to the types of skills required for that upgrading. And they need to articulate the roles of different stakeholders in addressing workforce development gaps.

Global value chains and skills development

Economic and social upgrading concepts

The GVC framework has developed over the past two decades to analyse the global spread of industries and the implications for corporations, countries and workers. This sector-

26 Human capital development is one of several competitiveness factors that must be undertaken to enable economic upgrading. Others include appropriate trade and investment policies, and infrastructure and business environment improvements. For a more detailed discussion of these factors, see Bamber et al., 2013.

specific approach allows one to understand how globalized industries are organized by examining their structure and the dynamics of the different actors involved. Central to this framework is the value chain concept, describing the full range of activities that firms and workers around the world perform to take a product from conception to production and end use. This includes both tangible and intangible value-adding activities, such as research and development (R&D), design, production, distribution, marketing and support to the final consumer. In global value chains, these activities are geographically fragmented and undertaken by cross-border intra- and inter-firm networks (Gereffi and Fernandez-Stark, 2016).[27] This fragmentation now allows firms in different countries to engage in international trade without developing the full range of vertical capabilities along the value chain. Generally, developed countries concentrate on higher-value-added activities in a given industry, such as R&D and design, while developing countries, based on low labour costs and natural resources, concentrate on lower segments of the GVC, such as assembly.

By breaking down an industry into its key segments, GVC analysis helps countries to determine the specific activities in the chain that their firms currently perform, as well as potential opportunities and challenges for these firms in the future (Gereffi, 2014). Economic and social upgrading are core GVC concepts and allow one to analyse the changing dynamics of comparative and competitive advantages. These concepts are central to the discussion of inclusive and sustainable employment in the global economy (Gereffi, Bamber and Fernandez-Stark, 2016). Economic upgrading is essential for job creation and the emergence of more sophisticated work opportunities, while social upgrading contributes to the improvement of standards and rights at work, access to social protection and the inclusiveness of GVC growth.

Economic upgrading involves increasing the value generated from engagement in the chain, using either the firm or the industry as the unit of analysis. As cheaper locations vie to join chains, those already participating must develop strategies to sustain their participation, such as increasing their total factor productivity, specializing in higher value operations or niche sectors that are more insulated from competition (Humphrey and Schmitz, 2004). This encompasses both shifting from low-value to medium- and high-value sectors, as well as upgrading into more sophisticated, higher technology work within existing chains. Economic upgrading patterns differ by both industry and country but are all highly dependent on skills development. Product-based sectors often follow linear upgrading paths, and countries must gain expertise in one segment of the value chain before upgrading into the next segment. Service industries usually present multiple upgrading trajectories that can occur in parallel (Gereffi, 2011; Fernandez-Stark, Bamber and Gereffi, 2010; Wadhwa, De Vitton and Gereffi, 2008).

27 Understanding the geographic scope of the value chain is essential for developing appropriate policies. Value chains can be domestic, regional or global in scope; that is, they can be oriented towards the domestic market, in which all activities are undertaken in the country to be sold to local businesses or consumers. In this case, all competitors are locally based. In regional chains, these activities and markets are geographically fragmented across a region, such as Asia or Latin America, and competitors and markets can be located in neighbouring countries. Global chains leverage the skills and assets of countries all around the globe for major markets. In these cases, market requirements, firms and competitors vary. The analysis in this chapter is focused on global chains.

Social upgrading analyses the quality of labour's involvement in the chain (Barrientos et al., 2011). Broadly framed by the International Labour Organization's (ILO) Decent Work Agenda, social upgrading uses the worker as the unit of analysis and encompasses three pivotal elements: (i) job creation – the quantity and quality of jobs and implications for social protection; (ii) improved conditions of work, earnings and labour rights, including a strengthening of workers' rights to freedom of association, collective bargaining and the provision of safe and healthy workplaces (Rossi, 2013; Milberg and Winkler, 2013 and 2011; Barrientos et al., 2011; Ponte and Ewert, 2009); and (iii) skills development, which allows workers to flexibly adapt to the changing requirements of GVCs and improves their mobility within and between different stages of the chain (Gereffi, Bamber and Fernandez-Stark, 2016). Skills development is also an essential driver of economic upgrading and for including the local workforce in global industries. Table 1 describes the main types of economic upgrading and its implications for the workforce.

Table 3.1: Most common economic upgrading trajectories in global value chains

Type of economic upgrading	Description	Potential implications for the workforce
Entry into the value chain and functional upgrading	Movement into the value chain and then into new segments in the supply chain.	This requires workers with an entirely new set of skills; higher wages for more technology and knowledge-intensive segments.
Process upgrading	Improvements in productive efficiency leading to higher productivity, such as the use of more sophisticated technology or the incorporation of lean manufacturing techniques.	Automation can result in a decline in manual jobs but provide higher-paid work for technicians; improved management techniques can improve work environment.
Product upgrading	Shift into the production of a higher-value product.	Training opportunities with increased complexity; potential increase in employment if labour intensity for new product is higher.
End-market and channel upgrading	Incursion of firms into new end market segments, either industrial (for example, from textiles to medical devices) or geographical (regional markets in Asia to Europe).	Potential increase in job security through longer production periods; more diversified market reduces fluctuations in employment.
Chain upgrading	Leveraging capabilities developed in one chain to move into an entirely new sector.	Existing labour can shift from one industry to another with specific training – reduced job loss in exit from one industry.

Source: Authors, based on ILO, 1999.

Together, economic and social upgrading outcomes – and thus the inclusive nature of work

– are affected by governance structures in GVCs; these can be categorized as public, private and social (Gereffi and Fernandez-Stark, 2011; Mayer and Gereffi, 2010).

- Private governance describes the power exerted by lead firms whose market power and technological or marketing assets allow them to set the performance criteria for their suppliers in terms of price, quality, process and delivery standards (Lee and Gereffi, 2015; Humphrey and Schmitz, 2004). These firms are typically based in developed countries, such as countries in the European Union, the United States and Japan. Information flows regarding production processes between global lead firms and local suppliers facilitate development of the capabilities and expertise of the latter and can be an important driver for economic and social upgrading (Bamber and Fernandez-Stark, 2013; Kaplinsky, Terheggen and Tijaja, 2011; Humphrey and Schmitz, 2002; Gereffi, 1999). Global norms of these firms can result in them being better places to work than those in the local economy. However, firms tend to invest in social-upgrading initiatives, including skills development, only when it is likely to have an impact on economic outcomes.
- Public governance includes the body of national and international laws and norms that provide a legal framework in which GVCs operate. National public governance involves formal rules and regulations set by governments. Labour laws, for instance, directly impact the conditions of workers in GVCs by regulating various aspects of working conditions and wages. Other public governance measures include trade policy and investment regulations, such as the inclusion of labour chapters in bilateral trade agreements, which can lead to improvements in trade-related employment.[28] Others may indirectly affect social upgrading outcomes by affecting the types of jobs created. Workforce development incentives and requirements in investment zones, for example, can attract firms with strategies that base competitiveness on productivity rather than cost reduction.
- Finally, social governance encompasses civil society pressure from labour organizations, trade unions and non-government organizations (NGO) that can alter sourcing operations (Gereffi and Lee, 2014; Ponte and Sturgeon, 2014). Core issues with respect to workers' rights and labour conditions include the implementation of ILO Conventions, such as those on freedom of association and collective bargaining and those related to occupational safety and health. Civil society organizations in developed-country markets (consumption location) tend to have a greater impact than those in the local developing country (production location) context.

The assumption has been that by achieving economic upgrading, social upgrading will follow. However, evidence shows that this link is neither automatic nor inevitable: economic upgrading may occur without social upgrading, and social upgrading may be both a driver of or undermine economic upgrading by raising costs (Bernhardt and Pollak, 2016; Milberg and Winkler, 2013; Lee, Gereffi and Barrientos, 2011). The following section explores how

28 One of the first agreements to do so was the United States-Peru Free Trade Agreement in 2009.

skills development takes a central role in supporting these dual goals by allowing firms and countries to develop the required capabilities to compete, while simultaneously empowering workers through knowledge development to access higher-paying jobs with better working conditions.

Box 3.1

Private governance and inclusive growth: Challenges for inclusion of small and medium-sized firms in global value chains

Powerful lead firms typically govern entry in and upgrading along GVCs. The behaviour of these firms determines how resources and knowledge are generated and distributed through the chain, as well as which firms have access. Through customized and complex exchanges with chain actors, lead firms leverage competent suppliers for additional services and product differentiation (Gereffi et al., 2011; Gereffi et al., 2005). As these chains evolve, there is a tendency for lead firms to use fewer, more capable suppliers, rationalizing their supply chains to reduce transaction costs (Gereffi and Lee, 2014). Compliance with global standards, which set out the quality requirements of developed-country markets regarding product characteristics and production processes, is increasingly used to manage chain entry (Humphrey and Schmitz, 2002; Gereffi, 1994).

This makes it more difficult for developing-country firms, many of which tend to be smaller, to enter GVCs. Generally, small and medium-sized firms (SMEs) have more difficulty to participate in GVCs because they face additional constraints that limit their competitiveness. These limitations can be summarized in four major categories: access to markets, access to training, absence of collaborative horizontal and vertical linkages and access to finance (Fernandez-Stark et al., 2012; Gereffi, 1999). Due to both capital and knowledge constraints, SMEs spend less money and time on training than larger firms. And when they do train employees, they are more reliant on the public education and training system. These training programmes cater to employees from a range of companies and sectors and thus lack the specificity to fully impact a firm's business (Lee et al., 2010). This lack of industry-specific training constrains SME potential to meet standards. To overcome these constraints, SMEs typically require external support, such as special policies and programmes from national governments, international development agencies or non-government organizations to facilitate their GVC insertion.

Source: Authors

Work and skills development in global value chains: A framework

As more countries compete in GVCs, the pursuit of the low-road strategies for leveraging cheap labour that spurred Asia's initial GVC entry is less sustainable (Nathan et al., 2016). Buyers demand better quality, faster delivery times and increased reliability; consumers are more concerned about the conditions under which the products they buy are made; international organizations and NGOs are increasing public awareness of international labour norms and building local government capacity to enforce them; and labour itself is taking a proactive role against the workforce bearing the lion's share of the burden (Gereffi, Bamber and Fernandez-Stark, 2016; ILO, 2016; Nathan, Tewari and Sarkar, 2016). Firms and countries thus must strive to compete on capability-based, rather than cost-based, platforms.

Consequently, there is growing interest in the role of human capital in driving competitiveness in the global sectors (Gereffi, Fernandez-Stark and Psilos, 2011b). Skills development is a key driver of both economic and social upgrading. In economic terms, it is a critical element for firms to enhance competitiveness in export-oriented sectors through increased capabilities, improved productivity and quality compliance, while in social terms it empowers workers, enhances labour mobility, contributes to job security and supports access to higher-paying jobs with better working conditions. In this section, we discuss a GVC approach to skills development for global industries that is based on a demand-driven, sector-based approach to education and training.

This approach was developed by the Duke Global Value Chains Centre using multisectoral analysis from 20 developing countries (Gereffi, Fernandez-Stark and Psilos, 2011a).[29] First, it uses the GVC methodology to determine a country's position and desired and/or feasible upgrading trajectories within a particular industry. Subsequently, the human capital required for those upgrading activities can be determined. By overlaying skills requirements with the varied upgrading trajectories, GVC analysis provides guidance for countries to forecast future workforce needs that correspond with anticipated industrial growth. Thus, the workforce will have the necessary skills to add value to the industry, both for an economy's current position and for projected future upgrading. The addition of labour as a unit of analysis also allows policy-makers to assess the quality of work related to each upgrading trajectory.

The following summarizes the principal findings from that analysis.

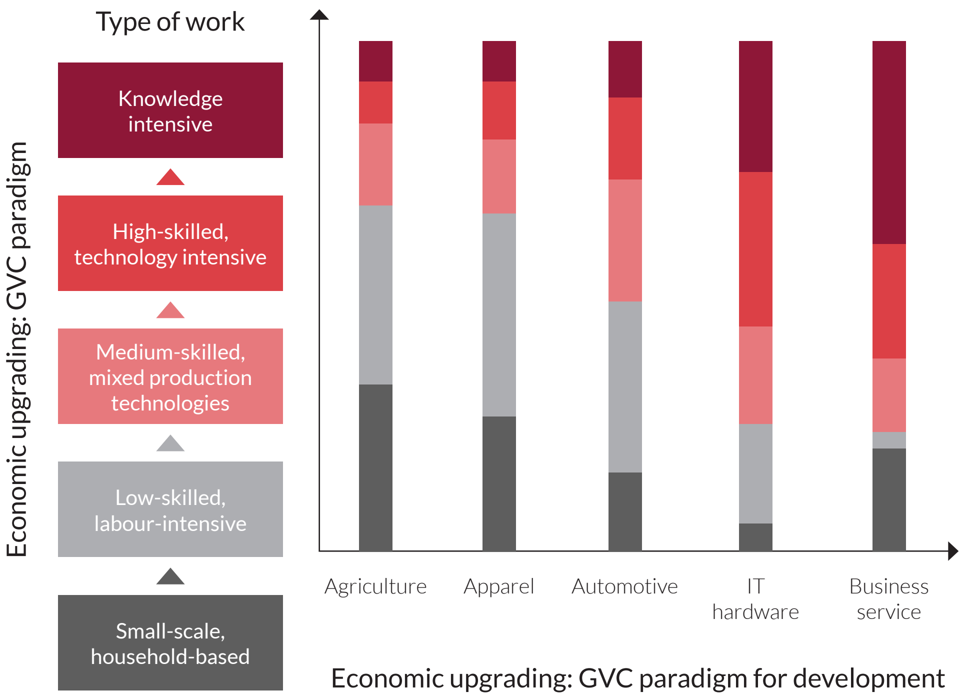
First, the experience and skill level of the GVC workforce differs, depending on the stage of the value chain (World Bank, 2014; Bamber and Fernandez-Stark, 2013; Fernandez-Stark et al., 2013 and 2012; Gereffi, Fernandez-Stark, and Psilos, 2011; Ramirez and Rainbird, 2010; Morrison et al., 2008). Countries thus only require skills corresponding to the stages of GVCs in which they participate. Based on analysis of workforce composition, low-value entry levels, such as cut-make-trim operations in apparel or electronics assembly, typically rely on a large number of less-skilled workers. But as a country moves up the value chain by increasing processing and/or performing new and more sophisticated activities, a more skilled workforce is required. This is illustrated on the vertical axis in Figure 1. Usually, developing countries participate in the low-level segments of GVCs, while only some have upgraded to mid-level segments.

Second, the relative intensity of skills needed depends on the sectors in which a country competes. This is consistent with traditional economic development paradigms. Even though the majority of countries enter into GVCs through agriculture and light manufacturing, such

29 This comprehensive study included the analysis of four industries in countries in Africa, Asia and Latin America.

as apparel, the right combination of trade, investment, infrastructure and human capital policies can lead to upgrading into higher-value sectors. Multiple countries and territories in Asia entered GVCs through apparel manufacturing, including the Philippines, Viet Nam and Taiwan, China. Several of these are now players in the electronics sector. Likewise, Singapore, which was a strong electronics manufacturer in the 1990s (Hiratsuka, 2013; Mirza and Giroud, 2004), is now a regional leader in high-tech sectors such as aerospace (Bamber and Gereffi, 2013a). Over time, as countries move into more sophisticated and higher-technology sectors, the relative distribution of required skills also shifts, creating new jobs. This relative distribution of skills is illustrated along the horizontal axis of figure 1.

Figure 3.1: Workforce composition across different global value chains



Source: Authors, based on Barrientos et al., 2011.

Third, skills are concentrated in different types of work along the chain, and the quality of employment and work conditions in each job category vary. Table 2 details the five principal types of work in GVCs[30] and links these to education level and conditions of work. In lower-value segments that utilize less-skilled workers, firms may not be inclined to invest in social upgrading if this increases their costs. In more knowledge- and technology-oriented supply chain segments that require higher-skill levels, however, firms are more likely to invest in

30 This scheme is based on Barrientos, Gereffi and Rossi, 2011 and Gereffi, Bamber and Fernandez-Stark, 2016. This classification scheme is not intended to refer to all jobs; rather, it only applies to jobs linked to GVCs.

social upgrading to retain talent (Rossi, 2013). Workers with higher skill levels can access higher stages of the value chain and tend to experience fewer decent work deficits than workers with low skills. Informal work also declines as firms seek to harness the returns of training and skilled labour. Thus, policies regarding social upgrading should be segment-specific, driven by an understanding of the type of work needed at different GVC levels.

Table 3.2: Types of work in global supply chains

Job category	Education level	Conditions of work	Examples
Informal SME or household work*	Low; often less than primary education	May or may not be compensated; precarious conditions; unregulated work hours	Small producers in agricultural chains
Low-skilled labour-intensive work	Low; often primary education or less	Formal; job insecurity, low wages, weak organization due to subcontracting	Workers on apparel or electronic assembly lines
Moderate-skilled work	Completed secondary education	Formal; increased job security, potentially poor working hours	Procurement and logistics-handling jobs in apparel and automobile chains
High-skilled technology-intensive work	Post-secondary technical education	Formal; high job security, higher-paid work, working hours and work-life balance challenges	Specialized component production and assembly in aerospace and medical devices chains
Knowledge-intensive work	Completed university education, including advanced degrees	Formal; potentially freelance, higher paid work, working hours and work-life balance challenges	Accounting, engineering and design jobs

Note: *=As a result of increased supply chain rationalization and the need to meet standards, SME participation in GVCs is becoming increasingly difficult (Fernandez-Stark and Bamber, 2012; Navas-Alemán and Guerrero, 2016).

Source: Gereffi, Fernandez-Stark, Psilos, 2011a.

Fourth, global workforce development needs to differ from that of the local economy. In the past, the preparation of the labour force was characterized by training designed to fit the needs of local firms. In GVCs, the standards regarding protocols, products and processes set by global lead firms must be met by local suppliers to avoid exclusion from these high-value markets. These global lead firms dictate industry norms not only with respect to product characteristics and quality but also production processes – often these are more technologically advanced than those of the local economy. Process standards are also being adopted for service-based sectors. In addition, individual buyers in GVCs have established codes of conduct, and they audit their suppliers regularly. These codes include such issues as sexual harassment, labour practices, environmental impact, productivity and quality assessment. Securing contracts and access to key markets increasingly depends on compliance with these norms. In response, the private sector in developing countries is undertaking a wide range of workforce development initiatives according to both global standards and individual corporate codes of conduct.

Fifth, these job categories vary in their demands from educational and workforce development systems. While low-value entry-level workers generally lack formal education and are often characterized as unskilled, there is an intense attention to on-the-job training that contributes significantly to productivity and competitiveness. This requires private sector firms to invest in training. The mid-level of the value chain, which typically entails some processing and/or performing new and more complex activities, tends to require specific technical competencies and usually draws on technical and vocational training (TVET) institutions. The highest GVC segments tend to be knowledge intensive, requiring specialized skills, and usually workers must possess tertiary education degrees at the undergraduate, graduate and even post-graduate levels. There are small numbers of specific bottleneck skills required in each stage that draw on higher skill levels, such as quality control managers in production operations, laboratory technicians and managers (figure 2).

Figure 3.2: Global value chains and skills

Industry value added →

Position in the global value chain	Low-level of the value chain*	Mid-level of the value chain	High-level of the value chain
Skill concentration	Manual	Technical and professional	Specialized professional skills
Key personnel/ concentration of personnel	• Large number of workers • Supervisors • Managers • Quality controllers	• Medium/small-sized workforce • Supervisors • Technicians • Managers	• Small number of highly qualified workers • PhDs • Engineers, Designers • Marketing experts • Managers
Primary skills development process	On the job training Internal training	• Short term training (1 week to 6 months) • Certification • Technical degree • Bachelor's degree	• Bachelor's degree • Master's degree • Doctoral degree

*Common participation of developing countries in global value chains

Source: Authors.

Workforce development systems in many developing countries are not well designed to meet this reality. With few exceptions, developing countries participate in the low and middle segments of GVCs; consequently, the types of jobs demanded are low to moderately skilled. Yet, there are often major gaps in even basic education, and university training is prioritized over technical skill development. Due to their relatively low positions in GVCs, many developing countries are not prepared to absorb the large number of university graduates entering the labour market, while they also lack important human capital with technical abilities and basic education to participate in chains. Countries in Asia are no exception to this rule, with a significant gap in students enrolled in TVET programmes (Ra, Chin and Liu, 2015). In the Philippines, for example, engineering graduates may even work on the assembly lines for aerospace exporters (Bamber, Frederick and Gereffi, 2016a). This can lead to high degrees of dissatisfaction, with workers feeling their investments in skills did not pay off, which often leads to a brain drain as they seek better opportunities abroad.

Redressing these issues can be overwhelming for public workforce development systems. Governments have limited resources to allocate to education; and, in general, educational institutions are supply-driven and slow to adapt to the demands of rapidly changing global industries. Traditional education and training institutions, such as TVET systems, thus have begun to be replaced or are now heavily assisted in filling skills gaps for GVCs, and the private sector is taking a growing role in labour force preparation. While this indeed provides the industry with skilled personnel for upgrading, when firms must take on the financial burden of additional training, it increases the comparative cost of labour in these developing countries and can affect their competitiveness. In addition to private firms, other new actors contributing to skills development include industry associations, multilateral organizations and NGOs. The following cases illustrate this complexity and explore how workforce development within GVCs can foster or hinder the upgrading potential of developing countries.

Lessons from the Asia-Pacific region's participation in global value chains

We present three cases of Asian participation in GVCs to illustrate the relationship between skills development and economic and social upgrading. Table 3 provides an overview of the case studies. These cases cover three GVCs in which developing countries, in the Asia-Pacific region in particular, typically participate: agriculture in the Philippines, apparel in Sri Lanka and electronics and shipbuilding in the Republic of Korea. Each participates in their respective industry at a different level; and each engages varying combinations of stakeholders in workforce development. The Philippines provides an example of how failure to invest in appropriate skills development to keep up with global standards has contributed to declining competitiveness in the mango GVC. Box 2 provides a contrast from Chile, one of the world's most successful fruit exporters. Sri Lanka, on the other hand, illustrates how a strong, multistakeholder, coordinated approach to human capital accumulation has allowed it to become a higher-value niche player in the highly competitive apparel sector, despite having some of the highest labour costs in the region. Finally, the Republic of Korea provides an example of tremendous success in upgrading the electronics sector, while at the same time, highlighting a lack of engagement in workforce preparation for upgrading into the skills required for the future.

Table 3.3: Overview of three case studies

Country case	Philippines	Sri Lanka	Republic of Korea
GDP per capita (current US$; World Bank, 2017)	$2 950	$3 835	$27 540
Industry GVC	Agriculture-Mango GVC	Apparel GVC	Electronics and shipbuilding
Stage of GVC	Production; basic processing	Full package, niche products	All production and pre-production stages
Workforce development approach	Only university education in agronomy with few graduates; minimal extension services	• Primary and secondary education • Technical training in services, such as procurement • Bachelor's degrees in fashion and textiles	• Primary, secondary, vocational and tertiary education • University programmes including graduate and post-graduate degrees • Major focus on science, technology, engineering and mathematics fields
Stakeholders involved	Universities (minimal)	Private firms, industry association, public sector, universities	Private firms, public sector, universities
Inclusive growth relevance and decent work concerns	High: labour draws from underemployed rural poor and producers	High: 71% of labour is female	Medium: Fewer jobs (electronics and shipbuilding, at 500,000), large companies; temporary workers make up 22% of labour

Source: Authors.

The Philippines in the mango GVC

The Philippine mango is globally renowned for its sweet taste and texture, and the country has ideal geographic and climatic conditions for its production. However, despite its popularity and natural comparative advantage, the country has seen its global market share threatened in recent years amid declining productivity and quality. Central to these issues has been a failure to modernize and professionalize the country's mango production base to compete with the increasingly competitive exports from Latin American producers, including Brazil, Mexico and Peru. Farmers operate with outdated, unproductive and, at times, dangerous production techniques. There is poor knowledge of global requirements at all GVC stages, including among public sector actors needed to support the industry. The limited efforts in human capital development by public and private sectors alike have prevented the country from taking full advantage of the mango export potential to help drive inclusive growth through job creation in rural areas and increasing incomes for small farmers.

The sector is dominated by small producers operating at arm's length from domestically owned processors. Exports comprise mainly dried mango; fresh product exports are almost negligible due to the failure to comply with global sanitary and phytosanitary standards. In the production stage, farmers typically operate using traditional agricultural techniques, with no use of irrigation, inadequate use of fertilizer and lack of proper pruning to maximize production. Spraying – a core activity for mango production – is often undertaken with hazardous chemicals that, today, are banned in most major markets and results in major health problems for workers. Poor yields – approximately half of the world average – combined with lack of adequate post-harvest handling also result in declining output. Post-harvest rejection rates due to poor cold chain management and physical handling are as high as 50 per cent (Song Seng, 2008; de Moura Castro and García, 2003). This means that local processors often do not have enough raw materials to fulfil international orders, which threatens their sustainability in the GVC.

Workforce development has been neglected in the agriculture sector in general. Although Philippine agriculture employs 29 per cent of labour, the second largest employer behind services, few effective initiatives have been carried out to support export-oriented operations. This has contributed to extremely low labour productivity. Formal training opportunities for farmers are largely absent; agricultural extension services focus on crops for household consumption (Fernandez-Stark et al., 2017). There are few private training organizations focused on standards, and no farms outside of the large, transnational banana and pineapple producers hold international certifications. Furthermore, although national standards for good agricultural practices have recently been introduced, they are not aligned with the global standards. Overall, education in agriculture and related studies attract a small share of students, accounting for just 3 per cent of all higher education enrolments and graduation rates have stagnated. The failure to professionalize the sector means youth are heading to urban centres to seek out more attractive opportunities (DAR, 2013). Table 4 shows the evolution of enrolment in agriculture-related degrees (agriculture, forestry and veterinary medicine) between 2005 and 2015.

Table 3.4: The Philippines: Interest in agriculture, forestry and veterinary medicine education, 2005–15

	No. enrolled	No. graduated	Percentage passed	No. enrolled in higher education (`000)	Percentage enrolled in agriculture
2005–06	63 744	13 019	31.77	2 489	3
2006–07	59 634	12 627	33.70	2 583	2
2007–08	58 248	10 650	35.35	2 633	2
2008–09	59 208	9 862	34.18	2 628	2
2009–10	59 745	10 043	35.07	2 774	2
2010–11	63 471	9 618	35.50	2 951	2
2011–12	68 098	11 605	36.70	3 044	2
2012–13	81 740	13 796	36.37	3 317	2
2013–14	96 164	13 986	35.30	3 563	3
2014–15	125 526	14 191	36.44	3 812	3

Source: CHED, 2016.

Box 3.2

Best practice: Chile in the fruits and vegetables GVC

Latin America offers several examples of strong GVC participation in high-value agriculture sectors. Chile, in particular, is illustrative of growth based on strong private sector investment together with clear public policy that acknowledges the role of agriculture in achieving economic and social upgrading. Initial growth was driven by a series of export-oriented policies to increase trade and attract foreign direct investment (FDI). Chile has emerged since the 1990s to become one of the leading global suppliers of fresh and processed fruit, from apples and kiwis to blueberries. By 2016, the country exported more than US$4.1 billion in fresh fruit and US$1.25 billion in processed fruit (UNComtrade, 2017a). It has leveraged this success to upgrade into a number of related service activities, including R&D in new genetic materials as well as packaging and cold chain technologies and engineering and consulting services for standards compliance at both the public and private levels.

To sustain this development, the country invested heavily in human capital formation. In particular, this was based on the understanding that commercial agricultural production requires producers and workers with high levels of training and education. The jobs at different stages of the chain present unique characteristics. In the production stage, a range of actors, from management to farm workers, must be trained in modern techniques to meet rigorous enforcement of sanitary and phytosanitary standards, strict buyers' requirements and increased productivity. In the packing stage, the labour force must be skilled in food handling, and they must follow strict health and safety protocols.

Box 3.2 (cont.)

In the processing stage of the chain, workers perform manufacturing tasks. With a shift from agriculture to manufacturing, workers require a completely different set of skills focused on operating processing equipment (Fernandez-Stark, Bamber and Gereffi, 2011).

The National Labour Skills Certification System, created in 1998 by Fundación Chile, is one of the country's most noteworthy human capital programmes. This competency-based system works to improve industry competitiveness by providing a framework for skills recognition, regardless of how they were acquired. The multistakeholder programme has involved both public and private stakeholders from 15 industries. More than 19,000 agricultural workers are now certified in a range of jobs, from production and packing to cold storage stages and processing (ChileValora, 2017). These skills standards have been transferred to TVET institutions to refine their curricula. Workers who do not pass the evaluation are offered training courses to fill their skills gaps. The system facilitates skill portability, improves efficiency in recruitment and, importantly, generates pride among certified workers, thus contributing to a culture of lifelong learning (Araneda, 2010; Chilealimentos, 2010; Kis and Field, 2009; López, 2009).

Facilitating access into the higher GVC stages was done gradually by leveraging foreign expertise, particularly through the Chile-University of California-Davis California Partnership. Established in the 1960s, this arrangement initially focused on developing production and agribusiness expertise and sponsoring Chileans to pursue undergraduate and graduate degrees in agronomy in California. More recently, this partnership has been directed towards R&D initiatives, with an emphasis on knowledge transfer and training in the grape sector, both in terms of developing new grape crop varieties and introducing new technologies into Chile's wine industry. A range of public, private and university stakeholders are involved in these initiatives. This has included the establishment of the UC Davis-Chile Life and Science Innovation Centre in Santiago, Chile. The centre, with a US$12 million initial budget, is tasked with carrying out R&D to support the agriculture industry, including plant breeding, post-harvest and climate-change technologies.

Source: Fernandez-Stark, Bamber and Gereffi, 2011.

Sri Lanka in the apparel GVC

The apparel GVC is generally considered a springboard for developing countries to gain access to global manufacturing chains (Fernandez-Stark and Frederick, 2011). The industry is a tremendous source of export revenue and employment for countries across Asia (Lopez-Acevedo and Robertson, 2016). GVC firms – buyers and suppliers alike – have been widely criticized for pursuing low-road competitiveness strategies (Pickles and Godfrey, 2012). Among Asian countries in the industry, however, Sri Lanka stands out for pursing capability-based competitiveness. And it is considered to have one of the most effective human capital approaches to apparel in the region (Lopez-Acevedo and Robertson, 2016; Fernandez-Stark and Frederick, 2011). With a much smaller population than others in the region, higher labour costs have required that the country pursue a higher-value, niche product strategy based on quality and productivity to remain an industry player. This has required technical and services skills.

Sri Lanka entered the apparel GVC in the lowest stage – cut-make-trim – in the 1980s, thanks to the quota systems, liberal trade and investment policies, government support and dedicated local entrepreneurs. In the 2000s, growth was fuelled by the European Union granting Sri Lanka reduced and later duty-free access to its market under the Generalized System of Preferences (GSP) and later the GSP-plus schemes. By 2016, the sector accounted for US$5 billion in exports (more than 50 per cent of goods exported) (UNComtrade, 2017b), and employed more than 300,000 people (Lopez-Acevedo and Robertson, 2016).

Sri Lanka produces primarily complex products, including intimate wear, swimwear and children's clothing. These higher-value niche products face lower competition globally because they rely on smaller-run sizes but require a more technically skilled labour force. Today, foreign direct investment (FDI) has given way to primarily domestically owned firms providing full-package operations for mainly European Union buyers (Lopez-Acevedo and Robertson, 2016). Some of the larger Sri Lankan apparel manufacturers have also internationalized, with operations in Africa and Asia, as well as developing backward linkages to textile industries in India and Bangladesh. This has positioned Sri Lanka as a sourcing hub that organizes production throughout the region (Lopez-Acevedo and Robertson, 2016).

Even though labour skills were not prioritized in the early years, human resources were viewed as particularly important in the post-quota environment (Kelegama, 2009). Human capital development has been coordinated by the industry association, the Joint Apparel Association Forum (Fernandez-Stark and Frederick, 2011). The apparel workforce in Sri Lanka is now better educated and more skilled than in most other Asian countries; at 10.3 years, the education level of apparel workers is almost twice as high as competitors in Bangladesh and India (Lopez-Acevedo and Robertson, 2016). This can be explained by a good general education system and the presence of specific education and training facilities for the apparel and textile sectors at different levels, including technical diplomas and university degrees. This environment built on early knowledge and technology transfer from FDI, under which 90 per cent of training was conducted by internal training departments (Kelegama and Epaarachchi, 2001).

Today, Sri Lankan workers often hold supervisory or management positions in other countries. This availability of highly skilled labour allows firms to offer more services to buyers while ensuring it can compete on quality rather than cost. Sri Lankan-made apparel is notably more expensive than that of others in the region (Lopez-Acevedo and Robertson, 2016).

Building this better-qualified workforce has required a multistakeholder approach, with contributions from and collaborations among the public, private and education sectors as well as drawing on foreign expertise. Table 5 outlines several actions taken by these actors. The government allocated financial resources to improve productivity within firms, develop technical competence, strengthen marketing capabilities, create design capabilities and encourage a cohesive focus for apparel and textile education. The Joint Apparel Association Forum produced a comprehensive training manual, *Competence and*

Beyond, designed to help education providers align their courses with the needs of the clothing industry. It outlines the skills, standards and knowledge required for 139 jobs relating to the clothing supply chain, from spinning to customer care. Two of the largest domestic firms, Brandix and MAS Holdings, set up institute facilities to train future workers, with a particular focus on female empowerment. Other leading firms, such as Nike, invested in local product development facilities, providing an avenue for workers to learn advanced skill sets on the job (Fernandez-Stark and Frederick, 2011).

Table 3.5: Sri Lanka: Global value chain upgrading and workforce development initiatives

Stage 1: **Cut, make and trim** **1980s to 1990s**	**Stage 2:** **Original design manufacturer** **2000s to 2012**
Private sector workforce initiatives	
1980s: Brandix and MAS Holdings open in Sri Lanka by local entrepreneurs. They keep their training internal. These are the two largest apparel companies within the country.	• 2002: Joint Apparel Association Forum (JAAF) Chartered Institute of Marketing: Graduate Diploma in Apparel Marketing developed to strengthen marketing competencies of the industry and strengthen links between local manufacturers and foreign buyers. • 2003: MAS Holdings: Women Go Beyond: Programme to empower women, both at work and at home, by providing skills and training while recognizing and rewarding special achievements. Has given MAS corporate social responsibility activities global recognition. • 2005: Brandix College of Clothing Technology: Training programmes up to degree level in apparel; first of its kind in Sri Lanka. College is in collaboration with the Royal Melbourne Institute of Technology in Australia. Students in the three-year degree programme earn a Bachelor of Applied Science in Textile Technology. • 2008: MAS Institute of Management and Technology: Goal to provide affordable world class training facilities for youth and corporate organizations. Offers soft skills development and textile and apparel programmes. • 2008: Initial lead firm investment in manufacturing and technical development facilities: Nike and M&S.
Public sector workforce initiatives	
• 1976: Department of Textile and Clothing Technology (DCTC) established at the University of Moratuwa; in collaboration with Leeds and Manchester Universities (UK); support from the United Nations Education, Scientific and Cultural Organization.	• 2002: New four-year Bachelor of Science degree programme in fashion design and product development through the Department of Textile and Clothing Technology in collaboration with the London College of Fashion.

Stage 1: Cut, make and trim 1980s to 1990s	Stage 2: Original design manufacturer 2000s to 2012
Public sector workforce initiatives (cont.)	
• 1991: DCTC added textile and clothing extension courses (production planning, quality control, pattern production and merchandising). • 1993: DCTC added Bachelor of Science Textile and Apparel Technology (four year); Master of Arts Textile or apparel studies or textile and apparel management.	• 2009: Sri Lanka Textile and Apparel Institute formed: merger of the Clothing Industry Training Institute and the Textile Training and Service Centre; mission is to facilitate sustainable development of Sri Lankan textile and apparel industry by producing competent workforce with specialized skills. • Government-run vocational training authority offers six-, three- and one-month training courses.
Multisector workforce initiatives	
1984: Sri Lankan Clothing Industry Training Institute and the Textile Training and Service Centre established under the Ministry of Industrial Development; technical assistance by United Nations Development Programme and United Nations Industrial Development Organization and later the Japanese International Cooperation Agency.	• 2004: JAAF-Government: Productivity Improvement Programme provides leaner, more effective organizations, which results in higher productivity, lower costs, better quality and on-time delivery. • 2004: JAAF-North Carolina State University's College of Textiles: Agreement to strengthen the technical capacity of the industry by delivering an affiliated diploma in collaboration with the Clothing Industry Training Institute and the Textile Training and Service Centre. The alliance is to assist the institutes in raising their training programmes to world-class standards. The focus areas of the six- month to one-year programmes include technical competence, supply chain development, management and industrial engineering. • Grassroots skill training programme: Supported by the United States Agency for International Development to create four model training centres within the 31 vocational training centres that provide training for the textile and clothing sectors. Objectives include upgrading infrastructure, equipment and resource people, providing education in multiple disciplines, providing guaranteed employment upon completion of the programme, industry accreditation and empowering rural youth with valuable skills and knowledge.

Source: Duke University Centre on Globalization, Governance and Competitiveness.

Republic of Korea in high-tech global value chains[31]

The Republic of Korea today is one of the world's most important manufacturing hubs, having transformed its economy from a rural base into an industrialized power in just a few decades. Several of the country's firms have risen to prominence in global sectors, including electronics and shipbuilding: Samsung and LG are household names around the globe. Exports in electronics and shipbuilding reached US$158 billion in 2016 (Frederick et al., 2017). This success has been built through rapid government-led industrialization, government support for a small number of large, globally competitive firms, significant investments in science, technology, engineering and mathematics (STEM) education and an emphasis on applied R&D. This focus, however, has left its workforce somewhat unprepared for the challenges of GVC upgrading in the future.

By 2017, challenged by low-cost manufacturers from around Asia, the Republic of Korea had reached a crossroads, requiring it to redefine growth drivers for the future. A hallmark characteristic of its industrial transformation will necessarily be upgrading into the services segment of its leading sectors as lower-cost locations begin to hollow out its manufacturing base (OECD, 2016). Indeed, the highest-value segments in manufacturing GVCs are typically in services segments rather than production activities. These services are generally in pre-production and post-production operations, including new product development, design, marketing and retail. The rise of Big Data means that after-sales, data-driven knowledge services in particular are now emerging and fast becoming the most valued segments, netting up to 50 per cent or more of chain revenues (Frederick et al., 2017).

Labour force quality is considered one of the most important drivers in Korea's economic and industrial success. The Republic of Korea is known for its well-established education system as well as a high level of education attainment. This has been driven by the government's strong commitment to education over the years, through the Ministry of Education and the Ministry of Employment and Labour. In particular, the country has excelled in orienting a significant share of its workforce towards STEM majors (45 per cent in 2015); one quarter of all graduates come from engineering – and this has been on the rise in recent years (Table 6). Technical degrees are the most popular specializations for vocational training, accounting for 46 per cent of vocational high school graduates in 2016. These graduates are essential for driving the country's participation in the pre-production and production stages of its manufacturing sectors, which have required large numbers of STEM graduates and skilled technicians.

31 This section is based on Frederick et al., 2017.

Table 3.6: Republic of Korea: College graduates, by major, 2012–15

Majors	2012		2013		2014		2015	
	No. graduates	%	No. graduates	%	No. graduates	%	No. graduate	%
Humanities	52 241	9.2	50 925	9.2	50 051	9.0	53 128	9.2
Social sciences	163 014	28.8	157 552	28.4	155 559	27.9	159 040	27.6
Education	32 526	5.7	32 590	5.9	32 199	5.8	32 823	5.7
Arts and physical education	71 681	12.7	70 612	12.7	71 574	12.8	73 407	12.7
Engineering	138 930	24.5	136 067	24.5	135 797	24.4	141 717	24.6
Natural sciences	58 861	10.4	58 328	10.5	59 564	10.7	62 138	10.8
Medical and pharmacy	49 071	8.7	49 068	8.8	52 490	9.4	53 770	9.3
STEM subtotal*	246 862	43.6	243 463	43.8	247 851	44.5	257 625	44.7
Total	566 324	100	555 142	100	557 234	100	576 023	100

Note *= total of engineering, natural sciences, and medical and pharmacy graduates.

Source: Ministry of Education (WDI, 2017); since 2012, the Ministry provides data on college graduates by major, covering all types of schools (junior college, university, general graduate school, university of education, industrial university, miscellaneous school, polytechnic college). This covers more types of schools than data prior to 2012.

Several challenges, however, can be seen in the country's workforce development strategy for future inclusive upgrading. First, the strong focus on university education does not extend through to lifelong training initiatives that will be required to benefit from automation and other emerging digital technologies. Currently, less than 1 per cent of the country's total education budget is spent on such programmes compared with 8 per cent and 30 per cent in Japan and the United States, respectively (MOE, 2014–2016).

Second, the strong emphasis on STEM fields has resulted in a somewhat limited development of non-STEM human capital required to help drive upgrading into the services segments of GVCs. These segments typically draw on more than technical knowledge. These jobs require a combination of "hard and soft" skills. In particular, interpersonal and language skills are necessary to negotiate the challenging terrain of client and consumer relationship management from a range of cultural backgrounds (Low and Pasadilla, 2016). Foreign language skills, particularly English skills, are sorely lacking in the Republic of Korea.

Third, the dominance of large family enterprises in the Republic of Korea (i.e. *chaebols*) in these sectors, coupled with poor labour flexibility[32] – and thus by proxy, mobility – prevents knowledge flows into SMEs, thus retaining the benefits of GVC participation for a select few. In the United States, for instance, people change jobs four times before the age of

32 The *2017 World Economic Forum Global Competitiveness Report* ranked the Republic of Korea 113 of 138 economies for flexibility in hiring and firing of employees (Gereffi et al., 2011b).

32 and 12 times in a lifetime (BLS, 2017). Koreans are more likely to remain within the same organization for much of their careers. At the same time, to balance these demands with the competitive GVCs in which the Republic of Korea participates, firms rely on a high use of non-regular workers, with rates twice those of the average for the Organisation for Economic Co-operation and Development countries (Dobbs and Villinger, 2017), contributing to labour vulnerability.

Discussion

These cases illustrate the findings described in the theoretical introduction, and several critical lessons can be derived for policy-makers seeking to use skills development to drive economic and social upgrading in GVCs.

Participation in GVCs is dynamic and requires a new and evolving set of skills

The Philippines and Chile examples illustrate that the rules for even mature industries are constantly changing; professional agriculture, which leverages modern production and post-harvest handling techniques, is required to participate in GVCs and must be adaptable to changing conditions, such as the banning of certain chemicals. Sri Lankan apparel workers had to improve their quality output while adopting more and more service functions to remain competitive. The Korean case illustrates, perhaps most notably, that the rapidly changing technologies being ushered in with the 4th Industrial Revolution require well-designed systems to remain flexible and prepared for the future, while at the same time responding to the challenges of today. Value in manufacturing sectors is increasingly being driven by services, and the country could lose out as a result of an overemphasis on STEM fields.

Multiple stakeholders have been important drivers of success in Chile, Sri Lanka and the Republic of Korea

The identification and breakdown of industry job profiles by value chain stages, as carried out by the Joint Apparel Association Forum in Sri Lanka (an industry association) and the Chilean certification programme (public and private partnership), helped industry stakeholders focus efforts on developing the precise human capital that was required for the next stage of the chain rather than investing only in highly qualified human resources with advanced university degrees. This allowed the countries to mobilize different stakeholders to develop GVC skills for upgrading. Sri Lanka first used FDI internal training to transfer production skills before leveraging domestic firms to do the same. Extension courses were then created within universities to develop service capabilities required for the full package approach. Longer-term plans were also put in place to develop design capabilities, first sending employees abroad, followed by establishing local university undergraduate degrees with public sector support. In Chile, these initiatives leveraged multistakeholder engagement, with firms determining skill needs and having these incorporated into national TVET curricula.

GVC upgrading requires training small numbers of workers for bottleneck positions

Every stage of the value chain depends on both a critical mass of workers as well as a small number of more highly specialized professionals and technicians. Supervisors, managers and quality controllers are three job profiles that are generally in high demand but low supply in developing countries. Establishing national education programmes to produce these bottleneck workers can be expensive due to poor economies of scale. Leveraging foreign expertise to help achieve this in the early years was used in both Sri Lanka and Chile. Sri Lankan firms placed their designers abroad to work in close connection with their buyers, while university programmes were developed with several British and North American universities. Chile leveraged its partnership with the University of California-Davis to gradually build up specialized personnel – first in undergraduate and graduate degrees in agronomy then later in specific R&D roles for the development of new genetic programmes.

Skills strategies for GVC upgrading: A typology of policy recommendations

Under current conditions, many countries face considerable difficulties in cultivating the skills for GVC upgrading. Education systems do not adequately prepare individuals for the continual learning and soft skill needs demanded by dynamic global industries and technical education remains weak and unable to provide the correct skills for industry upgrading. As well, scarce resources are being channeled to inappropriate areas. At the same time, politically, it can be challenging to assign significant resources towards serving export-oriented industries that employ only a fraction of the population. A large number of public, private and educational stakeholders are often required to provide solutions to cover gaps in basic education and training.

We present a typology for skills development policy for countries to overcome these gaps and promote skills development and job creation for inclusive participation in GVCs. These strategies can be pursued by a combination of different stakeholders, depending on the specific isntitutional set-up and strengths of each country and sector. Box 3 contains a discussion of stakeholders' potential roles in skills for GVC upgrading. Critical to this approach is to institutionalize systems for collaboration among the varied actors while maintaining flexibility in content to allow countries to respond to the changing needs of GVCs.

These policies can be divided into three categories: Early reactive interventions, ongoing proactive interventions and future-oriented interventions. These policy interventions are illustrated in figure 4, paying attention to the kind of skills needed for today, tomorrow and the future and the type of value chain upgrading and workforce initiatives required. Table 7 then highlights specific, actionable policy approaches. Because GVCs are constantly evolving, these three sets of policy approaches need to be undertaken simultaneously and continuously.

Figure 3.3: Typology of skills development policies for global value chain upgrading

	Early reactive interventions		Ongoing proactive interventions		Future-oriented interventions
Workers' skills	Current worker's skills		Emerging workers' skills		Future workers' skills
Intervention area	On-the-job training (private sector training firm), tailored government programmes		Post-secondary education: technical education & universities		Education system
Type of value chain upgrading	Value chain entry	Process upgrading	Product upgrading	Functional upgrading	All forms of upgrading

→

Meet global standards, expand market share, competitiveness (incremental innovation)

Long-term development of national economy

Source: Authors.

Early reactive interventions include actions to aliveate the immediate challenges of skills gaps. The purpose of these interventions is to align existing workers' skills with the demands of GVCs. This requires an industry analysis to assess the position of the country and determine the critical skills to meet international standards, expand market share and sustain competitiveness in that stage. These interventions are more effective when the private sector is directly involved in training, and the government acts principally as a facilitator and provides financial support and regulation. Widely adopted interventions include tax break incentives for training and special courses financed by the government to upgrade specific workers' skills. Improved competitiveness can contribute to job security.

Ongoing proactive interventions are aimed at preparing emerging workers' skills for GVC upgrading in the near future. Possible upgrading paths must first be determined, along with the corresponding critical job profiles. Due to the position of most developing countries in low- to middle-value-added stages of GVCs, priority should be placed on establishing excellent technical education institutions able to deliver relevant skills for GVCs and local public and private councils in which government, the private sector and educational institutions collaborate. Leveraging scholarships and internships abroad, partnerships with foreign educational institutions and the expertise of foreign consultants accelerates knowledge accumulation and skills for bottleneck positions. Government involvement is critical because workers are hesitant to invest in education and training when there is limited demand for these skill sets within the existing labour market.

Future-oriented interventions are designed to develop workers' skills to advance in GVCs in the long term. The main purpose of these interventions is to create "upgradeable" individuals who have solid basic skills and can successfully be inserted into dynamic global sectors. These future-oriented interventions should prepare the workforce to adapt to rapidly changing technologies of the future that are not yet known. These interventions require improvements in skills for workers from an early age, including primary and secondary education, technical education and advanced education. Intervention elements include solid literacy and numeracy programmes, tools for the world of work, high-quality technical and tertiary education, and soft skills training. Soft skills include work ethic, communication skills, fostering the desire to learn, teamwork, problem solving and adaptability at all education levels. Box 3 further highlights specific roles for the government as a stakeholder in facilitating skills development for GVC upgrading.

Box 3.3

The potential roles of stakeholders in skills for global value chain upgrading

Private sector: In many countries, **private firms** are taking on education and training of their workforce beyond on-the-job training in firm-specific procedures to cover a range of education needs. These include engaging with educational institutions to determine necessary skills, providing inputs into curricula and certification development, faculty to teach courses and internship programmes to allow students to gain practical experience by the time they graduate and enter the workforce. **Industry associations** provide a conduit for similar skills development, although because they represent a broad range of firms with both direct and supportive roles in GVCs, they can provide more comprehensive information for developing a well-rounded workforce than individual firms working alone. Key roles include establishing industry job profiles and their required competencies, creating internal training programmes and partnering with educational institutions to customize training and modify curricula for current and potential workers. Where training resources are not available locally, these associations can establish alliances with foreign universities to accelerate the skills development process. A benefit of this private sector engagement is to ensure that the skills developed are those required by the labour market. By ensuring a skills match, this increased collaboration becomes an efficient and effective instrument to achieve economic upgrading in global industries.

Public sector: The government can act as an essential catalyst for industry upgrading by providing four instrumental functions: Coordination, information sharing, financial support and regulatory action.

- **Coordination:** Best practice in GVCs favours coordination among all relevant stakeholders. Public-private engagement between firms, educational institutions and government has emerged as an efficient and effective model for GVC skills development. These partnerships allow each stakeholder to contribute its best resources to support GVC upgrading. However, bringing together multiple stakeholders with many divergent interests requires coordination, and the government emerges as a natural entity to invite actors to work together.

Box 3.3 (cont.)

- **Information sharing:** Facilitating access to labour market information helps to drive upgrading by matching demand and supply for different job profiles. This includes publishing timely information regarding job profiles, their qualification requirements and salary information. Collecting this information and effectively disseminating it among decision-makers can help both prospective students and the existing workforce to make better decisions about their careers and thus improve labour market efficiency.
- **Financial support:** The promise of important employment creation, potential spill-over effects and heightened competition from other countries have encouraged governments to directly finance education and training for entry and upgrading. The demonstration effect provided by government spending for both the individual in terms of career opportunities and the private sector in improved productivity has been important to incentivize local labour and firms to invest in their own skills development. State-funded scholarships and tax incentives for training have emerged as two of the most prominent tools used, also contributing to improved accessibility of education and training for disadvantaged individuals who may otherwise not have had the opportunity to pursue studies. As such, the government has a role to enable a fairer distribution of opportunities and finance.
- **Regulatory action:** The demand created for skills improvements can result in an explosion in the number of institutions offering training for the sector, many of which may not be at an acceptable level. The government can ensure the quality of training through accreditation of universities and technical institutions without limiting the necessary flexibility to modify the curricula in response to labour demands.

NGOs and international agencies: While the role of NGOs and international agencies is often more limited, they do intervene to fill the gaps not covered by other stakeholders, and they have helped to facilitate important process and product upgrading. They have been particularly important in supporting SME insertion into the value chain, such as in the provision of training in the fruit and vegetable sector, where the incorporation of small producers has made the difference for rural development. In less developed countries, these organizations are often important substitutes in the absence of active industry associations or government involvement. They take on a range of roles, from carrying out specific training for standards compliance and working directly with universities to facilitate coordination among stakeholders to ensure different actors within the chain have the required skills to enable sustained participation and upgrading. While the contributions from these organizations are important, they, too, have been less successful in facilitating skills formation when their interventions have not been carried out in close coordination with the private sector and aligned with national and/or international standards.

Source: Fernandez-Stark, K., et al. 2012

Conclusion

Insertion into GVCs offers important avenues for the Asia-Pacific region to drive further economic development, particularly for firms seeking to upgrade into higher-value products and services. However, the highly competitive nature of global industries makes it increasingly difficult to benefit gainfully from this engagement. Skills development is critical to ensure that GVC participation is inclusive – that it provides a pathway to more and better-quality jobs. Skills development, as illustrated by the cases of the Philippines, Sri Lanka and the Republic of Korea, is an important driver of both economic and social upgrading. Economically, it is critical for firms to increase capabilities, improve productivity and ensure quality compliance, while socially it empowers workers and increases labour mobility and access to higher-paying jobs with better working conditions. The skills required for GVCs tend to differ from those of the local economy, and therefore workforce development systems in countries seeking to use GVCs as a platform for economic growth must realign these towards global requirements of specific sectors.

Designing policies that balance both economic and social aspects is essential but challenging. Skills development supported by public, private and educational institutions can provide a platform for capability-based competitiveness that supports more inclusive employment. In most developing countries, including in the Asia-Pacific region, local institutions are often not adequately prepared to future-proof the workforce in this way, nor should they be. Due to the complexity of doing so, this requires contributions from and coordination of numerous stakeholders in the private, public and education sectors. Skills development policies must be accompanied by a combination of supporting policies in the areas of trade, investment and infrastructure as needed by each country.

As a result, complex local arrangements must emerge to support skills upgrading, encompassing a broad range of stakeholders. These stakeholders include private firms, public and private institutions in education, government, NGOs, employers' and industry associations, trade unions and international donors. Each of these stakeholders can be deployed to support the differing skills needs within and across GVCs. However, this must be based on a cohesive skills strategy oriented towards specific economic upgrading paths that the country can pursue. It requires determining policy approaches related to the types of skills needed for that upgrading and then articulating the roles of different stakeholders in addressing workforce development gaps. Sustainable development in our increasingly globalized world needs investments in human capital to ensure that no one is left behind.

Table 3.7: Skills for upgrading in global value chains: Policy priorities

	Early reactive policies	**Ongoing proactive policies**	**Future-oriented policies**
Upgrading trajectories	Product and process upgrading	Functional upgrading	Functional and inter-sectoral upgrading
Priorities	Skills needed to expand exports and market share, improving productivity and quality and meet international standards requirements	Skills needed to carry out activities in next stage of the chain; no current demand in workplace, students unlikely to pursue these careers alone	Adaptive skills needed in increasingly complex, rapidly changing knowledge and technology environment
Primary stakeholders	Private sector supported and incentivized by the public sector	Private and public sector, multistakeholder council	Public sector and educational institutions
Target workforce	Existing workforce and near-hires	Secondary students considering tertiary education alternatives; career changers	Primary and secondary students
Policy approach	• Evaluate the current skills gap within industries, identifying areas that need rapid remediation. Requires quick sector-based studies to detect major skill deficiencies for competitiveness. • Encourage and financially incentivize firms to invest in training for their workers. Ensure workers acquire correct skills on-site while simultaneously receiving practical on-the-job training. • Provide research and coordination support where firms lack the time or knowledge to identify the correct skills and training resources.	• Assess GVC position and determine potential upgrading paths. • Identify core job profiles for desired upgrading trajectories, including bottleneck positions. • Incentivize linkages between training institutions and firms particularly in curriculum development. • Prioritize targeted technical education through scholarships and low-cost financing. Technicians critical for upgrading into midstream segments. • Utilize foreign universities for near-term skills demand and bottleneck positions (study abroad scholarships, curricula development and train-the-trainer).	• Strengthen basic skills in primary and secondary education. Ensure that children master basic skills critical for lifelong learning. • Emphasize "soft skills" (including language skills) throughout all education levels as core skills for engaging with global economy. • Regularly re-evaluate technical education needs. This should be aligned with labour market needs. • Facilitate continuous, lifelong learning programmes to ensure access to updated skills and knowledge.

	Early reactive policies	Ongoing proactive policies	Future-oriented policies
Policy approach (cont.)	• Prioritize managers' skills development. Good managers are essential for knowledge dissemination and good working conditions. • Train near-hires and prioritize lifelong learning programmes for sectors. Special training, through lifelong learning programmes, can move near-hire individuals to ready-hire workers.	• Incentivize firms to undertake internal worker skills upgrading, including mentoring and career planning for workers. Leverage experience of existing workers. • Create national labour market information systems, with information on needed skills, salaries, key skill gaps, etc.	• Establish and institutionalize efficient and effective multistakeholder coordination mechanisms. Ensure sustained engagement between the government, private sector and educational institutions.

Source: Authors..

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Section II:

Responding to future demographic shifts: ageing societies and youth aspiration

4

Holistic framework for harnessing an ageing workforce in Singapore

Helen Ko

Abstract: Rapid technological advancement and the proliferation of artificial intelligence, robotics, virtual reality and the Internet of things are creating a perpetual need for workers to reskill and upskill. Many older workers are finding it increasingly challenging to cope with these transformations. Juxtaposing these with major demographic shifts, countries in Asia are looking at their rapidly ageing populations and what that means for their future development.

This chapter outlines the many changes needed in workplaces, using the experience of Singapore in adjusting to its ageing workforce. It proposes a holistic framework for fair and progressive employment practices and achieving inclusive growth and social justice. The first section of this chapter provides a brief background to the Singapore context in terms of policies and programmes related to ageing, skills and employment. The second section discusses specific programmes in Singapore and assesses their efficacy in achieving the Government's vision. The third section advocates a holistic framework to harness an ageing workforce to ensure that older workers of all socioeconomic strata and genders are included and well integrated into the workplaces of today and the future.

Introduction

In this era of major demographic shifts, countries in Asia are looking at their rapidly ageing populations and what that means for their future development. In 2017, Asia was home to 549 million persons aged 60 years or older. This constituted 57 per cent of the global older population. By 2050, this share is projected to increase to 61 per cent, with a projected 1.3 billion persons aged 60 years or older residing in the Asia region (United Nations, 2017). This implies that older workers will become increasingly commonplace. Rapid technological advancement and the proliferation of artificial intelligence, robotics, virtual reality and the Internet of things are creating a perpetual need for workers to reskill and upskill. Many older workers are finding it increasingly challenging to cope with these transformations.

To sustain economic growth and in anticipation of even more changes to the world of work and workplaces of the future, governments around the world have undertaken massive preparations for their country's ageing workforce (Vernon, 2010; *The Economist*, 2009; Nomura Equity Research, 2008; Hong Kong SAR Government, 2006). They include reforms of the labour market, health care and public pension, social security and skills development systems.

Other strategies include increasing the retirement age, women's labour force participation and the immigration of younger workers. Workplaces are adjusting to accommodate older workers. Mid-career skills upgrading, flexible and part-time work arrangements and attitudinal change among employers and management are promoted.

Responses to ensure an inclusive society that encompasses older people along with other marginalized groups necessitate changes at the societal, organizational and individual levels. These include the development of elder-friendly infrastructure, such as new housing options, affordable health care and social services through well-designed subsidies, appropriate fitness facilities and changes in the beliefs and attitudes of individuals about older people. However, because this chapter is primarily employment-oriented, it outlines the many changes needed in workplaces using the experience of Singapore in adjusting to its ageing workforce. It proposes a holistic framework for fair and progressive employment practices and achieving inclusive growth and social justice.[33] The first section provides a brief background to the Singapore context in terms of policies and programmes related to ageing, skills and employment. The second section discusses specific programmes in Singapore and assesses their efficacy in achieving the Government's vision. The third section advocates a holistic framework to harness an ageing workforce to ensure that older workers of all socioeconomic strata and genders are included and well integrated into the workplaces of today and the future.

4.1 Singapore context: Ageing, skills and employment

Singapore is a small nation State. As of 2017, its population was only 5.6 million persons. Of them, 1.7 million were non-residents (Department of Statistics, 2017). It is also ageing rapidly, significantly faster than any other country in Asia and the Pacific except Japan and the Republic of Korea (United Nations, 2017). As the earlier cohorts of post-war baby boomers moved into their 60s in the recent decade and the labour force participation rate for older residents continued to rise, the share of people aged 60 or older in the resident labour force more than doubled, from 5.5 per cent in 2006 to 13 per cent in 2016. The median age of residents in the labour force rose to 43 years in 2016, from 40 years in 2006 (MRSD, 2017).

Although the percentage has grown over the years, the majority (55 per cent) of adults aged 55 or older were still unable to achieve the minimum sum required in the Central Provident Fund, which is a compulsory savings scheme for retirement needs. The minimum sum was set at a level necessary to meet the typical expenditure needs of retiree households in the lower-middle income group (Ramesh, 2012). The 2011 National Survey on Senior Citizens, which involved adults aged 55 or older, indicated that 83.7 per cent of such persons were continuing to work for financial reasons (MSF, 2011). Another study involving people aged 60

33 The framework is based on the author's more than 25 years' experience training and counselling thousands of older adults and workers and employers and management staff hailing from a spectrum of organizations, primarily in Singapore, as well as from her research related to ageing and employment issues.

or older revealed similar findings. The respondents in that second study were characterized as having little education and working in low-skill jobs (International Longevity Centre – Singapore, 2011).

In 2016, the median monthly work income of persons aged 60 or older was 2,000 Singaporean dollars (SGD), compared with SGD3,500 among the general population. Approximately 13,500 of the older workers earned less than SGD500 a month. They were three times as likely as the average worker to hold low-paying jobs, such as cleaning (MRSD, 2016). Most of them were women. And women tend to have interrupted work histories due to various caregiving roles. They have fewer opportunities than men to accumulate financial resources for their later years. Moreover, because they tend to outlive men, they are more likely to experience poverty in their old age.

Although Singapore has enjoyed impressive economic growth in the past few decades, many of its older workers have been excluded from the fruits of such growth.

Against this backdrop and reflecting a society that subscribes to the philosophy of self-reliance and personal responsibility – where financial support at a subsistence level will only be given by the State as a last resort, the national agenda in Singapore in recent years has been promoting the employment of older workers and fair wages for them so that they will have adequate financial resources in retirement. In 2012, the Government adopted legislation that allows employers to re-employ workers upon reaching the retirement age of 62, up to age 65. This age limit was further raised to 67 years in 2017. With Singapore's drive to reduce its reliance on foreign workers and with human capital regarded as one of its critical resources, a strategic focus for government policy has been to maintain the employability and productivity of the workforce (Yacob, 2009), including the employability of the increasing numbers of workers aged 45 years or older.

Singapore is looking to compete in the global arena with a twenty-first century knowledge economy. Such an economy is more complex and rapidly changing than previously and intellectual capital is the new competitive advantage. In that environment, the Government treats lifelong learning as one of the most important strategies in moving towards a knowledge-based economy (MOE, 2014; Kumar, 2004). Therefore, it has been critical for developing the associated human capital to support the transition (Osman-Gani, 2004), as Prime Minister Lee Hsien Loong pointed out in one of his speeches (Lee, 2009): "For a small country like Singapore, acquiring and nurturing human talent is a matter of survival. Without much of anything else, we rely on human ingenuity and effort to build our economy and society. We have therefore made major investments in education, lifelong learning and talent development."

The push for lifelong learning, skills development and upgrading has intensified in recent years. In 2014, the Singapore Workforce Development Agency established a Lifelong Learning Council to encourage more Singaporeans to view learning as a continuous journey over their lifetime (Choo, 2014). Three weeks later, the high-level SkillsFuture Council initiated its first meeting, with the deputy prime minister as its chairman. It was tasked to develop an integrated system of education, training and career progression for all Singaporeans, to promote industry support for individuals to advance based on their skills and to foster a culture of lifelong learning (MOE, 2014).

4.2 Innovative initiatives

In the context of the Singapore Government's goal of forging an inclusive society and integrating older workers of all socioeconomic strata and genders into workplaces, this section assesses four important initiatives that have been implemented in the country in recent years. These are: SkillsFuture, the Tripartite Alliance for Fair and Progressive Employment Practices, the Work-Life Works! portal and WorkPro. Based on the assessment, a holistic framework is proposed in this chapter's final section to more comprehensively address the Government's objectives.

SkillsFuture

The work of the SkillsFuture Council triggered a national movement in January 2016 to provide Singaporeans with opportunities to develop themselves to their fullest potential throughout life, regardless of their starting point (box 4.1). The Government hopes that, through this movement, the skills, passion and contributions of every individual will drive the country's next phase of development towards an advanced economy and an inclusive society.

Box 4.1

Four thrusts of SkillsFuture

- Help individuals make well-informed choices in education, training and careers.
- Develop an integrated high-quality system of education and training that responds to constantly evolving needs.
- Promote employer recognition and career development based on skills and mastery.
- Foster a culture that supports and celebrates lifelong learning.

Source: See http://www.skillsfuture.sg/AboutSkillsFuture (accessed 22 Apr. 2018).

Based on SkillsFuture's recent annual report (SkillsFuture Singapore, 2017), in 2016, a record 418,000 individuals took up 950,000 training places funded by the Ministry of Education and SkillsFuture Singapore. The increase was partly driven by the launch of the national SkillsFuture movement. It also corresponded with a rise in the training participation rate of the workforce aged 15–64, which was 42 per cent in 2016 – the highest in recent years. The Ministry of Education and SkillsFuture Singapore provided SGD458 million in direct training subsidies in 2016, an increase of about 20 per cent from 2015. Most of that funding (about 91 per cent) was provided through targeted course-fee subsidies, in line with certain sectors of the economy. The remainder of the funding (about 9 per cent) went directly to individuals through such initiatives as SkillsFuture

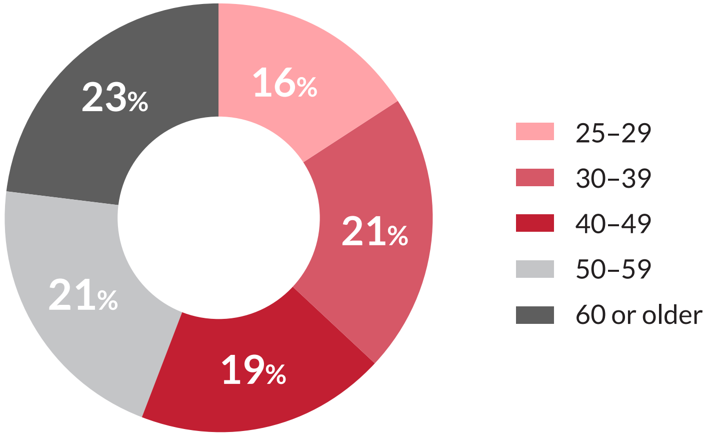
Credit. All Singaporeans aged 25 or older received a credit of SGD500 in January 2016 for use towards a training course. The credit does not expire; the Government will provide periodic top-up and the credit can be accumulated.

To better assess outcomes, SkillsFuture Singapore conducts an annual survey with individuals and business owners who had previously participated in the workforce skills qualifications training. The Workforce Skills Qualifications Outcomes Evaluation Survey 2016 indicated that most participating employers found such training beneficial to their employees and business, with 96.7 per cent of the surveyed employers reported that such training had a positive impact on their employees' skills application. It represented a slight increase from the 95.7 per cent in the previous year's survey findings. In a similar vein, the percentage of individuals who indicated that workforce skills qualifications training had enabled them to work more efficiently and effectively remained high, at close to or exceeding 90 per cent.

Although prior research (MRSD, 2014) indicated that older, less-educated workers were not well represented in the training courses, judging from the highly positive responses from both employees and employers in the latest survey and despite a scam in 2017,[34] SkillsFuture appears to be achieving some of its objectives (Seow, 2018). There was a good spread of participation across age groups among the 126,000 Singaporeans who had used the SkillsFuture Credit in 2016, and 44 per cent of them were aged 50 or older (figure 4.1). For this group, the most popular courses were information and communications technology, security and investigation, personal development, productivity and innovation. It is not yet clear, however, to what extent the SkillsFuture movement has contributed towards developing the skills, passion and contributions of every individual (including the lower-economic stratum of older adults) and propelling Singapore towards an advanced economy and an inclusive society.

34 In October 2017, SkillsFuture Singapore, which oversees the lifelong learning initiative, was swindled of nearly $40 million by people who submitted false claims for training grants from the Skills Development Fund. The police believe that a criminal syndicate was behind them. Following the scam, a task force, involving SkillsFuture Singapore, the Ministry of Education, the police Commercial Affairs Department and the Accountant-General's Department, was set up to conduct a thorough review of how the fraudulent cases happened, evaluate the fraud detection system and make recommendations for improvements.

Figure 4.1: Distribution of SkillsFuture Credit utilization, by age group, 2016



Source: SkillsFuture Singapore, 2017b.

The data on the quantum of training subsidies disbursed, the training outcomes (through the surveys) and the utilization rates of SkillsFuture Credits by age group no doubt provide good insights. But the existing data are not sufficient to track attainment of the SkillsFuture ambitions. What is needed is, for instance, monitoring over time: Research should consider whether individuals think they make more well-informed choices in education, training and careers compared with a previous period and whether the training has benefited them in gaining and remaining in employment. They could be asked to elaborate on the factors, issues or obstacles that affected their skills acquisition. Additionally, differences in responses could be monitored by gender and by job level to target persons most in need (which may prove to be women and the lower-wage and lower-skilled older workers). Employers could also be tracked over time to assess whether they give greater recognition to their employees based on skills and skills mastery, compared with a previous period.

Tripartite Alliance for Fair and Progressive Employment Practices

The Tripartite Alliance for Fair and Progressive Employment Practices (TAFEP) was set up in 2006 to resolve workplace discrimination issues that older workers experience. Its members represent employers, unions and the Government. Its scope has expanded since then to encompass issues pertaining to race, gender, religion, family responsibilities and disabilities. It now focuses on building fair and inclusive workplaces and championing the adoption of progressive employment practices. It promotes an educational approach to increase awareness and disseminate information on fair employment practices. It provides employers, employees and union members with a range of tools, resources, training workshops, advisory services and educational materials to help achieve fair and progressive employment practices and compliance with employment legislation. Employees who experience discrimination in the workplace can seek advice and assistance from TAFEP.

TAFEP has conducted numerous workshops on topics related to the progressive management of older employees, fair recruitment and candidate selection, progressive employment practices (such as flexible work arrangements) and grievance handling. TAFEP has reached thousands of workers and employers through its research and publications, its biennial Exemplary Employers Awards (which showcase progressive workplaces) and its conferences on such themes as “Unconscious Bias and Diversity and Inclusion” that look at older workers and age management.

TAFEP also conducts awareness-raising campaigns. In 2016, for example, the Ability is Ageless campaign targeted fair employment issues of older workers. A post-campaign survey revealed that it left a strong impression and forged a positive attitudinal shift towards the fair treatment of older employees and that the top unaided campaign message recall among employers and employees was “Ability is not limited by age”.[35] While it is difficult to assess the impact of the educational efforts, the steady increase in the employment rates of persons aged 65 or older, from 14.4 per cent in 2007 to 25.8 per cent in 2017, seems an indicator of progress.[36] A decline in the number of complaints about workplace discrimination, from an average of 66 per year between 2011 and 2014 to 43 in 2015, constitutes another positive sign (Seow, 2016).

Work-Life Works! portal

TAFEP developed the Work-Life Works! resource portal in partnership with the Tripartite Committee on Work-Life Strategy. Comprising members from government agencies, employers’ groups and unions, the committee was set up in 2000 to drive the promotion of work-life harmony in Singapore.

The portal provides an integrated resource platform to assist employers in applying work-life strategies and to increase awareness of such strategies among employees and the general public. Balancing work and life priorities is an important factor for older workers’ decision to continue working. These strategies include telecommuting, staggered time, job sharing, compressed work schedule, phased retirement, creative scheduling, weekend work, time bank, project-based work.

Launched in November 2014, the portal provides a range of tools and resources, such as research publications, case studies, funding information and a quarterly e-bulletin for employers to stay updated on work-life issues. An average of 7,500 per month visitors looked at the portal in the first 11 months of 2017,[37] for a total of 82,500 unique visitors. While it is not possible to determine whether this implies that flexible work arrangements are now more readily available than before, and specifically to older workers, the level of response is encouraging.

35 Author’s personal communication with TAFEP official, 27 Dec. 2017.
36 Ibid.
37 Ibid.

WorkPro

The Government introduced WorkPro in April 2013 to augment human resources, foster progressive workplaces and strengthen the core of the country's workforce through Age-Management Job Redesign and Work-Life Grants (box 4.2). As of December 2014 – more than halfway through the three-year time frame for the scheme – only 27 per cent of the SGD170 million funding had been committed. Moreover, only 1,500 of the 180,000 businesses in Singapore in 2014 had tapped into the funds (Seow, 2015). Due to the dismal take-up of the grants, the scheme was enhanced in July 2016 to encourage employers to foster age-friendly workplaces through job redesign and age-management practices for older workers (Singaporean citizens or permanent residents aged 50 or older) and adopting flexible work arrangements for all workers.

Box 4.2

Enhanced WorkPro grants (up to SGD425,000)

- **Age-Management Grant (up to SGD20,000):** raises awareness of age-management practices and offers support to businesses in acquiring the competencies to implement these practices.
- **Job-Redesign Grant (up to SGD300,000):** helps organizations create physically easier, safer and smarter jobs for older workers (aged 50 or older). It includes placement and retention of older workers, improved productivity, enhanced job scope and wage increases.
- **Work-Life Grant (up to SGD105,000, effective from 1 July 2018):** provides funding support for work-life strategies, especially flexible work arrangements.

Source: See http://www.ssg-wsg.gov.sg/ (accessed 25 Aug. 2018).

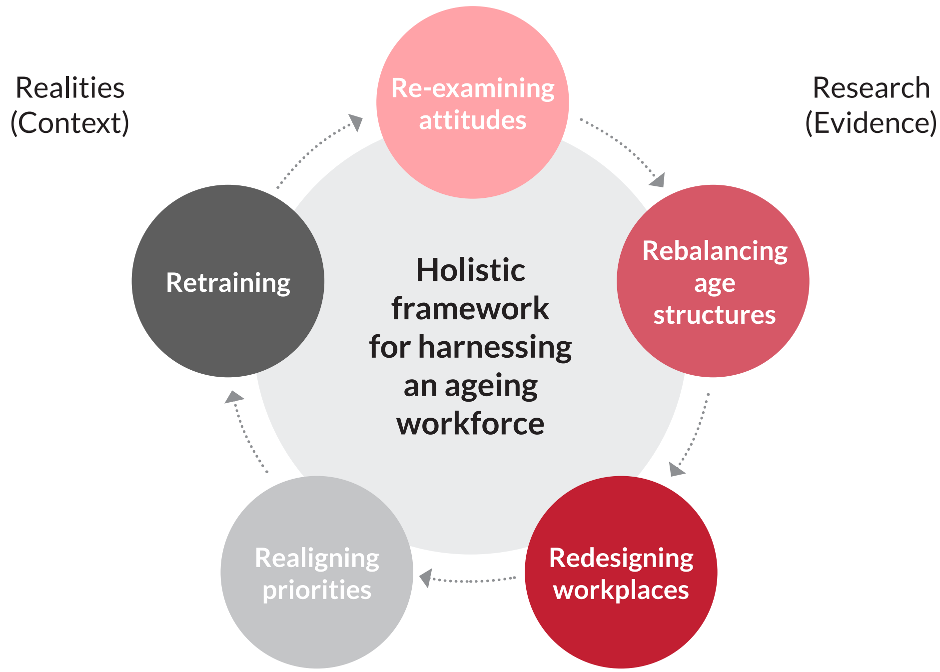
To improve the take-up rates with the grants, more technical assistance could be provided to businesses, particularly small and medium-sized enterprises (SMEs) that do not possess the know-how on job redesign and on implementing flexible work arrangements. Processes and documentary requirements could be further simplified or reduced as well.

While the programmes and other initiatives (not discussed here) to promote skills acquisition and employment of older adults are laudable, they should, for the accountability of public expenditure and future sustainability, be closely monitored, enhanced and fine-tuned. These programmes need to be assessed more critically against the goals of skills development and promoting inclusive growth for all workers and individuals in Singapore. While the existing measures are steps in the right direction, they do not appear to be adequate. What strategies should businesses adopt to more effectively leverage the experience, strengths and potential of older workers? How could workplaces be designed to better promote their work abilities? How might workplaces align their operational requirements to accommodate the domestic responsibilities of older workers, especially older women? How should skills-training activities be delivered to benefit all older persons, including the lower-wage, lower-skilled of all genders? Most importantly, what fundamental changes in beliefs and attitudes about older workers are necessitated among employers and in society? Solutions to these questions would require a holistic approach presented in the next section.

4.3 Holistic framework for harnessing the potentials of older workers

Achieving an inclusive workplace culture requires a holistic framework (figure 4.2) that encompasses (i) re-examining attitudes; (ii) rebalancing age structures; (iii) redesigning workplaces and environments; (iv) realigning business priorities to match those of older workers; and (v) retraining older workers. This framework should lead to the reskilling of older workers and harnessing their experiences in a way that balances business needs with individuals' passions. These strategies should be applied proactively and continuously, adapting as needed to external realities and new research findings. Although the framework is recommended for Singapore, it could be applied to other countries by adapting to specific demographic, sociocultural, economic and political situations (the contextual realities).

Figure 4.2: Holistic framework for harnessing an ageing workforce



Source: Author.

Re-examining attitudes

Research consistently reveals an overall negative bias against older workers (McCarthy et al., 2014), possibly due to the widespread deficit hypothesis. This implies that there is an assumption of a general decline of skills, abilities and performance among older workers, even though evidence suggests that this hypothesis is inaccurate (Bertolino, Truxillo and

Fraccaroli, 2013; Ng and Feldman, 2008 and 2010). Such negative stereotyping of older workers is accompanied by unfair treatment. They are often seen as "last resort" employees, which affects their employment and development opportunities (Billett et al., 2011). They are treated less fairly than middle-aged or younger workers (de Lange et al., 2010). The bias is so prevalent that older workers often need to disguise their real age, including using a much younger photo of themselves in a WhatsApp profile and omitting some of their work experiences to obtain an interview.

Research carried out in Singapore has further found that expectations of work withdrawal, assumptions about health and decision-maker's age influence negative attitudes towards older workers (McCarthy et al., 2014; Metcalf and Meadows, 2010). Even human resource managers responsible for age-related policies hold stereotypical views of older workers (Parry and Tyson, 2009). These myths and/or stereotypes, which are detrimental to age-diverse workplaces, need to be challenged. This requires the commitment of management (McCarthy et al., 2014).

Despite sufficient evidence, ageist attitudes in the workplace prevail and continue to work against the employment of older workers (Abrams et al., 2011). Recruitment practices in SMEs may limit opportunities for older workers (Kitching, 2006). Negative stereotypes can damage the perceived economic value of older workers (Fuertes, Egdell and McQuaid, 2013). The treatment of older workers by their employers and colleagues has significant influence on their decision to either continue working or retire (MRSD, 2011).

Extensive evidence exists to demonstrate that older employees (defined generally in the research literature and Labour Force Surveys as persons aged 40–50 and older) are just as effective at work as their younger colleagues (Metcalf and Meadows, 2010), especially when abilities match requirements and expertise is accounted for (Beers, 2014). In fact, fewer customer confrontations have been attributed to the presence of older workers, who are less exposed to negative customer behaviour than younger workers. Older workers tend to have better emotional control (Johnson et al., 2013) and better crisis management and problem-solving capacity (TAFEP and CIPD, 2013). There is no consistent evidence either that suggests older workers are less productive than younger workers. Job performance is generally the same across age groups.

There is also little evidence that chronological age is a strong determinant of health; and age-related declines in health do not generally adversely affect performance or productivity (Benjamin and Wilson, 2005). In general, it is not the age of a worker that is most important but the demands of work exceeding a worker's capabilities (Health and Safety Executive, 2011). In the modern era, health and technology improvements mean there are few jobs that the average 70-year-old cannot do (McNair et al., 2012). According to research, cognitive performance does not markedly decrease until after age 70 or even 80 (Health and Safety Executive, 2011). Thus, older workers in professional, managerial and executive jobs could potentially continue to excel for years after they reach age 60.

Contrary to common perception, older workers do not have more sickness-related absence than younger workers (Benjamin and Wilson, 2005). Young age is a risk factor for a short duration of sickness-related absence, although older workers tend to be absent for longer spells (Alavinia et al., 2009). In one study (Ng and Feldman, 2008), older workers were less likely to be absent; when they were, it was attributed to sickness. However, illness and infirmity do not necessarily negatively impact functioning at work (Pransky et al., 2005). The negative relationship between age and general absence becomes stronger in studies published after 2000. This may be due to the improved health of older workers now, in comparison with workers of 20 years ago. And people are commonly able to remain in work despite health issues (Health and Safety Executive, 2011). Research has also found that older workers are not at higher risk of work-related accidents. Although, accidents involving older workers can result in more serious injury (Beers, 2014; Health and Safety Executive, 2011).

Studies further reveal that older workers are more reliable and committed and less aggressive and tardy (Health and Safety Executive, 2011). In addition, older age is linked to higher motivation and satisfaction at work (Bertolino, Truxillo and Fraccaroli, 2013; Ng and Feldman, 2010). Older workers are less likely to leave an employer (Walker and Maltby, 2012). Although they may take a longer time to adapt to changes, older workers do adapt to them (Health and Safety Executive, 2011).

Older workers are not a homogeneous group in terms of gender, race, class, ethnicity and able-bodiedness (Van Rooij, 2012). Because people age differently, group averages are unreliable (Charness, Czaja and Sharit, 2007). Education levels and the position of an older worker in their workplace are critical differentiators (Schmidt, 2007; Schaie, 2005). Additionally, individual differences increase with age. This implies that older workers should be assessed based on their functional age (the ability to perform tasks) rather than their calendar age (Sterns and Doverspike, 1989).

In today's workplaces in which several generations work alongside one another, management should apply fair practices to all age groups and refrain from privileging one group over another. Recruitment, retention, compensation and rewards should be fair, based on merit and objective measures of performance – not on age. Otherwise, even the younger employees may become demoralized if they perceive that their efforts, achievements and career aspirations are not assessed on an equal footing by their employers.

Rebalancing age structures

To ensure the future sustainability of a business, an employer should carry out a forecast of the workforce age structure. It would be expedient to select a period between five and ten years to make realistic assumptions, yet far enough into the future so that major changes can also be illustrated. This would reveal the actual age structure of an organization's workforce and its expected development in the future. It thus offers a good launchpad to determine and discuss possible human resource problems (box 4.3) that relate to changes in the age structure.

Box 4.3

Age structure analysis: Pertinent questions

- If older workers predominate, is the time of the probable retirement of the employees known?
- Is there a threat of staff bottlenecks or a loss of expertise, owing to the departure of the older workers?
- Are there procedures for the early and systematic transfer of knowledge in the organization (such as succession and mentoring models)?
- If middle-aged workers predominate, is it to be expected that the middle-aged workers born in the years with high birth rates will remain with the employer?
- Will younger workers retire at a later date than today's older generation?
- How can the work ability and performance of this large age group be enhanced to prevent reductions in performance as they age?

Source: Adapted from Morschhäuser and Sochert, 2006.

The variables to consider in such a forecast are the **size of the workforce** in relation to business development, planned dismissals and organization restructuring and **recruitment**. For example, to what extent are new recruits to be expected and what might the probable age distribution of the new recruits be (Morschhäuser and Sochert, 2006). Recruitment should be based on skills and experience rather than qualifications because older workers often have expertise without qualifications (Lou et al., 2017; DWP, 2013).

Another variable to consider is **staff turnover** by age group and whether the rates are likely to remain the same in the future or if changes are probable. The anticipated **retirement age** of older employees in the future as well as the numbers who would be retiring should be considered. Changes in statutory provisions, such as an older age of retirement, must be factored (Morschhäuser and Sochert, 2006).

To achieve a healthy age structure, juxtaposed against demographic context and business imperatives, an employer should examine if the business proactively recruits and retains older workers. For example, does it formulate vacancy advertisements in such a way that older persons are also targeted? It could evaluate whether it has been successful in retaining older employees, such as by recognizing and compensating them based on their contributions and performance and by applying a fair salary structure for all employees that is commensurate with their roles and performance.

Redesigning workplaces

The third critical step in managing an ageing workforce is to redesign the workplace, adjust working conditions and re-tool the work environment (box 4.4). Studies have shown that ergonomic workplace design is particularly important for older employees because efficiency of the senses, physical strength and speed decline with age. Poor health, a major factor in shortening the working life, is often an outcome of poor-quality work and workplace design and poor management practices (Maltby, 2011). With the exception of sensory change, much of the so-called age-related decline closely links to environment and behaviour, which can be modified or reduced (Harper and Marcus, 2006).

Box 4.4

Workplace redesign: McDonald's, Singapore

Key adjustments were made to ensure an operations-friendly environment for older workers at McDonald's:

1. **Visuals and graphics to kitchen's food station**
   Previous training aids were text-heavy, and mostly in English. These training aids were revised to include more visuals and graphics.

2. **Cash Registers / Hand Held Order taker (PDA)**
   Existing cash registers were upgraded to touch-screen models, where each menu item is represented visually. This eliminated the need for mature employees to squint to read tiny texts on the registers. It also made it easier for employees to enter customers' orders, ensuring faster service to the customers.

Source: See https://www.tafep.sg/node/288 (accessed 25 Aug. 2018).

Research also indicates that work ability decreases with age when there is a large physical workload and little job control. In one study (Costa and Sartori, 2007), the decreased ability was constant over many years for jobs with high mental involvement and autonomy and little physical constraint. Workplace design that reduces workloads are not only necessary for older employees with health problems but is, concurrently, a health care measure for younger employees. The use of technical, strength-increasing work aids can help prevent the physical overtaxing of older employees and reduce the physical load on younger employees, thus helping to prevent injury among all employees. Additionally, the more strenuous the work, physically or mentally, the greater the need for scattered break times. Another study (Morschhäuser and Sochert, 2006) also found that even breaks of one minute or a few minutes had an important recovery effect.

Research has revealed that workplace stress, boring or repetitive work and little autonomy or flexibility influence employees' retirement decisions. These are especially important to people with health conditions or caring responsibilities, both of which are highly relevant to older workers (DWP, 2014; Billett et al., 2010). Evidence suggests that stress-reduction measures in the workplace and social support are important (Crawford, 2011) (box 4.5).

Studies also have found that working night shifts involves increased health risks because the circadian rhythm cannot be reversed. It is more difficult for older employees than younger ones to adapt to an "unnatural" sleep and awake rhythm. And it is the cumulative effects of years of shift work rather than age that is important in predicting ill-health effects (Griffiths, Knight and Mohd Mahudin, 2009). Another study (Ilmarinen and Tempel, 2002) discovered that shift workers aged 40 or older had increased risk of sleeplessness and were affected more frequently by coronary heart disease and depression than younger workers.

To mitigate the adverse impact of shift work, employers should consider offering workers from a certain age or after working a night shift for a certain period to change back to a normal shift. It is also advisable to provide short rotating shift changes and keep the interspersed night shifts to a minimum as much as possible. However, individual workers' preferences need to be respected because it also governs their well-being and health.

Employers should ensure that the physical requirements and demands of a job meet the capabilities of each individual – a good person-to-job fit. This should apply to workers of all ages. Employers should assess, at regular intervals, the suitability of existing jobs of older workers for them to achieve maximum productivity and best performance. A critical strategy is to adopt new technologies, such as utilizing appropriate machines, to compensate for the decline in the physical strength of older workers.

Box 4.5

Strategies to sustain the health and work ability of employees

- Institute regular health checks, such as occupational health and general health care examinations;
- Organize talks and training workshops and/or communicate through other media (email and printed materials) to inform employees on how they can retain and promote their physical efficiency and mental well-being. Topics could include nutrition, smoking cessation, coping with work requirements, managing stress and preventing burnout;
- Incorporate "wellness" activities, such as fitness centres and programmes, sports and recreation. Such activities need not necessarily be costly. Creative employers have found that to manage costs (for exercise equipment) they had to improvise. One employer used cardboard that her company no longer needed as exercise mats for employees to carry out stretching exercises. She even converted her factory floor space into a gym for aerobic workouts in the evenings.

Source: Author.

Re-aligning priorities

Studies have revealed that flexible work arrangements create opportunities for older adults to remain in employment (Schalk and Desmette, 2015). Flexible or part-time work can help older workers with caring and domestic responsibilities (Lou et al., 2017) or managing long-term health problems (Griffiths, Knight and Mohd Mahudin, 2009). In the latest Singapore Labour Force Survey findings (2016), women constituted the majority of persons outside the labour force. Many cited family responsibilities (housework, childcare, caregiving for immediate family members or other relatives) as the main reason for not participating in the labour force. Among potential entrants, preference for part-time employment was higher among women aged 40 or older and among men aged 60 or older (MRSD, 2016).

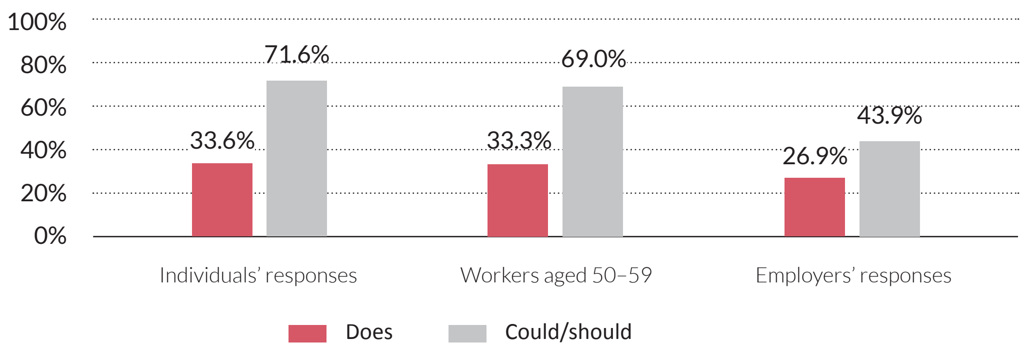
Other survey findings also reveal that many older workers would like to work part-time and even go back and forth between periods of work and periods of leisure (Ko and Khan, 2014; MRSD, 2011). In various training workshops in Singapore, some older participants pointed out they would like to spend more time with their families; others wanted to travel overseas to visit their children and grandchildren for a longer duration than two or three weeks but then they wanted to return to work.

The pattern of lower employment rates among women may have important consequences on their financial sufficiency later in life. In general, in many countries, the average life expectancy of women is higher than that of men (thus the notion of "feminization of ageing"). With interrupted work histories resulting in limited opportunities to accumulate financial resources for their later years, women are more likely to experience poverty (thus the phenomenon of "feminization of poverty" in old age).

Older women's financial circumstances are likely to be further aggravated if societies and employers do not make the necessary preparations to facilitate their participation in the labour force and accommodate their familial obligations, such as by implementing part-time and flexible work arrangements. The resulting effects on society might be that older women may require more health care and social service support as well as financial assistance because they tend to outlive men and are more likely to suffer a longer duration of morbidity prior to death than men.

Despite older workers' desire for part-time work in a 2011 study (69 per cent of those aged 50–59), only 33.3 per cent of that group claimed that they had been offered such opportunity by their employer (figure 4.3). In that study, there was a wide disconnect between what individuals thought employers could provide in terms of the opportunity to work fewer hours (71.6 per cent) and what employers wanted to provide (43.9 per cent) (Ko and Khan, 2014; Ko, 2011). A recent government survey found that the levels of part-time employment had remained similar over a three-year period (MRSD, 2016).

Figure 4.3: Opportunity to work fewer hours (n = 1,000 employees, 300 organizations)



Source: Ko, in Ennals and Salomon, 2011, p. 162.

Considering the evidence on older workers' capabilities and their desire for part-time and flexible work arrangements, employers (including those in the community and social service sectors) could benefit by making such opportunities more available. These may include allowing an older worker to take several months' leave and then return to the job. Coverage of duties would have to be arranged and flexibility exercised. A system could be put in place that is similar to maternity or unpaid leave for women to look after a newborn baby or young children. Another option is to have two older persons share a job, with each working for blocks of three to six months each time or four-hour shifts each day. While there may be inconveniences, the benefits likely will be a more energized, motivated, happier and appreciative group of employees. The experiences and skills of older workers could be maximized. Another alternative is to engage older workers during peak seasons, thus achieving win-win solutions. When there is an economic downturn, such arrangements would enable employers to reduce costs without having to retrench workers and yet have experienced workers when business picks up.

"Phased retirement" is another option in which an older person gradually decreases their number of work days a week until retirement. Such practices can be beneficial to employers because they allow mentoring opportunities and facilitate the sharing of organizational knowledge, thus preventing the loss of key skills and expertise (Department for Work and Pensions, 2013). Other possibilities include: compressed work schedules, creative scheduling, interim work, flexible hours, flexi-shift, flexi-time or staggered start and end times, telecommuting, time bank and phasing in and out.[38]

A further option is the promotion of self-employment. This offers greater flexibility in working hours and could accommodate older workers' transition into retirement. To engender self-employment, microfinancing should be more accessible to older persons in starting up a business, particularly for persons from the lower-income stratum. Some of the Grameen Bank principles could be used as a guide (Yunus, 2008).

Retraining

Another significant factor in facilitating older workers to remain in employment is training opportunities. Intensive, on-the-job training that closely aligns with actual job requirements is one of the most promising strategies to maximize the ability and employability of workers (Schalk and Desmette, 2015). Due to the rapid obsolescence of knowledge in a knowledge economy and accelerated rate of technical change, demands on qualifications and for innovative skills have been constantly rising. Research has found that workers with higher qualifications have a better chance of finding a job and remaining employed even after they reach age 55 (Bosch and Schief, 2005).

Training participation

Research have noted the importance of training for the employability of older workers (Pillay, Kelly and Tones, 2010; Armstrong-Stassen, 2008). Yet, in Singapore, older workers

38 For more information, refer to https://www.tafep.sg/ep-work-life-strategies (accessed 12 June 2018).

are under-represented in training, particularly the older and less-educated persons (MRSD, 2018 and 2014).

In the United Kingdom, training selection may be influenced by the time remaining before older employees' retirement, even though this is discriminatory and there is no guarantee younger employees will not leave after training (DWP, 2013). Older workers may be denied training opportunities outright (Consumer Search Hong Kong Ltd, 2016; Kadefors and Hanse, 2012; Vendramin et al., 2012).

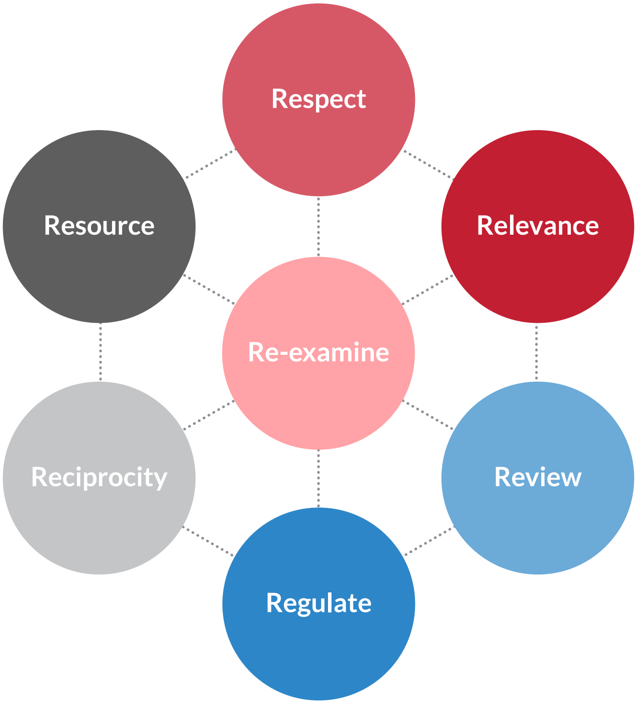
Training design

Research in Singapore has revealed that older employees want to learn new tasks and take on new work roles, use diverse forms of learning support and are self-directed in learning. While some older employees prefer to learn through an opportunity to share information, others prefer to learn through practice, observation, listening to and working closely with other colleagues and on-the-job training. Some older workers in Singapore, however, lack confidence to learn new skills and take on new forms of work, despite their interest and capacities (Ko, 2014; Billett et al., 2010). These characteristics are applicable to Hong Kong, China, too (Lou et al., 2017). Other older workers may have internalized the general negative societal perceptions about them and become self-limiting.

A targeted approach is required to offer the guidance, encouragement and support that older workers need. Studies have found that older employees desire to be positioned not just as "students" but as "resources" with valuable experiences, skills and knowledge to offer to others, even as they are learning from others (Ko, 2015; Billett et al., 2010; Kim and Merriam, 2010). This strategy is consistent with the findings of research conducted in Singapore on the strategies utilized by successful training practitioners for classes comprising mostly older workers (Ko, 2015). It also appears to be appropriate within the Asian cultural context, in which "saving face" and "being respected" seem to be ubiquitous cultural features and are highly valued by older workers (Lou et al., 2017; Ko, 2012).

Recent award-winning research conducted in Singapore (Ko, 2015) distilled seven salient principles on how successful instructors deal with the training of lower-wage, lower-skilled mature workers (aged 45 or older). As noted earlier, older workers in Singapore, particularly in the less-educated stratum, are less likely to enrol in training courses (MRSD, 2018 and 2014). Older learners have also emphasized the key role that an instructor has in driving their decision to enrol in particular learning programmes (Duay and Bryan, 2008). Hence, instructors' effectiveness could be enhanced by applying these principles. Moreover, the principles appear to be relevant for persons tasked with the responsibility of coaching or mentoring older workers. Additionally, they may be applicable to the less-developed regions of Asia, where a large proportion of older workers hails from the lower socioeconomic stratum. These principles are encapsulated in seven Rs, as shown in figure 4.4.

Figure 4.4: Principles for training mature workers aged 45 or older



Source: Author.

First, regardless of older learners' physical and psychological decrements and social circumstances, instructors should always adopt a posture of **respect** to them. This is especially significant within the Asian cultural context. Second, to strengthen and sustain motivation, the content or information to be imparted should be **relevant** to their work situations and have practical applications. Instructional methods that resonate with the learners should be employed. Third, instructors should be mindful of age-associated changes in memory and thus frequently **review** with older learners the lessons taught. Fourth, considering age-associated decline in information processing ability, it is important for instructors to judiciously **regulate** their instructional speed as well as the amount and level of complexity of the content to be taught during each episode of instruction. This will ensure comprehension and facilitate goal attainment by older learners.

The fifth principle is **reciprocity**. This implies that instructors should recognize older learners' experience and knowledge and be prepared and willing to learn from them. The next principle is **resource**. Notwithstanding mature employees' limitations and sensory decrements, instructors could identify their strengths and capabilities and consciously leverage them as a resource, for example, in peer teaching or coaching. This principle alludes to the Billett et al. (2010) study on positioning older learners as "resources" rather than merely as "students".

Finally, beyond these principles, instructors ought to critically **re-examine** their underlying perceptions and beliefs about older learners and discard those unsupported by evidence. Because this principle is most fundamental and because a significant extent, people's actions and behaviours emanate from their core beliefs and understandings about them, it is located at the heart of the seven principles.

Deployment

In a Singapore survey, two-thirds of respondents aged 50–59 said the opportunity to "guide and teach younger workers" would make work more attractive to them (Ko and Khan, 2014, p. 111). Older employees, particularly professionals, managers and executives, want their workplaces to fully harness and develop their capacities, including deploying them as mentors. In a survey of 103 human resource managers and senior decision-making persons in Singapore, 59 provided their own examples of how mature employees have benefited or could benefit their businesses. Of them, approximately two-fifths reported that mature workers were able to transfer their knowledge and experience to others and/or act as mentors, coaches and trainers (TAFEP, 2013). Yet, it appears that employers are not optimizing such interests and capabilities of older workers (Ko and Khan, 2014).

Research has also found that older workers perform well in managerial functions because it requires work experience, knowledge of organization circumstances, life experiences, assertiveness, awareness of responsibility and social skills. Because they can negotiate with customers, suppliers and business associates due to better acceptance and appropriate presentation outside the organization, older workers generally do well in procurement and sales, too. Accounting, cash register, documentation, quality management activities, secretarial work and other activities that require trustworthiness, accuracy and reliability are also suitable for older workers (Köchling, 2003).

Development opportunities

To optimize older workers' experiences, strengths, interests and passions, employers should support their personal development through special tools and processes, such as staff "development", "orientation" or "talks about the future". Indeed, after long periods of employment, it is important for employers to offer older employees the opportunity to reflect on where they stand in their career and what further development steps should be taken. This would facilitate employees to question their career situations, assess their potential and need for further training and to articulate their ideas on their continuing career.

Employers could even support a personal development plan, for example, by providing workshops on career assessment. These could be organized externally (by professional moderators) over a duration of two or three days. Occupational strengths and weaknesses, professional career and the current work situation of participants are examined with colleagues of similar age. Development prospects are worked out, with career moves planned. The focus of such programmes is on what employees can do to fashion their own career situation to be more interesting, less stressful and more aligned with their personal circumstances. This is likely a win-win proposition for both employers and older employees.

Conclusion

Because Singapore is a small nation-State, with a small resident population and little natural resources, human capital is regarded as a critical resource. Therefore, the strategic focus of the Government for economic growth, as well as for building an inclusive society, has been on maintaining the employment and employability of its people through lifelong learning and skills development. Such a focus is necessary and crucial.

But against the backdrop of a highly dynamic, complex and competitive environment that is fuelled by rapid technological advancement, this chapter argues that a holistic suite of strategies is needed to promote the employment and social inclusion of older workers in Singapore – and elsewhere – from every socioeconomic stratum and encompassing all genders. Skills development is an important part of such a holistic framework. However, by itself, skill development is insufficient. These strategies comprise: re-examining existing attitudes; rebalancing age structures; redesigning workplaces and environments; and realigning organizations' priorities to match those of older workers, in addition to retraining or skills development. These strategies should be implemented proactively and continuously, be responsive to contextual realities and reflect up-to-date evidence.

Most crucially, a paradigm shift – a fundamental change in personal beliefs, assumptions and attitudes about older workers – among policy-makers and employers is paramount. Ageist, outdated stereotypical perceptions and myths about older workers must be discarded. In addition, older workers should not be swayed by or self-impose negative societal perceptions that are unsubstantiated by research and are self-limiting.

The current phenomenon of an ageing workforce will continue in Asia as well as in the Pacific in the ensuing decades. Countries experiencing similar circumstances as Singapore are likely to find the holistic framework featured in this chapter to be of relevance to their context.

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5

Increasing young people's adaptability and mobility: from competency approach and twenty-first-century skills to capabilities and vocational streams

John Buchanan
Leesa Wheelahan
Serena Yu

Abstract: The chapter summarizes the inadequacies of the current competency approach to training and the emerging twenty-first-century skills alternative to augment, if not replace, it. The elements of a more effective alternative – a capabilities-based approach to vocational education – are outlined. The chapter explains how elements of failed competency-based training systems can be comprehensively reworked and reconfigured to establish a more dynamic approach to vocational development. It clarifies how vocational education can become a powerful element in any strategy for truly inclusive growth. It does this by answering the question: How can skills development best help young people navigate the future of work?

The chapter deals with five issues. Section 1 summarizes the features of the Australian vocational education and training system. This highlights its fragmentation, the weak links between vocational education and training and the labour market and the massive financial scandals surrounding the system's recent operation. Section 2 discusses how these problems are systemic and not incidental. They arise from narrowly defined objectives, a backward-looking approach to work, a low-trust system of quality control and a deficient notion of the role of "industry" in vocational development. Section 3 outlines the elements of a new, capabilities-based approach. This is informed by more nuanced notions of labour supply and labour demand and emphasizes the importance of social as well as formal systems of compliance for any quality system for vocational education. Section 4 provides observations on the reform process. In particular, it points out there is more than one pathway to renewal and cites three pre-conditions for success. Section 5 summarizes the implications of the new approach for citizens, employers, unions, educators and governments. The chapter concludes by noting that strategies of inclusive growth require a concern with nurturing productive citizens – and not infinitely flexible labour – if they are to succeed.

Introduction

The growing interest in inclusive growth is a welcome development. The global financial crisis of 2008 and the chronic underperformance of nearly all economies since has ensured that the failure of the 30-year experiment with neoliberalism is now plain for all to see. Interest in breaking the trajectory of economic development based on deepening inequality is now widespread. This situation has emerged for economic and not simply moral reasons. Deepening inequality retards economic development. Leading international economic agencies, such as the International Labour Organization, the Organisation for Economic Co-operation and Development, the International Monetary Fund and the World Bank, now argue that growth must be inclusive (more fairly shared) if it is to be sustainably restored (for example, ILO, OECD and World Bank, 2014). To date, however, the trajectory that delivered the global financial crisis has not fundamentally changed (Atkinson, 2015; Bowman et al., 2014; Picketty, 2014; Krugman, 2012; Stiglitz, 2012).

It is important to recognize that redistribution of income is not the only change needed. If the problematic trajectory of recent years is to be changed, a serious reorganization of society (and not just redistribution) is required. In the domain of education and its connection to the economy, it is important to recognize that the Anglo-Australasian competency-based approach to knowledge and learning is a serious problem. While initially heralded as providing a modern, more inclusive approach to skill development, the reality has proved to be otherwise. In places like South Africa and Australia, this approach has helped modernize – not reduce – labour market segmentation. Competency-based training regimes provide nothing that can assist in breaking the trajectory of economic development based on deepening inequality.

This chapter provides a summary of the inadequacies of the current competency approach to training and the twenty-first-century skills alternative emerging to augment, if not replace, it. It also outlines the elements of a more effective capabilities-based approach. In addition, it provides pointers on how elements of the current approach can be comprehensively reworked and reconfigured to establish a more effective approach to vocational development. Ultimately, it provides a powerful element in any strategy for truly inclusive growth. It does this by answering the question: How can skills development best help young people navigate the future of work?[39]

The chapter is organized as follows. It opens by establishing that if inclusive growth only deals with redistributive issues, many of the deeper, qualitative aspects of inequality will

39 The question answered is one posed by the editors of this volume – a collection of papers concerned with inclusive growth. It is important to recognize that education should not be valued for its economic benefits alone. Two matters in particular should be noted in this regard. First, education is not primarily about supporting economic growth. Indeed, causality should run the other way: economic growth should be supporting human flourishing, of which education is a key element. Second, and related: skill development is about contributing to the development of communities and supporting families – not just about developing “human capital”. That said, the question is still important and deserves close consideration, given that it is a matter of increasing concern to policy-makers interested in how skills development can contribute to desirable economic and social development.

survive. This is illustrated with brief reflections of the impact of recent public expenditure increases on education in South Africa and Australia. Just as problematic is the emerging "new vision for education" propagated by such groups as the World Economic Forum. These "visions" place greater emphasis on twenty-first-century skills (the latest incarnation of "soft", "foundation" or "generic employability" skills-policy narrative). Two deep flaws afflict this policy approach: a partial understanding of what human functioning entails and no appreciation of the importance of developing specific domains of expertise as vital foundations for generic skills, like problem-solving and collaboration.

Helping young people to navigate the uncertainties of the future requires nurturing their capacity to adapt (and ideally shape) rapidly changing situations. This quality is the primary concern of the capabilities and life course approaches to human development. Early years education needs to develop learning dispositions. The teen years must develop expertise in a number of domains – academic and/or vocational. Without these foundations, a reliance on only training in specific skills or skill sets, as circumstances dictate, compromises adaptive capacity. Matters requiring priority policy attention are how learning dispositions are best developed, how future-focused domains of expertise are defined, how associated communities of trust are devised and how anchor institutions are fostered to ensure effective quality control concerning the development, codification and institutionalization of knowledge and skills for the future.

The chapter's final section provides practical insights concerning how the transition to arrangements based on these ideas, can be achieved. It devotes special attention to countries that have or are introducing training systems based on the Anglo-Australasian model of competency-based training. The chapter concludes that the inclusive-growth agenda must incorporate a concern for human as well as economic development. Developing human capability will ensure not only more and fairer distributions of economic growth, it will also create the capacities required to help individuals and societies live a life they value and have reason to value.

5.1 Inclusive growth: Necessary but not sufficient for human development

The problem of inequality is, at its most basic, one of distribution. Any reduction of it requires a redistribution of income and wealth. It is not, however, a problem of resources alone. Education has long been recognized as having an important role in both reproducing and potentially reducing inequality. Increased expenditure on education can, therefore, potentially make a major difference – but not necessarily so. Recent experiences in South Africa and Australia illustrate this point: the former as an example relevant to underdeveloped countries and the latter relevant for advanced economies.

A hallmark of the South African apartheid regime was minimal expenditure on education for the country's majority black population. Following the end of that regime, significant additional resources were allocated to education. South Africa today spends more per capita on education than any other country in Africa as a proportion of its gross domestic product (GDP). The end result, however, has been unimpressive. As *The Economist* reported in January 2017, South Africa has one of the worst education systems in the world. The evidence cited included:

- Twenty-seven per cent of pupils who had attended school for six years could not read.
- In the Programme for International Student Assessment (PISA) rankings, South Africa consistently comes last or second last of 76 countries covered.
- Data from the Trends in International Maths and Science Study yield similar results.

In January 2016, the South Africa Minister for Basic Education was quoted as saying, "If 25 per cent [of students] fail [end of school of exams], we must have sleepless nights. … This is akin to a national crisis" (Nkosi, 2016).

The literature on this problem makes a number of important points. The first is that the situation is not uniform. Among the bulk of the white population, education standards remain very good – and the situation is improving for a small minority of the black population, too. The problem is the highly polarized distribution. For example, when the literacy achievement scores of Grade 6 were disaggregated in the Western Cape, four of five children in the former white-student schools were reading at the Grade 6 level, while in the black-student schools, only four in 100 children were reading at grade level (Western Cape Education Department, 2004 cited in Chetty, 2014).

Second, deep inequality is a problem. South Africa remains one of the most unequal societies on Earth. Having the formal opportunity to participate in education means little when the opportunities to flourish are so unequal. Chetty (2014, p. 99) was blunt: Many "poor black youths are being asked to learn in contexts of humiliation, betrayal and disrespect". Motala and Vally (2010, p. 6) made a similar point – adding that the problems of poor communities include lack of infrastructure, "lack of teachers in critical subjects, poor or non-existent material, indefensible approaches to teaching and learning".

Motala and Vally's reference to "indefensible approaches to teaching and learning" is our third, and for our purposes, most significant point. The roots of this lie in South Africa embracing what, at the time, was regarded as the most advanced and progressive ideas of education. For basic schooling, this took the form of outcomes-based education. For technical education, it was based on narrowly defined occupational competency standards (as opposed to knowledge content and time served) training.[40] This focus on outcomes

40 Some defenders of competency-based training systems argue that underpinning knowledge is an element of a good-quality competency-based training system. For these advocates, the absence of such knowledge is a function of poor implementation and not inherent in the system design. Such assertions overlook the fact that designing education around outcomes has fundamental consequences for the importance of – and resources devoted to – curriculum development and pedagogy. Aligning knowledge to specific competencies results in contextually specific applications of knowledge. This detaches knowledge from systems of meaning in which they should be embedded, thereby fragmenting knowledge. For an extended consideration of the design flaws in the competency-based training system from the perspective of having a coherent concern with curriculum to underpin education, especially vocational education, see Wheelahan, 2010, p. 126–144.

freed (in theory) teachers and students from the alleged constraints of top-down, tightly specified curriculum and associated pedagogy of a kind that was regarded as a hallmark of the old apartheid regime. Researchers, such as Stefanie Allais (2004; 2012a; 2012b), have documented how this has compromised education quality profoundly. Michael Young has also analysed the problem. Based at the University of London's Institute of Education, he is one of the world's leading sociologists of education and was involved in the initial reform process in South Africa. He has endeavoured to make up for the damage that he, in part, contributed to by legitimating the core design principles of the post-apartheid South African education system. His recent reflections on this experience are worth quoting at length:

> So [the post-Apartheid regime] created, with some help from naïve well-wishers from Europe, Australia and New Zealand, like myself, a broad framework of values for a racially "integrated" education system and left teachers in Black schools free from what had oppressed them under apartheid – a highly specified top-down curriculum.
>
> "But of course the teachers did not know what to do with the freedom – most Black teachers had received barely any post-school education and the only experience they had was of following instructions from white administrators; it was hardly surprising that the schools slid into chaos that they are still 20 years later, struggling to overcome. In this context, it gradually dawned on me that there is far more to emancipation than a combination of a critique of the past, experience and democratic values – important though as they are. Education is a specialized activity, like medicine and law, and what was needed was knowledge of curricula and pedagogy and knowledgeable teachers – even if, as in South Africa, some of that knowledge was associated with the hated apartheid regime" (Young, 2014, p. 8).

Understanding the problem of education system design is hugely important. Many proponents of competency-based, or outcome-based, systems argue that the problem is one of implementation – not system design. *The Economist* (2017), for example, asserted the problems in South Africa's education system had arisen from corruption in the school system and weak accountability for teachers and principals who fail to address matters of poor teacher quality and attendance records. Problems of this nature are serious, but they are not unconnected. Where there is no systemic valuing of matters like curriculum and pedagogy, problems like those cited by *The Economist* can flourish.

The reality of this last point is established by recent experiences in the Australian vocational education and training system, especially as it operated in the State of Victoria. There, like in South Africa, hundreds of millions of extra dollars were injected into vocational education and training in 2009–14 (Noonan, 2016). The end result has been the emergence of education providers of extremely low quality, enrolling tens of thousands of extra students and not educating them to graduation and then closing down to lock in huge financial gains

(Yu and Oliver, 2015).[41]

Clearly increased public outlays for education – usually regarded as an essential feature of inclusive growth strategies – is not necessarily a sound basis for reducing inequality. Indeed, to the extent such increased expenditures fail to deliver, they discredit the outlays and weaken the case for education initiatives directed at nurturing equitable growth.

Despite the profound failures of the competency-based training model, serious interest remains in using education initiatives to help overcome deep-seated economic and social problems and to better equip people to handle emerging challenges associated with deepening disruptions due to things like artificial intelligence. Recent self-styled "new initiatives" must, however, be seriously scrutinized to ensure one form of "innovative education" failure is not replaced by another.

5.2 Twenty-first-century skills: Part of the problem, not part of the solution

In 2015, the World Economic Forum (WEF) and the Boston Consulting Group (BCG) released their *New Vision for Education: Unlocking the Potential of Technology* report. This document has been widely circulated in leading policy circles globally. It starts with a fairly standard account of the threatened job losses likely to arise from the wider diffusion of artificial intelligence. The report gives some – very brief – consideration to the building blocks needed to establish an effective educational response to this threat. It argues there are four matters of "context" that condition effective policy response: poverty, security, population health and gender equality. It also notes that any effective education system has four components: standards for kindergarten to Year 12 education, expert teachers, adequate funding levels and effective information technology infrastructure. The bulk of the report, however, is structured around a two-pronged argument. First, despite the impending ravages of artificial intelligence in the labour market, there is hope: The future belongs to those with "creativity, innovation and collaboration skills" (WEF and BCG, 2015, p. 2). Second, these can be more effectively developed than ever before, given the possibilities opened up by modern education-based information and communication technology (ICT) offerings.

The skills needed to thrive in our disrupted world, explains the report, were distilled from a meta-analysis of research on twenty-first-century skills in primary and secondary education (WEF and BCG, 2015, pp. 2–3). The process arrived at 16 types of skills in three general categories: foundational literacies, competencies and character qualities (table 5.1).

41 This section covers many issues. Supporters of the Anglo-Australasian model of competency-based vocational education and training in places like Australia continue to assert that the problems merely reflect poor implementation – not inherent design flaws – of the system. More details of why the problems is one of the overall regime design and operations and not implementation are provided in the Annex: Problems in Australia's competency-based training regime: Legacies of poor implementation or design flaws? See also Wheelahan, 2016.

Table 5.1: World Economic Forum and Boston Consulting Group's list of skills for the twenty-first century

Foundational literacies	Competencies	Character qualities
1. Literacy	7. Critical thinking and problem solving	11. Curiosity
2. Numeracy	8. Creativity	12. Initiative
3. Scientific literacy	9. Communication	13. Persistence and grit
4. ICT literacy	10. Collaboration	14. Adaptability
5. Financial literacy		15. Leadership
6. Cultural + civic literacy		16. Social + cultural awareness

Source: WEF and BCG, 2015.

Most of the report considers how six modern ICT innovations can help develop these skills. These are resources that can assist with:

- personalized and adaptive content and curriculum;
- open educational resources;
- communication and collaboration tools;
- interactive simulations and games;
- digital professional development resources for teachers; and
- student information and learning management systems.

On first reading, these ideas seem reasonable. Who could be opposed to giving people skills like critical thinking, supported by the latest modern technology? Closer scrutiny reveals that the ideas proposed are merely a variant of a long-standing and highly limited narrative – the generic employability skills discourse. In Australia, as in other countries, this has been an object of ongoing policy interest for at least three decades. It has been an integral part of competency-based training arrangements. At the core of this narrative is the assumption that there can be a generically skilled worker who, with access to clearly defined competencies, can in theory turn their hand to any domain of work. There are two fundamental problems with this narrative. The first concerns assumptions about the dimensions of human functioning. The second concerns assumptions about the nature of knowledge and how skills are acquired.

Assumptions about human functioning and its deployment

Prima facie, the 16 skills areas identified by the WEF and BCG seem extensive. Appearances, however, can be deceptive. The WEF and BCG findings were scrutinized by a multidisciplinary team from the University of Sydney. It comprised researchers from the Engineering, Medicine, Health Sciences, Education and Social Sciences Faculties and the Business School (Buchanan et al., 2018). They looked at the comprehensiveness of the WEF and BCG framing of the issues on the basis of three comprehensively validated frameworks for mapping and analysing human functioning – as well as the capabilities approach. These four reference points were:

- The International Classification of Human Functioning, as devised by the World Health Organization, which provides a framework for measuring and defining both physical and psychosocial functioning.
- The PERMA framework from positive psychology, which identifies the following as crucial for human flourishing: positive emotion, engagement (flow), relationships (positive), meaning and accomplishment (achievement).
- The OCEAN categories for defining and measuring character or personality (openness to experience, conscientiousness, extraversion, agreeableness and neuroticism or mental stability).
- The human capabilities approach. Sen (1999) noted that this “focuses on the ability … of people to lead lives they have reason to value”. Nussbaum (2006, pp. 388–391) argued that, as applied to education, this means, first, the capacity for critical examination of oneself and one’s traditions; second, the ability to appreciate deeper connections with humanity, not just your immediate reference group; and three, “narrative imagination”, which is the ability to understand another’s situation and experience of life.

Table 5.2 summarizes how the WEF and BCG twenty-first-century skills taxonomy covers and (more importantly) neglects key matters cited in the research literature as essential dimensions of human functioning.

Table 5.2: Characteristics of human functioning – Key elements and how they are included, neglected or narrowed in the twenty-first-century skills framework of the World Economic Forum and Boston Consulting Group

Characteristics of human development		How these matters are handled in the twenty-first-century skills framework	Relevant authorities and examples of alternative or additional framing[4]
• Categories of functioning[1] or • flourishing[2]	• Physical • Body structure	• Overlooked completely.	• These matters are fundamental to health and medical science literature (see International Classification of Functioning).
	• Psychosocial: Mental - cognitive	• Half of all 16 twenty-first-century skills fall in this category (1–8). Often, narrow definition provided (critical thinking).	• Compare with Nussbaum (2006) on critical thinking for capabilities approach – a far more expansive notion.
	- affect	• Overlooked completely.	
	• Psychosocial: Social	• Skill 9, 10, 13 and 15 cover engagement, flow, activity, communication, interpersonal relations, social functioning and positive relationships. • Overlooked learning plus applying knowledge and self-care in the International Classification of Functioning.	• Compare this with positive psychology notion of "positive emotion" and capabilities notions of "world citizenship" and "imaginative understanding" – the latter of which are far more expansive. • This is a key part of PERMA, along with accomplishment and achievement.
	• Psychosocial: Meaning	• Overlooked completely.	
• Categories of character or personality[3]	**O**penness **C**onscientiousness **E**xtraversion **A**greeableness **N**euroticism or mental stability	• Strong on openness to experiences and conscientiousness. • Neglects extraversion, agreeableness and mental stability.	All five identified as critical to future labour market success (see Kautz et al., 2015).

Note: The categorical system used for comparison here is the account of twenty-first-century skills provided by the WEF and BCG, 2015. The listing of all 16 is provided in table 5.1. (1) The key categories here are the defining elements of the International Classification of Functioning (ICF) (see WHO, 2001 for more details). (2) "Flourishing" is really high-order functioning. The ICF categories have been combined with the PERMA framework from the positive psychology literature, as synthesized by Seligman, 2011. It concerns: positive emotions, engagement, relationships, meaning and accomplishments. (3) The categories come from the OCEAN framework for defining and measuring human personality traits: openness, conscientiousness, extraversion, agreeableness, neuroticism (or mental stability) (see Kautz et al., 2015 for a good summary). (4) Some twenty-first-century skills are not easily mapped to these frameworks. They include skills 11 and 12 (curiosity and initiative). Skill 14, adaptability, is really an end result of all of the above.

Source: This table is taken from Buchanan et al., 2018, Appendix 2.

As the researchers of the University of Sydney study noted:

> "What stands out from the table is that when compared with the wider research literature on the determinants of human development, the [twenty-first-century skills] framing of issues is relatively narrow or, more accurately, partial in the way it defines the issues of relevance to education. Key omissions are any concern with physical development, silence on emotional development and any notion of achievement or meaning. While the 21st Century Skills Framework deals with some issues of character, this framework ignores three of the "big five": extraversion, agreeableness and mental stability.
>
> "Of particular note is [that] the narrative places responsibility on individuals for adjusting to labour market change [with] the assumption that individuals are equally placed to be able to do so. Socio-economic factors, family circumstances, age and geographical attachments may limit the extent to which individuals are able to develop either employment-related skills or the personal skills needed to allow them to flourish over their life course.
>
> "An example can be seen in relation to the absence of any concern in the generic 21st century skills framework with the intrinsic impairment (e.g. sight, hearing, mobility) that a reasonable minority of people have in developing skills required to function well in the workplace. This can be seen particularly in the face of increasing expectations of the degree to which the today's workforce will exhibit a higher level of interpersonal and communication skills.
>
> "[If we take an interest in nurturing high-functioning people, it may be the case that firms need to design jobs in a way that draws the best out of what people have to offer – not expect people to be infinitely able to accommodate anything served up to them. For example, someone with autism spectrum disorder may not have several vital '21st Century Skills' – but they may have much to contribute if jobs are appropriately designed].
>
> …
>
> "The inadequacies of the 21st Century Skills Framework – and those like it – arise from their primary object of concern: meeting the needs of the 21st century marketplace [WEF and BCG, 2015, p. 1]. A more appropriate starting point (and the concern of all the literature referred to above) is human functioning and character development in the broadest sense. Development of high functioning, well balanced people with the capacity to flourish is not just good for the individuals concerned – it is a great asset for any community and its associated economy. Traditionally, the notion of a liberal education has had such broad concerns. We reduce a concern with these broader notions at our peril. These concepts provide a better frame of reference for thinking about the future than a focus on narrowly defined employability skills relevant for the 21st century marketplace" (Buchanan et al., 2018, pp. 26–28).

Assumptions about knowledge

The second problem with the twenty-first-century skills framing of issues concerns its assumptions about the nature of knowledge. It is unhelpful to define these skills as generic and assume they can be acquired in the abstract. As Wheelahan, Buchanan and Yu (2015) noted: A skilled coordinator of a childcare centre may have great problem-solving skills when handling a situation of 17 infants "melting down" in the playground simultaneously. But such a person would be poorly placed to solve the problem of an unfolding fire on an oil rig. Equally, a mining engineer would be poorly placed to handle routine challenges in a childcare centre, although they would be much better placed to handle the oil rig situation.

A paradox noted in a diverse range of literature is that, more often than not, the development of specialized expertise is essential for developing generic employability skills, like problem solving. As the University of Sydney research team cited above noted: Generic skills are often best acquired in the context of mastering specific disciplinary, trade or professional expertise (that is, having something substantive to contribute to a team or solving a problem) (Buchanan et al., 2018, p. 7). This is an understanding that comes from disciplines and literature as diverse as cognitive psychology (Perkins and Salomon, 1989), sociology of education (Young, 2014; Wheelahan, 2010) and more applied domains of study, such as that concerned with the IT professional (University of Cambridge and IBM, 2008) and occupational mobility through job clusters in the German and Swiss trade and apprenticeship systems (Geel and Backes-Gellner, 2011). A good example of the processes at work here is provided in the latter literature, that of apprentices in watch and clock making. While this specific occupation may be in decline, it involves mastering deeper capabilities relevant to a larger skills cluster, including, for example, medical technicians and tool making – sectors that are enjoying rising labour demand (in Germany and Switzerland at least).[42]

Also missing from the twenty-first-century skills framework is consideration of how skills development is nurtured at different stages of the life course. Mental health researchers, such as Kirkwood et al. (2008), have mapped out how mental capital rises and declines across the life course. The early years are important for gaining what they call a "learning identity". Others in education (Deakin Crick and Goldspink, 2014; Bourdieu; 1993; Vygotsky, 1978) referred to this as gaining "learning dispositions". These concern such matters as curiosity, resilience, learning relationships, change and learning, meaning making and creativity. Once these are acquired, they provide the platform for mastering particular domains of expertise – something that can commence in the teen years, as has historically been the case with apprenticeships and subject specialization in secondary school.[43]

Given the fundamental problems with competencies and the twenty-first-century skills approach to skills development, what are more appropriate bases for understanding how skills can contribute to inclusive growth?

42 More details about these matters are provided in Buchanan et al., 2018, pp. 30–34.

43 Further details about the matters covered in this paragraph can be found in Buchanan et al., 2018, pp. 28–30. Space does not permit a more extended account of the profound limitations of the twenty-first-century skills narrative. For example, also missing from this framework is any discussion about how they can be delivered, assessed and reported on. We thank an anonymous referee for this observation.

5.3 Better starting points: Human capability, vocational streams and communities of trust[44]

Human capability

Desirable economic development involves more than increased growth and its fairer distribution. This is one of the simple but powerful tenets of the capabilities approach to social science and the humanities in general and public policy in particular. Given the audience for this book – people from both advanced as well as developing economies in the Asia-Pacific region, analysis informed by this perspective is particularly useful. This is because the perspective emerged out of studies of the developing world undertaken by the economist Amartya Sen (1999) and the philosopher Martha Nussbaum (2000). It has subsequently been refined by researchers working in a host of policy areas in advanced industrial nations. It is useful for understanding and guiding policy in the developing and developed worlds alike.

The capabilities approach focuses on what people are able to be and do and the necessary resources and social arrangements that are needed to achieve this (Nussbaum, 2000; 2006; Sen, 1999). In thinking about work, the capabilities approach asks about the broad-ranging knowledge, skills and attributes that individuals need to be skilful at work, to progress in their careers and in their studies and to participate in their communities and in civil society.

Capabilities are differentiated from employability skills or graduate attributes because they are not general or generic. For example, while there are some common foundation capabilities required of all workers (literacy and numeracy), someone who undertakes, say, care work (as noted earlier) will require different capabilities from persons working in, say, engineering. Problem-solving with a 2-year-old in a crèche is quite different to problem-solving in a science laboratory, as is the communication required. In a capabilities approach, the focus is on the development of the individual and on work. Consequently, students need access to appropriate knowledge, skills and capabilities so they can be creative problem-solvers and exercise autonomy in their domain of activity – what we call

44 Much of this section is based on research briefing papers prepared during the course of conducting a three-year project (2012–15) for the National Centre for Vocational Education Research, entitled Vocations – Understanding the Links Between Qualifications and the Labour Market. The principal author of the original briefings, which this section reproduces in large measure, was Serena Yu. The diagram showing the implications of this work for developing a more nuanced approach to understanding labour supply and demand is based on work originally done by Mary Leahy at the University of Melbourne. The ideas summarized in the following sections were developed in more detail in a series of papers and projects (see especially Wheelahan and Moodie, 2011; Yu et al., 2012; Wheelahan et al., 2015; Wheelahan, 2018; Oliver, Yu and Buchanan, 2018).

a “vocational stream”.[45]

Vocations and vocational streams

A “vocation” emerges from fields of practice in which there are commonalities; for example, the commonalities between aged care and disability care. A vocation groups together related clusters of knowledge and skills that allow individuals to progress by specializing within a field of practice, by moving laterally in to linked occupations or by moving to higher studies.

A “vocational stream” consists of linked occupations within broad fields of practice and, in turn, each occupation leads to a number of jobs. That is, within a stream (for example, care work) there are more specialized occupations that allow for ease of labour mobility for people with recognized skills and, equally, exclusion of those without it (for example, drug and alcohol support worker, aged care worker, disability support worker). Even within tightly defined occupations, the final configuration of activity varies between jobs (for example, within disability support, there will be specialization, depending on the needs of different groups of clients).

There are significant benefits for the economy at large as well as for individuals having capabilities that allow them to move vertically and horizontally between and within vocational streams, rather than knowledge and skills for a specific job. In short, vocational streams are defined as linked occupations within broad fields of practice, for which the focus is the development of the person, the attributes they need and the knowledge and skills they require to work within a broadly defined domain (work space) that combines educational and occupational progression (Wheelahan, Moodie and Buchanan, 2012; Yu et al., 2012).

45 It is important to appreciate that this chapter is a contribution to a book concerned with skills and inclusive growth. The capabilities approach is about more than what is good for the economy and individuals as productive beings. Just over a century ago, John Dewey identified the importance of having an expansive notion of vocational education – one that is highly relevant today as we try to rethink the relationship between education and the economy. As he observed (Dewey, 1966 (1916), p. 295): “…each individual has of necessity a variety of callings, in each of which he should be intelligently effective; and…any one occupation loses its meaning and becomes a routine keeping busy at something in the degree in which it is isolated from other interests…. No one is just an artist and nothing else…. He must, at some period of his life, be a member of a family; he must have friends and companions; he must either support himself or be supported by others, and thus he has a business career. He is a member of some organized political unit and so on. We naturally *name* his vocation from that one of the callings which distinguishes him, rather than from those which he has in common with all others. But we should not allow ourselves to be so subject to words as to ignore and virtually deny his other callings when it comes to a consideration of the vocational phases of education.”

The capabilities approach to vocational education and training

The capabilities approach starts with the person and not specific skills, tasks or roles and asks about the capabilities that people need to achieve a range of outcomes. Education and training based on capabilities would focus on developing individuals in three domains:

- **The knowledge base of practice.** This includes the theoretical knowledge needed for the field of practice and for higher level study within the occupation. It also includes debates and controversies concerning the relevant domain so that people can be citizens in their occupations.
- **The technical base of practice.** This includes industry skills that transcend particular workplaces.
- **The attributes the person needs for that occupation or profession.** This includes such attributes as ethical practice but also effective communication skills, the capacity to work autonomously and in teams, creativity, information management and so forth. While these are sometimes described as generic, they are understood differently in different fields of practice and need to be developed within the context of specific disciplines and vocations.[46]

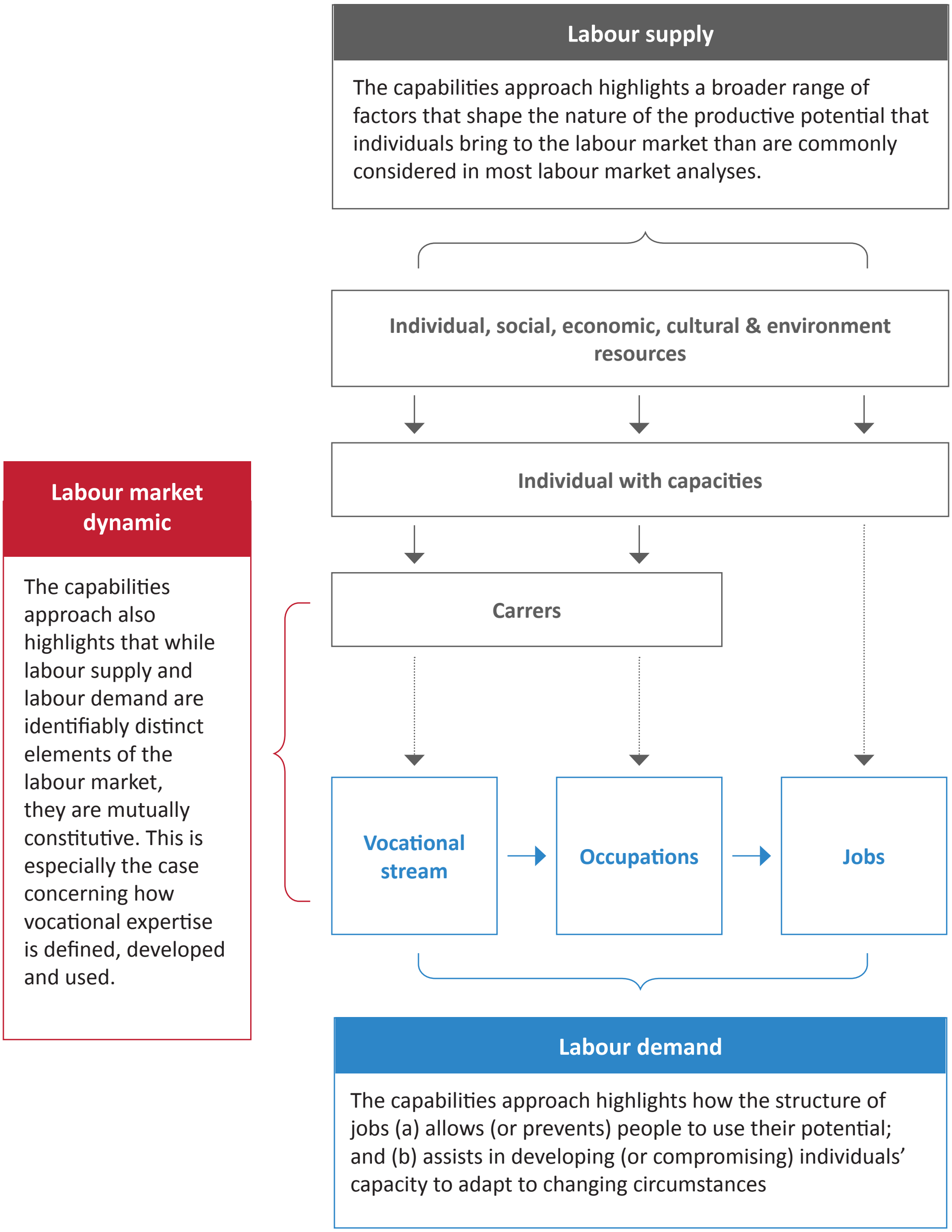
Within this approach, qualifications would prepare students for a range of occupations within loosely defined vocational streams, support students to engage in an occupational progression through a career, link occupational and educational progression and adapt to meet new and emerging needs. This has been a characteristic of the best apprenticeship arrangements and systems for training in the professions around the world: They nurture transferable, practical skills acquired in a wide variety of settings, mastered over extended periods of time.

Broadening the notions of labour supply, labour demand and labour market dynamics

The relationship between capabilities, vocations and vocational streams are presented in figure 5.1. The vertical components of the figure represent new ways of thinking about labour supply, and the horizontal components concern labour demand.

46 Advocates of competency-based training often assert that such training systems value these qualities, too. While they would like to do so, typically systems built around competency-based training (i) do not take underpinning knowledge seriously; (ii) fragment technical skills and do not nurture coherent ensembles of such skills; and (iii) have no coherent notion of disciplinary knowledge or occupational coherence. We thank an anonymous referee for alerting us to this issue.

Figure 5.1: How a capabilities approach enriches notions of labour supply and labour demand and how they interact



Source: Wheelahan, Buchanan and Yu, 2015, p. 21.

The **supply of potentially available labour,** especially its quality, is determined by:

- **Access to resources.** Individuals need a minimum level of resources if they are to function effectively. These underpinning resources are individual, economic, social, cultural and environmental in nature. For example, individuals need access to health care, good food, basic education, transport and networks of social support if they are to undertake vocational and/or more specialized education, go to work, become involved in their communities and so forth (Sen, 1999).
- **Capabilities to work as creative, productive beings.** These include the fundamental abilities of all citizens that concern the capacity to flourish – or at least fit in – socially at work and in their broader communities. It also includes the complex capabilities that allow individuals to integrate and synthesize knowledge, skills and attributes to exercise judgement and autonomy in their lives and at work (Winch, 2010). Importantly, they concern both conceptual and practical skills and the ability to link the two in solving problems. The capacity to be skilled at work emerges from wide-ranging capabilities, and so capabilities will always be wider than those required to undertake specific workplace tasks and roles. As noted, such capabilities are not mastered in the abstract – instead, problem-solving ability, for example, is mastered in a particular academic or vocational domain (what we call "vocational stream" or what others call "job families" or "clusters").
- **Careers.** Over the course of their lives, individuals, through their work, acquire specialized knowledge, technical capacities, intuitions, inclinations and reasoning associated with a distinct realm of practice, such as nursing, engineering, agricultural work and financial services. The accumulation of this expertise constitutes a career. For some, a career can involve deepening expertise in a clearly defined occupational pathway (such as nursing). For others, a career can involve moving across a number of vocational streams. For many, it involves churning through low-end work that, while varied, is rarely challenging in a skills sense. Careers of the latter type rarely involve the deepening of expertise in any domain and thereby limit the capacity of individuals to take on more difficult challenges and opportunities as circumstances in the labour market change.

The **demand for labour** is characterized by a sector's skills ecosystem, which is a cluster of skills in a particular region or industry that is shaped by the interdependencies of firms, markets and institutions (Buchanan, Anderson and Power, 2017; Buchanan et al., 2001). In particular, the demand for labour is shaped by the competitive nature of the product market and institutional frameworks as well as the nature of skill formation (the use of apprenticeships), the structure of jobs (seasonal work) and the modes for engaging labour (casual or shift work). The content of labour demand is defined with reference to the skills required to do particular types of work. This dimension of labour demand can define skill requirements narrowly or broadly.

Labour market dynamics. The capabilities approach also highlights that, while labour supply and labour demand are identifiably distinct elements of the labour market, they are mutually constitutive. This is especially the case concerning how vocational expertise is defined, developed and used. Vocational streams provide reference points that help define what workers bring to the workplace and what employers require.

This framework helps us to consider the relationship between education and work. While tertiary education should prepare people for employment, in developing the capabilities for work, education will need to go beyond preparing people for specific competencies. Rather than preparing people for particular jobs (and discrete workplace requirements), the emphasis will be on preparing people for vocational streams. Although people will acquire vocational skills in specific jobs, the workplace will be treated as a site where more generally applicable lessons can be learned. Desirable workplace vocational education therefore helps promote vertical and horizontal occupational progression and more opportunities for individuals. However, this can only occur when and if vocational streams are determined, and vocational preparation ensures that students have the depth and breadth of knowledge and skills they need as well as the personal attributes required for that vocational stream. We have found that the coherence of vocational streams is a direct function of how well social partners (employers, unions, industry leaders, government and educational institutions) work together.

Communities of trust

The capabilities approach provides a more open-ended way of thinking about work, qualifications and vocational preparation, and it depends on building communities of trust that comprise persons who have a stake in the sector's workforce development. The focus of the capabilities approach, as we are using it, is to focus on building communities of trust that can overcome low levels of trust where they exist (for example, over issues of resource allocation, the value of qualifications and other competing interests) and disconnection between vocational education and work, vocational education and higher education, and higher education and work. Communities of trust work to establish broad workforce development strategies that include identifying emerging occupations within vocational streams and developing the education and training programmes that are needed to support those occupations.

Confidence in qualifications, for example, is greater when defined communities of trust have had a role in developing standards and accrediting qualifications and where qualifications are supported by systems of certification and quality assurance. Communities of trust include professional and occupational bodies, employer bodies and unions, skills councils, recognized industry leaders, employers and educational institutions as well as appropriate government bodies. Another term that may be helpful is to refer to "social partners", which comprises all the key stakeholders. Social partners may have higher or lower levels of trust, but they are the starting point for building communities of trust. Communities of trust do not have to (and will not) agree on all things at all times, but their debates are usually resolved and the outcomes are usually better because this is how knowledge and skills are developed and identified for different occupations.

5.4 Getting to a better place: Elements, pathways and preconditions for success

The capabilities approach has intuitive appeal. The previous section described how it can be used to better understand current skill-development challenges and to think through better ways of structuring work and education to overcome them. How, if at all, can these ideas then be applied in practice? This is a difficult question to answer in the abstract. Effective responses require good analyses and understanding of local circumstances of interest. The following observations are provided on the basis of recent Australian experiences. They are of relevance to countries that have adopted the Anglo-Australasian – or similar – models of vocational education and training grounded on performance-based skill standards. In Australia, these are referred to as "competency standards".

Elements of reform: Capabilities in common, social partner readiness and anchor institutions[47]

The focal point for reform under the capabilities approach is what we call vocations and vocational streams. Remember that a vocational stream is a set of linked occupations within a broad field of practice. The focus is on the knowledge and skills a person requires to work within a broadly defined vocation that combines educational and occupational progression (Buchanan et al., 2009). A vocation could emerge, for example, from the commonalities between nursing, aged care and childcare, across different areas of financial advice or across agricultural work. Vocations defined this way foster identification with the field of practice or broad occupation rather than a specific employer or enterprise or fragments of work, as currently occurs in 1,472 vocational education and training qualifications on offer in Australia.

Most labour flows are not of this nature. In thinking through reform, we believed it was important to understand the nature of current flows and then work out how best to engage and, where necessary, reform them. What is the nature of current flows? Using the Household, Income and Labour Dynamics in Australia longitudinal data set, the research team found strong evidence of labour market segmentation and, in particular, limited vertical occupational mobility (Yu et al., 2012). We found three distinct pathways that accounted for most movement by individuals through the labour market: **high skill**, for example, health professionals with specialized training; **low skill**, such as care workers entrenched in low-skill work; and **marginal attachment**, typically affecting women and older workers with limited episodes of paid work. The job transitions we observed suggested limited, not expansive, occupational choice for a wide range of labour market entrants of varied education and training levels.

47 More details concerning the material in this section can be obtained from Yu, Bretherton and Buchanan, 2013. We are especially indebted to our colleague Tanya Bretherton for the matrix in figure 5.2 and the ideas underpinning it.

These different pathways pointed to some distinct destinations for workers within the three clusters and cast doubt on the notion that everyone who wants and is qualified for a good job can get one. For us, then, the key question of interest did not concern how vocational education and training could fit people into current jobs better. Rather, we were concerned with how reform could be conducted to achieve the development and utilization of a broader range of skills. We were especially interested in:

- How, if at all, are occupations related on the basis of shared underpinning practices and concepts? Can we thus identify occupations comprising a vocational stream?
- Who are the social partners who oversee these linked (or potentially linked) occupations, and how do they support or inhibit the development of capability within and between these occupations?

We examined these issues by undertaking interviews with key informants and stakeholders across four case study sectors: care work, finance, electrical engineering and agriculture. The findings suggest that vocational streams are readily identifiable across the four sectors (Yu, Bretherton and Buchanan, 2013). We determined two preconditions for the emergence of vocational streams: commonality in capabilities and social partner readiness.

Commonality in capabilities refers to the identification of links and overlap between occupations within a broad field of practice, in terms of their knowledge, skills and capabilities. These linkages materialized strongly (both horizontally and vertically) in health care and community services. For example, these linkages were identified between nursing assistants, enrolled nurses,[48] registered nurses and nurse practitioners; commonalities also exist, for example, in the rehabilitation and case assessment and management methods between the allied health areas of podiatry, occupational therapy and physiotherapy (Yu, Bretherton and Buchanan, 2013).

The second precondition concerns the **readiness of social partners** – the potential for institutional commitment and collaboration around workforce issues. This involves mobilizing a community of trust around a common objective – for example, dire skills shortages – and involves not only compromise and pursuit of cooperative solutions but also a commitment of resources. The social partners may include employees, industry employers, education, government and community groups. Social partner readiness depends not only on the existence of networks and formal or informal institutions but on the level of trust present and required for collective action. In the case of health care, for example, we found a complex web of formal and informal institutions, with high levels of contestation across the educational, regulatory, industrial and occupational domains.

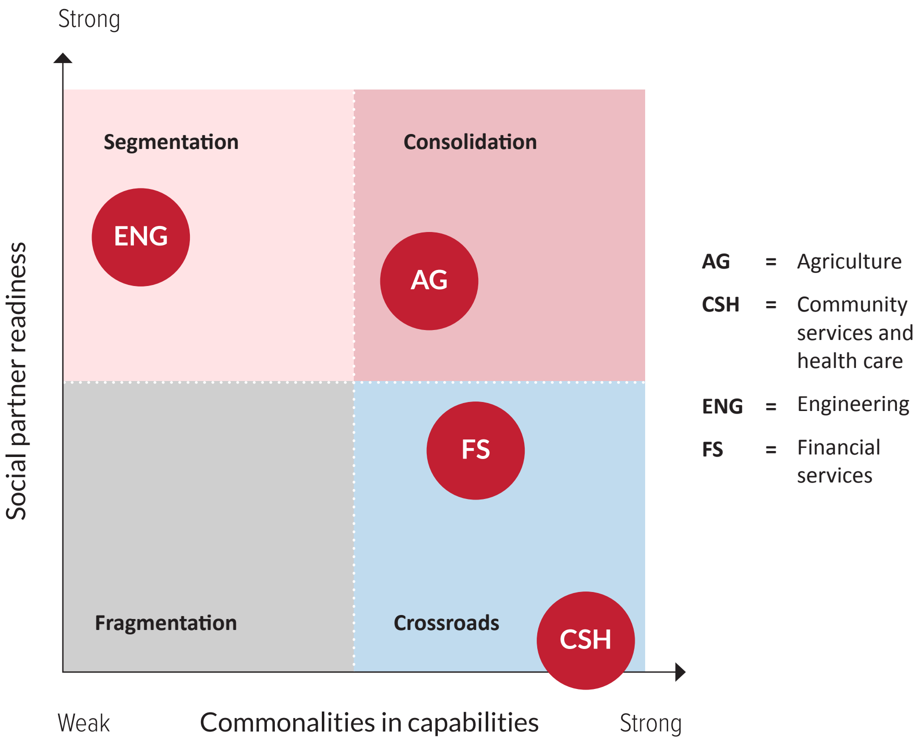
Figure 5.2 illustrates how different combinations of these preconditions lead to different potentialities concerning the formation of coherent vocational streams. It places each of the four case study sectors within this framework. For example, it helps to identify the nature

48 The occupational title "enrolled nurse" refers to nursing workers who do not have a degree but do have a qualification higher than Certificate I or Certificate II.

of opportunities and challenges facing community services and health care in developing vocational streams. On one hand, there are high levels of common capabilities in the fields of practice, such as nursing and allied health. On the other hand, poor collaboration and trust between social partners places it at a crossroads position. The two preconditions – commonalities in capabilities and social partner readiness – generate four distinct levels of openness or ability to establish vocational streams:

- **Segmentation** is characterized by lack of commonalities in underpinning knowledge and skills, as in the engineering sector, where specialization tends to occur early, and there is limited mobility across occupational boundaries. Segmentation is therefore likely to persist, despite a cooperative set of social partners.
- **Crossroads** is defined by a hitherto absence of institutional cooperation, despite recognized commonalities in capabilities between occupations. Two scenarios exist within this model: First, as in the health care and community services sector, institutional arrangements are characterized by groups that defend entrenched institutional boundaries; second, in financial services, there is an absence of explicit stakeholder engagement around skills issues, with workforce development occurring in an implicitly coordinated fashion across the sector.
- **Consolidation** is characterized by both recognized commonalities in capabilities linking occupations in a scope of practice, as well as a high level of social partner readiness, as evident by greater levels of stakeholder engagement and a commitment to explore developing vocational streams. We found the potential for such arrangements in agriculture.
- **Fragmentation** is characterized by both limited potential for identifying capabilities in common and weak (or absent) social partner readiness to cooperate. While none of our case studies exemplified this category, it is an area open to exploration in future research.

Figure 5.2: Preconditions for the formation of vocational streams and their consequences for four sectors



Source: Yu, Bretherton and Buchanan, 2013, pp. 8, 38.

The identification and promotion of commonalities in capabilities and greater institutional cooperation has the capacity to assist with current severe workforce challenges and also to support a workforce of more adaptable, capable individuals. Yu, Bretherton and Buchanan (2013) identified strong examples of initiatives that work towards collaborative solutions, models or ideas that reach across educational, industry and government divides in each of the sectors, but the prospects for success for developing vocational streams were strongest in agriculture.

Subsequent research found a third requirement for successful reform: **anchor institutions**. A major problem with the competency-based and twenty-first-century skills models is their narrow conception of the institutional infrastructure necessary for effective quality control. Both frameworks focus on outcome standards and are silent, if not hostile, to inputs. Formal specification of outcome standards is not enough. If quality is a priority, it is necessary that close attention be given to inputs, like curriculum and pedagogy, which are matters of long-standing and central concern to educators. The quality of such inputs cannot be controlled by formal standards-setting agencies; they need to be embedded in ongoing institutions, like schools, universities and vocational colleges, with practices of peer review and the collaborative development of educational materials, ideas and practices on how best to share that knowledge with different student populations (Wheelahan, 2018). Such arrangements in vocational education should not just involve educators, but neither should they be excluded or marginalized (as occurs in large parts of the Australian vocational education and training system). Anchor institutions will only be effective and have legitimacy if they are supported by broadly based, effective communities of trust.

How has movement towards a capabilities-informed approach to vocational education fared in practice? Over the past decade, a number of us of has been involved in efforts to support vocational education reform informed by the analysis used in this chapter. In addition to engaging with the Australian vocational education policy community at large, two particular cases of action warrant brief reflection. The first builds on a long-standing engagement with the agriculture sector, especially dairy farming. The second is a three-year research collaboration with the government of the largest state in Australia, New South Wales. We derived two major types of lessons from these experiences: The first concerns the potential pathways to reform, and the second relates to the preconditions for success.

Pathways to reform

When thinking about change strategies, it is important to reflect on who the potential pathfinders will be and how they will mobilize other stakeholders to support them. The experiences in our two cases provide preliminary insights into both issues.

The first case arises from an association with the Australian dairy farming sector for more than a decade and half. In a nutshell, this relationship arose from a study in the late 1990s that was commissioned to explore how the sector could secure its future workforce. This problem emerged after significant rationalization following dairy deregulation and the mounting difficulty of finding quality labour for an increasingly sophisticated sector comprising a smaller number of larger, more professional family farms (Buchanan, 2011, pp. 128–131). While the project was originally commissioned to shed light on labour supply challenges, the findings highlighted problems with labour demand. This especially concerned the quality of dairy farmers as managers and their highly uneven (and often low levels of) professionalism in engaging with non-family workers. Over the past decade in particular, the sector engaged in many initiatives to overcome the problems. Most of them were pitched at improving farmers' human resource skills and creating initiatives to improve labour quality at the regional level (Buchanan et al., 2017, p. 449).

The second initiative involved a member of the research team (Buchanan) working with New South Wales government officials and university-based data science research engineers to improve the operation and design of the state's vocational education system. This collaboration was based on using the latest data-science techniques as well as insights from the capabilities approach to vocational education to guide reform of the system in that state. There were three strands to this collaboration. The first involved examining what qualifications, based on the capabilities, would look like. Most activity centred around testing ideas with a nascent community of trust for the New South Wales agriculture sector. Strand two involved developing a predictive model of vocational education and training demand. This was developed to help ensure better management of current arrangements. The third involved identifying ways of better anticipating and structuring arrangements to respond to changes in the nature of labour demand and supply.[49]

From these experiences (and reflections on others of which we are aware), two pathways to reform appear to be possible.

Stakeholder-driven change based around constituting a community of trust

One pathway could be described as "bottom up". It involves assembling all the members of a potential community of trust to determine more appropriate and credible qualifications and more effective systems of workforce development for the sector. An example of modest success in this area occurred among the parties in care work. In this sector, there were previously separate qualifications for aged care, disability support as well as alcohol and other drug-abuse support work. Qualifications in this sector were grouped into a new Certificate III in Individual Support. Success was achieved because of the high degree of agreement among all parties – employers, unions and education providers at the state and federal levels. This was in contrast to the experience in agriculture.

While there is strong interest among many stakeholders (in dairy farming) in obtaining greater coherence with the 130 or so qualifications in this sector, the potential for substantive change was slowed by tacit resistance from national-level custodians of the competency-based training system. The possibilities for change are real, and in some local labour markets there have been successful experiments. For example, a qualification like "rural operations" that encompassed people doing similar middle-skill work in agriculture, construction, mining and local government was piloted in the north-western Narrabri region of New South Wales (Buchanan, Anderson and Power, 2017, p. 449). Extending such successes is difficult, however, where national-level bureaucrats within the government and employer and union organizations remain wedded to established, fragmented competency-

49 Government engagement in vocational education can take a number of forms. At the state level in contemporary Australia, this involves (i) its role as "system designer", especially in terms of defining models and levels of funding, and (ii) its role as a training provider, especially ownership and control of colleges of Technical and Further Education (TAFE). The experiences of the New South Wales government described in this chapter concern its role as custodian of key elements of system design, especially those associated with the categories defining the domains or subject areas of vocational education qualifications. In this aspect of its operations, the state government is very open to the ideas presented in this chapter. The government is also the owner of the largest provider of vocational education services in the state – TAFE NSW. In managing this asset, TAFE NSW is not regarded as an anchor institution providing coherence and quality control in the system. Rather, it is treated as "just another provider" and supported with supplementary funding in the form of "community service obligation" payments to support thin markets and disadvantaged groups. As the owner of the asset, the NSW government has radically changed the size and role of TAFE – effectively reducing (not upgrading) its capacity to be an anchor for quality and coherence in the NSW system of vocational education.

based training arrangements.[50]

Government- and public official-driven change based around identifying capabilities in common using data science

Inertia among established authorities does not need to necessarily constitute the final word on capability approach-reform initiatives. Modern methods of data science, especially text analytics, can be used to identify commonalities across current qualifications, both on listed units of competence and associated performance standards. State government funding authorities, in particular, can shift the onus in the reform process. By preparing, prima facie, bases for rationalization using text analytics, such authorities can open up discussions and nurture debate about rationalization that gets beyond vague assertions of desired intent. Where rationalization appears to make sense, the onus shifts to defenders of the status quo on why current arrangements should remain unchanged. Such work takes on special force when several key players are persuaded of the merits, based on the data-rich recommendations arising from the text analytics.

A problem with both pathways to date is that they still leave the underlying principles of competency-based training in place. The challenge for vocational education in countries like Australia today is that they do not require better implementation of a flawed system – they require initiatives that create better capacity for individuals and workplaces to adapt to a rapidly changing labour market. The pathways outlined here are best seen as first steps towards such a system. Enduring change will require reorganizing vocational education around design principles that are based on the capabilities approach, as outlined in the earlier sections, especially the need for nurturing credible communities of trust around coherently defined vocational streams and analytically sound underpinning knowledge.

Preconditions for success

Although at least two potential pathways to reform have been identified, comprehensive success has not been achieved to date. Initial experience revealed the three following insights about the reform process. While they do not have the status of "sufficient" conditions for success, they appear to be "necessary" preconditions for it.

Overcoming inertia and the "Dr Pangloss complex"

In the initial stages of our policy research and engagement with stakeholders on the need for reform, the most common argument we heard was that change was simply

50 Supporters of competency-based training often assert that examples of success like those cited here are evidence that problems in Australia's vocational education and training system are ones of implementation and not system design. The examples cited are indicative of how change from the established way of doing things is possible. The fact that such instances are so rare is no accident. A concern with occupational coherence is incidental, not integral to Australia competency-based training arrangements. These examples highlight how moving to a better approach to vocational education is possible. They are not cited as evidence of how good the established arrangements are. If one is interested in change, recognizing that one has to work with current arrangements is not a sign of endorsing those arrangements – it is a sign that engaging with current realities is essential if effective change is to occur. We thank an anonymous referee from the ILO for drawing our attention to this issue.

unnecessary. Australia, it was argued, had a dynamic and flexible vocational education and training system that needed no change in its fundamentals. With the passing of time, this Dr Pangloss narrative ("We are living in the best of all possible worlds," as Voltaire (1759) wrote) has subsided. Failures of the kind noted in South Africa at large and in the Australian State of Victoria in particular are receiving wide recognition. As a result, interest in how change can be effected and what form it should take is now rising.

Patient system custodians and community of trust partners

Systems of vocational education are embedded in wider political, economic and cultural arrangements. Although problems many seem obvious, those who have long been associated with the current arrangements only come slowly to the view that change is necessary. Under these conditions, it is vital to find leaders committed to working through the issues over the long term. In the dairy farming sector, for instance, industry leaders have been working on improving the systems of workforce development for more than 15 years. In New South Wales, the State Government has committed to doing the preliminary work over at least a three-year period. The challenges involved cannot be solved in the space of one project or in 12 months.

Building institutional capacity and institutional entrepreneurs

Involvement with the reform process to date has highlighted the importance of paying careful attention to building agents and systems that can follow through on the change. Information systems, in particular, need special attention. Careful construction of these can then provide the foundation on which more comprehensive and thorough changes can be made. Obtaining clarity in the key categories around which the system is organized, such as vocational streams or job clusters, as opposed to disaggregated units of competence, are very important. Such work also requires university-based researchers who better understand the realities of running a vocational education system – and government officials who have a better understanding of not only the importance and utility but also the complexity and time-consuming nature of quality research necessary to guide the reform process. Finally, the significance of anchor institutions cannot be forgotten. Moving to a capabilities approach in vocational education does not just require better concepts for guiding policy in this area. A well-resourced and respected set of vocational education institutions are needed. To date, the NSW government, like all state governments of Australia in recent decades, has reduced – not elevated – the role of quality, publicly funded institutions of this nature. This has weakened the anchor that for many decades provided the bedrock of quality in the system.

5.5 Implications for educators and the social partners

Getting stakeholders to open up to new, improved arrangements requires leadership. Such leadership needs to be thoughtful (that is, understand the issues at stake when it comes to defining, developing and deploying skills), inclusive and disciplined. Based on our work to date, the following stakeholders have critical roles to contribute.

Governments and government officials have, arguably, the critical role. They cannot solve the problems on their own. They can, however, be honest brokers or facilitators of ongoing, prolonged and sustained debate and piecemeal reform. They have a critical role in posing useful questions and providing developmental funds to pilot ways of answering them inclusively.

Employers need to both broaden their gaze and become more discriminating. Some employer groups have begun to recognize the limits of a system that is myopically focused on meeting immediate skill needs. They also need to accept that there must be more discrimination in employers' access to public education and training funds. Not every hospital is a teaching hospital. Equally, not every employer or workplace is a learning organization.

For too long in competency-based training systems, **technical and vocational educators and trainers** have been regarded as low-status service providers who deliver dismembered units of competence and associated highly specific qualifications that offer little in the way of transferable skills. As noted in the opening sections of this chapter, such a conception of skill development is flawed. Just about every realm of practice has some underpinning knowledge. Mastering this is integral and not incidental to developing vocational capability. Obtaining the status of a vocational educator or trainer needs to be earned on the basis of expertise in relevant pedagogy and curriculum development associated with underpinning knowledge as well as practice associated with an occupational domain. And concentration of such expertise should be based in recognized, enduring and respected institutions that become an anchor for educational and practical standards (Wheelahan, 2018).

School educators also need to rethink their role. Too often their work has been defined with respect to the traditional academic curriculum. As researchers, we have no problem with school educators' concern with coherence and standards associated with imparting disciplinary knowledge. This is vital for providing foundations on which capacities for critical thinking, problem solving and collaboration are built. That said, however, there is a need to rethink the academic-vocational education divide. Rigorous knowledge can have practical applications, and practical experiences can be a spur to mastering underpinning knowledge. Broadening the debate among school educators on these issues will mean the school system will be better placed to support a higher-quality vocational education system (Buchanan et al., 2018 pp: 34–38, 41–44).

Unions need to broaden their horizons. Vocational education and skills are not just a "good thing" for union members and potential members. The whole notion of vocations and vocational streams raises major questions on the new contours of solidarity. Engagement with this agenda could help with rethinking how unions engage with the labour market as well as with potential members.

Researchers also have a pivotal role. The challenges of understanding and responding to a rapidly changing reality are great. Researchers can help all parties by generating new knowledge as a driver and enabler for change and as the basis for building new trust as well as new understanding between parties.

Conclusion: Nurturing productive citizens as the basis for economic development

The increasing interest of organizations like the International Labour Organization, the Organisation for Economic Co-operation and Development, the World Bank and the International Monetary Fund in inclusive growth is significant. For too long, public policy has been myopically concerned with the absolute level – and not the distribution – of growth. It is important, however, that economic development not be defined in terms of GDP growth alone. Public policy should be equally concerned with deepening human capability and the means used for developing it.

As we enter the third decade of the twenty-first century, it is important that we are realistic about the constraints bequeathed by the policy orthodoxies of the late twentieth century. Economic inequality and its exacerbation by neoliberal prescriptions concerning the alleged superiority of markets and low taxation are now widely recognized as part of the problem and not part of the solution. The growing interest in inclusive growth is important in offering the prospect of moving onto a fairer, more sustainable trajectory of economic development. Achieving such a trajectory requires more than income and wealth redistribution. This chapter has shown that if policies for inclusive growth rely on institutions bequeathed by the neoliberal era, many of the problems of that era will remain.

Prime among the problems are poor-quality and low-status vocational education. In addition to effective redistributive policies, we need arrangements that deepen people's capacity to live a life they value and have reason to value – not just as individuals but also as communities and societies. Populations nurtured by policies that are informed by the capabilities approach have a vital role in this regard.

In concrete terms, the priorities must be to first provide quality education in the early years that nurtures strong learning dispositions that will endure for life. With such a foundation, teenagers must then be given access to powerful knowledge – domains of more specialist understanding. These can be either academically or vocationally based. Mastery of some domain is important for providing a concrete context for developing fundamental capacities, like problem solving, communication and creativity. Proposals that focus on these capacities in the abstract (such as the proposed twenty-first-century skills approach) must be treated with scepticism.

Similarly, the rising push to have vocational education primarily deliver fragments (or units) of competence as they are needed (the growing interest in so-called "skill sets" and "micro-credentials") must be challenged. The irony is that the ability to adapt and learn new skills quickly needs a foundation in having solid learning dispositions and mastery of at least one domain of expertise. Micro-credentials only work well if they build on – and are not treated as a substitute for – initial qualifications. Foundation qualifications are substantive in that they engage people in deep learning for a field, are widely trusted and recognized in the field as a condition for entry to it.

As we move into the future, there are important initiatives to be undertaken in defining what are the relevant domains of expertise, supporting (or establishing) allied communities of trust and supporting associated anchor institutions that are vital for quality skills development. Such infrastructure will provide the ideal platform for individuals gaining micro-credentials and undertaking near-fit training. These arrangements are different to skills acquired as ad hoc aggregations of competence when immediate needs dictate (as is the case with skill sets). Rather, micro-credentials and near-fit training would round out or contribute to acquiring carefully defined, deeper capabilities defined on the basis of coherent occupational domains (what we call vocational streams.) Nurturing deeper capabilities across the population will also support a richer society – and not just in terms of material gains. It will help create a society marked by higher-quality social relations and individuals able to act in the world as better-informed, autonomous citizens. Such individuals will be confident in the knowledge they can make their own judgements and understanding of their place in life. The end result will be both individuals and societies with a much better ability to navigate (and better shape) an increasingly volatile and uncertain future.

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Annex

Problems in Australia's competency-based training regime: Legacies of poor implementation or design flaws?

It is now increasingly recognized that there are deep problems in vocational education systems built around the Anglo-Australasian model of performance-based work tasks or skills standards – more commonly referred to as competency-based training systems. The key problems in Australia arise from:

- Fragmentation and the seemingly endless growth in the number of vocational education and training (VET) qualifications (currently 1,472 in Australia alone).
- Poor connection between VET qualification and the labour market. (For example, in Australian agriculture between 2005 and 2015, there were, on average, 330,000 workers employed at any one time,[51] average VET enrolments were 85,000 per annum but only 160,000 completions.[52] Over this entire period, however, VET educational attainment hovered at about 30 per cent of the agricultural workforce.[53] Flow data reveal there was no serious vertical promotion flows in the sector during this period.[54] In short, there was a huge amount of training but little lasting improvement in the sector's skills profile.)
- Transformation of funding models designed to open up competition in the provision of VET services (facilitated by competency-based training) resulted in financial scandals – with a third of government student "loans not delivering quality education outcomes" (Bita, 2016).

Most important of all has been failure of the system on its own terms. Collectively, all Australian governments – state, territory and federal – have endeavoured to lift the levels of VET qualifications. Between 2003/04 and 2012/13, annual funding for the sector rose 15 per cent (or just less than AUS$1 billion) (Noonan et al., 2015).[55] By 2015, however, the Council of Australian Governments noted that on its three chosen benchmarks for monitoring policy success, two were not on track to being reached and one was actually getting worse (table A1).

51 See National Farmers Federation for the National Agribusiness Education, Skills and Labour Taskforce, National Agriculture Workforce Development Plan, www.nff.org.au/get/submissions/4624.pdf (accessed 1 Oct. 2017).

52 The average of annual enrolments and report on completions. Most Certificate III and below courses take two years or fewer to complete. It can be conservatively estimated that at least 300,000 students commenced agricultural-related qualifications during this period. See Agrifood Skills Australia, 2014, http://www.fas.org.au/wp-content/uploads/2016/04/ESCAN2014.pdf (accessed 1 Oct. 2017).

53 The top figure in each cell is the proportion of employees in the industry with diplomas, advanced diplomas and Certificates I–IV. The figure in brackets in each cell includes employees whose highest qualification is either a bachelor's, graduate diploma/certificate or a post-graduate degree (see http://www.abs.gov.au/ausstats/abs@.nsf/mf/6227.0/ (accessed 1 Oct. 2017)).

54 See Yu et al., 2012.

55 With the incoming coalition government federally in 2013, annual funding increase for VET declined. Between 2003/04 and 2013/14, it only increased by 5 per cent (Noonan et al., 2015).

Table A5.1: Summary of national vocational education and training performance against national agreement benchmarks of the Council of Australian Governments, 2016

Benchmark: Halve the proportion of Australians nationally aged 20–64 without qualifications at Certificate III level and above between 2009 and 2020	**47.1%** (2009)	**42.5%** (2014)	Not on track
Benchmark: Double the number of higher-level qualification completions (diploma and advanced diploma) nationally between 2009 and 2020	**53 974 completions** (2009)	**74 091 completions** (2014)	Not on track
Indicator: Proportion of VET graduates with improved employment status after training	**67.6%** (2008)	**59.7%** (2014)	Negative change

Source: Council of Australian Governments, 2016, p 7. See also pp. 14–18.

Among some custodians of current arrangements in places like Australia, it is commonly asserted that the problems merely concern implementation – they are not the legacy of inherent design flaws. This sentiment is understandable but wrong. It is a habit of thought common among persons unwilling to engage with reality. One of the most extreme examples of the destructive consequences of such a sentiment comes from China in the mid-twentieth century. In the second half of the 1950s, China was subjected to the radical Great Leap Forward experiment in economic and social reform. As a result, the Chinese Communist Party now admits, 17 million people died of famine. Undeterred by manifest failure, the policy's chief architect, Communist Party Secretary Mao Zedong, diagnosed the problem as poor implementation of an essentially sound initiative. He then unleashed the Cultural Revolution to break the power of bureaucrats who stood, he alleged, in the way of success.[56] While the costs have not been in any way as severe, in Australia we are at a similar stage in the VET policy reform as China was in the early 1960s in policy more generally. We can either recognize that, after 30 years of ongoing reform, the Australian VET model has serious systemic flaws. Or, like Chairman Mao in the early 1960s, we can arrogantly assert that it is just a problem of implementation.

For more than three decades, a number of Australian researchers have been carefully analysing the unfolding situation concerning vocational education in Australia. These researchers have noted that the dominant VET narrative has its roots in a simple-minded version of human capital theory, a narrow and instrumental view of education and a formal notion of how wider social agents (especially employers) are involved in vocational development at the workplace and beyond (Oliver, Yu and Buchanan, forthcoming). The emerging alternative draws on Sen's and Nussbaum's capabilities approach to public policy

56 A concise overview of recent Chinese history on this point is provided in Mitter, 2008, pp. 55–65. A more extended account is provided in Spence, 1999, pp. 544–587. A summary of the costs of the Great Leap Forward and the Communist Party's admission of 17 million death are provided in McGregor, 2010, pp. 229–263. A detailed account of the actual processes involved and the costs in terms of human lives is provided in Yang, 2012. The latter estimates the costs in lives to approximately twice as large as those admitted by the Chinese Communist Party.

in general and education and working life in particular (Wheelahan and Moodie, 2011; Nussbaum, 2000; Sen, 1999). The analysis of the labour markets builds on the neoclassical-realist (Kaufman, 1988), institutionalist, labour-market segmentation and societal traditions in analysing work (Marsden, 1999; Botwinick, 1994; Maurice et al., 1986) and approaches to education, which recognize the importance of engaging with the complexities and subtleties of transmitting skills and knowledge (especially associated with the psychology, philosophy and sociology of education (Buchanan et al., 2018; Wheelahan, 2010)). The implications of these different approaches for designing a system of vocational education are summarized in table A2.

The problems arising from the competency-based training model of system design summarized on the previous page have not arisen because of poor implementation of an essentially sound system. Rather, they have arisen from a system that has narrow objectives (instrumental training for current jobs), a low trust system of strict but ineffectual quality control directed at outcomes alone and is based on engagement with industry in a way that is more stylized than substantive. Most importantly, there is no substantive institutional basis for education and skills quality. This system is anchored around formal compliance with fragmented units of competence – not coherent ensembles of skill that define people's substantive capacity to adapt to changing circumstances. These design weaknesses need to be recognized and not glossed over in the name of better implementation. As the Chinese found in the 1960s and 1970s, going faster down the wrong road does not solve problems – it merely intensifies them.

Table A5.2: Different approaches to understanding and reforming systems of vocational education: Implications for system design

Aspect of system	Different approaches to understanding and reforming vocational education and development.	
	VET model based on competency-based training	**Capabilities approach based around notions of coherent underpinning knowledge**
Objectives	High-functioning labour.	Productive, flourishing citizens.
Reference point for the defining categories of skill	Current jobs.	Capabilities to adapt to changing circumstances.
Basis of quality control	Low trust, centrally controlled outcome standards.	High trust arrangements with high barriers to entry, based on demonstrated ability to deliver high-quality education.
Understanding of "industry" and its role in education	Assumed symmetry between workplace and classroom learning.	Need carefully crafted connections between underpinning knowledge (usually learned away from the place of work) and practice in the workplace.
	Assume peak employer bodies = industry and such bodies define the education content of the system.	Workplace and local employer experts and leaders as well as officials of employer organizations have a crucial role – along with unions and educators – in defining "industry-relevant" education content.
The role of institutions and funding arrangements	Education assumed to be a commodity for sale. Funding models designed to support any provider who meets centrally determined standards for output quality.	Education quality is dependent on having institutions that enjoy respect and credibility among all relevant stakeholders. As the quintessential public good, public funds are needed for their provision. This support should go to a limited number of quality institutions that provide an anchor for standards in both education (especially curriculum and pedagogy) and the labour market.

Source: Authors.

6

Revisiting apprenticeships as a response to persistent and growing youth unemployment

Erica Smith

Abstract: This chapter examines the potential of quality apprenticeship in meeting multiple demands: skill development, changing industry needs, and promoting inclusivity. There are many and large societal and economic expectations of problems which apprenticeship should solve. These expectations vary among various actors. They range from solving youth unemployment and safeguarding decent jobs for young and disadvantaged persons, to supplying companies with a trained workforce, and boosting international competitiveness. More recent demands including apprenticeships' ability to cope with rapidly changing job roles. There are, however, risks associated with expansion of apprenticeship systems, including the possibility of contributing to exploitation, discrimination and exclusion of social/racial groups and/or certain occupations. Any radical changes risk upsetting existing balances in outcomes for different stakeholder groups. Moreover, apprenticeships need to retain the flexibility to cope with the demands of the future of work.

Guided by the question "(How) can apprenticeship be an answer to youth unemployment?", the chapter provides a conceptual discussion and presents challenges and opportunities in developing such apprenticeship programmes in the evolving world of work. It discusses strategies and policy directions by drawing on several national examples, and provides an analysis of such practical examples from national and/or sectoral cases in Asia and the Pacific. These examples illustrate attempts to address complex social and economic issues and developments through apprenticeships, in a manner that aims to assist inclusion of young people in the labour market but does not neglect other imperatives such as national and company skills needs. Some options are proposed and discussed which could help countries to meet stakeholder needs in this evolving context while also ensuring inclusive outcomes.

Introduction

Apprenticeship is first and foremost a means of occupational learning, which is generally understood to involve both on and off the job learning, and a close relationship with an experienced worker or workers. Learning is important not only for the apprentice; employers, training providers and other workers also learn through the process. Apprenticeship is also generally understood to promote youth employment and to assist young people out of unemployment. Apprenticeships have developed a meaning and reached well beyond their original nature, with many organizations and regulatory bodies involved in their implementation within industries and countries.

There are multiple expectations placed upon apprenticeship systems, particularly in the wake of the global financial crisis, and in rapidly developing countries. Expectations may differ radically among stakeholder groups; hence, apprenticeship, as a respected social institution, may be used as a site for power struggles among competing interests. Current and imminent global developments, sometimes grouped as 'the future or work' (changes in labour markets, the nature of employment contracts, and the increased use of advanced technology in many areas of work), have placed new demands on apprenticeship systems. After a brief recap of the key concepts and terminologies, this chapter explains the current and future expectations on apprenticeships and discuss whether apprenticeships can deliver what is expected of them. The chapter argues that where development of apprenticeship systems is aimed towards reducing youth unemployment, stakeholders' hopes and fears acquire additional significance and weight.

The chapter is based on data from a series of research projects carried out in Australia and internationally; the potential solutions are based on case studies of three countries in Asia and the Pacific, of varying sizes and stages of development: India, Indonesia and Australia.

6.1 Background

According to the Group of Twenty (G20) Labour and Employment Ministers Meeting Declaration (G20, 2016):

> Apprenticeship has proven to be an increasingly useful method to deliver vocational training globally. Quality apprenticeship programmes provide workers with unique opportunities to receive training, job experience and wages, while contributing to growth and innovation in the broader economy. Apprenticeship builds human resources and can improve opportunities for individuals, including disadvantaged youth and other vulnerable workers by facilitating their entry into the labour market, strengthening their skills, and thus contributing to higher wages and better-quality jobs. They provide businesses with skilled workers needed to adapt to the rapidly changing technology and markets and help support national prosperity and more inclusive growth.

But what is an apprenticeship? The term 'apprenticeship' can be used loosely to describe the way in which a person learns how to undertake an occupation from an experienced worker. In some countries, such informal arrangements predominate. But generally, it is used to describe formal systems which have often developed over centuries of operation. According to Smith (2010: 313), the essential components of a formal apprenticeship are generally understood to be:

- a training regime set up by, or with the approval of, governments;
- a combination of off and on the job training;
- the assumption of responsibility by the employer for the development of the apprentice; and
- the award of a qualification and/or licence and/or some other recognition that enables an occupation to be practised independently once the apprenticeship is successfully completed.

Smith (2010: 313) went on to say that apprenticeships often, but by no means always:

- are intended for young people rather than older people;
- incorporate a close relationship between a novice and a particular expert worker;
- involve the apprentice being actually employed in the enterprise where the on the job training is carried out.

Apprenticeship systems vary greatly. Different countries have different combinations of characteristics. Several studies, including an 11-country assessment funded by the ILO and the World Bank (Smith et al., 2014), clarify the many differences:

- whether apprenticeships are predominantly for young people or are open to any worker or potential worker;
- whether apprenticeships are primarily formal or informal;
- whether apprentices are paid as workers or receive a stipend and/or allowance for travel or other matters or receive no remuneration;
- whether an apprenticeship results in a formal qualification that is part of a country's qualification system, an apprenticeship-specific certificate or no certified outcome;
- whether apprenticeships are available across the economy or only in limited industry sectors;
- whether apprenticeships are lengthy (three to four years) or short (six months); and
- whether apprenticeships are subject to regulation and administration at national, provincial or local government levels, or combinations of these three.

The disparity among country systems, which has been noted by many authors, means that discussions have to be framed carefully so as to acknowledge, or allow for, the different nature of country systems. And many countries are constantly refreshing their apprenticeship systems.

During and immediately after the global financial crisis, apprenticeship was often cited as a way to reduce the rate of youth unemployment, which rose to extremely high levels in some countries (including several in southern Europe). The focus on apprenticeships continued after the recovery. An Initiative to Promote Quality Apprenticeship was adopted at the Beijing meeting of G20 Labour and Employment Ministers in July 2016. This initiative has ten components (see the Annex), which includes national targets, engagement of the social partners at various levels and ways to improve the quality of apprenticeships.

Apprenticeship is an important component of both employment and training systems, with implications for addressing social disadvantage as well as business needs. As a result of the renewed interest in apprenticeships, there have been many recent cross-country comparative studies, including the ILO and World Bank study already cited, Chankseliani, Keep and Wilde (2017), who compared eight national systems; Fazio, Fernández-Coto and Ripani (2016), who compared 17 countries, of which six were in Latin America and the Caribbean; and an European Centre for the Development of Vocational Training study using a common analytical framework (Hauschildt and Wittig, 2015) that is now being extended to other countries.[57]

6.2 Persistent challenge of youth unemployment

As has been mentioned above, apprenticeships are not confined to young people in many countries, but they are most often seen as being at least mainly for young people. They are often a pathway for school-leavers and are seen as a safe path akin to entering full-time university study, often for a similar time period of around three years (Harrison and Smith, 2017). In some countries, such as Germany and the Netherlands, they are generally part of the secondary school system. Either way, they are considered as helping young people into safe employment with training that leads to skills for future careers.

Youth unemployment is a perennial problem for governments internationally. Governments fear the social and economic costs of young people experiencing extended periods of unemployment and disengagement, especially at or near the beginning of their full-time working life. Globally, according to the ILO (2017), youth unemployment (people aged 15–24 only) consistently affected the same number of people as adult unemployment for all persons aged 25 or older for the past nine years (2009–16). This is remarkable, representing a youth unemployment to adult unemployment ratio of consistently around 3 per cent (ILO, 2017).

However, this is of course a difficult matter for international comparison. The prevalence of youth employment versus unemployment has different meaning in different countries or example, is working in an unsafe environment better than not working at all? Also, methods of measuring unemployment vary from country to country, including how the size of the labour force is calculated, what counts as unemployment and what method was used for the proportion of young people in a study. There are great variations among developed and developing countries in terms of the proportion of youth unemployment as well as the issues on which governments focus. The 36 countries covered by the ILO Regional Office for Asia and Pacific reflect variations in terms of wealth and poverty.

High youth unemployment is not necessarily a feature of higher incidence of poverty: Youth unemployment is projected to be consistently about 50 per cent higher in developed and emerging countries than in developing countries (ILO, 2017, p. 15). Table 6.1 highlights the youth unemployment rates for two separate sub-regions, South-East Asia and the Pacific, and Southern Asia respectively:

57 See http://www.cedefop.europa.eu/en/events-and-projects/projects/apprenticeships-work-based-learning (accessed 7 July 2018).

Table 6.1: Selected regional youth (aged 15–40) unemployment rates, 2008–16 (%)

	2008	2009	2010	2011	2012	2013	2014	2015	2016
World	12.3	13.0	12.9	13.1	13.1	13.1	12.9	12.9	13.0
Male	11.9	12.7	12.5	12.7	12.7	12.8	12.5	12.6	12.7
Female	12.9	13.5	13.6	13.7	13.6	13.7	13.4	13.4	13.6
South-Eastern Asia & the Pacific	13.5	13.4	12.8	13.1	11.9	12.9	12.1	12.5	11.7
Male	13.2	13.5	13.0	13.1	12.0	12.9	12.2	12.7	11.7
Female	13.8	13.2	12.7	13.1	11.8	12.9	12.0	12.2	11.6
Southern Asia	10.0	10.2	10.5	11.1	11.2	11.1	11.0	10.9	10.9
Male	9.8	10.0	10.1	10.7	10.9	10.8	10.5	10.5	10.5
Female	10.6	10.6	11.9	12.3	12.3	12.1	12.2	12.0	11.9

Source: Adapted from ILO, 2017, p. 101.

In table 6.1, the South-East Asia and the Pacific region includes the developed countries of Australia and New Zealand. Australia's youth unemployment in early 2017, for example, was 13.5 per cent compared with 5.8 per cent for the population as a whole (Australian Bureau of Statistic, 2017, series 6202.0), illustrating the relatively higher youth unemployment rates for developed countries.

However, putting aside the large problems of international comparability, it is clear that youth unemployment is greater than adult unemployment almost universally. This statistic can be ascribed partly to 'milling and churning' in the labour market. The term is used to describe the period when young people look for work that suits them, often moving from employer to employer and from place to place as part of becoming adult, although this theory is somewhat discredited (Marks, Hillman & Beavis, 2003). This inevitably leads to periods of unemployment. Nevertheless the high rate of youth unemployment is a concern.

In the light of the foregoing discussion, this chapter focuses mainly on apprenticeship as a means of preventing and addressing youth unemployment in Asia and the Pacific, and thereby contributing to a more inclusive society in which young people's skills and potential are fully utilized. But necessarily the discussion involves other aspects of apprenticeships, including rapid changes in societal and economic contexts. In the next session, three country examples are provided, from the region. Many of the examples in the subsequent discussions are drawn from these countries.

6.3 Current Apprenticeship developments in three countries in Asia and the Pacific

The state of apprenticeship in India, Indonesia and Australia are elaborated on in the following section to illustrate a cross-section of evolution. These three countries were selected because of their varying stages of economic development as well as varying size and development of their respective apprenticeship system. They all have in common, however, an intense policy focus on apprenticeships.[58]

India

Nature of the economy and of the apprenticeship system: India has a population of 1.3 billion (2015) and a labour force of 473 million. Unemployment is low and the median age is only 26.6 (2015). The economy is largely informal, with agriculture accounting for almost half of the employment. The formal economy recovered quickly from the post-global financial crisis downturn and is primarily services-based. The apprenticeship system is small for the size of the country; only around 300,000 people in 2014 worked as an apprentice, less than 0.01 per cent of the workforce – even though certain types of employers were, until 2014, required by law to employ apprentices. Apprenticeships are governed by the Ministry of Skill Development and Entrepreneurship, in conjunction with the Ministry of Human Resource Development through the Apprenticeship Act, 1961. Until recently, the law and the system remained fairly static. Apprenticeship terms vary from six months to four years, and there is a system for adding new occupations. Apprenticeships are part of India's Technical and Vocational Education and Training (TVET) system. But TVET in general is sometimes not seen as an attractive or aspirational pathway for young people. There is a large informal element to apprenticeship, both in the formal and the informal labour markets.

Occupational coverage: While there are around 250 apprentice occupations, around half of them are in a stream called "engineering and technology". Until recently, there were substantial numbers of apprentices in only nine occupations, with under-representation in the services, agriculture and business sectors.

Participation: Participation in India's apprenticeship system has been quite limited, especially because the law imposed physical fitness requirements. Most apprenticeships are in occupations generally undertaken by men and in urban areas. Discussions about improving participation have focused on women, people in rural areas, people from certain castes and people with disabilities (Smith, Brennan Kemmis and Comyn, 2014). Apprentices receive a stipend but no salary.

Training and assessment: Employers are required by regulation to provide a certain amount of on-the-job training. Off-the-job training is provided at government Industrial Training

58 The information in these summaries is taken primarily, and unless otherwise indicated, from OECD, 2015; Smith et al., 2014; and the UNEVOC and UNESCO World TVET database, http://www.unevoc.unesco.org/go.php?q=World+TVET+Database (accessed 11 July 2018).

Institutes or private Industrial Training Centres. People who have enrolled in one of these training providers enter an ensuing apprenticeship with a shortened training period. An apprenticeship certificate is awarded upon successful completion.

Involvement of government and social partners: Apprenticeship systems operate at the national, state and local levels. While the social partners are involved in policy discussions about apprenticeship in India, there is little practical involvement of trade unions and employers' associations in the day-to-day operations of the system.

Recent issues and developments: Multiple concerns have been expressed by stakeholders (Smith and Brennan Kemmis, 2014), including overly strict regulations for employers, limited occupational coverage, limited diversity among apprentices, the low rate of employment of apprentice graduates and the inadequate stipend. Some issues were resolved in amendments to the Apprenticeship Act in 2014, which removed the strict penalties that were to be imposed on employers for even small breaches of the regulations. Some concerns were also reflected in a 2015 National Policy for Skill Development and Entrepreneurship that included, among many other provisions, a strategy for marketing apprenticeships to young people and to enterprises and for offering more apprentice places in the services sector.

Indonesia

Nature of the economy and of the apprenticeship system: Indonesia has 260 million people. There is a large informal economy that is "leapfrogging" from the rural sector to service industries without proceeding through a manufacturing-prevalent stage. Manufacturing is largely dominated by foreign companies. Indonesia's youth unemployment rate is high in comparison with other Asian countries (at 17.8 per cent in 2016). Its apprenticeship system (referred to in Indonesian as *pemagangan*) is small, with only around 50,000 people enrolled in formal apprenticeships. This is being expanded to more than 170,000 places via five main industries. The term of apprenticeship is short, compared with other countries, with many lasting only six months to one year.

Occupational coverage: The apprenticeship system has coverage across a range of industries. The main areas targeted for expansion are tourism, manufacturing, banking, fisheries and retail.

Participation: Apprenticeship is seen primarily as a youth option, but there are adult apprentices. Apprentices receive a stipend only and are not employed during the apprenticeship.

Training and assessment: Training is seen primarily as the responsibility of the employer, who is required to supply supervising personnel with appropriate qualifications. But there are off-the-job training providers. Assessment is against national competency standards, although enterprise standards are allowed. There is some confusion around the word *pemagangan*, which is also used for unpaid work experience and is part of secondary schooling (which is managed by the Ministry of Education). In some instances, people can undertake upfront training with a training provider, which makes gaining an apprenticeship easier. Some stakeholders have argued that training providers should be allowed to recruit apprentices and manage apprenticeships.

Involvement of government and social partners: The Ministry of Manpower is the government department responsible for apprenticeships. Employers participate in discussions about the system, but trade union involvement has thus far been limited.

Recent issues and developments: Because apprentices are only paid a stipend, there are concerns that some employers, sometimes with the assistance of brokers, are taking on apprentices to do the work of regular employees and thus save money by avoiding paying wages. There are also concerns about the standard of training in some instances. The Government is moving away from enterprise standards towards enforcement of national competency standards. A revision of the Ministerial Regulation on Apprenticeship was accepted in 2016 (Ministry of Manpower, 2016), and while there are concerns about the regulation, including its lack of specificity in some critical respects, there are unlikely to be major changes in the near future.

Australia

Nature of the economy and of the apprenticeship system: Australia has a population of 24.5 million, with a diverse economy that is moving towards a concentration on services. Manufacturing has declined, but primary industries remain quite strong. Traditional apprenticeships were augmented in the late 1980s by the addition of traineeships, which are a form of shorter apprenticeship (one year) compared with three years for traditional apprenticeships. The apprenticeship system currently covers about 2.1 per cent of the working population (256,000 persons were in apprenticeship training in 2017), a reduction from the 3.8 per cent of ten years ago. In the mid-2010s, several avenues of funding were removed or severely reduced for traineeships, considerably reducing the numbers in those programmes. Currently, therefore, the numbers of apprentices and trainees are now about the same they were 20 years ago (1997), despite the 32 per cent increase in population over that time. Around 15 per cent of apprentices are employed by group training organizations, which are entities that take on the formal role of employer while "leasing" apprentices to "host employers". Group training organizations often provide extra support to apprentices under their care.

Occupational coverage: The occupational coverage is quite broad, although traditional apprenticeships are strongest in traditional trade and craft areas, which include hairdressing. Construction is the biggest single area for apprenticeships. Non-trade occupations are generally covered by traineeships, often in services and newer industries. Traineeships are more likely than traditional apprenticeships to be in jobs that women typically undertake, such as retail or aged care.

Participation: The Australian apprenticeship system caters for both young and mature people. Older people may have their apprenticeship term reduced. There are specific financial incentives for young people undertaking apprenticeships, such as access to free or cheap transport. Apprentices receive a salary that is discounted from a skilled worker rate (but methods vary among industries).

Training and assessment: Training generally takes place both on and off the job, with approximately 20 per cent spent with a training provider. Within some parameters and in a minority of cases, most of the training can be on the job. There is a contract between the employer, training provider and apprentice or trainee, which is lodged with a state government. Employers have no formal or regulatory responsibility for training; and the training provider takes responsibility for all assessments. Assessment relates to national competency standards, which are gathered into qualifications, located in training packages for particular industry areas. Pre-apprenticeship programmes (off the job) provide preliminary training for apprenticeships but are currently varied in nature, and their coverage is uneven.

Involvement of government and social partners: The national government oversees the apprenticeship system, while State governments oversee designation of occupations as apprenticeships or traineeships in their States, and manage apprentice contracts. The national government oversees the development of qualifications via industry committees, and provides small financial incentives to employers. The social partners are heavily involved in national discussions on the apprenticeship system. The trade unions dominate discussion relating to traditional trades as there are industrial relations implications.

Recent issues and developments: The number of traditional apprentices has begun to fall, as has traineeships. National concern therefore centres on rebuilding the system and attracting both potential apprentices and employers. One concern is that a three-year commitment is too great for both employer and apprentice. Various government-sponsored pilots are under way, including the expansion of pre-apprenticeships as a recruitment mechanism. In addition, completion rates are a concern, with only about half of apprentices completing their term. At both the national and state levels, reviews of the system are under way. A report from national consultations during 2017–18 will be available later in 2018, with a draft report already available (at PhillipsKPA, 2018).

New developments in the economy and in labour markets

This section discusses some recent developments in the economies and labour markets which likely will disrupt most apprenticeship systems. While apprenticeship has evolved over time in all countries, some trends point to difficulties in the gradual adaptation that has generally occurred in the past in apprenticeship systems. Apprenticeship is often rule-bound and long-term and requires agreement among a range of stakeholders. Moreover, sometimes, although by no means not always, systems are in fact focused on declining industries. Five major developments affecting the future of work are discussed below, and are referenced to developments in one or more of the three case study countries. There is as yet no agreed or co-ordinated response to these issues in the three countries. This section of the chapter may provide some ideas in these and other countries.

Technological innovation and industry 4.0: Many countries have set up a task force to manage Industry 4.0, sometimes known as the fourth industrial revolution. According to the Australian government's Industry 4.0 web site, Industry 4.0 refers to the current trend of improved automation, machine-to-machine and human-to-machine communication, artificial intelligence, continued technological improvements and digitalization in manufacturing.[59] Industry 4.0 creates new industries and occupations and also involves radical changes to existing occupations. Loveder (2017) identifies several effects and potential effects on apprenticeships in Australia, including: the need to develop a higher level of applicant who can learn rapidly evolving jobs, the likely employer demand for more higher-education graduates than apprentices and the need for TVET teachers to be up to date with rapid changes in their industry areas. In Australia, advanced manufacturing is a priority for national qualifications development and hence for apprenticeships. However, with the rapid evolution of industry, training for a particular occupation – the usual purpose of apprenticeship – may seem inappropriate to some people.

Globalization: It has long been a truism that apprenticeships are locally rooted and culturally specific (see, for example, Deissinger, Smith and Pickersgill, 2006) while an economy is increasingly globalized. Many workers are employed in companies whose headquarters are in other countries; their employers may or may not choose to participate in the apprenticeship system of the country of operation. In Indonesia, for example, much manufacturing is undertaken by foreign companies, for example, on the large MM2100 industrial estate near Jakarta. These foreign companies have their own system of skill development that extends to cooperation with secondary schools to prepare for working within the company.

Structural adjustment: As economies adapt to service industries or, in some cases, leapfrog manufacturing and move directly from primary to tertiary industry, the nature of occupations covered by apprenticeships becomes important. Countries need to consider which occupations may be appropriate for apprenticeships or which ones have "apprenticeability" (Lerman, Eyster and Chambers, 2009). There is also the matter of the "apprenticization" of occupations – this term is used in England where the Government's agenda of rapid expansion of the system has led to apprenticeships being created in occupations that previously were not considered appropriate for apprenticeship.

Higher-level apprenticeships have become quite common in England, even up to the degree level, such as nursing, media and school teaching. They are being piloted on a small scale in Australia in business and in advanced manufacturing. In the case study countries in this chapter, only India has a national system for adding occupations to the list of apprenticeships. Australia has a state-based system whereby any qualification can become apprenticeship-possible if the state government decides to fund the training. Hence, some occupations are apprenticeship-possible in some states but not in others.

59 See https://www.industry.gov.au/funding-and-incentives/manufacturing/industry-40 (accessed 11 July 2018).

Cross-border labour movements: As people increasingly move among countries, whether voluntarily or involuntarily, permanently or temporarily, governments have to make decisions about how this affects their apprenticeship systems. In the case study countries, Australia has not engaged deeply with global labour movements. People from other countries can have their qualifications formally recognized, but the process is cumbersome and expensive for applicants. Migrants are not allowed to undertake apprenticeships until they have become permanent residents or citizens, which takes some years. In India and Indonesia, in contrast, the apprenticeship system is well aware of the movement of labour. These countries are net exporters of labour, and their system, especially in Indonesia, include the concept of training people through apprenticeship to work in other countries. In Indonesia, such training tends to focus on hospitality.

New forms of employment and self-employment: The so-called 'gig economy' has led to a rapid increase in western countries of the proportion of people being self-employed, or as Gershon (2017) put it, "the worker as business". This has been characterized as a new informalization of the economy, especially in developed countries. It could be argued that apprenticeship has always operated in a gig economy in that many businesses (for example, construction companies) hire apprentices to work in circumstances in which work is project-based and uncertain. However, apprenticeships require involvement with an employer. Where people are working in jobs such as Uber driving, there is no employer as such; individuals operate as sole businesses or contractors although the work is contracted via a web-based platform, which is of course, owned by a company. While the importance and eventual impact of the gig economy is contested (see, for example, Healy, Nicholson and Pekarek, 2017), the implications for apprenticeship are undeniable because all apprenticeships involve an arrangement with an employer, whether through a formal contract or otherwise. In Australia, social partners in a 2017 consultation hosted by the State of Victoria discussed at length how apprenticeships could be made available to workers who operate in the gig economy, although no policy has yet been proposed.

6.4 Youth unemployment and the role of apprenticeships

This section of the chapter examines, in the light of the current and emerging context for apprenticeships, the potential of apprenticeships as one solution for youth unemployment. Stakeholders hold a common set of hopes and fears for young people entering apprenticeships (figure 6.1) which should be taken account of in the practice of those responsible for implementing apprenticeships and in the redesign of apprenticeship systems.

Figure 6.1: Hopes and fears for young people in apprenticeships

Hopes	Fears
• Young people will find a permanent job or be able to start their own business a the ends. • Young people will get good training. • Young people will develop employable skills. • Young people will learn a skill for life or at least for the next few years. • Young people will embrace the opportunity to learn.	• Young people may be exploited or bullied. • Young people may not be trained properly. • Young people may be dismissed at the end. • Young people may commit too soon to an occupation. • Young people may not apply themselves to learning.

Source: Author.

For some countries, refocusing the apprenticeship system on addressing issues of youth unemployment would require minimal adjustment, as their systems are deliberately set up for the purpose of transition from school to work; for others, where a greater proportion of apprenticeships are undertaken by adults (e.g. Australia) or in higher-level qualifications (e.g. the U.K.), it would require more radical change. Refocusing a system would undoubtedly have consequences. If apprenticeships were to be seen as mechanisms for preventing youth unemployment or rehabilitating unemployed young people, inevitably some participants would have lower-level skills and abilities or would require extensive development to accustom them to workplace behaviour and practices. Employers may have neither the patience nor capability to accommodate them, except in industries in which there is already a strong tradition of youth apprenticeship. At the risk of characterizing a substantial proportion of young people as incapable, some newly relevant questions spring to mind:

- Would employers be willing to take on the full range of young people in the apprenticeship places that they would want to offer? Would adverse experiences lead employers to retreat from apprenticeship provision?
- Would the absorption of larger numbers of young people, as opposed to a mix of young and older people, affect the workforce capability development of companies?
- Would employers, especially perhaps in micro, small and medium-sized enterprises, be capable of providing for the employability skills development needed by some young people? Would there be adverse outcomes for young people if they were not treated appropriately?
- Would the refocusing of apprenticeship systems towards young people affect the fine balancing of the aims of a current system and the interests of stakeholders?

One way of handling some of these issues would be with expert assistance for both young people and employers of apprentices. In Australia, for example, group training organizations provide such assistance. This solution is expensive, however, and requires additional administrative arrangements for countries and thus may not be realistic for many countries in Asia and the Pacific.

Based on extensive research on apprenticeship systems, figure 6.2 presents a visual depiction of the potential effects on some of the current goals of apprenticeship systems if the goal of reducing youth employment became paramount.

Figure 6.2: The effect of different emphases on a national apprenticeship system

Source: Author.

This "radar" diagram depicts the potential effects of two different foci for an apprenticeship system: youth employment and skill development. If the main focus is youth employment, then there is inevitably less focus on skill formation, particularly in enterprises. On the other hand, the long-term effects of greater youth engagement in employment could mean that national skill formation is not so adversely affected. It is likely, however, that training for innovation will suffer, at least in the short term, because the majority of apprentices would be at lower levels associated with school-leavers. But a strong focus on skill development could mean less attention to reducing youth unemployment through apprenticeship or on inclusivity because companies would seek only the best applicants who did not need support. While this model is tentative, it is useful for understanding potential risks.

Apart from the particular challenges associated with absorbing a greater proportion of young people into apprenticeships, there are more general challenges to expanding an apprenticeship system, which would be likely to accompany moves to use apprenticeship systems as a tool to combat youth unemployment. Smith and Brennan Kemmis (2014) using experiences of several countries, identified these expansion challenges:

- A rapid increase in apprenticeship places can lead to quality problems.
- Employers may be persuaded to participate without being fully aware of their responsibilities.
- Completion rates may be low unless quality is properly managed.
- Rapid establishment in new occupational areas without a tradition of formal training can lead to the risk of low-quality qualifications and workplace curriculum, which can be hard to shift later, thus leading either to persistent negative perceptions of the occupation and the apprenticeship or to rapid and confusing policy adaptations to redress the problem.

Altogether, It would be important to bear these risks in mind when redesigning countries' apprenticeship systems to provide more youth employment and include more disadvantaged groups. A further risk is that in attempting to increase numbers, insufficient safeguards may be put in place to prevent abuse of young people and other apprentices for financial gain, either by accessing government incentives or by opportunity to employ people at lower-than-normal wage rates. This has been noted in all three profiled countries as either current or previous practice. Extensive stakeholder consultation, including social dialogue, is essential to mitigate these risks.

A potential response to the challenges of an apprenticeship system geared towards youth could be to introduce two types of apprenticeship: one that is more complex, broader, deeper and longer (for example, two to three years); and the other less complex, narrower and shorter (for example, one year). Young people who are as yet unsuitable for or unwilling to commit to a longer-term apprenticeship could opt for the latter. However, Smith and Brennan Kemmis (2014) , based on their cross-country analysis, warned that the establishment of "differently badged" systems should be avoided, as it can lead to the newer system being viewed as inferior. Such perceptions are difficult to shift subsequently, as has been experienced with traineeships in Australia, "modern apprenticeships" in England and "learnerships" in South Africa. It is important, therefore that the term "apprenticeship" be retained for the two types and that the different types are presented in an acceptable fashion.

The potential for adapting to changes in work patterns and in industry while ensuring continued attention to the employment of young people depends partly on the underlying flexibility of a country's system. Table 6.2 provides an initial exploration of the potential adaptability of apprenticeship systems for future work, using the three profiled countries as primary examples.

This analysis indicates that some apprenticeship systems are better placed than others to address some of the features generally considered to characterise 'future'; work. However the potential solutions are not without problems, as the final column in figure 6.2 shows. Countries are only beginning to look at these issues in a strategic way. While flexibility seems at first glance to be an advantage, too much flexibility may undermine important features of systems, or affect workers' rights.

What are the particular consequences for young people of these changes? Looking at the last issues an example, it has been noted that non-standard forms of employment, of which the gig economy is one example, are more common among young people than older people (ILO, 2016). The ILO already reports (2016) that young people can be exploited through unpaid internships. This was cited certainly raised as a concern by stakeholders in the Indonesian system. It is also the case that young people often look specifically for part-time temporary work while studying and that this may be a normal stepping stone to other careers (ILO, 2016). Thus, non-standard forms of employment have both positive and negative connotations, which may be true with jobs in the gig economy. The question of whether an apprenticeship system should engage with this form of employment is problematic, and countries with a large incidence of informal apprenticeships have useful knowledge and experience in this area.

There is also a possibility that the growth of the gig economy might lead young people to become unaccustomed to non-standard forms of work. Thus, a three- or four-year commitment to an apprenticeship might become less attractive, as has been noted above for Australia. Shorter apprenticeships, as in Indonesia and in some occupations in India, might be more attractive for this reason. There may, of course, be disadvantages to overly short apprenticeships, such as insufficient time to develop skills or to become useful to an employer.

Another concern for young people is the potential effect of Industry 4.0. Earlier concerns that greater automation and digitalization might affect particular jobs adversely have largely been replaced by an understanding that Industry 4.0 will affect all types of work but is unlikely to create mass unemployment (CEDEFOP, 2017). Thus, it is unlikely that young people will face a restricted labour market. However it is important to ensure that young people who do not have the opportunity to access, for example, digital technology because of poverty are not excluded from apprenticeships, which assume that such skills are present in all applicants.

Table 6.2: Future of work implications and the potential of apprenticeship systems to adjust

Imperative	Relevant feature of a country's apprenticeship system	Example	Potential drawbacks
Industry 4.0	System for updating qualifications	In Australia, apprenticeships include formal qualifications, and advanced manufacturing is a priority for the qualifications process.	Such systems could lock countries into viewing qualifications as the only way of updating apprenticeships.
Globalization	Allowing companies to use internal competency standards for apprenticeships, allowing consistency across company sites worldwide	In Indonesia, companies are allowed to use their own internal competencies. There is also the example of the English apprentice framework, which can be registered for a single company.	Inconsistencies within countries could ensue, with apprentice credentials from one company not recognized in another company in the same country.
Structural adjustment	System for adding new occupations	India has a structured method for adding new occupations to the list of apprenticeship-possible occupations.	There would be a danger, if a system was not set up properly, of not including the views of all relevant stakeholders.
Cross-country labour movements	Attention paid to the possibility of apprentices moving overseas and for recognition of apprentice credentials for incoming labour	Indonesia has prioritized service industries in the expansion of its apprenticeship system, partly because many Indonesian people move overseas for work in these industries. Australia has Trades Recognition Australia to assist people moving into the country.	It would be necessary to make sure that the needs of the home country are prioritized along with the needs of other countries exporting or importing labour.
Gig economy	Third-party employers	Group training organizations in Australia and labour-hire companies specializing in apprentices and apprentice support could potentially become the employers for gig workers.	There is clear potential for exploitation of apprentices and difficult questions about whether and how apprentices would be paid or insured.

Source: Author.

Conclusion

Apprenticeships have always changed with developments in an economy and the labour market. They have proven to be remarkably resilient and flexible, and to provide a key example of an arena in which competing stakeholder interests, while robustly argued, generally result in outcomes that are favourable for young people and for employers alike.

A question now is whether apprenticeships can evolve quickly enough to address changes in the future of work to meet the evolving needs of employers while still meeting their role of helping young people into the labour market in quality jobs, as well as assisting with social inclusion of other groups.

The two figures in this chapter have illustrated some potential risks and challenges if countries refocus towards youth unemployment in their apprentice systems: Expectations for young people could be unmet, and expectations of skill formation could be at risk. Apprenticeship systems inevitably involve the balancing of competing interests, and this is both their strength and, sometimes, their weakness. Perhaps the most important guiding question is what would happen to the quality of an apprenticeship system. Creating a quality apprenticeship experience for young people, including those experiencing a disadvantage, does not necessarily create a quality apprenticeship system for a country. Figure 6.2 indicates the possibility that companies may feel impelled to consider additional or alternative means of skill development, particularly to address Industry 4.0 and other new developments in the economy and employment patterns, and hence engage less, at least proportionately, in the apprenticeship system. Table 6.2 provides an initial analysis of how current apprenticeship systems might address some of the features of the 'future of work.'

A particular challenge for social partners to consider is how an apprenticeship system can increase its function as a pathway out of or to avoid youth unemployment – while retaining emphasis on skill formation. A focus on youth while retaining a rigorous respected system would necessarily entail new features in some countries. These could involve a re-examination of some of the fundamental features of apprenticeship structures. Such new features could include a far greater emphasis on support during the term of apprenticeship, as with group training organizations in Australia.

Another feature could be the option of a less substantial commitment on both sides, perhaps through shorter-term apprenticeships or by dividing lengthy apprenticeships into "slices" with identifiable outcomes and certification. These options could be in addition to, rather than replacing, the lengthier and higher-commitment option, which is currently the main feature of systems in many countries (for example, Germany). It may be a way of providing the flexibility needed to address the likely future of work. Systems could thus provide both intensive skill formation as well as inclusive apprenticeship systems.

Greater preparedness for apprenticeship is needed, perhaps through pre-apprenticeships, as in Australia, or upfront training at a training provider, as in India and Indonesia. Such provisions have a social inclusion role but could also provide additional technical grounding to address Industry 4.0.

New thinking is also required. And the strength of social partner involvement in apprenticeship systems would ensure that, while negotiations may be protracted, the likely outcomes will be favourable and inclusive.

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Annex

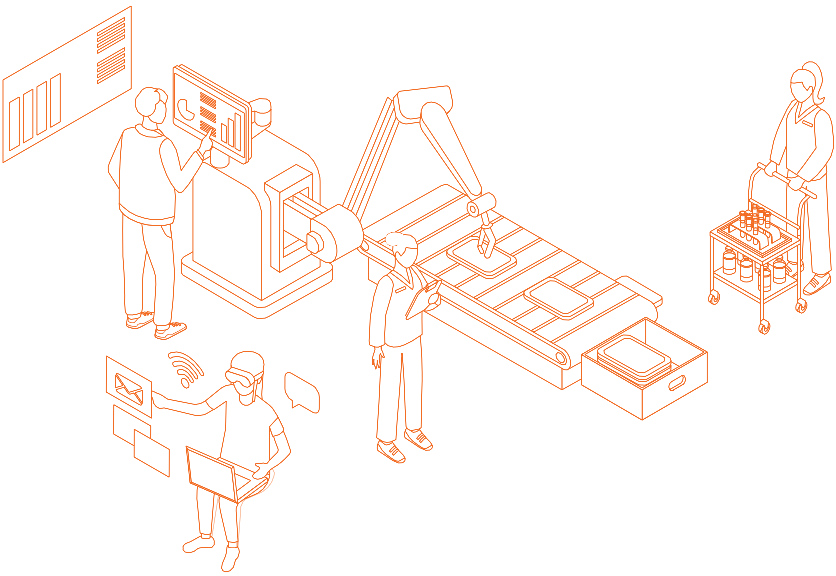
Initiative to Promote Quality Apprenticeships, adopted at the Beijing Meeting of the Group of Twenty Labour and Employment Ministers, July 2016

The ten agreed components of the Leaders' Communique (G20, 2016):

1. Establishing national goals or targets to develop, expand and improve apprenticeship programmes, including for higher education levels.
2. Raising the quality of apprenticeships by fully engaging social partners (governments and employers' and workers' organizations) in the design, development and delivery of apprenticeships and ensuring a strong work-based training component (dual training systems, effective career guidance and integration with formal schooling and skills recognition systems).
3. Promoting apprenticeship programmes in a broad array of occupations and sectors, particularly emerging sectors and those with skill shortages.
4. Fostering the engagement of businesses in the apprentice systems, making apprenticeships more attractive to employers, in particular SMEs, by reflecting their skill needs in training programmes, addressing legal and regulatory disincentives and promoting an adequate and appropriate sharing of costs among employers, providers and public authorities.
5. Ensuring that apprenticeship programmes offer good working and training conditions, including appropriate wages, labour contracts and social security coverage, as well as respect for labour rights and occupational safety and health.
6. Implementing the initiatives to raise the awareness and highlight the benefits of apprenticeship among enterprises, guidance counsellors, jobseekers and the general population.
7. Improving access to quality apprenticeships for disadvantaged groups through income subsidies, training credits, pre-apprenticeship programmes, affordable quality childcare and family-friendly work opportunities, among others.
8. Strengthening partnerships between businesses and vocational schools in apprenticeship programme design, delivery and certification.
9. Supporting programmes to upgrade informal apprenticeship and to facilitate the inclusion of informal apprentices to the formal economy through certification and recognition of prior learning, supplementary training or other appropriate measures.
10. Expanding quality apprenticeships globally, including through technical cooperation and regional initiatives.

Section III:

Technological change and its impacts on jobs and skills for the future



7

Creative Destruction? Technological progress, employment growth, and future skills in Indonesia, the Philippines, Thailand and Viet Nam

Souleima El Achkar

Abstract: Although previous fears that technology would lead to massive job destruction have failed to materialize, some analysts argue that the current wave of technological change has a higher probability of labour substitution and job destruction. At the same time, there may be new job opportunities for both producers and users of technology, through spillover effects, complementarity of technology and employment, the fragmentation of production processes, outsourcing and other mechanisms.

The chapter investigates the impact of technology on the future labour market in the Asia-Pacific region in relation to the key characteristics associated with the future of work debate. It examines the extent to which potential or theorized impacts of technological change on employment and skills have taken place in recent years (2010-2015), focusing on Indonesia, the Philippines, Thailand and Viet Nam. The analysis includes the risk to low-skilled workers (women are highly represented in Asia) of labour substitution; the impact of technology adoption on skills demand, including job polarization; the increasing demand for science-, technology-, engineering- and mathematics-related jobs; changes in the quality and nature of employment, the distributional effects and the social impacts of technological change in a context of widening income inequality. The analysis provides insights on where jobs are heading as a result of technology adoption and, to some extent, economic integration, with the aim to help guide skills training efforts and labour market policies for a more inclusive future for the region.

Introduction

> "Once, robots assisted human workers. Now it's the other way around."
>
> S. Kolhatkar, 2017.

At the heart of the challenge of building prosperous, inclusive societies, with higher living standards for all persons, is the future of work. This future is immensely uncertain due to many factors, the most notorious of which are globalization and technological progress. Some analysts foresee a doomsday scenario of a "jobless future" in which workers are replaced by robots and other innovations (Ford, 2015; Brynjolfsson and McAfee, 2014). At the opposite end are analysts who argue that this fear is unsubstantiated, that these innovations also represent opportunities and, that humans are flexible and adaptable, and will ride out this wave of technological change just like they did the previous ones (Denning, 2015; Harford, 2015; Vivarelli, 2007; Perez, 2002).

Intricately linked to this debate is the concept of "creative destruction" – a term associated with economist Joseph Schumpeter, who derived it from the work of Karl Marx (Elliott, 1980). It posits that constant change is inherent in capitalism and that the same forces propelling the economic system forward will ultimately lead to its destruction and replacement. In Schumpeter's view, innovation drives economic growth even as it substitutes for earlier innovation in a continuous process of destruction and creation. In recent years, the concept of creative destruction has been used to describe the impact of the Internet on the newspaper and printing industries,[60] of Uber and similar services on traditional taxi systems,[61] of Netflix on the video tape and disc rental industries,[62] of smartphones on digital cameras,[63] which had themselves displaced film photography,[64] and the list goes on.

With creative destruction, job losses, company bankruptcies and vanishing industries are a natural part of the growth process, setting the stage for new jobs, better products and improved business models, thus leading to richer, more productive societies and higher living standards. This, however, implies a "paradox of progress", whereby some individuals will be worse off while attempts to protect jobs and preserve industries could "lead to stagnation and decline, short-circuiting the march of progress" (Cox and Alm, 2008). If creative destruction, which inevitably involves winners and losers, is the backdrop of economic growth, then how can this growth be inclusive? How do we prevent the most vulnerable from falling further behind?

Technological progress may indeed lead to massive job losses and have significant distributional effects through its impact on factors of production and skills demand. Specifically, it may make jobs redundant faster than it generates new ones and benefit "a privileged class of robot-owning rentiers and highly paid workers with robot-compatible skills" (Harford, 2015) at the expense of the low-skilled, more vulnerable workers. While much of the relevant literature concentrates on advanced economies, this chapter looks at recent employment trends in Indonesia, Philippines, Thailand and Viet Nam to assess the extent to which these theorized impacts of technological change on labour markets are taking place.

60 See http://politicalentrepreneurs.com/a-nice-example-of-creative-destruction-and-the-market-process-the-decline-of-newspapers/ (accessed 15 Nov. 2017).
61 See http://www.aei.org/publication/schumpeterian-creative-destruction-the-rise-of-uber-and-the-great-taxicab-collapose/ (accessed 15 Nov. 2017).
62 See http://www.aei.org/publication/the-netflix-effect-is-an-excellent-example-of-creative-destruction/ (accessed 15 Nov. 2017).
63 See https://www.statista.com/chart/5782/digital-camera-shipments/ (accessed 13 Dec. 2017).
64 See http://articles.chicagotribune.com/2002-03-18/business/0203180010_1_digital-camera-traditional-cameras-order-prints (accessed 13 Dec. 2017).

The analysis is primarily based on employment trends from Labour Force Surveys and uses economic data from the 2017 Organisation for Economic Co-operation and Development's (OECD) Structural Analysis Statistics Input-Output Database.[65] The time frame used here, however, may not be sufficient to derive definite conclusions because many potentially disruptive technologies were only recently introduced, while others are yet to be implemented. Nevertheless, the findings indicate that while creative destruction has generally resulted in positive net employment growth, improvement in overall job quality and higher average wages, the distributional effects are real and significant. Our analysis shows that workers as a group have not always received their fair share of productivity gains and remain vulnerable to economic shocks, for which they bear a greater share of the burden. Skilled workers with information and communications technology (ICT) and robot-compatible technical skills are indeed better positioned to benefit from the current wave of technological change, while others, less equipped, may fall further behind. The data also show that women in these four countries are particularly vulnerable due to their distribution across industries and occupations. Policy-makers and civil society need to ensure widespread access to education and skills acquisition and to establish sound and efficient redistribution mechanisms, to mitigate the downfalls and expand the benefits of technological progress in a way that works towards and achieves inclusive societies.

7.1 Technological change, creative destruction and employment growth

From an economic theory perspective, technological progress results in greater production efficiency and higher labour productivity through an increase in capital intensity, in multifactor productivity, which refers to the increase in output that is not attributable to an increase in capital or labour inputs, or in both. The technological change, combining automation (more machines) and information technology (more efficient and intelligent machines), therefore has remarkable potential to raise labour productivity and substitute for labour input.

Although past fears that technological change would lead to massive job destruction failed to materialize, analysts are once again warning that such new technologies as learning robotics, the Internet of Things and 3D printing that build upon and combine previous technologies (information technology and automation) could lead to job losses of an "unprecedented" scale (ILO, 2017; Nubler, 2016). At the same time, however, the complementarity of technology and employment, technological spillover effects, price and income effects and other mechanisms may result in job creation for both producers and users of technology (Acemoglu and Restrepo, 2016; Autor, 2015; Vivarelli, 2007).

Using evidence for the four selected countries, this chapter examines which effect is

65 The database consists of a set of harmonized input-output tables in current prices (US$ million) for all OECD countries and 27 non-member economies, covering the years 1995–2011. For the purpose of the analysis presented here, the gross output, value added and labour compensation by industry series were retrieved from the database and converted to constant 2009 US dollars using the GDP deflator series from the International Monetary Fund's World Economic Outlook Database.

offsetting the other and in which industries. While data from the Labour Force Surveys were available until 2015, permitting the analysis of recent employment trends, the time frame for the analysis of productivity trends was initially limited by the availability of comparable data from national accounts to the 2000–11 period. Because both productivity growth, which was used as a proxy for technological change, and employment growth depend, to an important extent, on the business cycle, the period of analysis was further limited to 2000–08 (see the Annex tables for the complete presentation of findings). The crisis and recovery period of 2008–10 had to be excluded because the productivity trends were much distorted, given the important drops in output and employment. It is possible, and even likely, that technological change has intensified in recent years and will continue to intensify in the future, but the trends revealed here nevertheless offer interesting insights for years to come. The Labour Force Survey data are complemented in the discussion with analysis from other sources.

The data examined for Indonesia and the Philippines[66] indicate that since the early 2000s until the onset of the global financial crisis (that began in 2007), productivity growth was accompanied by employment growth in most, but not all, industries: While going hand in hand with employment growth in the services sector, technological progress resulted in labour substitution in some manufacturing industries.[67] Even in the latter industries, though, the decline in employment generally did not represent a long-term trend but occurred during a transition phase of industry restructuring whereby small enterprises and artisanal workshops were replaced by larger enterprises. As a result, lower-productivity manual jobs were destroyed and replaced by higher-productivity jobs linked to machine assembly and operation. The resulting shift in employment across industries and occupations had distributional implications, mainly on skills demand, as discussed in the following sections.

Automation and labour substitution in manufacturing: A sequential process of job destruction and creation

A recent study by the International Labour Organization concluded with the estimation that nearly three in five jobs in the ASEAN-5 (which includes the four countries analysed here plus Cambodia) are at high risk of automation. The estimates ranged from 44 per cent in Thailand to 70 per cent in Viet Nam, with Indonesia and the Philippines having a 56 per cent and 49 per cent share of jobs at high risk, respectively (Chang and Hyunh, 2016). In the period analysed in this chapter, had automation already begun to take its toll? In Indonesia and the Philippines, there was a negative relationship between labour productivity growth, measured as output per hour worked, and employment growth at the industry level between 2000 and 2008 (figure 7.1). Nearly all industries in both countries

66 Indonesia and the Philippines are the two countries for which both industry employment and output data are available for the years 2000 through 2008.

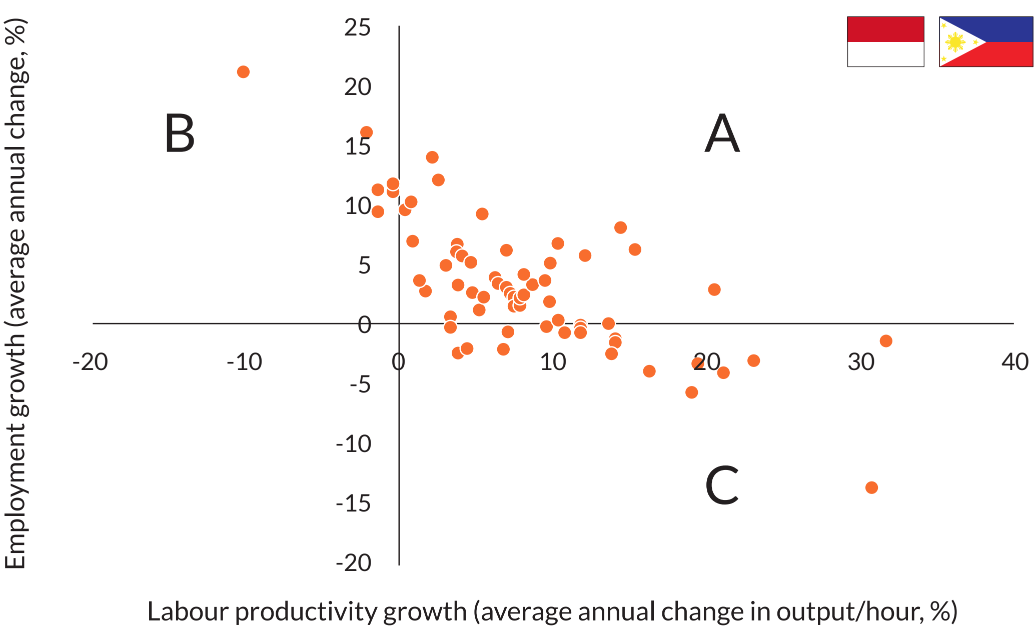
67 The agriculture sector, which remains a major employer in the four countries (ranging from around 29 per cent of employment in the Philippines to 44 per cent in Viet Nam in 2015) is not covered in the analysis here – not because technological change is not having an impact on the sector but because a general decline in the sector's employment share constitutes a longer-term trend of structural change attributable to many factors and thus warrants consideration on its own.

experienced steady productivity growth, and in most cases, higher productivity growth was accompanied by lower yet positive employment growth (quadrant A).

In a few industries, employment increased while productivity decreased, likely reflecting a shift in employment from high to low productivity subsectors within the industry (quadrant B). Of particular interest are the industries in quadrant C, where productivity increased while employment fell, which suggests that labour-saving technological change may have taken place. These quadrant C industries are all manufacturing industries and include the motor vehicles, trailers and semi-trailers industry (hence referred to for simplicity as the automotive industry) and the textiles, textile products, leather and footwear industry (hence referred to as the textiles industry) – both of which are considered to have higher risk of automation (Chang, Huynh and Rynhart, 2016) – as well as the chemicals and chemical products industry (hence referred to as the chemicals industry), the basic metals industry, and the coke, refined petroleum products and nuclear fuel industry (hence referred to as the petroleum products industry) in both Indonesia and the Philippines.

In Indonesia, this was also the case for the computer, electronics and optical equipment industry, as well as the wood and products of wood and cork industry (hence referred to as wood products industry). In the Philippines, it was also the case for electric machinery and equipment, machinery and equipment not elsewhere classified industry (hence referred to as the machinery and equipment industry), the rubber and rubber products industry and the fabricated metal products industry.

Figure 7.1: Employment growth and labour productivity growth, 2000–08 for Indonesia and 2001–08 for the Philippines



In only a few industries does the decline in industry employment constitute a longer-term trend; in most cases, more recent data reveal a reversal of the negative employment growth trend. Of particular importance is the labour-intensive textiles industry, accounting for the largest or second-largest share of manufacturing employment in all four countries (table 7.1). Employment in the industry, which had declined in Indonesia and the Philippines between 2000 and 2008, increased in recent years in both countries (see Annex tables A1 and A2). In Indonesia, it increased at a compound rate of 3.2 per cent between 2010 and 2015, resulting in net creation of nearly 600,000 jobs, which increased the industry's share of manufacturing employment to 26 per cent in 2015 (table 7.1). In the Philippines, it had more modest but nevertheless positive growth, averaging 0.2 per cent annually; the industry's share in manufacturing employment decreased to 20 per cent in 2015.

There is a stark contrast in recent employment trends in the textiles industry between Thailand and Viet Nam – not attributable to differences in technological adoption rates and labour substitution but mainly to changes in market share. During the past decade, and after 2010 in particular, Thailand lost its competitiveness in some labour-intensive manufacturing industries, including textiles (World Bank, 2016). In 2010–11, the textiles industry accounted for the largest share of manufacturing employment in both countries, at 22 per cent for Thailand and 33 per cent for Viet Nam (table 7.1).

However, rapid employment growth further increased the industry's share in manufacturing employment to 38 per cent in Viet Nam by 2015, whereas in Thailand, the industry's employment declined, driving its share down to 16 per cent (table 7.1, also see Annex table A2). All in all, the industry shed more than 160,000 jobs in Thailand between 2010 and 2015 but created more than 750,000 jobs in neighbouring Viet Nam during that same period.

Table 7.1: Industry share of manufacturing value added (2011) and employment (2010 or 2011 and 2015)

	Share of manufacturing value added 2011				Share of manufacturing employment 2010 or 2011				Share of manufacturing employment 2015			
	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM
Food products, beverages and tobacco	31.3	22.3	17.3	23.2	28.4	26.1	20.9	16.5	25.7	28.6	23.3	14.0
Textiles, textile products, leather and footwear	8.2	5.18	14.4	15.4	24.7	20.7	22.0	33.4	26.2	19.7	15.7	38.1
Wood and products of wood and cork	4.8	0.4	3.4	1.6	9.2	11.8	6.9	7.6	9.0	9.0	3.5	6.3
Pulp, paper, paper products, printing and publishing	4.0	2.5	2.8	4.2	4.1	4.1	3.1	2.8	3.7	3.8	3.5	2.8
Coke, refined petroleum products and nuclear fuel	14.5	8.1	4.8	2.1	0.2	0.2	0.3	0.2	0.3	0.1	1.0	0.3

	Share of manufacturing value added 2011				Share of manufacturing employment 2010 or 2011				Share of manufacturing employment 2015			
	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM
Chemicals and chemical products	8.4	6.5	9.3	5.3	2.8	2.7	3.6	2.1	3.0	2.8	4.2	1.9
Rubber and plastic products	2.2	2.7	3.7	4.5	3.6	2.4	4.4	2.1	3.6	2.4	5.4	2.0
Other non-metallic mineral products	2.9	3.6	4.9	9.8	8.3	3.0	5.3	8.3	7.5	2.8	4.9	4.9
Basic metals	1.8	5.23	3.5	4.4	1.1	1.4	1.7	1.0	1.5	1.6	2.3	1.1
Fabricated metal products	3.8	1.8	3.1	6.7	3.3	4.9	5.7	6.9	3.1	4.7	5.7	7.1
Machinery and equipment, n.e.c.	3.1	3.6	10.9	1.3	1.0	2.2	3.1	0.5	0.7	0.7	2.2	0.6
Computer, electronic and optical equipment	5.5	27.6	4.9	5.9	1.4	10.3	6.7	2.4	1.3	11.7	7.6	4.8
Electrical machinery and apparatus, n.e.c.	2.7	4.4	4.5	3.5	0.9	1.5	1.8	1.3	1.1	1.7	3.1	1.4
Motor vehicles, trailers and semi-trailers	1.4	2.9	6.6	3.7	0.9	1.0	4.0	0.8	1.3	2.0	6.5	1.1
Other transport equipment	4.9	1.5	1.5	4.3	2.0	1.4	0.7	1.4	2.0	1.4	1.0	1.1
Manufacturing, n.e.c.; recycling	0.6	1.7	4.3	4.0	8.0	6.4	9.7	12.8	10.0	6.9	9.9	12.5

Source: Labour Force Surveys and OECD Input-Output Database 2017, http://dx.doi.org/10.1787/data-00650-en (accessed 15 Nov. 2017).

As was the case for the textiles industry, employment in the automotive industry, which had decreased in both Indonesia and the Philippines between 2000 and 2008, grew rapidly in both countries between 2010 and 2015 (see Annex tables A1 and A2). The industry had rapid employment growth in Thailand and Viet Nam as well between 2010 and 2015. In terms of net employment creation, it added more than 200,000 jobs in Thailand, nearly 100,000 jobs in Indonesia, nearly 50,000 jobs in Viet Nam and 37,000 jobs in the Philippines during this period. Similarly, both the chemicals and the basic metals industries had a reversal of the negative employment growth trend in Indonesia and the Philippines. This was also the case for the electrical machinery and equipment industry in the Philippines and for the petroleum products industry in Indonesia.

These trends (and subsequent trend reversals) suggest that creative destruction occurred within these industries during the 2000–15 period, whereby some jobs were destroyed before new, higher-productivity jobs were created in a “sequential process of job creation, which is often stronger than job destruction” (ILO, 2017, p. 1). As discussed in the following section, in many manufacturing industries, job losses often consisted of manual, crafts and related trades occupations, which were later, partly or entirely, offset by job growth in the plant and machine operators and assemblers category, resulting in positive net employment growth. In only two industries did the decline in employment seem to represent a long-term trend and to be consistent across several countries: The machinery and equipment industry, which had a decline in employment in the Philippines between 2001 and 2008, continued to shed jobs in recent years, not only in the Philippines but in Indonesia and Thailand as well. Similarly, net employment fell in wood products in all four countries between 2010 and 2015, by 144,000 jobs in Thailand, 128,000 jobs in Indonesia, 114,000 jobs in Viet Nam and 65,000 jobs in the Philippines (see Annex table A2). In these cases, the destructive forces outweighed the creative forces within the industry, although job creation may have been simultaneously taking place in other industries. The unavailability of comparable output data after 2011 makes it difficult to determine the factors at play (such as labour-substituting technology, decline in demand for the industry's product, loss of competitiveness). The decline in employment is likely attributable to a combination of these forces.

The complementarity of technology and employment in the services industries

Although some labour-substituting technological change seems to have occurred in the manufacturing industries in Indonesia and the Philippines between 2000 and 2008, in the services industries, employment creation generally occurred alongside technological change. In particular, the service industries that had the largest increases in productivity or employment, or both, during that time were those related to ICT (post and telecommunications), where technology led to the fragmentation of the production process with the relocation of jobs to developing countries (research and development (R&D) and other business activities) or where technology complemented employment by expanding the spectrum of services provided (such as financial intermediation). Some of these positive effects of technology on employment seem to have taken place in all four countries in recent years.

The post and telecommunications industry also had high employment growth in both Indonesia and the Philippines between 2000 and 2008 (see Annex table A1). In recent years, the industry experienced a decline in employment in Indonesia, rapid employment growth in the Philippines and Thailand and moderate growth in Viet Nam. The R&D and other business activities industry had high productivity growth and moderate employment growth between 2000 and 2008 in Indonesia (see Annex table A71). In the Philippines, it had low productivity growth and rapid employment growth between 2001 and 2008. This industry includes business process outsourcing activities that have had remarkable growth in the Philippines, which has a large pool of high-skilled, lower-cost, English-speaking workers. Between 2010 and 2015, the R&D industry had significant employment growth in all four countries, with an annual average of 23.2 per cent in Indonesia, 11 per cent in the Philippines, 9.1 per cent in Thailand and 4.5 per cent in Viet Nam (see Annex table A2). In Indonesia, the Philippines and Thailand, the R&D industry ranked among the top-ten industries in terms of employment growth rates and net employment growth (figures 7.2 and 7.3).

Figure 7.2: Employment growth rate, by top-ten industries, 2010–15 (average annual percentage change)

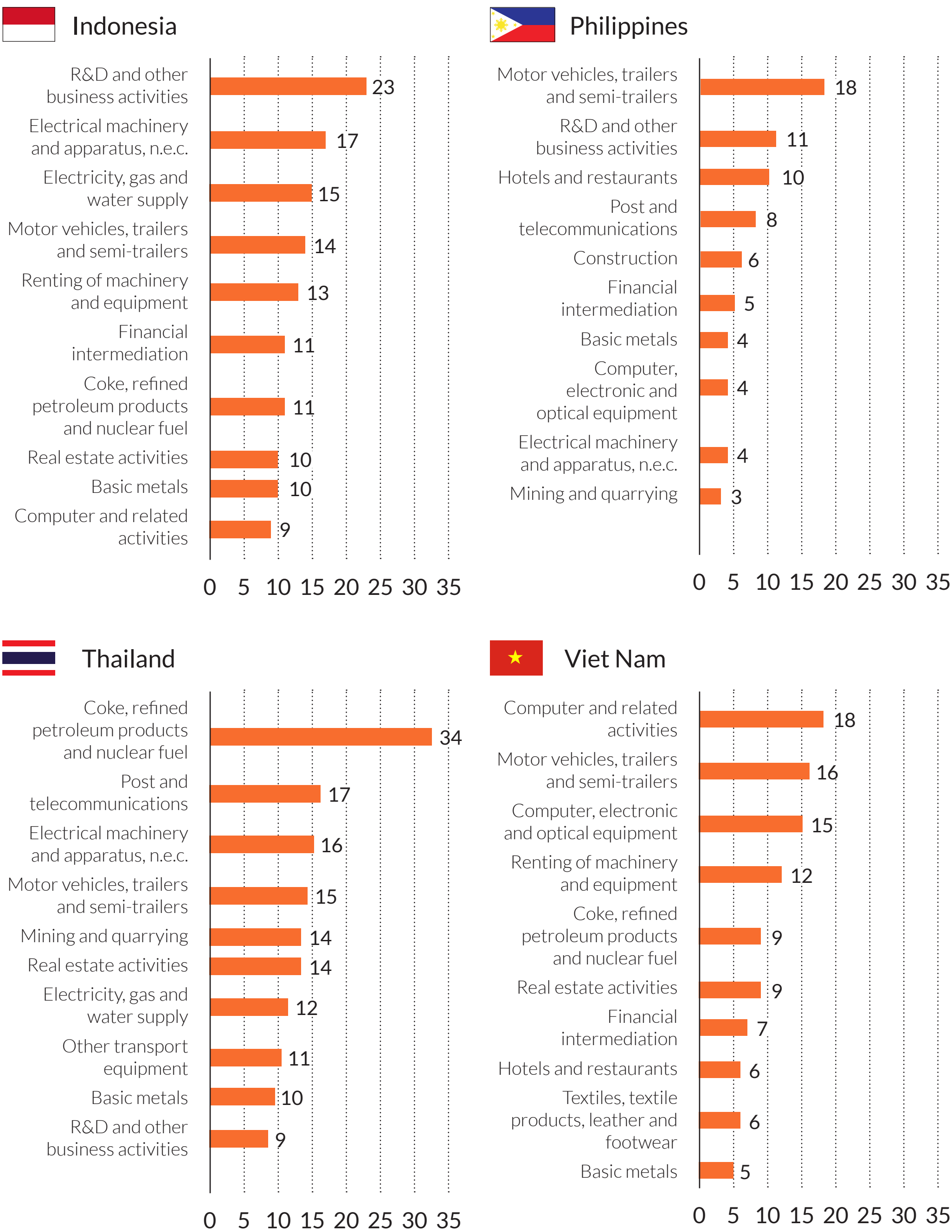


Figure 7.3: Net employment growth, by top-ten industries, 2010–15 (‘000)

Financial intermediation and real estate activities are industries that also experienced productivity growth and steady increases in employment in Indonesia and the Philippines between 2000 and 2008. Recent trends suggest that high employment growth is likely to continue in the near future in all four countries, particularly in financial intermediation. This may be partly attributable to labour-augmenting technology contributing to increased demand for the services.[68] Even in this industry, however, blockchain technology could eventually constitute a disruptive factor, with an uncertain net impact on employment. Consistently with creative destruction, it threatens some jobs, such as those involving processing and reconciling transactions and verifying documentation, while potentially creating other opportunities requiring different skills, for instance, involving encryption and identity protection.[69]

7.2 The skills content of technological change

Technology and globalization, among other factors, are continuously reshaping the global economic structure, with inevitable impact on labour markets. While the recent trends discussed here indicate that net job growth is likely to remain positive in the near future, major changes are under way in terms of skills demand in these countries. At the aggregate level and within many industries, job polarization is taking place, with an increased demand for both skilled and unskilled workers – at the expense of semi-skilled workers. Overall growth in semi-skill employment in manufacturing remains positive, but often with a notable shift from manual crafts and related trades occupations involving skills that are informally acquired on the job or passed on from generation to generation towards robot-complementing plant and machine operating and assembling jobs that require more formal technical and vocational training.

Job polarization and economy-wide skill mismatch

At the aggregate level (economy-wide), for which data are available for the 2001–15 period, changes in the occupational and skills distribution of the workforce in Indonesia, the Philippines and Viet Nam suggest that job polarization occurred between 2010 and 2015 and even over the longer term in Indonesia and the Philippines (figure 7.4). This trend is consistent with the growing employment share of the services sector in both the skill-intensive industries and the industries that employ large shares of low-skilled workers, at the expense of the manufacturing sector, where semi-skill employment constitutes the backbone of the workforce.

68 An example of the complementarity of technology and employment cited in Autor (2015), based on a study by Bessen (2015), is that of the impact of automated teller machines (ATMs) on the banking industry in the United States. Instead of resulting in a decline in employment, the technology reduced the operating costs of bank branches, allowing an expansion in their number and thus an increased demand for tellers. The ATM substituted for the routine cash-handling tasks of tellers, allowing them to broaden the spectrum of their tasks.

69 See "Blockchain can create financial sector jobs as well as kill them", in Financial Times, 7 Sep. 2016, https://www.ft.com/content/3a9ef8d8-33d5-11e6-bda0-04585c31b153 (accessed 20 June 2018).

The structural shift away from agriculture and the corresponding rural-to-urban migration in many developing countries has resulted in the services sector absorbing a significant number of low-skilled workers. Unable to find employment in manufacturing or elsewhere in services in the formal sector, many unskilled workers have ended up in informal employment in industries like wholesale and retail trade or personal services. At the same time, the expansion of public service provision and the advent of the knowledge economy, which are no longer confined to developed countries, has increased the demand for skilled workers in higher-end skill-intensive service industries, like health care, education, ICT and R&D.

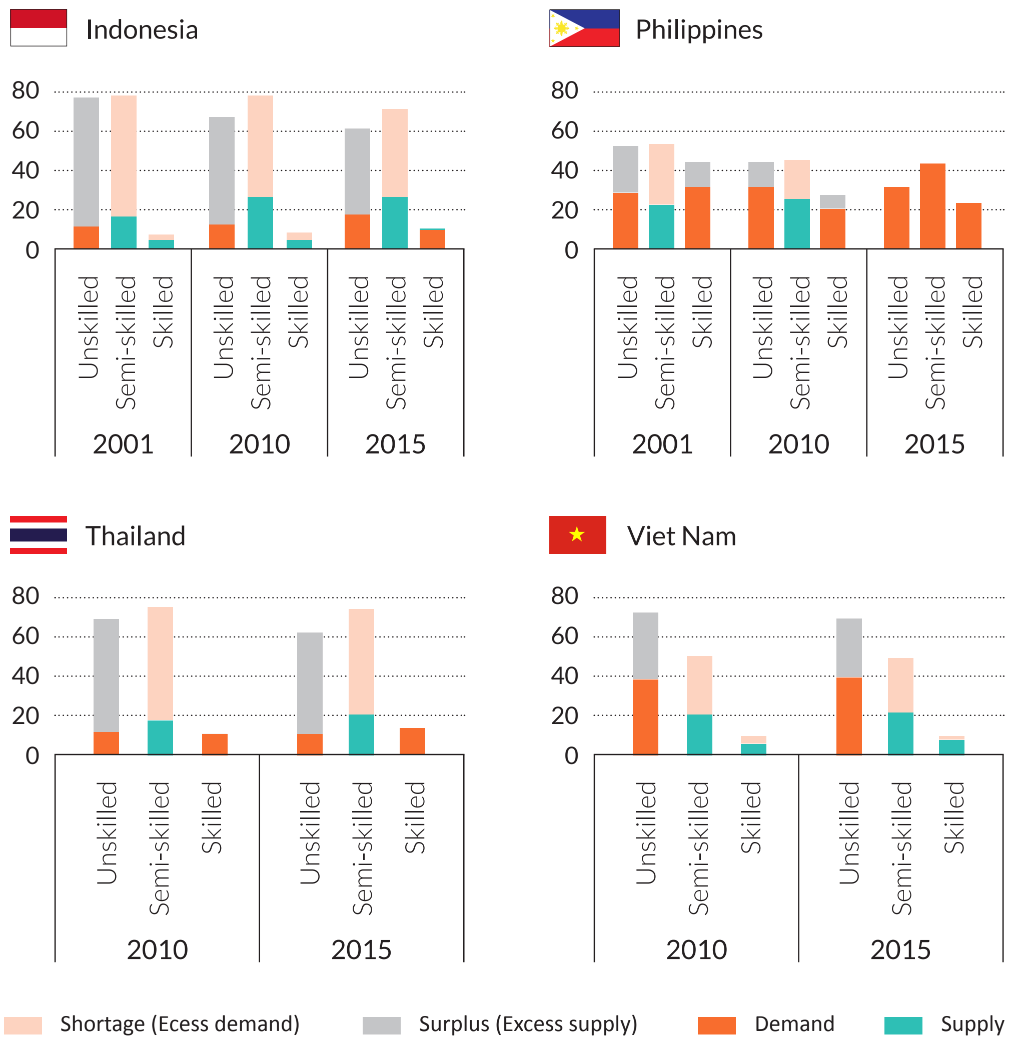
On the skills-supply front, education attainment has been improving across the board. But important skills mismatches remain in these countries in terms of the excess supply of unskilled workers and a shortage of semi-skilled workers.

In 2015, the four countries[70] still had an oversupply of unskilled workers and a shortage of semi-skilled workers, although these imbalances were narrowing over time. This does not mean that there is a pool of unemployed low-skilled workers nor that there are many vacancies in the semi-skill occupations. Rather, many unskilled workers are employed in semi-skill occupations and therefore have lower education attainment levels or skills qualifications than would normally be required by their respective occupations, as per the ISCO-08 and ISCED-97 concordances.[71] Only in the Philippines do semi-skilled worker shortages generally not consist of unskilled workers in semi-skill occupations. Rather, skilled workers unable to find employment opportunities that meet their aspirations instead work in semi-skill occupations. For instance, the rapidly growing business process outsourcing industry has absorbed a large number of skilled workers, many of them in semi-skill clerical or sales and service occupations. This is reflected in the important skills mismatch in the R&D and other business activities industry, of which the business process outsourcing industry accounts for a major share: In 2010, the supply of semi-skilled workers in the R&D and other business activities industry in the Philippines fell short of the demand by 42 percentage points, while the supply of skilled workers exceeded demand by 44 percentage points (see Annex table A5).

70 Data issues (a break in data series with respect to the education codes or supply-side data) did not allow calculating the supply-side skills distribution for the Philippines between 2014 and 2016. Figures and trends from previous years suggest that these imbalances still exist, although they were narrowing over time.

71 Conceptual model to be used for ISCO-08. See ILO, http://www.ilo.org/public/english/bureau/stat/isco/docs/annex1.doc (accessed 20 June 2018).

Figure 7.4: Skills mismatch, by aggregate level, 2001, 2010 and 2015 for Indonesia and Philippines and 2010 and 2015 for Thailand and Viet Nam



Note: Skill levels on the demand side were obtained by mapping ISCO-08 occupational categories from the Labour Force Surveys into ISCED-97 education attainment levels. Skills levels on the supply side were obtained from the education attainment variable in the Labour Force Surveys and compared with the supply-side data to determine mismatches. A break in series in the Philippines supply-side code (education attainment variable in the Labour Force Surveys) prevented comparisons; only demand-side data were used for 2015.

Among the four countries, the excess supply of unskilled workers remained largest in Thailand, which had the lowest demand for these workers, and smallest in the Philippines, which had the most limited supply (share) of unskilled workers. The decrease in the excess supply of unskilled workers was due to both supply-side factors (higher education attainment of the labour force) and demand-side factors (increased demand for unskilled workers) in Indonesia, the Philippines and Viet Nam. In Thailand, there was an increase in the demand share of skilled workers at the expense of both semi-skilled and unskilled workers between 2010 and 2015; the decrease in the surplus of unskilled workers in Thailand was due to supply-side factors only.

Although skilled workers still accounted for the smallest share of employment in the four countries in 2015, the demand for workers in this category has been growing and is likely to grow at a faster pace in the near future, as discussed further on. Skilled-worker demand was higher in the Philippines (at 24 per cent of employment), compared with the other three countries (at 14 per cent in Thailand and 10 per cent in Indonesia and Viet Nam) in 2015 (figure 7.4). Of the four countries, however, only Viet Nam had a small shortage of skilled workers; Thailand and Indonesia had a very small surplus (approximately 1 per cent), while the Philippines had a larger surplus (at 7 per cent in 2010).[72]

Semi-skill occupations in manufacturing: Smaller share in employment and increased demand for machine and robot-compatible skills

Job polarization at the aggregate level is largely driven by the general shift of employment towards the services sector. But this trend is taking place **within** many industries as well, reflecting skill-biased technology or new production processes that increasingly rely on skilled and unskilled workers at the expense of the semi-skilled workers. This has mixed implications in terms of skills intensity, as measured by the skills intensity index, which reflects a ratio of the shares of skilled workers to unskilled workers in an industry. Job polarization can result in either an increase or a decrease in the Skills Intensity Index, depending on which of the two ends of the skills spectrum has a more significant increase in share. Skills intensity, as defined here, declined for most industries in Indonesia and in the Philippines between 2001 and 2008. It continued to decline in many industries in Indonesia in more recent years (see Annex table A9). In the other three countries, most industries experienced an increase in skills intensity between 2010 and 2015 (figure 7.5).

Despite the ongoing job polarization, the "hollowing out"[73] of industry employment (whereby semi-skill employment disappears altogether) does not seem to be likely in the near future. Even in industries in which job polarization is taking place, net job creation for semi-skilled workers has often been positive, or at least the destruction of some semi-skill jobs has been partially offset by the creation of other semi-skill jobs within the same industry. Specifically, a general shift in employment from the craft and related trades category to the plant and machine operators and assemblers category in a number of manufacturing industries, and particularly in the textiles and automotive industries, suggests that while machines are substituting for some manual jobs, this is generally accompanied by an increase in jobs

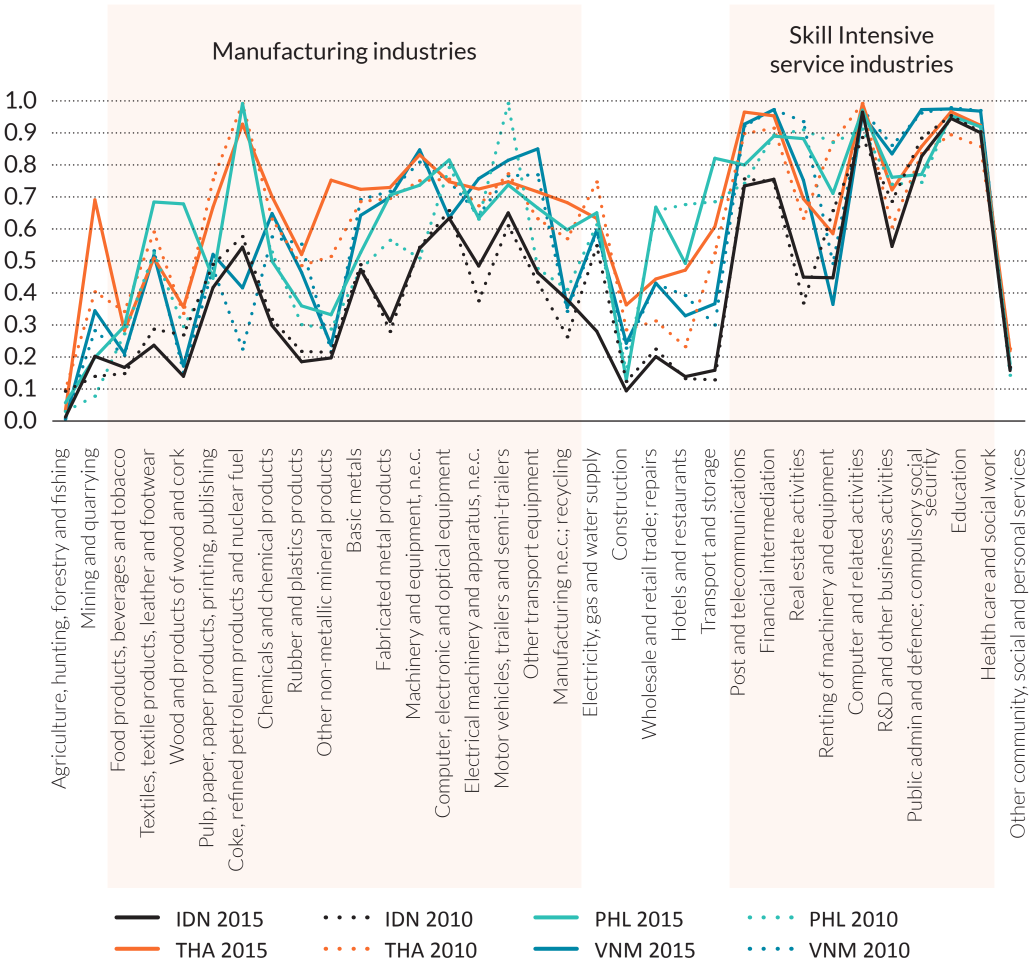
72 Data from the more recent Labour Force Survey (2015) suggest that the surplus of skilled workers in the Philippines may have narrowed since 2010. But because of the series break in the education attainment data (change in codes from 2014 onwards), it is difficult to determine whether this reflects an actual trend or whether it may be due to the change in classification.

73 See https://www.theguardian.com/business/2017/aug/20/robots-are-not-destroying-jobs-but-they-are-hollow-out-the-middle-class (accessed 24 Nov. 2017).

related to the maintenance and operation of these machines.

Although many tasks required for operating machines in the past did not require much training and specialization allowed many unskilled workers and labourers to undertake this work (Goos, 2013), machines are becoming increasingly sophisticated and "intelligent". Plant and machine operators are now typically required to have solid, context-specific training, usually acquired through TVET and possibly complemented with on-the-job training. Semi-skill occupations still represent the largest share of employment in all manufacturing industries. As discussed previously, when the skills supply side is taken into account, these countries still have important semi-skilled worker shortages due to low TVET participation rates.

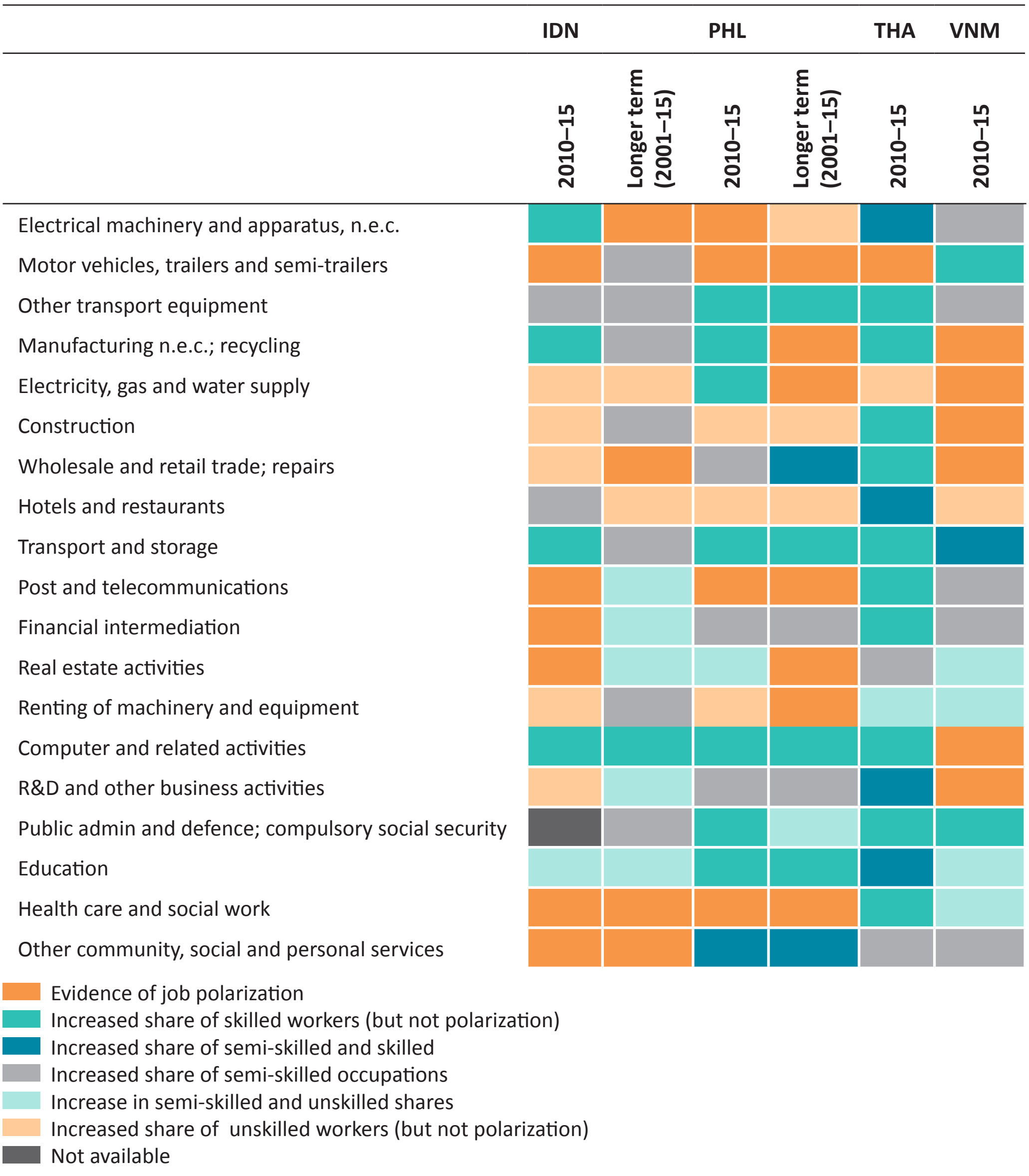
Figure 7.5: Skills Intensity Index, 2010–15 (skilled workers as a share of the sum of skilled and unskilled workers)



The job losses that took place in the textiles industry between 2001 and 2008 consisted mainly of semi-skill jobs in both Indonesia and the Philippines. In Indonesia, more than 750,000 crafts and related trades workers in the industry lost their jobs between 2001 and 2008. But this was partly offset by an increase in another semi-skill employment category, that of plant and machine operators and assemblers, with more than 300,000 additional jobs. In recent years, employment growth resumed across all occupational groups in the industry, led by plant and machine operators and assemblers, which added 320,000 jobs between 2010 and 2015, followed by elementary occupations, with nearly 150,000 additional jobs (see Annex table A6). In the Philippines, more than 140,000 crafts and related trades jobs and more than 15,000 plant and machine operators jobs were lost between 2001 and 2008. Although overall positive employment growth in the industry resumed in recent years, net losses continued in the semi-skilled workers category, with 77,000 lost jobs in the craft and related trades occupational group and 3,000 in the plant and machine operators and assemblers group between 2010 and 2015. This has resulted in job polarization in the Philippines, with the semi-skilled share in the industry's employment declining in recent years and even over the longer term (table 7.2).

Table 7.2: Skills demand trends, by industry, 2001–15 for Indonesia and the Philippines and 2010–15 for Thailand and Viet Nam

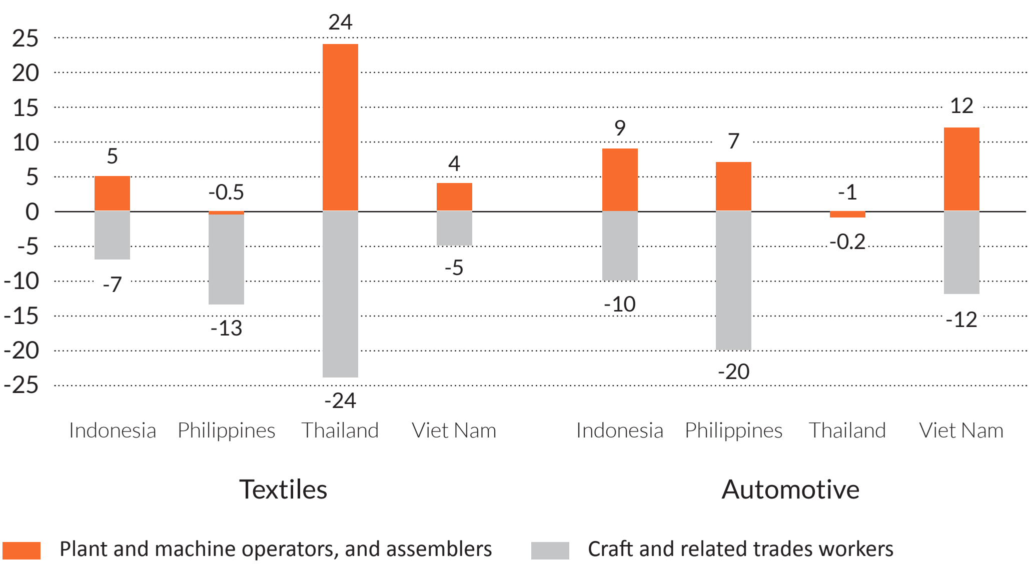
	IDN		PHL		THA	VNM
	2010–15	Longer term (2001–15)	2010–15	Longer term (2001–15)	2010–15	2010–15
Agriculture, hunting, forestry and fishing						
Mining and quarrying						
Food products, beverages and tobacco						
Textiles, textile products, leather and footwear						
Wood and products of wood and cork						
Pulp, paper, paper products, printing and publishing						
Coke, refined petroleum products and nuclear fuel						
Chemicals and chemical products						
Rubber and plastics products						
Other non-metallic mineral products						
Basic metals						
Fabricated metal products						
Machinery and equipment, n.e.c.						
Computer, electronic and optical equipment						



Although the share in employment of semi-skilled workers in the textiles industry in Viet Nam decreased between 2010 and 2015, net employment growth for these occupations was positive and even substantial during that period, with more than 500,000 additional plant and machine operator and assembler jobs and some 135,000 new crafts and related trades jobs (see Annex table A6). In Thailand, however, the industry's loss of market share resulted in major job losses for skilled and semi-skilled workers between 2010 and 2015 and a small increase in the number of unskilled workers, reflected in the rise of the vulnerable employment rate (see section 7.3). Once again, it is the craft and related trades group that had the largest net losses (more than 340,000 jobs between 2010 and 2015). But again, these losses were partly offset by a net increase in plant and machine operators and assemblers (at 195,000 jobs) (see Annex table A6).

In the automotive industry, semi-skill employment decreased in absolute terms in the Philippines between 2001 and 2008, as was the case for the country's textiles industry. But unlike textiles, in which the decline in semi-skill employment continued in recent years, positive growth resumed for semi-skill occupations in the automotive industry. Despite evidence of job polarization in terms of the decreased share of semi-skilled workers in the industry in Indonesia, the Philippines and Thailand (table 7.2), there was high net employment growth for the semi-skill occupations in all four countries between 2010 and 2015, particularly for the plant and machine operators and assemblers group, which had its share in employment increase at the expense of the crafts and related trades group in the Philippines, Indonesia and Viet Nam (figure 7.6).

Figure 7.6: Change in semi-skilled workers' share in industry employment, 2010–15 ('000 workers)



In the wood products industry, where overall employment declined in all four countries between 2010 and 2015, net losses in the crafts and related trades occupational group ranged from 113,000 jobs lost in the Philippines to 173,000 jobs lost in Viet Nam (Annex table A6). In the basic metals industry, there was a decrease in the number of semi-skill jobs between 2001 and 2008 in both Indonesia and the Philippines. Although positive growth resumed in recent years for semi-skill occupations, their share in employment continued to decrease in both countries. Other manufacturing industries, where data point to job polarization in terms of decreased share of semi-skill jobs, include the computer, electronic and optical equipment industry in Indonesia and Thailand and the electrical machinery and apparatus industry in the Philippines (table 7.2).

Globalization of the knowledge economy

With the rapid pace of technological progress, the phase of global economic restructuring that has been characterized by the shifting of labour-intensive production to developing countries (with the rise of the knowledge economy once mainly confined to developed countries) is changing yet again. The availability of lower-cost labour is becoming less relevant as a comparative advantage as innovation capacity and higher value-added activities become the key determinants of competitiveness. Technological advances, such as big data, the Internet of Things, Industry 4.0 and digital Taylorism,[74] are expected to increase demand for knowledge-oriented occupations across the board – and not only in the most advanced economies (ILO, 2017). For instance, while the business process outsourcing industry in the Philippines has so far benefited from a lower-cost, English-speaking workforce, these features may not be sufficient to maintain its comparative advantage in the future. Indeed, this industry "born out of technological advancement […] is now on the cusp of major changes due to technology", specifically to advances in cloud computing, software automation and knowledge process outsourcing (Chang and Hyunh, 2016, p. xxiv). Many forward-looking business process outsourcing enterprises in the Philippines are reorienting their services towards knowledge process outsourcing, including relatively higher-value services, such as fraud analytics, data integration, project management, R&D, mergers and acquisitions valuation and medical image analysis. This diversification is critical for enterprises facing competitive pressures and will result in increased demand for skilled workers and for science-, technology-, engineering- and mathematics-related (STEM) occupations in particular.

74 "Digital Taylorism" refers to the division of specialized tasks in service industries, similar to Taylorism in manufacturing, whereby even high-skill tasks can now be outsourced to developing countries due to digitalization

Figure 7.7: Skilled employment growth rate, by top-ten industries, 2010–15 (average annual percentage change)

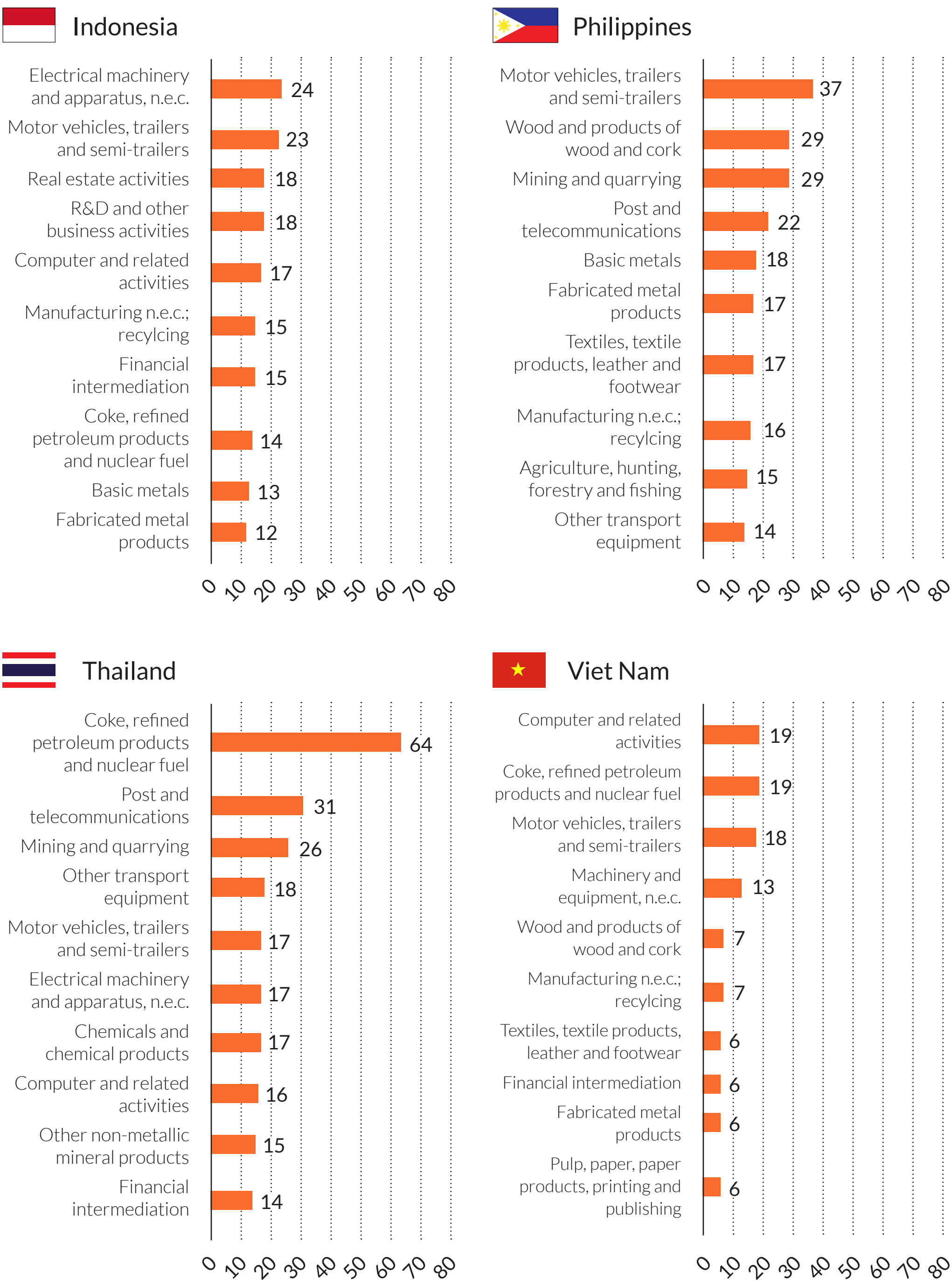
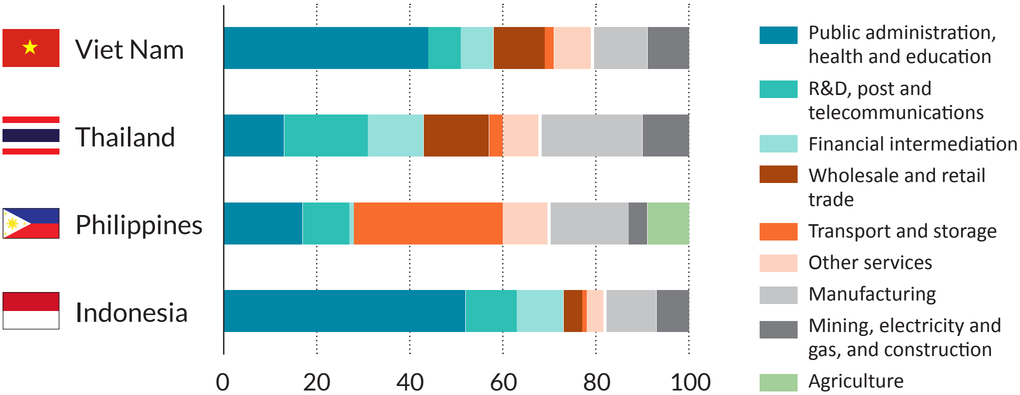


Figure 7.8: Net skilled employment growth, by top-ten industries, 2010–15 ('000)

Figure 7.9: Industry sector share in net skilled employment creation, 2010–15



In recent years, most of the net job creation for skilled workers in the four countries was in the services sector, which includes the most skill-intensive industries (figures 7.6 and 7.8). Overall, the services sector accounted for 83 per cent of net skilled employment growth in Indonesia, 79 per cent in Viet Nam, 71 per cent in the Philippines and 68 per cent in Thailand between 2010 and 2015 (figure 7.9).[75] In particular, public administration, education and health care and social work combined accounted for the largest share of net job creation for skilled workers in Indonesia (at 52 per cent) and in Viet Nam (at 44 per cent). The R&D and other business activities and the post and telecommunications group combined accounted for 18 per cent of net skilled job creation in Thailand, 11 per cent in Indonesia, 10 per cent in the Philippines and 7 per cent in Viet Nam. Financial intermediation also accounted for an important share in Thailand (at 12 per cent), Indonesia (at 10 per cent) and Viet Nam (at 7 per cent).

75 Net job creation here is the total employment growth over all industries that had positive net employment growth between 2010 and 2015 in each country.

Table 7.3: Industry share in net STEM-related job creation and growth rate of STEM-related jobs

	Industry share in net STEM-related job growth					**Growth rate of STEM-related jobs by industry**				
	PHL 2001–13	PHL 2010–13	IDN 2007–10	THA 2010–15	THA 2013–15	PHL 2001–13	PHL 2010–13	IDN 2007–10	THA 2010–15	THA 2013–15
Health care and social work	34.8	10.6	39.9	18.6	17.1	3.9	1.6	18.1	3.0	5.3
R&D and other business activities	9.4	8.4	1.5	13.9	20.1	5.6	6.5	9.2	10.6	33.7
Post and telecommunications	9.6	18.1	6.3	3.3	3.5	10.1	28.3	30.0	10.6	21.6
Construction	7.1	8.0	2.2	12.4	4.8	4.2	6.6	3.1	8.1	5.2
Public administration and defence; compulsory social security	8.5	1.8	8.3	0.0	0.0	1.5	0.5	8.8	-0.6	-2.8
Motor vehicles, trailers and semi-trailers	1.5	2.6	0.6	6.7	8.7	-	50.0	21.0	10.7	29.0
Chemicals and chemical products	1.4	4.0	2.0	5.6	5.2	4.3	23.8	21.0	12.1	20.6
Wholesale and retail trade; repairs	0.5	0.4	5.8	4.9	5.9	0.4	0.4	20.6	8.0	19.0
Food products, beverages and tobacco	1.8	6.4	1.5	0.0	2.9	3.4	24.5	11.5	-2.9	7.7
Coke, refined petroleum products and nuclear fuel	0.2	1.1	0.0	6.0	4.9	7.2	-	-3.2	68.5	54.4
Textiles, textile products, leather and footwear	2.4	4.3	4.3	0.0	0.0	6.6	18.1	31.0	-10.1	-5.7
Other community, social and personal services	2.8	0.0	8.0	0.0	0.0	1.8	-10.7	15.8	-0.5	-11.1
Computer and related activities	8.6	0.0	0.2	0.0	1.4	8.0	-2.2	5.6	-19.4	29.4
Financial intermediation	1.7	5.7	1.0	0.0	0.0	4.7	33.9	19.5	-25.5	-31.9
Computer, electronic and optical equipment	3.7	0.3	3.1	0.0	0.0	3.6	0.3	35.9	-5.2	-1.7
All other industries	6.2	28.3	15.1	28.5	25.4	-	-	-	-	-
All economy average – all industries	100.0	100.0	100.0	100.0	100.0	3.3	4.0	14.0	3.3	8.4

Note: STEM-related occupations include the following groups: physical, mathematics and engineering science professionals and associate professionals, and life science and health professionals and associate professionals.

STEM-related jobs, despite rapid growth rates, still accounted for a small share of employment (2–3 per cent) in Indonesia, Thailand and the Philippines in 2015 and were concentrated in a limited number of industries (see Annex table A11).[76] Around one third of STEM-related workers were employed in health care and social work in these countries, followed by public administration (12–17 per cent) and construction (6–8 per cent). In Thailand and the Philippines, the R&D and other business activities also accounted for 6–7 per cent of STEM-related jobs. These same industries accounted for most of the net STEM-related job creation over the years for which data are available (table 7.3).

Many of the manufacturing industries in which technological change has had an impact on employment and skills demand ranked among the top industries in terms of skilled employment growth rates between 2010 and 2015: the automotive industry in all four countries, the textiles industry in the Philippines and Viet Nam, the electric machinery and apparatus industry in Indonesia and Thailand, basic metals in Indonesia and the Philippines and petroleum products in Indonesia, Thailand and Viet Nam (figure 7.7).

The overall manufacturing sector, however, accounted for a limited share of net skilled employment creation in these countries, with 11–12 per cent in Indonesia and Viet Nam, 17 per cent in the Philippines and 22 per cent in Thailand, which has a more diversified economy and where skilled work opportunities are spread more evenly across industry sectors. Manufacturing industries generally made a marginal contribution to net STEM-related job growth in Indonesia and the Philippines, despite very high growth rates for STEM-related occupations in these industries. In Thailand, however, the automotive, chemicals and petroleum products industries accounted for a fair share of STEM-related job growth.

7.3 Skills intensity, job quality and inclusion

While technological progress does not seem to be substituting for workers on a massive scale, it is certainly having an impact on skill demands as well as working conditions, with important implications for social welfare and inclusion. Average real wages have been rising while vulnerable employment rates have been on the decline, but workers have not always received their fair share of productivity gains. With job polarization and skill-biased technology, some workers may be benefiting significantly more than others. Low-skilled workers, workers whose skills are more easily substitutable by machines and workers who face structural barriers to education and skills acquisition are at risk of falling further behind. In the context of the countries analysed here, women are particularly vulnerable due to their distribution across industries and occupations and to gender-specific barriers to skills acquisition and labour-market entry.

76 The level of aggregation of the occupational data in the Viet Nam Labour Force Survey data sets did not allow calculating this share.

Growth in real wages, but widening inequality?

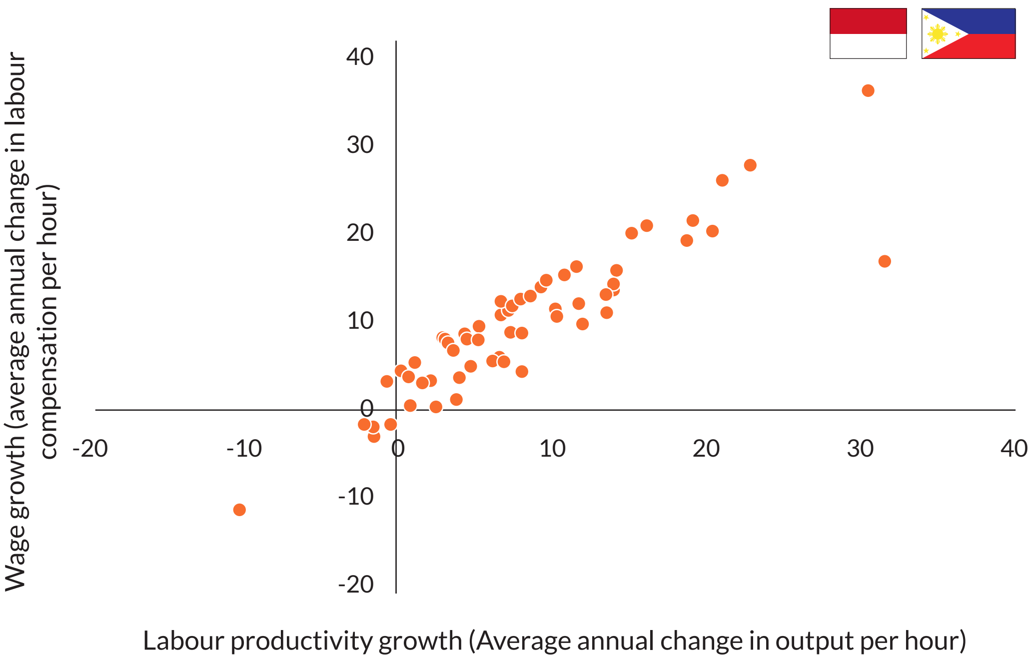
Labour productivity growth has generally been accompanied by a rise in real wages in the four countries. Figure 7.10 shows a strong correlation between growth in output per hour and growth in average compensation per hour for Indonesia (2000–08) and the Philippines (2001–08). In a handful of industries that experienced negative productivity growth, real compensation per hour declined also.[77] In one case for the computer and related activities in the Philippines, average compensation increased despite a decline in productivity. But in general, the higher the productivity growth in the industry, the higher was the growth in average labour compensation. This is important, first because real wage increases translate into greater purchasing power. But it is also important because it can have a multiplier effect on output by increasing aggregate demand, thus potentially compensating for employment losses (Acemoglu and Restrepo, 2016; Vivarelli, 2007).

Because of job polarization and the resulting mixed trends in skills intensity, it is not straightforward to relate the overall rise in average labour compensation to changes in the skills distribution of the workforce. Indeed, most industries had a rise in real average wages, despite a decrease in the Skills Intensity Index, in both Indonesia and the Philippines between 2001 and 2008 (table 7.4). The index does not take into account occupational distribution changes within the same broad skill level categories, however. A rise in average wages despite a decrease in the Skills Intensity Index may be due to the increased share of plant and machine operators and assemblers in semi-skill employment, which is consistent with higher investment and productivity growth.[78] As the share of occupations at both ends of the skills spectrum increases, the skills composition within the mid-level occupations may ultimately have the more significant impact on average wages, particularly in manufacturing, where these occupations represent the lion's share of employment.

77 These are mining and quarrying, electrical machinery and equipment, n.e.c., other transport equipment manufacturing, renting of machinery and equipment and computer and related activities in Indonesia.

78 The only case in which wage growth was negative (electrical machinery and equipment in Indonesia), a large increase in the no-skill employment share and decrease in the Skills Intensity Index were also accompanied by a decline in the share of plant and machine operators and assemblers in semi-skill employment. Similarly, a decline in both the Skills Intensity Index and the plant and machine operators' share resulted in limited wage growth in machinery and equipment in Indonesia. In some industries in Indonesia, average wages increased despite a decrease in both the share of plant and machine operators in semi-skill employment and the skilled workers share. This can be explained by a decrease in the share of own-account workers, who are managers (skilled workers) but earn less and are more vulnerable.

Figure 7.10: Real wage growth and labour productivity growth, 2000–08 for Indonesia and 2001–08 for the Philippines



Perhaps more important is that a rise in average wages could be driven by significant increases in compensation of a limited number of high-skilled workers, which may be offsetting a decline or stagnation of real wages for lower-skilled workers. In other words, a rise in average wages may conceal widening wage and income gaps, in part due to the skill-biased nature of technological change. For this reason, average wages may not be an adequate, or certainly not a sufficient, measure of welfare, particularly when it comes to inclusion – the same way that per capita GDP is of limited use without additional complementary indicators. In-depth micro-level analyses of the impact of technological change on the wage distribution within industries are needed and should not be limited to the skills channel but also include other factors, such as organizational responses that may mediate this impact (Powell and Snellman, 2004).

Table 7.4: Change in occupational distribution and labour compensation in selected manufacturing industries, 2001–08 for Indonesia and the Philippines

		Change in unskilled share (percentage points)	Change in semi-skilled share (percentage points	Change in skilled share (percentage points)	Job polarization	Change in Skills Intensity Index (points)	Change in plant and machine operators, assemblers share in semi-skilled employment (percentage points	Average annual growth in real hourly compensation (%)
Textiles, textile products, leather, footwear	IDN	6	-5	-2		-0.360	14	5
	PHL	5	-10	5	ü	-0.088	19	7
Wood and products of wood and cork	IDN	-43	44	-2		0.116	-23	13
	PHL	7	-13	6	ü	0.059	3	5
Chemicals and chemical products	IDN	18	-15	-3		-0.219	48	18
	PHL	7	-9	3	ü	-0.047	3	8
Basic metals	IDN	6	-7	1	ü	-0.142	4	11
	PHL	1	1	-2		-0.053	28	25
Machinery and equipment, n.e.c.	IDN	5	3	-7		-0.192	-29	1
	PHL	2	-4	2	ü	-0.018	18	27
Computer, electronic and optical equipment	IDN	7	3	-10		-0.317	14	14
	PHL	-1	3	-2		0.038	15	7
Electrical machinery and apparatus, n.e.c.	IDN	21	-16	-6		-0.361	-18	-3
	PHL	10	-1	-8		-0.316	1	20
Motor vehicles, trailers and semi-trailers	IDN	6	5	-11		-0.212	-14	17
	PHL	4	-11	7	ü	-0.018	18	15

An improvement in overall job quality and working conditions

Wages are not the only determinants of job quality and working conditions. Other aspects include the number of hours worked as well as work arrangements. One indicator that may offer insights in this regard is the vulnerable employment rate, which is the share of own-account workers and contributing family workers in employment. If technology-driven decreases or shifts in employment are accompanied by declines in the vulnerable employment rate, then lower-quality jobs are being destroyed and/or replaced by higher-quality jobs, which may not be such a negative outcome. In particular, it is a positive development in as far as workers whose low-productivity jobs are destroyed can be reskilled or shifted to higher-productivity jobs within the same industry or in another industry. Conversely, if jobs created consist of either precarious self-employment or precarious wage employment, then employment growth may not necessarily lead to improved living standards.

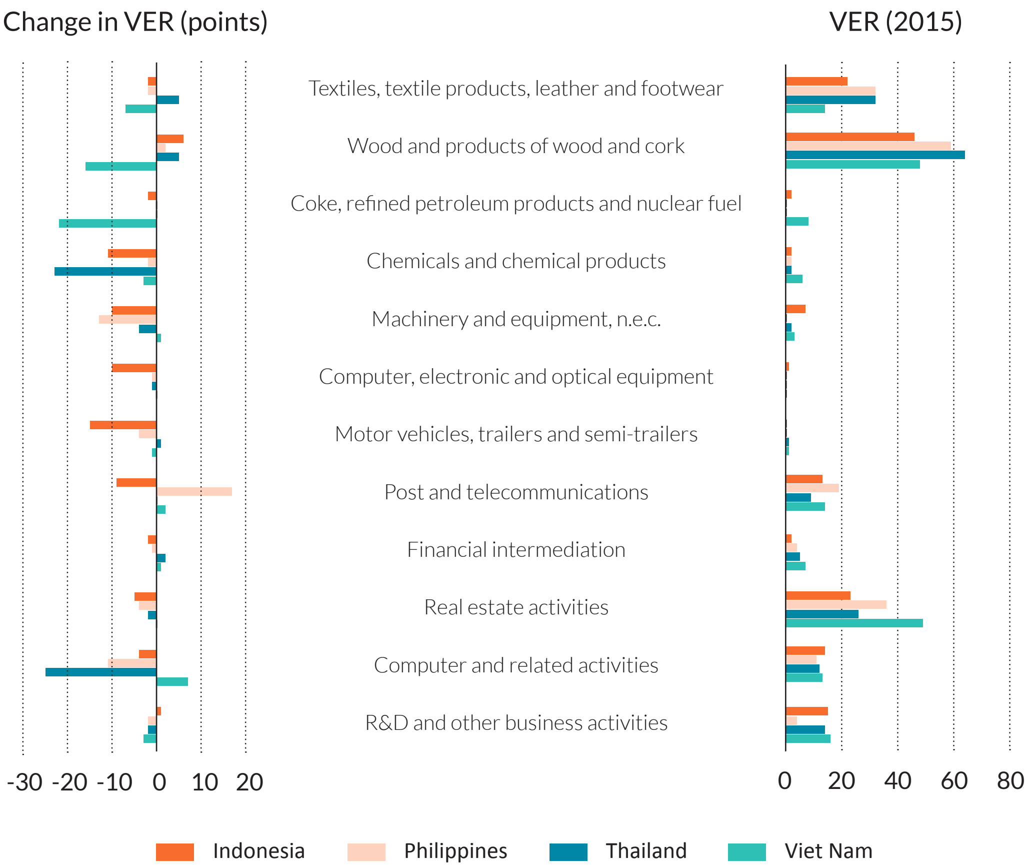
In general, the industries examined here have experienced a decrease in the vulnerable employment rate in all four countries in recent years, with a few notable exceptions (figure 7.11). In the textiles industry, which has a high vulnerable employment rate relative to other manufacturing industries, a decline was accompanied by employment growth in Indonesia, the Philippines and Viet Nam between 2010 and 2015. In Viet Nam in particular, the rate dropped by 7 percentage points. In Thailand, however, employment decreased and the vulnerable employment rate increased, reflecting the loss of higher-quality jobs in the industry. In the automotive industry, which had low vulnerable employment rates to begin with, the rate dropped by as much as 15 percentage points in Indonesia and by nearly 4 percentage points in the Philippines, to nearly zero between 2010 and 2015 in both countries. In the other two countries, it changed only marginally, remaining at 1 per cent in 2015.

In the wood products industry, which had the highest vulnerable employment rate among manufacturing industries in all four countries, there was a rate increase – except in Viet Nam, where it declined significantly. This suggests that in Viet Nam, the decline in the industry's employment in recent years consisted mainly of the destruction of low-productivity vulnerable jobs, although this may not be the case in the other three countries. Viet Nam also had an important drop in its vulnerable employment rate in petroleum products; Thailand and Indonesia in chemical products; Thailand and the Philippines in computer and related services; Indonesia and the Philippines in machinery and equipment.

The Philippines experienced an important increase in the vulnerable employment rate in the post and telecommunications industry, indicating that the high employment growth in recent years largely consisted of own-account workers rather than paid employees. In this case, however, the high growth in skilled employment, and for managers in particular, suggests that many of the new self-employed workers in the industry may be ICT start-up entrepreneurs or consultants.[79] This is also consistent with an increase in the part-time share of employment in the industry. On the other hand, some of these additional workers may be unskilled own-account workers mislabelling themselves as managers. Unfortunately, due to a problem with the supply-side data for the Philippines (see the note for figure 7.4), it is difficult to obtain more insight regarding this issue.

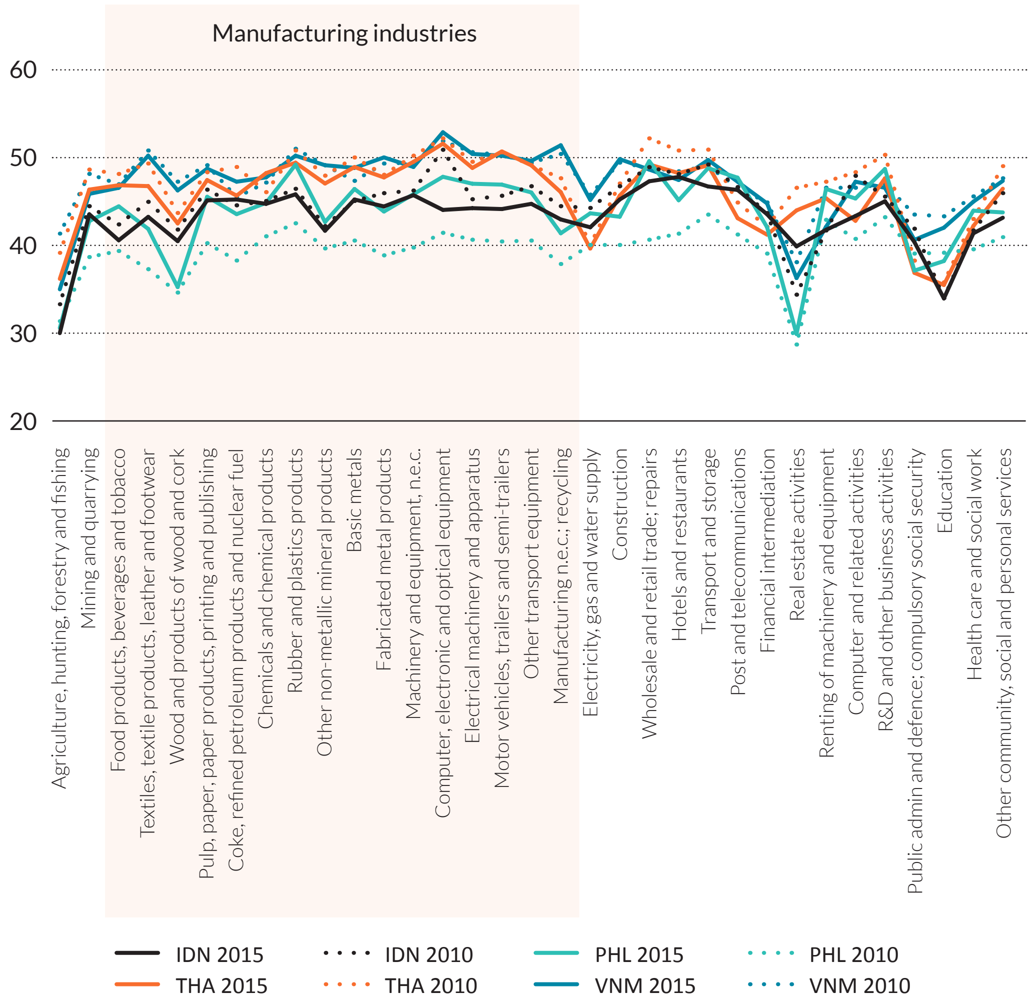
79 The dynamism and rapid development of the ICT start-up scene in the Philippines prompted the Government to provide support, with the objective of making the country a global start-up hub. In August 2015, the Department of Science and Technology, through its Information and Communication Technology Office, launched the Philippines Roadmap for Digital Startups – 2015 and Beyond.

Figure 7.11: Vulnerable employment rate (VER), 2015 and changes in the VER, 2010–15, in selected industries



The share of part-time work increased for nearly all industries in the Philippines, although most of these industries had an increase in average hours worked between 2010 and 2015 (figure 7.12, also see Annex table A4). This suggests that some workers must be working considerably longer hours to offset a decrease in average work hours caused by a larger share of part-time work. In the Philippines, average working hours were generally lower than the other three countries to begin with. In Indonesia, Thailand and Viet Nam, working hours decreased in many industries in recent years, and the share of part-time work either increased or decreased, depending on the industry and the country. Shorter working hours are associated with better working conditions and allow for more work-life balance and are often considered a means by which workers can share in productivity gains (Nubler, 2016).

Figure 7.12: Average working hours, by industry, 2010 and 2015

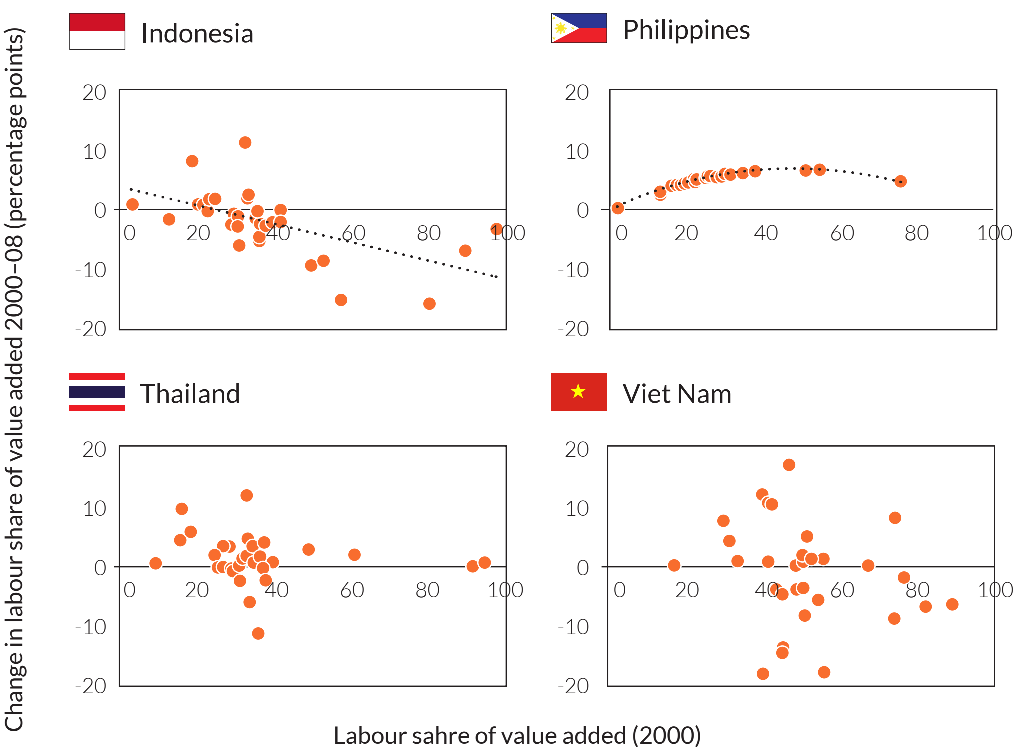


Workers have not always received their fair share of productivity gains

Productivity growth has generally been accompanied by increases in real wages, and working hours have indeed decreased in many industries in recent years. Are workers thus getting their fair share of benefits from technological change? One way to answer this question is to look at the change in the labour share of value added (labour compensation as a share of total value added) for each industry. This share differs significantly across countries, in terms of both levels and trends. In general among the four countries, the labour share was largest in Viet Nam and smallest in the Philippines and was generally larger in the labour-intensive services industries than in capital-intensive manufacturing industries.

In most of those industries, where high productivity growth over the 2000–08 period was accompanied by a decline in employment and an increase in real average worker compensation in both Indonesia and the Philippines, the labour share in value added decreased in Indonesia but increased in the Philippines (see Annex table A3). Two facts are worth highlighting here: first, that the labour share in these industries in the Philippines was smaller than in Indonesia to begin with and second, that if the period of analysis is extended to 2011, then these same industries would have had a decline in labour share in both countries (see Annex table A3). Indeed, between 2000 and 2008, the labour share in value added was on the rise in all industries in the Philippines. But in all of them, it decreased significantly during the global financial crisis and had not yet recovered by 2011 (the last year for which data are available). The labour share in value added decreased in many industries across the four countries during the crisis, which demonstrates that workers as a group remain more vulnerable to economic shocks, for which they bear a greater share of the burden.

Figure 7.13: Labour share levels, 2000 and change in labour share, 2000–08



In the other three countries, where the labour share is larger in most industries, compared with the Philippines, the labour share decreased in many though not all industries between 2000 and 2008 (figure 7.13). One hypothesis would be that technology adoption had a different impact on the labour share, depending on the initial labour share (used here as a proxy for the existing level of labour intensity of the industry): At higher levels of labour intensity, technology may be substituting for labour, resulting in a decline in the labour share, whereas at higher levels of capital intensity, technology would be leading to productivity gains that ultimately benefit workers through wage increases, thus resulting in an increase in labour share. Although this seems to apply when comparing Indonesia and the Philippines on an industry-by-industry basis, this hypothesis does not seem to be borne out by the overall data of the countries analysed here.

Only in Indonesia is there some evidence of this kind of convergence effect: The initial labour share and change in labour share are inversely related, such that the increase in the share is greater in the more capital-intensive industries (figure 7.13). Interestingly, labour share growth in the Philippines increases with the initial labour share until a certain point, after which the labour share grows at a decreasing rate. This implies that labour benefits little from technological change at very high levels of capital intensity and benefits less as well at very low levels of capital intensity. In Thailand and in Viet Nam, there appears to be no correlation between the industry's labour intensity and changes in labour share. In sum, although technological progress has generally led to an increase in real wages, its effect on the labour share of value added is debatable.

A disproportionate impact on women

Although technological change is resulting in improved wages and working conditions on average, as just discussed, it may be contributing to a rise in inequality, partly attributable to skills and barriers to skills acquisition. As a group, workers may not be receiving their fair share of productivity gains and remain vulnerable to economic crises. And among workers, those who benefit least are those whose skills are either substitutable by, or are less compatible with, machines and technology. As a result, women in these countries may be disproportionately affected: In manufacturing, many women work in the semi-skill occupations, where they are more at risk of being made redundant, while benefiting less than men from job creation in the technology-related services industries due to gender-specific social and institutional barriers to skills acquisition, labour market entry and employment in certain fields and occupations.

There were only two manufacturing industries in which women represented more than 60 per cent of employment in the four countries in 2015: the textiles industry, in all four countries and the computer, electronics and optical equipment industry in the Philippines, Thailand and Viet Nam (see Annex table A12).[80] Other manufacturing industries with large female employment shares (at more than 40 per cent) were food and food products, wood products and electrical machinery and equipment. In these industries, the significant semi-

80 Indonesia generally has a smaller female share in employment and lower female labour force participation largely due to cultural and institutional factors. Nevertheless, in 2010, women accounted for the largest share of employment in the computer, electronics and optical equipment industry in Indonesia but were affected by a decline in employment in semi-skill occupations.

skill job losses that had taken place were, as previously discussed, primarily in the crafts and related trades occupational group, in which women often account for large shares of employment and which represents greater shares of the industries' female employment than of male employment (table 7.5).

These job losses were particularly high in the textiles industry, which is a major employer for women in the region. In this industry, more than 85 per cent of the job losses in the crafts and related trades category in Thailand between 2010 and 2015 and more than 90 per cent in the Philippines (2001–08 and 2010–15) affected female workers (table 7.5). Female workers accounted for the majority of job losses in this occupational group in the computer, electronics and optical equipment industry in the Philippines (at 75 per cent between 2001 and 2008 and 82 per cent between 2010 and 2015), in the electrical machinery and apparatus industry in the Philippines (at 74 per cent between 2001 and 2008) and in wood products in both the Philippines and Viet Nam (2010–15).

The female share of managers increased significantly in both the Philippines and Thailand between 2010 and 2015 in the textiles and the wood products industries. Unfortunately, this increase, accompanied by a rise in the vulnerable employment rate (in textiles in Thailand only and in wood products in both countries) suggests that female workers who lost their wage employment in semi-skill occupations started working on their own account, most often with less desirable working conditions and limited job security. Although the managers occupational group falls within the skilled-worker categories, this group often includes low-skilled or semi-skilled self-employed workers who self-identify as managers.

In all other manufacturing industries (except in the computers, electronics and optical equipment in the Philippines), men represented the majority of managers. Women accounted for the larger share of employment in clerical occupations in most manufacturing industries in all four countries (see Annex table A12). These occupations represent a limited share of manufacturing employment, but it is a share that is generally stable and does not seem to be much affected by technology – at least thus far.

Table 7.5: Craft and related trades workers in selected manufacturing industries

		Change in employment levels ('000)				Female share of job losses (%)		Group's share in the industry employment (%)	
		2001–08		2010–15		2001–08	2010–15	2015	
		M	F	M	F			M	F
Textiles, textile products, leather and footwear	IDN	-363	-401	-27	103	52	-	19	35
	PHL	-7	-137	-6	-71	95	92	15	47
	THA			-50	-294		86	9	25
	VNM			32	103		-	7	27
Wood and products of wood and cork	IDN	102	455	-75	-71	82	49	38	33
	PHL	-22	2	-37	-75	0	67	9	10
	THA			-63	-53		46	32	41
	VNM			-63	-111		64	30	37
Computer, electronic and optical equipment	IDN	2	-19	-9	-4	100	32	2	1
	PHL	-3	-9	-1	-6	75	82	1	
	THA			5	17			6	5
	VNM			8	32			5	14
Electrical machinery and apparatus, n.e.c.	IDN	6	-2	6	5	100		7	6
	PHL	-1	-4	-2	-1	74	38	3	
	THA			18	8			13	4
	VNM			-3	5			9	11

In the rapidly growing service industries, where technology may be complementing employment, women accounted for the largest share of employment only in financial intermediation in the Philippines, Thailand and Viet Nam in 2015. In all three countries, women in this industry accounted for the larger share of employment in the professionals, technicians and associate professionals and in the clerical support workers occupational groups. In the Philippines, they accounted for the largest share in the managers group as well (see Annex table A12). In the post and telecommunications and R&D and business activities industries, women generally accounted for the larger share of employment in clerical occupations only, and in some cases, in elementary occupations as well.

Health care and social work and education are the only two industries in which women represent a larger share of skilled workers, namely professional and technicians and associate professionals. Similarly, although the share of STEM-related occupations in female employment is close to, and in Indonesia and the Philippines even slightly larger than, these occupations' share in male employment at the aggregate economy level, female STEM-related occupations are significantly more concentrated in health care and social work and in public administration (see Annex table A11). In all other industries, the share of STEM-related occupations in employment remains smaller for women than for men.

Conclusion

The findings presented in this chapter suggest that although there is no basis – or at least not yet – to the fear that "the end of jobs" is near, there are undeniable signs that the nature of jobs is changing. Although this is leading to an overall improvement in living standards, many workers are at serious risk of being sidelined and left behind. Overall employment growth remains positive, and on average, real wages and job quality are rising. But distributional effects are real and significant: While technological progress is benefiting capital owners and patent holders, as well as highly skilled workers and those with robot-compatible skills, it is lower-skilled workers, workers whose skills are more easily substitutable by machines and workers who face structural barriers to education and skills acquisition who, more than ever, run the risk of being trapped in poverty. Job polarization at the economy-wide level, largely driven by a growing share of employment in the services sector, reflects rapid employment growth in knowledge-intensive industries as well as in industries at the opposite end of the skills spectrum that employ larger shares of unskilled workers, often in informal employment and poor working conditions. At the same time, creative destruction in manufacturing means that some manual and mid-level jobs are being destroyed and replaced by other, usually higher-quality, semi-skill jobs related to machine operation and assembly, either within the same industry or in other industries.

As technological progress continues to reshape the global economic structure, innovation capacity and higher value-added activities are increasingly important for countries, such as the four analysed here, that will no longer be able to compete based on the availability of lower-cost, low-skilled labour. The demand for STEM-related jobs, which still represent limited shares of employment in these countries, is rapidly growing. In addition to STEM skills, the spread of the knowledge economy to these countries requires instilling creativity, adaptability, problem-solving, critical thinking and other so-called "twenty-first century skills" in students from early on and adequately integrating technological content into academic curricula throughout the different stages of the education process.

At the same time, major skills shortages in the semi-skill occupations remain and are accompanied by shifts in demand within this occupational group, from manual crafts and related trades occupations, where skills are often informally acquired, to plant and machine operator occupations that usually require more formal training, typically through TVET. It is therefore crucial for these countries to continue to expand access to – and improve the quality and content of – TVET as well as reskilling and lifelong learning programmes, with an emphasis on "robot-compatible" skills and solid context-specific expertise.

In sum, skills for the future include both the soft skills that provide human workers a comparative advantage over machines (Autor, 2015) and those concrete technical skills that complement the machines and technology. In the countries analysed here, in which large segments of the population consist of low-skilled workers, achieving an inclusive society requires working to bridge the digital divide and to improve access to education at all levels, as well as active labour market programmes that are training oriented and targeting the most vulnerable groups, including women. It will also be crucial to ensure that redistribution mechanisms and social safety nets are in place to limit the costs of creative destruction, or at least spread both the costs and benefits more evenly across the population. Although massive "technological unemployment"[81] seems unlikely in the near future, policies are needed to insulate the less-skilled, less-equipped and most vulnerable workers from poverty as well as encourage entrepreneurship and innovation. These policies will require solid public financing and transfer systems that are more difficult to design and implement in developing economies but that are becoming increasingly important as technological progress exacerbates existing inequalities.

81 John Maynard Keynes introduced the term "technological unemployment" in 1930 and defined it as "unemployment due to our discovery of means of economizing the use of labour outrunning the pace at which we can find new uses for labour" (Keynes, 1930).

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Annex

Table A1: Employment, labour productivity and unit labour costs, average growth rates, 2000–08 for Indonesia and 2001–08 for Philippines

	IDN average annual growth rate (2000–08)			PHL average annual growth rate (2001–08)		
	LP (output/ hour worked)	Emp.	ULCs (output/ total labour comp.)	LP (output/ hour worked)	Emp.	ULCs (output/ total labour comp.)
Agriculture, hunting, forestry and fishing	10.3	0.2	0.2	7.9	1.5	3.2
Mining and quarrying	-0.3	11.4	-0.8	15.4	6.3	3.7
Food products, beverages and tobacco	6.7	3.2	0.4	3.4	0.6	3.7
Textiles, textile products, leather and footwear	7.1	-0.6	-1.3	4.0	-2.2	5.3
Wood and products of wood and cork	14.1	-1.3	1.4	1.3	3.5	-8.6
Pulp, paper, paper products, printing and publishing	0.9	7.1	-0.2	3.4	-0.2	0.4
Coke, refined petroleum products and nuclear fuel	19.4	-3.3	5.2	30.6	-13.5	6.0
Chemicals and chemical products	19.0	-5.6	-1.4	4.5	-1.9	1.3
Rubber and plastic products	4.2	5.7	-2.5	10.9	-0.6	4.2
Other non-metallic mineral products	13.7	0.1	0.4	8.0	2.2	5.9
Basic metals	13.7	-2.4	-3.3	21.1	-4.0	3.5
Fabricated metal products	20.6	3.0	0.9	9.6	-0.1	2.2
Machinery and equipment, n.e.c.	2.6	12.2	-2.2	23.1	-3.0	10.6
Computer, Electronic and optical equipment	14.1	-1.2	0.6	3.8	6.2	5.6
Electrical machinery and apparatus, n.e.c.	-1.3	11.2	-0.5	16.3	-3.9	3.9
Motor vehicles, trailers and semi-trailers	31.7	-1.3	-2.0	11.8	-0.5	2.3
Other transport equipment	-2.1	16.1	0.1	9.9	5.2	4.2
Manufacturing, n.e.c.; recycling	11.9	-0.1	1.1	6.8	-2.0	4.2
Electricity, gas and water supply	2.3	14.0	3.7	5.2	1.3	2.5
Construction	12.1	5.7	-1.8	7.6	2.1	3.6
Wholesale and retail trade; repairs	7.5	1.5	1.5	7.2	3.0	3.3
Hotels and restaurants	8.3	2.8	1.1	4.7	5.2	2.7
Transport and storage	9.6	3.6	4.8	7.3	2.5	3.1
Post and telecommunications	14.4	8.0	1.1	0.4	9.5	4.1

	IDN average annual growth rate (2000–08)			PHL average annual growth rate (2001–08)		
	LP (output/ hour worked)	Emp.	ULCs (output/ total labour comp.)	LP (output/ hour worked)	Emp.	ULCs (output/ total labour comp.)
Financial intermediation	3.0	5.0	2.6	8.7	3.3	3.4
Real estate activities	5.4	9.3	3.2	7.0	6.2	4.0
Renting of machinery and equipment	-10.1	21.2	-0.8	9.8	1.8	3.0
Computer and related activities	-1.3	9.3	-0.9	-0.4	11.8	2.8
R&D and other business activities	8.2	4.3	-3.3	0.7	10.2	2.6
Public admin and defence; compulsory social security	14.1	-1.5	-1.6	1.8	2.8	-1.3
Education	6.3	3.9	-0.5	5.4	2.2	1.4
Health care and social work	3.9	6.8	-2.5	3.9	3.2	1.5
Other community, social and personal services	10.5	6.8	-2.6	4.8	2.7	-0.6

Table A2: Employment growth, by industry, 2010–15

	IDN		PHL		THA		VNM	
	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate
Agriculture, hunting, forestry and fishing	-3 745	-1.9	-531	-0.9	-2 275	-3.3	-712	-0.6
Mining and quarrying	63	1.0	37	3.4	38	14.2	-50	-3.9
Food products, beverages and tobacco	261	1.4	134	3.2	386	6.1	13	0.2
Textiles, textile products, leather and footwear	592	3.2	7	0.2	-163	-2.9	758	5.6
Wood and products of wood and cork	-128	-1.7	-65	-3.9	-144	-9.3	-114	-3.8
Pulp, paper, paper products, printing and publishing	-12	-0.4	0	0.0	59	6.2	44	4.3
Coke, refined petroleum products and nuclear fuel	18	10.5	-1	-6.2	48	34.0	8	9.1
Chemicals and chemical products	62	2.9	7	1.7	83	7.5	7	0.9
Rubber and plastic products	119	4.9	6	1.5	111	7.9	19	2.6
Other non-metallic mineral products	189	3.6	0	0.0	38	2.5	-119	-5.0
Basic metals	84	9.6	10	4.2	59	10.5	21	5.2
Fabricated metal products	104	5.0	2	0.2	63	3.8	130	5.1
Machinery and equipment, n.e.c.	-48	-6.9	-47	-20.9	-23	-3.0	1	0.5
Computer, Electronic and optical equipment	-93	-7.4	66	3.9	132	6.4	196	14.7
Electrical machinery and apparatus, n.e.c.	91	16.9	9	3.8	104	15.5	21	4.2
Motor vehicles, trailers and semi-trailers	99	13.9	37	17.6	207	14.5	49	16.2
Other transport equipment	65	4.9	4	1.8	26	11.3	-19	-3.9
Manufacturing, n.e.c.; recycling	310	4.5	30	2.9	119	4.2	219	4.9
Electricity, gas and water supply	235	14.9	-13	-1.8	81	12.0	16	1.3
Construction	2 615	8.0	717	6.3	-74	-0.6	148	0.9
Wholesale and retail trade; repairs	2 957	3.0	360	1.0	-61	-0.2	1 017	3.4
Hotels and restaurants	1 136	5.0	664	10.2	-11	-0.1	615	6.0
Transport and storage	-481	-2.0	259	2.0	152	2.9	186	2.5

	IDN		PHL		THA		VNM	
	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate	Abs. change	Av. annual growth rate
Post and telecommunications	-29	-1.0	99	8.0	138	17.3	44	3.2
Financial intermediation	680	11.0	100	4.6	173	8.0	108	7.3
Real estate activities	108	9.8	26	3.0	92	13.7	54	8.9
Renting of machinery and equipment	133	13.3	-25	-9.8	1	0.2	27	11.6
Computer and related activities	19	9.4	-37	-5.8	9	3.2	42	18.4
R&D and other business activities	700	23.2	537	11.0	308	9.1	92	4.5
Public admin and defence; compulsory social security	618	3.4	279	2.9	123	1.6	320	4.3
Education	873	3.4	118	1.9	-64	-1.1	169	1.9
Health care and social work	371	6.0	47	2.0	-20	-0.6	99	4.1
Other community, social and personal services	-1 355	-4.4	272	1.8	265	4.5	215	3.6

Table A3: Labour share of value added, by industry, 2011, and change, 2000–08 and 2000–11

	IDN			PHL			THA			VNM		
	(%)	(percentage point change)		(%)	(percentage point change)		(%)	(percentage point change)		(%)	(percentage point change)	
	L-share 2011	2000–08	2000–11	L-share 2011	2000–08	2000–11	L-share 2011	2000–08	2000–11	L-share 2011	2000–08	2000–11
Agriculture, hunting, forestry and fishing	22.9	0.5	0.6	17.1	4.9	-3.6	25.7	0.3	0.2	83.8	7.9	9.1
Mining and quarrying	12.5	-1.3	-0.4	19.0	5.1	-3.8	27.4	0.0	0.0	19.5	-17.9	-20.6
Food products, beverages and tobacco	28.2	-2.4	-1.1	9.9	3.2	-2.2	28.9	-0.9	-0.8	36.7	4.5	5.1
Textiles, textile products, leather and footwear	32.5	-4.9	-4.4	25.2	6.1	-4.6	35.8	1.0	1.0	53.7	11.8	13.6
Wood and products of wood and cork	28.4	-2.0	-2.2	17.2	4.9	-3.5	37.5	4.7	4.4	38.9	7.6	8.8
Pulp, paper, paper products, printing and publishing	29.8	-0.7	-0.1	20.6	5.4	-4.0	25.4	10.0	9.4	54.0	10.5	12.1
Coke, refined petroleum products and nuclear fuel	27.7	2.0	3.6	11.2	2.8	-2.1	19.9	4.7	4.2	53.9	1.1	1.3
Chemicals and chemical products	39.9	-1.8	-2.5	18.2	4.9	-3.6	31.5	3.4	3.2	53.8	1.1	1.3
Rubber and plastic products	34.9	-1.4	-0.5	18.0	5.0	-3.6	35.2	2.1	2.0	41.2	-8.3	-9.6
Other non-metallic mineral products	33.3	-2.3	-3.4	12.9	3.9	-2.8	26.9	0.0	0.0	34.6	0.8	0.9
Basic metals	25.6	-5.7	-6.0	16.4	4.6	-3.4	33.7	1.6	1.5	30.0	-13.4	-15.5
Fabricated metal products	37.5	-2.2	-2.0	21.5	5.6	-4.2	30.0	3.3	3.2	48.1	-5.6	-6.4
Machinery and equipment, n.e.c.	45.8	-8.2	-7.4	26.6	6.0	-4.6	26.4	1.8	1.8	56.8	1.2	1.4

Computer, electronic and optical equipment	22.8	-0.3	-0.6	32.2	6.4	-5.1	31.4	0.4	0.1	40.3	-4.7	-5.4
Electrical machinery and apparatus, n.e.c.	31.0	-4.4	-5.5	26.7	6.1	-4.7	25.4	-11.0	-10.5	52.3	1.1	1.2
Motor vehicles, trailers and semi-trailers	.	.	.	18.6	4.6	-3.5	28.0	-5.7	-5.3	29.0	-14.4	-16.6
Other transport equipment	35.9	2.1	2.4	17.0	4.7	-3.4	41.3	4.2	4.0	35.7	-17.8	-20.5
Manufacturing, n.e.c.; recycling	31.8	-0.6	1.1	22.5	5.8	-4.3	38.3	1.9	1.9	42.9	0.9	1.0
Electricity, gas and water supply	33.7	2.7	-0.1	14.6	4.2	-3.0	36.8	-0.3	-0.5	44.3	-3.7	-4.3
Construction	41.9	-9.0	-7.9	17.0	4.8	-3.5	37.9	3.5	3.3	65.9	16.6	19.1
Wholesale and retail trade; repairs	28.0	1.8	2.6	13.5	4.0	-2.9	24.1	6.2	5.8	53.0	1.9	2.2
Hotels and restaurants	36.2	-0.3	0.2	24.5	5.7	-4.4	29.2	-0.2	-0.2	57.1	4.8	5.5
Transport and storage	37.3	11.3	4.5	29.3	6.3	-4.9	40.1	0.8	0.7	46.6	-3.4	-3.9
Post and telecommunications	20.8	1.1	0.0	10.4	3.4	-2.3	29.0	-2.1	-2.1	39.4	-4.0	-4.6
Financial intermediation	28.4	8.2	9.4	15.8	4.1	-3.1	36.0	-2.0	-1.9	30.4	-24.8	-28.6
Real estate activities	4.7	1.0	1.2	1.3	0.5	-0.3	10.1	0.9	0.8	54.8	10.1	11.6
Renting of machinery and equipment	37.5	-2.4	-0.5	15.8	4.6	-3.3	.	.	.	17.5	0.1	0.1
Computer and related activities	37.6	-2.6	-0.5	20.8	5.5	-4.0	.	.	.	48.7	0.2	0.2
R&D and other business activities	43.6	-14.7	-13.8	23.5	5.7	-4.3	44.4	12.0	11.6	65.6	-8.6	-8.6
Public admin and defence; compulsory social security	90.5	-3.0	-7.3	70.1	4.9	-4.7	92.0	0.3	0.3	82.1	-6.3	-7.2
Education	81.3	-6.5	-8.2	48.2	6.8	-5.8	95.1	0.9	0.5	74.9	-6.5	-7.5
Health care and social work	63.0	-15.4	-17.9	44.8	6.7	-5.7	62.6	2.0	1.8	75.0	-1.9	-2.2
Other community, social and personal services	42.4	0.0	0.3	99.1	0.2	-0.2	51.7	3.0	2.7	67.5	-0.1	-0.2

Table A4: Part-time share in employment and working hours, 2010–15

	Part-time share (fewer than or equal to 26 hrs/week), 2015				Change in part-time share (2010–15)				Change in working hours (2010–15)			
	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM
Agriculture, hunting, forestry and fishing	50.3	47.4	27.6	31.9	9.9	12.9	2.1	20.0	-3.3	-0.8	-3.0	-6.4
Mining and quarrying	17.4	16.4	6.7	7.6	1.7	5.4	6.7	5.5	-1.0	4.1	-2.3	-2.3
Food products, beverages and tobacco	22.7	18.2	6.7	7.8	2.5	5.7	-0.3	2.9	-1.8	5.1	-1.3	-0.5
Textiles, textile products, leather and footwear	12.4	21.0	5.4	1.5	2.9	4.1	-0.3	-0.9	-1.7	4.7	-2.6	-0.6
Wood and products of wood and cork	21.4	38.3	10.8	7.9	0.8	10.5	-2.4	2.8	-1.3	0.6	-1.2	-0.9
Pulp, paper, paper products, printing and publishing	4.0	13.6	3.4	2.8	-2.1	9.1	0.9	0.5	-1.2	5.3	-0.8	-0.4
Coke, refined petroleum products and nuclear fuel	1.3			1.6	-6.3	0.0	0.0	-1.6	0.7	5.3	-3.4	1.8
Chemicals and chemical products	2.1	8.4	4.4	0.9	-2.8	8.4	-4.9	-1.7	-0.3	3.8	2.2	0.6
Rubber and plastic products	4.0	6.7	3.7	0.6	0.9	4.7	0.4	-0.3	-0.6	6.7	-1.4	-0.8
Other non-metallic mineral products	17.9	15.7	7.1	1.5	-1.0	10.7	1.2	-1.3	-0.4	3.0	-0.9	-0.1
Basic metals	1.9	9.3	5.6	1.1	-1.8	5.8	3.1	-1.2	0.1	5.9	-1.0	1.5
Fabricated metal products	8.2	13.4	3.9	1.4	1.4	6.7	-2.6	-0.7	-1.5	5.0	-0.3	0.8
Machinery and equipment, n.e.c.	4.1			0.6	1.3	-3.4	-3.7	0.1	-0.5	6.1	-0.7	-0.6
Computer, electronic and optical equipment	0.1	3.0	5.4	0.1	-1.2	3.0	1.0	0.0	-6.9	6.4	-0.7	1.0
Electrical machinery and apparatus, n.e.c.	2.5			0.2	-0.3	0.0	-4.0	-0.7	-1.0	6.4	-0.7	-0.3
Motor vehicles, trailers and semi-trailers	3.3	4.7	5.0		0.3	3.2	-0.1	0.0	-1.5	6.5	0.1	-0.1
Other transport equipment	1.8	8.4		0.5	-1.4	7.2	-5.9	-1.2	-2.0	5.5	0.0	0.2
Manufacturing, n.e.c.; recycling	12.5	20.5	6.1	1.5	1.1	7.5	-0.3	-0.7	-1.4	3.4	-1.6	1.0
Electricity, gas and water supply	14.6	6.9	10.1	3.6	6.5	4.0	1.3	1.4	-2.2	3.6	-0.4	-0.6

Construction	8.6	12.7	6.5	1.1	0.3	10.9	-2.0	-0.7	-1.5	3.3	-1.4	0.3
Wholesale and retail trade; repairs	16.3	16.8	4.3	5.9	0.6	0.5	-1.4	1.8	-1.7	8.9	-3.0	-0.2
Hotels and restaurants	16.4	17.4	5.6	9.4	-1.9	8.3	-1.6	2.6	-0.2	3.8	-2.6	-0.9
Transport and storage	13.4	13.2	5.1	3.2	1.6	5.0	-2.5	0.5	-2.5	5.3	-1.9	0.7
Post and telecommunications	6.5	9.2	7.6	3.0	-4.6	7.1	3.0	0.2	-0.3	6.5	-1.8	0.7
Financial intermediation	3.6	8.0	6.5	2.4	-1.7	3.0	1.5	0.9	-0.1	3.1	-0.9	-0.1
Real estate activities	26.2	45.9	11.1	31.9	-12.1	3.7	0.1	4.7	5.6	1.1	-2.6	-1.7
Renting of machinery and equipment	25.7	28.1	5.2	14.4	-0.8	16.5	-9.2	7.5	0.1	3.5	-1.9	-4.5
Computer and related activities	6.5	9.1		0.6	-4.3	2.3	-3.6	-0.5	-4.6	4.5	-5.6	0.7
R&D and other business activities	10.6	4.3	5.4	3.8	2.3	1.6	2.3	0.2	-0.4	5.5	-2.7	-0.4
Public admin and defence; compulsory social security	8.4	21.5	10.4	7.3	2.2	13.1	2.1	4.9	-1.4	-1.9	-1.4	-2.9
Education	29.1	11.4	14.4	5.1	-1.6	6.9	-1.1	0.8	0.0	-1.0	-0.3	-1.4
Health care and social work	11.0	6.9	6.6	3.0	-4.1	0.2	0.5	0.3	-0.3	4.4	-0.8	-0.6
Other community, social and personal services	26.4	29.6	7.9	8.1	5.4	10.9	-2.3	1.6	-2.9	2.7	-2.6	-0.3

Note: Changes are 2009–15 for Indonesia because missing working hours variable in the Labour Force Survey 2010 data set.

Table A5: Industry-level skills mismatch, difference between supply and demand share, by skill level, 2015

	Unskilled				Semi-skilled				Skilled			
	IDN 2015	PHL 2010	THA 2015	VNM 2015	IDN 2015	PHL 2010	THA 2015	VNM 2015	IDN 2015	PHL 2010	THA 2015	VNM 2015
Agriculture, hunting, forestry and fishing	75	24	78	12	-76	-30	-80	-13	1	6	2	0
Mining and quarrying	29	7	49	29	-26	-15	-53	-28	0	9	2	-1
Food products, beverages and tobacco	41	-7	43	48	-42	-7	-49	-48	0	14	1	0
Textiles, textile products, leather and footwear	49	28	69	62	-49	-37	-72	-62	0	9	0	-1
Wood and products of wood and cork	66	43	77	69	-66	-43	-76	-69	0	0	-1	-1
Pulp, paper, paper products, printing and publishing	10	-9	40	38	-13	-17	-38	-33	4	26	-4	-4
Coke, refined petroleum products and nuclear fuel	3		13	11	0		-13	-12	-3		0	1
Chemicals and chemical products	-3	-17	25	21	-3	-8	-23	-12	6	25	-3	-9
Rubber and plastic products	4	-9	39	43	-4	-16	-40	-42	0	25	-2	-2
Other non-metallic mineral products	55	-2	47	43	-53	-12	-42	-42	-2	14	-6	-2
Basic metals	13	11	50	44	-9	-40	-47	-41	-4	29	-8	-3
Fabricated metal products	32	26	55	58	-30	-40	-54	-57	-2	14	-3	-1
Machinery and equipment, n.e.c.	16	2	30	24	-14	-21	-26	-17	0	19	-5	-6
Computer, electronic and optical equipment	-4	-2	22	25	5	-34	-23	-24	-2	36	0	-1
Electrical machinery and apparatus,	-5	-12	33	30	6	-19	-31	-25	-1	31	-3	-5
Motor vehicles, trailers and semi-trailers	-1	13	28	26	2	-43	-27	-22	-1	30	-4	-4
Other transport equipment	7	18	48	34	-8	-40	-43	-31	1	21	-5	-3
Manufacturing, n.e.c.; recycling	50	20	62	69	-49	-24	-63	-68	-2	4	-1	-1
Electricity, gas and water supply	6	1	17	5	-2	-36	-17	6	-5	36	-1	-11
Construction	24	15	53	49	-23	-26	-45	-46	-1	10	-8	-3

Wholesale and retail trade; repairs	41	13	42	54	-45	-6	-50	-55	4	-7	7	1
Hotels and restaurants	41	9	57	62	-43	-27	-62	-63	2	18	4	1
Transport and storage	41	27	54	47	-43	-22	-58	-47	2	-4	4	0
Post and telecommunications	-1	-6	12	11	-3	-53	-17	-2	4	58	5	-9
Financial intermediation	-2	-2	6	9	-25	-45	-15	-9	28	46	9	0
Real estate activities	0	8	26	29	-5	7	-22	-11	6	-15	-4	-19
Renting of machinery and equipment	30	2	38	43	-26	-7	-54	-35	-4	6	16	-8
Computer and related activities	9	-3	0	4	-7	-22	2	7	-2	25	-2	-11
R&D and other business activities	-2	-2	25	16	-2	-42	-26	-7	5	44	0	-9
Public admin and defence; compulsory social security	2	5	15	11	-2	-29	-12	6	16	29	-4	-10
Education	1	-2	8	4	13	-4	-9	26	-14	6	1	-30
Health care and social work	4	0	15	6	1	-13	-7	46	-4	13	-9	-52
Other community, social and personal services	19	-16	27	37	-15	9	-25	-36	-4	7	0	-2

Note: *=Surpluses and shortages may not add up to zero for each industry in each country due rounding, and because the share of missing occupational or skills level data were omitted, which is equivalent to redistributing these shares proportionately among the categories.

Table A6: Employment, by occupational group, selected manufacturing industries, 2001, 2008, 2010 and 2015 for Indonesia and the Philippines and 2010 and 2015 for Thailand and Viet Nam

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Textiles, textile products, leather and footwear																								
Managers	10	56	45	57	0	2	1	1	39	59	54	126	5	9	9	20	20	17	2	2	7	8	0	0
Professionals	12	8	7	9	0	0	0	0	3	0	3	4	0	0	0	1	3	10	0	1	41	62	2	2
Technicians and associate professionals	150	48	68	73	5	2	2	2	7	13	10	16	1	2	2	3	43	24	4	2	41	51	2	2
Clerical support workers	26	111	142	161	1	4	4	4	15	17	13	14	2	3	2	2	32	24	3	2	52	97	2	3
Service and sales workers	84	51	50	60	3	2	1	1	6	1	0	0	1	0	0		1	6	0	1	41	47	2	1
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0											0	0	0	0	1	2	0	0
Craft and related trades workers	2 531	1 767	2 126	2 202	78	60	61	54	626	482	469	392	82	73	75	62	696	352	59	35	937	1072	39	34
Plant and machine operators, and assemblers	338	645	748	1071	10	22	21	26	42	26	20	17	5	4	3	3	336	531	29	53	1204	1708	50	54
Elementary occupations	93	275	299	447	3	9	9	11	28	58	59	66	4	9	9	10	45	48	4	5	77	111	3	4
Wood and products of wood and cork																								
Managers	5	13	17	11	0	1	1	1	9	31	36	128	4	10	10	44	9	4	2	2	3	5	0	1
Professionals	12	5	13	4	1	0	1	0	1	0	0	0	1	0	0		1	2	0	1	4	6	1	1

Technicians and associate professionals	62	10	9	7	3	1	1	0	1	0	0	1	0	0	0	0	7	5	2	2	4	5	1	1
Clerical support workers	11	25	25	27	1	2	2	2	2	3	4	3	1	1	1	1	7	4	2	2	2	9	0	2
Service and sales workers	32	19	19	24	1	1	1	2	1	0	1	0	1	0	0		1	1	0	1	5	8	1	2
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	20	21	9	0	7	6	3	4	7	1	3	0	0	0	0
Craft and related trades workers	587	1 145	1 131	985	26	74	74	71	175	155	167	54	73	51	47	19	281	165	76	73	525	352	82	67
Plant and machine operators, and assemblers	384	201	201	205	17	13	13	15	22	38	41	36	9	13	12	12	27	21	7	9	34	64	5	12
Elementary occupations	1 139	129	107	134	51	8	7	10	26	55	85	60	11	18	24	21	33	18	9	8	62	76	10	15
Chemicals and chemical products																								
Managers	3	11	12	14	1	4	3	3	17	12	12	9	20	16	15	11	7	24	4	9	3	4	2	3
Professionals	6	7	15	8	2	2	4	2	6	6	8	11	7	8	10	12	9	23	5	9	20	30	13	19
Technicians and associate professionals	58	31	30	37	16	10	7	8	6	9	7	8	7	13	9	8	21	34	11	13	17	16	11	10
Clerical support workers	27	29	46	73	8	10	12	16	9	9	10	11	10	13	12	12	12	24	6	9	13	9	9	5
Service and sales workers	15	29	21	27	4	9	5	6	7	1	0	0	8	1	0		3	6	2	2	11	10	7	7
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0											45	0	24	0	1	0	1	0
Craft and related trades workers	181	17	42	23	51	6	11	5	4	0	1	2	5	0	1	2	8	29	4	11	23	27	15	17
Plant and machine operators, and assemblers	4	74	110	140	1	24	28	30	17	15	18	21	20	20	22	23	62	96	33	36	34	36	22	23

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	**2008**	**2010**	**2015**	**2001**	**2008**	**2010**	**2015**	**2001**	**2008**	**2010**	**2015**	**2001**	**2008**	**2010**	**2015**	**2010**	**2015**	**2010**	**2015**	**2010**	**2015**	**2010**	**2015**
Basic metals																								
Managers	0	5	6	6	0	4	4	3	6	3	4	6	10	8	10	12	4	6	4	4	2	3	2	3
Professionals	14	1	3	1	7	0	2	1	1	0	0	1	1	0	0	3	4	6	4	4	6	6	8	6
Technicians and associate professionals	9	9	8	24	4	8	6	10	0	1	0	2	0	2	0	3	10	15	11	10	6	5	8	5
Clerical support workers	3	11	14	16	1	9	10	7	4	4	3	4	6	10	8	7	8	10	9	7	2	4	3	4
Service and sales workers	7	4	1	5	4	3	1	2	1	0	0	0	1	0	0		0	2	0	2	4	7	6	8
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0		
Craft and related trades workers	79	29	40	51	39	24	28	22	29	16	16	18	50	39	40	34	21	42	24	29	18	36	25	38
Plant and machine operators, and assemblers	80	46	54	92	39	38	38	40	10	11	12	13	17	26	30	26	34	54	39	37	29	27	40	28
Elementary occupations	13	15	18	34	6	12	12	15	8	6	4	8	14	15	11	16	8	10	9	7	6	7	8	8
Machinery and equipment, n.e.c.																								
Managers	2	5	5	6	4	5	3	5	6	6	10	4	7	11	16	20	5	8	3	6	0	1	1	1
Professionals	1	1	2	1	1	1	1	1	2	2	3	2	2	4	4	12	4	10	3	7	3	9	6	17
Technicians and associate professionals	9	9	14	11	16	8	9	10	4	2	0	0	5	3	0		23	16	14	12	4	5	9	9
Clerical support workers	2	11	9	10	4	10	5	9	5	4	3	2	6	7	5	10	11	8	7	6	2	3	4	5
Service and sales workers	5	5	4	6	8	4	3	6	2	0	0	0	2	0	0		0	1	0	1	1	1	2	1

Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0											0	0	0	0				
Craft and related trades workers	4	29	35	23	7	26	22	20	37	27	23	5	48	46	35	26	34	29	21	21	15	13	30	26
Plant and machine operators, and assemblers	29	36	74	38	50	32	46	34	15	12	14	4	20	20	21	19	74	62	46	44	23	18	45	35
Elementary occupations	6	17	17	15	10	15	11	13	6	6	13	2	8	10	19	11	11	7	7	5	2	3	4	5
Computer, electronic and optical equipment																								
Managers	6	4	4	7	3	2	1	4	19	23	20	17	9	7	7	5	6	16	2	3	1	1	1	0
Professionals	3	5	4	6	2	3	1	3	8	16	15	18	4	5	5	5	10	27	3	6	19	28	10	7
Technicians and associate professionals	41	18	39	31	19	9	13	16	16	22	21	21	8	7	7	6	46	42	13	9	14	16	7	4
Clerical support workers	9	10	17	24	4	5	6	12	15	18	16	16	7	6	5	4	15	29	4	6	9	15	5	4
Service and sales workers	11	4	5	3	5	2	2	2	2	0	0	0	1	0	0		2	1	1	0	3	10	1	3
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		0	0	0	0	0	0		
Craft and related trades workers	28	11	19	6	13	5	7	3	32	21	9	6	15	6	3	1	30	52	8	11	34	75	17	19
Plant and machine operators, and assemblers	112	132	181	96	52	64	62	48	108	211	211	288	51	65	69	76	230	294	64	60	107	226	54	57
Elementary occupations	6	20	23	25	3	10	8	13	10	11	14	12	5	3	5	3	19	28	5	6	11	25	6	6

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Electrical machinery and apparatus, n.e.c.																								
Managers	0	1	3	11	0	1	4	7	6	2	4	5	11	5	8	9	2	12	2	6	2	1	2	1
Professionals	3	0	0	1	4	1		1	3	4	3	3	5	9	7	6	5	13	5	6	9	11	9	10
Technicians and associate professionals	10	8	7	18	13	10	9	11	4	0	3	4	6	0	6	7	12	17	13	9	7	8	8	7
Clerical support workers	3	4	8	16	4	6	10	10	4	2	3	3	7	4	6	5	4	10	4	5	4	7	4	6
Service and sales workers	4	4	3	3	5	5	4	2	1	0	0	0	2	0	0		0	1	0	1	3	6	3	5
Skilled agricultural, forestry and fishery workers	0	0	0	0	1	0			0	0	0	0	0	0	0		0	0	0	0	0	0	0	
Craft and related trades workers	3	8	9	20	4	10	11	12	10	7	4	2	17	16	10	4	7	34	7	17	21	23	23	20
Plant and machine operators, and assemblers	45	28	30	66	60	36	40	39	25	21	22	31	44	49	51	56	56	97	58	48	38	52	41	45
Elementary occupations	8	24	17	32	10	31	22	19	4	7	5	7	6	16	12	13	9	16	10	8	9	6	10	6
Motor vehicles, trailers and semi-trailers																								
Managers	3	4	2	9	3	4	2	4	2	2	2	6	6	7	8	9	4	17	2	4	1	0	1	0
Professionals	3	1	1	3	4	1	1	1	0	1	0	4	0	4	0	6	6	24	3	6	3	10	7	10
Technicians and associate professionals	18	10	11	28	21	12	10	13	1	1	1	6	3	5	6	9	27	42	13	10	3	5	7	6
Clerical support workers	4	7	13	13	5	8	12	6	3	1	2	4	11	5	11	6	15	17	7	4	2	6	5	6
Service and sales workers	3	3	3	2	4	4	3	1	0	0	0	0	0	0	0		0	4	0	1	1	2	3	2
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0											0	0	0	0				
Craft and related trades workers	12	19	18	15	14	22	17	7	14	9	9	13	50	36	39	19	30	60	14	14	16	23	37	25
Plant and machine operators, and assemblers	30	26	52	118	36	31	48	57	7	9	9	29	26	35	37	43	118	229	56	55	15	43	35	46
Elementary occupations	10	16	9	21	12	18	8	10	1	2	0	5	4	8	0	8	11	27	5	7	2	3	5	4

Table A7: Employment, by occupational group, selected service industries, 2010–15

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Post and telecommunications																								
Managers	3	21	32	30	2	4	5	5	13	22	19	71	13	12	9	23	9	23	8	9	8	8	3	3
Professionals	5	10	29	55	3	2	5	9	11	17	18	30	11	9	8	10	14	66	12	27	98	115	38	38
Technicians and associate professionals	118	65	87	122	65	14	14	21	12	16	18	51	12	9	9	16	11	41	10	17	42	43	16	14
Clerical support workers	7	101	128	152	4	21	21	26	28	94	112	83	29	50	53	27	42	67	38	27	44	46	17	15
Service and sales workers	28	205	169	100	15	43	27	17	4	4	3	8	4	2	1	2	14	9	13	4	36	59	14	19
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		0	0	0	0	3	0	1	
Craft and related trades workers	3	14	13	26	2	3	2	4	18	17	20	27	19	9	10	9	11	17	10	7	12	15	5	5
Plant and machine operators, and assemblers	11	13	110	29	6	3	18	5	2	2	2	6	2	1	1	2	6	23	6	9	6	8	2	3
Elementary occupations	5	44	46	72	3	9	8	12	10	16	19	36	11	9	9	12	4	4	3	1	11	11	4	4
Financial intermediation																								
Managers	7	60	66	127	1	9	7	8	45	63	72	81	15	17	18	16	49	80	13	15	13	13	5	4
Professionals	15	25	30	49	3	4	3	3	27	33	38	48	9	9	9	10	23	55	6	10	148	199	58	54
Technicians and associate professionals	327	83	116	249	70	12	12	15	62	56	56	64	21	15	14	13	104	201	28	38	27	40	10	11
Clerical support workers	42	409	618	979	9	59	62	59	114	179	202	280	39	49	50	56	158	133	43	25	30	60	12	16
Service and sales workers	60	48	66	87	13	7	7	5	19	13	9	0	7	4	2		2	25	1	5	31	41	12	11
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		0	0	0	0				
Craft and related trades workers	2	1	1	1	0	0	0	0	1	1	0	0	0	0	0		2	5	1	1	0	0	0	0

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Plant and machine operators, and assemblers	3	15	23	44	1	2	2	3	3	4	4	4	1	1	1	1	12	22	3	4	5	7	2	2
Elementary occupations	10	51	69	134	2	7	7	8	20	18	18	22	7	5	5	4	15	14	4	3	4	5	1	1
Real estate activities																								
Managers	23	20	8	16	15	9	4	5	22	52	71	77	26	40	46	42	10	30	10	16	4	4	4	3
Professionals	3	5	2	4	2	2	1	1	6	4	4	5	7	3	2	3	4	9	4	5	20	25	20	16
Technicians and associate professionals	38	16	18	45	24	8	10	16	29	47	48	58	34	36	31	32	37	33	37	17	30	36	29	23
Clerical support workers	5	33	28	48	3	16	15	17	12	14	17	20	14	10	11	11	11	18	11	9	6	9	5	6
Service and sales workers	36	79	72	93	23	38	39	32	4	0	2	2	5	0	1	1	4	59	4	31	34	58	34	37
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0											1	3	1	1	1	0	1	
Craft and related trades workers	7	4	3	1	5	2	2	0	2	1	0	3	3	1	0	2	2	7	2	4	1	0	1	0
Plant and machine operators, and assemblers	4	3	4	3	3	2	2	1	2	0	3	2	3	0	2	1	1	3	1	2	3	3	3	2
Elementary occupations	39	48	48	79	25	23	26	27	7	13	11	17	9	10	7	9	29	31	29	16	3	21	3	13
Computer and related activities																								
Managers	1	2	3	2	3	6	8	4	7	21	31	15	15	18	22	14	3	5	6	9	1	3	2	5
Professionals	0	5	6	20	1	16	18	36	10	21	24	43	21	18	17	40	15	39	30	70	21	48	67	66
Technicians and associate professionals	24	8	7	13	56	24	19	24	10	23	27	15	21	20	19	14	8	10	17	17	4	9	12	12
Clerical support workers	2	8	7	12	5	25	21	22	17	35	39	32	34	31	27	30	3	2	5	4	2	2	7	3
Service and sales workers	3	3	4	3	8	10	12	6	0	0	1	0	0	0	1		2	0	5	0	1	7	3	9
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0															0	0	1	0

Craft and related trades workers	1	3	5	0	2	8	14	1	3	9	14	0	7	8	10		18	0	37	0	1	1	2	1
Plant and machine operators, and assemblers	8	3	1	3	19	8	2	5	0	0	0	0	0	0	0		0	0	0	0	1	1	4	2
Elementary occupations	3	1	2	1	6	4	6	2	1	5	7	2	2	5	5	1	0	0	0	0	0	2	1	3
R&D and other business activities																								
Managers	33	26	21	58	8	7	5	5	28	47	48	89	8	7	6	7	27	46	5	5	15	19	4	4
Professionals	25	56	63	131	6	15	16	12	43	61	68	124	13	9	9	9	68	160	12	18	103	152	28	33
Technicians and associate professionals	154	48	54	124	38	13	14	11	41	61	60	66	12	9	8	5	105	134	19	15	68	62	18	14
Clerical support workers	26	59	73	211	6	16	19	20	47	158	237	527	14	24	31	40	69	99	12	11	23	34	6	7
Service and sales workers	89	42	61	189	22	11	16	17	113	245	284	410	34	37	37	31	106	211	19	24	65	85	18	18
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		12	25	2	3	4	6	1	1
Craft and related trades workers	15	34	26	47	4	9	7	4	24	14	12	7	7	2	2	1	32	33	6	4	33	30	9	7
Plant and machine operators, and assemblers	21	29	24	65	5	8	6	6	7	5	5	9	2	1	1	1	14	34	3	4	31	27	8	6
Elementary occupations	40	70	61	257	10	19	16	24	30	63	60	85	9	10	8	6	128	128	23	15	28	44	8	10
Public admin and defence; compulsory social security																								
Managers	180	258	367	445	8	12	11	11	271	285	307	366	20	18	17	17	257	313	17	19	172	216	13	13
Professionals	46	191	244	288	2	9	7	7	145	127	129	183	10	8	7	9	204	264	14	16	396	584	29	35
Technicians and associate professionals	1817	286	359	417	77	14	11	10	150	180	207	266	11	11	11	13	262	239	18	15	251	233	18	14
Clerical support workers	2	1090	1513	1776	0	52	44	44	285	364	404	433	21	23	22	20	332	279	22	17	225	266	17	16
Service and sales workers	214	105	118	148	9	5	3	4	225	355	402	460	16	23	22	22	155	219	10	14	156	210	11	12
Skilled agricultural, forestry and fishery workers	1	0	0	0	0	0			0	1	0	1	0	0	0	0	22	25	1	2	2	0	0	0
Craft and related trades workers	29	14	16	15	1	1	0	0	31	26	30	35	2	2	2	2	35	51	2	3	12	8	1	0
Plant and machine operators, and assemblers	17	36	39	66	1	2	1	2	49	51	59	57	4	3	3	3	80	92	5	6	28	31	2	2
Elementary occupations	41	105	118	230	2	5	3	6	140	189	213	236	10	12	12	11	136	128	9	8	26	20	2	1

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Education																								
Managers	2 249	47	44	69	88	1	1	1	47	53	54	56	5	5	5	4	55	51	4	4	83	67	5	4
Professionals	2	2 803	4 115	4770	0	85	87	85	727	863	937	1 027	79	81	80	79	876	862	70	73	904	1 166	54	63
Technicians and associate professionals	191	35	37	36	7	1	1	1	21	44	54	82	2	4	5	6	46	24	4	2	531	406	31	22
Clerical support workers	1	245	327	423	0	7	7	8	44	50	57	63	5	5	5	5	76	65	6	5	36	38	2	2
Service and sales workers	89	34	36	52	3	1	1	1	22	16	21	11	2	2	2	1	56	126	5	11	100	140	6	8
Skilled agricultural, forestry and fishery workers	0	0	0	0	0	0			0	0	0	0	0	0	0		7	5	1	0	1	0	0	0
Craft and related trades workers	8	2	2	3	0	0	0	0	7	3	2	4	1	0	0	0	6	8	0	1	3	3	0	0
Plant and machine operators, and assemblers	6	4	8	14	0	0	0	0	8	4	8	6	1	0	1	0	16	15	1	1	5	3	0	0
Elementary occupations	20	116	165	238	1	4	3	4	41	36	42	46	5	3	4	4	107	25	9	2	19	29	1	2
Health care and social work																								
Managers	42	7	14	23	7	1	1	2	5	6	7	18	2	2	2	4	6	14	1	36	6	7	1	1
Professionals	5	179	258	370	1	24	24	25	137	191	239	278	44	49	53	56	190	243	27	23	131	185	30	34
Technicians and associate professionals	99	329	487	647	17	44	45	44	80	75	73	66	25	19	16	13	136	155	19	9	240	265	54	49
Clerical support workers	9	97	153	201	2	13	14	14	23	49	53	66	7	13	12	13	81	59	12	21	12	13	3	2
Service and sales workers	183	73	86	91	31	10	8	6	44	41	45	34	14	11	10	7	202	146	29	1	37	55	8	10

Skilled agricultural, forestry and fishery workers	44	0	0	0	7	0											4	4	1	1	0	0	0	0
Craft and related trades workers	177	2	1	4	30	0	0	0	3	2	2	3	1	0	0	1	8	7	1	3	1	1	0	0
Plant and machine operators, and assemblers	6	10	15	18	1	1	1	1	3	3	2	4	1	1	0	1	21	22	3	4	4	3	1	1
Elementary occupations	21	47	74	106	4	6	7	7	16	24	25	29	5	6	6	6	53	30	7	3	8	11	2	2

Table A8: Employment, by skill group, selected manufacturing industries, 2001, 2008, 2010 and 2015 for Indonesia and the Philippines and 2010 and 2015 for Thailand and Viet Nam

	IDN								PHL								THA				VNM			
	Levels ('000)				Shares (%)				Levels ('000)				Shares (%)				Levels ('000)		Shares (%)		Levels ('000)		Shares (%)	
	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2001	2008	2010	2015	2010	2015	2010	2015	2010	2015	2010	2015
Textiles, textile products, leather and footwear																								
Skilled	171	111	121	139	5	4	3	3	50	73	66	146	7	11	11	23	65	50	6	5	89	121	4	4
Semi	2 978	2 574	3 066	3 493	92	87	88	86	689	526	502	424	90	80	80	67	1065	913	91	90	2 235	2 927	93	93
Unskilled	93	275	299	447	3	9	9	11	28	58	59	66	4	9	9	10	45	48	4	5	77	111	3	4
Wood and products of wood and cork																								
Skilled	78	29	40	22	4	2	3	2	11	31	36	130	5	10	10	44	17	10	4	4	11	16	2	3
Semi	1 015	1 390	1 377	1 240	45	90	90	89	200	217	233	102	84	71	66	35	320	199	87	88	566	433	89	82
Unskilled	1 139	129	107	134	51	8	7	10	26	55	85	60	11	18	24	21	33	18	9	8	62	76	10	15
Chemicals and chemical products																								
Skilled	68	48	56	59	19	16	14	13	29	28	28	28	35	37	34	31	37	81	20	30	40	50	27	31
Semi	227	150	220	262	64	49	55	57	36	25	29	34	43	34	36	38	129	155	69	57	82	82	54	52
Unskilled	60	107	121	138	17	35	31	30	19	21	24	28	22	29	30	31	22	34	11	13	29	26	19	17
Basic metals																								
Skilled	24	15	17	31	11	13	12	14	7	4	4	9	11	10	10	17	17	28	19	19	13	13	18	14
Semi	169	90	110	163	82	75	76	72	43	31	32	35	74	75	79	67	64	109	72	74	54	74	74	78
Unskilled	13	15	18	34	6	12	12	15	8	6	4	8	14	15	11	16	8	10	9	7	6	7	8	8
Machinery and equipment, n.e.c.																								
Skilled	12	15	21	18	21	13	13	16	12	10	13	6	15	17	20	33	33	34	20	24	8	15	15	28
Semi	39	82	122	78	69	72	76	69	59	43	41	11	76	72	61	56	119	100	73	71	41	35	81	67
Unskilled	6	17	17	15	10	15	11	13	6	6	13	2	8	10	19	11	11	7	7	5	2	3	4	5
Computer, electronic and optical equipment																								

Skilled	50	27	46	44	23	13	16	22	44	61	56	56	21	19	18	15	62	85	17	17	34	45	17	11
Semi	159	157	222	130	74	77	76	65	157	250	237	310	74	77	77	82	277	376	77	77	153	325	77	82
Unskilled	6	20	23	25	3	10	8	13	10	11	14	12	5	3	5	3	19	28	5	6	11	25	6	6
Electrical machinery and apparatus, n.e.c.																								
Skilled	13	9	10	30	17	11	13	18	13	6	9	12	23	14	21	22	20	43	21	21	17	21	19	18
Semi	55	44	50	105	73	57	65	63	41	29	30	37	71	70	67	65	67	143	70	71	66	87	71	76
Unskilled	8	24	17	32	10	31	22	19	4	7	5	7	6	16	12	13	9	16	10	8	9	6	10	6
Motor vehicles, trailers and semi-trailers																								
Skilled	24	15	14	39	28	17	13	19	3	4	3	15	9	16	13	23	37	83	18	20	7	15	15	17
Semi	50	55	86	148	59	65	79	71	25	20	20	45	87	76	87	69	164	309	77	74	35	74	80	80
Unskilled	10	16	9	21	12	18	8	10	1	2	0	5	4	8	0	8	11	27	5	7	2	3	5	4

Table A9: Skills Intensity Index 2001–08 (skilled workers as a share of the sum of skilled and unskilled workers)

	2001		2008		2001–08 (total change)	
	IDN	PHL	IDN	PHL	IDN	PHL
Agriculture, hunting, forestry and fishing	0.300	0.022	0.030	0.025	-0.270	0.003
Mining and quarrying	0.416	0.224	0.153	0.089	-0.263	-0.134
Food products, beverages and tobacco	0.646	0.318	0.165	0.277	-0.481	-0.041
Textiles, textile products, leather and footwear	0.648	0.645	0.288	0.557	-0.360	-0.088
Wood and products of wood and cork	0.064	0.301	0.181	0.361	0.116	0.059
Pulp, paper, paper products, printing and publishing	0.198	0.699	0.395	0.514	0.198	-0.185
Coke, refined petroleum products and nuclear fuel	0.676	1.000	0.667		-0.010	-1.000
Chemicals and chemical products	0.530	0.611	0.311	0.564	-0.219	-0.047
Rubber and plastic products	0.139	0.487	0.142	0.286	0.003	-0.201
Other non-metallic mineral products	0.241	0.375	0.174	0.307	-0.067	-0.068
Basic metals	0.647	0.438	0.505	0.385	-0.142	-0.053
Fabricated metal products	0.744	0.655	0.299	0.508	-0.445	-0.147
Machinery and equipment, n.e.c.	0.662	0.645	0.471	0.627	-0.192	-0.018
Computer, electronic and optical equipment	0.891	0.807	0.574	0.845	-0.317	0.038
Electrical machinery and apparatus, n.e.c.	0.628	0.782	0.267	0.466	-0.361	-0.316
Motor vehicles, trailers and semi-trailers	0.693	0.689	0.481	0.671	-0.212	-0.018
Other transport equipment	0.219	0.406	0.457	0.433	0.238	0.028
Manufacturing, n.e.c.; recycling	0.220	0.413	0.285	0.442	0.065	0.029
Electricity, gas and water supply	0.900	0.702	0.611	0.660	-0.290	-0.042
Construction	0.031	0.203	0.120	0.175	0.089	-0.029
Wholesale and retail trade; repairs	0.557	0.578	0.200	0.637	-0.356	0.060
Hotels and restaurants	0.963	0.712	0.116	0.695	-0.846	-0.017
Transport and storage	0.056	0.403	0.106	0.601	0.050	0.199
Post and telecommunications	0.960	0.772	0.687	0.771	-0.274	-0.001
Financial intermediation	0.972	0.869	0.768	0.892	-0.204	0.023
Real estate activities	0.620	0.885	0.458	0.890	-0.162	0.005
Renting of machinery and equipment	0.465	0.838	0.462	0.839	-0.003	0.001
Computer and related activities	0.910	0.961	0.911	0.923	0.002	-0.038
R&D and other business activities	0.840	0.790	0.650	0.730	-0.190	-0.060
Public admin and defence; compulsory social security	0.981	0.801	0.875	0.758	-0.105	-0.043
Education	0.992	0.950	0.961	0.964	-0.030	0.013
Health care and social work	0.874	0.932	0.916	0.919	0.042	-0.013
Other community, social and personal services	0.279	0.136	0.232	0.139	-0.047	0.003

Table A10: Skills Intensity Index, 2010–15 (skilled workers as a share of the sum of skilled and unskilled workers)

	2010				2015				2010–15 (total change)			
	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM
Agriculture, hunting, forestry and fishing	0.091	0.028	0.096	0.005	0.010	0.055	0.030	0.003	-0.080	0.027	-0.066	-0.002
Mining and quarrying	0.138	0.076	0.405	0.283	0.202	0.198	0.696	0.346	0.064	0.122	0.291	0.062
Food products, beverages and tobacco	0.147	0.273	0.343	0.205	0.167	0.297	0.283	0.211	0.020	0.024	-0.060	0.006
Textiles, textile products, leather and footwear	0.287	0.528	0.594	0.535	0.237	0.689	0.512	0.522	-0.050	0.161	-0.081	-0.013
Wood and products of wood and cork	0.269	0.296	0.337	0.152	0.139	0.683	0.357	0.171	-0.131	0.387	0.021	0.018
Pulp, paper, paper products, printing and publishing	0.492	0.462	0.759	0.480	0.419	0.448	0.673	0.524	-0.073	-0.014	-0.086	0.044
Coke, refined petroleum products and nuclear fuel	0.580		1.000	0.225	0.547	1.000	0.935	0.418	-0.034		-0.065	0.194
Chemicals and chemical products	0.318	0.531	0.635	0.579	0.299	0.502	0.706	0.653	-0.019	-0.029	0.071	0.075
Rubber and plastic products	0.217	0.302	0.488	0.556	0.185	0.361	0.523	0.467	-0.032	0.059	0.035	-0.088
Other non-metallic mineral products	0.214	0.288	0.517	0.217	0.197	0.333	0.758	0.237	-0.016	0.046	0.241	0.020
Basic metals	0.491	0.476	0.690	0.697	0.476	0.529	0.729	0.647	-0.015	0.053	0.039	-0.050
Fabricated metal products	0.280	0.568	0.700	0.723	0.312	0.711	0.735	0.705	0.031	0.144	0.034	-0.018
Machinery and equipment, n.e.c.	0.546	0.512	0.756	0.815	0.543	0.742	0.838	0.854	-0.003	0.230	0.081	0.039
Computer, electronic and optical equipment	0.662	0.798	0.761	0.755	0.638	0.822	0.753	0.640	-0.025	0.024	-0.008	-0.115
Electrical machinery and apparatus, n.e.c.	0.377	0.635	0.677	0.648	0.487	0.638	0.730	0.763	0.110	0.003	0.053	0.115
Motor vehicles, trailers and semi-trailers	0.614	1.000	0.778	0.772	0.655	0.743	0.753	0.821	0.041	-0.257	-0.026	0.049
Other transport equipment	0.436	0.479	0.636	0.775	0.466	0.670	0.721	0.857	0.030	0.191	0.086	0.082
Manufacturing, n.e.c.; recycling	0.263	0.413	0.573	0.344	0.381	0.601	0.687	0.356	0.118	0.188	0.113	0.012
Electricity, gas and water supply	0.551	0.617	0.752	0.596	0.281	0.655	0.637	0.601	-0.270	0.038	-0.115	0.005
Construction	0.122	0.152	0.285	0.228	0.093	0.127	0.364	0.243	-0.029	-0.024	0.079	0.015
Wholesale and retail trade; repairs	0.224	0.661	0.313	0.431	0.201	0.673	0.446	0.433	-0.022	0.012	0.133	0.002
Hotels and restaurants	0.131	0.681	0.232	0.394	0.138	0.495	0.474	0.330	0.006	-0.186	0.243	-0.064
Transport and storage	0.127	0.690	0.528	0.301	0.158	0.827	0.611	0.368	0.031	0.137	0.083	0.067
Post and telecommunications	0.762	0.748	0.905	0.929	0.740	0.806	0.973	0.935	-0.022	0.058	0.068	0.006
Financial intermediation	0.753	0.900	0.922	0.981	0.761	0.897	0.961	0.981	0.008	-0.003	0.039	0.000

	2010				2015				2010–15 (total change)			
	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM	IDN	PHL	THA	VNM
Real estate activities	0.370	0.917	0.637	0.943	0.452	0.889	0.699	0.758	0.082	-0.028	0.062	-0.184
Renting of machinery and equipment	0.662	0.877	0.879	0.495	0.450	0.716	0.589	0.366	-0.212	-0.162	-0.290	-0.129
Computer and related activities	0.893	0.919	1.000	0.982	0.973	0.979	1.000	0.965	0.080	0.060	0.000	-0.017
R&D and other business activities	0.691	0.745	0.610	0.868	0.549	0.767	0.727	0.841	-0.142	0.023	0.117	-0.026
Public admin and defence; compulsory social security	0.891	0.751	0.842	0.970	0.833	0.776	0.864	0.981	-0.058	0.024	0.022	0.012
Education	0.962	0.962	0.901	0.987	0.953	0.962	0.974	0.983	-0.009	0.001	0.073	-0.005
Health care and social work	0.911	0.927	0.864	0.978	0.908	0.926	0.931	0.976	-0.004	-0.002	0.068	-0.002
Other community, social and personal services	0.167	0.142	0.225	0.163	0.157	0.178	0.219	0.160	-0.010	0.036	-0.006	-0.003

Table A11: STEM-related jobs, by industry and sex (top industries), latest year

	STEM share in industry employment			Industry share of STEM-related employment		
TOTAL	**IDN 2010**	**PHL 2013**	**THA 2015**	**IDN 2010**	**PHL 2013**	**THA 2015**
Health care and social work	66	66	50	34	32	29
Computer and related activities	34	49	11	1	5	1
Coke, refined petroleum products and nuclear fuel	16	28	26	0	0	1
Electricity, gas and water supply	15	10	19	2	2	3
Machinery and equipment, n.e.c.	9	20	11	1	0	1
Post and telecommunications	13	16	8	4	5	2
Chemicals and chemical products	8	12	12	2	1	3
Motor vehicles, trailers and semi-trailers	9	11	10	0	0	4
Computer, electronic and optical equipment	12	10	7	2	4	3
R&D and other business activities	12	5	10	2	7	8
Electrical machinery and apparatus, n.e.c.	6	13	8	0	1	1
Public admin and defence; compulsory social security	8	9	8	12	17	12
Construction	3	3	4	8	6	8
Share of all other industries	-	-	-	33	20	25
All economy average – all industries	2.0	2.5	3.1	100	100	100
MALE						
Health care and social work	50	61	38	15	18	9
Computer and related activities	37	55	16	1	6	1
Coke, refined petroleum products and nuclear fuel	17	70	42	0	0	2
Electricity, gas and water supply	16	11	24	3	3	5
Machinery and equipment, n.e.c.	10	35	17	1	1	2
Post and telecommunications	16	18	12	5	7	3
Chemicals and chemical products	9	10	14	2	1	3
Motor vehicles, trailers and semi-trailers	9	5	14	1	0	6
Computer, electronic and optical equipment	21	18	13	2	4	3
R&D and other business activities	14	6	13	3	9	9
Electrical machinery and apparatus, n.e.c.	6	17	13	0	1	2
Public admin and defence; compulsory social security	7	7	9	14	17	13
Construction	3	2	4	12	10	12
Share of all other industries				42	22	30
All economy average – all industries	2.0	2.1	3.3	100	100	100
FEMALE						
Health care and social work	76	68	53	67	48	58
Computer and related activities	23	42	8	0	3	0
Coke, refined petroleum products and nuclear fuel			15	0	0	0
Electricity, gas and water supply	8	3	4	0	0	0

	STEM share in industry employment			Industry share of STEM-related employment		
TOTAL	**IDN 2010**	**PHL 2013**	**THA 2015**	**IDN 2010**	**PHL 2013**	**THA 2015**
Machinery and equipment, n.e.c.	7	0	2	0	0	0
Post and telecommunications	7	12	3	2	2	1
Chemicals and chemical products	6	13	10	1	1	2
Motor vehicles, trailers and semi-trailers		14	3	0	0	1
Computer, electronic and optical equipment	7	7	4	2	3	3
R&D and other business activities	8	4	7	1	4	6
Electrical machinery and apparatus, n.e.c.		6	2	0	0	0
Public admin and defence; compulsory social security	10	10	8	10	18	9
Construction	6	16	3	1	2	2
Share of all other industries				15	16	16
All economy average – all industries	2.1	3.0	2.8	100	100	100

Table A12: Female share in industry employment

	IDN 2000	PHL 2001	IDN 2010	PHL 2010	THA 2010	VNM 2010	IDN 2015	PHL 2015	THA 2015	VNM 2015
Agriculture, hunting, forestry and fishing	40	25	37	26	43	51	36	26	42	50
Mining and quarrying	18	8	12	8	18	21	10	10	20	25
Food products, beverages and tobacco	53	36	53	33	50	51	49	36	53	53
Textiles, textile products, leather and footwear	52	76	59	71	75	76	60	71	73	76
Wood and products of wood and cork	44	46	40	47	50	56	39	49	50	52
Pulp, paper, paper products, printing and publishing	19	33	27	37	45	47	26	36	43	45
Coke, refined petroleum products and nuclear fuel	32		6	17	20	36	13		37	30
Chemicals and chemical products	49	30	32	39	47	43	31	35	46	45
Rubber and plastic products	48	34	32	29	48	47	31	33	45	46
Other non-metallic mineral products	32	18	28	18	37	34	24	14	36	31
Basic metals	4	8	9	14	28	30	9	11	26	20
Fabricated metal products	13	7	10	6	20	10	10	8	21	14
Machinery and equipment, n.e.c.	17	25	34	15	42	50	19	28	38	32
Computer, electronic and optical equipment	31	67	61	64	67	72	37	65	64	71
Electrical machinery and apparatus, n.e.c.	29	55	36	45	56	52	34	44	45	54

	IDN 2000	PHL 2001	IDN 2010	PHL 2010	THA 2010	VNM 2010	IDN 2015	PHL 2015	THA 2015	VNM 2015
Motor vehicles, trailers and semi-trailers	14	17	7	25	30	34	8	37	34	49
Other transport equipment	43	10	13	8	26	16	12	10	33	19
Manufacturing, n.e.c.; recycling	19	35	27	31	45	24	26	28	42	30
Electricity, gas and water supply	8	17	9	17	19	28	15	20	28	29
Construction	4	2	2	2	16	10	2	2	15	9
Wholesale and retail trade; repairs	45	62	49	60	49	59	48	60	50	57
Hotels and restaurants	60	57	52	54	65	70	55	57	65	67
Transport and storage	3	4	6	4	14	8	4	3	15	8
Post and telecommunications	30	28	31	38	35	39	25	37	36	39
Financial intermediation	33	59	34	56	57	53	33	56	59	54
Real estate activities	23	51	26	56	52	45	27	52	55	47
Renting of machinery and equipment	20	37	17	34	31	39	11	35	30	31
Computer and related activities	8	48	21	39	28	33	23	41	38	29
R&D and other business activities	26	30	24	31	45	32	26	39	45	37
Public admin and defence; compulsory social security	21	39	23	40	35	27	26	44	36	28
Education	46	73	57	75	60	68	59	73	64	73
Health care and social work	58	73	64	72	75	62	63	68	76	62
Other community, social and personal services	51	71	43	73	64	52	51	71	59	54

Table A13: Female share (%), by occupational group, selected industries, 2010 and 2015

	IDN		PHL		THA		VNM	
	2010	2015	2010	2015	2010	2015	2010	2015
Textiles, textile products, leather and footwear								
Managers	18	26	58	72	37	59	37	34
Professionals	27	46	68	-	73	48	62	68
Technicians and associate professionals	44	49	61	72	64	67	55	69
Clerical support workers	57	57	62	68	71	83	70	69
Service and sales workers	42	32			100	58	35	31
Skilled agricultural, forestry and fishery workers							80	23
Craft and related trades workers	63	65	78	75	79	73	79	79
Plant and machine operators, and assemblers	54	54	22	34	70	75	77	78
Elementary occupations	53	56	53	56	67	61	71	66
All occupational groups	59	60	71	71	75	73	76	76

	IDN		PHL		THA		VNM	
	2010	2015	2010	2015	2010	2015	2010	2015
Wood and products of wood and cork								
Managers	12	14	38	62	20	51	39	28
Professionals	29	17				38	46	58
Technicians and associate professionals	14	5		100	57	55	49	75
Clerical support workers	53	49	65	100	77	100	42	38
Service and sales workers	18	41	0			49	18	22
Skilled agricultural, forestry and fishery workers			9	0	0	9	73	100
Craft and related trades workers	47	47	63	53	52	56	58	55
Plant and machine operators, and assemblers	11	17	17	14	25	23	21	27
Elementary occupations	24	23	42	42	58	43	68	63
All occupational groups	40	39	47	49	50	50	56	52
Chemicals and chemical products								
Managers	8	10	40	40	46	42	8	36
Professionals	37	25	56	60	49	61	47	53
Technicians and associate professionals	25	18	48	45	63	54	52	57
Clerical support workers	50	58	64	68	59	64	46	54
Service and sales workers	28	30			75	48	40	23
Skilled agricultural, forestry and fishery workers					41		35	84
Craft and related trades workers	43	13	0	0	13	27	43	45
Plant and machine operators, and assemblers	21	20	19	18	45	33	35	35
Elementary occupations	34	36	36	23	52	67	47	49
All occupational groups	32	31	39	35	47	46	43	45
Basic metals								
Managers	22	0	0	0	50	18	22	12
Professionals	16	0		0	24	32	47	22
Technicians and associate professionals	13	5		0	29	44	19	37
Clerical support workers	39	66	63	72	65	61	62	37
Service and sales workers	0	18				0	31	24
Skilled agricultural, forestry and fishery workers								
Craft and related trades workers	3	5	0	0	18	10	13	18
Plant and machine operators, and assemblers	5	2	0	0	21	23	34	9
Elementary occupations	4	13	0	0	44	51	50	44
All occupational groups	9	9	14	11	28	26	30	20
Machinery and equipment, n.e.c.								
Managers	7	20	19	34	36	27	34	5
Professionals	44	0	36	37	31	28	68	30
Technicians and associate professionals	27	3			56	43	66	36
Clerical support workers	41	76	52	70	68	66	100	64
Service and sales workers	20	7			100	0	0	16
Skilled agricultural, forestry and fishery workers								

	IDN		PHL		THA		VNM	
	2010	2015	2010	2015	2010	2015	2010	2015
Craft and related trades workers	25	6	0	0	7	15	10	15
Plant and machine operators, and assemblers	45	11	12	0	49	44	65	40
Elementary occupations	17	39	26	100	62	64	80	53
All occupational groups	34	19	15	28	42	38	50	32
Computer, electronic and optical equipment								
Managers	39	0	50	59	32	37	35	0
Professionals	22	0	33	37	41	38	39	51
Technicians and associate professionals	40	37	60	59	71	52	68	35
Clerical support workers	39	63	73	71	79	70	89	73
Service and sales workers	10	0			58	64	38	41
Skilled agricultural, forestry and fishery workers								
Craft and related trades workers	35	43	50	0	22	46	71	75
Plant and machine operators, and assemblers	77	40	70	69	72	71	78	75
Elementary occupations	27	20	44	47	71	79	81	78
All occupational groups	61	37	64	65	67	64	72	71
Electrical machinery and apparatus, n.e.c.								
Managers	22	11	0	0	0	35	42	0
Professionals		0	0	0	43	45	27	45
Technicians and associate professionals	35	30	0	56	60	45	53	57
Clerical support workers	35	64	0	100	70	77	53	58
Service and sales workers	33	42				100	39	30
Skilled agricultural, forestry and fishery workers							0	
Craft and related trades workers	45	45	23	0	0	24	36	54
Plant and machine operators, and assemblers	39	22	59	49	60	46	59	58
Elementary occupations	28	45	49	24	76	74	91	74
All occupational groups	36	34	45	44	56	45	52	54
Motor vehicles, trailers and semi-trailers								
Managers	0	10	0	26	23	39	0	33
Professionals	0	0		60	43	19	17	25
Technicians and associate professionals	15	7	0	53	33	42	41	47
Clerical support workers	17	12		42	64	67	88	78
Service and sales workers	0	0			0	0	22	24
Skilled agricultural, forestry and fishery workers								
Craft and related trades workers	0	1	0	0	4	21	9	36
Plant and machine operators, and assemblers	4	8	38	49	30	34	52	57
Elementary occupations	25	11	0	26	49	52	75	80
All occupational groups	7	8	25	37	30	34	34	49
Post and telecommunications								
Managers	28	19	32	43	24	46	17	20
Professionals	23	19	37	44	49	42	41	44

	IDN		PHL		THA		VNM	
	2010	2015	2010	2015	2010	2015	2010	2015
Technicians and associate professionals	20	21	39	31	41	34	36	26
Clerical support workers	33	41	52	52	36	45	51	58
Service and sales workers	38	30	0	38	52	56	42	36
Skilled agricultural, forestry and fishery workers							30	
Craft and related trades workers	11	1	0	7	0	0	12	7
Plant and machine operators, and assemblers	41	5	0	0	0	0	0	3
Elementary occupations	10	11	9	17	58	100	54	42
All occupational groups	31	25	38	37	35	36	39	39
Financial intermediation								
Managers	25	24	52	54	45	48	31	28
Professionals	32	35	63	60	60	52	59	57
Technicians and associate professionals	36	36	61	61	63	64	58	59
Clerical support workers	41	40	63	58	61	72	58	59
Service and sales workers	22	20	0		36	58	31	36
Skilled agricultural, forestry and fishery workers								
Craft and related trades workers	20	0			0	0	23	100
Plant and machine operators, and assemblers	0	0	0	0	0	0	1	0
Elementary occupations	8	6	12	18	61	81	78	99
All occupational groups	25	24	52	54	45	48	31	28
R&D and other business activities								
Managers	24	30	42	45	33	44	19	22
Professionals	23	27	42	53	41	42	39	47
Technicians and associate professionals	21	26	34	42	56	57	34	32
Clerical support workers	48	44	60	60	61	70	52	56
Service and sales workers	15	25	6	9	9	19	19	17
Skilled agricultural, forestry and fishery workers					42	37	32	39
Craft and related trades workers	9	14	23	0	18	12	23	20
Plant and machine operators, and assemblers	23	19	0	22	12	11	18	16
Elementary occupations	16	14	20	26	71	81	47	62
All occupational groups	24	26	31	39	45	45	32	37

8

New forms of business and increased non-regular forms of employment: Opportunity and challenge for skills for inclusion and innovation in the Republic of Korea

Hai-Woong Park

Abstract: Across the globe, the world of work is being restructured due to multifaceted changes in terms of technological innovation, increased use of technologies and new production and consumption patterns. These trends are generating new types of employment as well as businesses, which is particularly evident in the Asia-Pacific region. Some countries, including the Republic of Korea, are coming to be known as "platform economies" or "gig economies", with increased contract labour and precarious and casualized work.

The chapter explores the roles of skills development and human resources development in these "new economies", wherein new forms of business operate and new forms of employment are provided. It examines how the Korean Government and enterprises are adjusting – and planning to adjust – their skills provision and human resources development policies to support new types of decent employment and sustainable businesses in the face of increased use of technology, artificial intelligence, automation and cyber-based business operations. The chapter also presents the extent to which these new forms of businesses and non-regular forms of employment are increasing in the Korean labour market. Further, the chapter analyses possible responses and skills policies to tackle the challenges and ensure that new developments are inclusive, productive, innovative, sustainable and contribute to creation of decent jobs in the wider Asia-Pacific region.

Introduction

The world of work is undergoing profound changes that are having important societal implications for people around the globe. Among the drivers behind these changes is what is often called the Fourth Industrial Revolution, or Industry 4.0. Rapid technological developments today are not only altering the ways in which societies produce but are reshaping production relations altogether. Creating new products and services at higher levels of productivity and optimizing inputs, the next generation technological improvements are estimated to add up to US$3.7 trillion in value to the world economy (WEF, 2018). Projections vary, but these advancements indeed carry plenty of promise.

Such imminent changes, however, have provoked concerns about expanding inequalities and exclusions if they are managed imprudently. In this context, ensuring that workers whose jobs are threatened by increased automation have access to opportunities to reskill themselves is a major apprehension surrounding the Fourth Industrial Revolution. Moving to new occupations will increasingly require newer sets of skills and know-how. This is even more of a pressing concern for the Republic of Korea, given its rapidly ageing population.[82] Creating adequate reskilling and lifelong learning opportunities will be vital to keep the workforce competitive and to achieve sustained inclusive growth. Furthermore, policies on social protection need to step up to protect persons who are most vulnerable to the negative consequences of the technological revolution, especially as more and more workers find themselves in precarious work arrangements without an adequate social safety net.

Narrowing the skills gap between small and medium-sized enterprises (SMEs) and large enterprises is another important policy agenda towards ensuring that Industry 4.0 works for all. SMEs, which include start-up and scaled-up enterprises, form the backbone of the Republic of Korea's economy. However, many of them are experiencing challenges, such as labour shortages and skills mismatch, as discussed later in the chapter (ADB, 2018). To respond to these multiple challenges, the Government has taken on facilitating role by providing a conducive legal and regulatory environment and a budgetary platform. Training institutions, such as the Korea University of Technology and Education (known as KOREATECH), have stepped up to engage multiple stakeholders (enterprises, SMEs, their employees and students) to help develop a variety of training modules and training and skills-development programmes aimed at countering the challenges.

The first part of the chapter takes a deeper look at some of the challenges to inclusive development within the Republic of Korea against the backdrop of Industry 4.0 and their implications for jobs, skills and inclusive growth. A discussion then follows on responses to the challenges of Industry 4.0 by the Government and training institutions, with an in-depth examination of the role that KOREATECH has taken.

8.1 Impact of Industry 4.0 on jobs and skills

The first three industrial revolutions between the eighteenth and twentieth centuries revolutionized production through mechanization, assembly line mass production and automation aided by electronic and digital technologies, respectively. Industry 4.0 is distinct from the previous three revolutions in that it is marked by the convergence of cyber-physical systems. It is characterized by a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries and even challenging ideas about what it means to be human (Schwab, 2016). In a world in which everything is connected, Industry 4.0 is reshaping the way we do business through advanced technologies, such as information and communications technology (ICT), artificial intelligence and big data. The increasing diffusion of these technologies means that anyone

82 In 2015, the median age in the Republic of Korea was predicted to be 40.9 years and is expected to rise above 50 years by 2033 (Statistics Korea, 2016a).

can produce products and become a supplier; the field of small and smart manufacturing is expanding.

As automation substitutes for labour across the economy, the net displacement of workers by machines can exacerbate the gap between returns to capital and returns to labour. This will give rise to a job market that is increasingly segregated into low-skill and low-pay and high-skill and high-pay segments, which, in turn, could lead to an increase in social tensions (Schwab, 2016). The demand for highly skilled workers has increased while the demand for workers with less education and lower skills has decreased. The result is a job market with strong demand at the high and low ends but a hollowing out of the middle (Ford, 2015). This helps explain why middle classes around the world are increasingly experiencing a sense of dissatisfaction and unfairness. Furthermore, an upward bias in skill requirements disproportionally affects older and lower-income cohorts and people working in industries most prone to automation by new technologies (ILO, 2017).

In short, the new changes in technologies will bring about significant changes in employment trends by industry, with the primary driver of such change being automation. This means that employees might increasingly be required to learn new skills through lifelong education. Governments and educational institutions need to innovate and adapt to the changing realities.

According to the World Economic Forum (2016), employment in the office and administrative sector could decline by nearly 4.8 million workers globally and in the manufacturing and production sector by 1.6 million workers between 2015 and 2020.[83] In contrast, the computer and mathematical job family is anticipated to experience high growth for data analysts and software and applications developers. In addition, demand for skills and competencies is expected to transform. By 2020, the top-ten competencies will experience considerable change, as shown in figure 8.1. Complex problem-solving skills, critical thinking and creativity are becoming ever more crucial for companies and workers to acquire to and thrive under Industry 4.0. Innovation in the fields of science and technology needs to be complemented by the know-how to integrate knowledge and competencies from different spheres. To develop these competencies, pedagogy and the education system must adapt and evolve.

83 Figures refer to focus countries and economic areas covered in the World Economic Forum report (2016): the Association of Southeast Asian Nations member countries, Australia, Brazil, China, France, Germany, the Gulf Cooperation Council member countries, India, Italy, Japan, Mexico, the Republic of Africa, Turkey, the United Kingdom and the United States.

Figure 8.1: Realignment in top-ten competencies

In 2015	In 2020
1. Complex problem-solving	1. Complex problem-solving
2. Coordinating with others	2. Critical thinking
3. People management	3. Creativity
4. Critical thinking	4. People management
5. Negotiation	5. Coordinating with others
6. Quality control	6. Emotional intelligence
7. Service orientation	7. Judgement and decision making
8. Judgement and decision making	8. Service orientation
9. Active listening	9. Negotiation
10. Creativity	10. Cognitive flexibility

Source: WEF, 2016.

Modern welfare States emerged, among other reasons, as a response to the colossal social adversities and the sharp rise in inequalities brought about by the previous industrial revolutions. Taking lessons from the past, States can prepare in advance to minimize the hardships of such rapid social changes caused by Industry 4.0. An important section of society that will find itself increasingly vulnerable is that of temporary workers and workers in situations of precarious employment. Commonly associated with the gig economy, these workers are hired temporarily, based on demand, and their precarious work arrangements mean that they do not have fixed tenure or regular income and are far less likely to have access to a social safety net to rely upon in the event of unemployment.

Due to the nature of their work, precarious workers are often unorganized and therefore do not enjoy the bargaining power in terms of wages, benefits and employment conditions that organized workers have. Furthermore, not being associated with a particular employer for an extended period, it becomes difficult for temporary workers to find institutional support to build up the skills and expertise that could continue to make them in demand in a quickly changing labour market.

8.2 Changes in industry and the labour market in the Republic of Korea

As a country that has pushed the frontiers of modern production technologies, the Republic of Korea has a leading role in Industry 4.0. However, it faces specific challenges related to employment and skills in ensuring that the revolution is an inclusive one.

The Republic of Korea has a manufacturing-oriented industrial structure. The share of manufacturing value added in gross domestic product (GDP) rose from 17.5 per cent to 30.3 per cent from 1970 to 2014, while the world average fell from 25.7 per cent to 16.5 per cent (World Bank, 2015). As a late industrializing nation, the Republic of Korea was able to leapfrog into the era of modern industrial production. It is the world leader in automated technology, with 631 industrial robots installed per 10,000 workers in the manufacturing industry in 2016, compared with the global average of 74 robots (IFR, 2018). The country accounted for around 14 per cent of total global robot sales in 2016, second only to China, at 30 per cent.

Large Korean enterprises, such as Samsung, LG and Hyundai, are taking advantage of emerging technologies in their fields. Samsung has invested heavily to develop a “connected car” in collaboration with its United States subsidiary, Harman International Industries, which is at the leading edge of technologies in semiconductors, display systems and batteries. Samsung has also built its own Internet of Things environment, called the Smart Home Hub. Through it, almost all home appliances are connected to each other; consumers can control all of them quickly and conveniently.

Hyundai Motors Group concentrates on developing wearable robots for medical and industrial purposes. It is collaborating with Baidu, the largest Internet supply company in China, to develop new technologies, such as a connected car, artificial information, and autonomous driving. These and other manufacturing companies are building advanced production environments, known as “small factories”. POSCO, the steel company, has grafted smart factory systems into its production sites. Based on a convergence between the Internet of Things, big data and artificial intelligence, the enterprise has invented its own smart factory platform, called the PosFrame. The factory maximizes productivity by collecting data, analysing it in real time and integrating the results to modify ongoing production. Using artificial intelligence, POSCO plans to participate in smart-city projects abroad, including in Kuwait. SK Innovation, a Korean energy and petrochemical enterprise, operates its production system based on big data. The enterprise has achieved record earnings by collecting and analysing data from manufacturing processes to improve production.

The push into Industry 4.0 has important implications for the Korean workforce and is occurring during a time of acute demographic transition. The population growth rate has fallen due to one of the lowest fertility rates in the world, at 1.24 children per woman. The total population is expected to fall to 44 million people by 2060, from about 51 million currently. As a result, the country is experiencing one of the fastest ageing trends in the world, and older persons will make up 40 per cent of the population by 2060 (Statistics Korea, 2015 and 2017; Young Kwan Noh, 2017).

Mechanization is already at a high level in the Republic of Korea, and the extent of job loss in manufacturing due to automation may be fairly limited in the years ahead. However, there may be a demand shift as workers are sought who can develop and manage new technologies, such as artificial intelligence, smart factories and autonomous vehicles, whereas demand for traditional occupations in the field of simple manufacturing, logistics and transportation will decrease.[84]

84 Yong Kwan Noh: “The Fourth Industrial Revolution and perspective to employment change” (KDB, 2017).

Beyond manufacturing, new jobs are being created. For example, numerous one-person media channels in the Republic of Korea have created large amounts of online content and generated considerable profit – thanks to high-speed Internet connectivity. The most popular online media content creation has been on YouTube. The top-three YouTube content creators in the Republic of Korea earn, on average, about US$30,000 per month. One creator has more than 7.8 million subscribers. This kind of occupation did not exist before a few years ago and serves as one example of how technological changes are opening the doors to previously unknown jobs, career paths and economic activities.

Box 8.1

New smart enterprises: The case of Kakao

Kakao is the number one mobile messenging enterprise in the Republic of Korea. It started its business as a social networking messenger service similar to WeChat and Line. With its useful interface and abilities, it has grown into a leading enterprise of 40 million users. Based on this platform and its consumers, Kakao expanded its business to online-to-offline services: Kakao Taxi and Kakao Driver. Kakao Taxi is a mobile application to call a taxi similar to Uber. It matches customers and taxi drivers. Kakao serves 800,000 rides per day, even without having any vehicle or driver. It simply connects consumers and suppliers. Similarly, Kakao Driver provides around 140,000 designated drivers who drive customer's vehicles instead of the owner, who might not be able to drive temporarily for various reasons. The drivers are not employed by Kakao but work for a short time as drivers provided by Kakao – a classic example of jobs in the gig economy.

Source: Author.

The nature of work is changing and so too is the nature of skills required to survive in the job market. The demand for people equipped with skills to operate in novel production ecosystems are more likely to be filled by newer, younger, digital-native workers, which could potentially render a considerable section of the older workforce redundant. In addition, an ageing population and a smaller share of young workers, coupled with relatively high youth unemployment,[85] means that matching newer jobs with workers possessing the desired skills could become increasingly challenging in the future.

For the Republic of Korea, these trends point to a need for large-scale reskilling or upskilling, especially geared towards mid-career professionals and other workers. Technical upskilling needs to be complemented by either acquiring or sharpening soft skills and competencies demanded by the changing nature of the work ecosystem.

The Republic of Korea also has one of the largest proportions of temporary workers among members of the Organisation for Economic Co-operation and Development (OECD), at 32.8

85 The average youth (aged 15–24 years) unemployment rate in the Republic of Korea between 2014 and 2017 was 10.4 per cent, compared with 5.4 per cent in the same period for Japan – another high-income country in Eastern Asia with an ageing population (ILOSTAT, 2018).

per cent in 2016 (Statistics Korea, 2017). The Government will need to provide a special focus on creating an adequate social support system for this group, both in terms of social protection schemes and avenues for training and reskilling. If it is unable to create these systems, social inequality and an increasing divide between regular and temporary workers may result.

While large enterprises are powering ahead, the success of Industry 4.0 will depend on whether SMEs are able to join the technological revolution. Large manufacturing enterprises are often viewed as the vanguards of the Republic of Korea's economic progress, but SMEs form the core of the economy, providing 80 per cent of private sector employment (ADB, 2018). Despite this, SMEs in the Republic of Korea have been unable to operate at full potential due to the challenges of labour shortages and skills mismatch (ADB, 2018). Because larger enterprises tend to offer better wages to skilled workers and are better placed to access newer technologies and to offer opportunities for on-the-job training and exposure to new technologies for their employees, SMEs find it difficult to compete for skilled labour. Start-up and scaled-up enterprises often have been crucibles of innovative disruptions in various industries; but if they have to increasingly compete with large enterprises for access to a skilled workforce, their capacity for innovation could be stymied.

Industry 4.0 is set to alter the equilibrium in the labour market in the Republic of Korea. To ensure that the negative implications of this change are minimized and inclusive growth is prioritized, there must be a paradigm shift in policy-making – with respect to education, social protection and social dialogue mechanisms. These mechanisms will need to be reformed or reinvented to suit the realities of the changing world of work and to ensure that the future of work is an inclusive one.

8.3 Response of the Government

The Republic of Korea is a country facing unique socioeconomic challenges. At the same time, it also has distinct advantages when it comes to the adoption and integration of novel technologies, including automation in the wider economy. Therefore, it is important that the country make multidimensional preparations for Industry 4.0 involving multiple stakeholders (the Government, enterprises and educational institutions). This section discusses some of the ongoing preparations from the Government and businesses. It addresses the challenges discussed thus far, especially regarding inclusive skills development, to make sure Industry 4.0 works for all and that it contributes to unlocking a period of sustained and inclusive growth.

Acknowledging the challenges that the Republic of Korea faces in terms of inclusive growth and development through Industry 4.0 and an industrial revolution that puts people at the centre, the Government has focused on developing the quality of technical and vocational education and training (TVET) institutions and industry-university integration with the National Competency Standards (NCS). In 2017, the new administration under President Moon Jae-in selected "innovation for Industry 4.0" for inclusion in the top-100 tasks for the Government; in October of that year, the Presidential Fourth Industrial Revolution Committee for Industry 4.0 was established (Jiae, 2017). This committee is planning for innovations for the economy, society, industry, technology and science.

The Republic of Korea already has strong advantages across various fields. In 2015, it was ranked number one in the world in terms of research and development (R&D) investment, with 4.2 per cent of GDP spent to that effect (EUROSTAT, 2017). Its manufacturing industry ranked fifth in terms of competitiveness among 40 countries in 2016 (Deloitte, 2016). The country also has certain disadvantages. The private investment rate for R&D has dropped dramatically, with the Republic of Korea ranking among the bottom four in product market regulation among 33 OECD countries. Its poor showing is attributed to regulatory complexities and difficulties for start-ups, among other reasons (Koske et al., 2015). In 2016, the Union Bank of Switzerland ranked the Republic of Korea 25th in adapted relative rankings from World Economic Forum Global Competitive Report, based on Industry 4.0 categories (Baweja et al., 2016).

The Presidential Fourth Industrial Revolution Committee has been planning for innovation in the future of education. The main goal is to educate students with customized courses on demand that will unlock their potential with creativity. It provides problem-solving and critical thinking-based education instead of learning by memorization. It also plans to strengthen software education for young students, offer intensive support to human resources in ICT and new industries, expand the Korean-Massive Open Online Courses and develop learning platforms with on-demand courses.

The Government has also been working to respond to imminent changes in employment as Industry 4.0 unfolds. It is expanding vocational training in the field of new industries in ICT and provides customized employment services to support changing jobs. The Ministry of Employment and Labour (MOEL) has adopted three strategies: fusion of competencies, innovation in vocational training and creation of TVET platforms. To respond to changes in employment, a higher level of skills development and comprehensive TVET provision are required. It also means that the role of universities will continuously expand. The Government must engage as a comprehensive facilitator with budgeting and a legal framework, with the MOEL as the focal TVET policy-maker.

As a supplier of TVET training and education, KOREATECH is developing high-level programmes (a master’s degree in TVET) and strengthening its connection with international TVET networks (such as the OECD Employment and Skills Strategies in Southeast Asia initiative in 2016 and a global TVET workshop in 2017).

8.4 Innovations of the Korea University of Technology and Education

Alongside enterprises and the Government, educational institutions are crucial for preparing societies for Industry 4.0. Lifelong education, reskilling, upskilling and advanced training will increasingly become commonplace with the advent of Industry 4.0. To ensure that skill sets demanded by new employment opportunities created in the process are adequately met by the population, educational institutions must innovate and rise to fill the gaps.

With the increasing demand for technological skills, TVET institutions in particular must help fill the gaps. As a leading university in the field of engineering and TVET, KOREATECH is spearheading this role. Established in 1991 by the then Ministry of Labour to develop TVET teachers and practical engineers based on the educational philosophy of "seeking truth from facts" (Park, 2017), KOREATECH believes that universities must cooperate with government and industry as consumers for in-service training. KOREATECH, as an affiliated institute of the MOEL, is building a strong partnership with the Government.

KOREATECH has three main functions for education: regular education (offering bachelor's, master's and PhD degree programmes) to foster TVET teachers and practical engineers; lifelong education to serve in-service training for TVET teachers and industrial employees; and industry-university cooperation to build capacity for engineers and support business incubation.

The university's regular education has eight top-tier schools and one department. Because KOREATECH is specialized in the engineering field, it has six engineering schools (mechanical engineering, mechatronics engineering, electrical-electronics-communication engineering, computer science engineering, design and architectural engineering, and energy-materials and chemical engineering). It also includes a school of industrial management.

A strong advantage of the KOREATECH system is the division of its programmes, half of which emphasize instruction and theory and the half of which is based on experiments and training. Students must complete at least 150 credits for a bachelor's degree. The university requires students to participate in a capstone design graduation project to gain practical experience that they can use when working in the field. One professor supervises five or six students (in the laboratory work). In 2017, 212 graduation projects were submitted.

The university also has an industry professional practice (IPP) system, which means that students work in an industry between four and ten months for six to nine credits. This system encourages participants to learn hard skills (practical knowledge from their studies) and soft skills (communication skills, team work and creativity). Currently, around 370 students and 200 enterprises are participating in the IPP system, which has also been adopted by 40 universities across the country.

KOREATECH was ranked in 2017 reviews of Korea's universities the number one education-centred university for the ninth year in a row, the number one institution for job placement of four-year university graduates, and a top-tier university in engineering by JoongAng Daily (KOREATECH, 2017).

Skills and competency innovation at KOREATECH

KOREATECH has sought to innovate in response to Industry 4.0. It is revising its education model in four parts: competency innovation with reform of its curriculum; TVET innovations via online lifelong education; TVET innovations via offline lifelong education through its Human Resources Development Institute (HRDI); and innovation activities for university-industry cooperation.

1. Competency innovation with reformation of education curriculum

Faced with Industry 4.0, KOREATECH has chosen two core competencies: problem-solving and lifelong learning. This is essentially because abilities for learning new skills and adapting to various situations are required in the new era. KOREATECH is planning to develop and reform the curricula for more than 70 subjects. It has established various subjects in the fields of smart factories and smart vehicle, drones, smart energy, the Internet of Things, big data, smart-city design and IT service design. Students in other departments can take these classes to build their competencies for Industry 4.0.

2. TVET innovations via online lifelong education

The KOREATECH Online Lifelong Education Institute (OLEI) has grown up as a hub of online vocational training for workers. It is funded by the MOEL and offers almost 400 free online courses in ICT and engineering. OLEI also collaborates with around 230 SMEs to contribute towards a narrowing of the skills gap and mismatch faced by these enterprises. The mission of OLEI is to utilize the latest ICT to develop e-learning in the engineering field and to help improve job skills by managing e-learning and virtual training content. OLEI empowers learners by allowing them to engage in training anywhere and anytime. This institute offers two types of education models: e-learning and virtual training. OLEI continuously updates its e-learning content to accommodate the jobs required in industrial fields for various occupations in technology and engineering.

OLEI helps to eliminate job inequalities by making training accessible to all, especially underprivileged citizens. It also provides e-learning training services, including job skills development training for jobseekers and unemployed people, as well as tailored courses for SME employees. Its courses and representative courses cover:

- Machinery, in which participants learn various techniques, such as 3D design using SolidWorks to perform modelling of complex forms.
- Electrical and electronics fields, in which participants learn to develop and build a digital circuit design and develop environment and design algorithms and controls using field-programmable gate array devices.
- Mechatronics, in which participants learn to control driving devices using the MELSEC programmable logic controller.[86]

86 MelsecNet is a protocol developed and supported by Mitsubishi Electric for data delivery.

- Information and communication, in which participants learn to identify the base, platform, analytical and business utilization technologies in the field through, for example, the Introduction to Practical Big Data Analysis course.

This education model develops, researches and disseminates virtual training content. OLEI develops content for immersive virtual training that applies virtual reality, augmented reality and interactive devices. In this virtual environment, OLEI provides training experiences in operating equipment or handling safety management – experiences that are difficult to access in real life. These virtual training-based technologies maximize the interaction between trainees and content and enhance the immersive effect of ritual training. The content includes courses that help participants practice how to use, replace or manage special industrial or laboratory equipment and that train participants in safety procedures and accident prevention. One of the laboratory's representative courses in equipment replacement is a virtual reality-based machining centre in which participants learn to coordinate system settings based on a fixed structure in the computer numerical control machining centre and set the coordinate system.

One example of safety accident prevention training is the plastic moulding test injection, which helps the participants learn from case studies about accidents that can occur during injection moulding. Unfortunately, all content is currently provided in the Korean language. However, KOREATECH and OLEI have a plan to provide this content in English in the future, which could widen the access of these specialized courses to international learners as well.

In 2015, OLEI opened a portal website, e-koreatech, to provide online courses. It covers mechanics, electronics, mechatronics, ICT, design, materials, architecture, chemistry and job basics. As of January 2017, there were 1.7 million visitors, 80,000 registrations and 195,000 course enrolments. E-koreatech offers certificate courses for lifelong education, non-certificate courses for lifelong education, an e-koreatech market that provides a platform to SMEs to share online content and an academic credit bank. It operates under the ADDIE model (analysis, design, development, implementation and evaluation). The analysis component comprises a needs assessment, task analysis and learner and context analysis. On the design process, it writes objectives, generates an instructional and test strategy and selects instructional media. The development comprises creating course material, pilot testing and revising. Implementation means the delivery of instruction, and evaluation consists of both formative and summative evaluation.

Two core features of the OLEI education approach are the online practice lab for computer programming and virtual training. Using this platform, learners can avail of C, C++, Python, Java and HTML programming courses. It provides practice problems pulled from a test bank. Students use a coding editor for practising to write software programmes and run a complier (or interpreter). The system automatically checks grammatical errors for two trials. This provides both the instructor's answer on the left side and the learner's input on the right side of the monitor. It then compiles results of the instructor's and the learner's codes. The online practice lab presents several benefits:

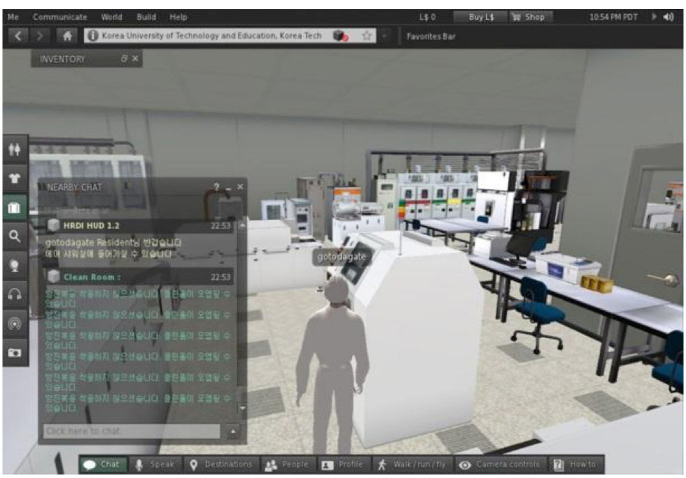
- It offers a convenient and efficient programming environment.
- It enables students to practise programming anytime they want.
- It encourages instructors to design interactive web-based programming courses.
- It is easy to implement problem-solving activities.
- It allows the instructor to give immediate feedback to individual students' works.

With Industry 4.0 proliferating around the world, virtual training has emerged as one of the most cutting-edge technologies. It refers to teaching in virtual learning environments for the special needs of training and for practising to manage special industrial equipment or hazardous work situations. Its educational purpose is to build learning systems that replace expensive high-tech equipment and to provide authentic training to foster creative technicians.

Virtual training education also presents many benefits. In a real training environment, it is difficult to have costly and macro-sized equipment. And there are spatial constraints – it is impractical to frequently disassemble and reassemble equipment. A real environment also makes it difficult to train in relation to emerging work situations. However, a virtual training environment replaces costly and macro-sized equipment. And it enables online practice through networks and the disassembling and reassembling of virtual equipment. The virtual environment makes it possible to train people about dangerous work by placing them in virtual dangerous situations.

OLEI has undertaken around 30 projects and proceeded with four projects for the teaching and learning model and network-related research in 2017. There are a total of 35 models of virtual reality- and augmented reality-based vocational training content, and ten more content models are being developed.

Figure 8.2: Example of virtual training



Source: KOREATECH.

3. TVET innovations via offline lifelong education through the Human Resources Development Institute

The HRDI was established in the 1990s to develop job competencies of incumbent techniques and cutting-edge technology. The HRDI is the Republic of Korea's only college-affiliated educational institute dedicated to vocational training and was founded by the MOEL. It was established with the goal of improving vocational competency for industrial professionals and vocational competency development experts with pivotal roles in industrial development.

The HRDI is striving towards a new horizon in lifelong vocational competency development that is well adapted to the needs of the twenty-first century knowledge-based society in three fundamental ways: through advanced teaching methods that equip learners with the latest technological know-how demanded in various industrial fields; through training programmes that are delivered by top experts in the field; and by providing access to the latest equipment and facilities.

Its target students are instructors, teachers and faculty members from private and public vocational training institutes, specialized schools and meister (master of a trade) high school teachers. It also aims to customize training available for a few selected companies (Samsung, LG Chemicals, Bosch Rexroth, etc.). The HRDI offers various programmes, such as a TVET teachers' license course, NCS training and consulting, high-tech industry training, human resources development training and on-the-job training.

TVET teachers' license course: This course is designed to produce vocational training instructors by helping students develop practical skills to efficiently teach the knowledge and skills required for various occupations and to better understand people's vocational competency development. The course is recommended for persons who want to acquire basic knowledge about vocational competency development, persons who want to become vocational training instructors and persons who want to acquire an advanced-level vocational training instructor certificate. Two courses are available: teaching job training (to acquire a new teaching certificate) and an advancement training (for promotion). These are designed to develop actual skills to effectively teach technologies and knowledge relevant to specific professions.

National Competency Standards training: This training is tailored to reflect the competency standards required in industrial fields. It refers to a set of knowledge, skills and qualifications that are required to perform jobs in industrial fields. These standards are systematically set by the governments of different countries for different industries and job levels. The term ultimately means the standardized package of capabilities (knowledge, skills, aptitude) that are necessary for successful job performance in industrial fields.

New high-tech industry training: This training consists of two parts. First, the new technology training involves the study of field-oriented practical skills and new technologies in fields that are rapidly changing, owing to developments in industrial technology. These courses are based on the NCS and thus help educate vocational development specialists so that they can take a leading role in domestic industry development. It also operates special training for advanced new industries related to Industry 4.0, with high demand from the industries that are promising in this field.

Human resources development training: This training provides advanced job skills that are necessary for persons who are engaged in vocational training related occupations. Its fields of studies are as follows:

- Vocational training and instructor retraining – This course cultivates the attitude, skills and knowledge necessary for personal career growth and for better job performance in vocational training-related occupations.
- Teaching techniques – This training aims to improve practical job skills, including techniques for more efficient vocational training-related instruction.
- Career guidance and counselling – This training cultivates professional skills, including theories and practices in career guidance and employment counselling
- Head of the vocational training school training – Training in this field aims to cultivate business management skills and leadership values for business leaders from vocational training institutes and helps them learn about trends and developmental direction in vocational competency development.

Industry-related on-the-job training: This industry-related on-the-job training is specifically tailored to build stronger practical skills for specialized and meister high school teachers so that they can help their students be better prepared for employment with stronger capabilities. This course is designed to help build field-practical job skills and to familiarize teachers with industrial trends through industry field tours after classroom lessons, which focus on advanced equipment-utilization practices.

The HRDI also offers technology training for essential and promising new growth-engine industries. This is a technology training course for vocational training instructors to learn about the efficient production of human resources. In response to the Government's initiatives on green growth (Kim, 2010) and the New Growth Engine: Visions and Strategy (Myung-je, 2009), the HRDI expanded the equipment and training facilities related to new growth-engine industries in 2008 and has been expanding and operating customized training for new growth-engine industries for vocational ability development instructors since 2009.

A total of 70,000 participants were enrolled in 2016. In the same year, approximately 18,700 participants took the TVET teacher license course; 18,400 participants took part in capacity-building for TVET teachers; 25,000 participants undertook the NCS training; and 7,700 persons participated in capacity-building through the work-based learning specialist course.

The HRDI has developed new courses related to the Internet of Things, big data, smart factories and other Industry 4.0 issues to meet the rising demand for skills training from new growth-engine industries and advanced new industries.

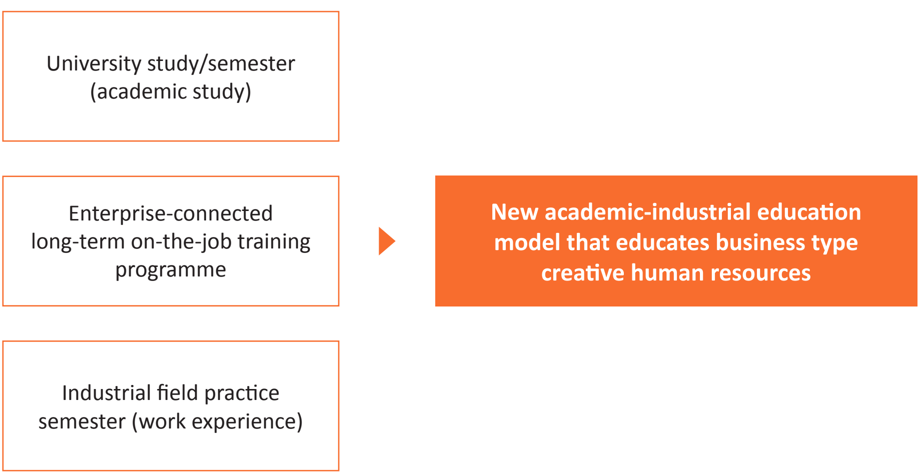
4. Innovation activities for university-industry cooperation

The final component of KOREATECH's skills and competency innovation in anticipation of the rising tide of Industry 4.0 is its university-industry cooperation. Under various arrangements within this cooperation, a nexus is created between the university, industries and, most importantly, students. This model of cooperation seeks to check the challenges arising from the rapid advent of Industry 4.0, such as skills gaps and mismatch. It creates a win-win-win scenario for all stakeholders involved and, in the process, seeks to prepare the larger economy to adapt suitably with technology-driven changes in various industries. The following outlines the four major channels of skills and competency innovation available through KOREATECH.

Industry professional practice

Industry professional practice (IPP) is an enterprise-connected long-term on-the-job training programme that started at KOREATECH in 2012. Students are required to complete a part of their curriculum in an industry field for four to ten months. It is distinct from other short-term programmes, such as internships or on-the-job training, in that it is an industrial-education cooperation model that combines an enterprise demand-reflected scholar curriculum and a practice semester in an industrial field related to a student's major (KOREATECH, n.d.). As shown in Figure 8.3: Industry professional practice concept map, this approach aims to create a new model of education. The programme has spread to around 40 universities in the Republic of Korea.

Figure 8.3: Industry professional practice concept map



Source: KOREATECH, n.d.

Finding a solution to such issues as the rise in the time and cost required for training a new worker due to skills mismatch and the excessive time and cost spent on equipping a young applicant with the right skills mandates the creation of a new education model. What is needed is a model that can resolve these issues with existing short-term on-the-job training programmes that also reflect the skills demands of enterprises. Enterprise problems include labour force mismatch between them and universities; excessive new worker training costs; difficulties in verifying new workers; avoidance of small enterprises by elite workforces; and limited budgets for technology and research. Students' problems, on the other hand, entail lack of hands-on experiences; worries about their own future; limited means to overcome unemployment; trouble raising tuition; and lack of advanced equipment and field-centred education.

The IPP system provides solutions to both enterprises and students. Under this system, students take IPP twice, for a total of ten months, and receive 15 credits (in a four-year school system). In the junior year, students take part in the IPP programme for six months to determine their aptitude and possible career interest and to increase their specialty capability. In the senior year, the students then participate in a four-month programme for employment connection and enhancing their employment capability.

The KOREATECH IPP centre acts as a bridge between students and participating enterprises. Students receive advice from IPP executive professors and choose an enterprise to work with. The industry provides opportunities to work in a real-field situation. The IPP centre helps job matching and evaluates both sides, the enterprises and the students, for feedback. Between 2012 and 2015, a total of 1,037 students participated in the IPP; 130 of them were hired by the enterprise where they had worked. About 10 per cent of students took part in the international IPP programme in such countries as Australia, Germany, Indonesia, the United Arab Emirates and the United States.

Centre for Research and Facility

KOREATECH operates the Centre for Research and Facility (CRF) for university and industry cooperation and mutual growth. The CRF supports SMEs with the use of high-tech research equipment and experts. It provides training and enterprise support with its high-priced equipment and operational personnel to meet the needs of enterprises for certain skills. It also works with enterprises through a practical industry-university cooperation system for conducting research and testing, such as surface analysis, property analysis, inorganic analysis, reliability assessment, organic analysis, 3D printing, nano surface analysis and detailed work.

CRF provides the following services: (i) construction of testing facility: construction of equipment and laboratory, procure research and establish a consortium; (ii) acceleration test evaluation techniques: construction of certification system, development for test evaluation and standard, and issuing test report and results; (iii) technique and commercialization service: total solution service, technique guidance and technical commercialization and cooperation research development; (iv) spread of supply: training on equipment, construction of test database, opening of a workshop and providing on-off line centre information.

The CRF is certified by the Korea Laboratory Accreditation Scheme (KOLAS), which is the official accreditation system that recognizes the testing ability of laboratories that meet international standards. The test results produced by certified institutes become internationally available while ensuring the reliability of analytics and improving the satisfaction of enterprises.

To support related institutes or enterprises, the CRF operates high-tech research equipment (figure 8.4), such as: focused ion beam (for surface observation of materials, section observation by processing local fractions), field-emissions scanning electron microscope (for microstructure analysis and surface analysis), high performance X-ray diffraction (for analysis of various categories of material crystal structure), thermomechanical analysis (for determination of melting point, thermal expansion, softening point, grass transition and determination of thermostability), 3D printer (for cooperation with fields that cannot be manufactured by cutting, 3D copying through real-object scanning and splicing) and numerous other equipment for research.

The CRF has various projects in the field of university-industry cooperation. One of these projects is on "trouble shooting for electro-mechanical materials and components". It started in 2007 and concluded in 2017. Its main purpose was to support regional SMEs and build their competencies with high-tech research equipment and dedicated human resources. It built networks between the university, SMEs and related institutes located in Chungcheongnam-do Province (where the KOREATECH main campus is located) and supported troubleshooting in the field of electro-mechanical materials and components, such as display, semi-conductor and automobile parts ("troubleshooting" means to assist SME activities and to strengthen their competitiveness with high-tech facilities, joint research, management support and technical transfer).

Figure 8.4: Facilities and machines operating in the Centre for Research and Facility

Focused ion beam
(accredited by KOLAS)

Differential scanning calorimeter
(accredited by KOLAS)

Thermal conductivity – LFA
(accredited by KOLAS)

Universal testing machine
(accredited by KOLAS)

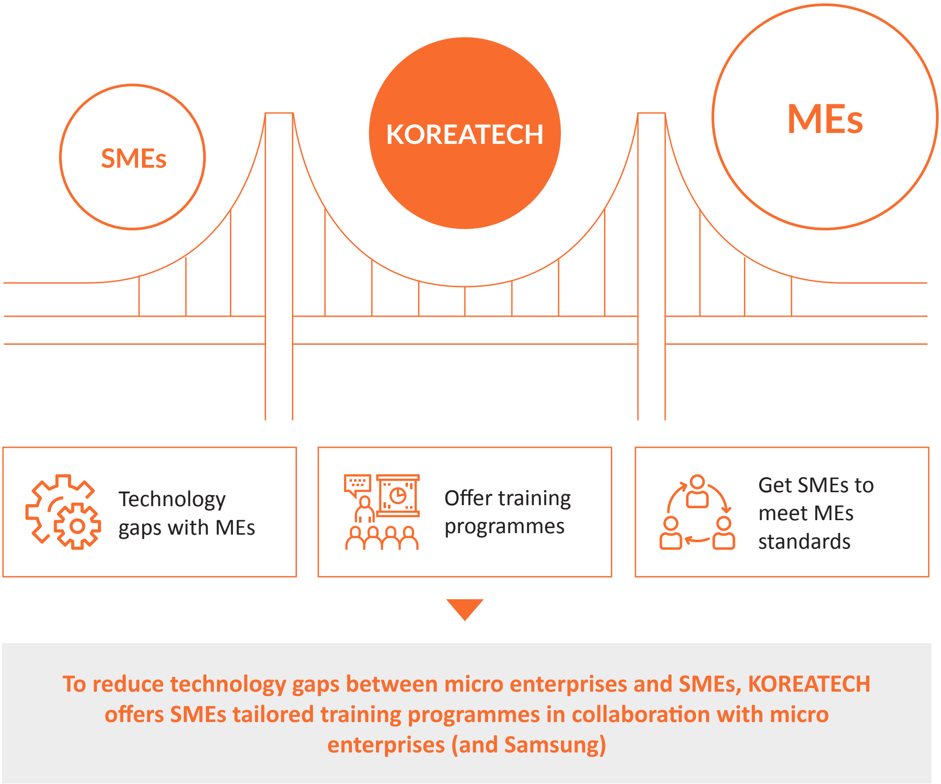
Source: KOREATECH.

Bridge education model and regional human resources training project

Now, in the era of the Industry 4.0, SMEs are not only subcontractors that produce simple parts. Some of them also take part in product and service planning and design. Under these circumstances, it is vital to develop SME competencies. The more SME skills are advanced, the more the quality of production improves. However, SMEs have a limited environment to provide in-service training for their employees, and it is not even easy for micro enterprises (MEs).

The KOREATECH bridge model comprises a three-way academia-industry partnership involving a ME, a partner SME and the university, as shown in figure 8.5. This innovative approach is essentially a vocational education programme (with short-term courses) for employees of participating enterprises. With micro enterprises constantly pushing the technological and innovation frontiers, the university acts as a bridge to reduce technology gaps between MEs and SMEs and increase SME participation in training. This arrangement also strengthens the relevance of the KOREATECH programmes. The first “bridge” was established with Samsung Electronics, its subcontractors and KOREATECH in 2006. Samsung and KOREATECH collaborated to build an advanced technology education centre and jointly conducted demand surveys to develop relevant programme curricula. To date, Samsung continues to contribute the technical knowledge, equipment and industry experts to co-teach the courses. Samsung’s subcontractors furnish the trainees who need to learn about Samsung’s latest technology, and KOREATECH provide the training facilities. Under this arrangement, the SMEs enjoy strengthened ties with Samsung, and KOREATECH gains opportunities to co-teach courses with Samsung’s experts. The bridge education model’s success has led to its expanded application across 11 universities and participation from 45 MEs and 2,268 SMEs (World Bank, 2013).

Figure 8.5: KOREATECH education bridge model



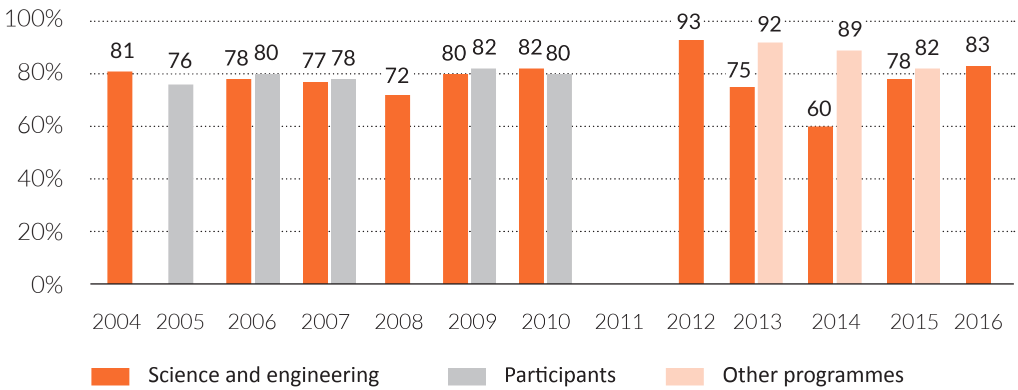
Source: KOREATECH.

The bridge model was chosen by the former president of the country as the best approach for eliminating technological gaps between MEs and SMEs. From 2014 to 2016, approximately 1,900 enterprises (such as Samsung, Hankook and Hyundai Steel) participated in the programme, and 20,000 trainees per year developed job skills.

Through the bridge model, SMEs can strengthen their quality of skills and technologies as well as their ties with MEs. KOREATECH gains opportunities to co-teach with ME experts, to provide training facilities and to operate related centres. This process enables MEs to narrow the technological gap between them and SMEs.

In addition, KOREATECH organized the Samsung Global Skills Competition, which it calls “a festival for engineers”. Prior to the KOREATECH involvement, Samsung had been the core organizer. Given the aspiration to establish a cooperation model across industry and university, KOREATECH and Samsung have been jointly organizing this competition since 2009. Its purpose is for engineers to compete with the skills that they learned through this model. The main target of these competitions has been trainees from KOREATECH’s technological education. In 2017, 144 trainees from five fields of studies participated (45 participants were from domestic enterprises and 99 participants from overseas). Among the trainees, four students from the KOREATECH mechatronics studies were included. KOREATECH offers a practical-based education model to its students and supports them to grow as engineers by providing opportunities to enhance practical know-how.

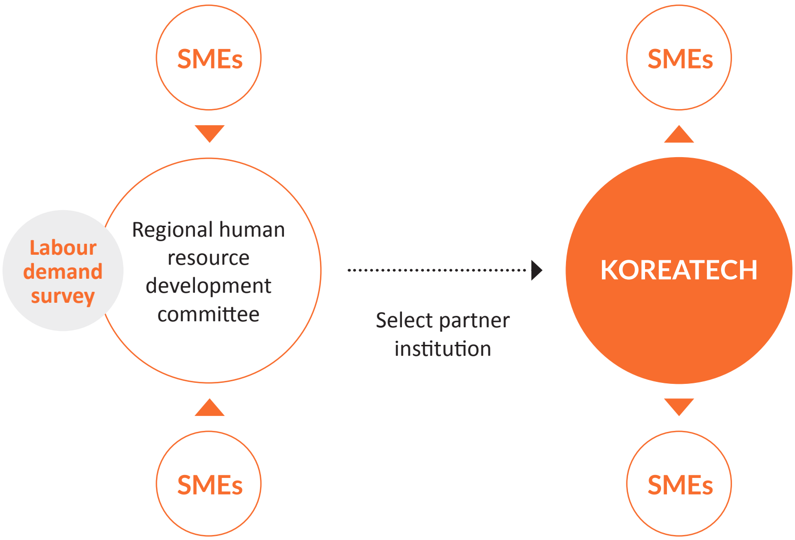
Figure 8.6: Job placement rate (share of students having *jobs before they graduate*) between 2004 and 2016 (%)



Source: KOREATECH.

Based on regional demand for human resources, KOREATECH also offers customized vocational training through a project supported by the MOEL and the Human Resources Development Service of Korea. Despite the Government's previous commitment of considerable budget for re-training unemployed workers and providing in-service training for SME employees to eliminate job mismatch and low job placement (70.5 billion won was spent in 2012, according to KOREATECH, 2017), the training system has failed to keep pace with industry demands. And as previously noted, SMEs have low capability for training their employees. The customized vocational training project works to alleviate human resource shortages and increase employment rates for small enterprises, provide customized training based on workforce demand for local enterprises and enhance the competitiveness of SMEs. A regional committee consists of local industry representative who investigate the labour demand and vocational training (figure 8.7). The project does not require any investment by enterprises or trainees. The training courses are customized based on the demand. There are two main targets: one is for employees who want to improve their skills, and the other one is for jobseekers who want to learn or develop new skills. Examples of courses include: System Applications Products Advanced Business Application Programming (SAP ABAP) (60 days, 480 hours); electrical goods manufacturing (75 days, 600 hours) which includes smart factory operation and control; Programmable Logic Controller Input/output (PLC I/O) control (four days, 32 hours); and marketing environment analysis by big data (KOREATECH, 2017).

Figure 8.7: Training process of the KOREATECH regional human resources training project



Source: KOREATECH.

College of Work and Study in parallel (Korean apprenticeships)

In the education field, decreasing the gap between education and industry is a major challenge to build inclusive growth. In 2014, the Government established the College of Work and Study at KOREATECH to contribute to a paradigm shift in the education and employment environment. This is a degree-based apprenticeship programme, patterned after models from Germany and Switzerland and redesigned to fit the Korean context. The model combines workplace training (on-the-job training) with on-campus education (off-the-job training) to enable apprentices to gain a bachelor's or master's degree. Its main features are: (i) customized programmes in accordance with enterprise-specific requirements; (ii) NCS-based qualifications with a combination of theoretical knowledge and practical skills; (iii) commitment to excellence in the best quality on-the-job training; and (iv) financial support from the MOEL (KOREATECH, 2017).

Degree-based apprenticeships are co-designed with employers to ensure that apprentices are equipped with the competence and skills the employers need. It is developed as an alternative to traditional full-time on-campus education with a diversified way of teaching and learning, such as: on-campus (50 per cent) plus online (25 per cent, including an online portion of flipped learning) plus on-the-job training (25 per cent). Apprentices can work and study in parallel towards their degree and qualification while they keep their job. Students typically spend weekdays in their enterprise following an on-the-job training curriculum (30 credits) with e-learning content and attend on-campus classes on Saturdays.

Students must be employed (full time). They do not pay any tuition fee (approximate cost of US$6,000 per year) or training costs (the MOEL covers these expenses). High school graduates and two-year college graduates can apply for the bachelor's degree programmes (more than 100 spots), whereas, four-year university graduates with three years of field experience can apply for the master's degree programme (more than 440 spots).

For the undergraduate programme, three majors are provided: electromechanical engineering, mechanical design engineering and SME management. Two majors are provided for the graduate course: mechanical facility control engineering and IT convergence software engineering. The main advantage of this college is its matching of required competencies between education and industry and its reduction of training costs for new employees.

Through these four channels of skills and competency innovation, KOREATECH has created a strong foundation for building and sustaining an inclusive industrial revolution that can unleash significant development dividends for the Republic of Korea and its people.

Conclusion

Developed and developing countries alike have been struggling to prepare for Industry 4.0. Above and beyond the general challenges that rapid technological change are set to pose, different countries will face different and specific challenges as they seek to adapt to the changing production processes and relations. Against this backdrop, the Korean Government and education institutions have made an effort to innovate and change themselves. As labour markets are set to be more dynamic than ever, a number of jobs will disappear and old skills are set to become obsolete. In such a fast-changing world, it is crucial to prepare and learn new skills effectively, quickly and, importantly, to do so inclusively so that development dividends can be shared by all. The Government and the education institutions have made impressive effort to innovate and change.

By engineering a comprehensive approach that involves multiple stakeholders (the Government, educational institutions, MEs, SMEs, workers and students) in addressing the challenges posed by Industry 4.0, the Republic of Korea has taken a step in the right direction. The Government has invested in research and development and in enhancing manufacturing competitiveness since the 2000s. Now, it has chosen to prepare for Industry 4.0 as its main priority. It carries out its role as a comprehensive facilitator that compiles a budget, enacts laws and draws up overall guidelines. The MOEL is following through as a TVET policy-maker with action plans through close cooperation with affiliated institutes.

KOREATECH has had an important role as a TVET hub and has contributed to building inclusive growth by providing industries with innovative solutions to adapt to the rapid change in the labour market. KOREATECH has a pivotal role in preparing the Korean economy for a future of inclusive industrial revolution by:

- creating avenues for SMEs to not only close the skills gap with MEs but to actively participate with them in training programmes;

- developing various modalities of education that ensure that employers and students can together respond to changing market demand in skills; and,
- creating avenues for lifelong learning and re-training as well as by working to produce the next generation of TVET workers and trainers.

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9

Technology-enhanced TVET delivery: The potential for improving access, relevance and inclusion[87]

Theresa Thang Tze Yian
Jonghwi Park

Abstract: The rapid transformational changes in technologies raise the hope that they will increase productivity by freeing people from mundane and repetitive labour and help them focus on work that is more creative. At the same time, these changes create fear that many jobs will become obsolete and replaceable by machines and that many people will lose employment. Fortunately, information and communications technology (ICT) can be harnessed to serve us. In particular, ICT has proven to add value to teaching and learning in technical and vocational education and training (TVET). If implemented and integrated adequately and purposefully, ICT certainly increases access for people from marginalized and disadvantaged groups. By innovating the pedagogical approaches to both formal and informal TVET, ICT can improve the transversal skills and hence the employability of workers. Ultimately, ICT-enhanced pedagogies can help build an inclusive society whereby all persons, regardless of their status, are equally supported to grow socially and economically.

This chapter singles out the ICT implementation in TVET in six countries and territories (Australia, Hong Kong (China), New Zealand, the Philippines, the Republic of Korea and Singapore) and highlights five of the promising cases in which ICT has been used to shift the paradigm of TVET and skills development. From these cases, the chapter illustrates how the use of ICT contributes to TVET in (i) promoting flexible lifelong learning, especially to those who had missed out on basic education owing to various challenges; (ii) enhancing learning engagement and social learning; (iii) providing authentic and simulated learning; as well as (iii) promoting a mindset of reflective learning and knowledge creation with the view of equipping learners, especially young people, with the right skills and dispositions for the future of work. The chapter concludes with policy recommendations to guide TVET institutions on ICT-supported practices essential for the future of work.

Introduction

We live in a world of unprecedented uncertainty. The rapid transformational changes in technologies raise the hope that they will increase productivity by freeing people from

87 This chapter is an abbreviated version of the report *Beyond Access: ICT-enhanced Innovative Pedagogy in TVET* (UNESCO, 2017), which was modified for this publication.

mundane and repetitive labour and help them focus on work that is more creative. At the same time, these changes create the fear that many jobs will become obsolete and replaceable by machines and that many people will lose employment. The education sector faces a heavy burden to nurture that hope while managing those fears. The answer lies in fostering inclusive accessibility to quality education and training, new skills for the uncertain future of jobs and continuous learning opportunities throughout each person's life.

The Education 2030 Agenda, which incorporates the fourth Sustainable Development Goal (SDG 4), extends the targets of universal primary education that were part of the Millennium Development Goals to create inclusive, equitable and quality lifelong opportunities for all people. Considering the rapidly changing job market and its social and economic influences on individual lives, the Education 2030 Agenda stresses the need to rethink technical and vocational education and training (TVET) and skills development. The Education 2030 Agenda includes two TVET-related targets: (i) SDG 4.3 on ensuring equal access to affordable and quality TVET for all and (ii) SDG 4.4 on increasing the number of youth and adults with relevant skills for employment, decent work and entrepreneurship.[88]

A 2016 study by the International Labour Organization (ILO) argued why inclusive TVET for relevant skills is an urgent necessity and not just a rhetorical goal. Based on more than 300 interviews and 4,000 employer survey responses, the study concluded that labour-intensive sectors are occupied by economically vulnerable populations, such as women and persons with little education, and that they are at high risk of being replaced by automation. Providing equal access to quality TVET and skills development that is relevant to current and future job needs is essential to achieving inclusive social and economic growth (ILO, 2016).

The question is whether the education sector is ready to train youths and/or retrain workers for an environment of rapidly changing skill needs. The surveyed employers in Association of Southeast Asian Nations member countries cited technical knowledge as the most important but difficult type of skill to find, followed by teamwork, communication, strategic thinking and problem-solving. This suggests that current TVET and skills development systems need to keep up with technological changes and incorporate transversal skills, or soft skills, in their training curriculum to produce creative and collaborative workers.

Technology may help save the day. In particular, information and communications technology (ICT) has proven to add value to teaching and learning in TVET. It certainly increases access. But it also offers transformational pedagogy to improve the acquisition of relevant skills. For example, simulations and computer-supported collaborative learning enhance the relevance of particular skills. They bring workplaces into the discussion. And learning analytics provide diverse channels for students with different needs. For example, teachers with insights about students' learning behaviour can promote remedial resources or additional self-check quizzes that are targeted at specific learning difficulties

88 See http://www.unesco.org/fileadmin/MULTIMEDIA/HQ/ED/ED/pdf/FFA_Complet_Web-ENG.pdf (accessed 18 June 2018).

or competency gaps.

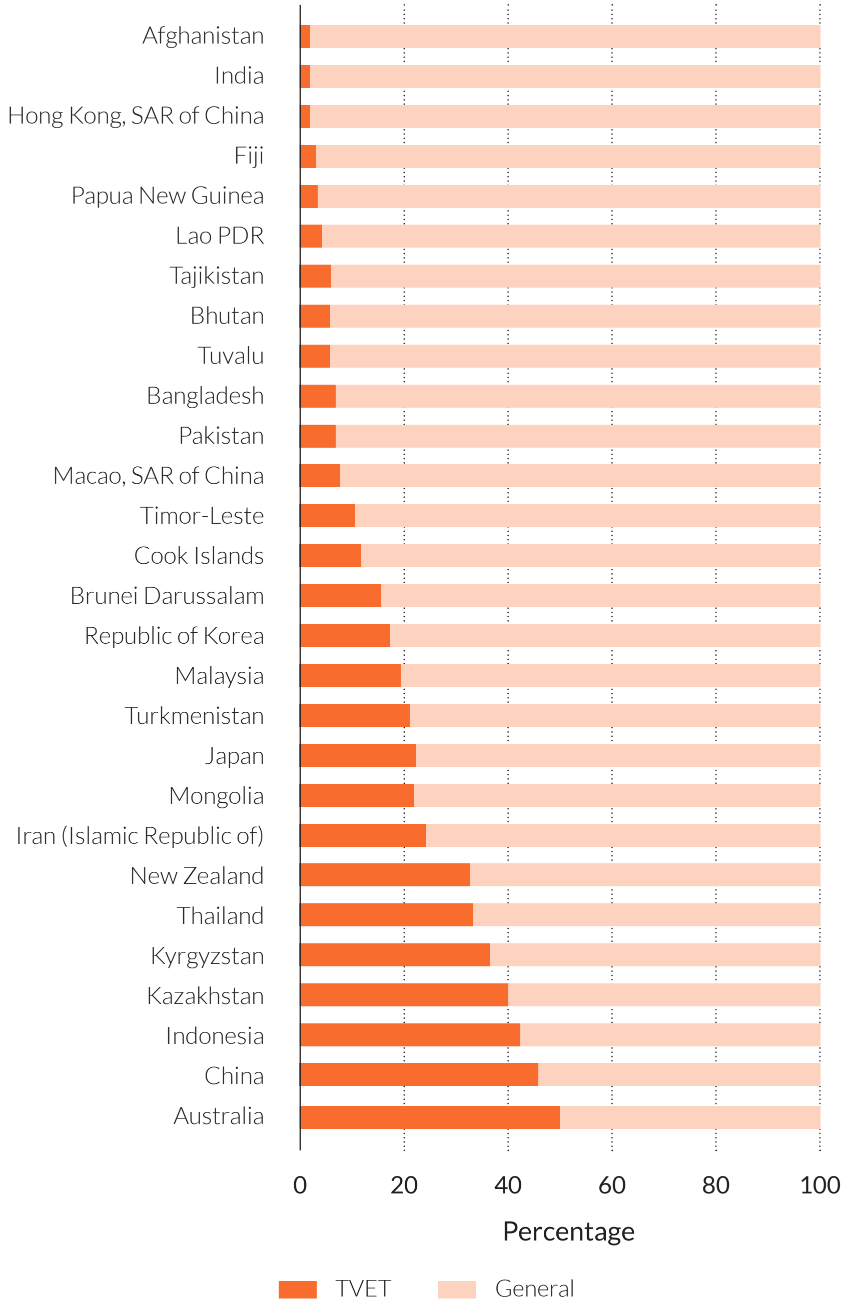
By innovating the pedagogical approaches to both formal and informal TVET, ICT can improve the employability of workers. This applies to people from marginalized and disadvantaged groups – if implemented and integrated adequately and purposefully. Ultimately, ICT-enhanced pedagogies can help build an inclusive society whereby all persons, regardless of their status, are equally supported to grow socially and economically.

This chapter highlights five promising cases in which ICT has been used to shift the paradigm of TVET and skills development in six countries and territories (Australia, Hong Kong (China), New Zealand, Philippines, Republic of Korea and Singapore). These cases illustrate advanced applications of ICT for retraining, virtual reality-based simulations, social learning and integrated work-based learning experiences from which adults have benefited. The chapter begins with an outline of TVET and skills development in Asia and the Pacific and concludes with policy recommendations to guide TVET institutions on ICT-supported practices essential for the future of work.

TVET and skills development in Asia and the Pacific

Despite the recent spotlight on TVET in the international development community, participation in technical and vocational courses is still significantly lower than in general education. In this region, the percentage of students in upper-secondary schools who were enrolled in TVET as of 2013 was as low as 3 per cent in Afghanistan and India and less than 10 per cent in many other countries (figure 9.1). Such a low participation rate demonstrates the failure of the TVET sector to provide quality vocational training and skills development for all persons. Clearly, it is in need of more effort to reach its full potential as a driver of inclusive socioeconomic development.

Figure 9.1: Percentage of students in upper-secondary education enrolled in TVET in selected countries, 2013 or latest year



Source: UIS, 2014.

In a 2015 report, the United Nations Educational, Scientific and Cultural Organization (UNESCO) pinpointed seven factors that keep TVET from being the best it can be: (i) the global focus on general basic education and hence underinvestment in TVET; (ii) poor technical and institutional capacity of formal TVET systems, including teachers; (iii) low social perception and status of TVET; (iv) a weak analytical knowledge base resulting from a lack of investment in research; (v) a lack of collaboration and communication between industry and TVET institutions; (vi) patchwork-type policy responses rather than long-term strategic reforms; and (vii) imported or borrowed policy without adequate contextualization.

UNESCO recommended a reconceptualization of the TVET system: as an overall lifelong learning system. Such a transformation could be facilitated by expanding and diversifying access, expanding work-based learning and cooperation with businesses and by enhancing the quality and relevance of TVET curricula and service delivery.

The urgent need is reflected in the Asia-Pacific Regional Strategy for Using ICT to Facilitate the Achievement of Education 2030.[89] In adopting the strategy, most governments in the region recognized TVET and skills development as a top priority and agreed to integrate ICT to reform their national curricula and service delivery.

Considerable research on modern technologies makes a fundamental assumption that learning is essentially a social phenomenon (Valentine, 2011; Cox, 2003; Haddad and Draxler, 2002; Wenger, 1998). ICT-enhanced pedagogies improve the employability of workers in the following ways.

1. **ICT can promote inclusiveness by making flexible lifelong learning available to a wider community:**

   ICT offers persons who dropped out of basic education or who want to return to college for skills development with ubiquitous formal and informal learning opportunities. Learning analytics, on the other hand, automatically process data generated by learning management systems to provide customized learning paths based on student learning style, strengths and weaknesses.

2. **ICT can provide more effective skills development through authentic and simulated learning:**

   Serious games[90] and simulations are technologies increasingly used in education to give learners more control and opportunities to manipulate different parameters in their experiments. Augmented reality and virtual reality technologies allow students to apply theory to practice in a realistic, safe and controlled way. These technologies create authentic or close to realistic learning environments that were not previously available for such reasons as the high cost of installation and non-availability of internship opportunities.

89 The Regional Strategy for Using ICT to Facilitate the Achievement of Education 2030 was adopted during the Asia-Pacific Ministerial Forum on ICT in Education, Seoul, 11 May 2017.

90 Computer games with educational purposes.

3. **ICT can enhance acquisition of transversal skills through learning engagement and social learning:**

   With blended learning and flipped classroom[91] techniques, ICT can help learners prepare for classroom discussion and activities whereby they can exchange ideas and deepen their knowledge. In addition, extensive social networks enable just-in-time learning from their peers and the wider network of experts.

4. **ICT can better prepare the workforce for future workplaces through reflective learning and knowledge creation:**

   Learning evidence in e-portfolio and real-world projects motivate students to develop the reflective capacity necessary to sustain self-directed learning. E-portfolio and project-based learning can change the way students respond to holistic and process-driven assessments. These pedagogies encourage students to be knowledge producers rather than knowledge consumers.

Promising cases

This section presents case studies of TVET organizations in the Asia-Pacific region that are sizable in terms of student enrolment (at least 1,000 students as of January 2016) and have implemented enterprise-level e-learning[92] as well as staff development. The selection criteria sought organizations that demonstrated strong ICT strategies. These cases illustrate advanced applications of ICT in teaching and learning that go beyond basic access to computing networks and services. Analysis of the case studies resulted in policy recommendations that can help guide TVET organizations in their ICT integration strategies to achieve the outcomes of better access, relevance and inclusion. There are also useful insights for policy-makers, including those from developing economies in the Asia-Pacific region, to re-think their pedagogies for TVET and to be strategic in their ICT implementation plans.

Ten organizations from six countries in the Asia-Pacific region participated in this study:

- Box Hill Institute, Australia
- Challenger Institute of Technology, Australia
- Vocational Training Council, Hong Kong, China
- Universal College of Learning, New Zealand
- Waikato Institute of Technology, New Zealand
- Informatics Holdings Philippines
- TESDA Women's Center, Philippines
- Online Lifelong Education Institute, Republic of Korea
- Institute of Technical Education, Singapore

91 A classroom pedagogy that reverses the traditional mode, whereby students do their reading and listen to the lecture at home and come to the classroom to reflect, discuss and debate.

92 E-learning is at the enterprise level when learning systems are available to all teachers and students in the institution, as opposed to systems that are available only to a few schools or departments.

- Singapore Polytechnic, Singapore.

Representatives from these organizations participated in an online survey and some contributed more than one case study on innovative practice of ICT integration in their TVET delivery.

This chapter features five of those case studies as promising practices:

1. **Towards ubiquitous lifelong learning** – The emphasis of this case study from the Challenger Institute of Technology in Australia is the use of ICT to improve access for adult learners as well as inclusion to meet diverse learner needs.

2.&3. **Authentic and simulated learning** – These two case studies, one from the Online Lifelong Education Institute in the Republic of Korea and the other from the Institute of Technical Education in Singapore, illustrate the relevance of ICT in supporting hands-on practical training to achieve skills mastery.

4. **Enhancing learning engagement and social learning** – This case study from the Singapore Polytechnic demonstrates how ICT supports the development of generic skills competencies of learners with different abilities.

5. **Promoting reflective learning and knowledge creation** – This case study, from Box Hill Institute in Australia, stresses the importance of using ICT to build lifelong learning competencies that can help graduates adapt in an increasingly volatile and complex labour market and other environments.

Each case study covers the institutional background, the challenge that the TVET organization used ICT to overcome, a description of the project and the learning insights for increasing access to quality training through the use of ICT to shift the paradigm of TVET.

Toward ubiquitous lifelong learning

Project title: Online learning for adults

Institution: Challenger Institute of Technology

Country: Australia

Institutional background: The Challenger Institute of Technology is a Technical and Further Education (TAFE) institution based in Fremantle, Western Australia. It offers more than 140 career development programmes that cater to industry training areas. In April 2016, South Metropolitan TAFE incorporated Challenger Institute of Technology and now provides services to both urban and regional communities.

Challenge: One of the Challenger Institute's post-school programmes for adults is the Certificate II in General Education for Adults. Students in this programme are from varying backgrounds, including mature-age students returning to work or education and students with special needs, limited education background or undertaking training as part of a welfare scheme. It is a traditional classroom-based programme, focusing primarily on mastering learning. Distance learning is possible, with paper-based resources mailed to students who then communicate with instructors via telephone and email. The diversity within the student cohort means that some students struggle with learning in a classroom setting. Some do well because they like the social aspect of classroom learning, while others find it intimidating, non-productive or unsafe. And then some distance learners struggle because they feel isolated.

After realizing that many people were not benefiting from the training due to these learning realities, the institute administrators decided to provide a better, more needs-driven service to students.

Project detail: The online version of the Certificate II in General Education for Adults aims to:

- provide a more individualized, student-focused learning experience, with a strong relationship between teachers and students;
- offer a more productive, supportive learning environment for distance learners;
- provide a more flexible and accessible learning environment for students; and
- produce a product that is accessible to students from great geographical distances.

In designing the online programme, the institution applied constructivist[93] pedagogies because most of the learning activities were cognitive driven, and it would ensure that learning outputs and products would be individual. Critical and reflective practices became the core of the programme. Students are now required to develop a deep understanding of "why" rather than simply recollecting facts. Instructors develop tasks and assessments based on the students' knowledge, previous experiences and personal interests at the start of the programme.

Because the programme is for adult learners who may be lacking confidence, the training is partly geared towards increasing that confidence while nurturing self-directed learning habits. Activities are designed to follow a trajectory of increasing autonomy among each learner, albeit with a teacher's supporting presence.

While the programme was designed to be fully deliverable online, students can opt for classroom delivery if they feel a need for face-to-face interaction with their teachers and peers.

Learning insights for increasing access to quality training: Online instruction provides learners with greater flexibility in accessing learning resources and support. Geographical location is no longer an issue for students, which encourages and facilitates lifelong learning. Such learning can be pursued anywhere and at any time. The course structure nurtures self-directed learning capacity, and the students find the learning environment safe and more student-centred.

93 Constructivist pedagogies are based on the belief that learning occurs when learners are actively involved in the process of sense-making and knowledge creation, as opposed to passively receiving information.

For the programme to be effective, the TVET organization requires time and commitment from the teachers. The teaching team must be as committed to pastoral care as they are to content. The Challenger Institute of Technology recognizes the need for continuous improvement of programmes and therefore adjusts the online programme, based on feedback from students.

A contributing factor to the course's success was the Australian Government's policy of promoting flexible learning. The Australian Flexible Learning Framework (2008–2011) policy covers e-learning through vocational education and expands training participants' access to professional development opportunities, products, resources and support networks in an increasingly technology-driven learning environment. The Flexible Learning Advisory Group, a policy advisory group on national directions and priorities for ICT in the TVET sector, manages the framework (including the regulatory guidelines, platform, resources and network of practitioners).

Authentic and simulated learning

Project title: Virtual training

Institution: Online Lifelong Education Institute

Country: Republic of Korea

Institutional background: The Online Lifelong Education Institute (OLEI), within the Korea University of Technology and Education, is a hub for online vocational training specializing in technology and engineering. The institute relies largely on interactive and experiential e-learning practices by incorporating new technologies into its online learning environment.

Funded by the Korean Ministry of Employment and Labour, OLEI has developed and now offers more than 200 online courses free of charge to industrial workers and jobseekers on mechanics, electronics, mechatronics, ICT, design, materials, architecture and chemistry.

Challenges: In the past, if a TVET institution wanted to teach students how to handle industrial equipment, it either had to install the equipment, which is expensive, or schedule a day trip to a site that allowed the students to see the equipment in practice. In either case, the students could not do certain things, such as take apart and reassemble the equipment. And instructors could only teach using books, images or video clips; interactive hands-on activities were typically not possible.

Project: Recognizing the need for more hands-on learning with industrial equipment, the OLEI administrators developed virtual training content using simulators, emulators and virtual reality (and augmented reality) software. Through specialized ICT, students can now learn about various types of equipment, including macro-sized tools, ultra-mini tools and highly expensive equipment that institutions cannot afford to buy. They also learn how to stay safe in dangerous work situations.

Through the online platform (http://vt.e-koreatech.ac.kr), students log in to access the learning content at any time. This environment enables them to study when it is convenient and lets them practise as much as they want. Since 2007, OLEI has developed 31 virtual training courses in subject areas such as mechanics, electronics, mechatronics, architecture, design and new energy and offers them in 141 training centres, both public and private. Deploying these courses, the centres have so far trained 24,418 students.

OLEI developed three types of virtual training: component, scenario and equipment practice (figure 9.2). The component type helps learners understand the inner structure of equipment by enabling them to take it apart and put it back together using 3D modelling. The scenario type helps learners understand how to operate equipment by following the prescribed procedure. The equipment practice type generates a diversity of practice environments in which learners control the equipment until they attain the right result.

Figure 9.2: Three types of virtual training content and examples of the equipment the training targets

Component	Scenario	Equipment practice
Type of equipment • Turbo refrigerator • Hybrid automobile • Clean diesel automobile • Wind generator system	**Type of equipment** • Absorptive hot and chilled water system • Concrete construction • Surface mount technology in-line system • Manufacturing process for solar batteries	**Type of equipment** • Electro-hydraulic control survo control • Siemens programmable logic controllers • Proportional hydraulic control • Operation of manufacturing • Equipment for semiconductors

Source: Online Lifelong Education Institute.

Using the virtual training ICT, learners experience how equipment works and under what conditions. They can master the handling procedures for each equipment item and learn how to react to various emergency situations at work.

OLEI uses virtual training technology in the context of student-directed teaching, based on constructivism and the experiential learning approach, which emphasizes active, hands-on learning and offers diverse learning experiences to ensure that students master the desired trade skills. OLEI operates on the belief that students learn better if they can control their learning and make their own choices with the learning content.

Learning insights to enhance skills development: The OLEI administrators surveyed students from 2013 to 2015 to evaluate the virtual training courses. They found a high level of satisfaction. OLEI also realized that providing virtual training content freely over time to its training centres reduced vocational training costs. For this practice to be effective in supporting skills mastery, it is important to choose subject areas that have a good fit for the virtual training content. While the virtual training content allows students to work with expensive equipment or learn a machine in a dangerous work situation, developing the software is also expensive. Hence, OLEI had to choose wisely and think carefully about how long the content would be relevant before the technology became obsolete.

Virtual and augmented reality

Project title: Virtual and augmented reality

Institution: Institute of Technical Education

Country: Singapore

Institutional background: The Institute of Technical Education (ITE) is a post-secondary education institution established in 1992 under the Ministry of Education. As a principal provider of career and technical education and the developer of national occupational skills certification and standards, the ITE mission is to create opportunities for students and adult learners to acquire skills, knowledge and values for employability and lifelong learning. With emphasis on practical training, its "hands-on, minds-on, hearts-on" approach is suitable for TVET delivery.

Challenge: In the past, theory was largely taught using conventional methods, while practical lessons were given in authentic learning spaces, such as a hotel, restaurant or aeroplane hangar. In such contexts, students learned how to deal with real customers, equipment and work situations. While lecturers tried to incorporate situated learning into their lessons as much as possible, they faced challenges for the following reasons:

- Certain tasks were not replicable due to safety concerns (heavy shipyard equipment or running aircraft engines, for example).
- Certain tasks were difficult to replicate due to high costs and limited budget (such as floristry courses where students have to decorate venues with floral arrangements for large-scale events).
- Authentic work environments were not replicable (adverse weather conditions at sea, for example, cannot be scheduled).

Project detail: Due to its recognized need for more authentic learning experiences, the ITE academic leaders introduced two types of immersive technologies: 3D virtual reality and 3D augmented reality. The school worked closely with technology solution providers to design relevant learning activities for students based on the curriculum requirements.

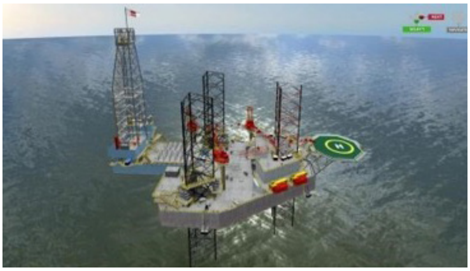
3D virtual reality system

The multi-wall 3D virtual reality system (iCube) is a revolutionary PC-based, multi-sided immersive environment in which students are surrounded by virtual images and sound. iCube is a high-end visualization system that can be configured with four to six walls made of light-enhancing rigid material. Students interact with an authentic 3D environment using motion-tracking devices and the system's built-in collaborative capabilities to discuss and explore solutions. For example, students in the marine and offshore technology course use the iCube technology to practise their skills on a simulated oil rig platform (figure 9.3). Using this ICT, students can safely train for adverse weather conditions, such as heavy rain and strong wind, and learn to react wisely to a variety of environmental conditions and associated job hazards.

In the marine course, one of the tasks involves lifting a nearly one-tonne pipe, a risky manoeuvre that can cause harm to workers if safety measures are not closely followed. Using virtual reality technology, students can undertake the task and experience the consequences of not following safety measures without being physically hurt. Having experienced this, the students can better understand that lives can be lost if workplace safety is not taken seriously. In the iCube, they can experiment with different scenarios and have fun while learning.

Feedback from students indicated that almost all of them like this mode of learning, and most of them requested more courses that incorporate immersive technologies for learning because they can hone their skills in a realistic and safe environment.

Figure 9.3: 3D virtual oil rig platform for training purposes (safety practice during pipe-lifting operations)

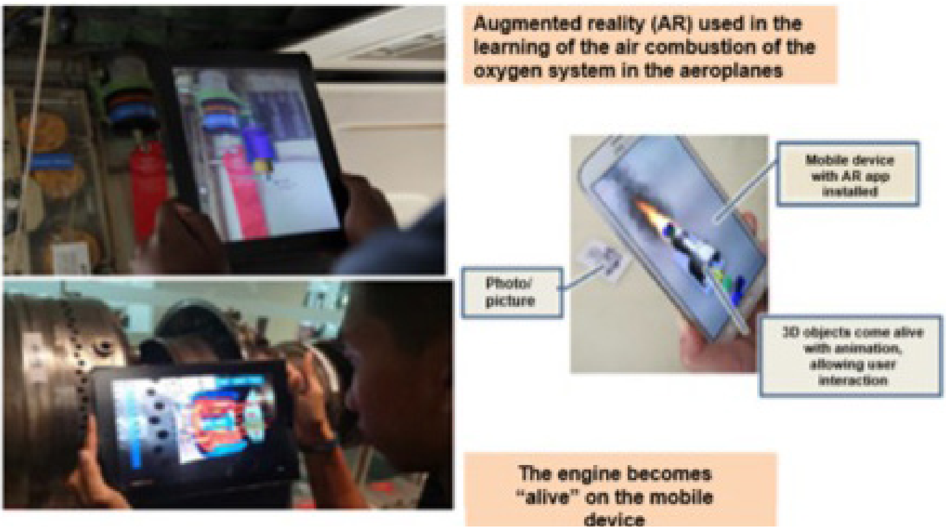


Source: Institute of Technical Education.

3D augmented reality applications

The 3D augmented reality applications enable students to interact with the real-world environment using real-time data, thus contextualizing knowledge for just-in-time learning. These augmented reality applications superimpose relevant data onto the real world, in the form of interactive 3D models or 2D information through graphical markers or quick response codes. For example, students in the aerospace technology course can load 3D aircraft engine models into mobile devices and watch simulations of these engine parts in the augmented reality viewer. These 3D simulations help them to visualize details of complex systems and the operational flow inside the equipment. With the augmented reality application, students who previously experienced difficulty in understanding how air combustion works in an aircraft engine can now visualize and appreciate how complex components work together (figure 9.4).

Figure 9.4: 3D augmented reality technology to learn about air combustion



Source: Institute of Technical Education.

The 3D virtual reality and 3D augmented reality technologies make immersive hands-on practice possible, thus expanding the scope of authentic learning spaces for ITE students. By providing a multi-sensory experience in specific work settings, students can appreciate the scale and constraints of work environments and the complex interdependency of the component parts of a system or workflow. Students are also required to use their judgement to make task-based decisions and must face the "consequences" of their decisions, albeit virtually. Students can use the technology in both independent learning and collaborative problem-solving activities in the context of specific work situations, thus promoting authentic learning.

Learning insights to enhance skills development: As with any technology, the design and development of 3D virtual reality and augmented reality learning resources must be driven by curriculum requirements to justify the high cost for industry-specific skills development. For the technology to be appropriate to the curriculum, it is essential to have close partnerships between schools and the immersive-technology-solution providers when developing the content.

Another essential point is to train the teaching staff on using the technologies effectively to ensure acquisition and retention of workplace knowledge and skills by their students. Plans to increase use of the technology also need to be put in place. Use of the 3D virtual reality system requires a dedicated space. The cost is significant, so a dedicated budget is also required, especially if immersive environments are installed on multiple campuses. For 3D augmented reality, the cost is lower because students can use their own mobile devices or school-supplied devices.

Enhancing learning engagement and social learning

Project title: Flipped classroom

Institution: Singapore Polytechnic

Country: Singapore

Institutional background: The Singapore Polytechnic was set up in 1954 to produce highly skilled graduates to meet the critical human resource needs of the economy. Today, it offers 47 full-time diploma courses and 32 part-time courses through ten academic schools. The Singapore Polytechnic prepares its students for university and the workforce and has an enrolment of about 16,000 full-time and part-time students (Singapore Polytechnic, 2016).

Challenge: Previous teaching practices at the Singapore Polytechnic consisted mainly of traditional face-to-face lectures and tutorials, with emphasis on practise and projects. A few years ago, the Singapore Polytechnic management recognized the need to harness technology to train students to become independent, self-directed workers adept at using technology to discover and use information to solve real-world problems collaboratively. This was a challenge, however, particularly when students lacked motivation to learn.

Project detail: In 2014, the School of Electrical and Electronic Engineering implemented a three-phase "flipped classroom" (pre-class, in-class and post-class) pilot project among first-year students studying digital electronics.
The three phases of the flipped classroom:

1. For the pre-class phase, students watched short video clips on a particular topic at home and familiarized themselves with the basic concepts and facts.
2. In class, lecturers used short quizzes to check students' understanding of the material covered in the video clips, evaluate student readiness for more difficult topics and determined the topics that need elaboration during class. The quiz results enabled the lecturers to adapt instructional strategies according to students' specific learning needs. These might consist of mini lectures on topics that students did not perform well in the quiz; opportunities for real-world applications of content to solve problems as well as a setting for collaborative problem-solving, peer discussion and assessment. Lecturers could also conduct a mid-point quiz to validate understanding and provide extra learning support for low-scoring students;
3. At the end of every lesson, students do an exit poll to evaluate the effectiveness of the learning experience and to determine areas that they had not fully understood.

To address difficult topics flagged by the students, lecturers created a “question and answer” video to clarify complex concepts.

To develop lesson packages, the lecturers use Camtasia, Screencast-o-matic and Softchalk[94] software. Most institutions would use a learning management system (usually at the enterprise level) as the platform to deliver electronic learning packages and e-learning activities. For quizzes, the lecturers used quiz tools, like Socrative and Kahoot.[95] All students were required to bring their own laptop computer to class to access the learning resources and online activities. Throughout the semester, the WhatsApp online communication was used to inform students of new resources and quiz deadlines. This app was also used to maintain a two-way communication and ensure timely feedback with students.

Students were encouraged to learn independently, search for new information to solve problems and collaborate with their peers online. Learning with and through technology to create knowledge is an essential skill for the modern technology-driven workplace. With the flipped learning resources available online, students are able to learn at their own pace and the quizzes provide useful feedback to them.

At the end of the pilot testing, Singapore Polytechnic conducted a student survey to assess the experience and its impact on their learning. Most students found that the pre-class learning materials and contact with their lecturers via WhatsApp were useful in preparing them for the face-to-face sessions. In the classroom, students enjoyed the use of Kahoot and the class discussions. The final quiz was seen as useful in clarifying areas in which they needed more work, and students saw it as a means of providing feedback to their lecturers. Overall, most students preferred the flipped teaching method, but they were concerned that it could potentially increase their workload.

The performance of the students who participated in the flipped classroom pilot was analysed and compared to that of students in classes using conventional methods. The pilot class outperformed the cohort, and the outperformance was significantly larger when compared against students of similar academic backgrounds. By 2016, all schools within the polytechnic adopted the flipped learning approach.

Learning insights to enhance skills for the future: For the flipped classroom method to be effective, it is important that lecturers orient their mindset to learner-centric delivery whereby learners are self-directed and less dependent on lecturers to disseminate information to them and understand how their graduates will be operating in the future workplace. For example, they should have the professional discipline not to simply re-teach the content but plan appropriate in-class activities that build on the home learning and emphasize the application of knowledge. The combination of high-effect teaching methods

94 Camtasia is a screen recorder to create video tutorials and presentations. Screencast-O-Matic is a free screen recorder for instant screen capture and sharing. Softchalk is a cloud-authoring tool for easy creation of interactive content.

95 Socrative is an instant response tool that allows teachers to engage their students through quizzes and polls. Kahoot is a game-based platform that makes learning fun by turning it into an interactive and social experience.

with supporting communication and educational web tools must be reviewed frequently to ensure that the workplace practice of scaffolding for learning is constantly reinforced.

Promoting reflective learning and knowledge creation: E-portfolio

Project title: E-portfolio

Institution: Box Hill Institute

Country: Australia

Institutional background: The Box Hill Institute is a leading vocational and higher education provider known in Australia and overseas for its collaborative and creative approach to education. It offers a wide variety of courses to local and international students and various delivery modes, including full-time, part-time and off-campus courses. As of 2016, Box Hill had about 40,000 students enrolled in its campuses in Australia and in licensed partners overseas.

Challenge: Box Hill discovered, via feedback surveys, that many students thought that the induction process at the institute could be improved in meeting their needs and in ensuring that they embarked on a successful learning pathway, both during their studies and afterwards. The Box Hill management also recognized that the institution did not have an organization-wide way of embedding e-learning that would encourage lifelong learning among its students. They decided that a methodological and organizational response was necessary to prepare the institution to connect between classroom learning and workplace learning as well as between teachers, the institution and employers.

Project detail: Recognizing the need to assist students in acquiring pathways for lifelong learning and to embed e-learning while also supporting connection and communication between classroom learning and workplace learning, Box Hill introduced the Mahara e-portfolio system. An e-portfolio can be understood as “a learner-driven collection of digital objects demonstrating experiences, achievements and evidence of learning” (O’Neil et al., 2013). Thus, e-portfolios are an evidence-gathering tool that students can use to show their learning achievements and to document the competencies they have attained from training courses and work-based experiences (including apprenticeships and studentships), thus allowing them to plan for recognition of prior learning.

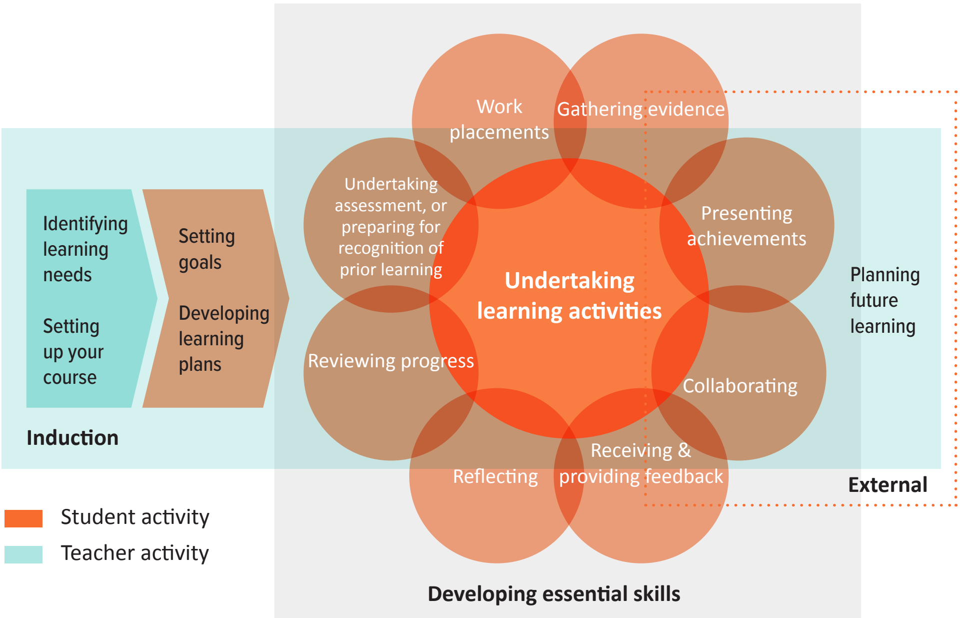
The Mahara e-portfolio system enables learners to capture evidence of their learning through a variety of media (video, audio, documents, blogs and plans) and to share that evidence with selected audiences. Mahara combines a range of social collaboration tools, including blogs, comments, groups, forums and profile pages, and integrates the use of mobile devices.

An e-portfolio can be a vehicle for (figure 9.5):

- supporting transitions and student mobility
- planning and reflecting on learning and career development

- recognizing skills and learning styles
- verification of qualifications
- security and control of private information
- recording evidence of employability skills.

Figure 9.5: Box Hill Institute's e-portfolios support learner transitions



Source: Box Hill Institute.

The e-portfolio teachers who advocate the use of the e-portfolio also designed assessment strategies that integrated summative assessment tasks to ensure that the e-portfolio became an integral component of the course structure. Teachers can use the e-portfolios as a tool for learning, for example, by disseminating instructional videos for students to watch and then asking them to film visual diaries of their tasks and share those via their e-portfolios. This promotes reflective learning and knowledge creation.

While students tend to use e-portfolios collaboratively, teachers tend to use them for assessment purposes or as a means of communication. E-portfolios have lifelong learning applications, such as on-the-job applications and building a resume, and are used by Box Hill students in many fields and contexts (table 9.1).

Table 9.1: Box Hill Institute's e-portfolio learning contexts

Teaching centre	Context
Biotechnology	Work placements
Creative industries	Industry portfolios for fashion and music
Business programmes	Work placements
Hospitality	Work placements and industry-based recognition of prior learning
Health and community services	Work placements and industry-based recognition of prior learning

The e-portfolio system is based on a student-centric and process-oriented pedagogical approach that encourages students to develop their ability to plan, synthesize, share, discuss, reflect and create knowledge. The system supports Box Hill Institute's efforts to equip students with the skills, knowledge and attitudes to apply their learning to new situations, solve problems, work creatively and cooperatively and engage in lifelong learning. Box Hill believes that e-portfolio-based learning encourages rich and complex processes of planning, synthesizing, sharing, discussing, reflecting and giving, receiving and responding to feedback and that this process is as important as the end product. Use of e-portfolios goes beyond course delivery to support student-led, lifelong and life-wide learning objectives through informal, non-linear and sometimes chaotic learning processes.

Learning insights to support lifelong learning: For the e-portfolio system to succeed, it is essential that an institute-wide strategy is adopted, with support for the system at every level of the organization. The institute's assessment strategies should be adapted to include e-portfolios as an integral tool for summative assessment.

Buy-in from teachers and their commitment to the e-portfolio system is critical for its success. Teachers provide the workplace context and support. Training for teachers must be conducted not only when the system is introduced but also at frequent intervals every year to address concerns, adapt to emerging needs and maintain the momentum of the system.

Students also require both initial training and ongoing training. The training should go beyond explaining how to use the technology to cover concepts of lifelong and life-wide learning and to explain how e-portfolios can improve classroom and workplace-based assessment and expand collaboration. It is also necessary to design and develop templates suitable for local industry-specific context and courses.

The organization should solicit teachers' opinions and inputs because they will be both users and managers of the system. The use of e-portfolios should also be integrated into workplace-learning contexts. This requires explaining the benefits of e-portfolios to workplace managers. Overall, it is vital to have clear communication with all stakeholders.

Organization-wide policies are needed, along with a phased approach. First, expand the programme from first-year students (orientation objectives) to senior students (collection of learning evidence). Second, transition from teacher-led e-portfolios to student-driven e-portfolios. Then move on from standalone e-portfolios to those that are integrated with all learning and assessment activities into students' learning workflows. And last, adopt a customized approach for each industry and profession.

ICT integration in the TVET education system

While the five case studies featured here illustrate how the application of ICT can improve the access and quality of teaching and learning, they also highlight the conditions or factors that contributed to their success:

1. Strategic planning and strong management commitment to ICT integration.
2. Redesigning curricula and selecting technologies that can reach a diversity of learners.
3. Leveraging partnership with industry to co-develop and co-manage curriculum and learning resources to minimize skills mismatch.
4. Harnessing pedagogies to help learners develop the generic skills competencies required in the future economy.

The following matrix (table 9.2) was created to measure the degree of ICT integration in the ten TVET organizations selected for analysis and to further determine the conditions and factors that best promote the use of ICT. The matrix consists of four domains and four stages of development.

Table 9.2: ICT integration matrix for the study

Level of ICT integration	Foundation	Emergent	Innovative	Transformative
1. School ICT Leadership (Strategic-Organizational Readiness)				
1.1 Level of ownership and influence of school leaders				
1.2 Focus of ICT implementation				
1.3 Level of engagement of students, staff and partners				
1.4 Processes for ICT implementation to support learning				
2. Design and development of ICT-enabled learning experiences (pedagogical readiness)				
2.1 Design of ICT-enabled learning experiences				
2.2 Focus of schools' professional learning strategy				
2.3 Learning communities				

Level of ICT integration	Foundation	Emergent	Innovative	Transformative
3. Deployment of ICT for learning (learner readiness)				
3.1 Level of higher-order thinking facilitated by ICT				
3.2 Level of ICT-enabled learning				
3.3 Use of ICT tools to support learning				
3.4 Extent of student involvement in curriculum and learning activities facilitated by ICT				
4. IT and estate infrastructure and support (technical readiness)				
4.1 Access to ICT resources in digital spaces				
4.2 Physical set-up of learning spaces				
4.3 Availability of ICT systems and tools to support learning				
4.4 IT helpdesk				

For this study, the matrix was used by the respondents with each of the ten selected TVET organizations self-rated the degree of transformation of their respective institution. The measure of each indicator's contribution was completed with defined descriptors to differentiate the four levels of progress (see table 9.3).

Table 9.3: Four levels of progress among the ten selected TVET organizations

Level of progress	Description
1. Foundation	Beginning the e-learning journey with ad hoc ICT-based practices and technologies
2. Emergent	Consistent ICT-based practices and technologies on a school-wide basis
3. Innovation	Sound integration of ICT-based practices and technologies with processes that ensure scalability beyond the school
4. Transformation	Sound and systematic integration of ICT-based practices and technologies with policies and processes that are evidence-based, thus ensuring scalability and sustainability beyond the school

The four levels of integration must be interpreted within the context of each domain and each indicator. The level of integration describes the organization's current ICT practices that are prevalent, for example, representative of at least 50 per cent of the student and teacher populations. Where the requirements of a level were only partially met, the lower preceding level was assigned. These four levels indicate a progressively deeper level of ICT integration. Hence, the attainment of all the lower levels had to be satisfied before the next higher level could be assigned.

For the study, the researchers computed the average score in each organization for all indicators for each domain. This score was used to determine if readiness for that domain was closest to foundation, emergent, innovative or transformative. Table 9.4 summarizes the readiness self-rating of each organization in all four domains.

Table 9.4: Summary of readiness self-rating by ten selected TVET organizations in the ICT integration matrix

	Foundation	Emergent	Innovative	Transformative
Leadership (strategic-organizational readiness)		• Box Hill Institute • Challenger Institute of Technology • Universal College of Learning • TESDA Women's Center • Singapore Polytechnic	• Vocational Training Council • Waikato Institute of Technology • Informatics Holdings Philippines • Online Lifelong Education Institute • Institute of Technical Education	
Teacher (pedagogical readiness)	• TESDA Women's Center • Online Lifelong Education Institute	• Challenger Institute of Technology • Universal College of Learning • Singapore Polytechnic	• Box Hill Institute • Vocational Training Council • Waikato Institute of Technology • Informatics Holdings Philippines • Institute of Technical Education	
Student (learner readiness)	TESDA Women's Center	• Box Hill Institute • Challenger Institute of Technology • Institute of Technical Education	• Vocational Training Council • Universal College of Learning • Informatics Holdings Philippines • Online Lifelong Education Institute • Singapore Polytechnic	
Infrastructure (technical readiness)	TESDA Women's Center	Challenger Institute of Technology	• Universal College of Learning • Informatics Holdings Philippines • Institute of Technical Education • Singapore Polytechnic	• Box Hill Institute • Vocational Training Council • Waikato Institute of Technology • Online Lifelong Education Institute

The analysis across the four domains of the ten TVET organizations revealed the following contributing factors for effective ICT integration:

- Because the participating organizations are from sophisticated education systems, the level of technical and infrastructure readiness was high.

- There was a relatively high level of ICT integration in the student and leadership domains: The current generation of learners is technology savvy and, when given the opportunity, they make the most of ICT to support their own learning. Leaders of these organizations recognized the value of ICT for learning outcomes, and leadership was recognized by most organizations as critical to the success of e-learning.
- Half of the organizations were at either the foundation or the emergent level for teacher readiness. In these organizations, there was a need to develop teacher competency in the design and delivery of e-learning and to support a coherent strategy for teacher training and professional communities.

Policy recommendation

For a TVET institution to achieve ICT-enhanced access, relevance and inclusion in skills development and training, multidimensional readiness is required – at the organizational, pedagogical, learner and technical levels. The following policy recommendations can help guide TVET organizations to focus ICT-supported practices for enhancing greater access and improving skills development and the attainment of generic skills competencies essential for future workplaces.

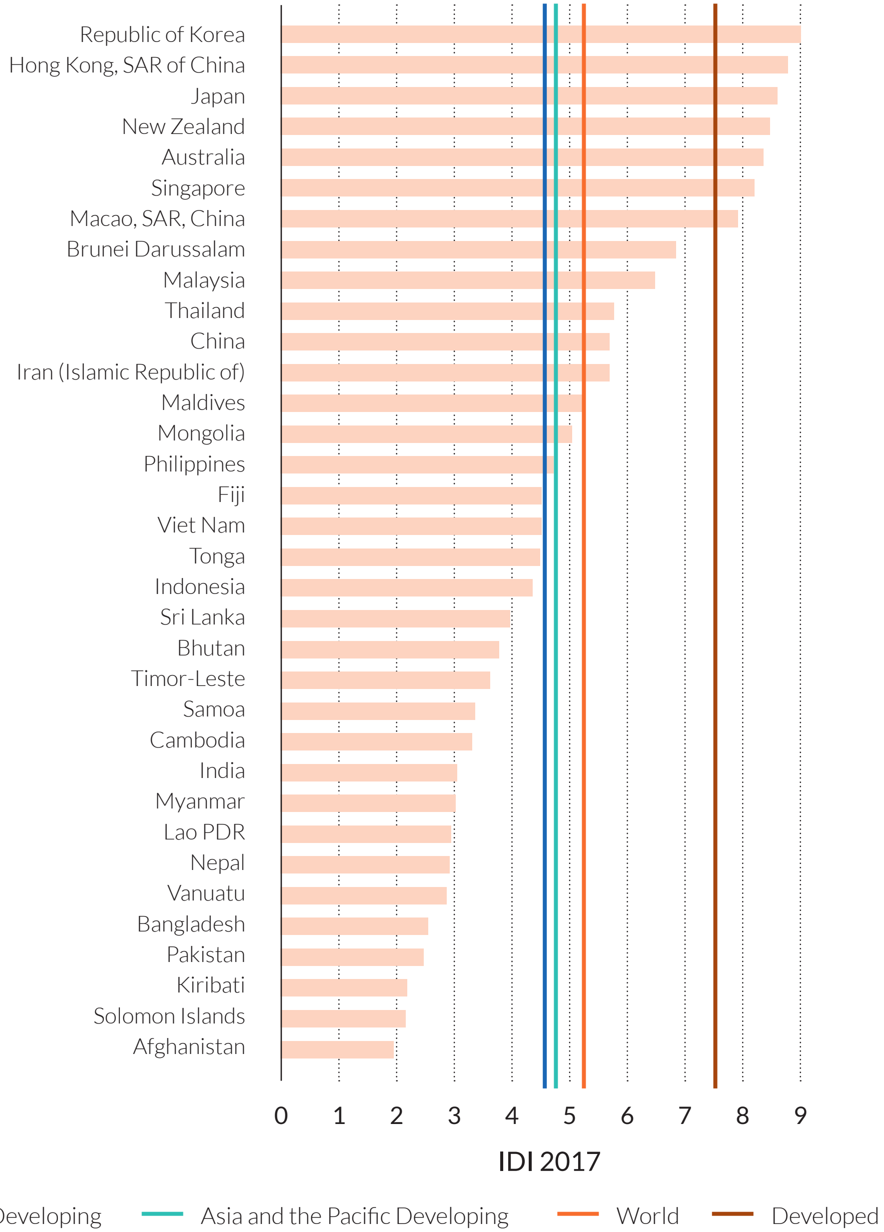
Make quality TVET training more accessible and inclusive

Organizations should explore innovative ways of meeting the diverse needs of students in curriculum delivery, such as learners who are also working and have multiple commitments (including family responsibilities) and those who are less mobile or disadvantaged for various reasons (including people with disabilities or people living in remote areas). The case studies show that ICT-enabled training delivery has the potential to expand TVET capacity so that programmes are accessible across geographical boundaries and available to workers. Blended learning and flipped classrooms are commonly used pedagogies that provide flexibility for students. Independent learning must be supported with interactive content and easy-to-use tools, like online quizzes and assignment submissions. Conducting online learning activities with tools, like blogs and discussion forums, can enrich the teacher-student and student-student interaction.

Invest in ICT infrastructure for TVET institutions to minimize digital divides

While the potential of new technologies to transform skills development and TVET is unprecedented, actual benefits in TVET institutions are uneven in the Asia-Pacific region. One of the main reasons is a persistent disparity in the level of ICT access and use. Three of the world's top-ten countries and territories with the highest ICT-connectivity rates are in this region: The Republic of Korea, Hong Kong (China) and Japan. But the region includes some of the least connected nations, such as Afghanistan, Bangladesh, Kiribati, Pakistan and Solomon Islands (figure 9.6)

Figure 9.6: Level of connectivity in ICT Development Index, by Asia and Pacific country, 2017



Note: The ICT Development Index values correspond to a 2014 report by the UNESCO Institute of Statistics: Learners in Singapore, the Republic of Korea and Hong Kong (China) enjoyed 100 per cent of broadband Internet connectivity at the secondary school level, while Bangladesh, Nepal and many other countries had less than 10 per cent of their schools connected (UIS, 2014).

Source: ITU, 2017.

The implications of such digital divides in TVET institutions can be more serious than one might think. ICT is a double-edged sword that, depending on how it is used, can either make the inequality even deeper and hamper socioeconomic development or close the gap between the more and the less privileged. To avoid potential inequality caused by digital divides, it is strongly recommended that a TVET institution or a government take a phased approach, strategically allocating resources for the integration of ICT in education for the next five years to progressively reach a final long-term vision. The starting point must be a strong focus on building the ICT infrastructure to meet and even surpass the foundation level of technical readiness (table 9.1). In doing so, the institution or government must pursue all possible measures to provide equal access to ICT for all persons, regardless of gender, income, disabilities and geographical challenges.

Seek partnership with industry and employers to ensure that graduates' skills are relevant

One of the major criticisms of TVET institutions is that graduates' skills are not relevant to the needs of the rapidly changing workplace. It is important to use pedagogy that enables students to explore real-world projects and engage in collaborative problem-solving, thereby mimicking the industry contexts. Specialized technology centres, like OLEI (in the previous case studies), could be set up in collaboration with industry players and external-funding agencies. Projects that support technologies for online learning could be co-managed by TVET organizations and industry players.

Review and redesign curricula and assessment

Institutions should review and redesign their curriculum to arrive at a more holistic assessment of students' performance and preparation for the uncertain future labour market, using tools like the e-portfolio to support their career development and lifelong learning. Such a curriculum and assessment integrate students' workflows and individual learning pathways with a career development plan through the collection of various items in their e-portfolio. Curriculum delivery should incorporate ICT-enhanced pedagogical approaches, like independent learning, group learning and reflective learning. Such approaches can give students opportunities to apply their technical, cognitive, entrepreneurial and professional competencies. These meta-learning competencies will enlarge TVET graduates' capacity for continual learning even after they join the workforce.

Support teachers

In order for teachers to design and deliver ICT-supported courses, they need to understand the double-edged impact of disruptive technologies on the jobs of the future. While some jobs may become obsolete, emerging technologies can generate sophisticated technology-enabled jobs and business opportunities that require new skill sets. Teachers must also keep abreast with the economic drivers and disruptors. Institutions can help their teachers update their knowledge and skills by giving them opportunities to work with businesses on industry projects, to get business inputs for curriculum development and business support for students' industry attachment (through apprenticeship-like training).

Teachers should also attend training opportunities related to the design and delivery of ICT-supported lessons. Training topics could include the re-design of courses for different modes of delivery to reach out to both full-time and part-time learners. They should learn motivation strategies and pedagogical techniques for online learners with different learning needs, such as self-directed learning, reflective learning and collaborative learning. Organizations should empower teachers to select and use discipline-appropriate pedagogies (such as the integration of workplace learning into course delivery). Training should also be differentiated according to teachers' competency levels.

Conclusion

The chapter examines how ICT can contribute towards ubiquitous lifelong learning, authentic and simulated learning, enhancement of learning engagement and social learning, and promotion of reflective learning and knowledge creation. The featured case studies illustrate the nature of ICT as enablers rather than as substitutes for hands-on training.

Modern technologies can help learners from marginalized groups in society overcome traditional barriers to quality education and skills training. Coupled with progressive pedagogies and modular programme delivery, learners who were previously disadvantaged by the traditional classroom-based programmes can partake of more inclusive access to training resources and learning networks through online options (provided they have computing devices and Internet access).

New technologies, such as virtual or augmented reality or virtual training packages, have provided authentic learning situations that allow learners to make mistakes in safe environments, practise more frequently and apply what they have learned.

Modern technologies with their social networking functionalities have also expanded opportunities for learners to receive peer and expert feedback to improve their task performance. For teachers, technologies have made it easier for them to facilitate their students' learning and have helped them to communicate with their students. Using ICT, teachers can arrange for students to learn independently, using the flipped classroom approach, for instance. And ICT can facilitate project learning by students in small groups. The World Economic Forum (2016) lists core work-related skills for the future of work, such as critical and analytical thinking and social and collaborative skills.

The chapter also underscores the importance of working with industry players to create an updated and industry-relevant curriculum. Partnerships with large businesses offer mutual benefits to all parties. Economically challenged countries benefit from the transfer of expertise and technologies to their workers through enterprise-based training. It is also possible for these businesses to partner with institutions of learning to co-manage digital learning content for more efficient programme delivery.

The chapter also introduces a handy ICT integration matrix for use as a guide to monitor leadership readiness, teacher readiness, student readiness and infrastructure readiness. Taking a strategic and long-term view to ICT implementation in all domains will help an organization adopt a coherent change-management plan.

Relevant and continuous skills development – formal, non-formal and informal alike – can alleviate poverty, reduce gender inequality and lead to decent work. Lifelong and universal opportunities for skills development can ensure the sustained and inclusive development that the SDGs aim to achieve. ICT, with strategic resource allocation and a clear plan, can fill a pivotal role in reaching the most vulnerable persons and thus help countries move closer to achieving the targets of each SDG.

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10

Achieving gender equality, job quality and diversity in the science, technology, engineering and mathematics fields

Matilda Dahlquist

Abstract: Skills related to the science, technology, engineering and mathematics (STEM) fields will be at the forefront for addressing the future challenges of climate change, demographic transformations, global health epidemics, technological advances and accelerating inequalities. Yet, there is significant labour shortages and vast gender gaps in these fields. In this chapter, promoting women in STEM subjects, training and related jobs is argued to be vital for creating an innovative and inclusive future of work – but it is not enough. If we are serious about achieving an inclusive society, we must understand and redress the power structures that preserve and increase inequalities, especially the unequal opportunities and treatment in the world of work. A gender lens is necessary to understand these inequalities.

With a focus on female workers, the chapter analyses two high-growth, in-demand sectors in the Philippines and Thailand. Despite a relatively large share of women in these sectors, rigid gender gaps and unequal career opportunities prevail. Strengthening diversity through enhanced skills and employment opportunities for women and other under-represented groups in the STEM fields is of huge importance in Asia and the Pacific. But merely increasing the share of women through gender-blind interventions will not solve the region's increasing inequalities because feminization of work comes with lower wages, status and job quality. We must also tackle the issues that are holding women back. Such action must be holistic and requires us to create an enabling work environment while confronting our biased valuation of skills and jobs. Only then can the STEM fields contribute to transformative change for an inclusive future of work.

Introduction

Globalization has profoundly restructured the world of work and brought wide-ranging benefits. The Asia-Pacific region has experienced rising productivity and rapid economic growth over the past few decades, which has lifted people out of poverty and into the middle class faster than any other region before. But globalization has been accompanied by increasing inequality. Changed business models and modes of production, through the use of more advanced technology and integration into global value chains, have been key to this process of expanding growth and inequality.

Many new jobs have been created, but the distribution of the region's economic gains have been skewed. Around 300 million people are trapped in working poverty and almost a billion are in vulnerable employment. The region has one of the world's wider gender gaps and a high prevalence of discrimination (ILO, 2018a). As we consider the future of work, the dimension of inclusion is paramount for ensuring continuous growth, sustainable development and the well-being and agency of people and societies.

Inclusion is also key to generating the knowledge, innovation and creativity needed to respond to these complex, transformative trends. Low-quality, low-paid job creation will no longer be enough to drive the region's growth while, at the same, skills shortages are a major blocker of business expansion. Skills related to science, technology, engineering and mathematics (STEM) are vital to finding solutions to complex problems and driving future development and innovation. STEM is a broad scope of in-demand fields in which stark gender imbalances persist (ILO, 2016a; 2016b; UNESCO, 2016).

In this chapter, I argue that promoting women in STEM is paramount for creating an innovative and inclusive future of work – but it is not enough. If we are serious about achieving an inclusive society, we must understand and address the power structures that preserve and increase inequality, especially the unequal opportunities and treatment of women in the world of work. The next section presents the context of skills shortages and gender imbalances in STEM-related sectors. The third section shows how a gender lens is necessary to understand inequality. The fourth section uses this approach to deconstruct the unequal opportunities and treatment in high-demand STEM occupations. The fifth section spells out gender-transformative and game-changing action to strengthen diversity in STEM fields and create an inclusive work environment.

10.1 Skill shortages and gender gaps in the STEM fields in Asia and the Pacific

Evidence shows that unequal opportunities prevail in the STEM fields. Women remain a minority of the STEM-related workforce, and a majority of women work at lower levels. This section looks at evidence for the Asia-Pacific region. But first – what is STEM? STEM is a term that groups together the academic and professional fields that relate to science, technology, engineering and mathematics. It can be defined differently but typically integrates production-oriented activities at all levels, from preschool to post-doctorate studies and a spectrum of occupations in formal and informal settings. In this chapter, I use STEM in a broad sense, including both the core sciences (physics, chemistry, mathematics) and engineering and the social sciences (political science, economics) and psychology. STEM education and scientific thinking (broadly defined here as the skills, processes and methods of science) are generally thought to provide economic and social benefits for workers in both STEM and non-STEM jobs. STEM-related skills are both hard and soft. STEM attracts attention in a wide range of policy areas but is commonly used in the context of education and skills policy and curriculum development, often with the view to address science- and technology-related competitiveness (Gonzalez and Kuenzi, 2012). Every dollar invested in research and development (R&D) creates almost two dollars in return (UIS, 2018a).

STEM drives global innovation and progress. Having skilled people in these fields will be essential to tackle the many complex challenges in the future of work.[96] The STEM relationship with sustainable development as well as a more inclusive, peaceful and prosperous world is recognized in the 2030 Agenda for Sustainable Development (United Nations, 2015). Until 2030, "scientific research will play a key role in monitoring relevant trends in such areas as food security, health, water and sanitation, energy, the management of ocean and terrestrial ecosystems and climate change" (Huyer, 2015, p. 85). Thus, the STEM sectors represent enormous opportunities to embark on a solution-oriented career that contributes to sustainable and inclusive development in a rapidly changing environment.

The large and growing demand for professionals with STEM skills is now met with vast labour shortages. Among the top-ten hardest jobs to fill, most are STEM related. The Asia-Pacific region has an estimated talent shortage of 45 per cent in STEM fields – higher than the global shortage, at 28 per cent (Manpower Group, 2015). This reflects current skills mismatches that are expected to grow in relation to future skills requirements (WEF, 2016). Simultaneously, STEM occupations are characterized by rigid and wide gender gaps.[97]

Although women have made substantial contributions to science throughout history, they remain severely under-represented in the STEM fields. The gender gap in STEM has been the focus of extensive research over decades, and there are many ways to quantify it (Ngila and Boshoff, 2017; UNESCO, 2017b). Globally, only 28.8 per cent of researchers are women[98] (UIS, 2018b), even though women outnumber men in tertiary education.[99] This global picture, with men occupying three out of four research posts, is one of a leaky pipeline (Huyer, 2015): The more senior the level, the fewer the women. Vast variation marks countries and regions; while some regions are tantamount to gender parity (45–55 per cent of either sex),[100] Asia-Pacific offers a mixed picture.

96 For example, to mitigate the impacts of climate change and natural disasters, we need STEM for innovative and effective warning systems and other space technology mechanisms. To slow the rate of global warming, we need STEM to develop new, effective, environmentally sustainable production processes, renewable energy sources, improved recycling systems, etc. To support older persons in our ageing society and people with disabilities, we need STEM to develop tools and aids that respond to their needs. To deal with health pandemics, we need STEM to find cures and vaccines and to develop low-cost preventive mechanisms to real and potential outbreaks. To bridge the urban-rural divide and increase farmers' yields, we need STEM to integrate information and communications technology in rural communities through, for example, centres of excellence in agricultural sciences.

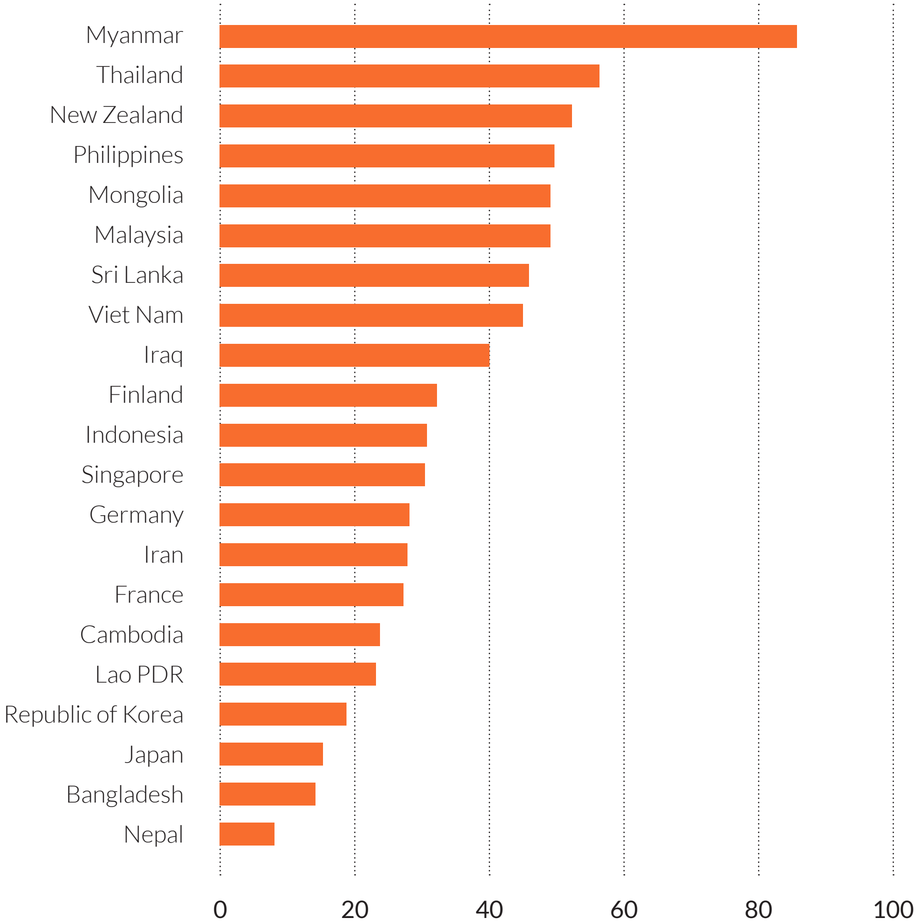
97 Due to this chapter's limited scope and space, this section centres on differences between women's and men's opportunities while recognizing that these are heterogeneous groups – and that other intersecting features and gender identities affect persons' opportunities in STEM. For the same reason, it does not integrate data on gender pay gaps, which is a big limitation.

98 This is measured in a headcount of the number of persons employed in R&D.

99 Women make up 53 per cent of bachelor's and master's degree graduates, but their proportion drops among PhD graduates, to 43 per cent (Huyer, 2015).

100 The best-performing subregions in terms of female share of researchers are: Central Asia, at 48.1 per cent; Latin America and the Caribbean, at 45.4 per cent; the Arab States, at 39.8 per cent; and Central and Eastern Europe, at 39.5 per cent (UIS, 2018). The UNESCO Institute for Statistics has collected visualization on women in science, available at: http://uis.unesco.org/apps/visualizations/women-in-science/ (accessed 8 Aug. 2018).

Figure 10.1: Share of women participating in STEM-related sectors (%), 2015 or latest year



Source: UIS, 2018a.

Some subregions perform the worst globally. In Eastern Asia and the Pacific, only 23.4 per cent of researchers are women. Southern and Western Asia presents an even smaller share, at 18.5 per cent. Seven countries in the Asia-Pacific region have achieved gender parity in R&D (with percentage share of women in parentheses): Thailand (56.1); New Zealand (52); the Philippines (49.5); Mongolia (49.1), Malaysia (48.6), Sri Lanka (45.7) and Viet Nam (44.8). At the highest end, we see Myanmar, with 85.5 per cent of researchers being female, and at the lowest end, Nepal, India and Bangladesh, with 7.8, 13.9 and 14 per cent, respectively (UIS, 2018b).

Another trend is the poor performance of high-income countries, like the Republic of Korea (at 19.7 per cent women) and Japan (at 15.7 per cent women).[101] Interestingly, research suggests that STEM-field participation appears related to learning achievement in mathematics and science. In the Republic of Korea and Japan, boys often outscore girls; however, in several Asian countries, including Malaysia and Thailand, girls outperform boys (OECD, 2014). A recent study on higher-income countries – including Japan, the Republic of Korea and China, in addition to the United States and European countries – outlines the linkage between the lack of women who study STEM subjects in schools and universities and the digital gender divide among inventors and software developers. The huge gender divide in innovation is mirrored in the small share of female patentees: of all patents in the G20 countries, between 2010 and 2015, fewer than nine in hundred were granted to inventions by women, and over 91 to those by men. During the same period, more than three-quarters of inventors' teams were all-male, whereas those composed of only women accounted for 4 per cent of patents granted (OECD, 2018). A similar picture is seen in the software industry, or more specifically in the development of R-based open source software packages for data analysis, where more than three in four teams had no women.

Is the picture improving? Many studies have concluded that the gender gap in the STEM fields is smaller today and decreasing. This may give the impression that there will soon be equal representation of female and male researchers and that today's initiatives to recruit and retain more women are successful. As box 1 points out, evidence suggests otherwise.

Such empirical phenomena are characterized as glass ceilings, such as barriers of prejudice and discrimination that exclude women from reaching leadership positions. Furthermore, glass walls obstruct women from embarking on a career in male-dominated (typically high-growth and high-profit) sectors (Dahlquist, Simpson and Clarke, forthcoming). In fields like life science, social science, medicine and health, psychology, agriculture and environmental management, women are rather well represented, while in many others they are not – notably, mathematic-intensive ones and those of high importance for the transition to a green economy, such as energy, engineering, geoscience, transportation, information technology (IT), computing and the physical sciences (Huyer, 2015; Ceci et al., 2014).[102]

The narrowed gap in education has not contributed to reducing sector and occupational segregation. Women's greater obstacles to accessing quality jobs than what men experience

101 Japan has the smallest share of female researchers of all member countries of the Organisation for Economic Co-operation and Development (OECD), regardless of the Government's efforts to change this pattern. Also, countries such as France, Germany and the Netherlands have only one woman in four researchers.

102 For instance, of graduates in health sciences, 60 per cent were women in the Lao People's Democratic Republic, 71 per cent in the Republic of Korea and 81 per cent in Myanmar; with Viet Nam standing out with a share of 42 per cent. Among graduates in engineering, the share of women was 31 per cent, 30 per cent and 39 per cent in Viet Nam, the Philippines and Malaysia, respectively, with Myanmar being an exception, at 65 per cent who were women. South-Eastern Asia presents a relatively even distribution of women across research fields, apart from that of the private sector, in which usually 30 per cent or fewer researchers are women (Huyer, 2015). Other exceptions include the gender-balanced Malaysian IT sector, in which many women are university professors and work in the private sphere (Mellström, 2009). India has seen a considerable increase in female undergraduates in engineering (Gupta, 2012).

apply to STEM fields, too. A critical juncture at which girls get left behind in STEM work is the school-to-work transition. While girls often perform well in STEM subjects in various parts of Asia, this is not translating into better job outcomes. The world of work crystallizes an equally imbalanced picture beyond academic research; women remain a minority of professionals and decision-makers in STEM fields and are concentrated in occupations with less job stability, poorer job quality and lower wages and status (UNESCO, 2017; ILO, 2016). This signals that expanding women's STEM education – while still important – is not enough to combat occupational segregation (Banerjee, 2014) and address women's under-representation in the STEM fields.

Box 10.1

Slow progress towards gender parity in the science, technology, engineering and mathematics fields

A recent comprehensive study by Holman et al. (2018) found that, notwithstanding recent progress, the gender gap will persist for generations, especially in surgery, computer science, physics and maths. Examining the slow rate of change, these fields will not reach gender parity this century. The study used gender empirically in covering 36 million authors from more than 100 countries publishing in more than 6,000 journals, covering most "STEMM disciplines" over the past 15 years[103] (Holman et al., 2018, p. 1) and pointed to a particularly large gap in senior authorship positions[104] and prestigious journals, estimating that the rate by which men are invited to submit papers is around double the rate of women. This is consistent with journal editors' gender bias. Great variation across countries exist, with wealthy countries (like Japan, Germany and Switzerland) having fewer female authors than poorer countries. The authors concluded that closing the STEM-gender gap will require further reforms in education, mentoring and academic publishing, targets for gender balance among, for example, conference speakers, editors and hiring committees and interventions that reveal underappreciated biases (Holman et al., 2018).

These findings are further consistent with other research that points to the small shares of women in prestigious posts, such as national science academies (Ngila and Boshoff, 2017), peer reviewers, editorial boards and research councils. For example, Cho et al. (2014) found that women represented only 16 per cent, 14 per cent and 12 per cent of subject editors, associate editors and editors-in-chief, respectively, in ten well-regarded STEM-related journals over almost three decades.[105]

103 Note that Holman et al. (2018) used the term STEMM, adding medicine. They use PubMed and arXiv databases and have created a web app to allow for easy access to the data, which can be found at: https://lukeholman.github.io/genderGap/ (accessed 8 Aug. 2018).

104 Such senior positions include the last-listed or sole author. As Holman et al. (2018, p. 2) stated, "Academic publications are the primary means of disseminating scientific knowledge and the principal measure of research productivity and thus influence the career prospects and visibility of women in STEMM."

105 The journals subject to the review were in environmental biology, natural resource management and plant sciences. The researchers looked at their number of women on editorial boards and among editors from 1985 to 2013.

Why do these gaps exist and persist? To understand the root causes of women's under-representation in the STEM fields, we must dig deeper into the gender biases that characterize working environments and labour markets. For this, using gender empirically is insufficient; qualitative gender analysis of contextual realities is necessary. Section 10.3 undertakes this task, but first, I share some analytical takeaways that will benefit the rest of the chapter.

10.2 Understanding inequality with a feminist analytical approach

"Gender" refers to socially constructed features of people that are learned in interaction with others. Notions of gender thereby vary across time and space and are changeable. While gender is often thought of as ideas about femininity and masculinity, it is a non-binary concept that embodies roles, responsibilities, norms and values. Gender as a social identity marker exists across a spectrum and intersects with race, ethnicity, colour, class, nationality, citizenship, religion, age, health, ability and sexual orientation. The term "intersectionality" refers to this interconnectedness of social categorizations and is key to understanding overlapping patterns of discrimination, disadvantage and unequal opportunities.

Gender relations are hierarchical and create power imbalances. Kabeer (2005, p. 14) conceptualizes power as the "ability to make choices". Agency has two elements. First, it is peoples' **power to do** something. It has a positive connotation and is the "ability to make and act on their own life choices, even in the face of others' opposition". Second, agency is **power over** something or someone. It has a negative connotation and is the "capacity of some actors to override the agency of others through, for example, the exercise of authority or the use of violence and other forms of coercion". These concepts are at the heart of development, which can be defined in countless ways. Sen (1999, p. xii) understands development as an expansion of freedom through a process whereby different kinds of unfreedoms – that prevent marginalized people from exercising agency – are removed, often through new social arrangements.

Gender biases in the world of work

Feminist research documents gender as a governing code. This means that gender goes far beyond the biological and cultural notion of women and men and is a basis for ordering how we think. We value what is seen as masculine and undervalue what is coded as feminine. This ordering is gender biased. As Peterson (2010, p. 205) pointed out, "ideas, skills, work and activities that are masculinized are more likely to be valued than those that are feminized: they are more likely to be seen as 'real' work and be taken seriously in terms of both symbolic status and material compensation." Understanding gender analytically creates the insight that privileging masculinity – not necessarily men – and undervaluing femininity are vital to normalizing and naturalizing the power relations that constitute gender inequality.[106]

Gender as an analytical category helps us understand inequalities in the world of work. Here are a few examples:

- **There is gender bias in economic thinking.** Expenditures in physical infrastructure are typically seen as investments, while expenditures in social infrastructure and care as a cost.[107] Beyond being a gender-biased categorization, taxation systems tend to prioritize male employment over female employment (ITUC, 2017). Projects funded are also more likely to employ men than women, often referred to as a belief that men are the breadwinners while women are only secondary earners.
- **While social reproduction is fundamental to economies, it is assumed to happen by classical economic theory – excluding it from gross domestic product (GDP) measurements.** In reality, women are expected to carry out care and household work unpaid, often in addition to paid work. A resolution of the 2013 International Conference of Labour Statistics guides countries to account for unpaid work. Some countries suggest the value of unpaid work is between 20 per cent and 60 per cent of their GDP (UNDP, 2015).
- **The undervaluation of social reproduction reflects a societal gender bias.** Unpaid care responsibilities, combined with the lack of social protection and family-supportive policies, create a "penalty" for women and cause discrimination, pay inequity and sector and occupational segregation. That women often work part time involuntarily or leave the workforce lowers female labour force participation rates and productivity (ILO and Gallup, 2017). Through a gender analysis of employment stimulus in high-income and emerging economies (including Australia, China, Indonesia and Japan in Asia and the Pacific), two studies (ITUC, 2017; 2016) found that public investment in social infrastructure (such as paid care jobs) generate large economy-wide benefits, like increasing productivity[108] and redressing care-provision deficits. Moreover, this has various positive gender-equality outcomes in both paid and unpaid work and improves people's quality of life (ITUC, 2017).
- **Workplaces are generally marked by gender biases that are unrecognized.** Unconscious bias, a term coined by psychologists, affects which career we choose, who we employ and promote and our sense of self-confidence. It often manifests itself through discrimination in, for example, recruitment processes (ACT/EMP, 2017)

106 Feminist research has developed conceptual innovations that visualize and politicize complex patterns of power and social hierarchies. Such innovations encourage and facilitate interdisciplinary, multidimensional analyses and critical practice regarding globalization's uneven and oppressive effects. They offer an alternative to predominant discourses that, through their biased, exclusionary and short-sighted focus, fail to make sense of globalization. To learn more, see, for example, Peterson (2010, 2006 and 2002).

107 For example, this thinking is reflected in the United Nations-mandated System of National Accounts; physical infrastructure investment counts as capital stock, whereas social infrastructure classifies as government annual current spending (ITUC, 2017).

108 The productivity increase was much higher than equivalent investments in physical infrastructure, like in the male-dominated construction industry (ITUC, 2017).

and limits the opportunities for women and other marginalized persons with the right skills and experience[109] (Dahlquist, Simpson and Clarke, forthcoming). Evidence from countries of all income levels shows that to secure comparably paid jobs, women need more years of education than men (Huyer, 2015). This indicates that education and skills development neither generate equal returns nor result in a career for all.

- **Gender biases characterize skills development, too.** Mismatch between supply and labour-market demand primarily affects women. Training for women is usually supply-driven and targeting female-dominated sectors with market saturation and low wages. While potentially transformative, skills training often reinforces occupational segregation (Ameratunga Kring, 2017). However, more work needs to be done in terms of applying gender analytically to skills development.

How is this linked to women in the STEM-related sectors? Gender analyses of labour markets help us make sense of globalization's unequal and even oppressive effects and how certain groups are excluded from certain spheres. This logic certainly applies to STEM.

Low skilled or undervalued?

Gender biases feature labour markets but also individual workplaces. Through gender analyses, we reach a deeper understanding of the interlinkages between job quality and skills – how skills are valued and utilized – and the role of the working environment for exclusionary or inclusive outcomes. How? Notions of gender form our cultural and economic value systems that affect which and whose ideas, skills and jobs that are recognized and valued. This insight is a factor in the equation of who works where, with what and at which level. The rising inequality upholds an extremely uneven playing field, with clear trends in who can develop their skills and pursue a career. Research has proven that jobs classified as low skill are those with poor job quality: little job security and social protection, extensive work hours, few or repetitive tasks, low status, few or no career prospects, weak collective voice and bargaining power and, importantly, low skill utilization and pay (Sung, 2016; Lloyd, 2008; Form, 1987). This correlation "makes more sense" through a gender lens, as low-status, low-quality jobs are often female dominated. Further, feminization[110] is associated with decreasing legitimacy, status and value[111] (Peterson, 2010 and 2006).

Globalization has for decades been associated with a feminization of employment (Tejani and

109 For example, statistics on the small share of women in leadership and senior management positions (glass ceilings) and on gender-based sector and occupational segregation (glass walls) mirror unconscious bias in the workplace (Dahlquist, Simpson and Clarke, forthcoming).

110 Feminization is here used to reflect a process whereby the share of women increases. For example, "feminization of migration" means that the number of women who migrate increases.

111 Not only work and workers but also roles, concepts, categories, desires, tastes, cultural expressions (like art, music, styles), institutionalized practices etc. can be feminized so that their legitimacy, status and value decrease (Peterson, 2006 and 2010). The theoretical expression "feminization as devalorization" is used to illustrate this process and applies to women but also to racially, sexually, culturally and economically marginalized men. The point is that the valuing of masculinity and undervaluing of femininity have vast consequences at both the structural and individual levels because they permeate language, culture and meaning systems and form our actions.

Milberg, 2016) because women have provided cheap and flexible labour (Standing, 1999; 1989; Elson and Pearson, 1981). Cheap labour has indeed been an important competitive advantage in the Asia-Pacific region's export-oriented growth, where flexibilization[112] and feminization have been key in cutting labour costs. Insofar as female workers are preferred for the low-paid jobs needed in export-driven industrialization, downgraded manufacturing, mass production along global value chains and low-skill service jobs, flexibilization feminizes the workforce (Peterson, 2002). Processes of feminization of insecure employment, migration, poverty, etc. all show the relationship between feminization and undervaluation. Even feminization in a more positive setting often has negative outcomes; when the number of women entering a field increases, wages tend to go down and job quality tends to worsen. Not only is this gender bias reflected in the sex-disaggregated data on workplaces and labour markets but in the very classification of certain jobs as high or low skill. This is illustrated in box 2 by two more recent studies.

Box 10.2
Feminization and undervaluation – two studies

A qualitative study on the Thai seafood-processing industry by Dahlquist (2017, p. 1) showed how the racialized, gender-based oppression and exploitive working conditions that female migrants from Myanmar experience in the sector reflect "patterns of systematic undervaluation of their paid and unpaid work". Thirty-five women from Myanmar provide thirty-five different stories. Collectively, their experiences inform us what being at the low end of a high-profit global value chain is like, working "like machines"[112] – hard, mechanically, neatly, flexibly and for low pay. Yet, their contributions to the Thai economy remain unrecognized. To fully understand their experiences, we must direct our attention to social reproduction, an essential dimension of their life. The study concluded that recognizing the undervaluation of "the feminine" is key for understanding how marginalized persons cannot benefit from economic development (Dahlquist, 2017).

A quantitative, econometric study by Tejani and Milberg (2016) looked at whether shifts in the female share of employment in manufacturing in developing countries in South-Eastern Asia and Latin America is associated with technological conditions of production (labour or capital intensity) rather than export growth since the mid-1980s. The study found that the capital intensity of production (evidenced by shifts in labour productivity) is negatively and significantly correlated to shifts in female employment shares, with exports being statistically insignificant. The authors concluded that "an anti-female bias exists in labour demand changes that result from output or employment shifts in developing countries when manufacturing becomes more capital intensive, a process likely related to industrial upgrading" (Tejani and Milberg, 2016, p. 24). This suggests that industrial upgrading through increased productivity and capital intensity carry gender biases in labour demand changes so that male workers are preferred over female workers.

112 Examples of flexibilization are: "more subcontracting, smaller enterprises (often linked to centralized networks), part-time and temporary employment, and avoidance of organized labour" (Peterson, 2002, p. 9).

While there are few easy answers to many questions concerning the future of work, some questions require more attention. For whom does economic growth translate into opportunities? Who wins and who loses in our globalized, interconnected economy? We are now at a crossroads, with changes happening at an unprecedented rate. With technological innovations like robotics, artificial intelligence and 3D printing, the demand for jobs in, for example, manufacturing is falling quickly. Such jobs will soon be eliminated. While this process is subject to an intense and often polarized debate, it surely raises both opportunities and challenges. The good news is that many precarious jobs will vanish, and productivity gains should bring about shorter working hours. The bad news is that millions of already disadvantaged workers will lose their job, shifting economies' occupational structure and creating further intensified socioeconomic inequality. Women are more frequently employed in high-risk occupations than men, and along with less-educated and low-paid workers, they face higher automation risk. Job quality will also not necessarily improve because of technological change (ILO, 2017a; Chang and Huynh, 2016). With a feminist analytical approach, we can better sense the future exhausting and exclusionary impacts of capital, dramatically fuelling productivity, if it remains with a few elite actors. Inequality will then rise exponentially. Is this the future of work we want?

From this section, we can conclude that, to build an inclusive society, we must understand the cultural and economic value systems that affect people's opportunities in the world of work, or lack thereof, and use this understanding in shaping appropriate actions and interventions. Applying gender analytically is key here, acknowledging how intersections of identity markers (like gender, race, age, indigenous identity, ability status and sexuality) affect people's opportunities. This means that we ask whose skills are recognized, valued and utilized and job quality for whom. We should also ask which skills and jobs. High-level cognitive skills, soft skills and creativity will be crucial in the future, as will jobs in research, development and roles that support technologies. In other words, STEM-related skills and jobs will be a cornerstone in the future of work.

But beyond filling the labour and skill gaps in the STEM-related sectors through interventions that influence skill and educational pathways, we must consider a span of social factors, of which two stand out: the choice to have a family and workplace environment (UIS, 2018b). A massive body of research supports this, and so do the two cases presented in the next section. Many studies have found that ethnicity and gender stereotyping, and even threats of stereotyping, negatively impact performance in STEM-related tests and jobs (Ceci et al., 2014). Mere awareness that others expect people of a social group to do poorly on math is enough to cause anxiety and lower performance among them (Spencer, Steele and Quinn, 1999; Steele, 1997). A field experiment in an upper-level college calculus course found that women in stereotype-free treatment conditions outperformed men (Good, Aronson and Harder, 2008).

Thus, creativity and innovation can only be unlocked in an enabling, inclusive, unbiased working environment. This is why gender equality, job quality and diversity are essential if we want the future of work to be inclusive, innovative and gender transformative.

10.3 Unconscious bias and unequal opportunities in South-Eastern Asia's STEM sphere

Some South-Eastern Asian countries belong to the region's top performers in STEM-related diversity, but are working environments enabling? Are skills and career opportunities equal? With a focus on female workers, two high-growth, in-demand sectors in the Philippines and Thailand are analysed in this section. By applying a feminist analytical standpoint, I want to open the discussion about the future of work to one that integrates female workers' experiences and the working environment broadly. Thereafter, I discuss the insights that such focus brings about strategic action for inclusion and diversity in STEM fields – and how to make it happen.

The Philippine information technology and business process manufacturing sector

The Philippines is considered a top-tier destination for the information technology and business process management (IT-BPM) sector, here focusing on IT outsourcing, animation and game-development subsectors. The country ranks third among "digital nations" (Tholons, 2017) and is counted among the market leaders alongside India. Over the past decade, the Philippines increased its share in the global IT-BPM market, from 5 per cent to 12.7 per cent (in 2006 and 2016, respectively). Since 2010, the Philippine IT-BPM sector's annual revenues have grown at the fast rate of 17 per cent, from US$8.9 billion in 2010 to US$22.9 billion in 2016.[113] This section builds mainly upon qualitative research conducted by the IT & Business Process Association of the Philippines (IBPAP) research team (2018) for the International Labour Organization (ILO) on female IT-BPM workers.[114]

A holistic approach was undertaken in the Philippines with curricula reform and training of teachers in STEM subjects that reinforced breaking gender stereotypes and gender roles (ILO, 2018c). The Philippines ranks as the world's tenth-most gender-equal country in the latest Global Gender Gap study and is the only Asian country in the top ten (WEF, 2017). A significant factor is the country's high-ranking educational attainment, with gender parity across primary, secondary and tertiary education levels, based on the net enrolment ratio (or the percentage of total school-age population enrolled). Indeed, a larger share of

113 This progress has been spurred by global businesses' outsourcing of their non-core business processes to low-cost countries like the Philippines, seeking to innovate and drive cost-efficiencies.

114 The IBPAP report draws on qualitative interviews with employers (N=16), online surveys with female IT-BPM workers (N=17) and interviews with IT and technology training providers (N=4) for IT-BPM businesses. Interviewed enterprises provide IT and technology (N=11), animation (N=2) and game development (N=3) services, of large (44 per cent), medium (50 per cent) and small (6 per cent) size. The female employees are entry-level workers (53 per cent), supervisors (29 per cent) and managers (18 per cent), with roles including animator, layout artist, creative content designer, infrastructure engineer, IT manager or specialist, senior IT analyst or manager and senior network engineer. Interviews were done online from xxx to xxx. Interviewees and respondents were selected through non-probability purposive sampling. The report maps out gender disparities and skill shortages in the sector and provides information on challenges, needs and opportunities related to the promotion of women into medium- to high-skill IT-BPM jobs. It benefits the ILO Women in STEM Workforce Readiness and Development Programme (IBPAP, 2018).

women and girls than men and boys are enrolled at each level.[115] Research identified social and cultural norms and particularly women's high burden of unpaid family and household work to be the greatest barrier, discouraging many women from pursuing a career (PIDS, 2017).

The IT-BPM sector is among the country's largest employers of women; 53 per cent of its more than one million direct employees are women (PSA, 2016). Female IT-BPM workers have benefited from "better income, the ability to gain new and varied skills, a better sense of empowerment, and better health care" (Acquire, 2016). However, most women still hold low-skill jobs, whereas men are better represented in technical roles classified as medium to high skill.[116] The IBPAP research confirmed women's under-representation in technical roles, which is kept low by the scarce supply of female IT students and graduates, coupled with their low employability in technical roles. While the IT outsourcing subsector almost reaches gender parity, the animation and game development subsectors have large gender gaps: Only one in four employees is a woman. One explanation is that substantially fewer women than men are enrolled in engineering and technology courses in higher-education institutions and technical and vocational education and training (TVET) institutions. Fewer than one in three higher-education students enrolled in engineering are women, but there are two women in five students in technology- and IT-related disciplines (CHED, 2017), seemingly reflected in the larger share of female IT outsourcing workers.

Women form a minority of technology- and IT-related TVET students (TESDA, 2018). That women more often opt for education and health-related disciplines has been tied to a desire to solve societal problems and help humanity (GoodCall, 2015). Nonetheless, as noted previously, STEM fields will be pivotal in solving many challenges arising in the future of work. Creating this awareness must start at the primary school level and continue until, and throughout, professional life. When considering automation's looming impact on especially the IT-BPM sector's low-skill jobs, the gender gap is even more alarming.

Technological evolutions are impacting current and future jobs and skills in the Philippines IT-BPM sector. Employment opportunities in mid- to high-value jobs are expected to grow twofold by 2022, provided there is enough supply of qualified talent adept in technology. A future outlook shows continuous growth and importance of IT-BPM jobs as the sector moves up the value chain and increases its share of higher-value-added services – a process associated with de-feminization. Consequently, by 2022, the IT-BPM sector's labour force demand will likely be very different. Jobs classified as medium and high skill will grow at a tremendous rate. Simultaneously, industry experts and practitioners have postulated that around one out of three low-skill IT-BPM tasks has a 40–60 per cent likelihood to be

115 Primary education: 97.9 per cent of girls, 94.2 per cent of boys. Secondary education: 73.5 per cent of girls, 61.8 per cent of boys. Tertiary education: 40.3 per cent of women, 31.4 per cent of men.

116 This section does not contain Labour Force Survey data to triangulate findings due to the data's outdatedness. The latest Labour Force Survey was conducted in 2015, and since then, the IT-BPM sector has undergone so many changes that it would provide little accurate information.

automated by 2020.[117] Conclusively, ensuring workforce readiness while increasing women's participation in higher-level IT-BPM jobs is critical to adapt to technological changes and tackle the persistently low female labour force participation rates.

Interviewed enterprise employers emphasized that their recruitment practices do not discriminate any gender, that candidates who meet the educational, skills and experience qualifications are hired, regardless of their gender. They say the lack of women in technical or senior roles derives from the small number of women applying to and qualifying for such roles. When interviewed, one IT outsourcing employer, however, remarked how men are better in software developer and systems engineer roles "because they have better understanding and apt programming skills than females. They can also analyse and explain complex problems better". In contrast, more women undertake quality-assurance analyst or tester roles, with fewer technical skill-related entry barriers, such as programming skills. Animation studios experience entry-level skill shortages and a lack of available talent, even among those with an animation-related degree, possibly indicating a low quality of such courses. Interviewed game-development employers noted that some graduates still lack the necessary minimum programming and coding skills.

But are dissimilar abilities what explain these gender gaps? The answer is no. Women are further funnelled away from supervisory and managerial roles owing to challenges in balancing work with family responsibilities. Almost 30 per cent of female employees surveyed by IBPAP stated that family responsibilities had cost them their promotions. Younger women often face the major parenthood responsibilities around the critical point at which their career may or may not take off. Some working mothers feel their commitment towards their work may be questioned if they take too many parental leave days, but childcare services are expensive. The tight production deadlines in animation, typically requiring overtime work and even overnight stays, are likely reasons for resignation among female workers, sometimes becoming home-based freelancers or leaving the workforce. Indeed, flexibility and the opportunity to return to the job after a career break are often determining factors when women choose disciplines. Therefore, STEM-related jobs for which being up to date on fast-shifting technologies is critical are unattractive (GoodCall, 2015). Evidently, for women to choose and remain in the STEM fields, a different working environment is needed, namely one that enables women and men to combine work and family responsibilities through, for example, flexible work arrangements and benefits for childcare support.

Aside from grappling with work and family responsibilities, the IBPAP primary interviews and secondary research identified three major challenges that women face: lacking awareness of career paths in IT-BPM; low employability in technical roles; and insufficient career-development support. Little surprising, these barriers reflect gender biases. Only one in

117 According to the IBPAP interviews with industry experts and IT-BPM practitioners, the following tasks have the highest propensity to be automated: medical transcription, simple contact centre services, basic 2D animation services, parts of IT technical support and transactional mid- and back-office processes.

every five interviewed businesses had a female CEO. Women's much lower representation at executive levels across the IT outsourcing, animation and game-development subsectors may be attributed to the talent pipeline's small share of women at the supervisory and managerial levels, leading to scarce role models and mentors for women (PRC, 2015; Washington, 2010). Another dimension (though not explicitly mentioned by the interviewed employers) is the male-dominated workplace environment, wherein women can lack a sense of belonging, feeling unwelcomed and/or receive insufficient support (Smith et al., 2013). In sum, entering an unlevel playing field where women find less support and fewer chances to pursue a career or undertake leadership roles than their male co-workers is discouraging. Creating an enabling working environment in which all genders get equal support and opportunities is key for women to embark on an IT-BPM career path.

The Thai electrical and electronics sector

The electrical and electronics (E&E) industry is one of Thailand's largest STEM-related sectors and the largest in the Association of Southeast Asian Nations region. Thailand has been an E&E production base for many decades.[118] Today, the E&E industry accounts for 15 per cent of the country's GDP (Errighi and Bodwell, 2017). Here, E&E includes manufacturing of computers, electronic and optical products and electrical equipment. This section draws largely on mixed-methods research conducted by Ruttiya Bhula-or (2018) on behalf of the ILO on the situation of female E&E workers. Interviews were conducted with female "mid-level" STEM-related workers and employers of small and medium-sized enterprises (SMEs) and large firms. Unless otherwise stated, statistical figures are from the 2015 Labour Force Survey (NSO, 2015, p. Q3).[119]

Although Thai girls outscore boys in mathematics and science and female enrolment in tertiary education is relatively high, of tertiary-level students in STEM-related programmes (engineering, manufacturing and construction), only 23.7 per cent were women in 2015 (UNESCO, 2016). While previously rare, the number of women graduating in engineering and applying for such jobs has increased in the past five to eight years. How is this reflected in the E&E sector?

Thailand's E&E industry employed around 658,000 people in 2015 – one fifth of its manufacturing employment – 245,000 of them had graduated from vocational schools and universities (around equal shares from STEM and non-STEM fields). Women accounted for less than one fourth (23.5 per cent) of STEM graduates, and of them, few proceeded into the

118 Lead electronics firms from richer countries have engaged in offshoring activities in Thailand to reduce costs and export to other neighbouring countries. These are more likely to subcontract their labour-intensive activities to contract manufacturers (Errighi and Bodwell, 2017).

119 The report builds upon qualitative data collected by Bhula-or between July 2017 and January 2018 through interviews with workers (N=20) and employers (N=10) in E&E establishments of small, medium and large size in Bangkok and vicinity (selected with a reference distribution approach proportional by size of the establishment, resulting in two small, three medium and five large enterprises), combined with analysis of the 2015 Thai Labour Force Survey data. This report provides information to the ILO Women in STEM Workforce Readiness and Development Programme on the challenges, needs and opportunities pertaining to the promotion of women in the Thai E&E sector (Bhula-or, 2018).

E&E industry. Of female STEM-related workers who had graduated in science, mathematics and computing, only 7.4 per cent worked in the high-growth E&E industry; and of employed women who had graduated in engineering, manufacturing and construction, 6.1 per cent worked in the E&E industry. Simultaneously, almost half (45.8 per cent) of the E&E workers were women. The electrical sector was gender balanced (at 46.5 per cent women), with some electrical subsectors being female dominated[120] and others male dominated.[121] The electronics sector was female dominated (at 64.9 per cent women). While offering an optimistic picture, these statistics do not provide the full story. At closer scrutiny, we see that of all female E&E workers, a clear majority (64.8 per cent) worked as plant and machine operators and assemblers, and 78.4 per cent of elementary workers were women (the lowest levels), despite many having a university degree. Conversely, only around one fourth of managers were women, although the electrical sector presented larger shares of female managers (at 38.9 per cent) than the electronic sector (at 17.4 per cent). Similarly, the female share of professionals in the electrical sector was larger (at 57.1 per cent) than in electronics (at 51.2 per cent).

Employers who were interviewed confirmed the Labour Force Survey figures: The few female top managers are exceptions to the rule, and women are employed at the operational levels for “delicate jobs”, especially electronic components and boards. Most employers omit any current sex preferences for technicians or engineers in job vacancy announcements, but two companies previously specified male preference for those jobs and female preference for operators. These preferences are embedded in gender norms; female-coded skills like “nimble fingers” and characteristics like docility, patience and willingness to follow orders are requested by employers for these roles, while operator work that involves physical strength are geared towards men. Engineers and technicians are still regarded as male-coded jobs, but the picture is improving.

The E&E statistics reflect the recent increase of female engineering graduates, as young women (aged 21–30) outnumber young men among E&E professionals. Whether current job ads are biased or not, still no or very few women apply for such jobs, despite employers saying female engineers are high performers in product design, programming, IT, R&D and quality assurance. This shows that gender stereotypes prevail while indicating that unconscious bias shapes job ads. Further, two of the ten participating employers (both small enterprises) admitted a gender bias towards men in their recruitment of engineers and operators. The other eight enterprises addressed difficulties in getting good candidates, especially women, for STEM-related posts, because women more often apply for non-STEM-related vacancies. As one employer said, “We are always equally open to all people, but no women apply for the job (for our company). This industry may not be sexy for women.”

Why is the E&E industry “unsexy” for women? We might get an indication by looking at the career paths. The 2015 Labour Force Survey data show that, beyond women dominating

120 For example, wiring and wiring devices manufacturing, electric lighting equipment and other electrical equipment.
121 Namely, electric motors, generators, transformers and electricity distribution and control apparatus; batteries and accumulators; and domestic appliances.

the lowest levels, the female-male ratio of technicians and associate professionals is higher among middle-aged women (aged 36–50) than younger ones, indicating that many years of assembly-line work may eventually translate into a better post – although, promotion comes faster for men. Some say women must consistently outperform their male counterparts to get promoted. Also, women's career path ends there; women of that age group do not even appear in the female-male ratio of professionals and engineers, while men can climb that ladder. Someone's possible career progression hinges on their company's managerial style, and gender often has a determining role, especially in segregated sectors. In practice, every worker's career progression highly depends on their supervisor's evaluation. With men dominating leadership positions, such evaluations are usually performed by men. Half of the employers interviewed believed that men are better managers, especially in a male-dominated environment. The other half expressed that women can work well in management positions "as long as they pay their most effort and time to the company."

This criterion highlights a main barrier for women's career progression: gender norms and unpaid care and family responsibilities. Thai culture largely relies on women in household chores. Indeed, interviewees said that single working women are more likely to succeed, which is consistent with the 2015 Labour Force Survey data: The share of female senior officials and managers who were married was 48.2 per cent, whereas the male share was 66.7 per cent. Female mid-level employees who were interviewed confirmed this. Working mothers have sent their children to their parents for care, typically in another province. Due to their long, inflexible work hours and high childcare fees, family support stands as the only alternative (though not available for all). Thus, both the qualitative and quantitative empirical data indicate that women work longer and (contrary to men) often "sacrifice" family life to increase their chances for promotion. As one male company owner said, "Of course, men are less engaging in family tasks, while women are likely to take responsibility in family chores. If a female employee really places priority in her work, not the family, she's more likely to be successful in her career. Therefore, women, especially those with family and kids, are unlikely to take a manager position, which is a stressful job. However, without gender preference, we're open to their applications. It's really up to them if they apply for a higher position or not."

This quote throws light on the gender stereotypes institutionalized in the workplace as well as his perception of women. It demonstrates a focus shift: Rather than assessing structural and workplace barriers or their own biases, employers accuse female employees for not being motivated enough. Rather than considering measures to create a more even playing field, such as flexible working arrangements and childcare support, employers often emphasize workers' priorities: "a female choice between family and work".

Inability to see structures was common among the employers but also among the female employees who were interviewed. It was easier for them to cite critical success factors (determination, motivation, hard work) and barriers (lack of determination and motivation, reluctance to work longer hours, prioritization of family) in individuals' personal characteristics than gender-based barriers in the working environment and workplace culture. In practice, gender norms and the expectations they create are so rigid that a woman might not even have a choice between paid work and unpaid family responsibilities. Even "choosing" not to have a family does not free women from care responsibilities, when, for example, their parents become sick. This reflects low power (limited ability to make choices) due to few options available and little agency (limited ability to make and act on their own life choices).

This brings us to another blocker: gender stereotypes internalized by employees. Many female employees who were interviewed seemed to have low self-confidence and self-esteem. The absence of female role models was cited by many women as a barrier. Some expressed that female managers have good managerial skills and can manage both women and men. As one female engineer manager explained, "Being a manager is tough yet manageable. It depends on how you manage. We, as women, should think about our advantages: we are flexible and understandable; we need to know when to be tough and when to be soft."

Many of the interviewed women were unconfident in their abilities and reluctant to aim for managerial positions because they were aware of the sacrifices it would require. They associated leadership skills with "male" characteristics. And/or they said that men have had more chances to develop such skill sets. Skills development is obviously an enabler – on-the-job, in-house and public and external training enables workers to improve their skills and thereby productivity. This is even more important, considering the differing educational backgrounds of the E&E workforce.

Lifelong learning (in technical and vocational and other areas, for example, language and presentation skills) is indeed key for persons climbing from early to mid-career levels and from mid-career to higher levels. But learning opportunities are not equal and depend partly on firm size; SMEs usually have limited (human and financial) resources for training. While most of the IBPAP-interviewed employers said they provide equal access for women and men to training, in practice, training opportunities rest upon supervisors' evaluation and whether they see a "fit". Such judgements are often gender biased. If not, we would have seen a faster rate of change towards an even playing field in the E&E industry.

The two cases show that unequal opportunities in the STEM sectors are manifested in job-quality aspects, discrimination, skills mismatches, glass ceilings and glass walls. Not only are women concentrated at the lower levels, they must sacrifice more to get where they are. We see that women's unpaid care and household work is a big career blocker, indicating that gender roles and social reproduction cannot be neglected when trying to grasp our globalized world of work. We see how women's education is often high, despite having repetitive so-called low-skill tasks as, for example, machine operators, reflecting low skill utilization with gendered undertones. This further shows that education and skills are not enough to enable quality jobs and career progression, not even in high-demand sectors in good-practice countries like the Philippines and Thailand (with comparably large shares of women in STEM sectors and the labour force). Hence, while getting skills is important, they will not deliver unless we look to what is holding women back.

10.4 Gender-transformative action in the STEM-related sectors: Creating an enabling working environment with gender equality, job quality and diversity

Feminist critique and intersectional gender analysis has a transformative potential that goes beyond conceptual and theoretical levels. Such insights help us unpack inequalities in the world of work and – perhaps most importantly – can shape our proactive strategies, informed by local realities. They can be translated into action in creating a STEM sphere featured by gender equality, job quality and diversity.

Gender-transformative policy changes are fundamental, namely, those tackling "strategic gender needs to transform unequal gender relations to promote shared power, control of resources, decision-making and support for women's empowerment" (Goulding, 2013, p. 5).[122] These include but go beyond national labour, skills and employment policies and must also be reflected in laws and regulations, complying with international labour standards (Dahlquist and Simpson, 2017; ILO, 2016; Goulding, 2013).[123] Undeniably, these are investments, not costs.[124] Such strategic changes must build off of local realities and of "what works" research and good practices.

Gender-transformative policies and initiatives constitute a road map towards a STEM sphere that delivers in the future of work – which is one in which diversity, job quality and equality of opportunity and treatment prevail. The steps offered here are divided into (i) skills and education and (ii) workplace and job quality (although in reality they are interlinked).

Practical measures on the skills and education side include:

Improve access, quality, relevance and gender responsiveness of STEM education and training for all age groups, academic and vocational, aligning with demand and a broader notion of skills, targeting under-represented groups and high-demand sectors – for example:

- **Government and employers:** Affirmative action to stimulate and support women's skills acquisition in STEM subjects through equal, high-quality education and training, starting from early-year interventions, which concern both supply (the quality, relevance and gender-responsiveness of education and training) and demand (that it

122 It is important to emphasize that gender-blind or even gender-neutral interventions, including those with good intentions, are often harmful.

123 Ways to design and implement gender-transformative policies are found in many guidelines, frameworks and reports but constitute an area for further investment, research, pilots and scaling. See, for example: *Women and the Future of Work (ILO, 2018), ILO Action Plan For Gender Equality 2016–17 (ILO, 2016d); Gender Dimensions of National Employment Policies: A 24-Country Study (Goulding, 2013); Guidelines on Gender in Employment Policies* (Ameratunga Kring and Kawar 2009); the United Nations Secretary-General's High-Level Panel on Women's Economic Empowerment's Toolkits (compendia of resources, case studies and good practices) for each of the seven drivers of transformation that have demonstrated impact in reducing gender gaps (such as how to change norms and business culture and practice) – available at: http://hlp-wee.unwomen.org/en/reports-toolkits#toolkits (accessed 9 July 2018).

124 Gender-transformative policies are investments because gender equality contributes to eliminating poverty, business growth and productivity growth and thereby to inclusive growth.

addresses, corresponds to and aligns with industry and labour-market needs).

- **Government:** Frameworks that facilitate the entry of women and disadvantaged persons – who otherwise lack the time and/or financial, cultural or physical capital to study – into STEM fields through gender-responsive incentives, such as quotas, targets, scholarships, study grants, flexible family-friendly study arrangements and other gender-responsive incentives in skills-training institutions.
- **Government, higher education institutions, TVET institutions:** Removal of gender norms and stereotypes to encourage girls and women into STEM fields, with advocacy for non-stereotypical skills and widened gender roles, through norm-breaking role models in STEM, reforms of education and curricula, improved gender-responsive teaching and teacher's training, and development of new teaching methods, like engaging, creative learning about robotics, coding and design, and ICT integration to improve access and learning support.
- **Employers, trade unions, government:** Proactive school-to-work-transition measures like career guidance and information on career paths in STEM fields, job-search support, mentoring, career counselling by female role models and private-sector and workplace exposure throughout studies – such as apprenticeships and internships – to make studies translate into better job outcomes.
- **Government:** Develop measures for unbiased skill valuation and a broader notion of skills through, for example, recognition of prior learning, so that skills (soft and hard) developed and learning acquired informally are appropriately acknowledged and valued.

Practical measures on the workplace and job quality side include:

Develop and implement strategies, standards and policies to improve job quality and diversity and create a working environment that is enabling, inclusive and safe, with an unbiased, family-friendly workplace culture without discrimination in recruitment, hiring, pay and treatment, for example:

- **Government, employers, trade unions:** Establish and maintain a family-friendly workplace culture through a comprehensive range of policies such as flexible working arrangements, adequate parental entitlements, like maternity and paternity leave policies, that incentivize men to also take it. Include childcare support, coupled with efforts to "recognize, reduce and redistribute" care responsibilities, through changing gender norms, to encourage women to remain in the STEM-related workforce.
- **Employers and trade unions:** Nurture a workplace culture in which workers' voices matter; where they can and are encouraged to organize and participate in the decisions that affect their lives: and where certain people's power over others does not limit others' power to do what they want, thus exercise their agency.
- **Employers and trade unions:** Develop and implement interventions that reveal

underestimated biases. This can entail, for example, gender-responsive human-resource practices with new, unbiased recruitment processes involving gender-balanced committees and recruiters, "blind CVs" and structured interviews and tasks.[125] There should be continuous effort to obtain a better understanding of a worker (including their preferences, passions, etc.) to better recognize and utilize their full potential.

- **Government and employers:** Implement and institutionalize gender-responsive career guidance with clear, well-defined and transparent career mapping, mentoring, supervision and promotion of female role models in STEM sectors.
- **Employers and trade unions:** Ensure that productivity gains due to technological advancements are fairly distributed and bring about shorter working hours with full-time pay for all workers.
- **Employers:** Create equal lifelong learning and upskilling opportunities in the workplace to generate a more even playing field while responding to evolving skill demand and technological innovations.
- **Trade unions:** Ensure fair, attractive pay and that principles of equal pay for work of equal value are respected in STEM fields and that they are part of collective bargaining agreements.
- **Trade unions:** Work with STEM- and non-STEM industries and enterprises to encourage and facilitate the formation of R&D teams and units.

How do we ensure these measures are undertaken? I emphasize two areas to bring about transformative change:

1. **Create gender balance and diversity in leadership and decision-making positions.** These include all visible, influential positions in or for the STEM-related sectors, such as representatives in national science academies, who credit scientific successes and synthesize scientific findings to support evidence-based policy-making and are thus well positioned to strengthen their country's innovation systems. Further, they can advocate for more women and girls' participation in STEM subjects and sectors and advise on system-wide use of an intersectional gender lens in research and innovation (Ngila and Boshoff, 2017). However, voice and representation in leadership matters at all levels need to be expanded, from workers' supervisors and mentors via hiring committees and business managers; early-year teachers via school principals and education and curriculum advisers; journal authors and editors; conference speakers, etc. This critical building block for improved diversity in the STEM fields would have ripple effects on other areas, too.
2. **Strengthen and diversify social dialogue and partnerships.** Gender-balanced tripartite social dialogue and bipartite collective bargaining are a cornerstone to form gender-

125 To learn more about such proactive measures, see The Behavioural Insights Team at: https://www.behaviouralinsights.co.uk/ (accessed 9 July 2018).

transformative policies, including those related to STEM. Beyond comprehensive, inclusive collaboration among trade unions, employers' organizations and governments, collaboration is also necessary among training institutions, academia, civil society, United Nations agencies, multilateral institutions and the media (UNHLP, 2016; Goulding, 2013). Evidence indicates that promoting gender equality and social dialogue is mutually beneficial and inextricably linked (Goulding, 2013). Policy-makers' task is to shape measures and actions built on new (and old) understandings, evidence and questions and to discover creative, innovative ways to integrate the skills, perspectives and ideas of marginalized people who are rarely invited to the negotiating table. Only if anchored in their realities – and if they partake in crafting solutions – can social change be truly transformative and inclusive.

We can no longer afford to omit the social and economic potential of the talent, skills and innovative ability of women and other under-represented groups' equal contributions to the STEM fields. The pervasive gender segmentation, unsupportive working environments, lack of diversity and growing skill gaps in the STEM-related sectors hinder the innovation and creativity needed in this rapidly changing and increasingly complex world of work. Finding solutions and responding to many needs and challenges cannot be undertaken by a few, with homogeneous experiences and backgrounds. We are setting ourselves up for failure – unless action is taken towards diversity in the STEM fields. These actions can have gender-transformative outcomes far beyond these fields and contribute to an inclusive, innovative and indeed gender-transformative future of work. The steps offered here could be applied to other areas because they build an enabling working environment, which is essential for skills to contribute to social inclusion. But by creating equal opportunities while improving the quality of jobs in the STEM sectors, vast populations' well-being and quality of life will improve, too. To build an inclusive society while finding solutions to the transformative drivers shaping the future of work, the STEM fields must be diverse, with all jobs of good quality and opportunities and treatment fair and equal.

Conclusion

In this chapter, I argue that if we want to give rise to an inclusive society, we must better understand and address the power structures that preserve and increase inequality, especially the unequal opportunities and treatment in our globalized world of work. In this regard, a feminist, intersectional approach – inevitably founded on real-life experiences – offers insights. This approach helps our sense-making of inequality by exposing gender bias in labour markets and workplaces.

In the context of the Asia-Pacific region's rising inequality, climate change disasters, massive skill shortages and technological advancements' replacement of so-called low-skill jobs in various industries, I have investigated the region's female STEM-related workforce, focusing on high-demand sectors in the Philippines and Thailand. Despite a comparably large share of women, rigid gender gaps and unequal career opportunities prevail. Women remain the most underutilized pool of talent, represent most workers with low-quality jobs and face the greatest risk of automation's replacement. Gender gaps will not close automatically. Strengthening diversity through enhanced skills and employment opportunities for women and other under-represented groups in the STEM fields is of utmost importance in Asia and the Pacific – it can be a game changer in the future of work. However, solely increasing the share of women through gender-blind interventions would have damaging effects from an inclusive perspective because feminization typically comes with lower wages, status and job quality. Thus, while promoting women in the STEM fields is critical in building an innovative and inclusive society, it is not enough. We must also tackle the issues that are holding women back – within and beyond STEM. Such action requires us to create an enabling working environment and address our biased valuation of skills and jobs.

Skills alone are insufficient for quality jobs and careers for all. A contribution of this chapter is the use of a feminist approach to explore how the powerful interlinkages between job quality and skills cause inequality. I looked at the undervaluation of "feminine" skills and work, a gender bias that is both culturally institutionalized and collectively internalized, resulting in and "justifying" poor job quality. Undervaluing feminized activities is "implicitly and explicitly manipulated to reproduce inequalities as if this were natural and inevitable, thus undercutting critique and resistance" (Peterson, 2006, p. 36). However, inequalities are neither natural nor inevitable; but equality will not come effortlessly. Resistance is shaped by critique, and in a critical assessment, we realize that a single logic of analysis or limited range of vision makes little sense in our complex and fluid world of work. With STEM skills at the forefront in the future, contributions must be equal among people of all genders with diverse experiences and backgrounds. Without diversity, we are setting ourselves up for failure.

The chapter concludes that STEM can be a vital building block of an inclusive society – but only with diversity; an inclusive, safe and enabling working environment with job quality; and an unbiased workplace culture in which equality of opportunity and treatment prevails. Only then, can the STEM fields find innovative and creative solutions to the transformative drivers shaping the future of work.

Skills to bring about inclusion, widespread social change is necessary. Feminist critique and analysis have a transformative potential beyond conceptual levels – it can shape our proactive action. Gender balance and diversity in leadership and decision-making positions and social dialogue can spur this social change. Gender-transformative policy-making and efforts to reshape the STEM fields, by purposefully strengthening diversity and creating an enabling working environment with job quality, involves comprehensive skills- and workplace-related measures. Both should develop and implement ways to combat underestimated, unconscious bias through new ways to recognize, value and utilize skills and talent in an unbiased, more holistic manner.

From the Asian-Pacific STEM case, we learn that for transformative change, the approach to tackle inequalities must be holistic. This lesson can be taken on all skills topics. The structural, gendered determinations of value, which are reproduced and normalized at all levels in a neoliberal economy, are encapsulated in the inequitable distributions of resources, responsibilities and power. With others, I argue that revealing how power operates in a capitalist society – and acting upon it – must be an objective of a critical political agenda. But gender-transformative outcomes require diverse experiences, ideas and perspectives of all genders when crafting solutions in any area. Therefore, expanding women's and marginalized persons' roles and space in the world of work is perhaps the most important step on our pathway towards an inclusive society.

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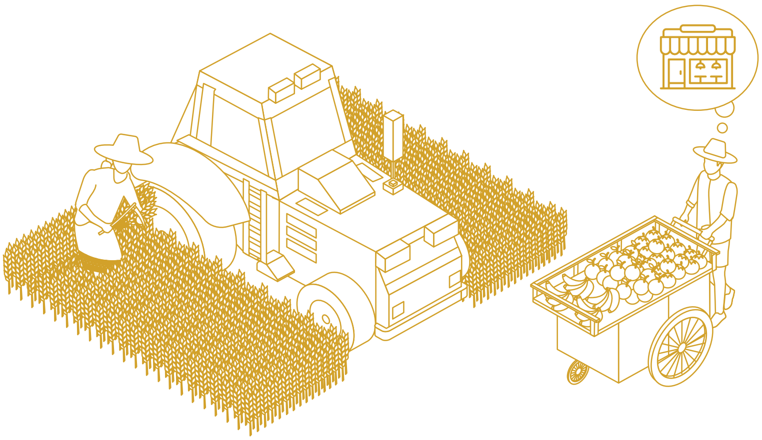
Section IV:

Meeting recurrent challenges of the labour market: Skill mismatch, informality and rural economy



11

Problem of skills mismatch in Asia and the Pacific: How useful are the existing measurement for future skills strategies?

Makiko Matsumoto
Ruttiya Bhula-or

Abstract: The process of economic development is typically driven by structural change and productivity growth requiring adjustments in the labour market, including expansion of the available skills set. Such adjustments are rarely easy or smooth as it involves movement of the labour force from one sector to another and from one occupation to another. Often there are vacancies that remain unfilled or that experience high turnovers. One important policy area that boosts further structural change and productivity growth is skills development policies to overcome skills shortages and mismatches.

This chapter undertakes a skills mismatch analysis in ten countries in Asia and the Pacific to provide a comparative regional perspective on skills mismatch. It fills the gap in the existing literature that consists mostly of national level studies that use different approaches to examine skills mismatch. The countries utilized in this study include Bangladesh, Cambodia, India, Indonesia, Mongolia, Pakistan, Philippines, Thailand, Viet Nam, and Timor-Leste. The data sets utilized are from relevant household surveys. The study investigates both vertical and horizontal skills mismatch and finds an interesting correlation between these. Finally, this chapter also finds significant over-supply of low-skilled workers, while skills shortages will be most serious for semi-skilled occupations up until 2020.

Introduction

The process of economic development typically engenders structural change and productivity growth. This is accompanied by adjustments in the labour market. Workers move from subsistence or traditional livelihoods towards employment opportunities that offer better income prospects or support the income diversification strategy of households. Engaging in new economic activities is neither an easy nor smooth process for workers because management practices and work requirements in terms of hours, outputs and skills differ considerably from work in the household or village.

In the process of structural change, skills mismatch is often raised as an important challenge in many low- and middle-income countries in Asia. Such views are often based on the fact that young, better-educated jobseekers have difficulties finding employment and that their fields of study tend to concentrate in subjects other than science, technology, engineering and mathematics, such as economics, management or law. In addition, the share of upper--secondary students enrolled in technical and vocational education and training is fairly small, in spite of the apparent demand for job-oriented skills that these programmes typically provide.

More importantly, the average years of schooling have been improving but at a fairly slow pace. Between 2000 and 2010, average years of schooling increased from an estimated 6.9 years to eight years in Eastern Asia and the Pacific and from 4.3 years to 5.3 years in Southern Asia (Barro and Lee, 2013). The bulk of young people continues to drop out of education and training at an early stage, which results in skills shortage and oversupply of low-skilled or unskilled workers. Continued investment in education and training is clearly the way forward to sustain economic development. Yet, there are many instances where economies are locked into a low-wage, low-skilled growth path. This, in turn, can discourage workers and their families from investing more in the education and training of children and youth because the perceived opportunity cost of education may be high and the time horizon for reaping the returns from education may be uncertain.

At the same time, there is a pressing need to prepare the future workforce and upgrade their skills to realize the benefits of ongoing technological progress. Technological progress is currently mainly driven by socioeconomic parameters of high-income countries, including in countries where labour shortages are happening or are expected in the medium term due to an ageing population. Such technological progress is more likely to shift the profile of employment towards higher and updated skills. Failing to realize improvements in educational outcomes may leave low- and middle-income countries further behind; they will lack the capacity to catch up with technological advances and make productive use of the opportunities that arise from such advances.

To mitigate skills shortage and mismatch in low- and middle-income countries in Asia, the labour market and policies need to adjust effectively. Effective policy responses require good empirical information and analyses. Yet, the literature on skills mismatch in the region is limited. The published studies concentrated on high-income countries, such as Japan and the Republic of Korea, where overeducation tends to prevail. The few studies for low- and middle-income countries in the region, including Bangladesh, Nepal, Sri Lanka and selected Member States of the Association of Southeast Asian Nations (see for example, NIS, 2015; Elder, 2014; Hilal, 2014; Senrath and Patabendige, 2014) suggest that more than half of employment is affected by skills mismatch. Among the instances of mismatch, undereducation prevails in many occupations, while overeducation affects some selected occupations. There are also indications that skills mismatch declines with improving levels of educational attainment.

Most of the empirical literature focuses on the match between the level of education and the predefined educational requirements for a group of occupations. This chapter points out the shortcomings of using such information as a basis for policy dialogue and responses to improve employment and incomes and, instead, suggests a possible way forward.

The chapter also highlights that an overemphasis on skills mismatch, which is difficult to empirically capture, may lead to narrow and unbalanced policies and institutional development. The evolution of the labour market in the context of structural change is affected by various kinds of imbalances, in which skills is only one factor.

For an effective policy response to improve labour market outcomes, balanced institutional development is needed beyond skills development, including the strengthening of: labour market information; the network between education and training institutions and employers; employment services; the monitoring of working conditions and the regulating of them; and, the provision of social protection. In addition, employers' active role in improving the skills-matching outcome is crucial. Education and training history are only entry-level selection criteria from an employers' perspective. And employers are best placed to know what is required for their workers to be productive.

11.1 Does skills mismatch matter for future economic development?

Skills mismatch captures the imbalances between skills supplied and skills needed in the labour market (ILO, 2014; ILO, 2013). Skills mismatch may ensue when employers hire workers even if they do not have the skill set that will be directly applicable for the job. Skills mismatch may also manifest when jobseekers with a specific level or type of education and work history remain unemployed or undertake work that does not utilize the skills that they have. Such matching outcomes occur if information, recruitment and job search costs are high. It may be costly for employers to invest sufficiently in screening jobseekers for the right set of skills. Jobseekers may not be able to keep searching for a job that best matches their occupational choice, given their skills and experience, because of the expense and their lack of income.

Thus, skills mismatch matters most when jobseekers have difficulties finding employment and suffer prolonged periods of no or low income. Skills mismatch may not matter so much if jobseekers find employment and are able to develop job- or enterprise-specific skills. This requires employers to factor in learning environments and a training period that allow workers to adjust to the workplace. This also requires workers to have an ability to absorb and develop the needed skills on the job. In practice, employers may hesitate to invest sufficiently to allow workers to adjust and to develop their skills and workers may lack the ability to absorb and develop their skills further on the job. Skills mismatch may then result in a negative labour market outcome, such as low productivity because of under-performance and high worker turnover. A high incidence of skills mismatch can result in economic output below the full potential. Underutilization of productive capacity also affects future growth because profits and incomes that could have been accumulated and rechannelled are foregone.

Nevertheless, the effects of skills mismatch on overall economic and labour market outcomes, such as unemployment, turnover, productivity and wages and incomes, should not be overemphasized. The literature and the data presented in this chapter indicate the prevalence of undereducation in low- and middle-income countries of Asia. If such data are read in a straightforward manner, they can reflect an overutilization rather than underutilization, of existing productive capacity. Furthermore, skills is only one form of mismatch in the labour market, albeit an important one. The broader employer-worker matching issues include spatial mismatch (when jobseekers and employment opportunities are in different places and there is high mobility or information costs) and expectations mismatch between workers and employers in terms of output, remuneration, working conditions and management practices.

Effective policy responses require good empirical information. Yet, translating skills and competencies in terms of level or profile into an understandable and usable number is a daunting task. Skills are not measurable in any satisfactory manner by regular labour force statistics, and it is difficult to ascertain the effects of skills mismatch on labour market outcomes, such as unemployment or productivity. Various attempts have been made to proxy skills, including background information on education and training and work experience. In this chapter, we apply one of the simplest methods, using standard labour force statistics in selected Asian countries. It matches education attained to predefined, educational requirements for a group of occupations, without considering the socioeconomic context of the different countries. The cross-country examination highlights the shortcoming of such an approximation method to quantify skills mismatch. One shortcoming is that the data on education and training is often collected in a limited manner. Another shortcoming is that a large group of occupations is clustered into semi-skilled occupations in vertical skills mismatch analysis. As will be highlighted below, it is difficult to gain useful policy insights or messages from the cross-country examination of the incidence of skills mismatch.

11.2 Measuring skills mismatch

Using national standard data sources that are typically produced for regular policy monitoring purposes, including the Labour Force Survey, skills mismatch can be approximated as a vertical or horizontal mismatch. Vertical skills mismatch measures the diversion of the level of qualification of workers from the level that is required for their jobs (Hilal, 2014; ILO, 2014; ILO, 2013). Horizontal skills mismatch captures the diversion of workers' fields of education from those required for their jobs (Montt, 2015; Domadenik et al., 2013).

Country coverage, data sources and limitations

The chapter's analysis is based on national data for ten countries in Asia that were accessible through the International Labour Organization's (ILO) Microdata Repository. The data sets consist of nationally representative Labour Force Surveys, Employment and Unemployment Surveys and Household Socio-Economic Surveys. The years covered are 2005, 2010 and 2015 or, depending on data availability, the closest corresponding year with a maximum divergence of two years. (See Annex table A1 for the data sources and the years used.)

Using existing national household surveys has notable disadvantages in that the questionnaires are not specifically designed to conduct in-depth analysis of skills. The primary objective of these surveys is to generate key labour market indicators, such as employment and unemployment, status in employment, and occupational and industrial distribution of employment. The data usually cannot measure innate or cognitive skills. Also, household surveys, by definition, do not collect information from employers. Many countries conduct regular establishment or industry surveys. Such surveys, however, usually do not collect sufficient information on workers, skill needs and other information related to working conditions. Moreover, establishment coverage is usually restricted to either the formal sector or to bigger establishments. Thus, information collected for regular national monitoring purposes is insufficient to distinguish between demand- and supply-side factors and the interactions between them, which is what determines skills mismatch.

Measuring vertical skills mismatch

Based on ILO guidance (2012), classification at the one-digit level of the International Standard Classification of Occupations (ISCO) is assumed to require certain levels of education, as defined by the International Standard Classification of Education (ISCED). (See Appendix table A2 for the matching procedures).

Occupations were classified into four groups according to the predefined level of education required for each grouping. The four groups consist of low-skilled, semi-skilled, relatively high-skilled and high-skilled occupations. Managers are assumed to be in high-skilled occupations requiring skills at level 4 because they are likely to have accumulated and demonstrated skills through their work experience.

The shortcomings of this matching procedure are clear. There is a broad range of occupations that were defined as semi-skilled. A large proportion of workers were found in this occupation group. Skilled agricultural, forestry and fishery workers accounted for around 30 per cent of employment for the countries covered, on average. Elementary occupations accounted for another one quarter of employment.

Two other prevalent occupations are services and sales workers and craft and related trades workers, each accounting for more than 10 per cent of employment, on average, for the countries covered. The corresponding level of education was also broader than for other occupation groups, which included both lower- and upper--secondary schooling. Often, lower-secondary schooling is mandatory, and one of the constraints to upskilling is the significant incidence of dropping out as students progress from lower- to upper--secondary schooling. Thus, such large aggregation in occupation and education does not enable identification of constraints to skills development and policies needed to overcome them.

Measuring horizontal skills mismatch

Horizontal skills mismatch occurs when a worker trained in one field works in a sector in which the knowledge acquired in the training is not directly applicable. In this chapter, the field of study is matched to two-digit level occupations, based on Levels et al. (2014), Nordin et al. (2010) and Robst (2007). For example, employed persons who have graduated in the agricultural field are considered matched in skills if they are agricultural workers and unmatched if they work in other occupations.[126]

The country coverage is restricted to Thailand and Indonesia for the exploratory examination. The sample was first restricted to technical and vocational education and training and higher education graduates who were in employment. The sample was further restricted to selected sectors: (i) manufacture of food and beverages; (ii) manufacture of motor vehicles, trailers and semi-trailers; and (iii) financial intermediation, except insurance and pension funding.

There are at least two shortcomings with the matching procedure used. One is that a worker may have undertaken more than one field of study but did not have space to report all fields of study in the survey. For example, information on the highest level of education attained was usually collected, such as a person working as an engineer with a bachelor’s degree in engineering and a master’s degree in management science. The reported field of study would be management science, which may be considered only weakly relevant for the current job while the bachelor’s degree was relevant. Another shortcoming is that the Labour Force Surveys often do not have sufficient space to collect information on areas of knowledge and skills acquired beyond the field of study, including skills acquired through firm-specific training.

11.3 Skills mismatch: What does the data tell us?

The total number of employed persons in the ten countries examined amounted to 878.4 million in 2015. From 2005 to 2015, employment grew by 1.3 per cent per year, on average. The fastest employment growth occurred in Pakistan, at 3.1 per cent, while Thailand experienced the slowest growth rate, at 0.6 per cent.

The demographic shift is a challenge in the region because employment growth is likely to be below the growth of the working-age population. The employment-to-population ratio has been gradually falling, from 63.7 per cent in 2005 to 60.6 per cent in 2015 (ILO, 2016). This generates pressure to raise productivity and, hence, the skill intensity of the employed population to support the social protection system in richer countries and to sustain income growth in lower-income countries.

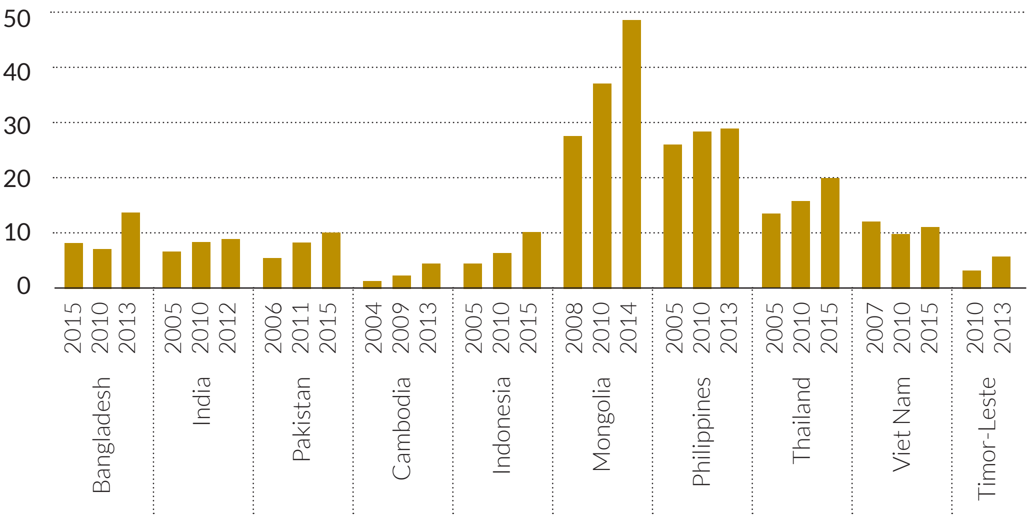
The employed persons in almost all ten countries shifted to higher levels of education over the years examined.[127] One of the factors behind the upward shift in the educational profile of workers was the improved access to education. In addition, demand for higher-skilled workers may have increased. The share of employed persons who were highly educated increased in most of the countries examined (Figure 1). The share of highly educated workers was notably high in Mongolia, reaching 50 per cent in 2014. The Philippines and

126 The detailed matching criteria can be made available upon request.

127 In Viet Nam, however, the share of those with tertiary education and above declined somewhat, from 12.2 per cent in 2007 to 11.2 per cent in 2015.

Thailand also had fairly large shares of highly educated workers, at around 30 per cent and 20 per cent in most years, respectively.

Figure 11.1: Share of employed persons with tertiary education and above (%)



Note: Tertiary education includes short-cycle tertiary education.

Source: Authors' estimates.

Semi-skilled occupations were predominant in almost all countries examined, accounting for more than 40 per cent of employment; in many cases, it accounted for more than 70 per cent (table 11.1). The share of high-skilled occupations tended to be small, at around 10 per cent or less, except in Mongolia and the Philippines, where the shares stood at 30 per cent and 22 per cent in the most recent years, respectively.

A divergent trend in occupational composition of skill requirements was discerned across countries. There was a move away from low-skilled occupations to more skill-intensive occupations in Bangladesh, India, Timor-Leste and Viet Nam. In contrast, in Pakistan, the shares of low- and semi-skilled occupations increased while that of higher-skilled occupations declined. In Cambodia, there was some shift away from semi-skilled occupations towards low-skilled ones. In Indonesia and Mongolia, the share of semi-skilled occupations declined while it increased for low- and high-skilled occupations. Such a divergent trend in occupational compositions, when the increase in the level of education of workers seems to be fairly uniform across countries, suggests that the workers' educational attainment was driven by supply-side factors and not necessarily by responding to the available employment opportunities.

Table 11.1: Distribution of occupations grouped by skills (%)

Country	Year	Low-skilled	Semi-skilled	Relatively high-skilled	High-skilled
Bangladesh	2005	25.8	68.9	1.5	3.7
	2010	46.8	47.5	1.6	4.0
	2013	13.6	78.7	1.8	5.7
India	2004/05	30.6	60.9	2.8	5.7
	2009/10	32.7	54.6	3.0	9.4
	2012/13	19.9	58.6	6.1	15.4
Pakistan	2005/06	15.6	64.9	5.0	14.4
	2010/11	16.5	64.2	5.7	13.7
	2014/15	15.8	73.8	3.2	7.2
Cambodia	2004	8.5	86.7	0.5	4.4
	2009	15.6	79.8	0.9	3.1
	2013	14.0	79.8	1.0	4.4
Indonesia	2005	13.6	77.5	4.5	3.4
	2010	12.7	78.2	2.2	6.3
	2015	17.5	72.1	2.7	7.1
Mongolia	2007/08	5.2	72.2	4.9	17.6
	2010	8.5	60.3	6.6	24.5
	2014	9.5	56.2	3.7	30.0
Philippines	2005	32.4	49.0	2.6	15.7
	2010	32.5	46.3	2.6	18.2
	2013	32.2	43.4	2.6	21.5
Thailand	2005	11.5	73.7	4.1	10.7
	2010	10.6	78.0	4.0	7.4
	2015	10.3	75.6	4.5	9.6
Viet Nam	2005	61.7	29.0	4.0	5.3
	2010	39.1	50.9	3.7	6.1
	2015	38.5	50.0	3.3	7.8
Timor-Leste	2010	47.4	33.2	7.7	11.7
	2013	2.2	84.2	3.0	10.5

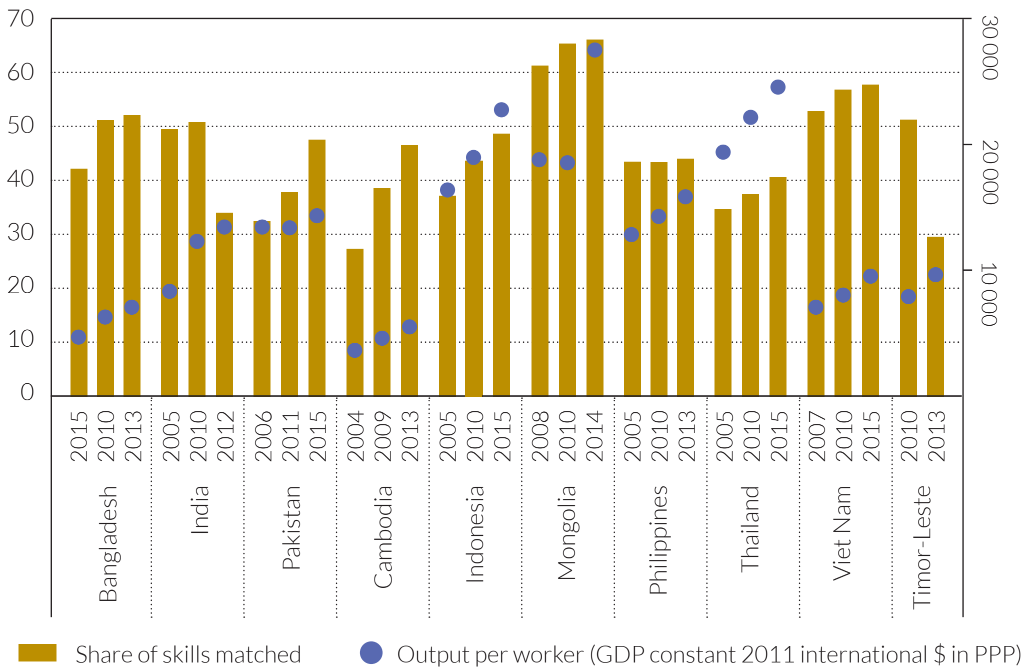
Note: Low-skilled occupations require skill level 1 and include employed persons with primary education or less. Semi-skilled occupations require skill level 2 and include employed persons who have completed the first and second stages of secondary education. Some semi-skilled occupations may require completion of vocation-specific education undertaken after completion of secondary education. Relatively high-skilled occupations require skill level 3 and include employed persons who have completed post-secondary education for a period of one to three years. High-skilled occupations require skill level 4 and include employed persons who have completed higher education and have been awarded a first degree or higher qualification. Managers are assumed to require skill level 4.

Source; Authors' estimates.

Vertical skills mismatch

In the ten countries examined, vertical skill matching ranged from around one third to two-thirds of employment (figure 2). In almost all the countries, vertical skills matching improved over the time examined. India and Timor-Leste seem to be exceptions due to their declining incidence of matching. Improved matching was accompanied by productivity increases in many countries. However, this relationship seemed weak or non-existent in Cambodia, Mongolia, Pakistan and Timor-Leste. While better skills matching may move along with productivity, it was only one of the factors that determine productivity growth.

Figure 11.2: Incidence of vertical skills matching (%) and labour productivity



Note: PPP = purchasing power parity.

Source: Authors' estimates. Output per worker was drawn from ILO, 2016 (KILM 9th edition).

The incidence of undereducation was more prevalent in almost all countries. The Philippines is an exception, where overeducation accounted for larger proportions of skills mismatch in all years examined. The high incidence of undereducation in all ten countries highlights the low level, though improving, of educational attainment and the pervasiveness of skills shortage. Thus, for most of the countries examined, it would be more straightforward to focus the policy debate around skills shortage rather than skills mismatch. The issue of skills mismatch may exist, particularly in countries like Mongolia, the Philippines and, to a lesser extent, Thailand, where workers are more highly educated. But it clouds the policy debate in other countries, where mismatch may be an issue for a fairly limited proportion of workers.

During the period examined, the incidence of overall skills mismatch tended to increase in low-skilled occupations, while it generally declined or remained constant in other occupational groups (table 2). Overeducation tended to increase in low- and semi-skilled occupations. This is not surprising, given the general improvements in educational attainment. Thus, the focus of economic policies and investment efforts needs to accelerate structural change and occupational upgrading to ensure higher value additions and to shift the occupational structure towards more skill intensity. The occupational structure of the labour market in terms of skills needed is shifting more slowly than the educational attainment of the workforce.

One problem with the vertical skills mismatch data presented here is that there can be a perverse interpretation of data that thus gives a perverse policy message. For instance, if overeducation is increasing, then workers need not invest more in higher levels of education in countries where low- and semi-skilled occupations predominate. However, such a message goes against long-term development goals and may provide the wrong signals to the labour market from a long-term development perspective. Viet Nam may be a case in point. It is unique among the ten countries examined in that the incidence of overeducation declined in every occupational group while the incidence of undereducation increased in every occupational group. Even if the Viet Nam data imply an overall improvement in skills “matching” through a downward movement in the level of education, there may be longer-term implications for future productivity growth and the absorptive capacity of the workforce in the face of new technological development.

Table 11.2: Period-average share of under-educated and overeducated employed persons, by occupations grouped by skills

Country	Low skilled		Semi-skilled				Relatively high skilled				High skilled	
	Over educated		Undereducated		Overeducated		Undereducated		Overeducated		Undereducated	
	AVG	Δ PP	AVG	Δ PP	AVG	Δ PP	AVG	Δ PP	AVG	Δ PP	AVG	Δ PP
Viet Nam	50.8	(11.5)	32.9	12.0	4.6	(2.8)	50.1	60.1	12.5	(18.7)	15.2	4.0
Mongolia	93.2	(1.6)	15.1	(6.8)	14.7	7.6	26.1	(9.4)	48.9	21.7	31.0	(29.6)
Thailand	30.4	9.8	59.1	(12.4)	9.7	4.7	35.1	(9.6)	48.5	15.6	36.6	(24.8)
Philippines	54.9	3.3	32.5	(8.8)	26.8	3.8	27.7	1.1	72.3	(1.1)	44.6	7.6
Indonesia	46.4	(6.3)	55.0	(13.8)	3.2	3.8	62.9	(16.0)	22.4	5.3	50.2	(23.9)
Bangladesh	32.3	26.8	53.7	(28.3)	8.1	3.9	51.2	4.1	29.9	(7.4)	55.6	(1.1)
Pakistan	22.6	6.4	60.2	(21.9)	4.7	5.3	67.6	11.2	30.0	(15.2)	70.0	(34.5)
India	30.0	27.8	54.7	(4.7)	6.5	3.8	63.4	36.7	34.8	(35.3)	72.7	30.3
Cambodia	30.9	4.4	64.4	(23.2)	1.6	2.5	80.2	2.0	15.2	(1.8)	80.4	(19.1)
Timor-Leste	25.1	17.1	67.9	(1.5)	1.5	1.4	85.5	(20.7)	11.1	17.0	83.6	(7.2)

Note: Countries are sorted in ascending order by period-average share of under-skilled workers in high-skilled occupations. AVG = period average shares of over- or under-skilled workers. Δ PP = percentage point differences in this share between the mid-2000s and mid-2010s. For percentage point changes, negative numbers are shown in brackets.

Source: Authors' estimates.

To summarize, the vertical mismatch analysis presented here shows that framing the skills and labour market challenges as a mismatch problem could divert policy attention away from addressing the demand side of the labour market and to overconcentrate on education and training policies for adjustments. The occupational structure has tended to stagnate at the lower end of skill intensity. The message that should be clear is the need for economic and labour market policies that generate economic activities towards higher-value-adding activities with more skill-intensive occupations.

Horizontal skills mismatch

A horizontal skills mismatch occurs when a workers' field of study and the knowledge required for a job do not correspond. Such mismatch can occur when young graduates enter the labour market, and there are few or no job offers that require their field of study. In such a situation, the graduates may: (i) undertake work for which their field of study can be applied but not at the same level (vertical mismatch); (ii) work in a job that is unrelated to their field of study (horizontal mismatch); (iii) continue with the job search and remain unemployed; or (iv) continue with their studies, whether in the same or in a different field. In most instances, the last option cannot be afforded by young graduates. For persons who decide to work in mismatched areas, if occupational mobility is difficult at a later date, the horizontal mismatch at the labour market entry point will reflect a loss of investment that went into skills development.

To explore how the applied method of estimating horizontal skills mismatch can and cannot be useful in informing policy decisions, sectors were selected for Indonesia and Thailand. These sectors were manufacture of food products and beverages, manufacture of motor vehicles and other transport equipment, and financial intermediation, except insurance and pensions. These sectors together accounted for around 10–15 per cent of gross domestic product (GDP) (table 3). Their share in GDP grew in Thailand but declined in Indonesia between 2005 and 2015.[128] Nevertheless, in both countries, the share of employment in the three sectors increased, reaching 2.3 per cent in Indonesia and 6.2 per cent in Thailand in 2015. The share of workers with upper- secondary education and above was generally small in food products and beverages but increasing during the period examined. This share was much larger in the other two sectors, reflecting their more skill-intensive nature.

128 The decline in shares of these sectors in Indonesia may be partly accounted for by a statistical break between 2005 and 2015, when the industrial classification system changed.

Table 11.3: Selected manufacturing sectors' shares in GDP and total employment and share of workers with upper- secondary education and above, Indonesia and Thailand

	Indonesia			Thailand		
	2005	2010	2015	2005	2010	2015
GDP[a]						
Manufacture of food products and beverages	6.4	5.3	5.6	5.5	6.4	6.3
Manufacture of transport equipmentb	6.2	2.0	1.9	2.7	2.8	2.7
Financial intermediary services	3.9	2.2	2.5	4.5	4.4	5.9
Total value added of 3 sectors, % GDP	16.6	9.4	10.0	12.7	13.6	14.9
% in total employment						
Manufacture of food products and beverages	1.3	1.6	1.6	2.9	2.9	3.9
Manufacture of transport equipment	0.1	0.1	0.1	0.5	0.6	1.1
Financial intermediary services	0.2	0.4	0.7	0.6	0.7	1.1
Total employment share of the 3 sectors	1.6	2.0	2.3	4.0	4.2	6.2
% of upper-secondary education and above						
Manufacture of food products and beverages	24.4	28.7	36.6	14.4	18.4	23.3
Manufacture of transport equipment	89.0	83.3	81.6	42.5	32.3	35.6
Financial intermediary services	91.3	80.7	86.4	86.6	85.6	85.1

Note: a = The published data on GDP in Indonesia in 2005 was grouped differently from the subsequent years. In 2005, the manufacture of food products and beverages included the manufacture of tobacco. The manufacture of transport equipment in 2005 also included machinery and apparatus. The financial intermediary services in 2005 also included real estate and business services (both bank and non-bank). Because the sectors were more broadly defined, this may account for the declining share in GDP. b = There may be some non-correspondence between Indonesia and Thailand for this sector. The Indonesian data refer to manufacture of transport equipment, while the Thai data refer to manufacture of motor vehicles and other transport equipment.

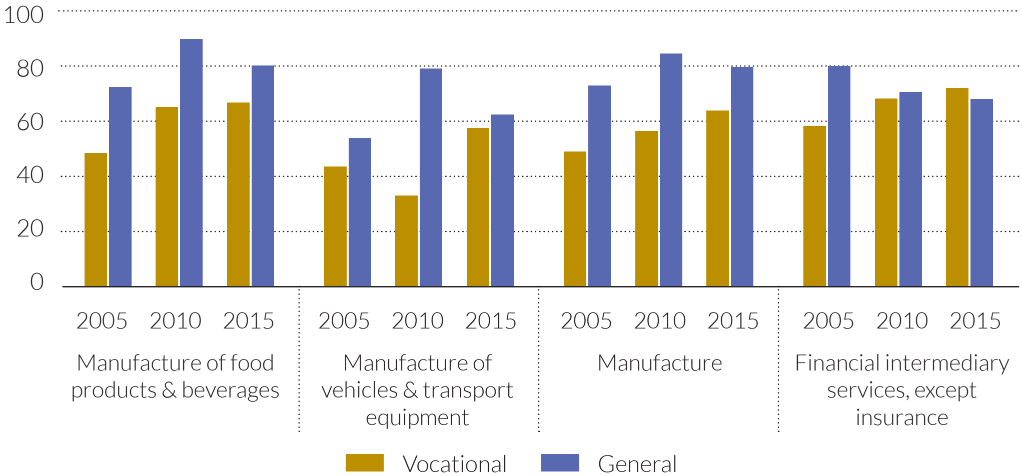
Source: Authors' calculation for employment shares and shares of workers with senior-secondary education and above. For GDP, see Statistics Indonesia, http://www.bi.go.id/en/statistik/seki/terkini/riil/Contents/Default.aspx# (accessed 19 Sep. 2016); National Economic and Social Development Board: "National income of Thailand, chain volume measures" (2014, http://www.nesdb.go.th/ewt_dl_link.php?nid=5518&filename=ni_page (accessed 19 Sep. 2016).

Indonesia

The incidence of horizontal mismatch gradually increased over time in Indonesian manufacturing employment (figure 3). Unlike manufacturing, horizontal matching of skills in the financial sector improved for general education graduates, even though it tended to deteriorate for vocational education graduates. On the whole, however, persons with vocational education were less likely to experience horizontal skills mismatch than those with a general education.[129]

129 Except in financial intermediary services in 2015.

Figure 11.3: Incidence of horizontal skills mismatch in Indonesia, selected sectors (%)



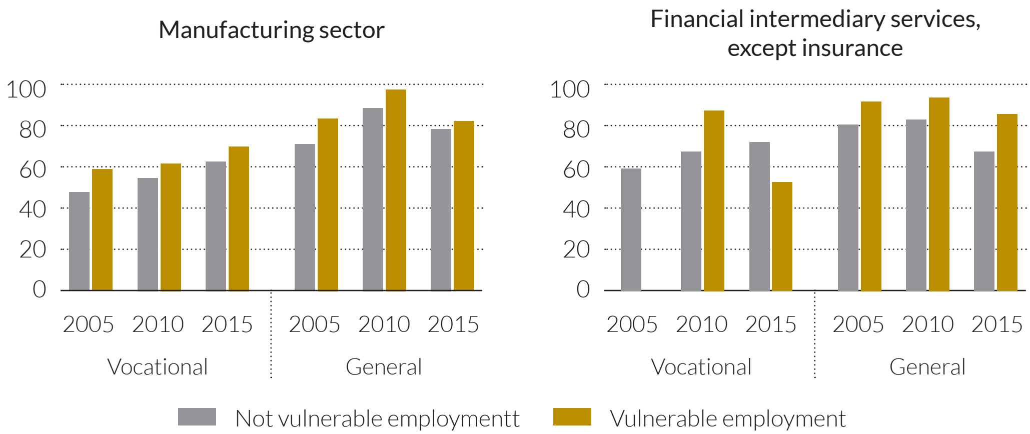
Note: 'Vocational' stands for vocational education graduates and 'General' stands for general education graduates.

Source: Authors' estimates.

Does an increase in horizontal mismatch, as captured by the data, matter for the future of manufacturing in Indonesia? From the examination of the data presented here, there is no clear conclusion that can be drawn. For example, the predefined matching procedure used does not reflect the employers' hiring preferences when it comes to fields of study, and there may be specification errors in the procedure (see section 3.3). Even if the workers have an education and a training background that are seemingly unrelated to their work, the fact that they are employed implies that their field of studies per se may not matter so much. Furthermore, with such horizontal mismatch, the labour market outcome of interest is productivity, turnover and earnings. Thus, additional data analysis will be needed to draw some conclusions on whether the observed increase in horizontal skills mismatch in the Indonesian manufacturing sector should be a concern or not. What will matter, in terms of future productivity growth in manufacturing, particularly in the context of ongoing technological progress, is the ability of those workers to gain new or additional job-related skills through different forms of training during their working lives.

Having a matching educational and training background in terms of field of study seemingly increases the chances of staying out of vulnerable employment in the manufacturing and financial sectors (figure 4). Nevertheless, the difference in the incidence of horizontal skills mismatch across employment statuses declined over the decade examined, suggesting the diminishing importance of matching the field of study to employment in influencing the workers' status in employment.

Figure 11.4: Incidence of horizontal skills mismatch in Indonesia, by employment status in selected sectors (%)



Note: ‘Vocational’ stands for vocational education graduates and ‘General’ stands for general education graduates.
Source: Authors’ estimates.

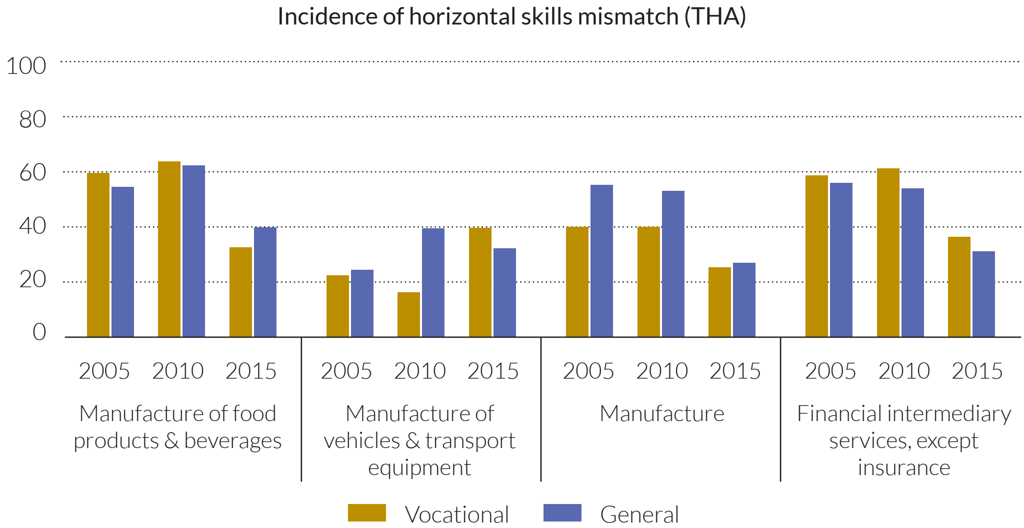
In the manufacturing sector, horizontal mismatch was on the rise in Indonesia for both vocational and general education graduates in the examined period. In contrast, horizontal mismatch declined for persons with a general education in the financial sector, and this decline was more notable among persons working as wage employees or employers. According to the data, the field of study matters in the financial sector for employment outcome in terms of status.

In summary, aside from the methodological shortcomings of estimating horizontal skills mismatch, application of the method to actual data shows considerable inter-sector differences in the implications of horizontal skills mismatch for the vulnerability of workers. It highlights the need for caution in overgeneralizing sector-specific findings to the overall economy and calls for an in-depth examination of horizontal skills mismatch, what it means and what it implies in terms of productivity and workers’ welfare in each sector.

Thailand

Unlike in Indonesia, the incidence of horizontal skills mismatch generally declined in Thailand in the sectors examined, regardless of the workers’ institutional background in education and training (figure 5). In the vehicles and transport equipment manufacturing, however, the incidence of horizontal skills mismatch increased between 2005 and 2015, particularly for workers with vocational education.

Figure 11.5: Incidence of horizontal skills mismatch in Thailand, selected sectors (%)

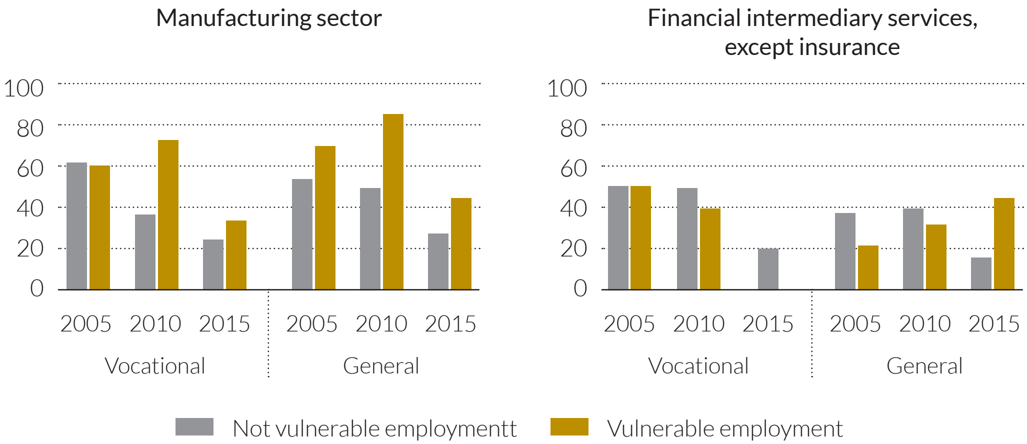


Note: 'Vocational' stands for vocational education graduates and 'General' stands for general education graduates.
Source: Authors' estimates.

Does it mean that in the selected sectors, the prospects for further productivity growth and employment stability are better in Thailand than in Indonesia? Once again, a conclusion is difficult to draw without comparing employers' hiring preferences and without comparing training outcomes and supply-side factors in education and training in the two countries. What the data may be reflecting is the increase in the courses offered that are relevant for the manufacturing and financial sectors in Thailand and employers' preferences for hiring graduates from these courses.

In Thailand, however, such an overall decline in the incidence of horizontal skills mismatch seemingly contributed to the improved labour market outcomes in the selected sectors. Persons in non-vulnerable employment were generally associated with a lower incidence of horizontal mismatch than those in vulnerable employment in the manufacturing sector in Thailand (figure 6). This mismatch decreased over time in the manufacturing sector. Among wage employees and employers, the decline in the incidence of horizontal skills mismatch was steady between 2005 and 2015. Among the vulnerable workers, however, the incidence of horizontal skills mismatch increased between 2005 and 2010, followed by a subsequent decline by 2015. This likely reflects a situation in which persons with an unmatched field of study had little choice but to undertake vulnerable forms of employment in the manufacturing sector after the economic downturn in the late 2000s. Thus, having an occupationally matched field of study affected the forms of employment – towards ones that were more likely to be secure and protected.

Figure 11.6: Incidence of horizontal skills mismatch in Thailand, by employment status in selected sectors (%)



Note: 'Vocational' stands for vocational education graduates and 'General' stands for general education graduates.

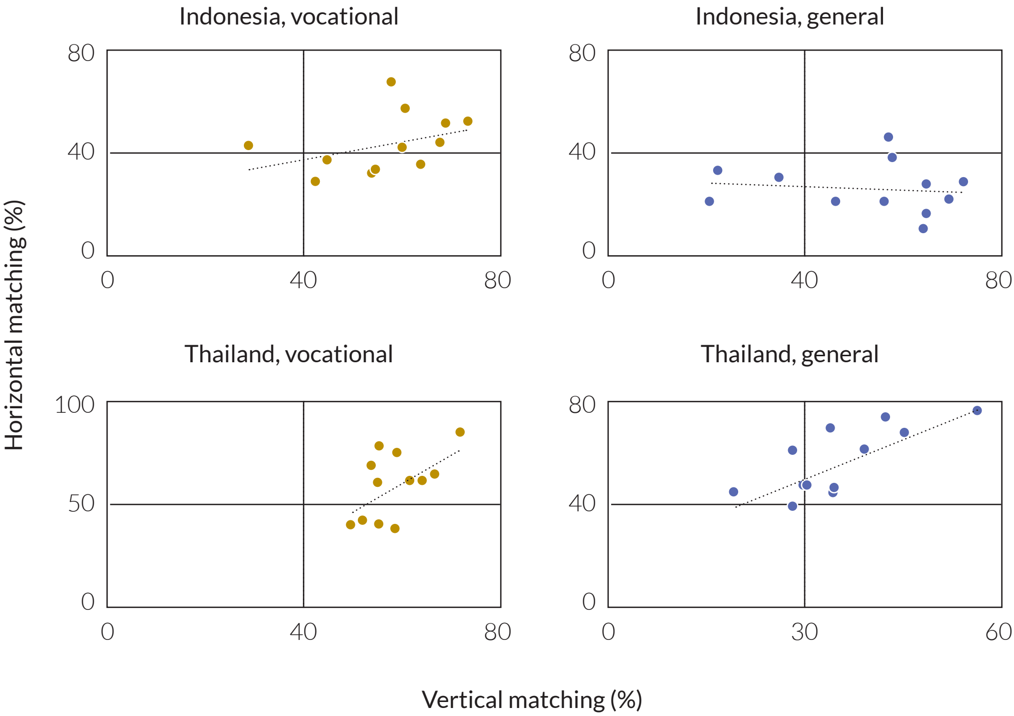
Source: Authors' estimates.

Vertical versus horizontal skills mismatch

Examining vertical and horizontal skills matching patterns highlights some of the difficulties associated with the simple estimation procedures used in this chapter. First, the level and field of studies are specific to the country's education and training system. Some fields of study may not be on offer at the lower levels of education and training and thus cannot be accessed by those with a vertically matching level of education. Second, employment and matching outcomes in specific sectors may be reflecting employers' hiring strategy, which can change rapidly over time as they adapt to the available supply of skills in the labour market. Some employers may prefer to focus on the level of education as a signal of the potential ability of a jobseeker to learn on the job. Some employers may prefer to hire jobseekers with a relevant training background to minimize the on-the-job adjustment period. Some employers may treat the education and training background of jobseekers as information of secondary importance and focus on other competencies, such as communication skills during the job interviews.

For Indonesia and Thailand, the pooled data for the manufacturing and financial sectors show some interesting diverging patterns (figure 7). In Thailand, vertical skills matching was associated with horizontal skills matching as well. This pattern held more clearly for general education graduates in Thailand. In Indonesia, vertical skills matching was weakly associated with horizontal skills matching for vocational education graduates. However, for persons with a general education background, the relationship seemed to be non-existent and, if anything, negative. This implies that improving the match between the level of education and occupational requirements can occur without the accompanying matching in the content of education and training for those occupations. It somewhat supports the points made previously, that the data are more reflective of the differences between Thailand and Indonesia in education and training systems and in employers' hiring practices.

Figure 11.7: Vertical and horizontal skills mismatch in Thailand and Indonesia, by type of education in selected sectors (%)



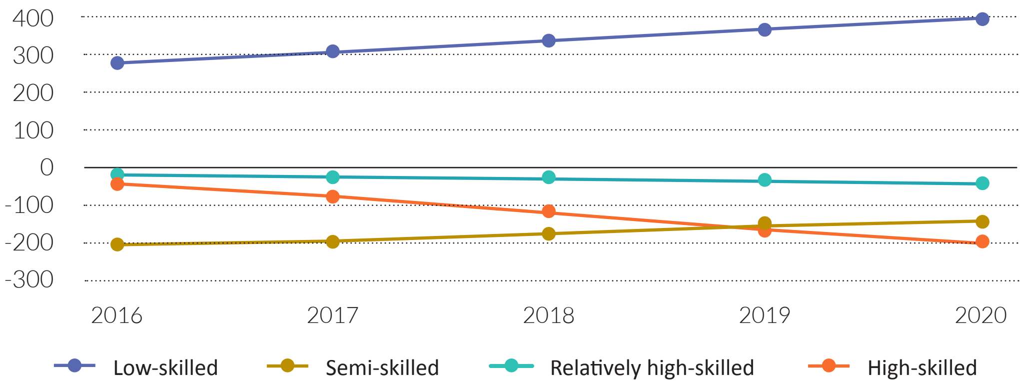
Note: 'vocational' stands for vocational education graduates and 'general' stands for general education graduates.
Source: Authors' estimates.

For policy purposes, such divergent matching outcomes caution against overgeneralization on the importance of skills matching across countries, as captured by the level and field of education and training. The extent to which skills matching is important for employment outcomes depends on employers' behaviour, particularly at the time of hiring. It also depends on the qualifications offered within the country-specific education and training systems, including the quality of training offered and the actual learning outcomes that these systems generate. Furthermore, jobseekers' decisions on education and training depend on the courses that are accessible to them, the cost of education and training and the information available about job requirements. Thus, there are host of factors beyond the matching of skills to the jobs that determine successful labour market outcomes.

A concluding discussion: Should skills mismatch be measured more accurately?

In Asia, there is likely to be a significant oversupply of low-skilled workers with a primary education or less, and skills shortages are likely to persist for other more skill-intensive occupations.[130] For the ten countries covered in this chapter, the oversupply of low-skilled workers was a little less than 400 million persons.[131] The skills shortage was most prevalent for the semi-skilled occupations, followed by the high-skilled and relatively high-skilled occupations. If these trends continue, a shortage of high-skilled workers will become more serious by 2020 (figure 8).

Figure 11.8: Skills shortage and surplus in the selected ten countries, 2016–20 ('000)



Note: Forecasted employment by education approximates the skills supply, and the forecasted employment by occupation approximates the skills demand. The figures presented sum up the estimates for the ten countries (table A1). The positive numbers capture skills surplus, while the negative numbers capture skills shortage.

Source: Authors' estimates.

The data presented in this chapter also highlighted the prevalence of skills shortage in most of the countries examined, as captured by the high incidence of undereducation in most of the countries. Thus, raising the level of educational attainment of future entrants to the labour market should continue to be a policy priority. The level of education particularly matters if employers use it as one of the key hiring criteria. At the same time, the cases of Indonesia and Thailand in the selected sectors highlight space for improved skills matching outcomes for the better-educated group of workers. Improving skills matching may become more important in countries characterized by higher levels of education, such as Mongolia, the Philippines and, to some extent, Viet Nam.

130 The estimation was made using the national Labour Force Survey data for the supply side and the ILO model estimates of total employment for the demand side.

131 India accounts for the biggest population share in these estimates.

The analysis in this chapter underscored the shortcomings of proxying skills using existing information from regular national household surveys. It uses one of the simplest quantifying methods to examine skills mismatch, vertically and horizontally. The advantage of the adopted method is its simplicity and low data intensity. But the imposition of universal assumptions on the skill-intensity categories of occupation and education seem to differ from the realities in the countries examined. Thus, it is difficult to gain further insights from cross-country differences in experiences without detailed analysis that requires additional data.

The data presented generally reflect the educational output, which tends to be low in most of the countries, with little information on the quality of education and training. The information on education and training was also, most often, labour market entry-level information, with little additional information on the skills acquired on the job. In the context of low- and middle-income countries, what matters to support economic development is that workers and jobseekers are able to move across occupations or become more productive in the same occupations and are able to earn higher incomes.

The extent to which skills mismatch constrains productive mobility or incomes of workers needs another layer of analysis. Estimating skills mismatch per se provides little information on the employment outcomes that matter for economic and labour market development. Thus, it may divert the policy focus or debate away from investing in demand-side factors, such as mobilizing investment into higher-value-adding sectors, and place onerous policy attention on the supply-side factors. Also, for a serious understanding of implications of skills mismatch, various existing studies, mostly in the context of the Organisation for Economic Co-operation and Development, collect additional information by implementing specific surveys, such as self-assessment information on whether workers consider themselves overeducated or undereducated for their current job (Jenssen, 2010; Frenette, 2004).

Equally importantly, it is the employers' behaviour that matters for employment and incomes. For example, some existing analyses use information from ad hoc surveys of employers or firm managers to assess skills shortages and gaps (SCB, 2015; TDRI, 2015; Bruni et al., 2013). If policy-makers, employers and workers believe that the skills mismatch is a constraining factor for future growth, more investment should be made to regularly collect information from employers or establishments on their needs as well as their hiring and management practices, such that education and training institutions are able to adjust to the labour market.

At the same time, skills matching outcomes need to be placed within the broader context in a country. They reflect a complex configuration of perceptions and decisions by employers, students, jobseekers and workers. They also reflect the available services, such as educational and training systems and the courses offered at different levels, the cost and quality of education and training services provided and public employment services, to name a few. They are also influenced by macroeconomic factors, such as the amount of employment on offer in a country. In countries where the level of educational attainment has become high, probing further into the causes of skills mismatch, within such a broader context, can provide more policy-relevant information. In countries where the bulk of the population remains with a primary education or less, policy efforts need to continue to ensure that children and youth stay longer in education and training. In the context of technological advances, the need for such efforts has become ever more pressing than before.

Finally, measuring skills, including innate abilities of workers, is recognized in the labour economics literature to be a difficult, if not an impossible, task. Rather than attempting to measure it, skills is treated as an unobservable that is specific to an individual. Empirical techniques have been developing on how to rid its effect to estimate the impact of policy actions, such as the provision of training or participation in active labour market programmes, on the labour market outcomes of interest, such as employment, wages and incomes, or productivity. This type of analysis is more straightforward when there are panel data.[132] Thus, if policy-makers are seriously concerned about the effectiveness of their policy interventions on the labour market, investment to construct a panel data set at a fairly regular interval may be an issue for further consideration. Furthermore, organizing and collecting information on the history of policy actions related to skills development that have been implemented in different localities in a country also become critical.

132 Panel data, or longitudinal data, provide information on the same individual or establishment at numerous points in time. They enable measurement of changes in outcomes, such as employment status, income and productivity, for given individual attributes, some of which are not measurable and remain unobserved.

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Annex 11.1: Data sources and coverage

Table A1: Country coverage

Country	Data source	Years		
Southern Asia				
Bangladesh	Labour Force Survey	2005	2010	2013
India	Employment and Unemployment Survey	2004/05	2009/10	2012/13
Pakistan	Labour Force Survey	2005/06	2010/11	2014/15
Eastern and South-Eastern Asia				
Cambodia	Socio-Economic Survey*	2004	2010	2013
Indonesia	Labour Force Survey	2005	2010	2015
Mongolia	Labour Force Survey	2005	2010	2013
Philippines	Labour Force Survey	2007/08	2010	2014
Thailand	Labour Force Survey	2005	2010	2015
Viet Nam	Labour Force Survey	2007	2010	2015
Timor-Leste	Labour Force Survey	--	2010	2013

* = Although Cambodia also conducts the Labour Force Survey, the data collection is irregular. This study used the Socio-Economic Survey to ensure consistency over time. Defining working-age population as those aged 15 years and older, the Labour Force Survey provides a lower employment-to-population ratio compared to estimates from the Socio-Economic Surveys due to differences in survey methodologies (ILO and CNIS, 2013, pp. 33–39).

Annex 11.2: Scheme for vertical skill matching

Table A2: Mapping of the skill levels between ISCED and ISCO[a]

Skill level	ISCED 1997 groups	ISCED 2011 groups	ISCO-88 and ISCO-08 major groupsc
4	**ISCED level 6 –** Second stage of tertiary education (leading to an advanced research qualification) **ISCED level 5A –** First stage of tertiary education, first degree (medium duration) b	**ISCED level 8 –** Doctoral or equivalent level **ISCED level 7 –** Master's degree or equivalent level **ISCED level 6 –** Bachelor's degree or equivalent level	**1 –** Managers, senior officials and legislators **2 –** Professionals

Skill level	ISCED 1997 groups	ISCED 2011 groups	ISCO-88 and ISCO-08 major groupsc
Skill level	ISCED 1997 groups	ISCED 2011 groups	ISCO-88 and ISCO-08 major groupsc
3	**ISCED level 5B** – First stage of tertiary education (short or medium duration)d	**ISCED level 5** – Short-cycle tertiary education	**1** – Managers, senior officials and legislators **3** – Technicians and associate professionals
2	**ISCED level 4** – Post-secondary, non-tertiary education **ISCED level 3** – Upper-secondary level of education **ISCED level 2** – Lower secondary level of education	**ISCED level 4** – Post-secondary, non-tertiary education **ISCED level 3** – Upper-secondary level of education **ISCED level 2** – Lower secondary level of education	**4** – Clerks **5** – Service and sales workers **6** – Skilled agricultural and fishery workers **7** – Craft and related trades workers **8** – Plant and machine operators and assemblers
1	**ISCED level 1** – Primary level of education	**ISCED level 1** – Primary level of education	**9** – Elementary occupations
A	**ISCED level 0** – Pre-primary education	**ISCED level 02** – Pre-primary education **ISCED level 01** – Early childhood educational development programmese	

a = ILO (2012, table 2) shows the mapping of the four ISCO-08 skill levels to ISCED 1997 levels of education. There is no mapping between ISCED level 0 and the skills level. In this study, persons who completed the primary level or less will be categorized as skills level 1.

b = The main categories of ISCO-98 and ISCO-08 remain the same but the sub-categories have changed. Correspondence table between ISCO-08 and ISCO-88 was drawn from http://www.ilo.org/public/english/bureau/stat/isco/docs/correspondence08.docx (accessed 19 Sep. 2016).

c = ISCO-08 group 0 (military occupations) can be matched to multiple skill levels (skill level 1, 2 and 4). This study excludes persons who are working in military.

d = In ISCED, 1997: ISCED level 5A and 5B can be grouped into ISCED level 5. Type of programmes was used to sub-classify ISCED 5A into first degree programmes and second and further degree programmes. There is no obvious classification in terms of period of education. Persons who studied about two years or less were likely to be categorized into ISCED 5B, while those who studied about three years or more are likely to be categorized into ISCED 5A (UNESCO, 2012, p. 678).

e =. Early childhood educational development programmes generally designed for children younger than three years. It is the new category in ISCED 2011 and is not covered by ISCED 1997.

6. According to the ISCO skills mapping, managers, senior officials and legislators can be categorized as skill levels 3 and 4. This study assumes that managers, senior officials and legislators can be grouped at skill level 4 only. It is assumed that those who are working in this category achieve a certain level of training and skills accumulation before becoming these occupations.

12

From the informal to the formal economy: Skills initiatives in India

Santosh Mehrotra

Abstract: The chapter focuses on skills development for the informal (unorganized) economy. While much effort has been made over the years to improve the skill level of workers in the informal economy as a means for improving their living and working conditions, the challenge remains – and will continue to be an issue well into the future. Given the still-large size of the informal economy in Asia and the Pacific, the extent to which the skills system can respond to the needs of this sector will be key for realizing an inclusive future. Recognizing that India has made considerable effort in meeting this challenge, the chapter examines the experience of India by assessing various reforms and programmes, such as reforming industrial training institutes to be more relevant and responsive through the Centres of Excellence Scheme and the implementation of the Modular Employable Skills programme, which were implemented for improving the skills of informal economy workers. The chapter examines the effectiveness of these programmes and reform initiatives to indicate how and to what extent India has made progress in skills development for the informal economy and suggests policy directions for other countries in the region.

Introduction

Of India's 475 million workforce in 2011–12, some 78 per cent were working in enterprises (both agricultural and non-agricultural) that employ fewer than ten workers (categorized in India as the unorganized sector). All workers in the unorganized sectors are informal. If we define informal workers as persons who do not possess social insurance, then the share that is informal rises to 93 per cent of the total workforce[133] because as much as 62 per cent of workers in the organized-sector enterprises are also without social insurance (Mehrotra et al, 2014).

With the lack of social insurance as the defining feature of informality globally, informal workers in India are thus found in both organized as well as unorganized enterprises. Informality is a problem in any economy, especially for inclusive growth, for three reasons: First, informality is a source of continued poverty and inequality. Most workers in the unorganized sector in India are caught in a low-level equilibrium trap because they are

133 If only the non-agriculture workforce was counted, then some 85 per cent of all non-agricultural workers were informal (Mehrotra et al., 2014).

self-employed own-account workers with little capital. Persons who are wage workers (whether engaged in regular or casual wage work) tend to earn a wage below the legal minimum wage because they receive little or no protection from laws, which mainly apply to enterprises in the country's organized segment.

Second, informality is a problem for inclusive growth. Informal work typically is characterized by little use of technology or low-level technology, which accounts for low productivity per worker. This implies that such enterprises typically generate little surplus. With little access to credit and capital markets and due to information asymmetries, they are rarely able to grow. The result is they can never upgrade their technology or raise their productivity. They are thus caught in a low-level equilibrium. Because they cannot grow into larger enterprises, they cannot even generate new jobs. When new units emerge, they compete in a similar service or good, except that they might operate in another, equally tiny, market with limited reach (such as within their own neighbourhood).

A third reason why informality is the enemy of inclusive growth is that it undermines public finance. Informal workers in unorganized enterprises are likely to be outside the tax net, both for direct and indirect tax purposes. Their ability to survive partly depends on their ability to escape the formal government tax system because it eats into their small surplus. However, the poor tax base in a country that has a large informal economy also means that the government is unable to provide quality services (health, education, social insurance) for precisely that segment of the population who needs it most.

The chapter gives a brief overview of the characteristics of the informal economy in India and examines the skills-related shortages and problems in the country's labour force. It then describes what the skills development ecosystem looks like at present, discussing its five pillars and whether it is capable of overcoming the quantitative challenge of skilling such a large and growing labour force, including informal workers. The chapter argues that the skills ecosystem system is designed to service the organized segments but ends up still catering to the unorganized. The chapter then examines the quality issues with both the education and skills development ecosystems and analyses the issues of relevance of training being imparted, as well as the mismatches between the supply and demand of skills. These quality issues are such that the skill ecosystem is training people but only a small proportion of them are capable of entering formal employment. The chapter presents three case studies of skilling programmes that cater to informal workers, even though at least one of them was supposed to cater to the needs of the organized sector. The chapter concludes with policy implications.

12.1 Informality in India

A large workforce that is informal and engaged mostly in tiny enterprises indicates that the level of education and skills of workers in such enterprises is low (an issue discussed further on). But the implication becomes even graver because of the country's ageing dynamics: The country is at the midpoint of its demographic dividend, which began in the early 1980s.

The dividend is defined as an increasing share of the population in the labour force aged 15–59 and a decreasing share of the dependent population (younger than 15 and older than 60); it will end by 2040. The dividend, which is usually associated with a rise in gross domestic product (GDP) growth, comes but once in the lifetime of a nation; once it is over, it will never come back because the society becomes an ageing one, and the working-age population then must support the growing older population who are not economically productive (while facing rising health costs). Since 2011–12, India has added only 2.5 million young people to its labour force each year who will need decent jobs (Mehrotra, 2018). This number will rise sharply until 2030, to 12 million or so per annum.[134]

Accordingly, the skill development ecosystem in India will need to cope with the vocational skilling not only of the young people joining the labour force but also persons in the informal economy who have only acquired vocational skills informally. And this is a stupendous challenge.

This challenge to inclusive growth stems from the very nature of the growth. As of 2018, India is the third-largest economy in the world in purchasing power parity terms and the sixth-largest at market exchange rates). It is also the fastest-growing economy and is likely to continue its rapid growth over the next two decades, at least. This fast growth will be accompanied by a changing structure of output (larger secondary and tertiary education sectors) as well as an evolving structure of employment (with the share of agriculture shrinking and the share of the two remaining sectors expanding). This structural change will require a better educated and more vocational skilled workforce. Otherwise, the workforce quality will become a constraint upon the pace of structural transformation. In other words, the skills of the labour force will need constant upgrading if the pace of economic growth, and especially its inclusiveness, is not to be compromised.

There is an alternative path to economic growth, but it is characterized by greater inequality rather than inclusion. To prevent exclusions, jobs must grow with GDP growing. However, the logic of capitalism in this phase of transition and sustained GDP growth is that it could be “jobless growth” (not inclusive). If employers cannot find enough skilled and educated workers, they will turn to greater levels of imported technology and inputs, which is likely to be capital intensive and which is already happening in India. This path will lead to greater wage and income inequality because it will create fewer jobs in the secondary and modern services sectors.

Job growth, itself partly dependent upon improving education and skills, is an integral part of the narrative and may be a crucial determinant of how inclusive or exclusionary the GDP growth process is. India’s challenge is even greater if we recognize that, generally, there are three types of skills: cognitive (or foundational), non-cognitive (or transversal) and vocational. The challenge for India is monumental because all three types are in seriously

134 In addition, the economy will need to find jobs for persons wanting to leave agriculture (which is already happening on a large scale) as well as for persons who currently are either underemployed or unemployed.

short supply. The foundational skills are sorely lacking, given that while the total population at independence was slightly more than 300 million persons, the total number of illiterate persons in 2011 was also slightly more than 300 million. And it is the latter who are mostly self-employed own-account workers, landless agricultural labourers or construction workers – constituting the vast majority of the informal-sector workers of India (see the Annex table A2).

This chapter concentrates on how these multiple challenges will be met. We know that job growth in the formal economy (or organized sector, as it is referred to in Indian academic and policy parlance) has been less than impressive, despite rapid GDP growth. Unless formal-sector jobs grow faster than the fast-growing economy, they will be unable to absorb new entrants to the labour force, let alone ensure that persons in the informal economy find formal, decent jobs. Thus, the foundational problem the economic policy-makers face is job growth and, with it, job growth in the organized enterprises with social insurance. Even with slow job growth, the demand for better skills grows from formal employers. So, when the skill ecosystem produces poor-quality skills or mismatches between the type of skills needed and what trainees are learning, then the workers inevitably end up finding less than decent jobs in the informal economy.

An implication of the foundational problem is that high-quality skills development is only one supply-side factor, inter alia, that influences whether youthful entrants to the labour force join the formal workforce in the organized segment of industry and services. But there are many factors on the demand side for labour – such as the pattern of growth and the labour market institutions – that impact the decision by employers on whether they will offer formal employment with social insurance. Education levels and skills are but a small part of the underlying dynamics, even when total non-agricultural jobs are growing, whether it is formal jobs that are growing or informal ones.

This conundrum can be easily resolved by ensuring that informality and its concomitant poor skills base in the workforce does not become a constraint upon inclusive growth. If the government can institute a tax-based social insurance system (with old-age pension, death and disability insurance and parental benefits), at least for the poorest informal workers, informality can be sharply reduced. Then the main or binding constraint upon the inclusiveness of GDP growth will be (i) the pace of labour absorption of new entrants and of workers leaving agriculture; and (ii) the education and skill level of both the new entrants as well as those leaving agriculture. Most of the chapter talks about this latter problem and the challenge it poses to Indian policy-makers.

12.2 Education levels and skills issues in the Indian labour force

This section first examines the education level of the current workforce, most of which is employed informally. Then it examines skill levels in terms of vocational training and particularly the issue of how many people need to be trained. The latter is important for planning purposes and has been a subject of much debate.

Education level of the Indian labour force

Some 146 million (or 30 per cent) of India's workforce of 485 million in 2012 are illiterate. An additional 253 million workers (52 per cent) had a secondary level of education (class 10) or less.[135] Barely three per cent of the workforce had technical education at the tertiary level, and another 7.2 per cent had general academic education at the tertiary level (see the Annex for all details). There is high correlation between informality and the low levels of education among workers.

The National Sample Survey data, the best source of data on this subject, allow analysis of the workforce by three types of employment: self-employed, casual labour and regular salaried work. It is not surprising that hardly any illiterate worker has a regular salaried job. Most workers who are illiterate are either casual workers or in self-employment, usually engaged in low-productivity work. The latter two categories of workers are almost entirely found in informal work.

Slightly more than half of the workforce with an education up to the secondary level are self-employed. The international literature reflects a high degree of correlation between self-employment and informality (ILO, 2018). What is more worrying in India is that as many as 75 million persons with ten years of school education are in casual work.

The total number of persons with a senior secondary education (12 years of schooling) (34.4 million) and those who have graduate-level education or more (35.6 million) are roughly similar. Half of the persons with a senior secondary education are self-employed. Less than a third of persons with a senior secondary education are in regular salaried employment (while only 15 per cent of workers with a secondary education have regular salaried jobs). And half of the persons with graduate-level education or more are in regular salaried employment. What is worrying is also that nearly four million persons with senior secondary level of education are engaged in casual work.

Having a technical education (at less than graduate level or more) significantly raises the probability of finding a regular salaried job, compared with persons having only a general academic education.[136] The good news is that the share in the workforce of persons with any tertiary education has been rising, from 7.3 per cent in 2004–05 to 10.3 per cent in 2011–12 (see the Annex table A1).[137]

Both the labour market as well as tertiary education outcomes for women and men are different. It is well known that the labour force participation rate is lower for women (at

135 But 40 per cent of them had less than a Class 8 level of education. Only 15 million workers had a tertiary level or technical education, about half of whom had a diploma (two years post-senior secondary (Class 12) or certificate level (or one-year post-senior secondary), and the other half of this group had graduate-level technical education. See Mehrotra and Parida (2018) for more detailed analysis.

136 The rate of unemployment of persons with graduate general academic education is only slightly lower, at 7.3 per cent, than for persons with a graduate level of technical education or less (at 8.8 per cent).

137 Since 2011–12, the tertiary gross enrolment rate has increased sharply, reaching 26 per cent of the relevant age cohort of 18–23 years by 2016.

23 per cent in 2012) than for men and is one of the lowest in the world (Mehrotra et al., 2014). Even more worrying is that it has been declining. While there were 351 million men in the workforce in 2012, there were only 134 million women. Nearly half of the women were illiterate, compared with less than one third of men. If women acquire education up to the graduate level, whether it is general, academic or technical education, there is high likelihood they will find regular employment. The probability of finding regular employment is slightly greater with a graduate-level education for women than for men.

Two-thirds of workers with a graduate level of education enter the services sector. This is more than seven times as many workers engaged in the manufacturing sector. Services account for 25 per cent of total employment in the Indian economy, while manufacturing accounts for only 12 per cent. The services sector accounts for the majority of workers with a technical education as well. Half of the workers with less than a graduate technical education are employed in the services sector. That share rises to 80 per cent when persons with a technical education at the graduate level are factored in (Mehrotra and Parida, 2018).

Thus, the services sector accounts for the majority of workers with some tertiary-level education, including those with a technical education. For example, more engineering graduates from the prestigious Indian Institutes of Technology end up in finance and other services, while manufacturing and non-manufacturing employment accounts for less than a third of all technical education graduates who have employment.

Skill level of the workforce and the massive need for training

Vocational education and training have remained relatively neglected in India historically. As a result, only 2 per cent of the workforce has acquired vocational education or training formally. An additional 8 per cent of the workforce has acquired vocational training informally. The result is that some 90 per cent of workers have no formal or informal vocational education or training, which compounds the problem.

It is no wonder that when structural shifts were happening, with the GDP growth rate rising sharply over the past two decades, there was sudden government interest in increasing technical and vocational education and training (TVET) capacity in the country. Planning for skills development began with the 11th Five-Year Plan (2006–07 to 2011–12). It was the first plan ever that had a chapter devoted to skills development.

In the 2009 National Skills Policy, the Government estimated that 500 million workers needed to be trained between 2010 and 2022. However, in 2014, when a new government came to power, the need for vocational training was downsized to an estimated 400 million persons (MSDE, 2016) and a new National Skills Policy was announced. Mehrotra (2013) and Mehrotra and Parida (2018) disputed both estimates and, based on analysis of the National Sample Survey data, put the need for vocational training at no more than 200 million persons between 2012 and 2022. In addition, nearly 100 million persons need at least a secondary education over this period to meet the requirements of the non-agriculture sectors.

The 500 million-persons estimate would have resulted in a requirement of training and educating 50 million new workers annually, while the 400 million estimate would have been not much less. These estimates were unachievable mainly because the skills ecosystem was geared in 2010 to train fewer than 1 million persons per annum. Even in 2015 it could only provide TVET to no more than 5 million persons. In fact, this rapid expansion of vocational training providers had already been criticized for focusing on quantity at the expense of the quality of training (Mehrotra, 2014; MSDE, 2016).

In 2016, an expert group[138] for the Ministry of Skill Development and Entrepreneurship (MSDE) estimated that the training capacity in India was seriously inadequate. There are 131,287 secondary schools in the country, in which approximately 37 million children enrol every year. If we take a pass percentage of 75 per cent, about 27.7 million children will graduate every year. There is a total of 102,558 senior secondary schools in which 22.2 million children enrol every year. Thus, about 5.5 million children drop out after ten years of schooling (MSDE, 2016).

Vocational training should aim to attract those 5.5 million students who drop out of school plus around 20 per cent of the students[139] enrolling in senior secondary school, for a total of about 9.9 million students. The training infrastructure should therefore be capable of accommodating about 10 million students each year.

Based on the rationale that the reduction in labour force entrants between 2004 and 2012 related to young people staying in education longer, the system should thus prepare for those new workers as they graduate. And that number is estimated at between 5 million and 10 million persons per annum, including those who leave agriculture and those who are openly unemployed.

There are 3,925 polytechnics institutions in India with a capacity of more than 1.2 million seats (an average of 317 seats per institute). There are 12,412 industrial training institutes (ITIs) with a seating capacity of 2.5 million (an average of 206 seats per institute). Increasing the capacity of the diploma colleges and the ITIs to about 500 trainees per annum would increase total capacity to 8.1 million seats. To reach the ten million per annum training seat target, only some 3,600 new institutions would be needed (at an average of 500 seats per annum) – which does not seem a daunting task. If capacity of each existing institution is not increased, then 7,630 new training institutions will be needed.

Without new capacity to ensure TVET for all young people, they will inevitably enter the informal sector.

The analysis now turns to the skills ecosystem to understand what the problems are with

138 The author was a member of this expert group.

139 This 20 per cent would still constitute a significant scaling up of vocational education at the secondary and senior secondary level of schooling. Any larger proportion would strain the capacity of vocational instructors available in India. Assuming demand, this ratio of 20 per cent could be raised later on, provided the instructors become available.

the institutions that are currently training workers in the economy, especially the informal economy, and why so many apparently vocational trained persons are informally trained.

12.3 The five pillars of the skills ecosystem of India

India's skills ecosystem has evolved over the past 70 years since planned development began in 1951, with the first Five-Year Plan. There are five pillars of TVET in India: (i) vocational education in schools and higher education; (ii) vocational education by the National Skill Development Corporation's (NSDC) private training partners; (iii) public and private ITIs; (iv) in-plant training by companies; and (v) skills development schemes of the 16 government ministries.

Since 1991 and the beginning of the economy's post-liberalization era, the private sector has grown hugely. Its involvement in skills development, however, has not grown proportionately. Overall, general tax revenues are used to fund public and private vocational training partners. Government funds are utilized for all pre-employment training for every pillar of TVET. The Ministry of Human Resources and Development funds vocational education in the secondary school system. The MSDE funds vocational institutes (the public ITIs) and regulates (though does not fund) the private ITIs (each set up after meeting certain criteria of the MSDE). The other 16 government ministries fund their own skills training programmes. The NSDC (created only in 2010) is funded completely by the MSDE, which in turn funds the private vocational training partners and also covers the cost of training provided through the Pradhan Mantri Kaushal Vikas Yojana (Prime Minister's Skill Development Scheme).

First pillar: Vocational education in secondary and senior secondary schools

The Right to Education Act, 2009 makes eight years of general or academic schooling compulsory**.** Until 2013, no vocational education was offered in schools before the senior secondary stage (Classes 11–12). In 2014, however, vocational education became an option in Classes 9–12 and mainly for employability in the services sector. This vocational education is roughly based on the country's National Skills Qualification Framework (NSQF), initiated in early 2014. The NSQF consists of ten levels. Levels 1–3 in service-oriented courses are now available in 6,000 schools (as of end 2017). A total of 225,000 students were enrolled in 2016 (Sharda Prasad Committee, 2016).

Vocational education in the senior secondary school system is in its infancy. However, it has evolved a bit in the sense that it has begun to provide for vertical mobility. Bachelor in vocation courses have been introduced in 150 colleges. However, the long-standing traditional divide between skills versus education remains in Indian society, and there are clear disconnects between skills and knowledge.

Second pillar: Industrial training institutes

The ITI Craftsmen Training Scheme is run by government as well as private institutions. A total of 13,105 institutes (2,293 government and 10,812 private as of 2015) historically formed the foundation of the vocational system in India. While vocational education in its current form is relatively recent, the ITIs were initiated in the early 1960s. They provide training primarily for manufacturing job roles. Industry has also supported the ITIs by adopting some government ITIs and placing its trainees in these institutes. But there are regular industry complaints of non-relevant curriculum. Not surprisingly, employers have had to retrain most of the ITI graduates they absorbed (Mehrotra, 2014), while many other graduates ended up working in the unorganized sector or became self-employed (in the informal workforce either way).

But the problem with ITIs runs deeper. Graduates' lack of employability in organized industry is often the failure of employers to engage with the ITI system. But it is also the cumbersome government procedures that make industry participation a tedious chore for employers. The ITIs have modified their curriculum twice over the past six years, with industry presence in that process not very prominent (Mehrotra, 2014).

The presence of private ITIs does not reflect the participation of employers either; rather, it only indicates the business opportunity for private service providers in skills development. An attempt to create Industry Management Committees to run the government ITIs has had moderate success. The ITIs offer long-term courses but are overshadowed in the numbers trained by the NSDC-funded private vocational training partners, although this is only the case because the latter offer short-term courses (not exceeding four months; see the discussion further on). Despite the weaknesses of it is (discussed at length in Mehrotra, 2014). Studies suggest that the ITIs remain the best option that the industry has today for hiring skilled workers (World Bank, 2015; Mehrotra, 2014).

Third pillar: Private sector providers

The 2009 National Skill Development Policy attempted to adopt a demand-driven approach to skills development and envisaged the significant participation of employers in articulating and meeting skills demand. The NSDC was created as a "market maker" to catalyse private investment. The NSDC, which is within the MSDE, was created in 2010 to finance vocational training by private sector providers.[140] The result was that overnight, a large number of providers emerged due to what they saw as huge market opportunity for skills training, on one hand, and significant government subsidizing on the other. These private vocational training partners were to be accredited by new private-sector bodies, called sector skills councils, that were financially supported by the NSDC (for an initial three-year period). This resulted in such councils cropping up quickly – 41 sectors had a skills council between 2011 and 2016.

140 The NSDC covers 75 per cent of costs, while the provider covers the remaining 25 per cent.

The Government also created the NSQF,[141] which envisaged a common standard for skills development across the country. However, according to a government report (MSDE, 2016), employer adoption of the NSQF has been limited. The skills councils were created as employer-led bodies, but they were all incubated with government funding from NSDC, with negligible contribution by employers. The peripheral employer involvement and ownership by employers (as opposed to private training providers) is reflected in the poor placement percentages and the courses that are not often used, even though they are supposed to have been prepared with industry involvement. Not surprising, the employment or placement record of the private vocational training partners has also been less than stellar; many of their trainees have ended up in the informal economy.

A major reason for the poor employability of trainees is that the training is too short. In the NSDC-funded flagship Pradhan Mantri Kaushal Vikas Yojana scheme, training does not exceed four months. Training providers (affiliated with the sector skills councils) conduct both classroom and practical training as per industry recognized National Occupational Standards.[142] The certification is done by independent assessing bodies accredited by the sector skills councils. The total training capacity is 2.4 million seats per annum (after about five years of operation of the scheme and its predecessor, the Standard Training Assessment and Reward Scheme). The so-called public-private partnership within the NSDC, which had a vision of private ownership, has not delivered and still relies on government funding. The NSDC private vocational training partners were funded for a skills-training business model, but no market-led model has followed, and they remain dependent on government funding.

The NSDC was supposed to conduct studies on gaps in the skills demand. But such studies have been inadequate and cannot be relied on for planning. The NSDC gives targets to the sector skills councils, which are supposed to be industry owned. The NSDC targets given to training partners are based on splicing its own targets (provided by the MSDE). The more than 1,850 qualification packs that were prepared by consultants are too narrow and not understood well by employers or training stakeholders.

Training courses are decided by convenience, and the budget of the vocational training partners is not based on demand, resulting in a skewing to training for job roles with little capital cost. With a fervent chase for numbers of youth trained, the quality of training has deteriorated, and the short-term training is not translating into jobs. Youths, now armed with government skills certificates, are shifting the blame to the Government (see the final section of this chapter for discussion on how these programmes need to radically change if more workers are to be eligible for formal employment).

141 The author of this chapter leads the task force that prepared the blueprint of the NSQF (see Mehrotra, 2016). Unfortunately, the implementation of the NSQF did not follow that design, and many of the current ills of the skills ecosystem owe their origins to the poor understanding among all stakeholders of what role the qualification framework should have in the skills ecosystem.

142 There are issues with these standards, as they were often drafted by consultants appointed by sector skills councils; neither really knew what a standard was meant to be. The result is that these standards have not really been adopted in practice by employers (see MSDE, 2016).

Fourth pillar: Ministry-provided training programmes

Each ministry has its own skills targets, programmes and budgets for skills training. The MSDE is the nodal ministry for skill development. In addition, 16 other ministries provide vocational training. In 2015–16, MSDE courses accounted for 58 per cent of all vocational training students, while all the other ministries combined trained 42 per cent of the students. Eight ministries[143] have set up their own training centre and trainers to meet the perceived skill needs of their sectors.

The nine other ministries[144] do not have any training infrastructure and conduct only short-term training courses of a generic nature with the help of vocational training providers in the private sector or the NSDC training partners. These are mostly run for the benefit of youths and offer subject matter relevant to their ministerial specificity, such as the Ministry of Rural Development for persons living below the poverty line in rural areas; the Ministry of Housing and Urban Poverty Alleviation for youth in urban areas; the Ministry of Tribal Affairs for youth belonging to Scheduled Tribes; the Ministry of Women and Child Development for women; the Ministry of Development of North Eastern Region for youth in that area; the Ministry of Minority Affairs for youth belonging to minorities; the Ministry of Social Justice and Empowerment for youth belonging to Scheduled Castes; the Ministry of Home Affairs for youth living in Jammu and Kashmir State. However, these programmes do not respond to skill needs of employers nor offer a standard course curriculum for trainees. Nor do they have independent assessment and certification machinery. "The training is mostly substandard, supply driven and doesn't have any correlation with the specific needs of the employers. As a result, it does not meet two basic objectives of the vocational training – meeting the exact skill needs of the industry and providing the youth with decent opportunities of livelihood at decent wages," noted the expert group in a 2016 report (MSDE, 2016).

Fifth pillar: Enterprises with in-house training

Only large enterprises conduct in-house training. Not surprising, a World Bank survey of enterprises in India found that only 16 per cent of enterprises in 2009 conducted such training (it was 85 per cent in China). The World Bank survey in 2014 concluded that 36 per cent of all registered enterprises were conducting in-house training. Small and medium-sized enterprises (SMEs) hardly train at all. The lack of a training culture in the enterprises that value getting work done over getting work done in a proper manner has compounded the skills problem in India.

143 Including the Ministries of Agriculture; Micro, Small and Medium Enterprises; Human Resource Development; Textiles; Commerce and Industry; Tourism; Chemicals and Fertilizers and Food Processing Industries.

144 Including Ministries of Rural Development; Housing and Urban Poverty Alleviation; Communication and IT; Tribal Affairs; Women and Child Development; Development of North Eastern Region; Home Affairs; Minority Affairs and Social Justice and Empowerment.

12.4 Quality issues in the formal TVET system resulting in training for informal work

In addition to the insufficient number of young people trained by the TVET system, the skills training provided is often of poor quality, for a variety of reasons, as this section explains.

Instructor shortage

There is a serious shortage of trainers and instructors in the formal TVET system, which leads to poor-quality training outcomes. For instance, the best of the vocational training (which happens to have the longest history in India) is provided in the ITIs. However, Mehrotra (2014) found an acute shortage of well-qualified trainers even in the ITIs (the situation in the other pillars of the TVET system was worse). Slightly more than a third of the ITI instructors were ITI graduates and had been employed immediately upon graduating. Another 20 per cent or so had had some teacher training. Another third of all ITI instructors were those who held a two-year diploma in the subject after their senior secondary education. Their salaries were low and most (some 55 per cent of all instructors) held contractual or ad hoc appointments (Mehrotra, 2014). A previous World Bank study (2007) had found that one third of the instructors had no industry experience.

The secondary and senior secondary school instructors offering vocational education are hired from among persons recommended by the sector skills council project implementing agency. The same applies to all the other ministries offering TVET. Only the Ministry of Micro, Small and Medium Enterprises has its own training institutions, like the ITI system (which operate with German and Danish government assistance).

All the private vocational training partners funded by the NSDC merely draw upon project-implementing agencies that are appointed by the sector skills councils, which are themselves the subject of much controversy (MSDE, 2016). According to a MSDE report (2016): The NSDC and sector skills councils made a mockery of trainers training by giving fresh diploma and engineering graduates two to five days training to become a qualified trainer. The importance of trainers could be judged by the efforts of the central government, who started the Crafts Instructor Training Scheme as early as 1948. The instructor training is of one-year duration, but despite the efforts of the government, the training capacity of trainers in India still stands at 8,268 per annum while we require at least 20,000 trainers per annum.

Apprenticeship is stand-alone activity

A feature of a good TVET system are three components to vocational training: (i) theory; (ii) practical training in a workshop environment; and (iii) practical industry experience. The NSQF[145] makes a provision for such training. However, apprenticeship, which is a normal way in which practical training in an industry environment is provided to trainees (such as the German agricultural technical vocational education and training system), has never

145 The author chaired the Ministry of Human Resource Development Task Force that drafted the NSQF in 2011.

been integral to TVET in India. The Apprenticeship Act of 1961 provides for apprenticeship (promoted by the Ministry of Labour and Employment), but it is conducted as a stand-alone activity in which ITI graduates as well as recent senior secondary school graduates can participate. Even in the case of engineering graduates and polytechnic graduates, in-plant apprenticeship has not become integral to the course curriculum.[146]

Recognition of prior learning remains of poor quality

The result of poor-quality training in TVET programmes for the formal economy results in a situation in which many trainees, even if emerging from so-called formal institutions, end up with informal-sector employment. For them, as well as the millions of informal workers before them over the past half century, there is no recognition of any skills they may have acquired that would help them transition to formal sector employment. Globally, one way out is the recognition of prior learning. This means that anyone who dropped out of school and joined the labour market should be given a second chance to acquire certification for the vocational skills they acquired in the labour market informally.

A typical feature of the rural and unorganized economy is the prevalence of informal apprenticeships. In the absence of formal vocational training institutions in these areas, young people do not get an opportunity to become skilled formally, but they acquire competencies while engaged as informal apprentices. However, in the absence of any certification of their skills, they command low wages and are unable to move vertically or horizontally. There is immense urgent need for recognition of their learning acquired informally.

The NSDC started a recognition of prior learning scheme under the Standard Training and Assessment Reward (STAR) Scheme and that carried into the Prime Minister Kaushal Vikas Yojana. But it did not follow the essence and spirit of recognition of prior learning. The concept was misused to inflate the numbers reached by certifying existing employed contractual workers after giving them two to three hours of training (MSDE, 2016). The expert group report of 2016 (MSDE, 2016) recommended the creation of the following framework for recognition of prior learning:

1. A person who claims to have acquired skills informally and wants to be certified should be tested and any gap in terms of process, professional knowledge, professional skill, core skill and responsibility should be determined.
2. After the identification of the gaps, the person should be trained according to the requirements of the NSQF level at which they want to be certified in relevant competency units.

146 Thanks to this kind of criticism, a nine-month apprenticeship has been tagged on since 2017 to the three-month training programmes of the NSDC-funded vocational training providers. However, it is a bit unclear if this add-on will solve the problem of the poor employability, and inability of trainees to get jobs. See later discussion.

3. Once the person has attained those attributes, they should be assessed by the National Board for Assessment and Certification.
4. The assessment should be for the National Competency Standards as a whole, but if the person has acquired skills in some competency units only, they should be encouraged to acquire competencies in all the units and then be certified so that their skills are recognized at a level that commands higher wages. This will engender them to upward mobility and lifelong learning.

12.5 Examples of training programmes for the informal sector

In addition to the five pillars of the formal TVET system, there are many training programmes that appear to be training merely for work in the informal sector. In this section, we look at such cases to understand how inclusion is still being undermined by such programmes.

Many bodies funded by the Government (under the Ministry of Human Resource Development) offer programmes that focus on skills development principally based on the needs of the informal sector, such as community polytechnics. An expert group of the All India Council for Technical Education (AICTE) recommended in 1978 that a few polytechnics should promote rural development on scientific lines through technology transfer. As a result, community polytechnics were started under a direct central assistance scheme in 1979 in 35 polytechnic institutes. They were envisaged as important centres for the application of science and technology in rural areas and the generation of self-employment and wage-based employment opportunities through non-formal training in various trades and multiple skills. There are now 617 AICTE-approved community polytechnics.

Another institution that provides training for informal sector workers is the Jan Shikshan Sansthan (People’s Learning Centre). This programme was launched as an adult education programme of the MSDE, intended to improve vocational skills and the quality of life of workers. It targets adults and youth who have migrated from rural areas as a district-level vocational training programme. In 2012, 221 centres were functioning in the country.

Another resource is the National Institute of Open Schooling. This programme imparts education through open and distance modes, from primary to senior secondary school levels. It offers vocational education to general and prioritized groups (Scheduled Castes, Scheduled Tribes, women, rural people and persons with disabilities) through a network of study-cum-training centres known as accredited training institutes. The National Institute of Open Schooling has a network of 11 regional centres and some 2,067 study centres. In 2012, there were about 1,063 accredited training institutes. The average duration of these courses is shorter than courses in an ITI.

Prime Minister Kaushal Vikas Yojana

The Prime Minister Kaushal Vikas Yojana (PMKVY) was approved by the Government (in 2015), with an outlay of 15 billion rupees (INR) to provide skills to 2.4 million persons (1.4 million new trainees plus 1 million under recognition of prior learning). The NSDC implements the scheme.

The objective of this skill certification and reward scheme is to enable and mobilize a large number of youths to take up outcome-based skills training and become employable. A monetary reward is provided to trainees who complete a training course run by affiliated training providers and are assessed and certified. The training focuses on first-time entrants to the labour market, mostly school drop-outs. Targets are assigned to different ministries and departments, sector skill councils, state governments and various private vocational training partners on the basis of demand emanating from the skills-gap studies.[147]

Under the scheme, the indicative reward amount for trainees ranges from INR5,000 to INR12,500, with a greater amount for the manufacturing, plumbing and construction sectors. The indicative reward for recognition of prior learning amounts to INR2,500 for the manufacturing, plumbing and construction sectors and INR2,000 for other sectors. The training has been provided through 8,749 centres across 375 job roles. Under the scheme, a total of 1.8 million persons have been trained, 1.29 million persons certified and 223,000 persons placed at an average training cost of INR8,319 per trainee. The placement rate is 12.4 per cent.

The expert group (MSDE, 2016) that examined this scheme concluded the following:

- Such an ambitious scheme with an outlay of INR1,500 billion was started without conducting any evaluation of its predecessor, the STAR Scheme, which was provided a budget of INR1,000 billion in 2013–14, with poor employment outcomes. Only 8.5 per cent of the persons trained were able to find employment. But this was the NSDC estimate of employment; the reality will emerge only after a detailed survey of trainees trained and placed.
- A second version of the PMKVY was approved by the Union Cabinet (July 2016) with an outlay of INR12 billion to impart skills training to 10 million people over the next four years (2016–20). However, no evaluation was conducted of the PMKVY in 2015 to determine the outcomes and whether it was serving the twin purposes of providing employment to youth and meeting the skill needs of employers before launching such an ambitious second scheme.
- In consultations with various stakeholders, all of them noted that the targets allocated to them were high and without regard to any sector requirement. Everybody was chasing numbers without providing employment to youth or meeting sector-based employers' needs. Many participants eloquently said that it benefited the private vocational training partners, assessment bodies and sector skills councils only.
- Even if the trained youth were able to access placement opportunities, they received a monthly salary of INR5,000 to INR10,000, while the aim should be to train in a manner and with skills that could command INR40,000 to INR50,000 to make skills aspirational and attract youth towards the training.
- We do not need to chase numbers. The entry into the labour force between 2004–

147 We question the value of these so-called skill gap studies in a previous section.

5 and 2011–12 was only 2 million per annum, which increased to 2.5 by 2015–16. The seating capacity of ITIs and polytechnics alone is 3.85 million. With little effort and using part of the PMKVY outlay, we can double the training capacity in long-term competency-based courses that could provide employment to youths and meet the skill needs of employers. If not, the funding of the PMKVY will continue as a waste of public resources.

Modular employable skills

Yet another scheme of the Government, initiated in 2005–06, is the Modular Employable Skills Scheme (MES, also called the Skill Development Initiative and managed by the Ministry of Labour) catering to workers in the unorganized sector and to school leavers. The skill level of persons already employed can be tested and certified under this scheme through the certification of an informal or experiential learning component. A public-private partnership was envisaged for the scheme, with employers participating at every stage of the design and implementation. And indeed, the centres for training were decided in consultation with industry. Employers and state governments have been conducting the training, while the central Government funds the training. Testing of skills is done by independent assessing bodies, which are not involved in the training delivery.

There are 6,500 private vocational training partners across the country. Their objective is to meet the demand for skills in the services sector, given that is the fastest-growing sector in the economy. Training in the services sector trades does not require huge investment in tools, equipment and machinery, and job entrants are required to do entry-level jobs for four to five years. This Skill Development Initiative was supposed to provide skilled human resources at a faster rate than the two-year courses under the Craftsmen Training Scheme. It was not a substitute for the long-term craftsmen training courses run through the network of ITIs. It also was necessary to run these courses because not many of the ITIs offer skills for the services sector.

During the 11th Five-Year Plan period (2007–12), short-term modular courses were formulated. Subsequently, the number of modules was consolidated and reduced to 632. The training is available through a network of 13,700 vocational training providers throughout the country. Under the scheme, assessments are carried out by 180 independent bodies. The scheme was continued during the 12th Five-Year Plan period, with some modifications and an outlay of INR2 billion. About 2.92 million youth have been trained and tested under the scheme, at a cost of more than INR750 million. Trainees who complete the course are awarded a National Council for Vocational Training Certificate.

Both the NSDC-funded PMKVY and the Modular Employable Skills Scheme (and three other schemes) were examined in a study by the World Bank.[148] In the case of the NSDC, 90 per cent of training providers within the sample were private. For the Modular Employable

148 The other schemes examined were the Ministry of Rural Development's DDU-Grameen Kaushal Yojana, which was previously called Aajeevika; the Rural Skills and Employment Training Institutes; and STEP-UP.

Skills Scheme, 75 per cent of the vocational training partners were private. At least two-thirds of the vocational training partners were located in urban areas, and the remaining were in rural areas.

Around half of the vocational training partners of the PMKVY claimed to get feedback from employers on their curriculum, and about 40 per cent said they hire instructors from the industry or arrange for apprenticeships with the local industry.

Although the survey of 1,995 trainees reported participation in a range of trades, certain trades dominated – they attracted more than 50 per cent of all trainees (table 12.1).

Table 12.1: Top-five courses of the National Skill Development Corporation programme and the Modular Employable Skills Scheme

NSDC	Modular Employable Skills Scheme
Computer	Tailoring
Data entry operator	Tally
Tally	Electrical
Retail sales and marketing	Beautician
Hardware and networking	Computer

Source: World Bank, 2015.

Most trainees are hired by private employers, and, as intended, three-fourths of them are in services (table 12.2). The majority of trainee graduates are hired by enterprises that employ fewer than ten workers, thus, they are effectively in the informal sector.

Table 12.2: Who is hiring beneficiaries?

Employers or enterprises	NSDC	Modular Employable Skills Scheme
% hiring from the scheme	42	36
% private	91	95
Employment sector		
Agriculture	2	2
Manufacturing	23	22
Services	75	76
Size		
Fewer than 10 employees	60	81
10–19 employees	14	10
More than 20 employees	26	9
No. of hiring firms	283	239

Source: World Bank, 2015.

Table 3 provides information on the placement rate at completion of training, and former trainees' job status one to two years later.

Table 12.3: Placement rate at completion of training and job status one to two years later

Programme	Initial placement rate	% working 1–2 years after training	Of them, % in wage employment	Of them, % in self-employment
National Skill Development Corporation	31	32	22	10
Modular Employable Skills Scheme	23	26	18	8

Source: World Bank, 2015.

Job status one to two years after training

As table 3 indicates, the employment rate one to two years after training was 28 per cent overall. This indicator may be more relevant than the initial placement to measure the impact of training because it relates to a period after job search and job adjustment have taken place. World Bank (2015), however, shows that after a period of one or two years, the employment rate is not markedly different from the initial placement rate for all programmes.

Data from a survey of youth of similar age and socioeconomic background[149] who did not participate in any training were used to estimate the counterfactual for each programme. As in other non-experimental evaluations, estimates are obtained controlling for individual characteristics of both treatment and comparison groups, such as age, sex, marital status, education, family income and state of residence. Estimates indicate a modest but positive treatment effect. The participation in skills development programmes increases the employment rate by 7 percentage points overall, with a stronger effect for women than for men (12 percentage points compared with 4.5 percentage points). Given the different population groups targeted by each programme and their different operating modes, estimates were also obtained for each programme separately.[150] The results indicate that participation in the NSDC training increases the employment rate by 11 percentage points, while the Modular Employable Skills Scheme increases employment by 7 percentage points (World Bank, 2015).

Participation in skills development programmes also seems to lead to better-quality jobs, as measured by proxies, such as length of the work day (not more than eight hours worked per day) and whether individuals were given a job contract and/or were provided with a

149 The comparison group comprised youth who had been admitted to any of the reference schemes but did not complete the training and youth of same age and socioeconomic background, such as friends or neighbours of trainees who could have been eligible to undertake the training (World Bank, 2015).

150 In this case, separate regressions were run, with a matched control group for each programme.

pension plan and paid leave by their employer. Although the proportion of workers in the World Bank survey sample with "quality jobs" was small,[151] the analysis suggested that persons who participated in a skills development programme were 7.6 percentage points more likely to have a job contract, 14.7 percentage points more likely to have access to a pension plan and 9.5 percentage points less likely to work more than eight hours a day than control persons (World Bank, 2015).[152]

Assessment and certification are important quality-assurance mechanisms. While the guidelines for these government programmes mandate third-party assessments and certification, in the NSDC, assessment is also carried out by vocational training partners, with no external independent evaluation. While enabling the training partners to carry out assessments has the advantage of a lower cost and a more rapid process, the absence of an independent evaluation gives scope for masking quality deficiencies.

As explained previously, short-term training programmes have some limited benefits. They continue to remain beset with design flaws, which undermine their utility. This information is useful to feed into strategies to improve outcomes. Most importantly, short-term training is leading the majority of persons trained into employment in unorganized enterprises.

12.6 The way forward

This section summarizes what might be implications for policies within four overarching recommendations on the way forward. If the following recommended actions are taken, skills development efforts likely will contribute to improving the prospects of promoting inclusiveness in the economic growth process by preparing workers to enter formal work of high quality in organized enterprises.

Augment the training capacity

The entire skills ecosystem is still too small to offer vocational education and training to the majority of young entrants to the labour force. Not surprising, with limited access to formal training, the number of workers in the informal economy has expanded. One reason why workers have historically joined the informal sector in India is because they have lacked formal vocational training opportunities. If India can increase the capacity of its diploma colleges and ITIs to about 500 trainees per annum, the capacity will increase to a total of 1.96 million seats in diploma colleges and 6.2 million seats in ITIs (for a total of 8.1 million seats). If training capacity is augmented to about 10 million seats per annum, India will need only about 3,600 new institutions, with an average seating capacity of 500 per annum, which does not seem to be a daunting task. If there is no increase in capacity, India

151 Only 15 per cent of workers (trainees and non-trainees) had a contract, 37 per cent had paid leave, 24 per cent were given access to a pension plan and 21 per cent worked more than eight hours a day.

152 The analysis of wage and earnings effects can only be done with a small sample. Information on wages or earnings and work history can only be available for persons (trainees and non-trainees) who are or have been working, reducing the original sample size to about one third. Participation in a skills development programme appears to provide a positive wage premium. The premium is of the order of 21 per cent and is statistically significant. There is an additional wage gain when the content of the training programme is directly relevant for the job being held.

will require 7,630 new institutions.

If there is no new capacity to ensure access to TVET for all young people, they will inevitably enter the informal sector. Or they will continue into higher levels of general academic education. Since there has been a rapid universalization in elementary school enrolment followed by nearly universal secondary-school enrolment in general academic education, there has accordingly been upward demand for tertiary level general academic education. As a result, between 2006 and 2016, the tertiary-level enrolment ratio rose from 11 per cent of the 18–23 age cohort to 26 per cent. Such a rapid increase in general academic tertiary level enrolment in India has caused a precipitous fall in quality at that level. Hence, growing enrolment at the tertiary level is an extremely poor alternative because it does not prepare young people for work. It will be much more effective from the perspective of ensuring employability of youth that they are diverted towards vocational education and training in larger numbers so that they do not continue to higher levels of general academic education. Larger numbers of youths graduating from tertiary institutions' general academic subjects will not lead to their greater employability. Such an outcome undermines inclusiveness in the economic growth process. Hence, access to TVET must grow for young persons of legal working age (beginning at age 15 years).

But augment capacity while ensuring high quality

Without quality training, young workers will continue to enter informal work. Enhancing training capacity while improving the quality of training will require several actions, as the following articulates.

1. **Training of trainers needs to increase and improve.** First of all, the country needs more TVET trainers. The instructor training for ITIs is of one-year duration, but despite the efforts of the Government, the training capacity of trainers in India still stands at 8,268 persons per annum while the system requires at least 20,000 trainers per annum. But this is just for the ITI system. The other pillars of the TVET system also need more and better-quality trainers.

2. **Apprenticeship cannot be stand-alone but must be integral to the curriculum of training.** As noted earlier, a good TVET system offers theory, practical training in a workshop environment and practical industry experience. In India, the only provision for formal apprenticeship has no formal connection to the pre-employment training. Therefore, all pillars of the TVET system must include not only internships as part of the training but also apprenticeships must become compulsory before certification is awarded.

3. **Industry and employer engagement must increase.** All but one of the five pillars of the TVET system (the exception being enterprise-based training and private ITI) is financed by the Government. This makes the TVET system practically entirely supply driven, as opposed to demand driven. Even the enterprise-based training is confined to large-scale corporations among the registered firms. The SMEs that are registered

with any government body do not conduct much enterprise-based training (Mehrotra, 2014). However, this can be changed by the Government making apprenticeship mandatory and requiring registered SMEs to offer apprenticeships. Even in the absence of enterprise-based training, employers can contribute to pre-employment TVET in their own interest, provided the Government negotiates this at appropriate levels with industry. The next section looks at ways this could be done.

Draw in industry to improve TVET and reduce informality

There are five ways in which the TVET system could prepare workers for employment in the organized segment of industry and services. First, if industry wants well-trained people, it should provide professional trainers. Government or private vocational training partners will have to compensate industry for this service, and this process must be facilitated by the government bodies at the state level.

Second, employers must engage with curriculum development institutions of the government that manage the secondary school curriculum (such as the Central Institute of Vocational Education, Bhopal) and for ITIs (such as the Central Staff Training and Research Institute Kolkata, the National Institute for Media Instruction and the advanced training institutes). Industry will also need to be compensated by the state government for this role.

Third, industry must provide internships to trainees in vocational secondary courses, ITIs (private and public) and vocational training partners of the NSDC as well as for those ministries that are conducting long-term training. This, too, must be facilitated by the state governments, in consultation with the central Government.

Fourth, state governments must engage with industry on an institutional basis to ensure that a cadre of assessors from industry are well trained. Stand-alone assessors have cropped up due to NSDC efforts, but that system is less than effective and full of conflicts of interest (MSDE, 2016).

Finally, industry must provide placement counsellors for secondary schools, ITIs and the NSDC vocational training partners as well as the pre-employment training institutes of the Government to provide graduating youth placement guidance.

If all these measures were taken jointly by the Government and industry, there is a possibility that most trainees would not end up in informal work in the unorganized sector of industry and services. However, poor skills alone is not the reason for the growth of informality – there are many others (Mehrotra, forthcoming).

Institutionalize recognition of prior learning

Recognition of prior learning is barely institutionalized in India, even though it has one of the largest numbers of workers in the unorganized sector and in informal work. Only when recognition of prior learning becomes serious can informal workers be regarded as even capable of joining the organized sector. All short-term training in India (for three to four months) must be converted to recognition of prior learning. This will ensure certification of vocational skills for persons who are already in the workforce but had become workers after dropping out from school and acquiring formal vocational training.

Short-term vocational training should not be imparted to any young person who recently entered the labour force unless it is part of a continuous training in a credit-based system. In other words, short-term training must lead to the accumulation of credits by trainees; they can then re-enter the labour market. But if they are to be given a terminal certificate or diploma, the training must last at least one full year, through the accumulation of credits.

However, three to four months of training can and should be imparted to persons already in the workforce who have acquired skills informally and have low levels of education. Recognition of prior learning must consist of three parts: (i) some foundational cognitive skills (given that a large proportion of workers are without basic cognitive skills); (ii) some non-cognitive and soft skills (given that these are rarely imparted in schools or TVET institutions in India); and (iii) upgrading vocational skills. A recognition-of-prior-learning certificate should only be awarded if these three conditions have been met. Otherwise, it will remain a farce, even if workers need to be prepared to enter the organized sector workforce with some form of certification.

Conclusion

As this chapter explains, there are ways in which a skills development strategy can contribute towards reducing informality of work (though not eliminating it). In the absence of such action, skills development will merely prepare workers for informal work, which is why reducing the size of new entrants to the labour force who are informally trained workers is so critical; this is the way in which skills development is important for inclusive growth. In sum, to reduce inequality, we must reduce informality – but also improve TVET. The informal economy will stay in Asia and the Pacific; that is, informality will exist also in the future of work, not just artificial intelligence or robotics. It is essential for policy-makers in Asia and the Pacific to ensure that their skills strategy does not encourage informality but that it encourages the growth of quality jobs in the formal economy.

Informality of work is characterized by lack of social insurance; this is a necessary condition, but in India, only 7 per cent of all workers (including in agriculture) and 15 per cent of non-agricultural workers are in the formal economy. There are other characteristics of informality (low level of education or skills of workers, low wages, high self-employment or own-account work, no career progression), but these are symptoms, not causes. Providing social insurance for a growing share of informal workers will strike at the heart of informality and is critical to inclusiveness in the economic growth process.[153]

Skills development (along the lines outlined here) will contribute to prepare workers for formal-sector jobs across Asia and the Pacific. But skills are not a panacea for dealing with informality. While skills are critical in dealing with informality, on its own, skills development suffers from limitations as a means of reducing informality. The main instruments for ensuring inclusiveness in the growth process are expanding jobs in the formal non-agriculture sectors along with social insurance for persons left behind in the informal sector.

153 In 2017–18, the Government formulated a Code for Social Insurance for Unorganized-sector workers by converging 15 laws in the statute books and also extending them to the unorganized sector workers. The draft code is on the Ministry of Labour website (https://labour.gov.in) but has not yet been introduced in Parliament as a formal law (as of Sep. 2018).

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Annex

Table A1: Distribution of the Indian labour force, by sex, level of education and types of employment, 2004–05 and 2011–12 (million)

Level of education		2004–05					2011–12				
		SE	RE	CL	UE	LF	SE	RE	CL	UE	LF
	Male+ Female										
General education	Illiterate	102.0	7.9	71.9	0.67	182.5	76.4	7.7	61.5	0.67	146.2
	Up to secondary	132.2	32.5	58.2	5.47	228.4	135.5	38.1	75.3	4.48	253.4
	Senior secondary	12.5	6.8	1.5	1.41	22.2	18.4	10.8	3.7	1.60	34.4
	Graduate & above	9.6	10.9	0.4	1.94	22.9	13.8	18.4	0.9	2.52	35.6
Technical education	Below graduate	2.6	4.2	0.4	0.85	8.0	2.1	5.2	0.5	0.81	8.6
	Graduate & above	1.7	3.0	0.1	0.48	5.2	1.4	4.4	0.1	0.53	6.5
Total		**260.6**	**65.3**	**132.5**	**10.8**	**469.2**	**247.6**	**84.6**	**142.0**	**10.6**	**484.7**
	Male										
General education	Illiterate	45.1	4.9	37.4	0.43	87.9	38.4	4.8	35.8	0.46	79.5
	Up to secondary	98.9	27.9	46.6	3.69	177.1	104.6	32.3	60.6	3.40	201.0
	Senior secondary	10.8	5.6	1.3	0.83	18.5	15.7	9.0	3.3	1.13	29.1
	Graduate & above	8.7	8.6	0.3	1.08	18.7	12.4	14.2	0.7	1.58	28.9
Technical education	Below graduate	2.1	3.3	0.3	0.51	6.2	1.8	4.3	0.5	0.52	7.1
	Graduate & above	1.4	2.4	0.1	0.28	4.1	1.2	3.4	0.1	0.33	5.0
Total		**167.0**	**52.7**	**86.0**	**6.8**	**312.5**	**174.1**	**68.0**	**101.0**	**7.4**	**350.6**
	Female										
General education	Illiterate	56.9	3.0	34.5	0.24	94.7	38.0	2.8	25.7	0.21	66.8
	Up to secondary	33.3	4.6	11.5	1.77	51.3	30.9	5.8	14.6	1.08	52.4
	Senior secondary	1.7	1.2	0.2	0.58	3.6	2.6	1.9	0.3	0.47	5.3
	Graduate & above	0.9	2.4	0.0	0.86	4.2	1.4	4.2	0.1	0.93	6.7
Technical education	Below graduate	0.5	0.9	0.1	0.35	1.8	0.3	0.8	0.1	0.29	1.5
	Graduate & above	0.2	0.6	0.0	0.21	1.1	o0.2	1.1	0.0	0.20	1.5
Total		**93.5**	**12.7**	**46.3**	**4.01**	**156.7**	**73.4**	**16.6**	**40.8**	**3.2**	**134.2**

Note: Higher secondary education includes both regular and diploma certificate courses. SE=self-employed, RE=regular salary employed, CL=casual labour, UE=unemployed; LF=labour force.

Source: Author's estimates based on National Sample Survey unit-level data.

Table A12.2: Industry distribution of the Indian workforce, by sex, level of education, types of employment, 2011–12 (million)

Level of education	Male				Female				Male & female			
	SE	RE	CL	Total	SE	RE	CL	Total	SE	RE	CL	Total
	General education (illiterate)											
Agriculture & allied	27.2	0.4	20.1	47.6	30.5	0.2	19.0	49.6	57.7	0.6	39.0	97.3
Manufacturing	3.1	1.7	2.1	7.0	4.9	0.4	0.9	6.1	8.0	2.1	3.0	13.1
Non-manufacturing	1.1	0.4	11.9	13.5	0.1	0.2	5.2	5.5	1.2	0.6	17.1	19.0
Services	6.9	2.3	1.7	10.9	2.6	2.1	0.7	5.3	9.5	4.4	2.3	16.2
Total	**38.4**	**4.8**	**35.8**	**79.0**	**38.0**	**2.8**	**25.7**	**66.6**	**76.4**	**7.7**	**61.5**	**145.6**
	General education (up to secondary)											
Agriculture & allied	58.9	0.8	27.9	87.6	20.3	0.3	9.8	30.4	79.1	1.1	37.8	118.0
Manufacturing	10.7	10.5	5.0	26.2	7.2	1.4	1.4	10.0	17.9	11.9	6.4	36.2
Non-manufacturing	3.4	2.7	22.6	28.6	0.1	0.1	2.8	2.9	3.4	2.7	25.4	31.6
Services	31.7	18.4	5.1	55.2	3.3	4.0	0.7	8.0	35.0	22.4	5.8	63.1
Total	**104.6**	**32.3**	**60.6**	**197.5**	**30.9**	**5.8**	**14.6**	**51.3**	**135.5**	**38.1**	**75.3**	**248.9**
	General education (senior secondary)											
Agriculture & allied	7.64	0.13	1.49	9.26	1.41	0.00	0.18	1.59	9.04	0.14	1.67	10.85
Manufacturing	1.31	1.93	0.30	3.53	0.57	0.22	0.05	0.84	1.89	2.15	0.34	4.37
Non-manufacturing	0.44	0.48	1.17	2.09	0.00	0.02	0.07	0.09	0.44	0.50	1.23	2.18
Services	6.33	6.42	0.37	13.12	0.66	1.62	0.05	2.33	6.99	8.04	0.42	15.45
Total	**15.7**	**9.0**	**3.3**	**28.0**	**2.6**	**1.9**	**0.3**	**4.8**	**18.4**	**10.8**	**3.7**	**32.8**
	General education (graduate & above)											
Agriculture & allied	4.06	0.09	0.24	4.39	0.40	0.01	0.03	0.44	4.47	0.10	0.26	4.83
Manufacturing	1.01	1.75	0.06	2.81	0.23	0.18	0.01	0.42	1.24	1.92	0.07	3.23
Non-manufacturing	0.35	0.56	0.32	1.23	0.02	0.06	0.03	0.10	0.37	0.61	0.35	1.34
Services	6.97	11.8	0.13	18.87	0.78	3.97	0.04	4.79	7.75	15.7	0.17	23.67
Total	**12.4**	**14.2**	**0.7**	**27.3**	**1.4**	**4.2**	**0.1**	**5.8**	**13.8**	**18.4**	**0.9**	**33.1**

Level of education	Male				Female				Male & female			
	SE	RE	CL	Total	SE	RE	CL	Total	SE	RE	CL	Total
	Technical education (below graduate)											
Agriculture & allied	0.50	0.01	0.09	0.60	0.07	0.00	0.02	0.09	0.57	0.01	0.11	0.69
Manufacturing	0.14	1.61	0.11	1.86	0.05	0.06	0.01	0.12	0.19	1.67	0.12	1.98
Non-manufacturing	0.16	0.49	0.13	0.78	0.00	0.03	0.01	0.04	0.16	0.52	0.14	0.82
Services	1.01	2.23	0.13	3.36	0.22	0.73	0.01	0.96	1.22	2.96	0.14	4.32
Total	**1.8**	**4.3**	**0.5**	**6.6**	**0.3**	**0.8**	**0.1**	**1.2**	**2.1**	**5.2**	**0.5**	**7.8**
	Technical education (graduate & above)											
Agriculture & allied	0.14	0.02	0.03	0.19	0.01	0.00	0.00	0.01	0.16	0.02	0.03	0.21
Manufacturing	0.10	0.75	0.02	0.86	0.01	0.03	0.00	0.04	0.11	0.78	0.02	0.90
Non-manufacturing	0.08	0.24	0.02	0.34	0.00	0.03	0.00	0.03	0.08	0.27	0.02	0.37
Services	0.92	2.36	0.01	3.29	0.16	1.0	0.00	1.17	1.08	3.36	0.01	4.46
Total	**1.2**	**3.4**	**0.1**	**4.7**	**0.2**	**1.1**	**0.0**	**1.3**	**1.4**	**4.4**	**0.1**	**5.9**

Note: Higher secondary education includes both regular and diploma certificate courses. SE=self-employed, RE=regular salary employed, CL=casual labour, UE=unemployed; LF=labour force.

Source: Author's estimates, based on National Sample Survey unit-level data.

13

Rethinking skills for the rural economy in Asia and the Pacific

Phu Huynh

Abstract: The chapter examines rural employment and skills dynamics in eight developing Asian and Pacific countries: Cambodia, Indonesia, Mongolia, Myanmar, Pakistan, Samoa, Thailand and Viet Nam. Based on quantitative analysis of data from national household surveys, it presents the employment, education, skills and wage gaps of rural farm and off-farm workers. It argues that investments in human capital development and active labour market policies are key to enhancing access to better quality jobs and higher wages for rural workers. The chapter also examines the magnitude of skills gaps in rural labour markets and highlights the potential for employment services to address some of these gaps. The chapter then discusses the looming technological transformation in the rural workplace and implications for rethinking rural education and skills systems.

Introduction

Economic development has too often neglected the 2.2 billion people living in rural areas of the Asia-Pacific region (DESA, 2014). Despite some progress in recent decades, rural communities remain constrained by limited economic diversification and opportunities for productive jobs, gaps in infrastructure and poor connectivity to urban and external markets. Rural households also experience disparities in the quality of education, health care and other public social services. Unsurprisingly, poverty continues to persist in the region, often due to policies that have prioritized urban prosperity at the expense of rural development. In this context, the 2030 Agenda for Sustainable Development and other international policy commitments strongly recognize that promoting inclusive rural growth is necessary for a sustainable development trajectory.

Tackling rural poverty and deficits in the developing countries of the Asia-Pacific region requires addressing the multifaceted features of rural economies and labour markets. The rural workforce is heterogeneous across numerous dimensions, including variances between farm and off-farm employment (World Bank, 2007). Consideration for this sharp dichotomy of the rural economy is essential for dealing with the challenges related to promoting skills for decent work. Investment in education and training has been critical as a pathway out of rural poverty in many developing countries by providing better opportunities in the labour market for higher paid wage employment (Winters et al., 2008).

The complex challenges for inclusive rural development is magnified by advances in ICT and other emerging technologies. On one hand, these innovations present potentially transformative accelerators to bridge many rural development gaps, including better information access, improved provision of social services and enhanced agricultural production. However, these opportunities will not be realized without investments in rural technology infrastructure and upgrading workforce skills. Some technologies could also undermine many rural industries without a strategic vision to anticipate and tackle the looming disruptions.

This chapter examines employment and skills dynamics in eight developing Asian and Pacific countries: Cambodia, Indonesia, Mongolia, Myanmar, Pakistan, Samoa, Thailand and Viet Nam. Following a brief discussion of data sources and the analytical framework, the chapter sketches the status of employment, education, skills and wage gaps of rural farm and off-farm workers vis-à-vis the urban workforce.[154] The subsequent sections present quantitative evidence that increased schooling is strongly associated with greater odds of being employed in a good-quality rural job. The chapter then examines the magnitude of skills gaps in rural labour markets and highlights the potential for employment services to target some of these gaps. The discussion then turns to the looming technological transformation in the rural workplace and implications for rethinking rural education and skills systems. The chapter concludes with overarching policy considerations to foster inclusive rural development through skills and decent work.

13.1 Data sources and methods

Labour Force Surveys

The quantitative analysis presented here is based primarily on the Labour Force Surveys of Cambodia, Indonesia, Mongolia, Myanmar, Pakistan, Samoa, Thailand and Viet Nam. These eight countries were selected based on three criteria. First, the countries have had deemed skills and rural development as a national priority in their current efforts to promote decent work. Second, they have made available recent Labour Force Survey microdata using a threshold of the past six years. And third, they collectively represent all four Asia-Pacific subregions of Eastern Asia, Southern Asia, South-Eastern Asia and the Pacific islands.

The most recently available year of the Labour Force Survey was used. In countries that conduct surveys on a quarterly or biannual basis, the reference period with the optimal survey sample size was chosen (see Annex table A13.1).

The Labour Force Surveys provide the best official source of nationally representative statistics and indicators on employment and working conditions. However, a couple

154 Unless noted otherwise, skill levels are based on occupations. High-skill occupations are defined as ISCO groups 1 (managers), 2 (professionals) and 3 (technicians and associate professionals). Medium-skill occupations include ISCO groups 4 (clerks), 5 (service and sales workers), 6 (skilled agricultural and fishery workers), 7 (craft and related trade workers) and 8 (plant and machine operators and assemblers). Low-skill occupations consist of ISCO group 9 (elementary occupations). See ILO, 2012b.

important caveats are worth highlighting regarding the urban and rural estimates presented. First, the classification of urban or rural locality is based on the residence of the household of the employed person and not on the location of the workplace. Survey data do not allow for distinguishing workers from rural households who may make daily or weekly commutes to work in urban areas. Thus, the characteristics of rural workers in this study more accurately represent the features of workers from rural households, including those who may technically work in an urban setting. Extensive prevalence of this type of short-term, rural-to-urban commute could bias the metrics of rural employment and wages upward.

Second, the common distinction between urban and rural areas within a country was based on the assumption that urban areas provide a different way of life that is usually of a higher standard of living than in rural areas. However, there is a lack of an international definition of urban or rural areas, and statistical classifications are made at the national level. National definitions tend to define rural areas as a residual of urban areas and base the typology on one or more criteria (see Annex table A13.1). These typically include a mix of the following: (i) administrative area; (ii) population size and/or density; (iii) predominance of agricultural and non-agricultural activities; and (iv) availability of infrastructure services and amenities. Given these national variances in definitions, the urban-rural figures presented in this study are not strictly comparable across countries. Interpretation of findings therefore focus on general trends across the region and intra-country dynamics and less so on precise cross-country comparisons.

Analytical framework

Descriptive statistics on urban, rural agricultural and rural non-agricultural employment in the eight countries were analysed to determine urban-rural gaps and intra-rural differences. Employing a standard Mincerian regression model (Mincer, 1974), the urban-rural wage gap and rural wage determinants were estimated by controlling for differences related to sex, age, province or region, marital status, education, training, experience, economic sector, occupation, enterprise characteristics and qualifications mismatch:

$$\ln w_i = \alpha + \beta x_i + \varepsilon_i$$

The dependent variable is the log of the employee i's hourly wage, w_i, except in the case of Myanmar, where the log of the daily wage was predicted. Independent variables in the model for all eight countries include an urban-rural dummy variable, a female dummy variable, age and age squared (signifying that after a certain age, earnings tend to diminish for older workers), a dummy variable indicating if the employee is married, education attainment variable, subnational variable for the province or region, industry and occupational variables and a variable for qualifications mismatch.

The metric of qualification mismatch is based on an approach outlined in ILO (2013a), which aligns education attainment levels according to the International Standard Classification of Education (ISCED) with occupational groups according to the International Standard

Classification of Occupations (ISCO). ISCO occupational groups 1, 2 and 3 are considered high skill and match with ISCED-97 levels 5 and 6. ISCO groups 4, 5, 6, 7 and 8 are considered medium-skill occupations and align with ISCED levels 3 and 4. ISCO group 9 of low-skill occupations correspond with ISCED levels 1 and 2. In this framework, workers whose occupation matches the assigned education attainment level are considered adequately qualified. Workers with a higher level of education are considered overqualified, and workers with a lower level are classified as underqualified. Together, the overqualified and underqualified are considered mismatched.[155]

Other independent variables were incorporated in a subset of countries without survey data constraints. Experience variables (less than one year, between one year but less than five years, between five years but less than ten years, and ten or more years) were applied in the cases of Cambodia, Indonesia and Viet Nam. Five of the eight countries (Cambodia, Mongolia, Myanmar, Pakistan and Samoa) collect data on participation in a skills development course or technical training programme outside of the general education system. For these five countries, a binary variable for training was thus included. Control variables for enterprise characteristics related to the institutional sector (public or private) was used for all countries except Indonesia. Likewise, an independent variable for enterprise size according to the number of employees (fewer than 10, 10–19, 20–49 and 50 or more) were used in all countries except Indonesia and Viet Nam.

Standard logistic regressions were also applied, using the same control variables, to assess the relative probability of being employed in a better-quality job for a rural worker and to determine the disadvantages faced by rural workers classified as overqualified. For this analysis, a proxy metric for a better-quality job – specifically defined as non-agricultural wage employment where wages are at least two-thirds of the median wage and weekly hours of work do not exceed 48 hours – was used as the dependent variable in the logistic regressions. To derive this proxy indicator, different conceptual components of decent work were incorporated, while considering survey data limitations. The key dimensions that were incorporated relate to the economic sector of employment, the stability and security of work, adequate earnings and the hours of work.

Off-farm employment is typically better paid and more productive than agricultural jobs (see Annex figure A1; Winters et al., 2008). In terms of the stability and security of work, wage employment, as compared to self-employment, tends to be more secure with stable earnings and better access to legal and social protections (ILO, 2013b). In addition, work can be considered decent only if it is productive and provides wages sufficient to keep workers and their families out of poverty. This study adopted a relative threshold to define low pay – that is two-thirds of median hourly earnings – and excluded any low-paid employee from

155 ILO (2013a) outlines some limitations to this approach. For example, it assumes all occupations with the same job title have identical education requirements, and it does not account for years of experience, which are intrinsically low for young people.

being classified as having a better-quality job (ILO, 2012a).[156]

Finally, the working time aspect was another important factor, given that long working hours can have a detrimental effect on mental health and physical safety. According to the international standard, 48 hours is the threshold for defining excessive hours of work, as specified in the Hours of Work (Industry) Convention, 1919 (No. 1) and the Hours of Work (Commerce and Offices) Convention, 1930 (No. 30) (ILO, 2012a).[157]

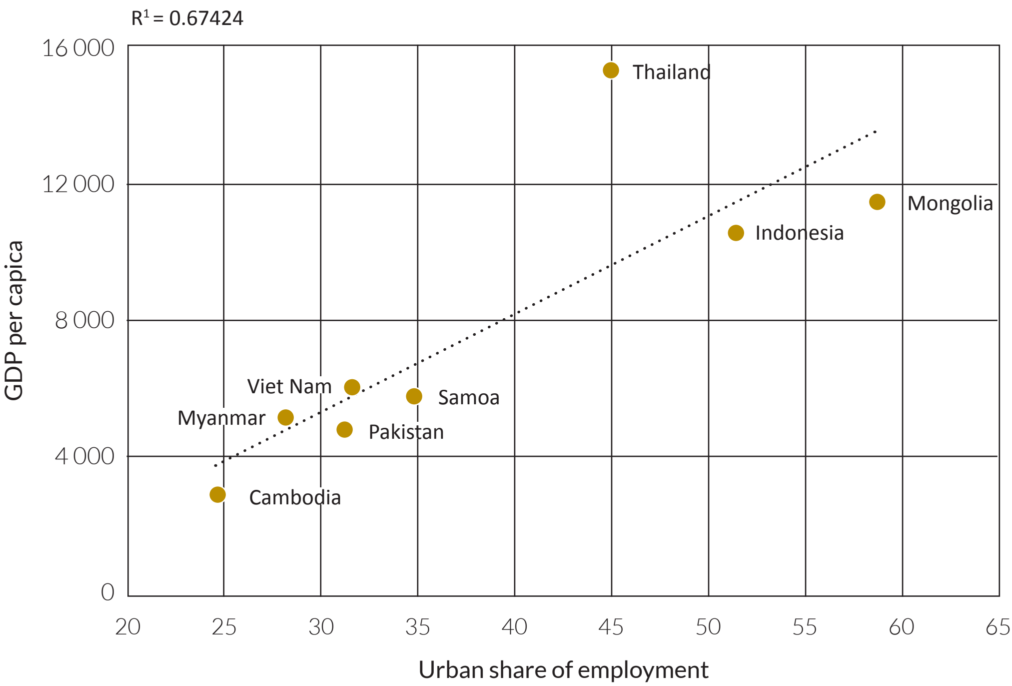
13.2 Urbanization and rural jobs

Transformative change in recent decades has shaped the developing countries of the Asia-Pacific region. Deeper integration into global markets and economic upgrading have led to improved living standards and a rapid decline in poverty. Integral to this process has been a demographic shift to urban areas, driven mainly by better job prospects. Through positive consolidation, cities have become engines of growth by facilitating lower transaction costs, fostering more efficient markets and accelerating innovation and knowledge exchange. Convincing evidence shows that urbanization is inextricably linked with higher productivity and incomes and economic transformation (Annez and Buckley, 2009). Dynamism in cities has spurred enterprise growth and job creation. As the share of employment has become more centralized in urban areas, economies have become wealthier (Figure 13.1). The one outlier among the eight countries analysed in this chapter appears to be Thailand, where an urban employment share of 45.1 per cent correlates with an expected income per capita level much lower than $15,200. Thailand has promoted a rural development agenda for decades that has helped to bridge gaps in income, education, health care and infrastructure, among other areas (OECD, 2016). Another explanation could be the significant role in Thailand that rural-to-urban migration and remittances have had on the welfare of rural households and thus incomes overall (Amare et al., 2012).

156 In the case of Myanmar, two-thirds of the median daily wage is applied. Alternatively, an indicator based on earning at least the minimum wage was considered as a criterion for adequate earnings but ultimately was excluded due to the complexity of minimum wage regimes in such countries as Indonesia and Viet Nam.

157 A minimum threshold of hours was also proposed to capture labour underutilization but, in the end, was not included due to the lack of international criteria in defining time-related underemployment or part-time employment. Other variables of interest that were omitted due to gaps in the survey data include non-standard forms of employment, type of contract, social protection contribution, unionization and collective bargaining.

Figure 13.1: Urban share of employment, persons aged 15 and older (%) and GDP per capita (constant 2011 international $), latest year

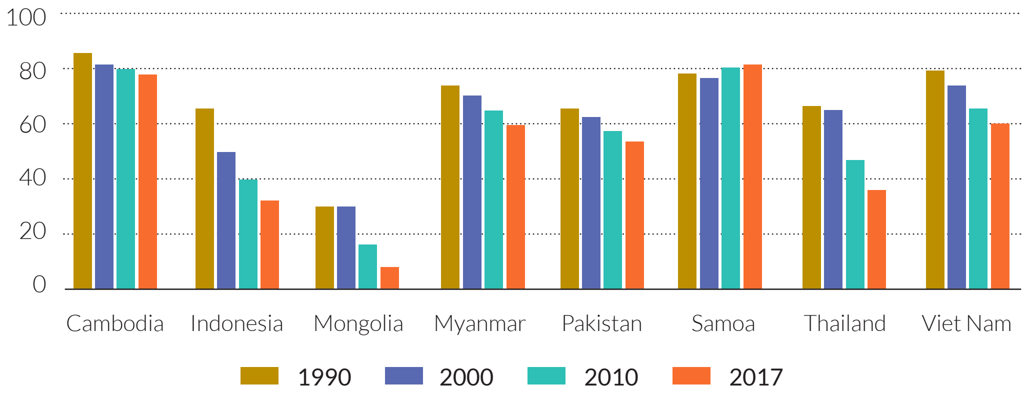


Note: GDP per capita adjusted for purchasing power parity.

Source: Author's estimates based on Labour Force Surveys and World Bank: World Development Indicators, 2017, https://data.worldbank.org/ (accessed 15 June 2018).

The dynamic rise of Asian-Pacific cities is clearly impacting rural societies. In seven of the eight countries analysed, the share of the rural population has fallen considerably since 1990 (Figure 13.2). In Indonesia and Thailand, for example, the rural-to-urban transition was the swiftest, with the share of the rural population falling by 25 percentage points and 23 percentage points, respectively. Conversely, the one exception to these trends is Samoa, where the share of the rural population has remained constant at around 80 per cent of the overall population. Other countries in which the rural population share, despite a historical downward trajectory, still exceeds 60 per cent are Cambodia, Myanmar, Pakistan and Viet Nam. The population residing in these rural areas tends to live with considerably more disadvantages than urban residents. Significant rural-urban disparities persist and in many cases have worsened in regard to incomes and access to education, health care and other essential social services (World Bank, 2007).

Figure 13.2: Rural share of total population, 1990, 2000, 2010 and 2017 (%)



Source: DESA, 2014.

Rural areas accounted for around three in five jobs on average across the eight countries

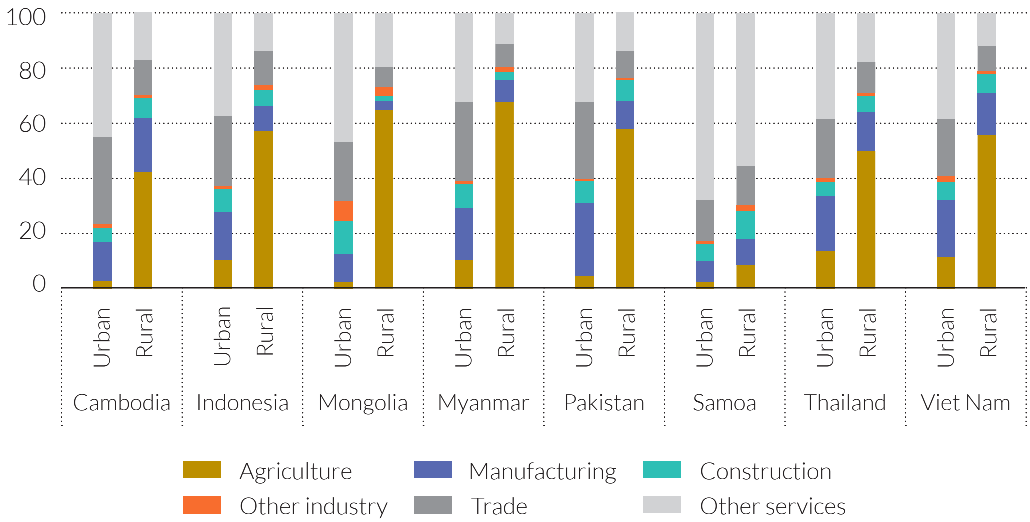
Despite the progress and achievements of urbanization, rural areas remain a critical source of jobs (Annex table A13.2). Across the eight countries analysed, rural areas accounted for around 173 million workers, or approximately three-fifths of total employment. In Cambodia and Myanmar, the ratio was higher, at around three in four. Conversely, in Indonesia and Mongolia, less than half of all employment was rural. In general, rural areas were equally important for female and male employment, with the one exception of Pakistan, where the female share of employment in rural zones exceeded that for males by 21.1 percentage points. There, the process of rural-to-urban migration for employment historically has been dominated by men; women tend to migrate for marital or family reasons (Hamid, 2010).

Agricultural employment was dominant in rural Asia and the Pacific, but manufacturing and trade were also critical

A distinguishing characteristic of the rural economy is clearly agriculture. For the eight countries overall, agriculture accounted for 56.4 per cent of rural employment, compared to just 10.4 per cent of urban jobs. In Mongolia and Myanmar, about two in three rural workers were employed in agriculture, the highest ratio among the countries in the study. Conversely, the rural economy was comparatively less reliant on farming in Cambodia (43 per cent) and Samoa (9.1 per cent). By sex, rural agricultural employment trends varied widely. In Pakistan and Viet Nam, farming accounted for a larger share of female employment than for male employment, but the opposite was the case in Mongolia, Myanmar, Samoa and Thailand.

While farming typically characterizes perceptions of country life, the rural economy in reality tends to be more diversified. A sizeable portion of off-farm employment is also prevalent outside urban localities (Figure 13.3). In Cambodia, for example, the manufacturing of garments is important for rural jobs and development. In rural Pakistan and Viet Nam, manufacturing employs a sizeable workforce, particularly in the production of garments and textiles in the former and footwear and garments in the latter.[158] In Thailand, manufacturing, especially of food and beverage products, is significant for rural non-farm jobs. Construction and wholesale and retail trade were the other prominent rural economic sectors in the eight countries. With the exceptions of Mongolia and Myanmar, construction employed 6–9 per cent of the rural workforce, while trade accounted for 7–14 per cent.

Figure 13.3: Employment, by economic sector and locality, ages 15 and older, various years (%)



Note: Agriculture includes agriculture, forestry and fishing; trade includes wholesale and retail trade and repair of motor vehicles. See Annex table A13.1 for reference years.

Source: Author's estimates based on Labour Force Surveys.

Rural workers were considerably more likely to have less education and less likely to fill high-skill jobs

To succeed in the rural economy, land and water are important resources. But education is essential for rural women and men to pursue higher-value agricultural production, find better-quality off-farm jobs and consider a transition to the urban economy (World Bank, 2007). In developing Asian and Pacific countries, education in rural areas is generally very poor. Countless studies have examined the diverse constraints that drive the gaps in rural education and human capital development. For example, Arze del Granado et al. (2007)

158 For comparative analysis of the garment, textile and footwear industry in Asia, see Huynh, 2015.

highlighted the rural disadvantage in Indonesia in terms of the inefficiency of education investments and the unequal spatial allocation and earnings of rural teachers.

Separate studies on Thailand attribute the urban-rural inequality in learning achievements of secondary school students primarily to differences in the quality of the education system and less to differences in the student population, raising particular attention to teacher quality and resource shortages in rural areas (Lathapipat and Sondergaard, 2015; World Bank, 2012). In Cambodia, the sizeable urban-rural education gaps can be traced in part to lower salaries and qualifications of rural teachers and weak performance-incentive schemes (Tandon and Fukao, 2014). In Viet Nam, the deficits in rural education enrolment and completion, while improving, are correlated to not only low household education expenditure but also poor school infrastructure and parental engagement in the community (World Bank, 2011). In Pakistan, gender biases have had a measurable negative impact on school enrolment, education outcomes and rural poverty, which compound the challenges of understaffed rural schools (Dundar and Waheed, 2013; Chaudry and Rahman, 2009).

The analyses of the different metrics of human capital of the urban and rural workforce in the eight countries corroborated observations found in the literature (Figure 13.4, panel A). Metropolitan workers were inclined to be better educated and more likely to have an upper secondary diploma or have attended tertiary schooling. Conversely, rural workers were significantly more likely to have at most a primary education. The urban-rural divide, however, decreased considerably when adjusting for the economic sector of the rural economy. That is, the educational advantages for city workers tended to diminish when rural agriculture was excluded. In some cases, the educational profile of off-farm rural workers was more similar to the qualifications of their urban counterparts than of their rural agricultural neighbours. For example, in Mongolia and Samoa, post-secondary education qualifications among rural off-farm workers lagged behind those of the urban employed by just 5–6 percentage points but exceeded that for rural farmers by 22–38 percentage points.

Using the type of occupation as a proxy for the skill content of employment, the rural workforce also exhibited a two-sided story (Figure 13.4, panel B).[159] Across the eight countries, the opportunities for high-skill employment as a manager, professional or technician were almost exclusively found off the farm. In seven of the eight countries, less than 1 per cent of rural farmers were in a high-skill job, with the one exception of Samoa, where the share was 5.6 per cent. Conversely, the share of high-skill employment was much more prevalent in rural non-agricultural activities. In Mongolia and Samoa, for instance, the portion was nearly one third, while it was one sixth in Pakistan and Thailand.

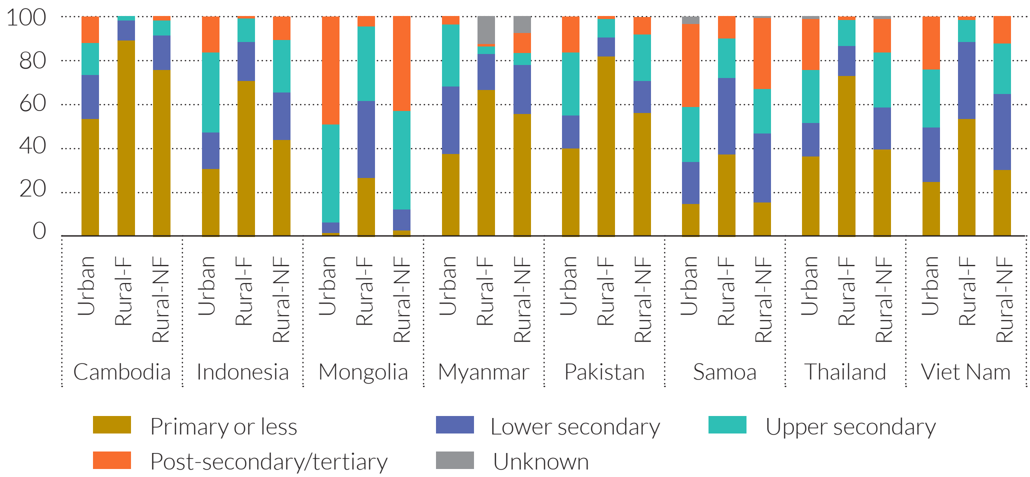
Rural off-farm workers are more similar to urban workers than to rural farmers in terms of their skill levels. In comparison to the urban labour market, high-skill employment for the rural non-farm worker differed only marginally in Indonesia and Mongolia. As the next

159 For further discussion on metrics of skills and occupations, see ILO, 2012b.

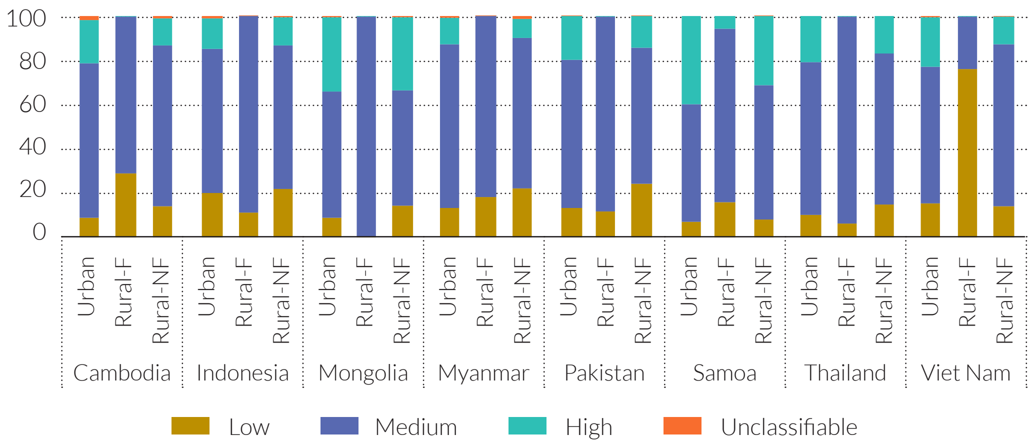
section underscores, better education certainly opens the door to higher-skill and higher-quality jobs. But even with the right qualifications, rural women and men mostly have two options: explore off-farm opportunities or migrate for new urban employment.

Figure 13.4: Employment, by locality and skill profile, ages 15 and older, various years (%)

Panel A. Education attainment



Panel B. Occupation-based skill level



Note: "Rural-F" denotes rural farm employment, "Rural-NF" denotes rural non-farm employment. High-skill occupations are defined as ISCO groups 1 (managers), 2 (professionals) and 3 (technicians and associate professionals). Medium-skill occupations include ISCO groups 4 (clerks), 5 (service and sales workers), 6 (skilled agricultural and fishery workers), 7 (craft and related trade workers) and 8 (plant and machine operators and assemblers). Low-skill occupations consist of ISCO group 9 (elementary occupations). See ILO (2012b) for further discussion of occupation-skill linkages. See Annex table A13.1 for reference years.

Source: Author's estimates based on Labour Force Surveys.

13.3 Education as a key determinant of access to quality jobs

Better education can be the critical difference in accessing better-quality jobs for rural workers

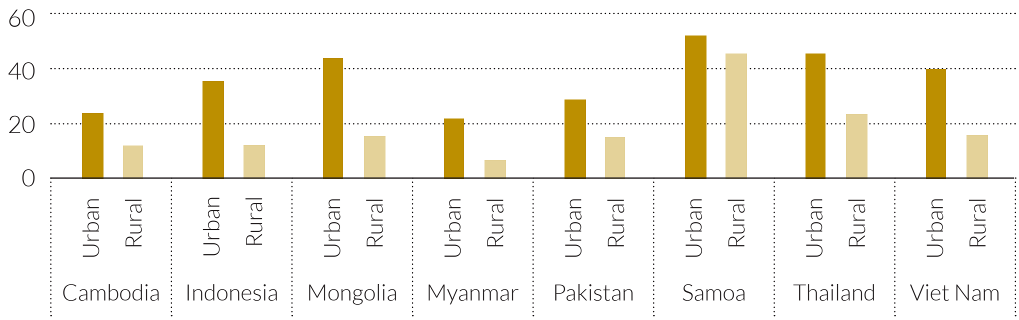
Investment in education is a key driver in accessing better-quality jobs for workers who remain in rural areas. Based on a proxy metric of better-quality employment – defined as non-agricultural wage employment in which wages earned were at least two-thirds the median and actual weekly hours of work did not exceed 48 hours – rural workers experienced sharp disadvantages. In all eight countries, the share of better-quality jobs in total employment was consistently higher in cities (Figure 13.7, panel A). In Mongolia, for example, 43.8 per cent of urban workers were employed in a better-quality job, compared with only 15.6 per cent in rural areas, reflecting a difference of 28.1 percentage points. In Indonesia, Thailand and Viet Nam, the urban-rural gap exceeded 20 percentage points. By contrast, the difference was more indistinct in Samoa, at 6.5 percentage points.

Figure 13.7, panel B further corroborates the disparity for rural workers in their pursuit of better-quality jobs. When adjusting for differences in individual characteristics along various social, demographic and employment dimensions, metropolitan workers in all eight countries had a higher propensity of securing a better-quality job. In Indonesia, which exhibited the worst odds for rural workers when controlling for individual characteristics, urban workers were 54 per cent more likely to have a better-quality job. In Viet Nam, the relative odds were 50 per cent higher for city workers, while it was nearly 18 per cent in Thailand.

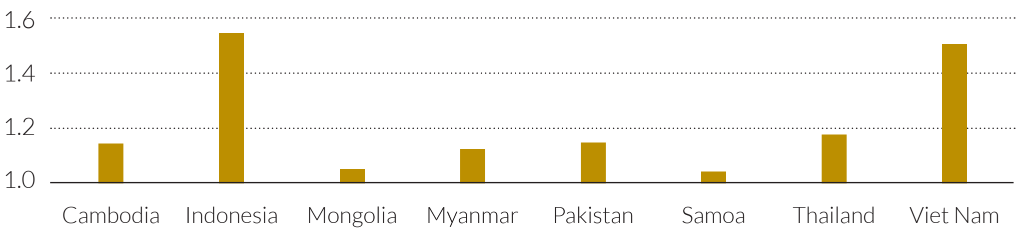
For rural workers without the resources, desire or conditions to migrate for urban employment, securing a better-quality job is challenging – but not impossible. Certainly other factors can help increase the odds in rural areas. In seven of the eight countries (the exception being Viet Nam), higher levels of schooling remarkably improved the likelihood of better employment quality, with all else equal (Figure 13.8). In Indonesia, for instance, the payoff for increased education was remarkable. There, a rural worker with an upper secondary diploma was four times as likely to have a better-quality job as a counterpart with only a primary school degree. With tertiary studies, the odds increased to 14 times. In comparison in Cambodia, Myanmar and Pakistan, tertiary-educated rural workers could expect their chances of securing a better-quality job to improve by six to eight times, relative to having, at most, a primary school education.

Figure 13.5: Urban-rural differences in better-quality jobs, ages 15 and older, various years

Panel A. Share of better-quality jobs in total employment, by locality (%)



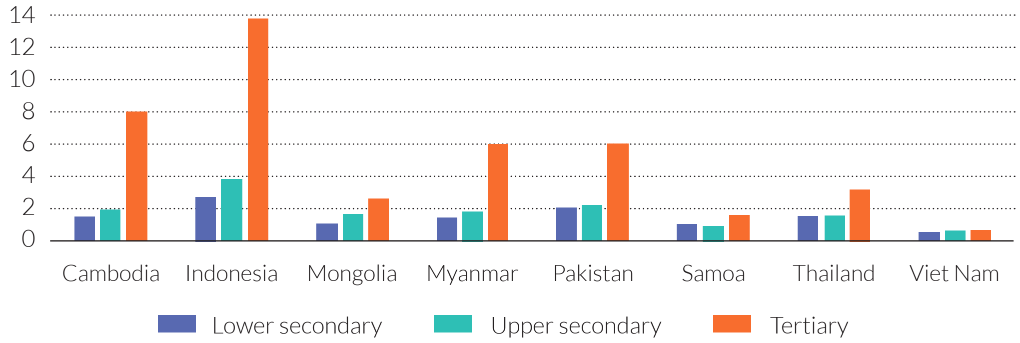
Panel B. Relative probability of employment in a better-quality job between urban and rural areas



Note: Better-quality jobs are based on a proxy defined as non-agricultural wage employment, where wages are at least two-thirds the median and actual weekly hours of work do not exceed 48 hours. Panel B indicates the probability of being employed in a better-quality job in urban areas relative to rural areas, while controlling for differences in province, sex, age, marital status, education, training, experience, economic sector, occupation, public-private institutional sector, enterprise size (number of employees) and qualifications mismatch. A value of 1 represents equal likelihood of being employed in a better-quality job. See Annex table A13.1 for reference years.

Source: Author’s estimates based on Labour Force Surveys.

Figure 13.6: Relative probability of employment in a better-quality job in rural areas, by education, ages 15 and older, various years



Note: Better-quality jobs are based on a proxy defined as non-agricultural wage employment, where actual weekly hours of work do not exceed 48 hours. This indicates the probability of being employed in a better-quality job in rural areas for different levels of education attainment relative to the base case of primary education or less, while controlling for differences in province, sex, age, marital status, training, experience, economic sector, occupation, public-private institutional sector, enterprise size (number of employees) and qualifications mismatch. A value of 1 represents equal likelihood of being employed in a better-quality job. See Annex table A13.1 for reference years.

Source: Author's estimates based on Labour Force Surveys.

13.4 Qualifications mismatch in the rural workforce

Investment in human capital through better education and training can help facilitate access to higher wages and good jobs in the rural economy. But another component that is integral to rural development strategies is the matching of skills of jobseekers and those requested by employers. Matching facilitates efficiency in labour markets by helping to bring supply and demand more in line with each other. It reduces skill mismatches through a process of filling vacant jobs with qualified jobseekers (Andersen, Feiler and Schulz, 2015). Skills mismatches can hinder productivity and slow progress towards improving the quality of employment while contributing to worker dissatisfaction and discouragement. Public employment service agencies have a critical role in providing labour market information, offering job-search assistance and placement services and managing various labour market programmes, such as worker displacement support and retraining. In developing Asian and Pacific countries and around the world, however, public employment services in rural areas are inadequately resourced and generally not prioritized, which can exacerbate skill mismatches in the rural labour market (IDB, WAPES and OECD, 2015).

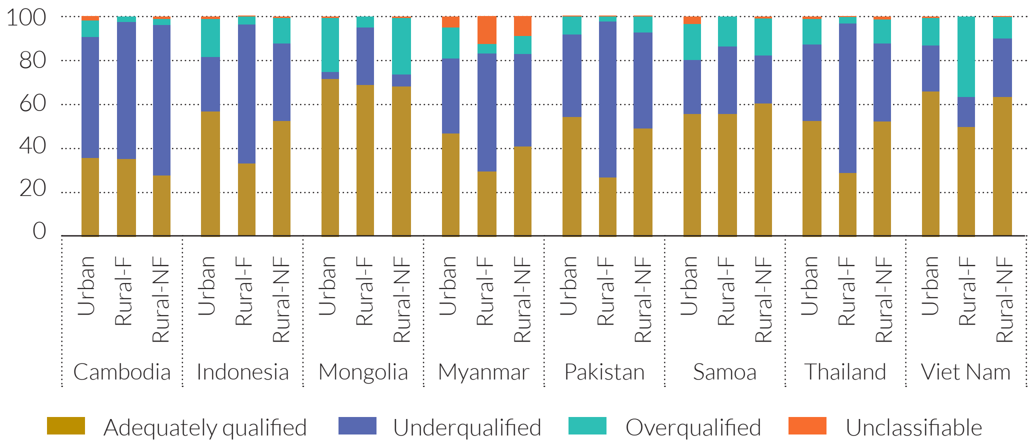
Skills gaps in rural areas were more sizeable than those in urban areas, with underqualified rural workers often outnumbering those with too much schooling

Vertical skills mismatch, which was measured using a standard statistical approach of aligning educational qualifications with the occupation of employment, included workers who were either overqualified or underqualified for their job. In the eight countries, skill mismatch in rural areas tended to be more prevalent than in cities, even when factoring in differences in rural farm and off-farm employment (Figure 13.9). In Cambodia, the skills mismatch challenge was notably stark. In urban Cambodia, 62.3 per cent of workers were not appropriately qualified for their job, and the share among off-farm rural workers was larger, at 71.3 per cent. In Pakistan and Thailand, skill mismatch affected the rural agriculture sector, where more than 70 per cent of workers were mismatched, compared with less than half of their urban counterparts. Another important finding is that in rural areas, underqualified workers tended to outnumber workers with too much schooling, especially in Cambodia, Indonesia, Myanmar, Pakistan and Thailand.

Overall, rural workers who were overqualified could expect a wage penalty and faced poorer odds of accessing better-quality employment

Examining the relationship between skill mismatch and indicators of wages and better-quality employment revealed that skill mismatches may adversely affect employment outcomes. First, in six of the eight countries, being overqualified for a job was associated with decreased wages of a rural employee, after controlling for other individual characteristics (Figure 13.10, panel A). In Samoa, the wage penalty for being overqualified was around 32 per cent. In Cambodia and Thailand, it was 24 per cent and 16 per cent, respectively. These overall results are rather intuitive and would support the notion that skill mismatch hurt the efficiency of labour markets. Workers that are engaged in jobs that are below their qualifications earn less than their market potential. This not only affects the overqualified rural workers and their family in terms of lower wages and household purchasing power but also suppresses aggregate demand in the rural economy.

Figure 13.7: Employment, by qualifications mismatch and locality, ages 15 and older, various years (%)



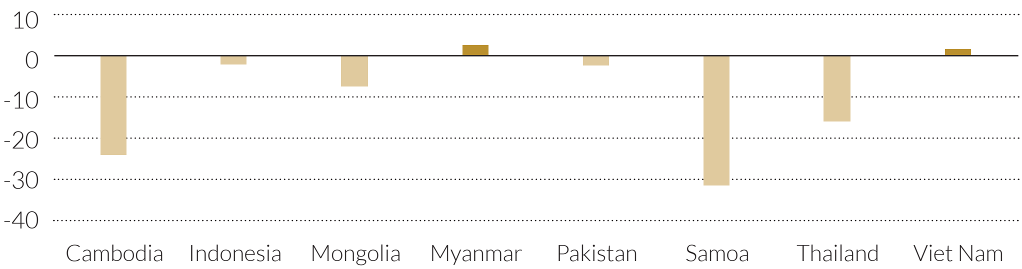
Note: See Annex table A13.1 for reference years.

Source: Author's estimates based on Labour Force Surveys.

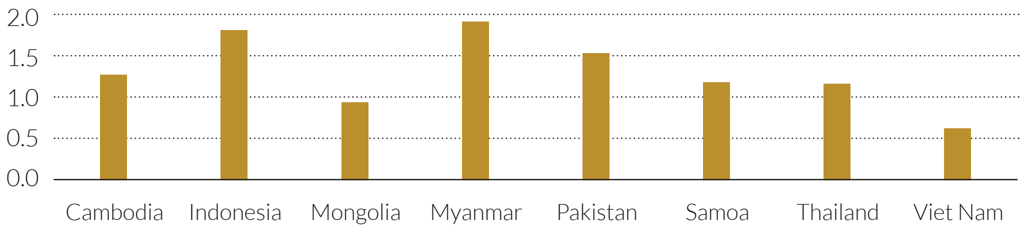
Being overqualified in the rural labour market also tended to impede access to better employment. In the eight countries, being overqualified decreased the odds of being employed in a better-quality job (Figure 13.10, panel B). With the exception of Mongolia and Viet Nam, a rural worker with the appropriate qualifications had higher odds of being employed in a better-quality job than an overqualified worker, when other individual characteristics were held constant. In Indonesia and Myanmar, having qualifications that matched the job provided almost double the probability of someone who was overqualified. Likewise, in Pakistan, the odds of better-quality employment improved by more than 50 per cent when having the right qualifications.

Figure 13.8: Impact of skills mismatch on rural employment outcomes, various years

Panel A. Wage penalty (or premium) in rural areas for overqualified employees, ages 15 and older (%)



Panel B. Probability of employment in a better-quality job in rural areas relative to an overqualified worker, ages 15 and older



Note: Panel A indicates the estimated wage penalty (or premium) for rural employees aged 15 and older who are overqualified relative to those who are adequately qualified, while controlling for differences in province, sex, age, marital status, education, training, experience, economic sector, occupation, public-private institutional sector and enterprise size (number of employees). Panel B indicates the probability of being employed in a better-quality job for a rural worker who is adequately qualified relative to a worker who is overqualified, while controlling for differences in province, sex, age, marital status, training, education, experience, economic sector, occupation, public-private institutional sector and enterprise size (number of employees). A value of 1 represents equal likelihood of being employed in a better-quality job. Better-quality jobs are based on a proxy defined as non-agricultural wage employment where wages are at least two-thirds the median wage and actual weekly hours of work do not exceed 48 hours. See Annex table A13.1 for reference years.

Source: Author’s estimates based on Labour Force Surveys.

13.5 Rethinking education and training for rural jobs of the future

The analysis provides strong evidence that increased education and training and better skills matching are associated with improved employment outcomes. Thus, the importance of improving the quality and relevance of rural education and training systems to empower the future workforce cannot be overstated, given the documented gaps in rural areas. The urgency of tackling this challenge is further magnified in the context of looming technological transformations in the workplace.

Technological advances in the workplace will necessitate transformative changes to rural skills development

For decades, labour-intensive manufacturing in developing Asian and Pacific countries fuelled economic growth and provided a conduit to better jobs outside of agriculture. Millions of rural workers, typically with limited education and training, moved off farms and into formal factory jobs that paid regular wages. Spurred by deeper trade integration, opportunities increased rapidly as global demand grew for various manufacturing products, ranging from low-end garments and footwear to higher-value electronics and automobiles.

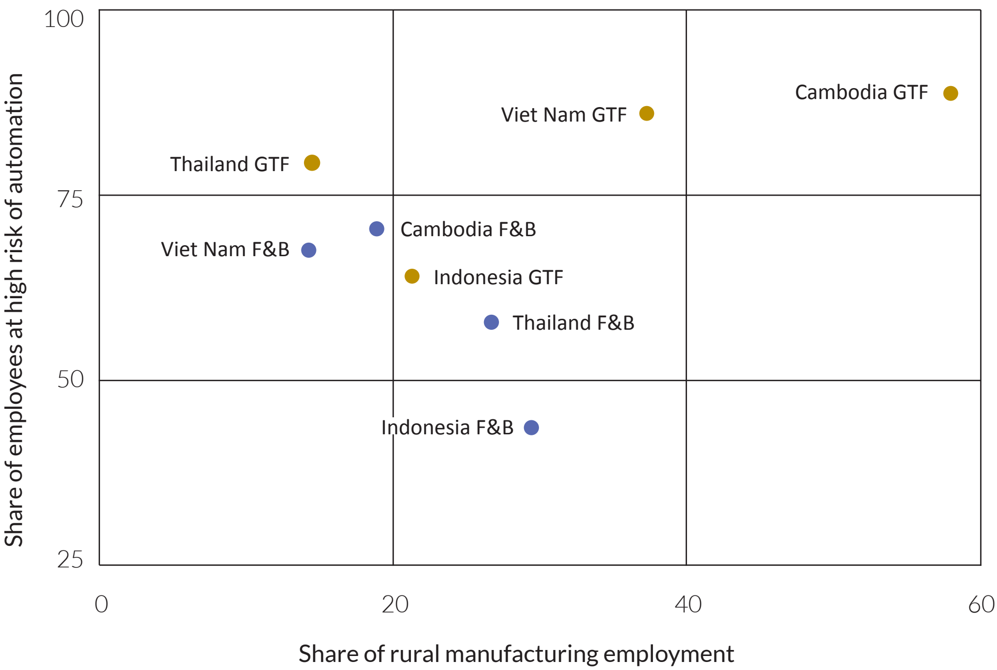
Recent technological advances, however, could undermine this development pathway. New scientific advances, such as robotic automation, big data analytics, artificial intelligence, additive printing and the Internet of things, among others – commonly referred to as the Fourth Industrial Revolution – could fundamentally reshape manufacturing in developing Asian countries. These technological advances are unprecedented in terms of their speed of diffusion and scope of impact. The effect on rural economies, where manufacturing is still highly concentrated, could be considerable.

In the labour-intensive garment, textile and footwear sector, for instance, technology is now available to fully automate the process of garment cutting and sewing, with minimal human involvement. Different factors will determine when it becomes economically justifiable to see widespread adoption of such technologies. It will be driven by the declining cost of technology along with rising wages and technical skills of the workforce, shifting consumer demands and regulations, among other determinants.

Most of the assembly line jobs in such sectors as low-end food and beverage production and garment manufacturing involve routine, repetitive tasks that increasingly can be substituted by robotics. In Cambodia, Indonesia, Thailand and Viet Nam, for example, estimates indicate that innovations in engineering will place a majority of employees in garment and textile production at high risk of displacement from automation in the next couple decades (Figure 13.11). Likewise, factory employees in food and beverage processing also face considerable risk of technological automation. For the rural economy, the impact could be detrimental without the right economic and labour market policies. In Cambodia, garment production accounts for nearly two in three of all rural manufacturing jobs. In Viet Nam, the comparable ratio for the garment and textile industry is nearly two in five. In Indonesia and Thailand, food and beverage production contributes around 27–30 per cent of all rural manufacturing employment.

On the other hand, rural economies in developing Asia could seize sizeable gains from technological innovations if they are well prepared. Adopting new technology can help to eliminate dangerous and precarious factory jobs, improve product quality and upgrade skills. To this end, there is clearly a need for rural development policies to reprioritize economic upgrading and diversification in this technology-driven context through sectors critical for future growth and jobs (Chang and Huynh, 2016).

Figure 13.9: Subsector share of rural manufacturing employment and share of employees in manufacturing subsector at high risk of technological automation, ages 15+, various years (percentage)



Note: "F&B" denotes manufacturing of food and beverages; "GTF" denotes manufacturing of garments, textiles and footwear.

Source: Share of rural manufacturing employment: author's estimates based on Labour Force Surveys; automation risk estimates: Chang and Huynh, 2016.

Several skills development priorities would help rural Asia and the Pacific lead in navigating the technological transformations while mitigating the risks. Promoting rural education and training in STEM subjects, particularly among young women, will be key to developing a future workforce with technology-centred skills. Moreover, future career success will require the ability to continually learn, adapt and acquire new skills, calling for innovative curricula that develop the passion to learn in different and new ways. In addition, rural schools will need to foster originality and creativity and increasingly prioritize skills development related to problem-solving and teamwork. The Escuela Nueva Programme, for instance, has transformed education for half a million primary school children in rural Viet Nam. The curriculum focuses on student-centred and collaborative learning in the classroom with close parental involvement in the education experience. The results show improved cognitive and socio-emotional skills development and creativity and stronger individual ownership of learning (Parandekar et al., 2017). Finally, rural economies would benefit from strengthened partnerships between enterprises, technology firms and training providers to accelerate the integration and use of advanced technologies into curricula.

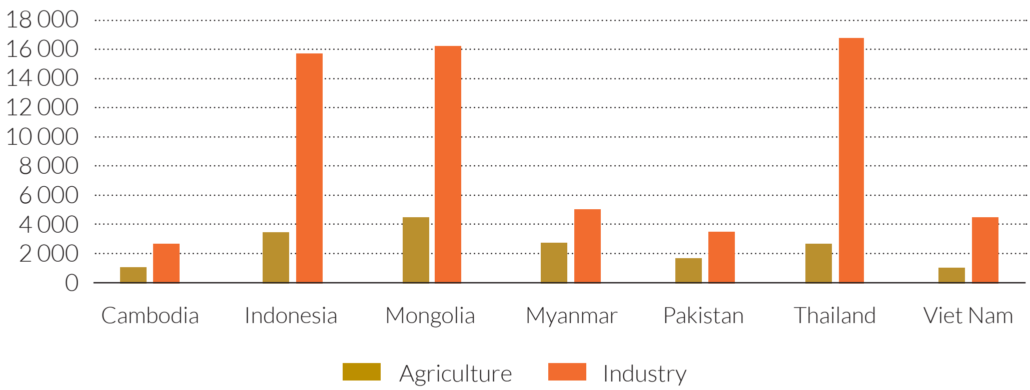
13.6 Boosting skills and productivity in agricultural jobs

Emerging innovations in farming and shifting consumer demand can improve the quality of agricultural jobs

The findings presented thus far have centred on the higher-quality of jobs in cities and in rural economic sectors outside of agriculture. Nonetheless, agriculture accounts for nearly 98 million of the 173 million rural jobs (or 56.3 per cent) in the eight countries (table A13.2). These agrarian workers, many of whom are self-employed as smallholder farmers, typically lack the resources and conditions to shift to off-farm employment or to migrate for urban jobs. Efforts to transform agriculture and upgrade the value of agricultural production would be instrumental towards improving the quality of employment and livelihoods of rural workers and thereby generate positive outcomes from an inclusion perspective.

As discussed previously, developing Asian and Pacific countries have undergone rapid structural change and urbanization in recent decades. Agriculture in the region has experienced numerous dynamics. In a comparative regional study, Briones and Felipe (2013) outlined some salient features and trends. First, the output share of agriculture declined faster than that of employment as the sectoral share of the economy trailed the contribution to jobs. Moreover, labour productivity in agriculture grew faster than in other developing regions around the world. This could be linked to another key finding that technological change in agriculture since the 1960s has led to sizeable gains in yields of traditional crops, while the composition of agricultural output of developing Asia has shifted from traditional to high-value products.

Figure 13.10: Value added per worker, by sector, 2016 (constant 2010 US$)



Note: Samoa is not included due to a lack of comparable data.

Source: Author's estimates based on ILO: ILOSTAT Database, 2017, http://www.ilo.org/ilostat (accessed 15 June 2018); World Bank: World Development Indicators, 2017, https://data.worldbank.org/ (accessed 15 June 2018).

Despite these positive gains, labour productivity in agriculture, defined here as agricultural value added per agricultural worker, remains comparatively low in developing Asian and Pacific countries. Of the countries covered in this chapter's analysis, for example, agricultural labour productivity was only around $1,100 in Cambodia and Viet Nam and approximately $1,700 in Pakistan (Figure 13.12). Moreover, productivity in agriculture continued to lag considerably behind industrial production. In Thailand, the inter-sector gaps were particularly stark, with industrial productivity more than six times the level in agriculture. In Indonesia and Viet Nam, the comparable ratios were 4.5 and 4.3 times as high, respectively.

Efforts to increase agricultural productivity can be supported by emerging technological breakthroughs in the use of data and information. Advances in ICT, including mobile technologies, big data analytics and sophisticated computer algorithms, are helping farmers, scientists and agricultural development practitioners to more accurately understand the environment and generate better predictions of future conditions, thus enabling more informed decision-making (Woodard et al., 2017). Remote sensors and other technologies are being employed in agriculture to distantly monitor soil composition, crop storage containers and irrigation systems to maximize farming efficiency and minimize waste. With the cost of technology falling considerably, precision farming technologies, such as global positioning systems, remote sensors and satellite imagery, are increasingly utilized in middle- and low-income countries. The Government of Thailand, for instance, has invested in piloting big data analytics in farming (Chin, 2016).

To make automation in farming more widespread, however, addressing cost constraints and improving access to finance are still needed. Credit for agriculture remains low overall, accounting for around 10 per cent of total credit in Cambodia, Pakistan and Viet Nam, 6 per cent in Indonesia and less than 1 per cent in Thailand (Figure 13.13). Recognizing this barrier, a private sector firm in Viet Nam has helped expand technology-enabled precision agriculture by leasing hardware devices to farmers' cooperatives, which reduced the cost burden on smallholder farmers (World Bank, 2017). In addition to lowering cost and improving access to finance, stronger digital skills and literacy are also required (see Box 13.1). Smallholder farmers and impoverished producers especially would benefit from training to develop capacity in understanding how to use these new technological innovations and interpret and apply the data provided. If these constraints are neglected, the potential for smart farming will remain untapped.

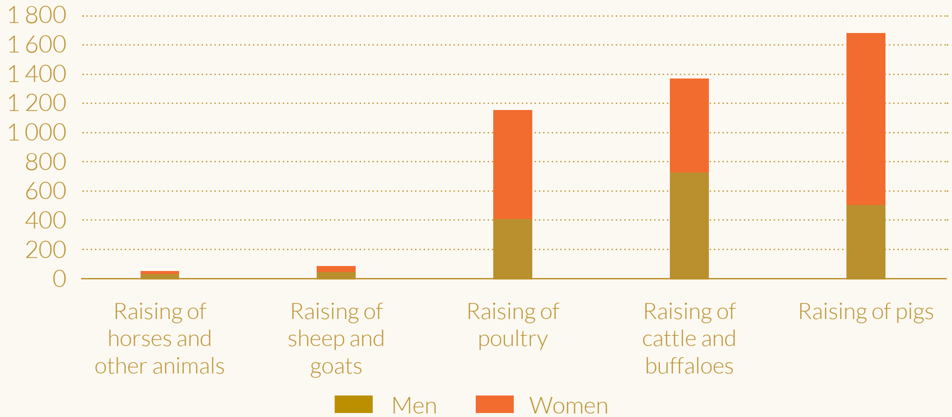
Box 13.1

Technology and digital skills for pig production in Viet Nam

Technological innovations present an extraordinary opportunity to transform agricultural production in developing Asia. However, enormous challenges remain in terms of access to technology and developing the requisite digital skills. A recent survey of the pig farming industry in Viet Nam helps to highlight the magnitude of these hurdles.

In Viet Nam, pig farming is critical to the livestock production sector, accounting for 72.3 per cent of total livestock production value. Pig farming employs nearly 1.7 million workers, more than any other livestock subsector, and 69.7 per cent of these workers are women (figure B13.1.1). In recent years, the pig farming subsector has undergone a period of restructuring, as seen in the declining role of household farms and the simultaneous growth of large-scale producers. In addition, there has been a geographical shift of production to the more remote and mountainous areas of Viet Nam.

Figure B1: Employment in livestock production, by sex and subsector, ages 15 and older ('000)

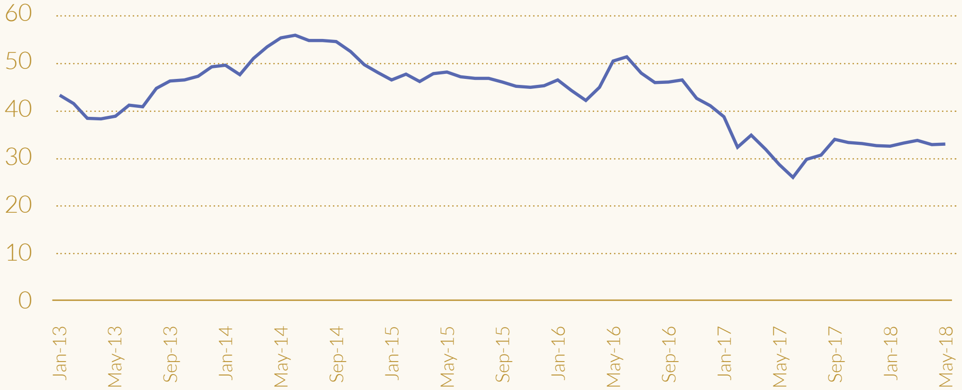


Source: Author's estimates based on microdata analysis of the Viet Nam Labour Force Survey 2016.

Box 13.1 (cont.)

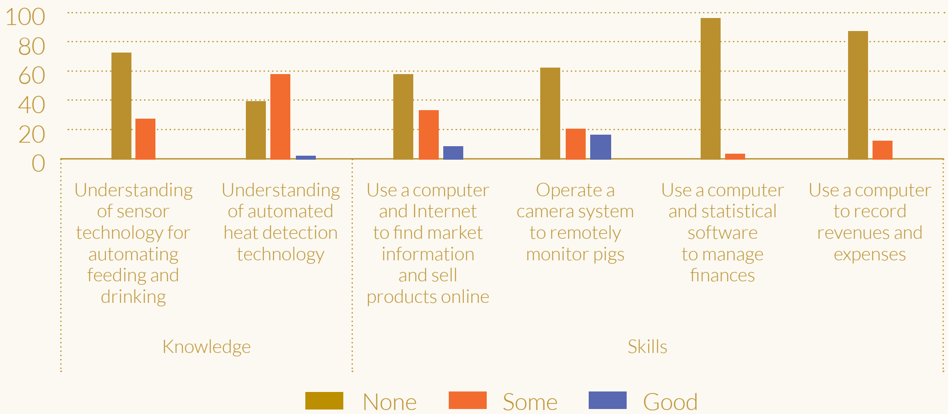
Competition has spiked in the past few years, driven by an influx of meat importers and the growth of domestic suppliers. Consequently, market price trends have been unfavourable for pig farmers. From January 2013 to January 2018, pig prices fluctuated widely but fell overall by more than one third, putting strong downward pressure on the profitability of pig farming enterprises (figure B13.1.2). Thus, the need for enhanced productivity, through skills upgrading and process improvements, is critical for sustained competitiveness.

Figure B2: Market prices for pigs, Jan. 2013 to Apr. 2018 (thousand dong per kg)



Source: IPSARD and ILO, forthcoming.

Figure B3: Knowledge and skills in various digital technologies (% distribution)



Source: IPSARD and ILO, forthcoming.

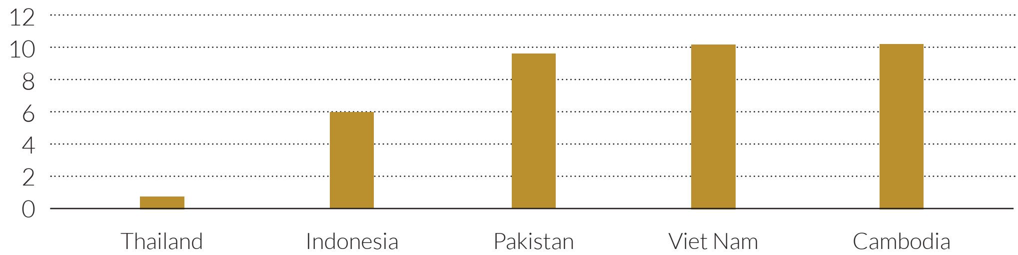
Box 13.1 (cont.)

Developing the sector through the application of good practices and adoption of digital technologies will require significant investments to overcome the skills gaps. Covering a sample of 160 large-scale and household pig producers in the four provinces of Ha Noi, Ha Nam, Phu Tho and Vinh Phuc, a survey was conducted in the first half of 2018 to better assess the knowledge and skills of pig farmers and identify shortcomings in the current vocational training system. The survey results indicate limited knowledge of sensor technologies for automated feeding and heat detection systems. In terms of digital skills, around three in five respondents had no skills whatsoever to use a computer and the Internet to gather market information and sell products online. Around nine in ten respondents did not possess any skills to use a computer or statistical software for managing finances or recordkeeping. However, the demand for related training was evident. Around two-fifths of respondents indicated a desire to have training within the next one to two years, if not immediately, to enhance their skills in the use of computers and the Internet to research market data, sell products online, and manage accounting and finances.

Reforming technical and vocational training for pig farming is key to filling these knowledge and skills gaps. The survey results highlight the need to make training curricula more practical and relevant by including content related to high-tech farming, food safety and hygiene, animal nutrition, product quality assurance and financial administration. Renovating technical training facilities by adopting new machinery and modern technologies is also critical, in addition to strengthening partnerships and engagement with the private sector. Such efforts would also help to attract and recruit younger students, particularly those with the aptitude for innovative approaches to transforming the sector.

Source: IPSARD and ILO, forthcoming.

Figure 13.11: Credit to agricultural, forestry and fishing as a share of total credit, 2016 or most recent year (%)



Source: FAO: FAOSTAT Database, 2017, http://www.fao.org/faostat (accessed 15 June 2018).

Boosting the value of agricultural production and job quality can be driven by new opportunities related to shifting consumer preferences. For example, growth in organic farming is a clear response to expanding consumer demand for agricultural products that avoid the use of synthetic fertilizers and pesticides and genetically modified organisms and that promote environmental sustainability and prioritize health and safety. In the Asia-

Pacific region, rising demand for higher-value organic products has been spurred by both export markets, particularly in China, and domestic consumers. Thailand, for instance, has recorded double-digit growth in organic production and sales in recent years, triggered by strong demand for organic rice and coconut (Willer and Lernoud, 2017).

Nonetheless, organic farming remains relatively marginal overall, highlighting the potential for significant expansion. With the exception of Samoa, where the share is around 10 per cent, organic farming accounts for less than 1 per cent of all agricultural land in the other economies (Willer and Lernoud, 2017). In this context, agricultural advisory services can support farmers to develop the capacity to better understand market standards and organic certification requirements. In Samoa, agricultural extension for smallholder farmers is critical for harnessing organic farming as a development policy with links to the tourism and hospitality sector. Other important areas of training include developing digital skills related to understanding how to collect and analyse data through the use of mobile applications and emerging distributive ledger technologies that help consumers identify the source and methods of production and verify certification labels. Fostering the skills needed to meet the growing demand for organic farming would better prepare farmers for the future of agricultural markets.

Conclusion and policy considerations

Rural areas remain, and will continue in the future to be, a significant driver of development and creator of jobs. Rural economies and labour markets tend to be more diversified than typically characterized, with diverse sectors ranging from farming and construction to manufacturing and retail trade. Yet the quality of employment for rural workers tends to lag considerably behind that for the urban workforce in terms of wages, productivity, skills and working conditions.

Through a quantitative analysis of rural employment dynamics in Cambodia, Indonesia, Mongolia, Myanmar, Pakistan, Samoa, Thailand and Viet Nam, this chapter stresses that investments in human capital development and active labour market policies would improve access to better-quality jobs and higher wages in rural areas. The analysis revealed that increased schooling is strongly associated with greater chances of being employed in a good-quality rural job. Moreover, rural workers who are overqualified for their occupation tend to receive a wage penalty and are considerably more likely to be employed in a poor-quality job, highlighting the potential for promoting enhanced employment facilitation services in rural areas to improve inclusion. There are indeed challenges related to the looming technological transformation and the implications for the future of rural labour markets, particularly in relation to rethinking education and training systems.

The analysis and findings suggest a number of policy areas that would help foster inclusive rural development through better jobs. First, demand-side measures are critical, such as stimulating job creation in non-farm sectors through improved access to markets, better rural infrastructure and investment in better ICT and connectivity. For example, Thailand, despite periods of shifting policy direction, has achieved relative success in closing rural gaps in both physical and social infrastructure and aggressively pursuing rural economic diversification (OECD, 2016). In the context of potential technological disruptions in rural manufacturing, the eight countries must re-think the traditional development model that has driven rural economies and job creation in the past.

Second, prioritizing agriculture remains critical for supporting rural communities. Better access to finance and agricultural extension for smallholder farmers would help boost rural productivity. The use of new technologies, from mobile phone applications for rapid information exchange to advanced sensors for precision farming, and shifting consumer demand for organic produce could also increase farm production considerably. This would, however, necessitate greater public and private investment and partnerships to widen access to emerging technologies and to develop the skills needed to effectively harness these technologies. Initiatives in Samoa highlight the need for strong institutional and policy frameworks to link organic agricultural production to demand in high-value, non-farm sectors (Willer and Lernoud, 2017).

Third, rethinking rural education and training is key for ensuring the development of skills that can drive the future of rural economies in an inclusive direction. Investments to upgrade technical and vocational training should prioritize fostering skills related to high-tech and organic farming, food safety and hygiene, animal nutrition, product quality assurance and financial administration. The evidence also clearly shows that more education can lead to better employment outcomes for rural workers. Critical to this end is to focus on education quality. Efforts to enhance qualifications and earnings of rural teachers, rectify resource shortages and infrastructure gaps in rural schools, strengthen performance incentive schemes and improve parental engagement in the community could have far-reaching and positive impacts. Promoting science, technology, engineering and mathematics in education and training systems is important for preparing rural youth for imminent technological advances in the workplace. Innovative approaches that foster the passion for continuous learning and prioritize originality, creativity, problem-solving and teamwork can also help to develop critical skills needed to drive competitive rural economies in the future

Finally, employment services in rural areas remain neglected and inadequately resourced. The analysis indicates that skills mismatches across rural areas in the eight countries are widespread, and many rural workers could potentially earn more and have enhanced access to jobs with better working conditions if labour markets were more efficient in aligning skills demand with supply. Investment in job placement services in rural areas would help reduce skills gaps, support overqualified workers to find better jobs that may be more suitable for their qualifications and improve the productivity and competitiveness of rural enterprises.

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Annex

Table A13.1: Reference period of Labour Force Survey used for analysis and national definitions of urban-rural areas

Country	Reference period	National definition of urban-rural areas
Cambodia	2012 (annual)	Since 2005, urban areas include every commune that meets at least one of the following criteria: (a) population density exceeding 200 per km, (b) percentage of male employment in agriculture below 50 per cent, or (c) total population of the commune exceeding 2,000. Rural areas are all other areas not urban.
Indonesia	2015 (August)	Urban areas include village equivalent administrative areas that satisfy certain criteria in terms of population density, percentage of agricultural households, and a number of urban facilities such as roads, formal education facilities and public health services. Rural areas are all other areas not urban.
Mongolia	2015 (annual)	Not available.
Myanmar	2015 (annual)	Not available.
Pakistan	2015 (annual)	Urban domains include Karachi, Lahore, Gujranwala, Faisalabad, Rawalpindi, Multan, Sialkot, Sargodha, Bahawalpur, Hyderabad, Sukkur, Peshawar, Quetta and Islamabad as large cities. Each of these cities constitutes a separate stratum, further sub-stratified according to low-, middle- and high-income groups based on the information collected in respect of each enumeration block at the time of demarcation or updating of urban area sampling frame. In all the four provinces after excluding the population of large cities from the population of an administrative division, the remaining urban population is grouped together to form a stratum. For the rural domain, each administrative district in the Punjab, Sindh and North-West Frontier Province is considered an independent stratum whereas in Baluchistan, each administrative division constitutes a stratum.
Samoa	2012 (annual)	Urban areas include the entire region of Apia urban area and rural areas include the three regions of North-West Upolu Rest of Upolu and Savaii.
Thailand	2015 (third quarter)	Urban areas include all municipal areas. 981 sanitary districts were reclassified as tambon municipalities in 1999. Rural areas include all non-municipal areas.
Viet Nam	2016 (annual)	Urban areas include urban districts and wards within cities or towns. Rural areas are all the other base administrative units (communes).

Source: ILO compilation from national statistical offices.

Table A13.2: Employment, by sex and locality, ages 15+ (000), rural share of total employment (per cent) and agricultural share of rural employment (percentage)

	Urban	Rural			Total		
		Total	Agriculture	Non-agriculture		Rural share of total employment	Agricultural share of rural employment
Cambodia	1 783.6	5 413.8	2 326.0	3 087.7	7 197.4	75.2	43.0
Male	933.3	2 864.4	1 244.1	1 620.3	3 797.7	75.4	43.4
Female	850.3	2 549.4	1 082.0	1 467.4	3 399.7	75.0	42.4
Indonesia	59 306.6	55 512.6	31 448.4	24 064.2	114 819.2	48.3	56.7
Male	37 414.6	34 736.0	19 737.9	14 998.1	72 150.6	48.1	56.8
Female	21 892.0	20 776.6	11 710.5	9 066.1	42 668.6	48.7	56.4
Mongolia	677.8	473.4	306.0	167.4	1 151.2	41.1	64.6
Male	357.5	247.2	166.2	81.0	604.7	40.9	67.2
Female	320.3	226.2	139.8	86.4	546.5	41.4	61.8
Myanmar	6 171.1	15 620.2	10 560.8	5 059.4	21 791.3	71.7	67.6
Male	3 529.0	8 862.4	6 109.3	2 753.1	12 391.4	71.5	68.9
Female	2 642.2	6 757.8	4 451.5	2 306.3	9 399.9	71.9	65.9
Pakistan	17 531.1	38 416.3	22 053.9	16 362.4	55 947.4	68.7	57.4
Male	15 633.3	27 656.7	13 173.6	14 483.2	43 290.0	63.9	47.6
Female	1 897.8	10 759.6	8 880.4	1 879.2	12 657.4	85.0	82.5
Samoa	9.3	17.2	1.6	15.6	26.4	65.0	9.1
Male	5.7	10.9	1.2	9.7	16.6	65.7	11.1
Female	3.6	6.3	0.3	5.9	9.8	63.7	5.6
Thailand	17 291.3	21 039.1	10 545.9	10 493.2	38 330.4	54.9	50.1
Male	9 207.9	11 568.4	5 981.3	5 587.2	20 776.3	55.7	51.7
Female	8 083.4	9 470.7	4 564.6	4 906.1	17 554.1	54.0	48.2
Viet Nam	16 923.6	36 379.1	20 255.7	16 123.5	53 302.8	68.3	55.7
Male	8 744.4	18 698.4	9 932.3	8 766.1	27 442.8	68.1	53.1
Female	8 179.2	17 680.7	10 323.4	7 357.4	25 859.9	68.4	58.4
Total	119 694.4	172 871.8	97 498.3	75 373.4	292 566.2	59.1	56.4
Male	75 825.5	104 644.6	56 345.9	48 298.6	180 470.1	58.0	53.8
Female	43 868.9	68 227.2	41 152.4	27 074.8	112 096.1	60.9	60.3

Note: Ages 15 and older.

Source: Author's estimates based on Labour Force Survey.

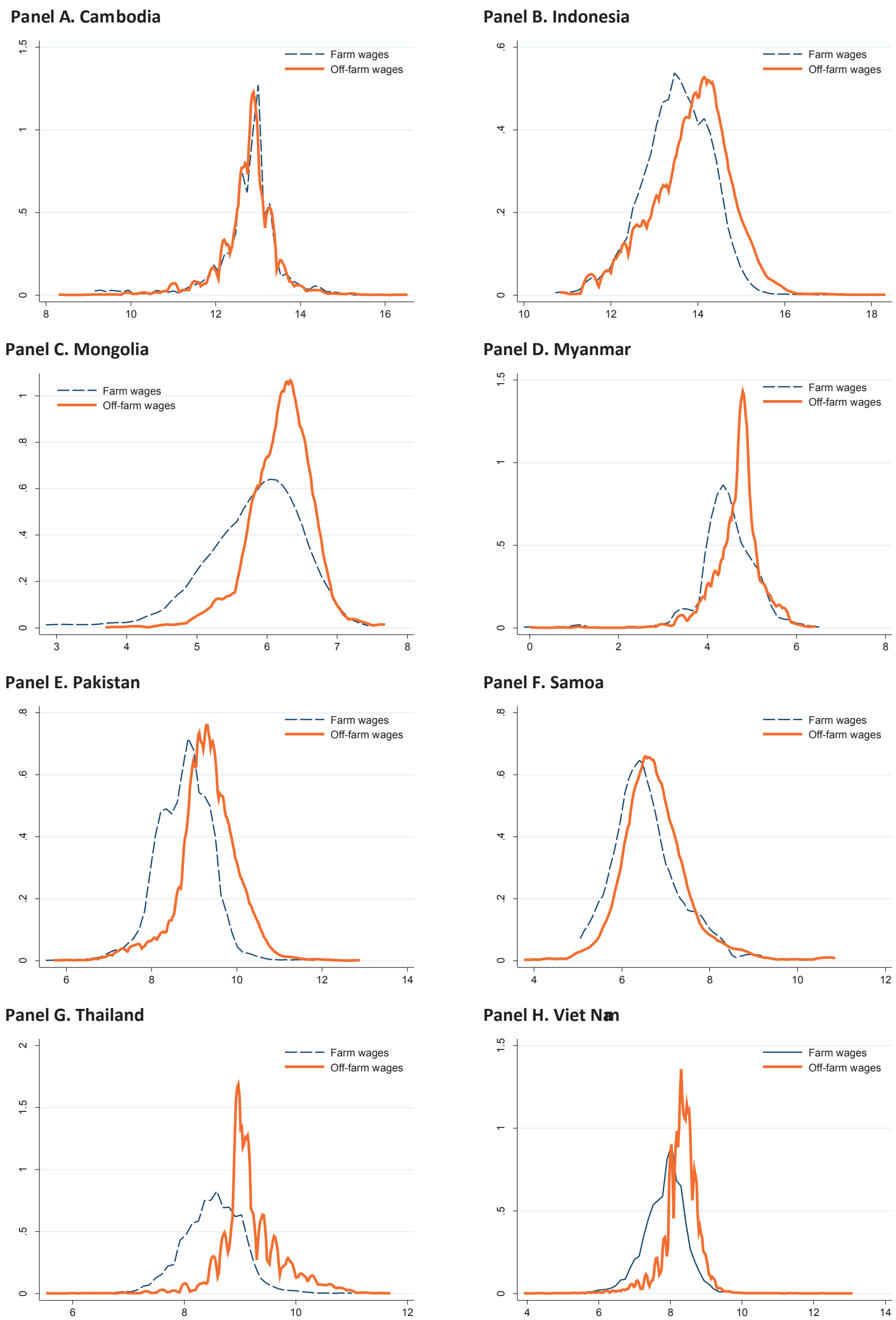
Table A13.3: Employment by locality and status of employment, ages 15+ (percentage distribution)

		Employees	Employers	Own-account workers & contributing family workers	Members of producers' cooperatives	Contributing family workers
Cambodia	Urban	46.4	0.4	53.2	0.0	19.8
	Rural farm	28.9	0.2	70.9	0.0	31.7
	Rural non-farm	58.7	0.6	40.7	0.0	11.3
Indonesia	Urban	62.6	4.1	33.3	0.0	7.1
	Rural farm	20.5	3.0	76.6	0.0	31.2
	Rural non-farm	55.7	3.0	41.3	0.0	8.4
Mongolia	Urban	66.8	1.8	31.4	0.0	2.2
	Rural farm	2.0	0.2	97.7	0.0	0.7
	Rural non-farm	64.3	1.6	33.8	0.2	2.9
Myanmar	Urban	47.2	4.2	48.7	0.0	13.6
	Rural farm	27.3	4.5	68.1	0.0	34.3
	Rural non-farm	51.3	1.9	46.8	0.0	10.7
Pakistan	Urban	56.3	3.2	40.5	0.0	7.9
	Rural farm	11.8	0.1	88.2	0.0	44.9
	Rural non-farm	58.5	1.4	40.1	0.0	6.3
Samoa	Urban	84.6	8.5	6.9	0.0	1.8
	Rural farm	58.9	9.9	31.2	0.0	7.9
	Rural non-farm	85.7	4.8	9.2	0.0	1.5
Thailand	Urban	56.9	3.8	39.2	0.1	12.8
	Rural farm	11.5	1.4	87.1	0.0	36.8
	Rural non-farm	64.5	2.8	32.4	0.3	9.3
Viet Nam	Urban	58.1	4.9	36.9	0.0	9.1
	Rural farm	8.6	0.8	90.5	0.1	29.3
	Rural non-farm	64.4	3.2	32.4	0.0	6.7

Note: Ages 15 and older.

Source: Author's estimates based on Labour Force Surveys.

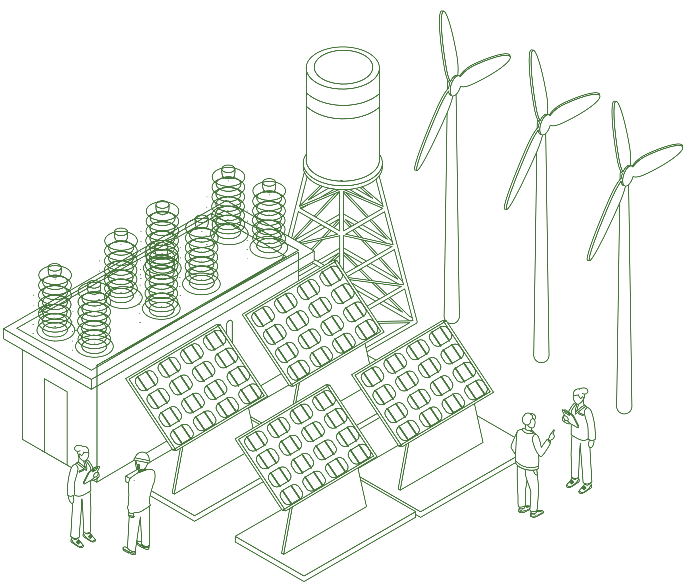
Figure A13.4: Farm and off-farm wage distributions in rural areas, ages 15+



Note: Distribution of natural log of monthly earnings for wage employees aged 15 and older, full weighted samples.
Source: Author's estimates based on Labour Force Surveys.

Section V:

Enabling a just transition towards environmentally sustainable economies and green growth



14

Towards inclusive growth through green jobs, skills and entrepreneurship: A Pacific perspective

Jean-Hugues Hatier

Abstract: Climate change and biodiversity loss pose serious challenges to all countries across the globe. For small island states in the Pacific, the increasing intensity of climate change events and biodiversity loss may also imply that their traditional capacity to adapt will soon reach its limit. Transiting toward greener, more inclusive and resilient economies may become a matter of survival for Pacific populations.

This chapter analyses current labour market, skills challenges and explores the potentially transformational role of inclusive skills development programmes with green jobs, entrepreneurship and skills/competencies component as part of a wider strategy towards a more resilient and greener economy in the Pacific Islands. It discusses how green jobs and green skills in diverse sectors such as communication, energy, agriculture, tourism, waste management and education can contribute to the Pacific's future of work by accelerating the transition to more sustainable societies.

Introduction

For centuries, Pacific islanders have relied on their rich natural resources and traditional knowledge for their survival. They have developed strong cultural and spiritual attachments to their land and the surrounding ocean. Pacific island countries are, however, highly exposed to the impact of climate change. Five of them rank among the top-20 most vulnerable countries in the world, according to the World Risk Index, with Vanuatu and Tonga ranked first and second, respectively (Hilft, 2017).[160] For low-lying island countries, such as Tuvalu, which has an average elevation of only 1.83 metres, the strong affiliation with nature has allowed its population to survive and adapt to the consequences of climate change and natural disasters.

As climate change intensifies, a strong affiliation to nature no longer seems enough in the face of devastating natural disasters. Moving towards a green economy has become a matter

160 Unless otherwise stated, calculations for the Pacific island countries' regional figures in this chapter refer to information on the 11 ILO Pacific island countries: Cook Islands, Fiji, Kiribati, the Marshall Islands, Palau, Papua New Guinea, Samoa, Solomon Islands, Tonga, Tuvalu and Vanuatu.

of survival in this context. A green economy is defined here as a low-carbon, resource-efficient and socially inclusive economy. It is directly connected to improved human well-being and strengthened social equity as well as the reduction of environmental risks and scarcities (ILO, 2017a).

Efforts to adapt to climate change[161] and measures to mitigate greenhouse gas emissions offer, at the same time, opportunities to create new jobs while securing existing ones (Fankhauser, Sehlleier and Stern, 2008). If adequately managed, climate change action can lead to more and better employment. However, some of the key labour market characteristics of the region, such as high rates of emigration, limited employment opportunities and limited levels of education and training of the workforce, present considerable challenges to this prospect.

This chapter discusses the imperatives for the Pacific islands to increase their resilience[162] to climate change. It explores the transformative role of greener economies in embarking on a growth path that is green and inclusive with a focus on skills development. After briefly presenting the concepts of green jobs and the transition to a greener economy, the chapter analyses current labour market and skills challenges and explores new employment opportunities in the green transition. It highlights the importance of improved strategy coherence in employment, education and training, the environment, the energy sector and climate finance for accelerating climate action and speeding up a just transition to more sustainable societies. Skills development and entrepreneurship are critical parts of the wider strategy towards greener economies for the Pacific.

14.1 Climate change disasters and inequality in the Pacific island countries

In February 2016, Tropical Cyclone Winston – the strongest cyclone ever recorded in the region (Category 5 on both the Australian tropical cyclone scale and the Saffir-Simpson hurricane wind scale) cut a path of destruction across Fiji, causing the loss of 44 lives and affecting 62 per cent of the population (Government of Fiji, 2017). From a gender perspective and in economic terms, men overall sustained the largest damage and production losses (57 per cent of the damage occurred in the agriculture sector). However, women's losses had far-reaching implications at the household level due to their subsistence activities and consequently contributing directly to nutritional insecurity. It was therefore reported that women from the poorly remunerated informal sector were the most disadvantaged and negatively affected by Tropical Cyclone Winston and were left with no income security after the disaster (Government of Fiji, 2016). Natural disasters generally, such as cyclones, have been shown to affect women's traditional spaces disproportionally due to their role as the

161 Climate change refers to a change in the statistical distribution of weather patterns for an extended period of time (decades to millions of years).

162 Climate resilience is defined here as the capacity of a socio-ecological system to absorb stresses, maintain function, adapt and evolve into more desirable configurations that improve the sustainability of the system to climate change impacts.

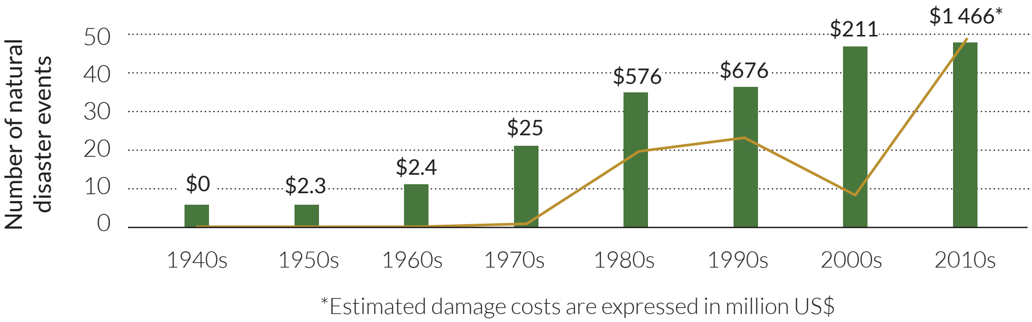
primary caregiver to children, older persons and family members with a disability.

With current projections suggesting that climate change will increase the likelihood of events like Winston reoccurring, it is not a question of if but when the next cyclone, flood or extreme weather event will strike one of the Pacific islands. There is little doubt that the consequences of sea-level rise, sea-temperature increase, ocean acidification, altered rainfall patterns and resulting biodiversity loss will continue to affect Pacific islanders on all aspects of their lives.

The Pacific countries rank among the most remote economies in the world (Gibson, 2007). With less than 1 per cent of the world population living in this region (UN, 2015), surrounded by an ocean covering an area larger than all of Earth's landmass combined and in the throes of reform towards market-based economic systems, the Pacific countries have become increasingly reliant on commodity imports (SPC, 2014a). This leaves them increasingly susceptible to global economic crises. As climate change weather patterns intensify, the Pacific countries may have reached the limit of their capacity to adapt to climate change through traditional practices.

Beyond the large challenges for Pacific islanders, the Asian Development Bank (ADB) the seriousness of the drain on public budgets of post-disaster reconstruction has highlighted, warning that it will be detrimental to future positive economic outcomes (ADB, 2016a). As figure 1 illustrates, the damage costs induced by natural disaster events over the past decades on average increased nearly a hundredfold between 1940–70s and 1980–2010s.

Figure 14.1: Natural disaster occurrence and associated costs in Pacific island countries



Source: Guha-Sapir: Emergency Events Database, www.emdat.be (accessed 10 Mar. 2018).

It is also estimated that if the world were to stay on the current fossil-fuel intensive growth model (the business-as-usual scenario), total climate change costs across the Pacific region would reach 12.7 per cent of annual gross domestic product (GDP) equivalent by 2100 (ADB, 2013). The current growth patterns, like the ones adopted by the Pacific island countries, are not only unsustainable (use of fossil fuel and overexploitation of natural resources) and inefficient (increased susceptibility to global price fluctuation and income volatility). They also promote inequalities, notably by failing to address the social challenges caused by the transition from communally based activities to more urbanized individual employment (World Bank, 2012).

The employment and social impacts of climate change tend to be underestimated, as well as the needs for appropriate skills and technology development to explore greener economies (ILO, 2015a). The difficulty to reach out to the extensive number of people who needed immediate support for retaining jobs and income-generating opportunities was highlighted during the recovery support after cyclones hit Vanuatu in 2015 and Fiji in 2016 (ibid.). The government budget intended for development had to be redirected exclusively for recovery. The impoverished segments of society who live at the subsistence level were then the most affected by the long, dragging recovery period. To re-highlight, women and people with disabilities are disproportionally affected by disasters and much more likely to fall into poverty.

The Pacific countries have taken a strong lead on the international stage in driving the global response to the climate crisis. For example, Palau became the first nation ever in 2017 to change its immigration laws for the cause of environmental protection and requesting its visitors to sign a passport pledge to act in an ecologically responsible way on the island. In November of the same year, Fiji presided over the 23rd Conference of the Parties to the United Nations Framework Convention on Climate Change.

The challenge now is to consolidate this leadership with the adoption of economic models that aim at promoting efficient growth in the use of natural resources, minimizing pollution and environmental impacts, improving populations' resilience by accounting for natural hazards and addressing issues around population mobility. Importantly, such transition must be inclusive and rich in green and decent jobs.

14.2 A just transition[163] to a green economy – a solution?

In November 2015, the ILO adopted the *Guidelines for a Just Transition Towards Environmentally Sustainable Economies and Societies for All*. These guidelines provide a framework and practical tool to ensure that employment creation goals, social justice and fair transitions for workers, enterprises and communities are equally addressed as part of national and global efforts to tackle climate change and other environmental challenges (ILO, 2015b).

These guidelines also provide a valuable tool for countries to transition to low-carbon economies; it can assist them in achieving their Intended Nationally Determined Contributions and the 2030 Agenda for Sustainable Development goals.

The potential of inclusive green growth for the Pacific island countries

Inclusive green growth is necessary for the Pacific countries and may even become a

163 A "just transition" is defined here as a process to environmental sustainability that is inclusive.

matter of survival because sustainable development cannot be achieved without it. Green growth strategies are growth strategies with the additional goal of fostering the sustainable management of natural capital, notably in such sectors as tourism, energy, agriculture and manufacturing. They do not provide substitute for good growth policies, but they do address the weaknesses of the Pacific countries' current growth model:

- Most of the Pacific island countries operate a substantial merchandise trade deficit, partially because of their reliance on imported diesel and the associated high transportation costs. Fossil fuel consumption currently comprises 80 per cent of total energy consumption, 75 per cent of which is used for transportation and power generation (IREA, 2012).
- Due to the reliance on imported fossil fuel, power generation costs in the Pacific islands are among the highest in the world and are likely to increase in the future because oil resources that are easy and cheap to extract have already been extracted and the world is now turning towards fossil fuels that are more expensive (and more damaging to the environment) to extract.
- In addition to its high economic cost, the importation of fossil fuel involves a potentially serious environmental disaster risk to the crystal-clear seas and pristine environment of the Pacific countries, which attract more than 1.5 million visitors each year (Pacific Islands Centre, 2013).
- Green policies have been shown to increase the amount of natural, physical and human capital available through better environmental and natural risk management, which results in lower capital losses due to natural disasters (Hallegatte, 2011).
- Green policies also have the potential to reduce inequality by opening new opportunities for job creation and therefore poverty alleviation (Rozenberg et al., 2010) and are often more affordable because many of them pay for themselves directly (such as renewable energy).

Green jobs and skills

Green growth thus presents a significant potential to be a new engine for job creation, driving the countries to turn the challenges into opportunities to embark on a new path of economic growth. Green jobs contribute to preserving or restoring the ecosystems and biodiversity; reduce consumption of energy, raw materials and water; reduce greenhouse gas emissions; and minimize or altogether avoid the generation of all forms of waste and pollution (ILO, 2011). Green jobs include provisions for decent work and proper living conditions to all persons involved in production as well as respecting workers' rights (ILO and EU, 2011).

While green economic growth models could increase the employability of Pacific migrants in areas with high potential growth for both home and destination countries, green policies cannot alone address the structural constraints to growth and employment creation. They will not be effective at creating green jobs where labour regulations discourage small business development and where the labour force skills or education achievements are inadequate nor conducive for developing a competitive sector.

Before further exploring the potential role of green skills and technologies in the future of work, it is necessary to understand the Pacific landscape and context in which they are to be implemented. The following two sections overview the labour market context, followed by current skill challenges and opportunities.

14.3 Setting the scene: Labour market characteristics and trends in the Pacific

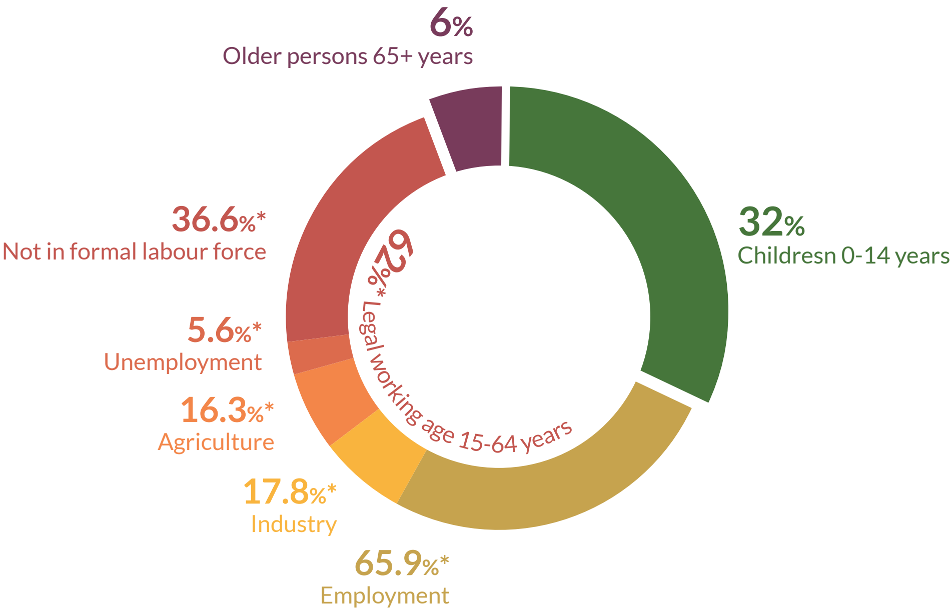
Pacific island demographics

The vast majority of the 10.4 million Pacific islanders live in Papua New Guinea (7,920,000), Fiji (892,000) and Solomon Islands (587,000) (UN, 2015).

Even though most people live outside the few urban centres, the percentage of the population living in urban areas either increased or stagnated between 2000 and 2015, with the exception of Samoa, where a negative urbanization rate was observed (ILO, 2017b). The lack of opportunities and climate change-induced migration reportedly are the main factors pushing rural residents towards cities (Jones, 2016).

Populations in the Pacific islands are young and growing (ILO, 2017a). A major challenge for greening the labour markets and job creation is to make sure that workers, especially youth, have the right skills. As figure 2 illustrates, about 62 per cent of the region's population is of legal working age. Available data suggest a general pattern of decreasing labour force participation, with a current labour participation rate of 65.4 per cent and an unemployment rate of 5.6 per cent. Women's participation in the labour market is significantly lower than men's, with the gender gap eclipsing 34 per cent in Fiji and Samoa. This gender gap tends to be even greater in the Micronesian countries. Women are more likely to take up vulnerable employment, leading to inadequate earnings (ILO, 2017a). Moreover, none of the countries have legislation that prohibits gender discrimination in employee recruitment. The majority of employment is in services, except for Papua New Guinea, Solomon Islands and Vanuatu, where the agriculture sector is the main employer (ILO, 2017a).

Figure 14.2: Pacific island demographics



Source: Modified from ILO, 2017a.

Several countries have started to specialize in niche markets. The most successful example is the well-established and growing Fijian garment industry, which was encouraged by the preferential access that the Forum Islands Countries have to Australia and New Zealand through a non-reciprocal trade agreement, the South Pacific Regional Trade and Economic Co-operation Agreement. As part of this agreement and a contributing factor to the success of the Fiji garment sector, scientific and technological cooperation as well as training directed towards the acquisition, adaption and development of skills essential to industrial development were provided.

Despite such successful initiatives, in most cases, the industrial sector is still in its infancy and is dominated by a few products. Even though industry in the Pacific contributes almost one quarter of the value added in the region, it represents less than 6 per cent of all employment (ILO, 2017b). Unfortunately, the Pacific economies do not produce enough jobs to accommodate the young workforce (aged 15–24 years) and thus reduce the youth unemployment rates. Female unemployment rates especially are much higher than the overall active population, averaging 12 per cent.

High migration rates among the Pacific island countries

As a result, the net migration rates among Pacific island countries are the largest in the entire Asia-Pacific region (ADB, 2016a); more than 460,000 Pacific islanders currently live overseas. This number nearly doubled over the past 25 years (ILO, 2017b). Remittances sent by overseas migrants to their families have become a major source of income for most of the Pacific nations. In 2014, such remittances accounted for 10 per cent, on average, of the region's GDP (Duncan, 2014).

New Zealand has been the primary destination for migrants leaving Polynesian countries, while migrants from the Melanesian countries, such as Papua New Guinea, Fiji and the Solomon Islands, tend to favour Australia. The Vanuatu migration pattern is an exception, with migrants tending to choose New Caledonia as their main destination, most likely due to proximity and historical ties between the two nations.

In the Micronesian countries, the main destination for migrants is the United States. The Marshall Islands, the Federated States of Micronesia and Palau are part of the Compact of Free Association, which allows their citizens to live and work in the United States (ILO, 2017b). But the Free Association agreement is set to end in 2023, which raises concerns among beneficiary countries because the income generated as part of this agreement has become integral to each economy and labour market.

According to household surveys carried out in Kiribati, Nauru and Tuvalu, employment is the primary motivation for internal and international migration (at 37 per cent), followed by education (at 26 per cent) and climate change (at 18 per cent) (ESCAP, 2015).

Even though climate-induced displacement is already common in the Pacific countries, including Papua New Guinea, its demand is expected to increase, especially for the low-lying atoll nations, as rising sea levels, increased land erosion and climate-induced disasters intensify (ILO, 2017b). A survey carried out by the Institute for Environment and Human Security of the United Nations University demonstrated that about 70 per cent of households in Kiribati and Tuvalu and more than 30 per cent of households in Nauru believe that migration will be necessary as the impact of climate change amplifies. However, because most citizens are involved in subsistence agriculture, only 25 per cent of households currently have the financial means to migrate (Oakes, Milan and Campbell, 2016).

Emigration rates for skilled Pacific islanders are among the highest in the world. In terms of schooling, 80 per cent of migrants from Palau, for example, have at least one year of tertiary education (Docquier, Lowell and Marfouk, 2009). A large proportion of migrants from Melanesian countries also have tertiary education: 39 per cent of migrants from Papua New Guinea and 37 per cent of migrants from Solomon Islands, for example. Qualified or even well-educated Pacific migrants, however, experience higher unemployment rates than the region's average citizen or non-migrants. This is most likely due to the perception that Pacific islanders have lower qualifications (OECD, 2010) because they tend to lack recognition in migrants' destination countries.

The share of low-skilled migrants is largest among Polynesians; half of them do not have an upper-secondary education qualification. Except for migrants from Palau, the Micronesian migrants generally fall between Polynesia and Melanesia in terms of educational attainment.

Compared with native-born workers and migrants from other parts of the world, Pacific islanders tend to have higher unemployment rates (ILO, 2017b). Polynesian migrants have particularly poor employment outcomes, exceeding the 12 per cent unemployment rates in the three main destination countries (New Zealand, Australia and the United States), while Melanesian migrants have the lowest unemployment rates, averaging 7.2 per cent.

Females and youth from the Pacific especially struggle with unemployment when overseas. When compared with their male counterparts, female migrants show relatively high inactivity or unemployment rates, with more than 30 per cent of women migrants of working age being inactive while only 25 per cent of migrant males falls into that category. The unemployment rate of young Pacific migrants is 22.4 per cent on average. These statistics highlight the importance of improving and streamlining education and accreditation throughout the region.

14.4 Current skills challenges and opportunities in the Pacific

According to Briones and Felipe (2013), the two most limiting factors in structural transformation in developing countries, such as the Pacific islands, are the current level and quality of primary schooling and training to upgrade workers' skills to enable them to adapt quickly to newly introduced technologies. A Secretariat of the Pacific Community survey recently conducted on the literacy and numeracy situation at the primary school level throughout the Pacific (SPC, 2014b) found an alarming situation, particularly in literacy, with only three in every ten pupils able to acquire the literacy skills expected after four years as well as after six years of formal schooling (30 per cent after four years and 29 per cent after six years) (SPC, 2014b). Recent research shows that the quality of training and education, especially primary education, is central to the ability of the workforce to learn unfamiliar functions, which is a necessary skill to enable economic diversification and develop new comparative advantages (ADB, 2016a).

The Pacific islands experienced a digital transformation with the deregulation and reform of their telecommunications sectors in 2003. The fast-growing rates of mobile phone uptake have the potential to change the way Pacific islanders communicate, learn and coordinate activities and services (ITU, 2012). In addition to improved mobile networks, the region benefits from the increased connectivity in recent years due to the investment in underwater cables and telecommunication sector reforms, which have allowed greater competition and improved service reliability and costs.

This has had major implications for the region's development, and not the least from an inclusion point of view. What makes information and communication technologies (ICT) particularly relevant to the region are the new opportunities they bring to the education sector. ICT enables access to enhanced learning experiences, including open-access materials for teachers and students' development and up-to-date learning content, and makes them available to a wider audience, notably by bridging the connectivity gap between rural and urban areas. Such flexibility is expected to provide learning materials that are more responsive to the labour markets' needs. ICT also opens new opportunities to connect people within and across countries, including with those from bigger economies, which could make a significant difference for the remote Pacific economies. Development in ICT also opens new opportunities for the services sector, such as the establishment of call centres or by increasing exposure of businesses operating in niche markets.

The case of the High-Tech Youth Network

Initiatives from organizations like the High-Tech Youth Network embody many of the new opportunities. Launched by a non-profit organization that is registered in both New Zealand and the United States (Hawaii), the Network has a successful track record at creating opportunities for marginalized youth in the Pacific by providing them a range of ICT, creative media and design thinking. The Network operates studios in New Zealand (eight), Hawaii (three), Fiji (one) and Samoa (one). Each studio is a place for young people aged 8–25 years to build twenty-first-century competencies of collaborative problem solving, design thinking, teamwork and cultural and communication skills.

In these studios, youths work on design-based learning projects that aim to solve real-world problems, including environmental ones, and find solutions from within the context of their communities and across the Network. As members, young people can access mentoring, training and support, both online and through licensed programmes. Projects can range from creating a media campaign about an environmental issue to coding a game about dealing with cyber bullying to a simple community event celebrating local heroes.

Research shows that such initiatives improve students' attendance and academic results at school and provide better opportunities for youth in higher learning and careers.[164] It also has the potential to enhance capacity building of community members around the digital economy and to expose emerging talents to potential employers.

The case of the seasonal worker programmes

The seasonal worker programmes also present an opportunity to enhance early education and training schemes. Seasonal worker schemes are temporary or circular migration programmes that cater to less-skilled workers, through which migrants, the sending country and the receiving country seem to all benefit (World Bank, 2006). Although, women are currently under-represented in the seasonal work schemes, evaluations of the recognized seasonal employer programmes in New Zealand have shown positive results overall. Vanuatu, which was selected to participate as part of the initial pilot scheme, appears to

164 See www.hightechyouth.org (accessed 15 Dec. 2017).

have benefited the most, accounting for almost half of the participating seasonal workers. This is mainly due to employers preferring to hire returned workers because of their higher productivity. Employers also are more inclined to recruit through their current seasonal workers' connections (ILO, 2017b).

However, despite governments such as Vanuatu undertaking an active supportive role and working closely with employers in New Zealand, there are currently little opportunities for training and no incentive for families to invest in their children's education as part of this scheme (Duncan, 2014).

Even though the success of the seasonal worker programme is indubitable, it could be argued that more could be done in the areas of skill development and financial management support to assist participant workers in achieving their full potential. Support could include trainings and qualifications for workers as well as assistance to business development, for example.

14.5 The role of skills development for green, inclusive growth and the future of work in the Pacific

The adaptive capacities of many Pacific communities to the impacts of the changing climate has been shown to be limited in terms of financial, human and physical capital (SPC, 2014a). Despite the potential advantages of adopting a green economic model, the transition should be carefully sequenced and based on the future needs of the Pacific island countries and global economic trends to reduce the cost of that transition and to facilitate the political and economic reforms. This section discusses how green jobs and green skills can contribute to the region's future of work and help enable a just transition to a green economy. It is divided into five subsections, which are considered, along with the previously discussed communication sector, among the most essential sectors in which green jobs and green skills can turn climate change challenges into opportunities: energy, agriculture, ecotourism, waste management and the education sectors. Examples of initiatives relevant to the Pacific islands' challenges related to climate change, skills, future jobs and inclusion punctuate the discussion.

Energy sector

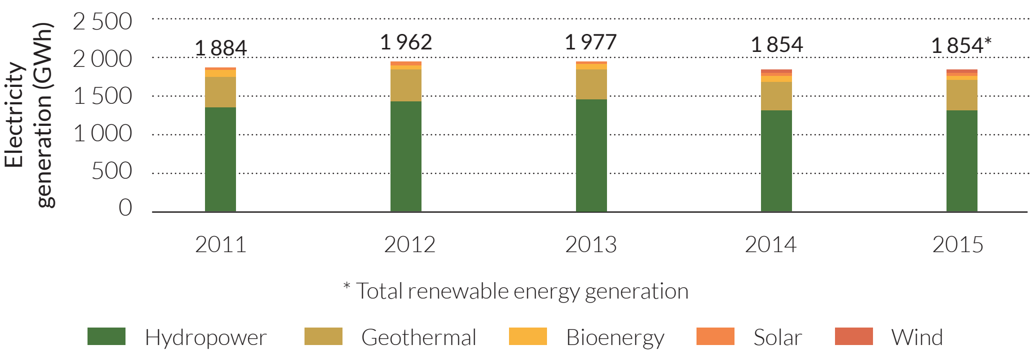
Enhancing renewable energy production capacity is probably one of the most critical development strategies for the Pacific countries – considering the region's dependency on imported energy and goods as well as the growing interest worldwide for industrial automation and transportation electrification, not only for cars but also for commercial fleets and seaports. The adoption of such technologies is expected to increase the demand for electricity production in the near future.

Renewable energy production not only has the potential to reduce greenhouse gas emissions, enhance energy security and improve the balance of payments through reduced fossil fuel imports, it is also a potentially substantial generator of green jobs. For instance, approximately 14 million jobs are expected to be created in Asia and the Pacific if the right policies to promote a greener economy were put in place (ILO, 2018).

Even though it is difficult to estimate the portion of jobs that could be generated for the installation and maintenance of such renewable energy options because reliable data on labour force participation in the small Pacific island countries are often inconsistent and scarce, the region is conducive to the use of solar energy. With solar panel prices dramatically dropping over the past few years, the numbers of solar power initiatives have been increasing (ADB, 2016b). Fiji, Kiribati, Nauru, Tonga, Tuvalu and Vanuatu recently became signatory countries to the International Solar Alliance Framework Agreement. This is an alliance that aims at scaling up solar applications for agricultural use, increasing opportunities for affordable finance and scaling up solar mini grids in "sunshine countries", which are located between the Tropic of Cancer and the Tropic of Capricorn.

Despite most of the Pacific countries having ambitious national energy strategies on renewable energy use, the share of renewable energy generation has slightly declined since 2011 (figure 3). The majority of the production has been generated through hydropower; solar-generated electricity only accounted for 1.5 per cent of the Pacific region's overall renewable energy production in 2015. Even with this relative good performance, the data illustrate the potential for improvement, especially in the area of solar energy production.

Figure 14.3: Renewable energy generation in the Pacific island countries



Source: ILO compilation using the 2017 IREA Dashboards, http://resourceirena.irena.org/gateway/dashboard/ (accessed 15 Dec. 2017).

Private firms are of major importance in providing solutions to green growth and could be involved in the installation of solar panels for individual households, especially if solar feed-in tariff regulation were introduced by the Pacific island governments to boost demand for solar panels and thereby reduce their cost. Currently, the set-up of renewable energy technology requires much higher upfront investment than fossil fuel technology does. It also requires skills that are not necessarily found or taught in the Pacific at the moment. Most Pacific islands that have introduced renewable energy technologies have done so as part of international development projects that did not have skill transfer components necessary to the emergence of a private sector. Even though small businesses create and maintain jobs that are locally sourced and tend to produce more jobs than bigger businesses, they provide up to 50 per cent less professional development opportunities for their employees (OECD, 2013). Therefore, the portion of employment that could be generated in the Pacific countries for the installation and maintenance of renewable energy technology will notably depend on skill availability and market attractiveness.

One of the most recent examples of such a successful scheme occurred in November 2016 in Ta'u Island (in American Samoa). The completed construction of a micro-grid comprising more than 5,000 solar panels cut the island's dependence on more than 100,000 gallons (about 38,000 litres) of diesel, which cost approximately US$400,000 per year for decades. A group of 15 local men were employed by overseas contractors in the construction process, five of whom – previously low-skilled – transitioned to full-time jobs as solar power technicians managing the grid (AingeRoy, 2016).

The role of multilateral partners in providing financial and technical assistance remains crucial to achieving 100 per cent renewable energy by the 2030 targets set by the Pacific countries (ADB, 2016b). Governments also need to influence the behaviour of firms. This can be done by providing appropriate incentives and regulations, such as the possible introduction of a solar feed-in tariff that would permit greater inclusion of communities by offering the possibility to generate profit at the household or village level and thereby contribute to the stability of the solar grid, which needs to be geographically spread out to minimize the drops in productivity due to cloud shading. Such feed-in tariff schemes have been instrumental in European countries to boost renewable energy production and drive solar panel prices down (World Bank, 2012).

Agriculture, forestry and aquaculture sector

Agriculture is just one industry outside of renewable energy production that has the potential to improve the balance of payments and enhance mitigation efforts on climate change. The region is also becoming increasingly dependent on food imports which tend to increase both carbon footprint and vulnerability to natural disasters and economic crisis. Enhancing agriculture production, notably through increased access to market, but also by adopting smart agricultural practices that optimise resilience to natural disasters and reduce greenhouse gas emission are key to insure food security, increasing resilience and improving public health.

Traditionally, food security in the Pacific countries was achieved through subsistence farming and fishing practices, relying mostly on traditional food crops. This led to a large informal sector. And most of today's agriculture activities are still carried out within the informal sector (Bammann, 2007). In Papua New Guinea, for example, an estimated 95 per cent of workers involved in coffee production are smallholder semi-commercial farmers operating in the informal economy (Hoffmann, 2014).

Even though informal economies tend to leave workers unprotected (because the regulations that protect workers in the formal sector do not apply to those involved in the informal sector), it could be argued that the level of vulnerability may differ between informal workers in urban areas and informal workers in villages, who are more likely to receive community support.

However, as the Pacific countries continue to move towards market-based economic systems and are committed to providing education, power and water to their populations, a return to a subsistence economy is not possible. As a result of the transition and the inherent rural exodus, as dwellers migrate to cities to seek employment, the vulnerability of former rural dwellers will increase as they struggle to find decent work, shelter and social services. They will therefore more likely remain in the informal economy. The precarious situation of workers in the informal economy is exacerbated by missed opportunities prevalent in the Pacific for skills development and financing and saving schemes, such as the Provident Fund schemes, which in some countries can be used as collateral in financial support applications.

Enhancing grass-roots communities' economic opportunities and women entrepreneurship through capacity building, with an emphasis on growth sectors, green technologies and safe and sustainable farming practices, is expected to reduce rural dwellers' vulnerability. It will also contribute towards upgrading clusters or sectors that support the transition of women-led enterprises from informal to formal status across the Pacific islands (CTA, 2016).

The traditional farming practices are very much in line with organic agriculture practices, and the demand for organic agriculture commodities is growing rapidly worldwide. However, to be exportable to overseas markets as organic, products must be certified. The development of the organic sector requires specific policy and institutional standards to meet international market requirements (FAO, 2008). Accreditation processes, such as Organic, Fair Trade, Hazard Analysis and Critical Control Points or ISO certifications, also require manufacturers to ensure that procedures and good practices are in compliance with their certifications throughout the whole production chain. The adoption of such skills and competencies throughout the production chain provides a good opportunity for more inclusive growth in agriculture, for improved access to international markets and to support the transition from the non-formal sector to the formal sector.

The impact on the number of jobs created or suppressed in agriculture will depend on each country's approach to sustainability. Even though the land-rich Melanesian countries are expected to benefit from improvements in agricultural productivity (Duncan, 2014), a community-based vulnerability analysis carried out by the Secretariat of the Pacific Community in six countries (Fiji, Kiribati, Samoa, Solomon Islands, Tonga and Vanuatu) showed that farming of some traditional crops and animals is changing. An increase in pests and disease, combined with reduced soil fertility, are among the factors having a negative impact on agricultural production (FAO, 2008). Other factors include poor farming practices, poor water quality (SPC, 2014c) and changes in rainfall patterns (about

70 per cent of the Pacific's agricultural area is heavily dependent on seasonal rainfall) (FAO, 2008).

Therefore, it is important that the business activities, especially agriculture, forestry and aquaculture activities, are carried out as part of a broader soil conservation approach that aims at increasing infiltration, rehabilitating degraded land and improving soil texture.

Forests provide a range of economic, social, cultural and ecological services to the Pacific island countries in the protection of watersheds, soil erosion prevention, clean water provision, climate regulation and food security. Mangrove forests, in particular, grow along tropical coastlines and in saltwater environments and are highly adapted to coastal conditions. They are often the first line of defence for coasts and coastal communities because they have the potential to moderate climatic extremes, notably by reducing wave forces by 70–90 per cent due to their extensive and dense above-ground root systems (Bhatt and Kathiresan, 2012).

The mangrove carbon sequestration potential is estimated to be up to 50 times greater than other terrestrial tropical forests. Mangroves are a critical component of marine ecosystems because they serve as nursery grounds for many aquatic species (UNESCO, 2017). Mangrove forests are nearing extinction in 26 countries in the world, including in the pacific region (Bhatt and Kathiresan, 2012). Their annual reduction rate worldwide was estimated at 0.66 per cent between 2000 and 2005 (FAO, 2007). Several restoration projects have been launched in the region, such as the Mangrove Ecosystems for Climate Change Adaptation and Livelihoods Project in Fiji, Samoa, Solomon Islands, Vanuatu and Tonga between 2009 and 2013.

The transformation of the agriculture sector presents a strong potential for green job creation and strengthening food security. This transformation can be facilitated through the adoption of more sustainable, climate-smart technologies and skills, such as silvopastoral systems (forestry and grazing combined), conservation agriculture (an approach characterized by minimum mechanical soil disturbance, permanent organic soil cover and diversification of crop species grown in sequences and/or associations), use of Zaï holes in dry lands (a farming technique that collects water and concentrates compost) and use of anti-erosive structures, which are all known to enhance soil restoration, increase organic carbon fixation and protect carbon-rich soil and biodiversity.

Non-government organizations (NGOs) and community organizations are crucial for providing training, monitoring and mentoring to communities in sustainable agriculture and resilient livelihoods. A successful example of such NGO involvement in providing communities with sustainable, affordable and resilient farming practices is the Matuaileoo Environment Trust Inc. (METI), an environmental NGO based in Samoa that aims at building the capacity of grass-roots communities to empower them to live in harmony with their environment. METI has implemented an integrated approach involving 50 villages that targets the 80 per cent of young people who drop out of school before completing Year

13. This approach, called *Taiala* ("guide" in Samoan language), builds on a pilot study that has run since 2010. A life skills training component is followed by the farming concept of permaculture, which focuses on building the soil to promote carbon fixation. On completion of the course, the participants become a Taiala life skills coach. The qualification is certified by the Samoa Qualifications Authority (CTA-NUS, 2015).

Promoting green and inclusive growth is in many ways extending countries' capacity to adapt to climate change through traditional practices because most of the work that has been carried out the traditional way in the Pacific region could be defined as green.

However, despite the potentially beneficial contribution of further introducing green skills and competencies and technologies as part of economic development initiatives (in terms of improving the economic balance, employability, livelihoods and building more resilient communities by reducing dependence on food imports and promoting a greater and more sustainable production potential), green policies alone will unlikely address the existing structural constraints to growth and employment creation.

The economies of the Pacific island nations still rely heavily on development assistance and remittances from overseas. The need to strengthen cooperation between governments, development agencies and communities (including the private sector and NGOs) will become increasingly important, in light of the Paris Agreement[165], to improve access to markets, especially for agriculture products, and to further strengthen action undertaken to enhance communities' resilience to climate change impacts.

Ecotourism sector

Agribusiness and ecotourism also present good avenues for decent job creation in the agriculture sector. By taking advantage of global consumer trends favouring fair-trade, sustainably and ecologically produced commodities, they could help revive cultural pride and engage populations in the protection and maintenance of their surrounding ecosystems.

The tourism sector is a large employer in many of the Pacific islands, especially for women and young people, and has a strong multiplier effect on employment because it is tied to other parts of the local economy. In Fiji, the region's number one tourism destination, the travel and tourism industry supported about 42,500 jobs directly in 2015 and almost twice as many indirect jobs (ILO, 2017b).

Although the tourism industry is a seasonal industry and is vulnerable to climate change impacts (ADB, 2013), it has strong potential to spur the growth of green jobs, notably in climate-resilient infrastructure and ecosystem preservation. Enhancing sustainable practices in tourism could provide great opportunities for innovation, employment and greening of the Pacific economies. The tourism industry already provides market access for

165 The Paris Agreement refers to the common agreement signed in Paris in 2015, by the parties to the United Nations Framework Convention on Climate Change, to combat climate change and intensify actions and investments towards a sustainable low-carbon future.

added-value products derived from locally produced or culturally inspired products, such as coconut oil-based cosmetics or in the fashion industry, for example, as observed in Fiji, Cook Islands and Samoa (Duncan, 2014).

In September 2017, the South Pacific Tourism Organisation and the United Nations Development Programme signed a partnership agreement to strengthen Pacific island stakeholder engagement in green tourism and to enhance the safeguarding of pristine and fragile ecosystems of the Pacific for future generations. The partnership aims to build members' capacity, notably by promoting green skills and competencies, and encourage the private sector to ensure that waste and wastewater are responsibly discharged, that biodegradable chemicals are used and that diving and other recreational activities are monitored, while marine ecosystems around their boundaries are protected.

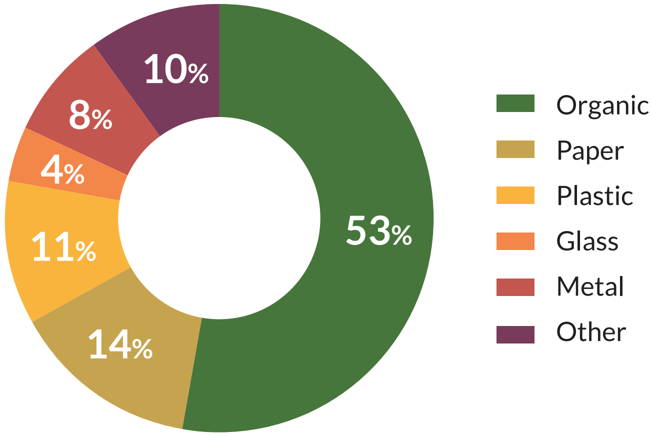
Green skills and competencies, green growth policies and financial incentives are all critical for the future of work in the Pacific island countries and for enhancing the tourism sectors' multiplier effect on employment. They are also critical for optimizing economic performances and minimizing the recovery time after a disaster.

Waste management sector

Waste disposal is not just an environmental issue. By clogging drains, it leads to health hazards and flooding, with possible serious economic and human health consequences, such as the spread of diseases like dengue (World Bank, 2012). Effective waste management has been a challenge, despite sound policies and the use of the 5Rs principal (refuse, return, reduce, reuse and recycle), which in theory allows small island developing States to be more proactive in controlling waste imports and their management.

However, the potential for recycling is high, with an estimated 90 per cent of household solid waste generated on average being recyclable (see figure 4, although data only available for Fiji, Marshall Islands, Samoa, Solomon, Tonga and Vanuatu).

Figure 14.4: Average household solid waste generation in the Pacific island countries



Source: World Bank, 2012.

Despite several recycling pilot initiatives being tested in the region, only commercial metal recycling operations and exports have proven to be commercially sustainable over the long term (ADB, 2014).

Exporting costs and market price fluctuations of raw recycling materials have been identified by the Pacific island private sector as the two main factors influencing profitability and therefore sustainability of recycling activities. Recycling material prices are set overseas on a weight basis; thus, having high-density material, such as metal, reduces volume requirement and therefore the exportation cost. This makes the recycling of low-value and low-density materials prohibitive, such as plastic, motor oil and e-wastes that can have potentially high environmental impact.

Capacity building through skills development and adequate financing assistance to acquire machinery could stimulate the development of a green circular economy model for waste management. The potential to use “waste” as resource productivity (waste to energy, waste as a raw material for construction, etc.) may be greater, more environment-friendly and sustainable than the potential for recyclable material exports.

Glass bottles that can no longer be reused, for example, could be crushed and utilized in paving projects, concrete blocks or road aggregate. This is already happening in several Pacific countries. The compressive strength of concrete made with glass-sand substitute has proven to be comparable to premix concrete (SPC, 2003).

Other examples include the use of vehicle tires for the construction of retaining walls to prevent erosion and landslides. The labour force can be upskilled to build such walls. The integration of drainage and structural features could be included in the walls to ensure their integrity, even after years of extreme rains.

The role of the education sector in the transition to a green economy

The Pacific Island Forum Ministers of Education have consistently called for increased strengthening of the ability of workers to adapt to changing market demands as a response to a growing skills gap, to replace low-skilled jobs threatened by evolving technology and automation and to address the rapid growth of unemployment that disproportionately affects youth (UNESCO, 2015).

An overarching framework for technical and vocational education and training (TVET) was endorsed by those ministers for the years 2012–15 to provide opportunities for young women and men to gain productive skills and to benefit from innovation and investments in new technologies, clean energy, environment, health and infrastructure. This would enable Pacific countries to be more competitive in the global economy.

The European Union, through its Pacific TVET for Sustainable Energy and Climate Change Adaptation Project, also contributed to this initiative by developing regional accreditations in the area of climate change adaptation and by supporting the development of sustainable energy (solar). Such TVET programmes are in the process of being adapted by national accreditation agencies. However, the strengthening of TVET capacity has proven to be a challenge. The levels of students' literacy, numeracy and life skills remain a concern for employers and post-school providers of further education and training (UNESCO, 2015).

The issue is exacerbated by the lack of trained instructors (instructors must have a TVET qualification one level higher than the level they teach for the programme to comply with accreditation requirements). Outdated courses, poorly equipped workshops and limited budgets to afford the additional cost of consumables and utilities are also challenges that hinder progress.

In the coming years, economic stimulus will most likely come from public spending, donor-funded investments and reconstruction needs due to natural disasters (ILO, 2017b). The dissemination of green technologies could possibly be accelerated through trade and industrial policies. Such policies could factor into the tender process criteria on the minimum number of local jobs for youth, in combination with the delivery of vocational quantifications recognized internationally by the industry to increase youths' chances of finding employment beyond the lifetime of the development project.

Conclusion

It is estimated that 14 million jobs could be created in Asia and the Pacific through the transition to green economies (ILO, 2018). As discussed in this chapter, such a transition may not only be a matter of survival, it also has great potential to increase the Pacific island countries' resilience to natural disasters by providing employment and innovation in many sectors, including energy, agriculture, tourism, waste management, natural resource management and climatic disaster prevention.

The adaptive capacities of many Pacific communities in terms of financial, human and physical capital are limited. Positive economic outcomes will most likely depend on the speed of recovery from natural disasters and on the establishment and implementation of inclusive and sustainable growth policies. This increases the urgency to equip the private sector and communities with the necessary skills to turn the challenges of climate change and inequality into opportunities for a sustainable, inclusive future.

This chapter argues that transitioning to a low-carbon economy has the potential to make Pacific island communities healthier and safer by reducing environmental risks as well as by increasing their resilience to climate change, notably by opening new opportunities for the future of work. While acknowledging the contextual specificities of the Pacific region, the actions planned and undertaken to enable a just transition to a green economy will be useful for countries preparing their societies for the future of work.

Improving strategy coherence and skill development in the Pacific is a necessary step to ensure an efficient transition to a green economy by matching supply and demand for skills and assisting workers to adjust to a rapidly changing workplace. A coherent strategy should focus on: education, including primary education; enhanced employability, notably through TVET programmes and online courses; the environment, through the establishment of a circular economic model; energy, by establishing policies that promote the use of renewable energy; and climate finance. A focus on these areas will be key to accelerating climate action and speeding up a just transition to more sustainable Pacific societies. With the Pacific countries at the forefront of the global responses to the climate change crisis, they have the potential, though their actions towards a green, low-carbon economy, to inspire other countries in the Asia-Pacific region to embark on a green, inclusive path.

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15

Transition towards a green economy: Enterprise restructuring, skills and job resettlement in China for continued employability

Lixin Zhang

Abstract: Climate change and biodiversity loss pose serious challenges to all countries across the globe. Whether high- or low-income, countries will need to make sizable efforts to adapt to these threats and mitigate the negative effects. Pathways towards a green economy provide vast opportunities in terms of creation of decent jobs and entrepreneurship and possibly increased productivity. At the same time, however, the process of transition to greener economies can also involve enterprise restructuring, with serious implications for existing jobs. If not addressed and managed adequately, the transition can risk intensifying social inequality. Therefore, targeted action will be needed to ensure that low-skilled workers, women workers and other marginalized persons are not left behind. Providing persons with the right skills can be essential to foster sustainable green growth while tackling social inequality.

The chapter explores the potentially transformational role of skills development programmes in the face of enterprise restructuring as an economy moves towards a green economy. In recent years, the Government of China has taken steps to enable green growth. By drawing on the Chinese experience and lessons learned from a number of other regional initiatives and studies, such as the International Labour Organization's Green Business Options training scheme, the chapter elaborates on: (i) how the process of enterprise restructuring can be better managed so that enterprises can be "greener" while, at the same time, mitigating negative impacts on existing jobs (highlighting the role of trade unions); (ii) what is, or can be, the role of skills development (skills upgrading, acquiring new skills or official certification of existing skills of workers) in enhancing employability of those workers whose jobs are affected by restructuring; and (iii) case examples from China.

Introduction

China is the world's largest manufacturer and exporter of goods today. This status is not without difficulties. The country faces considerable challenges, including environmental degradation.[166] The Government is aware of these problems, and its economic and social reform programmes includes environmental protection, natural resource conservation and fostering inclusiveness. The 13th Five-Year Plan, which forms the core of China's industrial policy up to 2020, highlights "economic restructuring, the environment, promoting energy efficiency and encouraging scientific development" as pathways to a new normal economy (Casey and Koleski, 2011).[167]

Moving towards a green economy provides vast opportunities for the creation of decent jobs and entrepreneurship and possibly increased productivity. At the same time, however, the process of transitioning to a greener economy, at least for China, involves rigorous enterprise restructuring, with serious implications for employment. If these concerns are not addressed, the transition will intensify social inequality. More specifically, targeted actions are required to ensure that low-skilled workers, women workers and other marginalized workers are not left behind.

This chapter explores the dynamics of intertwined policy objectives in pursuit of green development and enterprise restructuring while mitigating the negative employment impacts. It analyses the transformative role of skills development and job transitions (resettlement) for workers in the face of enterprise restructuring as China moves towards a greener future. It focuses on the government-led transformation of enterprises that are affected by policies tackling overcapacity and green development. It features practices within enterprises and enabling factors, notably the legislative framework, that have successfully managed and adjusted to such restructuring. The chapter also highlights the significant role of trade unions in managing this transition process.

15.1 Moving to a greener economy

A green economy is defined as "a system of economic activities related to the production, distribution and consumption of goods and services that result in improved human well-being over the long term while not exposing future generations to significant environmental risks and ecological scarcities" (UNEP, 2010). China is moving towards developing such an economy, but in doing so, it must tackle a legacy of disregard for environmental concerns.

It is well known that in pursuit of rapid economic development and the promotion of heavy industrialization, the environment in China has sustained serious damage. In addition, the country's energy sector is heavily reliant on coal. To sustain massive production volumes, large amounts of valuable resources are used, which has resulted in excess production and

166 See http://theconversation.com/what-we-can-expect-from-chinas-economy-in-2018-89911 (accessed 8 Aug. 2018).
167 See https://www.apcoworldwide.com/docs/default-source/default-document-library/Thought-Leadership/13-five-year-plan-think-piece.pdf?sfvrsn=2&sfvrsn=2 (accessed 8 Aug. 2018).

overcapacity while leading to rising environmental concerns. These policies and approaches have proven to be unsustainable.

It has become important for the Government to provide leadership to facilitate the transition of businesses towards a greener economy. The Government has developed a comprehensive legislative framework and launched a number of policies targeting renewable energy, energy efficiency and industrial production. These actions have encompassed macro-level planning and the mobilization of stakeholders who seek to promote harmony and inclusivity. The Government's understanding of the green economy has undergone a process of formation and development. It has worked to adjust the economic structure while paying close attention to people's livelihoods. The restructuring, reorganization and mergers of enterprises – particularly state-owned – have become a key approach to making the transition. However, the Government has taken this approach while promoting the "ecological civilization", a term used to mean the pathway to transition China's economy to be greener while simultaneously embracing social equity and inclusivity by mitigating job losses. The 13th Five-Year Plan was designed to ensure that China's prosperity is shared among its population, with inclusive development that expands social services (McGregor, 2015).

15.2 A landscape of enterprise restructuring and employment adjustments

China's 13th Five-Year Plan and other policies aim to reduce overcapacity, eliminate outdated and inefficient production facilities and promote green development. Integrated into these policies are measures to resettle displaced workers. Between 1998 and 2003, the Government restructured an array of state-owned enterprises, which led to 28 million redundancies and cost the Government 73.1 billion yuan (CNY) to resettle workers in new jobs (Lim, Miller and Stanway, 2016).

State-owned enterprises producing iron, coal and steel are perceived to be the most affected by the reforms. These industries are mostly located in the north-eastern and south-western parts of China, including Shanxi and Heibei provinces. This has affected workers in upstream and downstream industries of the steel sector, including cement, plate glass, calcium carbide, electrolytic aluminium, copper smelting, lead smelting, paper making, tanning, printing and dyeing and lead-storage batteries. Shipping industries will also phase out facilities considered to be outdated with excess capacity, and a large number of workers in these industries will need to find new jobs. Shanxi and Heibei generally have a single industrial structure for which they depend highly on the iron, coal and steel industries, which have narrow and limited employment channels. New industries are still under cultivation and development. As a result, the job market is not as large and dynamic as in other parts of China.

Some jobs have disappeared or are expected to disappear due to enterprises' upgrading of equipment and adopting newer, more efficient technologies. Production costs are likely to rise as enterprises invest in energy-saving and emission-reducing processes to meet the higher standards of environmental protection. This rise in cost may cause enterprises to reduce staff.

In some cases, skills development, vocational training, entrepreneurship, green technology innovations and the Government's facilitation of green financial flows have helped reduce unemployment risks by stimulating and building skills and jobs in green and clean innovations and green infrastructure programmes (Weijun, 2015).

It has become increasingly evident that skilled workers with an innovative mindset and entrepreneurial skills have facilitated the process and encouraged not only their own but also their peers' skills upgrading, as explained in box 15.1. Such learning processes demonstrate that productivity can be increased and carbon dioxide emissions decreased by using environment-friendly technologies. Weijun (2015) reported survey findings that indicate green-skilled workers have become an important link in pushing forward inclusive growth by promoting the need to upgrade the skills of workers made redundant by the green development process. This is in line with the Government's industrialization plan, which promotes entrepreneurship and innovation while emphasizing social cohesion, as illustrated in boxes 15.1 and 15.2.

Box 15.1

Tangshan Iron and Steel promotes and adopts green innovations

Tangshan Iron and Steel Group Co., Ltd was founded in 1943 to produce and distribute carbon steel products. In alignment with the green reform policies, the company strategized to reduce overcapacity, eliminate backward capacity and explore non-steel businesses. The company modernized its production with macro-scale operations and brought in a number of world-leading metallurgical technologies. The company's widely used "top-absorbing"* technology was invented by its workers, which was made possible by the company's own internal research and development unit. This unit was established by the company in view of the green transformation process, and one of the many green ideas churned out by this unit won second place in the National Prize for Progress in Science and Technology competition. Having gained international recognition, these workers have become a company asset: continuing with eco-friendly innovations and, most significantly, upgrading the skills of their fellow workers through training.

Note: *="Top-absorbing" is an innovative invention of Tangshan Iron & Steel workers by adding a top suction cover on the top of the underground bunker to eliminate metal dust and achieve a clean factory.

Source: London School of Economics and Political Science, 2015, http://www.lse.ac.uk/GranthamInstitute/wp-content/uploads/2015/06/Chinas_new_normal_green_stern_June_2015.pdf (accessed 8 Aug. 2018).

Box 15.2

Shanxi Coking Coal Group workers invent a new form of work and create jobs

Shanxi Coking Coal Group Co. Ltd is an established state-owned coal mining conglomerate with strong international connections. Under the group's wide re-organization exercise and the closing of excess and unproductive plants in 2016, it had to contend with a transfer of workers to new jobs. As part of the resettlement options, the group established a platform that supports internal business start-ups and entrepreneurship that promotes environment-friendly innovations. A noteworthy example is that of Mr Liang, originally a first-line miner of the Xishan Coal Electricity Group, a subsidiary of the Shanxi Coking group. From years of service, Mr Liang and his team of six workers had gained expertise in coal mining and processing. Facing potential redundancy, Mr Liang and his colleagues joined the group's business start-up scheme and developed an electronic mine-screening system, referred to as the Coal Mine Safety Knowledge WeChat Examination System, which is now extensively applied within the group. This is a solid example of supportive policies enabling workers to not only utilize and adapt existing skills but to upgrade their skills to produce eco-friendly mechanisms, hence, contributing to the group's growth and their employability.

Source: Oriental United Resources (Hong Kong) Co. Limited, 2018, http://www.coalsteel.com/en/tanggang.htm (accessed 8 Aug. 2018).

The Department of Human Resources and Social Security in Shanxi Province uses the following measures to tackle labour resettlement (job transfer) issues: cross-industry labour transfers, cross-administrative regional transfers and cross-ownership transfers. Often, the social insurance premium rate is lowered for transferred workers, and training and job search opportunities are enhanced. The resettlement option most commonly implemented is cross-regional employment information exchange and organized labour export. The Government has also sought to cultivate entrepreneurial and innovative careers that are adapted to the competencies of the workers in these industries. This includes expanding the scope of "home business" pilot projects whereby workers would come back to their home city to find jobs or start new enterprises, and increasing investments in special construction funds which were set up to provide money for infrastructure projects.

Finding jobs for disadvantaged workers, such as those with limited education, and older workers remains a challenge. China has about 200 million industrial workers, of which 73 per cent are primary and intermediate level workers and 5 per cent are senior technicians. About 74 per cent of migrant workers have an education attainment of junior high school or less, and 60 per cent do not have any non-agricultural vocational skills training.

Workers in non-public enterprises and micro and small enterprises are often low skilled. Workers in enterprises who were made redundant often have low productivity, particularly older workers who may have been engaged in the same type of work over an extended period and hence have a single skill or limited skills. And due to this prevailing perception, older workers have limited learning ability and are more likely to become the first ones affected by green transformation and the reduction of overcapacity. These workers lack a competitive edge and the potential for re-employment, and therefore they are vulnerable to long-term unemployment.

According to surveys conducted in Heibei and other provinces, affected workers have three characteristics: (i) more than 45 per cent are aged 40 years or older; (ii) they have a low level of educational attainment and only a single skill, and about 70 per cent of them have secondary school education certification or less; (iii) they usually have long years of service. For example, more than 40 per cent of the workers have more than ten years of service. Workers who require government assistance are those who are disadvantaged, with the lowest qualifications and weak competitive edge. Workers with stronger employability have either secured new positions or found employment alternatives without requiring much government assistance.

At first glimpse, green development-induced job losses seem to stem from equipment upgrading and technological innovations. However, production costs will also rise as enterprises invest in energy-saving and emissions-reducing techniques to keep up with higher environmental standards. Higher production costs then often result in lay-offs. In times like this, there is increased difficulty in coordinating and managing labour relations, especially in responding to the demand for reform from the world's largest workforce.[168]

Workers employed in industries that use old production techniques and have excess capacity have lived an integrated life in their work and within an established community. The challenges they face are intricately interconnected, and neither the enterprise nor market regulation can resolve these matters. Workers' welfare needs to be reassured, and their lives and jobs need to be properly looked after. In practice, the wages of some workers have been affected, and some enterprises have not contributed to social insurance schemes. Identifying that such conditions can trigger collective movements, the Government has made effort to maintain harmony and stability of labour relations through resettlement options. However, these seem to be aimed more towards placating the workforce rather than to responding to actual needs.[169]

168 See http://www.law.nyu.edu/news/ideas/Cynthia-Estlund-China-Labor-Law (accessed 1 Aug. 2017).
169 ibid.

Box 15.3

Zheijiang Hangzhou Iron and Steel Group resettles 12,000 workers in one month with a programme of 12 options

The transformation path will take ten years for Zhejiang Hangzhou Iron and Steel Group, and the group will continue to deploy a people-oriented approach in reducing its production capacity. The group developed tailor-made resettlement programmes that provide employees with as many as 12 options. Zhejiang Hangzhou announced the closing of one of its subsidiaries, Banshan Iron and Steel Base, in the spring of 2016. The announcement was two years earlier than planned. The company's management reasoned with the workers of Banshan that the earlier announcement would provide adequate time for the group to facilitate the resettlement process. The 12 resettlement options included finding jobs within the group and in other subsidiaries; finding jobs in other state-owned enterprises; self-employment; and early retirement. The resettlement options came with differing benefits packages. Within one month, the resettlement of 12,000 workers was completed. In this process, Zhejiang Hangzhou strengthened its market position and diversified its development path.

Source: Wang Hiaoyi: "Hangzhou Iron and Steel Group smoothly shut down Banshan Iron and Steel Base two years ahead of schedule", China Enterprise News, 1 Oct. 2017. Available at: http://money.163.com/17/0110/00/CACJSG3K002580S6.html (accessed 8 Aug. 2018).

Box 15.4

Mr. Han in Hebei Province shifts jobs after 40 years in one company

Mr. Han is a native of Xingtai in Hebei Province and was laid off from a glass manufacturing plant where he had worked for 40 years. From a job fair, Mr. Han managed to find a new job in an art glass processing plant. He does not know for how long the new job will be available, but for now he is reassured by the continuing demand for building materials and steel in the region. Because finding a new job in emerging industries is not easy, he decided to look for employment within his industry. This problem is common among local laid-off workers.

Source: *Renmin Ribao*, 7 Apr. 2016, http://paper.people.com.cn/rmrb/html/2016-07/04/nw.D110000renmrb_20160704_1-17.htm (accessed 8 Aug. 2018).

Green development processes require a balance between the immediate treatment of symptoms and maintaining a longer-term perspective. China thus far has pushed hard to increase employment through forward-looking economic transformation and development policies while enhancing the skills of its workforce to support the green economy.

15.3 Legislative framework for balancing green development and employment adjustments

China has been proactive on the legislative front, including innovating systems, to provide guidance to eliminating overcapacity, improving resource-utilization rates, developing new green industries, upgrading skills and realizing the law-based sustainable development of enterprises. The government has launched expanded policy and legislative measures for green transformation and development for enterprises. The State Council's Guidance on Resolving the Problem of Serious Overcapacity, 2013 identified major tasks to resolve the severe overcapacity problems, including: eliminating outdated production capacity, guiding an orderly withdrawal of production capacity, advancing mergers and acquisitions, optimizing industrial spatial distribution, breaking through with core technologies, strengthening innovation in enterprise management and enhancing enterprise innovation to drive development momentum.[170] The guideline emphasizes the need for a variety of options for curbing overcapacity, including: internal transformation and reduction, integration with other industries, phasing out redundant industries and the proper handling of workers' resettlement so as to avoid possible risks and repercussions.

The amended Environmental Protection Law of 2014 is considered a milestone in the Government's environmental policy-making. It provides a solid legal framework for furthering comprehensive environmental protection activities and promoting much-needed incentives that encourage green transitions. It is seen to be instrumental to the restructuring efforts as the Government tightens the once perceived weak local government oversight and the lack of systematic policy for environmental impact assessments, including an undeveloped environmental litigation system (Worldwatch, 2011). The Environmental Protection Law promotes participatory methods and requires enterprises to release emissions information; it also seeks to gradually close enterprises that have the least value-added potential, are highly polluting and have high carbon emission rates. These obsolete factories will then be replaced by ones that have greater value-added potential and contribute more significantly to the well-being of the environment.

The Environmental Protection Law also penalizes illegal sewage discharge on a daily basis, using measures like seizure, production control and shutdowns. Compared with the simple government supervision in the past, the new law adds government support in the form of tax incentives and subsidies.

Such measures as "lifelong accountability" for officials with regards to ecological damage and the measure of "dual responsibility on both the Party and the Government" have been put forth.[171] Green measurement indicators have become performance assessment criteria for officials. This also points to a need for greater adjustment in the industrial structure. Enterprises will now need to pay more attention to their competitive advantage and integrate environmental protection practices. Consequently, workers will also need to further develop their skills.

China has enacted multiple laws and regulations on environmental protection that cover many aspects, such as the ecological environment, resource conservation and

170 State Council is constitutionally synonymous with the Central People's Government and is the chief administrative authority of China.

171 Measures put forth by the Ecological Preservation Accountability Measures for Party and Government Leading Cadres (Beijing, Communist Party of China, 2015).

comprehensive utilization protection, promotion of the circular economy and cleaner production. Since the 18th Communist Party of China National Congress, more than ten laws and regulations on ecological protection have been formulated and revised, including the Law on the Prevention and Control of Atmospheric Pollution of 2014, the Law on the Promotion of Development of Small and Medium Enterprises of 2017, the Law on the Prevention and Control of Water Pollution of 2017 and the Environmental Protection Tax Law of 2017.

Additionally, market mechanisms, such as emissions trading and environmental taxes, have been introduced, and administrative measures have been diversified. These laws have promoted the green transformation of enterprises by encouraging them to develop and utilize clean, low-carbon energy sources and by penalizing offenders.

With guidance from the central level, local governments have formulated mergers and re-organization policies. For example, the Jiangsu provincial administration successfully promulgated Opinions on Promoting Enterprise Merger and Re-organization and Opinions on Accelerating the Cultivation of Large-scale Backbone Enterprises and other related policies. It also formulated incentive policies that would encourage industries cited for outdated capacity (factories with low efficiency) and overcapacity to engage in and accelerate mergers and acquisitions, reduce excess production and increase competitiveness. Incentives to such ends are financial subsidies, reimbursed land transfer costs and social security schemes.

The Government of China has been working to enhance the employability of workers and to step up legislative and policy efforts to promote employment and develop skills. The introduction of the National Middle to Long-term Talents Development Plan (2010–20) and the 13th Five-Year Plan for Employment Promotion of 2016 encompass these efforts. The State Council went on to promote the Made in China 2025 strategy to speed up the green transformation process; it emphasizes innovation, quality and cultivating talents.

The Government has envisaged the formation of a multi-level and multi-type talents training system to promote industrial restructuring and skills upgrading. The Reform Plan for the Development of Industrial Workers, 2017 proposes 25 reform initiatives focusing on the following five aspects: ideological study, skills development, Internet application, innovation in workers' development system and support for workers' development.

In the transformation process, China continues to adhere to a people-centred approach, carefully considering job security and skills training. The Employment Promotion Law of 2015 was amended to increase support for disadvantaged groups. The employment assistance system was specifically stipulated, and tax deductions, loan and interest subsidies, social insurance subsidies, job subsidies and so forth were adopted through the public welfare system. People with difficulties in finding employment will receive priority assistance. Several policies issued in the past few years state that the placement of workers is the most important task in resolving the overcapacity of the steel and coal industries.[172] In 2016, the Ministry of Human Resources and Social Security and the All-China Federation of Trade Unions promulgated the Suggestion on Workers' Resettlement in the Process of Difficult Elimination through Overcapacity Reduction in the Iron, Steel and Coal Industry of 2016 to ensure that workers will not be laid off and will be provided with resettlement options. Four channels of job transfers were established: internal diversion, position transfers, internal retiring and make-work jobs.

At the national level, the resettlement of displaced workers continues to be a priority. Policies that do not adequately address a resettlement plan with a lack of funding guarantees will not be passed by the Staff Representative Conference. The State has arranged for adequate funds to be used for the resettlement of displaced workers, especially those from the iron, steel and coal industries. These policies have been critical in protecting the livelihoods of affected workers, together with providing an opportunity for their re-employment.

Box 15.5

Hebei Province skills development provisions and subsidies to promote laid-off workers' employability

Hebei is a large steel-producing province in China. In 2016, enterprises in the steel, coal, cement, glass and similar sectors altogether laid off 58,249 workers. In alignment with the central Government's legislative framework, the province formulated ten resettlement policies covering internal retirement, retirement on-hold, subsidies, vocational training, setting up public welfare posts, provisions for unemployment insurance support and so forth. For workers with ambition to start a business, entrepreneurship training and supportive services offered soft loans, incubation services and subsidized office space. The provincial government organized special recruitment activities and job fairs, as frequently as on a fortnightly basis. Re-skilling and skills upgrading vocational training courses were also provided. Additionally, compensation of CNY800 per trainee was provided to the province by the central Government.

In Hebei, the resettlement rate was high: 32,500 people were resettled through job transfer; 4.28 million people were internally repatriated; 240,000 people were hired by other enterprises; 4,080 people became self-employed; and 130,000 people were placed in public welfare posts. The remaining 1 per cent of affected persons chose to return to rural areas or opted to remain unemployed and receive unemployment insurance. In the first half of 2017, the province subsidized 20 enterprises and helped 87,600 transitional workers, amounting to a total investment of CNY456 million.

Source: Ministry of Human Resources and Social Security: "Hebei to capacity, resettlement does not relax", 20 June 2017, https://mp.weixin.qq.com/s/YqB5oIdIOzfvBIiwRlrz4g (accessed 1 Aug. 2017).

172 Examples of such laws are the State Council's Opinions on Resolving Overcapacity in the Steel Industry to Realize the Development of Poverty-Relief (No. 6 of 2016) and Opinions of the State Council on Resolving Overcapacity in the Coal Industry to Realize the Development of Overcoming Difficulty (No. 7, 2016).

Box 15.6

Shanxi Province skills development provisions and subsidies to promote laid-off workers' employability

Shanxi Province is located west of the North China Plain and is an old industrial province commonly referred to as the "coal sea". In 2016, 25 coal mines closed, leaving nearly 18,000 people to resettle. And in 2017, under order to reduce production capacity by 26.65 million tonnes, 27 more coal mines closed, and the province was tasked to resettle 18,000 workers, with great difficulty.

Shanxi Province has about 19 million workers with skill levels lower than the national average. The provincial government formulated the National Skills Enhancement Project in 2018, providing for large-scale and multi-level vocational training. To enable this support, CNY1 billion will be allocated to special employment funds and unemployment insurance funds. The annual target is to train and certify at least one million workers.

Source: *Economic Daily*: "Shanxi implements the national skills upgrading project: nearly 20 million employees will transform their physical strength into skill delivery", 4 Nov. 2018, http://finance.jrj.com.cn/2018/04/11151624374904.shtml (accessed 8 Aug. 2018).

Governments at all levels have stepped up efforts to help re-employment by providing skills training to unemployed workers and post-job skills training and upgrading for those re-employed by enterprises. Special vocational training programmes are available to displaced workers; from 2016 to 2020, unemployed workers are entitled to receive government-subsidized vocational training. Entrepreneurship training programmes are also accessible to unemployed workers. For workers with particular needs and who have more difficulty in finding new employment, the Government furnishes individualized options with more intensive training, career counselling and job referrals. Training curricula focus on high-technology industries, advanced manufacturing, production and service industries, tourism and entertainment industries, health care, home services and other services to effectively provide the necessary skills that will facilitate re-employment.

The 13th Five-Year Plan provides for an employment priority strategy, cultivation of new dynamism and the creation of new jobs. The Internet-based sharing economy is an example of a new dynamism and is the most popular in China. In 2017, the number of employees working in the sharing economy platform reached approximately 7.16 million, accounting for 9.7 per cent of the newly increased number of urban employees. The number of service providers involved reached approximately 70 million. The Internet+ strategy[173] has been a significant mechanism in the re-employment of workers in poorer areas of China.

173 "Internet+" refers to the application of the Internet and other information technologies in conventional industries. It is an incomplete equation where various internets (mobile internet, cloud computing, big data or Internet of things) can be added to other fields, fostering new industries and business development in China.

Box 15.7

China Baowu inclusively transforms its high energy-consuming facilities to greener efficiency

China Baowu Steel Group Corporation, Ltd (China Baowu) was established in December 2016 from a merger between Bao Steel Group Co., Ltd. and Wuhan Iron and Steel (Group) Co., Ltd. China Baowu is a state-owned enterprise that strives to be a leading global player in iron and steel products manufacturing by modernizing its plants through integration, mergers, transformation and upgrading. Its move to build a greener iron and steel entity conforms with the Government's aim to cut overcapacity and its green development policies. The latter is to be achieved by turning towards greener manufacturing alternatives while requesting the same from its entire supply chain through platforms like Internet+ and big data.

Encouraged by the Made in China 2025 strategy, China Baowu built a smart manufacturing system that integrates intelligent equipment, smart factories and smart operations. The enterprise helped 33,417 employees resettle in other positions or jobs and eliminated 9.97 million tonnes of products, exceeding the target. For this, the state-owned Assets Supervision and Administration Commission awarded the firm Operation Performance A Level to recognize China Baowu's outstanding performance in 2016.

Source: Interface News: "Baowu Iron and Steel Group optimized 33,000 employees on the job last year", 24 Feb. 2017, https://www.jiemian.com/article/1133027.html (1 Aug. 2017).

There is an overall perception that the policies and measures highlighted here have helped China to move in the right direction towards achieving the ambitious nationwide task of reducing overcapacity in selected industries in favour of green innovations and simultaneously promote employment measures for displaced workers. Thus far, the Government has managed the process while maintaining steady labour relations, stability and inclusivity. The social security system has provided a safety net that ensures basic requirements are met and a channel for unemployed persons to maintain their livelihood. In 2016, the Government won the Social Security Outstanding Achievement Award from the International Social Security Association.

That said, some jobs have become obsolete in the process, and the older and low-skilled workers continue to have difficulties in finding suitable new employment. Some structural contradictions continue to exist in the job market. And most importantly, vocational training and the upgrading of skills have lagged behind, affecting the creation of high-quality jobs.

Box 15.8

Tangshan Iron and Steel Group expands into non-steel industries and resettles laid-off workers into its new subsidiaries

Tangshan Iron and Steel Group Co., Ltd. produces and distributes carbon steel products and is a major steel production base supplying various domestic infrastructure development and construction sites. The Group was founded in 1943 and is based in Tangshan city of Heibei Province.

Since 2010, Tangshan has re-oriented towards developing non-steel business and identified six major non-steel industry groups: deep processing of steel products, logistics, equipment manufacturing and engineering technology, resource development and comprehensive utilization, real estate, services, and education and training. Consequently, 20 non-steel-related companies were set up. Given the nationwide policy to cut overcapacity, Tangshan closed its outdated and highly polluting plants and resettled the workers into jobs in its new non-steel subsidiaries. Acknowledged for its forward-looking and inclusive management style, Tangshan has been ranked among the top 500 enterprises in China for nine consecutive years.

Source: Xie Wei: "Hegang Group will absorb 50,000 jobs in the next two years", *Tencent News,* 25 Mar. 2016. Available at: https://new.qq.com/cmsn/20160325/20160325008895, (accessed 1 Aug. 2017).

15.4 Trade unions' role in China's restructuring and social dialogue as a means to inclusivity

It is common knowledge that trade unions in China are deeply intertwined with the Government. In 2008, the Government imposed provisions in its labour law requiring enterprises to consult employees on "material" work-related issues. In response, companies have formed in-house workers' groups. This labour law was a prelude to the establishment of trade unions in all non-state-owned companies by 2010. Companies that resist the formation of unions will, for example, face frequent audit visits.[174] In light of the Government's efforts in streamlining its bloated industrial sectors and maintaining socioeconomic stability, the Chinese trade unions have an active role in providing for the displaced workers.

On a national scale, trade unions, at all levels, have mobilized workers to receive training on skills for green jobs, raised awareness on green development and the ongoing restructuring of enterprises and resettlement options, and provided information sessions on workers' rights and interests to ensure stability, harmony and inclusivity. The trade unions have participated in the formulation of industrial restructuring policies and legislative measures at the national and local levels. They have assisted the Government to standardize the operations of enterprises and facilitated changing labour relations brought about by the transformation. They have also advised the Government to adopt measures that promote

174 *The Economist*: "Trade unions in China: Membership required", 31 June 2008. Available at: https://www.economist.com/node/11848496 (accessed 8 Aug. 2018).

employment as a means to avoid social unrest and strike a balance between economic restructuring and stable employment. The trade unions’ role is key to ensuring that inclusivity and stability remain priorities.

Complementing government initiatives, trade unions have offered employment promotion activities through skills competitions, job training, technical training, knowledge sharing and information exchange forums to strengthen the technical skills of its members and promote innovation. By 2020, more than 100,000 innovation studios are expected to be operating, with some 300 national model innovation work studios.[175] The following highlights good practices of selected trade unions in handling the transformation and the resettling of displaced workers.

All-China Federation of Trade Unions

First is the All-China Federation of Trade Unions (ACFTU). It is the largest trade union in the world, with more than 300 million members. It is divided into 31 regional federations and ten national industrial unions.[176] The ACFTU has been seminal in promoting green development and green jobs. As early as 2005, the ACFTU carried out the My Contribution to Energy Saving and Emissions Reduction campaign and organized activities geared towards training on energy-saving and emissions-reduction methods (ILO, 2016). The ACFTU implemented the 2016–20 Labour and Skills Competition Plan, which identifies and awards workers with strong technical skills and promotes the visibility of innovative enterprises.

Other activities include: raising the technical quality of union staff and workers through training provision; building a group of knowledgeable, technically advanced and innovative workers who will further the training and capacity building; and promoting energy conservation and emissions-reduction strategies among workers. The ACFTU has also worked to protect workers’ rights to occupational health and safety protection and guide members to have a better grasp of the green development concept. Through these activities, the ACFTU promotes the ecological civilization vision of the Government. The ACFTU and other trade unions participate in the grading and evaluation system. Trade unions at all levels are strengthening their skills training programmes, which are made possible with government funding.

Trade unions at local levels and industrial unions within the ACFTU rely on their communication channels and extensive network to raise awareness and promote the visibility of workers’ competitive edge and skills through public relations strategies. Trade unions at all levels in Tianjin Province, for example, carry out skills competitions and have launched ten demonstration projects in labour competition, ten demonstration areas and units and ten model worker innovative workshops. Employees of enterprises and the enterprises that make contributions to technological innovation are provided with cash awards to motivate them towards enhancing their capabilities.

175 A workplace or a kind of programme where technological innovation, technological assistance, inventions and techniques training are conducted. It also helps to train high-skilled workers and improve workers’ creativity.

176 See https://en.wikipedia.org/wiki/All-China_Federation_of_Trade_Unions (accessed 8 Aug. 2018).

Federation of Trade Unions

Another good practice is that of the Federation of Trade Unions in Xining city, Qinghai Province, where trade unions conduct labour competitions on comprehensive environmental management, ecological engineering construction, energy conservation and emissions reduction. A majority of the innovations that enter the competition are applied in actual production lines. The Federation of Trade Unions in Guizhou Province carries out a similar practice through its Golden Ideas in Energy Conservation and Emission Reduction Programme. Every year, a total of 10,000 good ideas are collected; 80 per cent of them have been applied.

Some trade unions publish opinion pieces that provide direction to the management of enterprises undergoing restructuring. The Jiangsu Federation of Trade Unions, for example, has distributed seven opinion pieces on a range of topics, such as industrial and labour relations, improving job placement mechanisms and enhancing employment assistance.

Other trade unions

Trade unions across the country promote the re-employment of workers affected by the Government's green economy transformation when some outdated capacity productions are made obsolete. The Wuhan Confederation of Trade Unions, the Municipal Human Resources and Social Security Bureau and the Wuhan Iron and Steel Group Trade Union have been hosting large-scale job fairs and have attracted more than 330 companies to provide 12,000 jobs in 96 categories. Many of the employees of the Wuhan Iron and Steel Group's factories, mines and other subsidiaries participate in the job fairs.

China's strategy has shown that the resettlement of workers in the green transition process and skills training for workers is vital to the country's economic restructuring and upgrading.

Conclusion

In recent years, China's economy has developed rapidly after several decades of heavy industrial development. But the processes for industrialization, urbanization and agricultural modernization have come with a price – environmental degradation and heavy pollution.[177]

Despite the significant challenges in making a just transition towards a green economy, the Government has targeted a 40–45 per cent drop in carbon dioxide emissions per unit of gross domestic product by 2020 (compared with the 2005 data). Its gradual shift to a green economy began by tackling industries that negatively impact the ecological environment, particularly those in the steel, cement, coal, non-ferrous metallurgy and petrochemical industries (ILO, 2016).

China's economic transformation was initiated by a shift away from unsustainable

177 See https://history.libraries.wsu.edu/spring2015/2015/02/05/humans-and-the-environment-the-history-of-air-pollution-and-the-effects-on-china-today/ (accessed 8 Aug. 2018).

development methods. With a Government that also prioritizes a firm control on unemployment and maintaining social order,[178] it is pertinent for China to ensure that the process of enterprise restructuring is managed properly and inclusively. This process must result in greener enterprises and do more than mitigate the negative impacts on jobs by creating new jobs that replace the ones made obsolete. It is also crucial to enhance the employability and skills of workers whose jobs are affected by the restructuring.

What needs to change is far beyond overcapacity reduction, however. China may be known as the “world’s factory”, but the manufacturing industry is still at the low end of the international value chain. It lacks high-end technology and high-skilled workers. The development of a services industry is lagging. The dynamism needed in the labour market to absorb displaced workers has yet to be realized. This chapter focuses on overcapacity reduction in China, but the Government’s approach continues to change, given the emerging challenges. And the problems that arise during the process of reducing production capacity are of great relevance in the overall adjustment of the economic structure.

Skills are assets that provide for employment stability and decent livelihoods. Based on the cases highlighted and experiences thus far, skills development and skills upgrading seem to be the more popular resettlement option for displaced workers. The challenge has been the resettlement and re-employment of low-skilled and disadvantaged workers. Going forward and taking into account the imminent changes in the future of work, the Chinese government should continue with its efforts to increase capital investment, refine the skills appraisal and certification system and improve training systems to include the strengthening of skills and the improvement of workers’ competitiveness as important elements in the country’s green-growth strategies.

178 See https://www.theguardian.com/business/2016/feb/29/china-to-cut-jobs-in-coal-and-steel-sectors (accessed 8 Aug. 2018).

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ILO Regional Office for Asia and the Pacific
United Nations Building, Rajdamnern Nok Avenue
Bangkok 10200, Thailand
Tel.: +66 2288 1234
Fax: +66 2280 1735
Email: BANGKOK@ilo.org
www.ilo.org/asia

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