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2018
EUROPEAN
SKILLS INDEX

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2018 European skills index

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Foreword

Europe's skills base is seen as a major driving force in creating more jobs and inclusive and sustainable growth. Skills development is a golden thread across nearly all policy domains: it aims to empower people to succeed professionally and personally while benefitting Europe's enterprises and societies. This is also evident in the Commission's proposal for its 2021-27 multiannual financial framework.

But it is not just development of people's skills and competences that matters. How smoothly people can move from education to work or how well their skills are matched at work are equally important. Skills development, activation and matching: these three aspects make up a country's skills system.

Skills systems are complex entities embedded in their national contexts and intertwined with other policy domains. How well they perform depends largely on their capacity to respond to external drivers affecting skills supply and demand, currently and in the future.

But how can we better understand whether our skills systems are performing well as a whole? Cedefop's European skills index serves this purpose. It offers, for the first time, a single measure which makes it possible to understand the performance of skills systems within and across European Union (EU) Member States. It helps countries see what is driving their results, indicates scope for improvement, and guides them to the areas they need to focus on.

As the EU's agency at the interface between education and training and the labour market, one of our core activities is informing Member State endeavours to provide skills that are relevant and to tap into and match their skills reserves. It was this interest in the interaction between skills development and work – which is crucial for economic and social success – which motivated us to embark on the skills index project.

This publication reflects the outcomes of intensive work and pilots carried out over the past five years. We are particularly pleased about the acknowledgement this work has received. In its audit, the Joint Research Centre confirmed that Cedefop's 2018 European skills index framework is well-constructed, suggesting that one of the greatest strengths is the amount of original research into the multiple facets of skills systems in the Member States.

Shedding more light on skills systems, the skills index will contribute to better-informed policy discussions by promoting dialogue among actors from education and training, employment, economic and social policy domains. The results presented in this publication should serve as a starting point for deeper investigation rather than the end point of the analysis.

Showing the differences in performance across countries, the skills index helps benchmarking and encourages and supports policy learning. As a tool for policy analysis and learning, it may contribute to monitoring countries' progress in economic and social policy domains and support their work to achieve their goals. Its holistic perspective and its individual facets will also enrich our own analyses and the support we provide to our stakeholders.

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Executive summary

Cedefop's European skills index (ESI) (¹) is a composite indicator aiming at measuring the effectiveness of Member State skills systems. Traditionally, skills systems are thought of as the means of delivering skills to a country's population. However, the role of such systems is also to ensure smooth transition from education to work and appropriate skills match in the world of work. The development of the European skills system makes measuring the performance of skills systems possible for the first time. Within the ESI framework, better performance can primarily be achieved through achieving a well-balanced skills system. Focusing only on one dimension, in contrast, may have adverse effects as it may neglect aspects that are essential for a harmonious system overall. One of the purposes of the ESI is to help identify problematic areas calling for improvement, even in cases where Member States have very good overall performance.

Skills systems are an important component of national competitiveness and, in aggregate, of the European Union (EU) as a whole. A number of key principles of the European pillar of social rights are built around a well-functioning and inclusive labour market where education, training, and lifelong learning are centre stage. The New skills agenda lists a set of actions aimed at improving the skills system through better formation, greater visibility, and more informed career choices.

The ESI builds on three pillars, each of which captures a different stage of a skills system: development, activation and matching. These pillars are used to organise and aggregate 15 individual indicators into a single summary measure. The indicators chosen are policy-relevant and linked to policy issues, such as the EU2020 strategic framework targets (European Commission, 2018a). Though many more indicators were considered for constructing the ESI (and were suitable for the theoretical framework), the final structure was confirmed through statistical processes. An independent statistical audit by the Joint Research Centre has placed the ESI within

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(¹)   Cedefop: Skills panorama: *European skills index:* https://skillspanorama.cedefop.europa.eu/en/ indicators/european-skills-index

'international quality standards for statistical soundness' (Norlen and Saisana, 2018, p. 27).

The ESI produces a score that can be used to consider the performance of EU skills systems in relation to each other. Monitoring over time is also made possible through the adoption of the distance-to-frontier approach, which sets out the distance of a country's score to be best achieved by any country over a period of seven years. However, the information provided by the ESI goes beyond the overall index scores. Through the information provided by individual indicators and pillar scores, country-specific strengths and challenges in developing, activating or matching skills can be identified and serve as an input for data-informed policy analysis. Specific areas calling for improvement can be brought into surface, even for Member States with a high overall ESI score.

The ESI is meant to serve as a starting point for looking deeper into Member State skills systems. Further investigation, coupled with local knowledge of the structures of a skills system, is necessary for contextualising the results and setting priority areas. Simplistic policy messages drawn from the overall score should be avoided.

The following key findings emerge from the analysis of Cedefop ESI 2018 results:

(a) based on the ESI scores, it is possible to distinguish three performance groups: top performers varying within the top seven positions (with scores above 67); a big group of middle performers varying approximately between the eighth and the 21st positions (with scores 45 to 62); a group of lower performing countries (with scores 23 to 35);

(b) the ESI scores show that there is still significant room for improvement in the skills system of each Member State. Even those with the top-performing skills systems (the Czech Republic, Finland and Sweden) have room to improve;

(c) no single Member State reaches the top score in all the pillars of the index, (skills development, skills activation and skills matching), meaning that every one can improve in at least one area of their skills system;

(d) out of the 28 Member States, 22 saw an increase in the ESI score during the period ESI scores have been estimated (2014-16), meaning that the general trend seems to be toward a gradual improvement of skills systems across the EU;

(e) the Czech Republic has ranked first in the ESI for all year points the ESI has been estimated;

(f) over the period examined, no Member State has entered or exited the top best performing seven, although some changes in the ranking were observed;

(g) the Czech Republic, Estonia, Luxembourg, Slovenia and Finland are where most good practices for skills development and activation and skills matching are to be found;

(h) despite their low performance in skills development and activation, Bulgaria, Hungary and Romania achieve above-average performance in skills matching;

(i) there is a worrying skills matching situation in many Member States, with significant room for improvement.

The ESI relates to other measures linked to education and labour market policies. For example, the ESI is found to be positively related with initial vocational education and training (IVET) spending, negatively with the NEET ([2]) rate and positively with employment rates. High income Member States (measured by the level of the gross domestic product (GDP) per capita) have better performance in skills development.

Skills development

The skills development pillar looks at the training and education activities of the country and the immediate outputs of that system in terms of the skills developed and attained.

There is significant room for many Member States to improve in skills development, particularly those occupying the bottom-half positions in the ESI ranking.

The skills development pillar is calculated as the weighted average of two sub-pillars: basic education and training and other education. Member States perform better in the basic education sub-pillar than in the training and other education sub-pillar. For some Member States, there are significant gaps in the scores of the two sub-pillars, pointing to better performance in the basic education level (up to ISCED level 4) compared to other training and education.

([2]) Neither in employment nor in education and training.

Analysis of individual indicators of the skills development pillar shows poor performance across most Member States in the recent training indicator and uneven performance in the VET students indicator, accompanied by good performance in the upper secondary attainment (and above) indicator.

Few changes in scores and rankings within the skills development pillar were observed during the period (2014-16) the ESI has been computed. Some low-performing Member States grew slightly more than the others, suggesting generalised difficulties in short-term improvement in skills development over time, especially at the post-compulsory level.

Skills activation

The skills activation pillar includes indicators on the transition from education to work, together with labour market participation for different population age groups, to identify the relative representation of those different groups within the labour force.

Member States generally perform better in skills activation than skills development and matching. There are a few exceptions, such as Bulgaria, Italy and Romania, which have low scores in skills activation.

The skills activation score is calculated as the weighted average of two sub-pillars scores: transition to work and labour market participation. Some Member States show sizable differences between the performances in the two sub-pillars (such as Spain), while others perform equally well in both (such as Denmark). On average, Member States perform slightly better in the transition to work sub-pillar than in labour market participation.

Looking at individual indicators making up the skills activation pillar, it is possible to observe significant differences between activity rates for age group 20 to 24 and for age group 25 to 54. The younger labour force cohort has lower rates than the older, which may indicate that the younger cohort spend more time in education and tend to enter the labour market later. Better performances are observed across all Member States in indicators on early leavers from training and recent graduates in employment; this suggests that the measures put in place under the education and training 2020 (ET 2020) strategy are showing some positive results.

There have been some small changes in rankings within the skills activation pillar for the period the ESI has been calculated (2014-16), with most of the Member States increasing their score over time. However, some

low-performing Member States saw a reduction in the skills activation score, pointing to persistent difficulties in activating the skills of their workforce.

Skills matching

The skills matching pillar shows the degree to which labour force skills are used successfully within the economy, and the extent to which skills are effectively matched in the labour market. This can be observed in the form of jobs mismatches, which include unemployment, skill shortages, skill surpluses or underutilisation of skills in the labour market.

Some Member States performing quite poorly at the overall index level – for example Bulgaria, Italy and Romania – have a better performance in matching skills with appropriate jobs.

The skills matching pillar is composed of two sub-pillars: skills utilisation and skills mismatch. For many Member States there are important differences in performance between the two: they perform better, on average, on skills utilisation than skills mismatch. They have less difficulty integrating the skills of their entire workforce (as measured by the indicators of the skills utilisation sub-pillar) than in matching skills with demand (as indicated by the skills mismatch sub-pillar).

Analysis of individual indicators included in the skills matching pillar shows that qualification mismatch is an area where Member State performance is lowest, and this is also true when comparing against the indicators included in the other pillars. The indicators of best performance, both at pillar and index levels, are in long-term unemployment, with significant variations in performance in the other indicators included in skills matching.

During the period examined there were sizable changes in the ranking for a few Member States, such as Denmark and Poland. These changes were accompanied by relatively small percentage changes in skills matching scores for most Member States.

CHAPTER 1.

European skills index: measuring skills systems

Cedefop's European skills index (ESI) [3] is a composite indicator that measures the performance of a country's skills system, in terms of skills development, activation and matching. It gauges the relative performance of Member State skills systems and, in doing so, aims to contribute to the policy discourse on skills, employment, and the labour market.

The ESI aims to aid the implementation of the European pillar of social rights, which calls for a well-functioning and inclusive labour market where education, training, and lifelong learning are keys to success. While the *Social scoreboard supporting the European pillar of social rights* (European Commission, 2018a) monitors the way labour market policies are effectively addressing the skills needs of their economy, the ESI offers a new, dynamic measure assessing the complexity of skills systems: different aspects are looked as integral parts of a skills system, to prevent focusing on one aspect over the other misleading about overall performance. Adding such complexity is essential to a deeper understanding of reality and aids the quest for answers. Its framework allows for both cross-country comparisons and deeper examination within a Member State. Monitoring over time is also made possible, to track current shocks in one or another aspect of a skills system that may not be captured now.

1.1. A short history of the European skills index

The 2018 European skills index updates and refines the work undertaken for the 'making skills work' index, published in 2016, which started in 2013. Earlier versions of the index were evaluated by the European Commission Competence Centre on Composite Indicators and Scoreboards at the Joint

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[3] Cedefop: Skills panorama: *European skills index:* https://skillspanorama.cedefop.europa.eu/en/indicators/european-skills-index

Research Centre (JRC) in May and in December 2017. The new index builds on subsequent technical discussions with the JRC, experts in composite indices, and national stakeholders. During 2018 the current version of the index successfully underwent independent statistical audit by the JRC.

1.2. Defining skills systems

Traditionally a country's skills system has been seen as responsible for delivering improved skills to its population through basic education, post-basic education, and training. Typically, a skills system measures formal and informal training and education, secondary, further (continuing) and higher education, and both academic and vocational education and training (VET).

However, this is only one facet of a skills system, a complex entity which can be seen to include several different roles:
(a) delivering the skills the country needs and/or is anticipated to need in the future (including reskilling and upskilling);
(b) activating the skills in the labour market, by providing enough job opportunities to different groups in the population;
(c) matching, as far as possible, individuals' aspirations, interests, and abilities to the needs of the labour market.

The capacity of a skills system to realise these goals has traditionally been measured with respect to individuals' propensity to avoid unemployment, obtain relatively high-wage work, and secure progression in the labour market. These have driven the design of the ESI.

Nevertheless, it is acknowledged that there are also important non-pecuniary benefits of a well-functioning skills system, such as personal development and well-being. Capturing these is currently out of the scope of the ESI.

1.3. Theoretical framework

The concept of a skills system is multifaceted and complex. There are various dimensions that need to be taken into consideration, including the socioeconomic context within which a skills system has been built. The ESI, as with any composite indicator, provides a simplification of reality. Adopting

Figure 1. **Theoretical framework for the skills system**
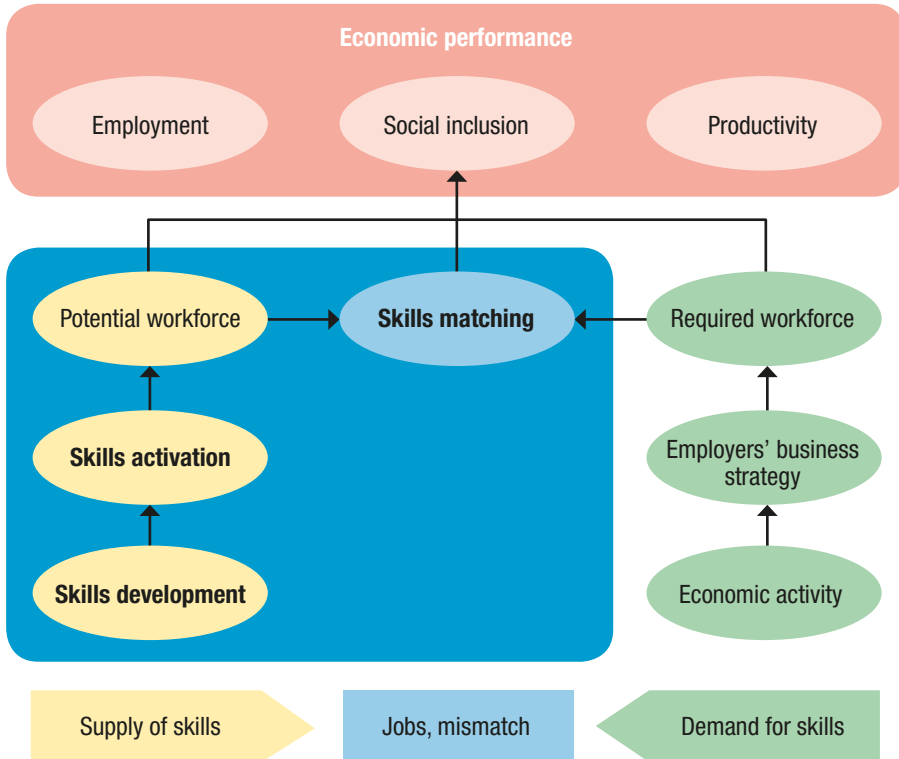
Source: Cedefop, ESI 2018.

a human capital approach to skills, the ESI acknowledges as primary purpose of acquiring skills to reap economic and societal benefits through employment, social inclusion and productivity. Social inclusion stands as a desired outcome within this framework because success in improving employment and productivity outcomes will depend on the latter being shared across the population as a whole. Outcomes are socially, as well as economically, optimal.

The role of the skills system is to bring together and match a suitably skilled potential workforce (supply) with the needs of employers (the required workforce, demand). The required workforce and the skills needed are determined by the nature and scale of economic activity and by employers' business strategies. The potential workforce (available supply) is determined

by skills development (education and training, and adult learning) and the activation (or participation) of workers in the labour market. It is through the interplay between skills supply and demand that the degree of successful skills matching is observed. The ESI theoretical framework on a country's skills system is presented in Figure 1.

1.4. Index structure

Following the theoretical framework in Figure 1, the ESI focuses on the supply and matching aspects of the skills system (in blue). The supply is determined by the education, training and adult education policies (skills development) and the institutional framework set to activate skills in the labour market (skills activation). The interplay between demand and supply is captured by skills matching.

Achieving the final structure of a composite indicator is an iterative process. Figure 2 presents the ESI structure, which has been tested and confirmed for its theoretical foundations and statistical soundness. The European skills index is broken down into three pillars, six sub-pillars, and 15 indicators. This is a well-balanced structure (each pillar is divided in two sub-pillars, and each sub-pillar includes two or three indicators) while its statistical methodology ensures an equal contribution of each indicator, sub-pillar and pillar, to the overall index.

Even though building the ESI entailed experimenting with a much larger number of indicators from various sources, the final structure only includes those that are both suitable for the theoretical framework and also statistically proven to contribute to the index ([4]). However, the overarching principle for choosing indicators has been to focus on outcomes rather than intentions: this avoids choosing measures whose interpretation is vague. For instance, high spending on education may indicate either a strong skills system or one that overspends. Focusing on outcomes is considered an efficient way of measuring countries' skills systems performance. However certain quality aspects may not be captured as this remains, for the time being, out of the ESI scope.

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[4] The next sections of the report discuss the methodology adopted while Annex 3 outlines details of the indicator included. The ESI technical report provides further insights into the selection process and the additional indicators tested for inclusion.

Pillars and sub-pillars represent different but inter-related aspects of the skills system. In the ESI framework, pillars can be interpreted as a process: the development of an individual's skills influences their activation in the labour market and consequently their matching to employment. However, inter-relationships could also run in the opposite direction: for example, an individual's decision to invest in training may be influenced by the likelihood of training improving their employment opportunities (matching). Skills systems are complex and each dimension should be considered in relation to the others.

Figure 2. **ESI structure**
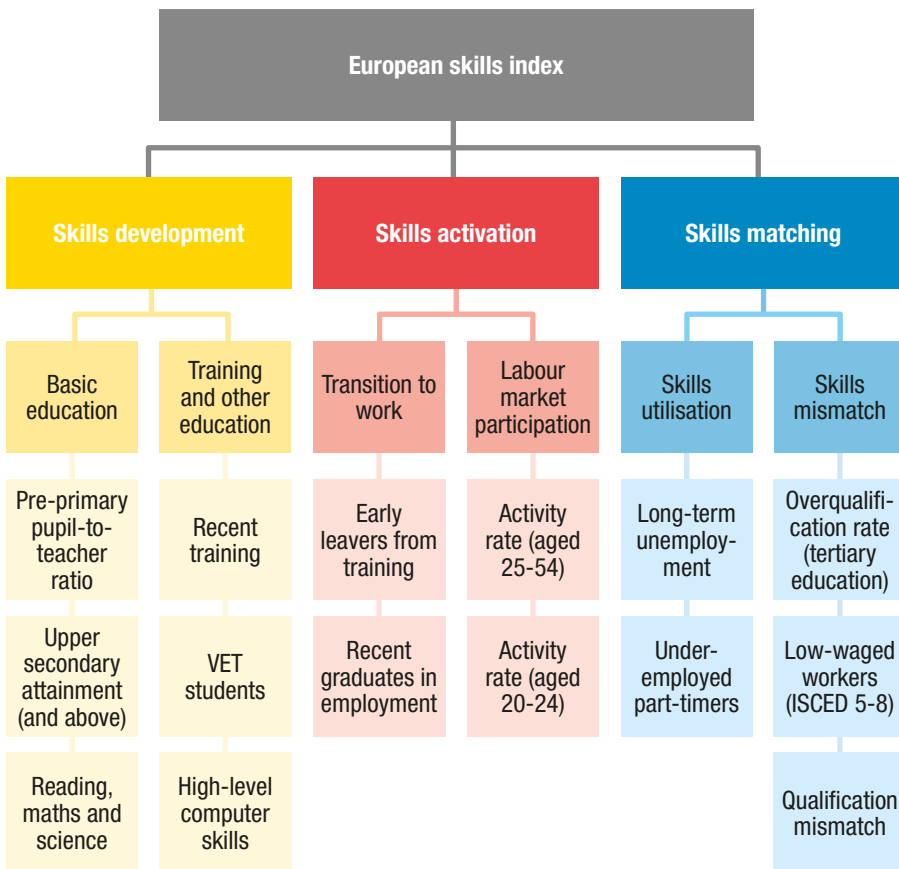
Source: Cedefop, ESI 2018.

1.4.1. **Skills development**
The skills development pillar represents the training and education activities of the country and the immediate outputs in terms of skills development and attainment. This pillar has two sub-pillars:
(a) basic education;
(b) training and other education.

1.4.2. **Skills activation**
The potential workforce of a country is determined not only by the development of skills in the population, but also by the activation (or participation) of skills in the labour market. The skills activation pillar includes indicators on the transition from education to employment, together with labour market activity rates for different groups in the population. This pillar has two sub-pillars:
(a) transition to work;
(b) labour market participation.

1.4.3. **Skills matching**
The skills matching pillar represents the degree of successful utilisation of skills, the extent to which skills are effectively matched in the labour market. This can be observed in the form of jobs and mismatches which include unemployment, skill shortages, and skill surpluses or underutilisation of skills in the labour market. This pillar has two sub-pillars:
(a) skills utilisation;
(b) skills mismatch.

Box 1. **Index construction**

The construction of the composite index followed the procedure recommended in the *Handbook on constructing composite indicators* (OECD; European Commission JRC, 2008) ([a]).
In total, the index covers 15 indicators derived from publicly available data compiled by Eurostat and the Organisation for Economic Cooperation and Development (OECD) ([b]). Original indicators are scaled, normalised to a score ranging from 0 to 100 (100 representing the best outcome), weighted and aggregated successively into sub-pillar, pillar, and index scores. Minimum and maximum values for each indicator were chosen to act as the 'logical worst case' and 'logical best case' (or else aspirational targets), respectively, from which the ESI indicators were normalised using the

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method called distance to best achievable target. Seven years of data were used to determine the fixed bounds, i.e. minimum and maximum values. The main reason for the decision to use fixed bounds, as opposed to adopting the observed minimum and maximum values, is the need to benchmark performance over time. Keeping time-invariant the lower and upper bounds for the ESI indicators allows benchmarking over time ([c]).

The index score is computed as the weighted geometric average of three pillar scores. Pillar scores are derived by calculating the weighted arithmetic average of the sub-pillar scores. Sub-pillar scores are calculated as the weighted arithmetic average of the indicator scores. The weighted arithmetic average method is easy to interpret but makes a key assumption of perfect compensability between indicators, as it assumes that the score in one indicator/sub-pillar can fully offset the score in another. The choice to use the weighted geometric average to combine the three pillar scores into an index score stems from the consideration that perfect compensability at this level would have implied that the level of priority given to an ESI pillar is invariant to the level of attainment. By using a weighted geometric average, a poor performance in one of the ESI pillars cannot be fully compensated by a good performance in another pillar. This method of aggregation rewards balance in scores between the three pillars but penalises uneven performance between them. Therefore, Member States with even performance across the three pillars will score better in the overall index than those with uneven performance. This aggregation method also has important policy implications because greater priority is given to pillars where Member States have lower performance. Thus, the worse the performance in a particular pillar (in a skills system area), the more imperative it is first to improve this area of the skills system to improve the overall performance of the skills system. The ESI shows a Member State's performance relative to the best or worst EU Member State's performance for any indicator, sub-pillar or pillar, and for the skills system as a whole (the index score). In interpreting the ESI, the focus can be either on absolute scores or on relative ranking. From a policy-making point of view, the idea of relative performance is that the focus should be on the gap between the actual score and 100, indicating the room for improvement. To add a temporal dimension to the analysis, the scores and the rankings were computed for 2014-16, the most recently available data during the period the ESI was being constructed.

The outcomes from changes to the skills system are unlikely to manifest themselves over such a short space of time; change is ideally examined over a much longer time horizon. This is something that can be readily developed as more data in the time-series become available. It is important to monitor change over time and its general direction. →

For a detailed explanation of the index methodology, refer to the technical report (d) on the Skills Panorama website (e). An abridged version of the technical report is in Annex 4.

(a) More information about the technical and methodological choices is included in Annex 4.

(b) The details of each indicator used in the construction of the index are summarised in Annex 3. The original data and the date of update for each indicator are found in Annex 2.

(c) Detailed explanations on the normalisation method and the rationale for the bounds for each indicator are offered in Annex 4.

(d) (Cedefop, 2018). *2018 European skills index: technical report* [unedited proof copy]. https://skillspanorama. cedefop.europa.eu/sites/default/files/ESI%20-%20Technical%20Report.pdf

(e) http://skillspanorama.cedefop.europa.eu/en

CHAPTER 2.

European skills index results

This chapter discusses EU Member State overall scores and rankings in the 2018 European skills index (ESI), presents some changes over the period examined, and explores the policy implications. A summary of the audit report performed by the European Commission's Competence Centre on Composite Indicators and Scoreboards at the Joint Research Centre (JRC) is also presented.

2.1. Overview

Based on the 2018 ESI version, Table 1 shows the ESI results for each Member State. The ESI is calculated such that a higher score indicates a better performing skills system. At index level, the Czech Republic ranks highest and Spain lowest.

The last column in Table 1 shows the distance to the best outcome or the gap in skills system performance for each country. No individual Member State reaches, or is really close to, the best outcome (100) ([5]). This means that there is scope for all Member States to improve some aspect of their skills systems (relative to other EU countries). For example, in the best performing country, the Czech Republic with a score of 75 shows, there is still scope for the performance of the skills system to improve.

In Table 1, the trend column shows the change in the scores between 2014 and 2016. Changes over time are further discussed in Section 2.2.

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[5]   Each indicator is normalised to a score ranging between 0 and 100 (100 representing the best outcome). Further explanation of the normalisation method and best outcome is in Section 1.5 and Annex 4.

Table 1. **ESI ranking, scores, trend**

Rank	Country		Score (0-100)	Trend 2014-16	ESI score and room for improvement (*)
1	CZ	Czech Republic	75.5		
2	FI	Finland	72.2		
3	SE	Sweden	71.6		
4	LU	Luxembourg	71.1		
5	SI	Slovenia	69.2		
6	EE	Estonia	67.7		
7	DK	Denmark	66.6		
8	PL	Poland	62.2		
9	DE	Germany	62.1		
10	AT	Austria	61.9		
11	LT	Lithuania	60.6		
12	HR	Croatia	59.6		
13	SK	Slovakia	59.3		
14	LV	Latvia	59.1		
15	NL	Netherlands	57.8		
16	MT	Malta	56.2		
17	HU	Hungary	55.2		
18	BE	Belgium	53.2		
19	UK	United Kingdom	51.5		
20	FR	France	48.2		
21	PT	Portugal	44.8		
22	IE	Ireland	36.5		
23	BG	Bulgaria	32.6		
24	CY	Cyprus	31.8		
25	RO	Romania	31.4		
26	IT	Italy	24.6		
27	EL	Greece	22.9		
28	ES	Spain	22.8		

(*) The blue bar represents the ESI score and the white part the distance to be best outcome (100).
NB: Member States are sorted from highest ESI score to lowest.
Source: Cedefop, ESI 2018.

From Figure 3, three main groups ([6]) of countries can be distinguished:

(a) leaders: seven countries, from the Czech Republic to Denmark, in the top quartile of the score distribution, scoring above 67, characterised by the prevalence of top 10 scores in the three pillars;

(b) middle-achievers: 14 countries, from Poland to Portugal, in the two middle quartiles of the score distribution, scoring between 45 and 62, characterised by relatively unbalanced profiles, with a few exceptions (Latvia, ranked 14th, has a balanced performance among the three pillars);

(c) low-achievers: seven countries in the bottom quartile, scoring below 36, characterised by relatively poor performances across all pillars.

Figure 3. **Index ranking and scores with country groupings, 2016**
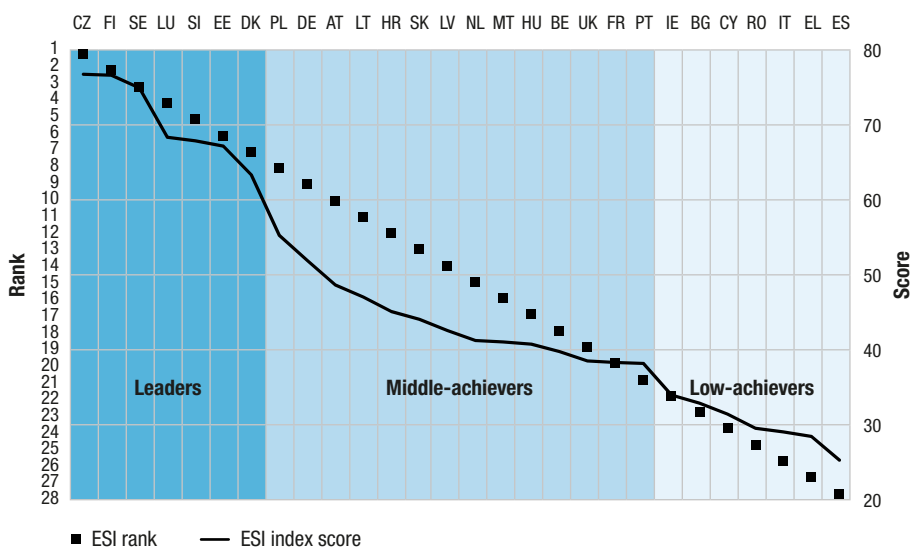
NB: Member States are sorted from highest index score to lowest. They are split into three groups: leaders score in the top quartile; middle-achievers in the two middle quartiles; and low-achievers in the bottom quartile.
Source: Cedefop, ESI 2018.

([6]) A different grouping of countries is also possible (see JRC later suggestion for using five groups). However, the current report uses the broad groups to facilitate the presentation of the results. Further analyses of the ESI results may adopt a more disaggregated presentation of country groups.

Table 2 presents index, pillar and sub-pillar scores. Finland is ranked the highest and Malta the lowest in terms of skills development. Sweden is ranked the highest and Italy the lowest in skills activation. And the Czech Republic is ranked the highest and Greece the lowest in skills matching. Using the example of the Czech Republic, Table 2 suggests that, other things being equal, there is scope for the Czech Republic to look further into improving the development and activation of skills, despite it being ranked first on the overall index.

The dispersion of rankings at the pillar level indicates that no one Member State is far outperforming all the others, not even among the top-ranked ones. This finding suggests that there is added value in referring to the ESI results to identify aspects of countries' skills systems that do not directly emerge from looking into the three pillars separately. At the same time, this outcome indicates the value of examining individual pillars (and all underlying ESI components) on their own merit to see which aspects (indicators) of a skills system are driving a Member State's performance.

Table 3 shows the scores at index, pillar and sub-pillar levels; each of these scores brings valuable information in terms of identifying where there is room for improvement. No score reaches the desired value of 100. Table 3 also shows how the arithmetic and geometric aggregation works at each level. At pillar level, a good performance on one of the sub-pillars fully compensates for lower performance on the other sub-pillars. For example, Luxembourg is ranked highly on transition to work sub-pillar but among the worst performing Member States on labour market participation sub-pillar. Luxembourg is in the middle performers on skills activation due to the full compensability property of the arithmetic aggregation.

The weighted geometric method used to aggregate the three pillars at index level works towards penalising poor performance on a pillar rather than rewarding good performance. For example, Hungary ranks highly on skills matching but that does not compensate for its poor performance in skills development and less than average performance in skills activation. Therefore, the index score captures the overall performance of a system, which must be examined as focusing on just one dimension does not capture the whole picture revealing the interrelations of the different parts. Nevertheless, the overall score is the starting point as policy-makers using the ESI framework can carefully analyse the areas requiring specific focus and attention. Targeting areas of the system already performing well will have less impact on improving the system overall.

Figure 4 shows the same information as Table 3 but with a focus on distribution of scores at each level. Figure 4 shows the wider distribution of scores across European Union (EU) Member States in the second and third pillars (skills activation and matching), than in the first pillar (skills development). The wider the distribution, the more spread is the position of the coloured dots, each one representing a Member State. Within four of the six sub-pillars, some Member States lag in a cluster below the score of 20. The top ranked Member States in each of the three pillars show similar scores, around 89 out of 100. Chapters 3 to 5 examine in more depth the performance of the Member States within each pillar, sub-pillar and indicator, to understand what drives these differences between them and draw possible policy implications.

Figure 4. **Distribution of scores, 2016**
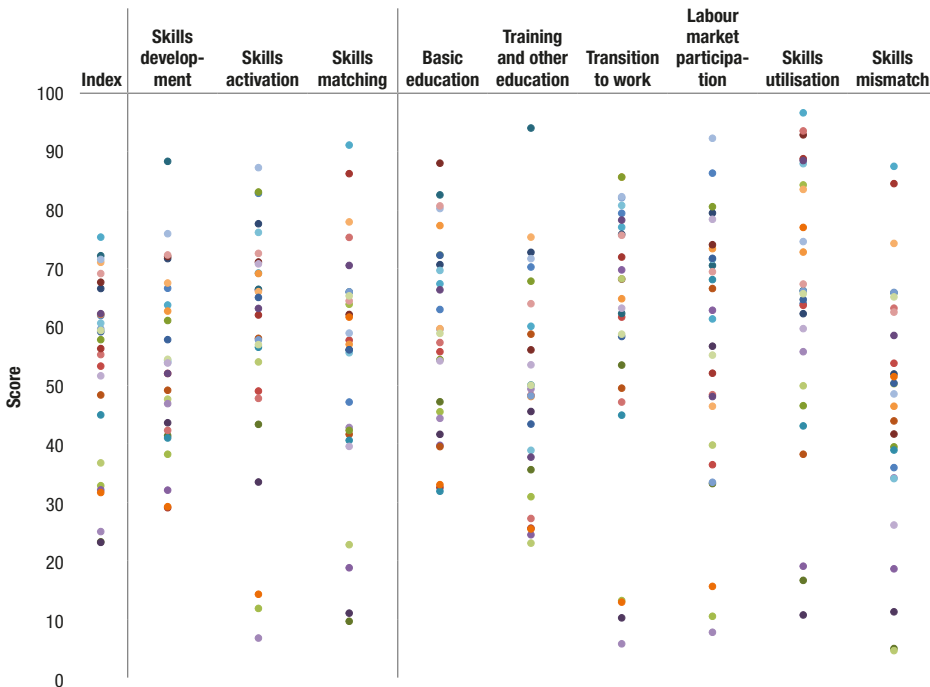
NB: The Member States were sorted from highest ESI score to lowest.
Each coloured dot represents a Member State. Dots closer to each other mean a distribution clustered around a range of scores, while dots farther away show a wider distribution of cores.
Source: Cedefop, ESI 2018.

Table 2. **Index, pillar and sub-pillar rankings using traffic light**

Rankings	Index	Skills development	Skills activation	Skills matching	Basic education
CZ	1	8	9	1	10
FI	2	1	11	6	2
SE	3	2	1	13	4
LU	4	6	13	3	13
SI	5	3	6	9	3
EE	6	4	7	11	1
DK	7	5	4	17	8
PL	8	17	15	5	11
DE	9	9	10	15	5
AT	10	7	3	19	12
LT	11	13	5	18	9
HR	12	14	18	7	14
SK	13	12	19	8	15
LV	14	11	14	16	7
NL	15	10	2	21	18
MT	16	28	16	2	27
HU	17	22	23	4	16
BE	18	16	22	14	17
UK	19	15	8	24	19
FR	20	18	17	22	25
PT	21	24	20	23	28
IE	22	19	21	25	6
BG	23	25	27	10	21
CY	24	26	12	26	24
RO	25	27	26	12	26
IT	26	20	28	20	22
EL	27	23	24	28	20
ES	28	21	25	27	23

NB: The Member States were sorted from highest ESI score to lowest. The green scale represents higher rankings, yellow represents medium rankings, and red scale represents low rankings.
Source: Cedefop, ESI 2018.

Training and other education	Transition to work	Labour market participation	Skills utilisation	Skills mismatch
8	8	15	1	1
1	17	10	13	5
4	3	1	10	15
2	2	21	8	3
7	10	11	12	8
10	14	6	3	18
3	9	4	19	11
21	7	20	5	9
17	15	7	11	16
5	6	2	17	21
20	5	9	6	23
16	4	24	14	4
13	19	17	15	6
19	20	8	16	13
6	1	3	23	19
25	11	18	4	2
24	23	19	2	7
15	18	23	18	10
11	16	5	20	24
9	22	13	25	17
12	24	12	24	20
28	13	22	22	28
23	25	27	7	14
27	12	14	26	25
26	26	26	9	12
14	28	28	21	22
22	21	25	27	27
18	27	16	28	26

Table 3. **Index, pillar and sub-pillar scores, 2016**

	Index	Skills development	Skills activation	Skills matching	Basic education
CZ	75	64	69	91	67
FI	72	89	66	66	83
SE	72	76	87	59	80
LU	71	68	66	78	60
SI	69	72	73	64	81
EE	68	72	71	62	88
DK	67	72	78	56	71
PL	62	52	63	71	66
DE	62	63	69	57	77
AT	62	67	83	47	63
LT	61	54	76	55	70
HR	60	54	58	66	60
SK	59	54	57	65	59
LV	59	58	65	56	72
NL	58	61	83	42	54
MT	56	29	62	86	32
HU	55	42	48	75	57
BE	53	52	49	58	56
UK	52	54	71	39	54
FR	48	49	58	41	39
PT	45	41	56	40	32
IE	36	47	54	22	72
BG	33	38	11	64	45
CY	32	32	66	18	40
RO	31	29	14	62	33
IT	25	47	6	43	44
EL	23	41	43	9	47
ES	23	43	33	11	41

NB: Member States were sorted from highest ESI score to lowest.
Source: Cedefop, ESI 2018.

Training and other education	Transition to work	Labour market participation	Skills utilisation	Skills mismatch
60	77	61	97	88
94	62	71	66	66
72	82	93	75	48
75	86	46	84	74
64	76	69	67	63
56	68	74	93	41
73	76	80	62	52
37	78	48	89	58
48	65	73	73	46
70	80	86	64	36
39	81	72	88	34
48	82	33	66	66
50	59	55	66	65
43	58	72	65	50
68	86	81	46	39
25	72	52	89	85
27	47	48	94	63
48	62	36	64	54
53	63	79	60	26
59	49	67	38	44
50	45	68	43	39
23	68	40	50	4
31	13	10	84	50
24	70	63	19	18
25	12	15	77	51
49	5	7	56	34
35	53	33	16	4
45	10	57	10	11

2.2. No recent major changes in relative performance across the EU

The scores were calculated using the most recent data available at the time of computing the ESI. As a way of checking the robustness of the results, the ESI was calculated for each year of the period 2014-16; data were made available for these years during the work on the ESI. Apart from checking the robustness of the rankings, this also serves as a means of examining changes over time.

Table 4 shows changes in absolute performance (changes in ESI scores), and corresponding changes in relative performance (ESI and pillar rankings) over 2014-16. Increases in ESI scores do not necessarily translate into increases in rankings. The Czech Republic (1), France (20), the Netherlands (15), Portugal (21) and the UK (19) do not change during this period even though their scores change over time. In the pillar rankings, Italy maintains the same position in all three years.

At index level, the Czech Republic maintained its lead position throughout the three-year period. The change in positions in the leaders' group was limited to the seven countries that form the group. Finland improved in the overall ranking in in 2015 due to improvements in the skills development and activation pillars. Sweden improved in 2016 compared to 2014 because of improvements in skills matching.

The composition of the low-achievers group remains the same over the period 2014-16: the ranking also remains the same on the skills development and skills activation pillars in each of the three years, with only small changes in skills matching. The bottom of the ranking is occupied by Spain, Greece and Italy throughout the period, with some change of positions between them. Greece and Spain have low scores on the skills matching pillar, while Italy has a low skills activation score.

The highest-ranking Member States in skills matching are the same throughout the period: the Czech Republic, Malta, and Luxembourg. In skills activation, the highest-ranking Member States remained unchanged over the period: Sweden, the Netherlands, and Austria. In skills development the three highest rankings were held by Finland, Sweden and Slovenia.

Although no major changes are observed over the period, the results are interesting: the time dimension is important because it indicates the direction of change. In some cases change was brought about by improvements in some of the weaker areas of a country's overall performance. The timing

Table 4. **Back-cast index, 2014-16**

	ESI				Skills development	Skills activation	Skills matching
	2014 score	2015 score	2016 score	2014-16 rank change	2014-16 rank change	2014-16 rank change	2014-16 rank change
BE	53	51	53				
BG	34	36	33				
CZ	75	74	75				
DK	70	70	67				
DE	61	62	62				
EE	63	65	68				
IE	28	32	36				
EL	23	23	23				
ES	19	20	23				
FR	48	47	48				
HR	58	56	60				
IT	21	19	25				
CY	30	31	32				
LV	59	61	59				
LT	60	59	61				
LU	72	71	71				
HU	51	54	55				
MT	52	53	56				
NL	54	56	58				
AT	62	62	62				
PL	59	60	62				
PT	40	44	45				
RO	34	33	31				
SI	69	67	69				
SK	58	58	59				
FI	72	71	72				
SE	69	70	72				
UK	49	51	52				

Source: Cedefop, ESI 2018.

of such change indicates progress. While three years is not a long time over which to look at the development of skills systems and the outcomes produced, it provides a starting point to look at change over time and whether this is moving in the desired direction.

2.3. Policy implications

Policy-makers are interested in identifying the relative strengths and weaknesses of their skills system by monitoring progress in the context of past/existing policy interventions and by considering where future policy priorities might need to be focused.

The outcomes of skills development and skills activation (which can be considered as the skills formation dimension), even with their demand-side influences, define the supply of skills available in the labour market. Skills matching, reflects the interaction between supply and demand. This dichotomy is also confirmed when each pillar is plotted against each other, where skills development and activation are found to have a good linear relationship, skills matching is found to have little relationship to any of the other two. From a policy perspective, this suggests that while development and activation (skills formation) can be influenced by common policies, skill matching requires specific attention. This is partly evident from the overall lower scores in matching, compared to development and activation. It also implies that few, if any, policies can influence the overall performance of a skills system both dimensions.

An interesting exercise is to view Member State's skills system by comparing across these two dimensions (formation and matching), as shown in Figure 5. Here the score under the skills matching pillar is shown against an average of the skills development and skills activation pillars.

The quadrants are bounded by median scores, so the Member States in the top-right quadrant are those with above-median performance in both dimensions. Although these Member States are ranked highest in the overall index, there is still considerable variation in the relative performance across the two dimensions. Finland, which ranks second behind the Czech Republic in the overall ESI, has a more balanced profile compared to the Czech Republic. Sweden ranks third on the overall ESI, but its score in the matching pillar is close to Belgium's score on the same pillar which is positioned in the top-left quadrant, showing that Belgium has below median

Figure 5. **Relative strengths and weaknesses of the skills system measured by ESI**
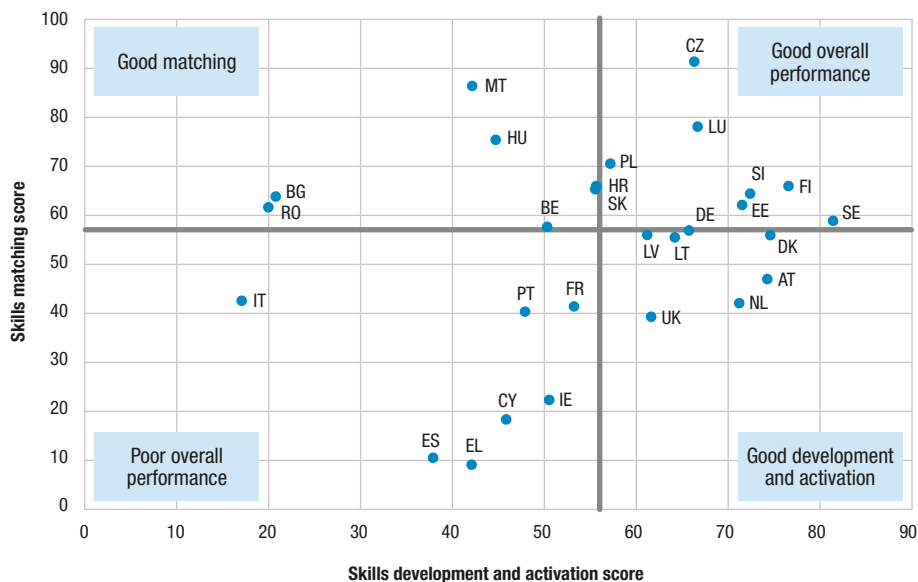
NB: The lines represent the median score value for each of the axes.
Source: Cedefop, ESI 2018.

skills development and activation. This indicates scope for further focus on this aspect of Belgium's skills system. Similarly, there is wide variation in the relative performance of the two dimensions of the skills system for those Member States with poor performance on both measures (bottom-left quadrant). For example, Italy's relatively low performance is better in the development and activation of skills, while for Spain and Greece the relatively low performance is greater for the matching element of the skills system. These Member States may need to take action to adopt policies for promoting the two skills objectives: skills development and activation, and matching. For those Member States in the remaining two quadrants (top-left and bottom-right) the area for improvement is more easily identifiable: for those in the top-left quadrant it relates to skills development and activation, while for those in the bottom-right quadrant it relates to skills matching.

2.3.1. **Relationship to other measures**

The performance of skills systems can be linked to other indicators, such as macroeconomic performance or specific features of education and training. This section investigates the linkages to IVET spending, NEET and employment rates, and illustrates the type of analytical insights the ESI offers. These linkages place skills systems in a wider context, not captured within the ESI, and start a discourse about the bigger picture and what factors may influence, or be influenced by, a skills system. The links presented in this section only attempt to understand the complexity of skills system: the choice of related measures is not exhaustive or complete. Looking at these relationships cannot prove causality and should be treated with caution.

2.3.1.1. *Spending on training and education: a key to success?*

The purpose of IVET is to provide young people with skills and competences to access and maintain their position in the labour market. Therefore, Member States investing more resources in IVET should, other things being equal, produce better skill outcomes and a higher ESI score. Since expenditure on IVET is not included within the ESI as an indicator, it is possible to explore the relationship between IVET expenditure and the ESI scores. This helps to validate the index, if the relationship turns out as expected.

Figure 6 shows the expected positive relationship between the overall ESI scores and IVET expenditure; Member States with higher IVET expenditure also have higher ESI scores.

Four distinct groups of Member States are observable from Figure 6:

(a) high-return countries (a green dot in Figure 6): those with an average-to-high ESI score and relatively lower expenditure on IVET, for example Estonia, Luxembourg;

(b) low-return countries (a yellow dot in Figure 6): those with an average-to-high ESI score and relatively high IVET expenditure, for example Slovakia and Sweden;

(c) low-spending countries (a red dot in Figure 6): those with a lower-than-average ESI score and lower-than-average IVET expenditure, for example Spain and Romania;

(d) high-spending countries (an orange dot in Figure 6): those with the highest IVET expenditure but where the skills system performs similarly to other countries, for example Belgium and Finland.

Figure 6. **IVET expenditure is linked to better skills systems**
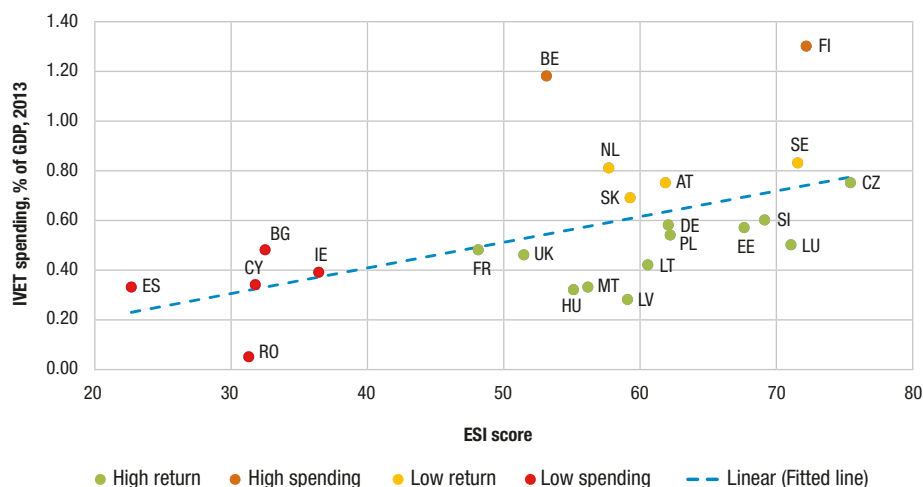
The notable outlier in Figure 6 is Belgium. Despite high spending on IVET, Belgium is among the middle-achieving countries in terms of skills system performance, perhaps due to its multiple language system. In contrast, the other high-spender, Finland, ranks highly (second) on the overall ESI.

2.3.1.2. *Better skills systems: lower NEET rate*
Better functioning skills systems should, other things being equal, produce a more employable labour force, reducing the share of young people neither in employment nor in education and training (NEET) [7]. A negative relationship between a country's NEET rate and ESI score might be reasonably expected,, with Member States capable of effectively developing skills, of activating them and matching them with jobs, expected to be in a better position to offer a way out of unemployment and inactivity to those aged 18 to 24.

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[7]   The NEET rate is not used to calculate the ESI.

Figure 7. **Better skills systems have fewer NEETs**
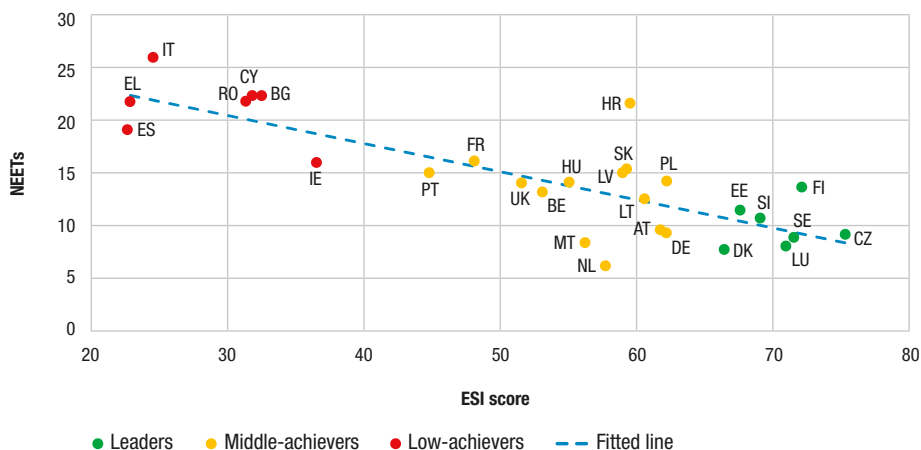
Source: Cedefop, ESI 2018 and Eurostat (2018e).

Figure 7 shows the negative relationship between ESI scores and NEET rates for those aged 18 to 24. The Member States with the highest ESI score (the leaders group shown in Figure 3, and the green dots in Figure 7), have relatively low NEET rates. The Member States in the leaders group have good performance in skills development, activation, and matching. In contrast, those with the lowest ESI score (the low-achievers group, signified by red dots in Figure 7) display significantly higher NEET rates. In this group, the Member States exhibit a generally low performance in developing, activating, and matching skills.

2.3.1.3. *High employment rates are associated with better skills systems*
Figure 8 shows the relationship between ESI scores and the employment rate in 2016 ([8]). Other things being equal, a positive relationship between ESI scores and employment rates is expected, since a relatively high employment rate suggests a relatively good degree of matching insofar as people are in employment. Better skills systems are associated with various factors, but Figure 8 suggests that one way to foster employment would be to improve the effectiveness of the skills system within the Member States.

([8])   The employment rate is not used to calculate the ESI.

Figure 8. **Better skills systems have higher employment rates**
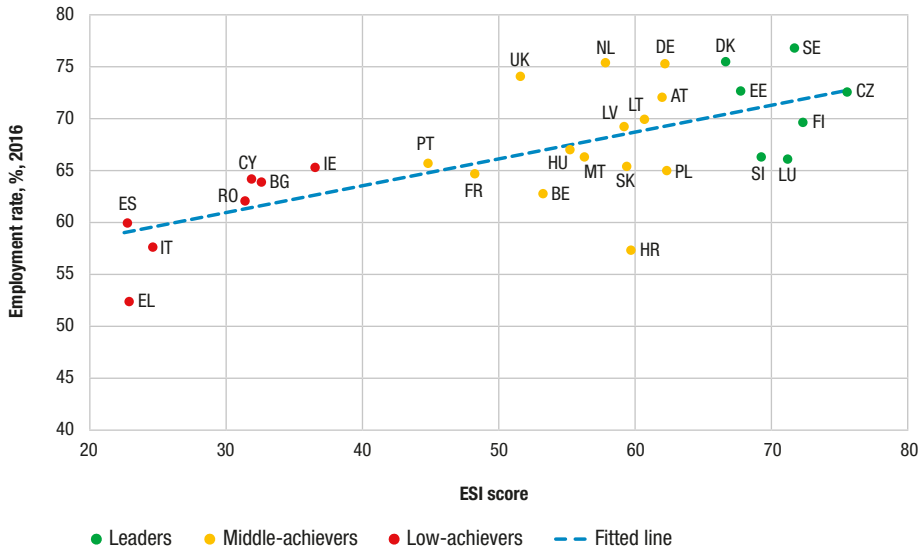
Source: Cedefop, ESI 2018 and Eurostat (2018b).

2.4. Summary of the JRC audit report

This section presents a summary of the JRC audit report ([9]), aiming at maximising the reliability and transparency of the European skills index ([10]). The audit was performed by the European Commission's Competence Centre on Composite Indicators and Scoreboards at the JRC and was conducted by invitation of Cedefop. The analysis aimed at shedding light on the transparency and reliability of the ESI model to enable policy-makers to derive more accurate and meaningful conclusions, and potentially guide their choices on priority setting and policy formulation.

([9]) This summary report was compiled by Cedefop, using original text from JRC'S audit report; see Norlén and Saisana (2018). Full audit report at: https://skillspanorama.cedefop.europa.eu/sites/default/files/European%20Skills%20Index%202018-JRC%20audit.pdf

([10]) The JRC statistical audit is based on the recommendations of the OECD and European Commission JRC (2008) *Handbook on constructing composite indicators*, and on more recent research from the Joint Research Center. Generally, JRC audits of composite indicators and scoreboards are conducted by request of their developers, see European Commission: *Competence Centre on Composite Indicators and Scoreboards (COIN):* https://ec.europa.eu/jrc/en/coin and https://composite-indicators.jrc.ec.europa.eu/

The JRC assessment of the ESI 2018 focuses on two main issues: the statistical coherence of the hierarchical structure of indicators, and the impact of key modelling assumptions on the ESI ranking. The JRC analysis complements the reported country rankings for the ESI with confidence intervals; this helps better appreciate the robustness of these rankings to the computation methodology (particularly estimation of missing data, normalisation method, use of goalposts for the indicators, and weights and aggregation formula at the pillar level).

The JRC statistical audit has delved into the workings of the ESI framework to assess the statistical properties of the data and the methodology used in the index construction. The audit confirms that the ESI framework is well-constructed and that a lot of thought has clearly been put into it. One of the greatest strengths is the amount of original research into the multiple facets of skills systems in the Member States, as well as the transparency and detail of all data populating the ESI framework and the rationale for all choices made. This transparency and detail in the source information lends credibility to the European skills index as an ensemble of carefully selected indicators and opens the data and the ESI components for use by policy analysts and researchers alike.

The key findings of the statistical assessment are the following:

(a) two statistical tests suggest that the conceptual grouping of the 15 indicators into six sub-pillars, three pillars and an overall index is statistically coherent, and that the index is equally influenced by the three main pillars: skills development, skills activation and skills matching. Of the 15 indicators in the ESI framework, 10 are also found to be influential up to index level. Nevertheless, three indicators – pre-primary pupil-to-teacher ratio in skills development, activity rate aged 20 to 24 in skills activation, and proportion of low-waged workers (ISCED 5 to 8) in skills matching – have a low impact on the ESI country ordering and can explain only a small (negligible) amount of variation in the ESI scores. Although these indicators are conceptually enriching to the ESI framework and their statistical impact arrives up to the first and/or second aggregation levels (thanks to the decision to calibrate the weights), it is recommended to monitor carefully how these three indicators behave in the coming releases of the index and eventually to fine-tune the framework in this respect;

(b) the results offer statistical justification for the theoretical framework underpinning the ESI, which places skills development and skills

activation under the same building block (forming the supply of skills), while skills matching belongs to another building block found between supply and demand. This statistical justification comes from the good linear relationship between the ESI skills development scores and the ESI skills activation scores; in contrast, there seems a weak and diffuse pattern between the ESI skills matching scores and either the ESI skills development or the ESI skills activation scores;

(c) the ESI data set has very good data coverage and 85% of the data refer to 2015 or 2016. Only three values are missing: Ireland's value on pre-primary pupil to teacher ratio in skills activation, and Croatia's and Malta's values on qualification mismatch in skills matching. Uncertainty and sensitivity analysis have shown that it is important to find a reliable estimate for Malta's value on qualification mismatch because of the impact on Malta's ESI ranking. The ESI ranking for Ireland and Croatia is not affected by the way missing values are estimated;

(d) treating the outlier value for Greece for long-term unemployment rate (capping it from 17% down to 9.5%) is not required, given that by adopting the goalposts during the normalisation step the lower bound (worst case) for that indicator is set at 10%. To ease communication to the wider audience, this winsorisation step can be removed; yet it is important to monitor in the next releases if the normalised (with the use of goalposts) indicator values satisfy the double criterion for skewness and kurtosis;

(e) Cedefop's decision to adopt the min-max normalisation method with a view to easing communication with the wider public, compared to the z-scores used in the previous beta-version of the index, does not significantly affect the overall ESI results (there is a modest impact on ESI rankings for Malta and Croatia);

(f) Cedefop's choice to calibrate the weights for the three pillars (0.3, 0.3 and 0.4) helps to ensure that all three pillars – skills development, skills activation and skills matching – are placed on equal footing when it comes to calculating a summary measure for the performance of a country's skills system. Further, adopting a suitable aggregation formula (geometric averaging) to combine the three pillars allows for the level of priority given to an ESI pillar to reflect the level of attainment (more priority given to the pillar where country has lower performance);

(g) the tests helped to single out two countries — Malta and the Netherlands — with ESI rankings that are very sensitive to the modelling choices: rankings for these should be interpreted cautiously. Some caution, though

much less, is also needed for the ESI rankings for Croatia and Austria. In contrast, and compared to the baseline ESI ranking, there is a shift of up to three positions for 24 of the 28 countries when varying five key assumptions in the ESI development over 12 000 simulations. Thereafter, the ESI framework allows meaningful inferences on the performance of skills systems in most Member States. Exploring a high number of modelling scenarios, and their joint effect, has helped to confirm that the five scenarios considered in the ESI technical report, although limited in number, are representative of a much wider range of uncertainties;

(h) when analysing ESI country rankings in the realm of the inherent uncertainties, it is possible to distinguish five performance groups: top performers varying within the top seven positions (with scores above 67); a small group of three upper-middle countries follows; a big group of middle performers varying approximately between the 11th and the 21st positions (with scores 45-61); a group of lower-middle performers varying between the 22nd and the 25th position (with scores 31-36); and finally a small group of lower performing countries (with scores 23-25). These five performance groups are worth discussing in detail when communicating the ESI results;

(i) results show that there is added value in referring to the ESI results to identify aspects of countries' skills system that do not directly emerge by looking into the three pillars separately. The ESI ranking, and any of the three pillar rankings, differ by seven positions or more for 15% up to 29% of the Member States;

(j) relevant and actionable policy insights may emerge when analysing Member States that have similar levels of skills formation or skills matching. Skills formation is a proposed additional component of a country's skills system calculated by aggregating together the two ESI pillars that determine the supply of skills available: skills development and skills activation. Best practices and policies related to skills matching in Malta may inspire action in Greece and Cyprus. Effective policies on skills formation in Estonia, Slovenia and Finland may be helpful in gauging how policies can be shaped in Bulgaria and Romania. Austria and the Netherlands may be used as good examples of 'what works' policies on advancing skills formation in Italy.

All things considered, the present JRC audit findings confirm that the European skills index 2018 meets international quality standards for statistical

soundness, which indicates that the ESI framework offers a sound starting point for more informed discussions on skills systems at country level in the EU. The readers and policy analysts of the European skills index should go beyond the overall index scores and take into account the individual indicators and pillars on their own merit. In doing so, country-specific strengths and challenges in developing, activating or matching skills to the job market can be identified and serve as an input for data-informed policy analysis. The European skills index cannot possibly serve as the ultimate and definitive yardstick of EU national skills systems. Instead, the ESI best represents an attempt by Cedefop to help focus policy discussions on the multiple facets of national skills systems in the EU, continuously adapting the European skills index framework to reflect the improved availability of statistics and theoretical advances in the field.

Skills development

Skills development covers the training and education activities of the country and the immediate outcomes in terms of the skills attained. The skills developed serve as inputs to the skills system; they are the essential elements the system needs to start its functions. The skills development pillar measures the outcomes of this part of the system. Sub-pillars distinguish basic education separately from tertiary education and training. The overview section discusses Member State scores in the skills development pillar; the section after that analyses the scores at the sub-pillar and indicator level, highlighting the underlying drivers of the skills development pillar. Then there is analysis focusing on developments during 2014-16, considering the changes in both ranking and scores. This is followed by consideration of the policy implications of the findings and, finally, a conclusion that synthesises the findings presented in this chapter.

3.1. Overview

Figure 9 shows the skills development scores for each Member State. The dark orange bars represent the skills development score and the light orange bars show the room for improvement. The shorter the light bar, the closer is the Member State to the best possible score in the skills development aspect of the skills system (a score of 100).

The European skills index (ESI) is the result of a weighted average of the three pillars, which means that the overall score (or rank) will not necessarily coincide with the score of any given pillar; a Member State can perform poorly in one pillar but partly compensate for this with good performance on the other two pillars. Finland ranks first in skills development (with a score of 89 out of 100), with the Czech Republic (which ranks first in the ESI) occupying eighth place. Malta has the lowest performance in skills development (with a score of 29 out of 100), a position occupied by Spain in the overall ESI ranking.

Figure 9. **Member State room for improvement in skills development**
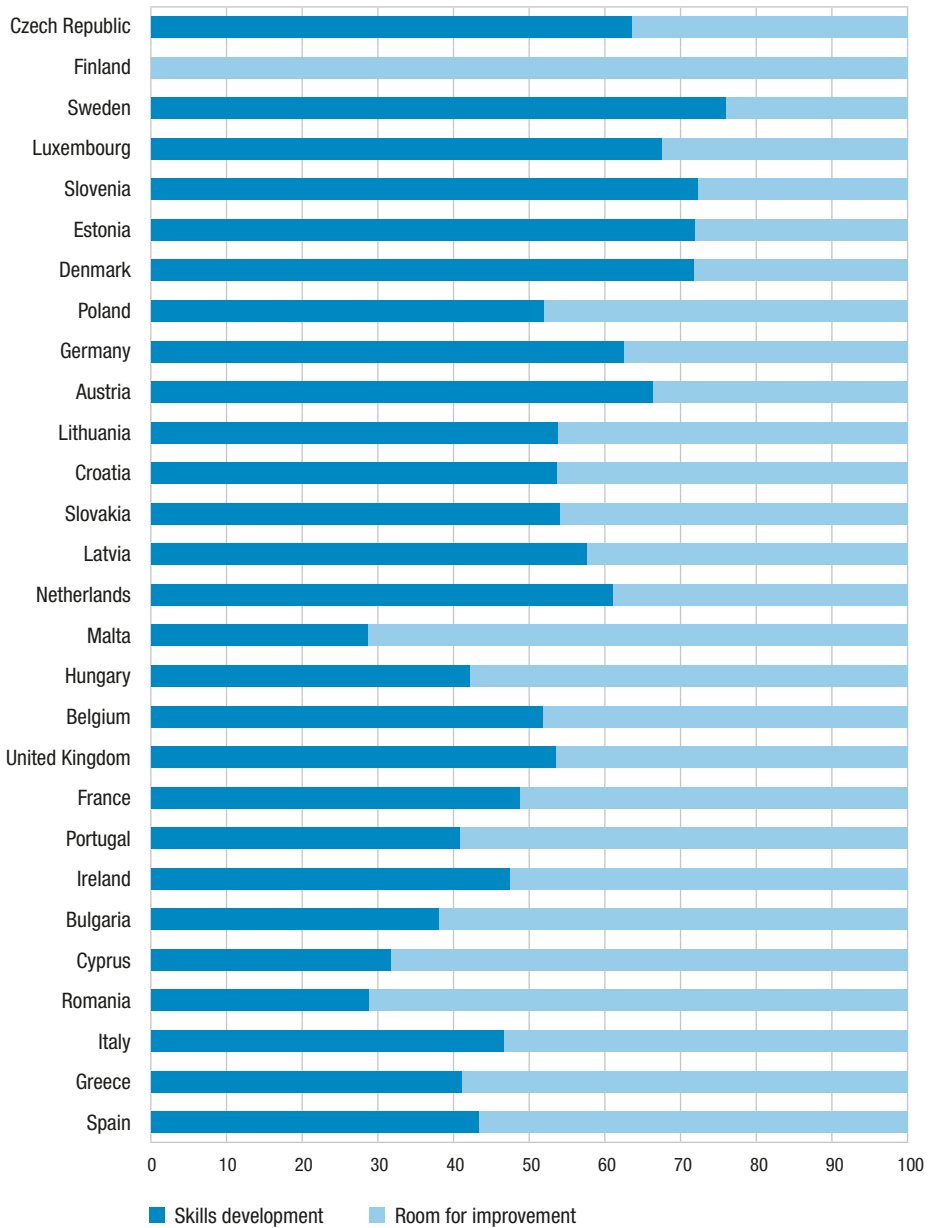
NB: Member States are sorted by ESI ranking.
Source: Cedefop, ESI 2018.

Even though it ranks first in the overall index, the Czech Republic could improve by enhancing its skills development system; the same is true for Malta (ranking last in skills development), which could improve its position in the ESI with better performance in skills development. It is clear from Figure 9 that there is potential for improvement for many Member States, particularly for those in the bottom half of the ranking.

3.2. Skills development profile

The skills development pillar is the result of a weighted average of two sub-pillars: basic education and training and other education.

Figure 10. **Skills development structure**
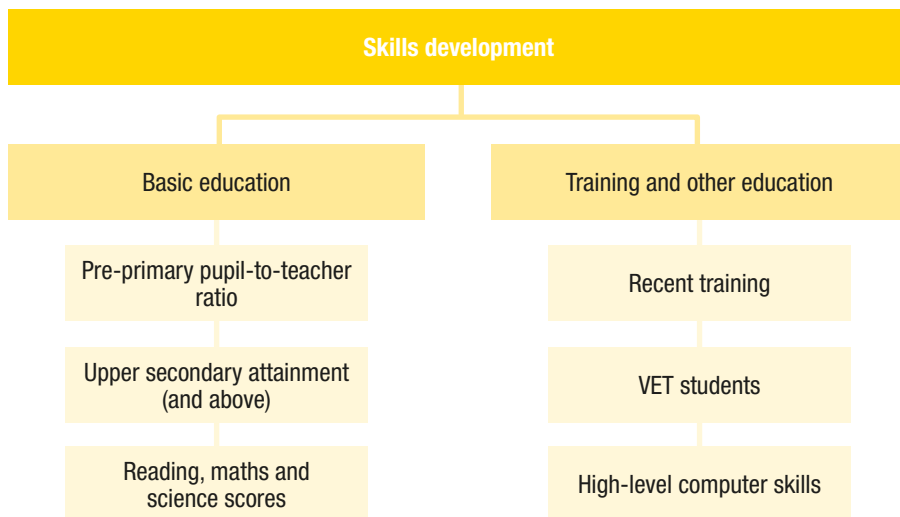
Source: Cedefop, ESI 2018.

The following indicators make up skills development:

(a) pre-primary pupil-to-teacher ratio shows the ratio of pupils and students to teachers/academic staff at the pre-primary level. A lower value for this ratio implies more teachers per groups of students and a higher quality of education. Early education is widely recognised as a significant factor affecting later individual outcomes (European Political Strategy Centre, 2017) the pre-primary pupil-to-teacher ratio indicator is included as a proxy for early education quality;

(b) upper secondary attainment (and above) shows the share of population aged 15 to 64 with at least upper secondary education (ISCED11 level 3). A higher value of this indicator can be interpreted as a higher level of educational attainment of the population;

(c) reading, maths and science score is the average PISA score (Box 2) for reading, mathematics, and science. This indicator measures the knowledge of 15-year-olds, denoting the quality of education. A higher value for this indicator signals better preparation among students. Box 2 features more information on this indicator;

(d) recent training shows the share of population aged 25 to 64 stating that they received formal or non-formal education or training in the four weeks preceding their participation in the European labour force survey. A high value for this indicator means that more workers are upgrading their skills;

(e) VET students shows the share of the population at ISCED11 level 3 who are undertaking VET. Within the group of graduates from upper secondary education, graduates from vocational education and training (VET) programmes have better employment prospects, particularly in countries where work-based learning is a strong component of VET programmes (European Commission, 2017c);

(f) high level computer skills indicator represents the share of 16 to 74 year-olds with high level computer skills, able to carry out five or six of the six tasks described in the European labour force survey. A high value for this indicator implies more digitally competent workers.

The data used in the construction of this pillar are in Annex 2. The data sources and definitions for all these indicators are in Annex 3.

Box 2. **PISA reading, maths and science scores (aged 15)**

The OECD's programme for international student assessment (PISA) is a triennial survey evaluating the skills of 15-year-old students worldwide in the domains of reading, mathematics and science. In 2015, 35 OECD countries and 37 partner countries participated in the survey, with a focus on science (OECD, 2016a). PISA students are aged between 15 years 3 months and 16 years 2 months at the time of the assessment and enrolled in an education institution at grade 7 or higher (OECD, 2016a).

To understand the characteristics of better performing education systems, the students also answer a questionnaire about their socioeconomic background, their motivations and other key factors that might shape learning in and outside of school (OECD, 2016a).

The PISA test score allows policy-makers to gauge the development of knowledge and skills in their own countries in comparison to those in other countries, set policy targets against measurable goals achieved by other education systems, and learn from policies and practices applied elsewhere (OECD, 2016a). PISA is a comparable and robust measure of progress towards quality and equity in education, for all countries, as set by the United Nations *Sustainable development goal 4*, 'inclusive and equitable quality education and promote lifelong learning opportunities for all'.

In the European Union (EU) context, the PISA score is adopted as one of the key monitoring indicators in the Education and training 2020 (ET 2020) framework, which sets the aim of reducing the share of low-achieving pupils in reading, mathematics and science, as measured by PISA, to less than 15% (European Commission, 2018b). As shown in Figure 11, the EU not only had not yet met the target in 2015, but, according to the PISA 2015 survey, suffered a setback compared with the 2012 survey. This makes the debate on how schools and teaching need to be improved even more timely (European Commission, 2018b).

Given its importance for policy-making, the PISA score is included among the indicators making up the ESI within the sub-pillar 'basic education', to capture the effectiveness of Member States' education systems in achieving basic skills. The PISA score is used in ESI by averaging the scores in the three domains (reading, maths and science), given that an overall score is not available. At the same time, it is acknowledged that these indicators are not all-inclusive regarding basic skills.

Source: Cedefop in consultation with OECD.

Figure 11. **Underachievement across EU in reading, mathematics and science**

Underachievement in basic skills (age 15 years-old)

Education and Training Monitor 2017

Reading
2012: 17.8%
2015: 19.7%

Maths
2012: 22.1%
2015: 22.2%

2 + 2

Science
2012: 16.6%
2015: 20.6%

TARGET below 15%

Source: OECD (PISA, 2015)
Illustration: © European Commission

European Commission
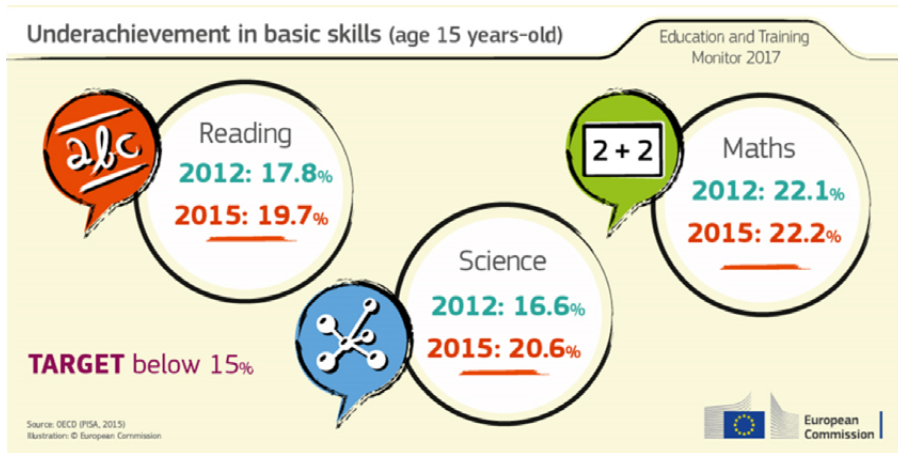
Source: European Commission (2018b).

Figure 12 shows the scores for skills development and its two sub-pillars, basic education and training and other education. The square represents the pillar score, while the two lines represent the sub-pillar scores (the brighter colour is basic education; the darker colour is training and other education).

The score at the pillar level is the result of averaging the scores at the sub-pillar levels. For example, Estonia has a high score in basic education, and a lower score in training and other education, with the overall pillar score in the middle between the two sub-pillar scores. Ireland is a more extreme example, with significant distance between the two pillar scores.

Figure 12 also shows on which sub-pillar the Member States should first concentrate their efforts to improve their skills development. For example, France could give priority to improving its performance in basic education. Other Member States, such as Denmark, Spain Italy and the UK, show a similar performance in both sub-pillars and so should concentrate on reducing the gap between the pillar score and desirable 100 value.

Table 5 shows the scores at the indicator level within the skills development pillar. Member States generally fare better in the sub-pillar basic education, with an average score of 59 compared with 50 for the other sub-pillar training and other education. The scores in Table 5 point to a fairly good quality of basic education, although there is still room for improvement in the

Figure 12. **Skills development and sub-pillars scores**
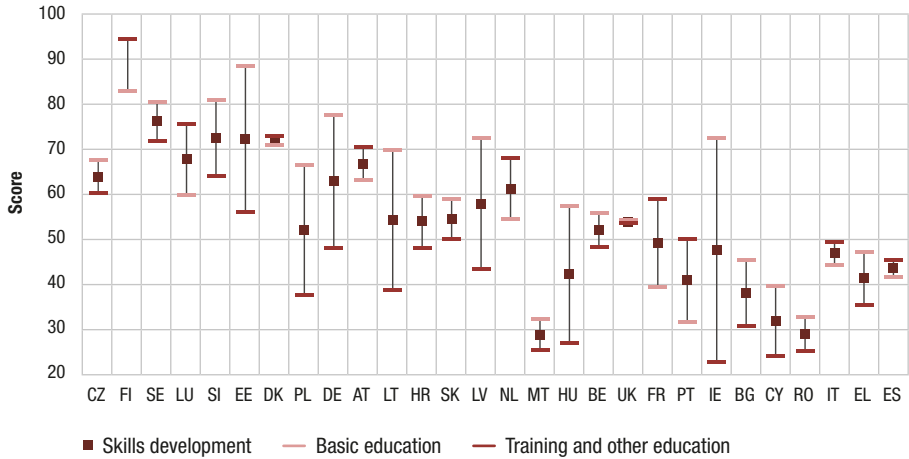
Source: Cedefop, ESI 2018.

indicators for many Member States, particularly in the reading, mathematics and science. It also appears that most of the Member States have more room to improve other forms of education and training (see the scores under training and other education).

In Table 5 the 'recent training' indicator, has a low score for most Member States with an average at EU level of 34 out of 100. Reflecting on this, policy-makers should act in light of the ET 2020 target on lifelong learning, which states that at least 15% of adults should participate in lifelong learning (European Commission, 2018b). Exceptions in this indicator are Denmark, Finland and Sweden, whose score is close to the best possible value (100). The indicator 'VET students' shows uneven performance, with several Member States scoring close to the best value (such as the Czech Republic) and others scoring at or close to zero (such as Malta and Ireland). Most Member States perform well on the 'upper secondary attainment (and above)' indicator, with an EU average score of 63 out of 100.

Box 3 features a discussion of the performance of Finland across all indicators in skills development.

Table 5. **Skills development: scores across indicators**

Member State	Basic education			Training and other education		
	Pre-primary pupil-to-teacher ratio	Upper secondary education (and above)	Reading, maths & science scores	Recent training	VET students	High level computer skills
Belgium	43	55	74	21	76	44
Bulgaria	61	70	-	4	64	21
Czech Republic	53	94	60	27	97	51
Denmark	77	58	76	92	47	82
Germany	77	76	80	26	56	59
Estonia	84	83	99	51	40	77
Ireland		64	81	19	-	49
Greece	64	50	22	10	33	59
Spain	44	19	60	29	38	67
France	3	61	66	61	48	67
Croatia	63	74	42	7	93	38
Italy	55	21	53	25	70	49
Cyprus	50	65	-	20	10	41
Latvia	74	88	55	22	46	59
Lithuania	73	94	42	17	26	69
Luxembourg	70	55	51	54	79	90
Hungary	60	71	40	18	18	44
Malta	60	-	27	22	4	49
Netherlands	34	55	80	61	90	51
Austria	54	76	61	48	90	69
Poland	43	89	75	9	63	36
Portugal	29	-	67	30	48	69
Romania	41	55	-	1	71	-
Slovenia	79	82	82	37	90	62
Slovakia	60	89	27	7	91	46
Finland	75	79	97	88	94	100
Sweden	98	72	66	99	41	79
United Kingdom	27	74	70	46	46	67

Source: Cedefop, ESI 2018.

Box 3. **Finland leading the way in skills development**

Finland is the top performing Member State in skills development with a score of 89 out of 100, scoring 83 in basic education and 94 in training and other education sub-pillars. It reaches the best achievable value for indicators such as reading, mathematics and science (aged 15) and high level computer skills, in addition to being among the top performers for the other indicators in this pillar. It provides an effective basic education and possibilities to enhance skills beyond the compulsory level (as indicated by the score in the recent training indicator, much higher than for most other Member States), producing a skilled workforce.

Finland is also a top performer in VET students (scoring 94 out of 100) and has the highest proportion of students in VET, and of adults in lifelong learning, in the EU (European Commission, 2016b). Nevertheless, it continues to modernise school education and VET, and promote adult learning, with higher education undergoing reform to increase its efficiency and relevance (European Commission, 2016b).

The older generation (over 45 years) in Finland has Europe's highest attainment rates of tertiary education, with almost half of the country's workforce employed in high-skilled occupations (WEF, 2017). It has already met the target set in the EU2020 strategic framework (European Commission, 2018b) for education, given its share of underskilled in reading, mathematics and science is below the target of 15% for all the subjects, and its share of tertiary graduates among 30 to 34 year-olds (45% in 2017) compares well against an average target for the EU of 40% and the one specific for Finland of 42% (European Commission, 2018b).

Source: Cedefop.

3.3. Slow change in skills development

Figure 13 shows ESI rankings in skills development over recent years. Most Member States maintained their rankings throughout the period, except the UK which fell from 12th to 15th place. While changes in relative performance (rankings) were not observed, changes in scores were seen.

Positive growth in skills development occurred in 19 Member States over the period examined. Of the seven in the low-achievers group, only Ireland experienced a reduction, with Cyprus recording 12% growth in its score between 2014 and 2016. Three of seven in the leaders group experienced a reduction over the same period. This trend might point to a process of catching-up, with the low-achievers group slowly improving their

skills development system from their low starting point, and some better performing countries facing difficulties in improving beyond the high scores they have already achieved in skills development.

3.4. Policy implications

The power of ESI lies in its capacity to reveal much about the performance of skills systems in the Member States. Individual pillars and indicators reveal in-depth aspects of the skills system. In the case of the skills development pillar, the results discussed in this chapter suggest that policy-makers should focus their effort on providing the means to improve the skills of the population beyond the compulsory level in education, by supporting the delivery of suitable lifelong learning. There is also scope to improve the quality of existing basic education, as indicated by the average score of the 'reading, mathematics and science' indicator, which is 55 out of 100.

Figure 13. **Relative performance of Member States between 2014 and 2016**
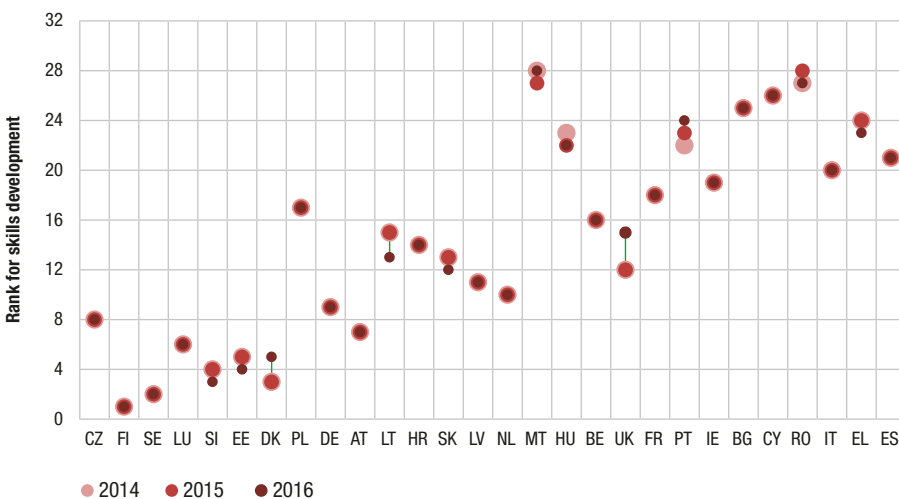
NB: Member States are sorted by ESI ranking.
Source: Cedefop, ESI 2018.

The New skills agenda (European Commission, 2016a) includes similar conclusions: it recognises the need to strengthen the VET system and to promote learning at the workplace. It also acknowledges the need to improve the foundation of basic literacy and numeracy skills. To tackle the first issue, the Commission adopted a proposal, subsequently agreed by EU ministers, to boost apprenticeships in Europe by setting out seven criteria for learning and working conditions and seven for framework conditions (European Commission, 2017a). The development of skills is further recognised as one of the 20 pillars of the European pillar of social rights where it is stated that 'Everyone has the right to quality and inclusive education, training and lifelong learning in order to maintain and acquire skills that enable them to participate fully in society and manage successfully transitions in the labour market' (European Commission, 2017d).

Figure 14 shows the positive relationship between skills development scores and GDP per capita as a proxy for income; Member States with better skills development performance have also a higher level of GDP per capita. The colours identify the Member State groups from Figure 3. Figure 14 also shows that Member States with similar skills development scores have very different levels of GDP. For example, Denmark and Estonia have the same score in skills development, 72 out of 100, but Denmark has twice the income of Estonia. Many factors influence the level of GDP per capita, so the graph is not meant to draw strong conclusions about causality between the development of skills and income per capita. Nevertheless, the evidence points to an overall positive relationship between skills development and GDP per capita. This might mean that richer countries are better able to afford high-quality education systems that foster skills development, or it may indicate a degree of simultaneity where skills development and GDP per capita develop hand in hand.

Figure 14. **Relationship between skills development and GDP
per capita, 2016**
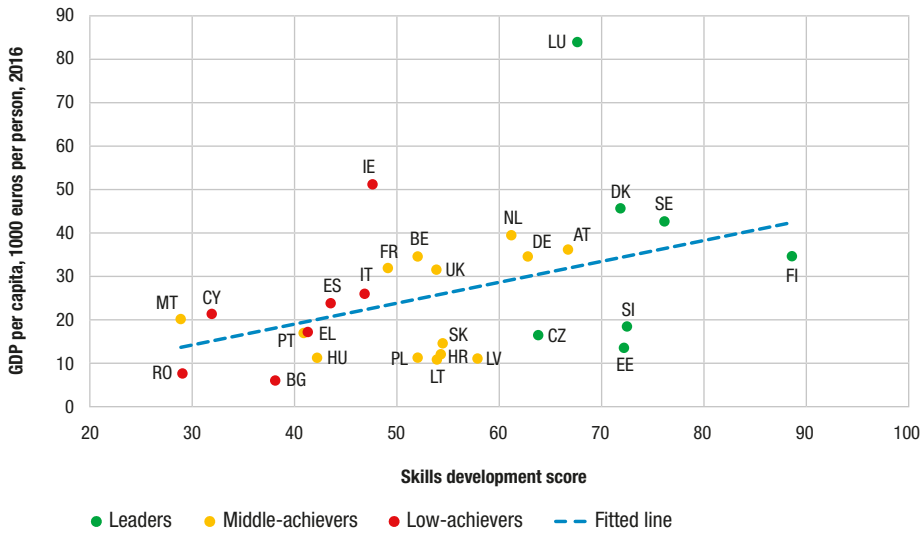
Source: Cedefop, ESI 2018 and the annual macroeconomic database of the European Commission Directorate
General for Economic and Financial Affairs, AMECO.

CHAPTER 4.
Skills activation

Skills activation includes the transition from education to work, together with labour market participation for different groups of the population, to identify the representation of key groups within the labour market. Skills activation comprises the processes of the skills system and the functions set in place (via the institutional framework) to activate the skills developed. The skills activation pillar measures the outcomes of these processes. The outcomes of skills development and skills activation determine available supply within a skills system. The overview section presents and discusses the scores obtained by the Member States in the skills activation pillar. Section 4.2 analyses the scores at sub-pillar and indicator levels, highlighting the underlying drivers of the skills development pillar. Section 4.3 focuses on developments during 2014-16 and Section 4.4 concludes with the policy implications for Member States.

4.1. Overview

Figure 15 shows the skills activation scores for each Member State. The dark green bars represent the skills activation score and the light green bars show the room for improvement in each Member State, the distance from the actual score to 100. The shorter the light bar, the closer is the Member State to the best possible score in the skills development aspect of the skills system (100).

Skills activation is the pillar where Member States fare better, with an average score of 58 out of 100 compared with the average score of 54 out of 100 for both skills activation and matching. Similar to the skills development pillar, the ranking here is not the same as the ranking in the overall index. It is possible to find Member States that rank in the bottom half of the overall European skills index (ESI) but in the top half on the skills activation pillar, such as the Netherlands and the UK. The best performing country is Sweden, with a score of 87 out of 100, while the worst performing is Italy, with a score of six out of 100.

Figure 15. **Skills activation scores**
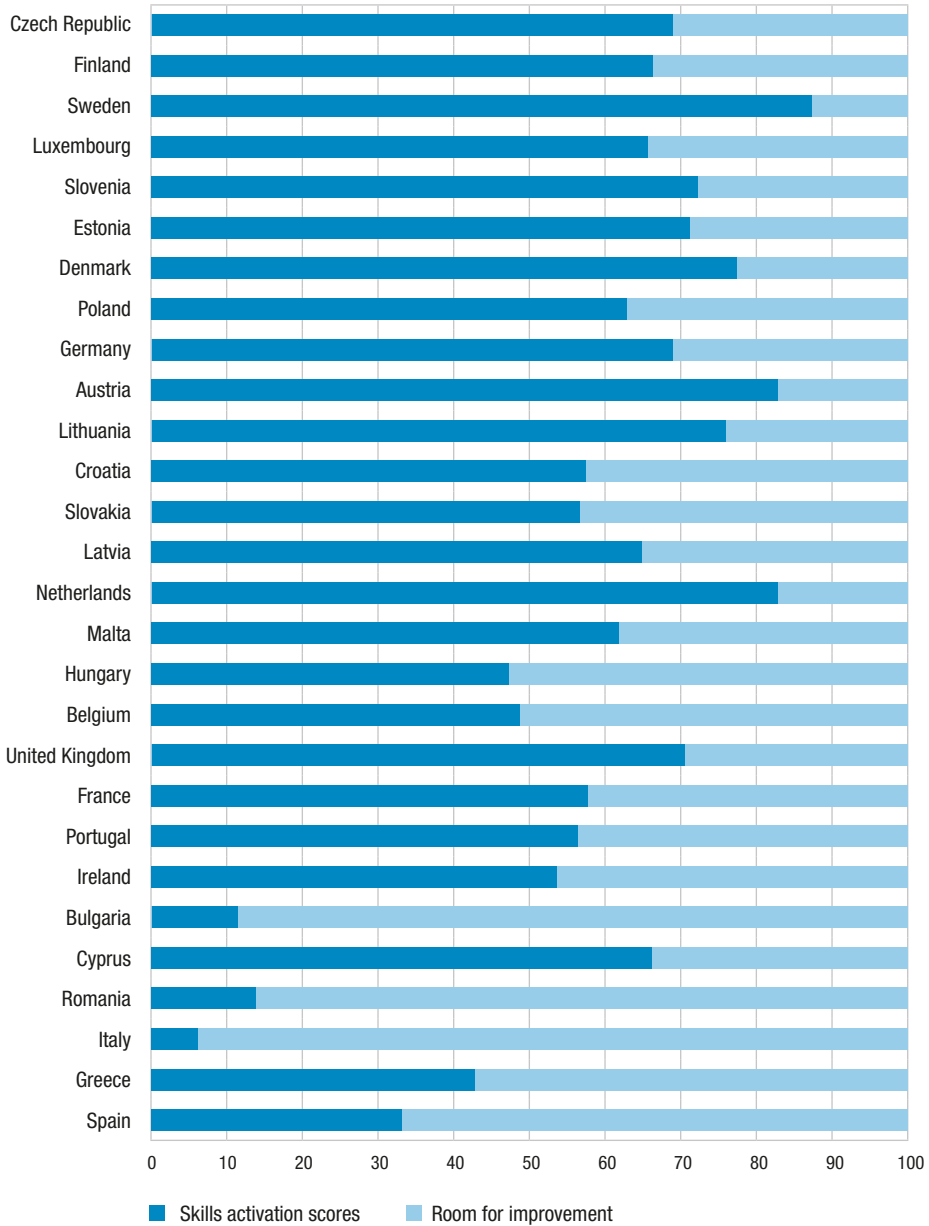
NB: Member States are sorted by ESI ranking.
Source: Cedefop, ESI 2018.

4.2. Skills activation profile

The skills activation pillar is the result of the weighted average of the two sub-pillars 'transition to work' and 'labour market participation'. Figure 16 shows the sub-pillars and the indicators that comprise the skills activation pillar.

Figure 16. **Structure of skills activation pillar**
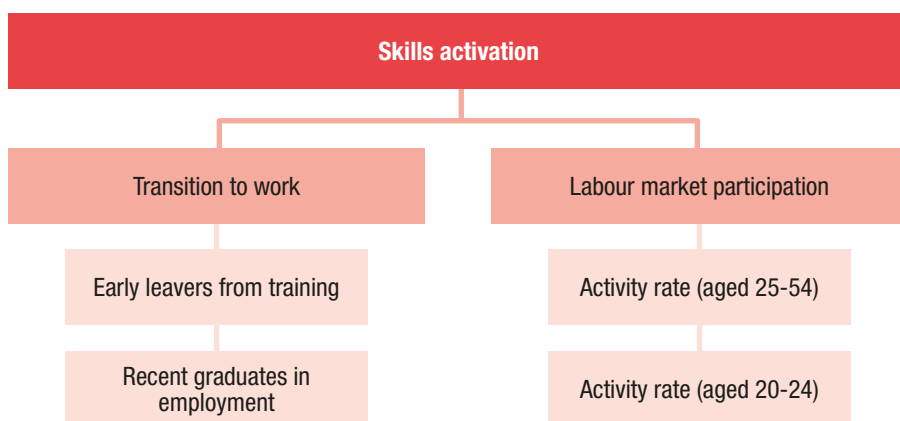
Source: Cedefop, ESI 2018.

The following indicators are used in the construction of this pillar:

(a) early leavers from education and training (work status 'not in employment') captures the share of the population, aged 18 to 24 having attained ISCED11 level 0 to 2 and not receiving any formal or non-formal education or training in the four weeks preceding the European labour force survey (Eurostat, 2018a). Early leavers experience reduced lifetime earnings and longer and more frequent unemployment spells; early leaving also brings large public and social costs (Brunello and De Paola, 2013). A high value for this indicator implies that people with, at most, lower secondary education have difficulties finding jobs and are not improving their employability through further training. A broader indicator is monitored in the *Strategic framework: education and training 2020:* the ET 2020 benchmark refers to reducing the share of young people (aged 18 to 24) in total population having completed lower secondary education at most, and not being in further education or training, to less than 10% by 2020

(European Commission, 2018b; European Commission, 2017c). In 2016, 17 of the 28 Member States achieved this target (European Commission, 2017c). Since the indicator used in the index is based on a sub-population of that used for benchmarking, the best achievable target was set to 2% which is close to the minimum value observed for this indicator across the seven years;

(b) recent graduates in employment captures the share of employed people aged 20 to 34 having successfully completed upper secondary or tertiary education one to three years before the reference year of the European labour force survey and who are no longer in education or training (Eurostat, 2018a). A low value for this indicator implies difficulty for recent graduates to find employment, which is a waste of skills and, possibly, of public resources. This indicator is monitored in the *Strategic framework education and training 2020* target 5: 'the share of employed 20 to 34 year-olds having successfully completed ISCED 3 to 8 one to three years […] who are no longer in education or training [should be at least] 82%' (European Commission, 2018b, see preface). In 2016, almost half of the Member States achieved this target. Therefore, for the purpose of this index, the best achievable target was set to 95%, close to the maximum value observed for this indicator across the seven years. More information on this indicator is featured in Box 4;

(c) activity rate of 25 to 54 year-olds captures the number of active persons aged 25 to 54 as a share of total population of the same age (Eurostat, 2018c). The supply of skills can be increased through higher activation. High values for activity rate are a signal of healthier labour markets;

(d) activity rate of 20 to 24 year-olds captures the number of active persons aged 20 to 24 as a share of total population of the same age (Eurostat, 2018c). Integrating under-represented groups into the labour force can increase the skills base in an economy. High values are a signal of healthier labour markets.

The data used in the construction of this pillar are in Annex 2. The data sources and definitions for all these indicators are in Annex 3.

Box 4. **More recent graduates in employment in 2016**

The recent graduates in employment indicator captures the share of the employed aged 20 to 34 having successfully completed upper secondary or tertiary education one to three years before the reference year of the survey and who are no longer in education or training (Eurostat, 2018a). ET 2020 sets a target level of at least 82% (European Commission, 2018b) for this indicator. The inclusion of such a policy-relevant indicator is deemed crucial for monitoring the skills activation part of a skills system.

Since the 2008 crisis, the employment rate of recent graduates at European Union (EU) level has improved, reaching 78% in 2016, close to the goal of 82% (European Commission, 2018b). There are significant differences between the types of graduate and across Member States. At EU level, individuals holding a tertiary degree have an employment rate of 83%, slightly exceeding the target, while individuals with an upper and post-secondary vocational education have a rate of 73%. Graduates with general, non-vocational, upper and post-secondary education fare even worse; around 60% is still far from the target (Figure 17).

Many Member States have yet to achieve the overall target, with some of them failing to reach it for both the upper secondary and tertiary level. While almost all Member States need policy measures aimed at increasing the employment of individuals with an upper secondary degree, some need to improve entry to the labour market for all new graduates.

While the EU has moved closer to the target for employment, the future debate should also include the match between jobs and the skills workers possess (European Commission, 2018b); in tertiary education, the mismatch remains high. More discussion on tertiary graduates' mismatch is in Box 6.

Within the ESI composition, this indicator is included in the sub-pillar 'transition to work' to capture the quality and the relevance of the education of recent graduates in meeting the needs of Member State labour markets (Figure 17).

Source: Cedefop in consultation with Directorate General for Employment, Social affairs and inclusion.

Figure 18 shows the distribution of Member States scores for the pillar and its two sub-pillars. The square represents the pillar score, while the two lines represent the sub-pillar scores (brighter colour, transition to work; darker colour, labour market participation). Member States perform slightly better in the transition to work sub-pillar (with an average score of 60 out of 100) than in the labour market participation sub-pillar (average 57 out of 100).

Figure 17. **Employment rate of recent graduates by ISCED level, 2016**

Legend:
- Upper secondary and post-secondary non-tertiary education (levels 3 and 4) - General
- Upper secondary and post-secondary non-tertiary education (levels 3 and 4) - Vocational
- Tertiary education (levels 5-8)
- Target
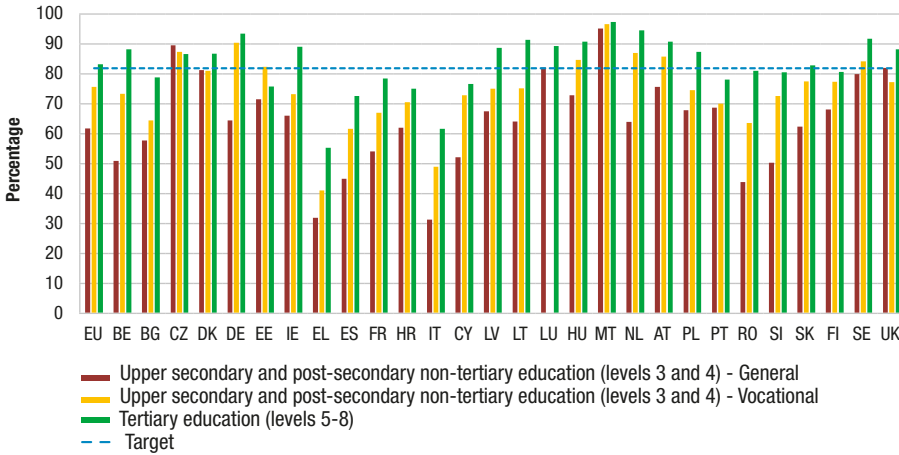
Source: European Commission (2018).

Figure 18. **Distribution of skills activation and sub-pillars score**

Legend:
- Skills activation
- Labour market participation
- Transition to work
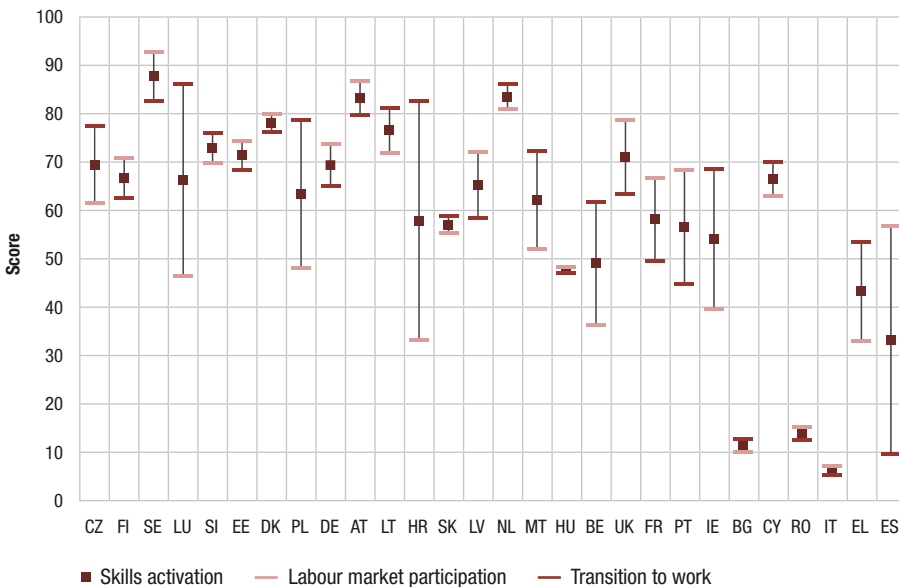
NB: Member States are sorted by overall ESI ranking.
Source: Cedefop, ESI 2018.

The score at pillar level is the weighted average of scores at the sub-pillar levels. For example, Luxembourg has a high score in transition to work and a lower score in labour market participation, with the overall pillar score sitting between the two. Other Member States are more balanced, as with Hungary, which scores almost the same for the two sub-pillars and therefore the pillar.

Figure 18 indicates which sub-pillar performance the data suggest should be improved first. Croatia and Spain have the biggest gap between the sub-pillar scores so it is recommended that they focus on improving the sub-pillar with the lowest relative score (transition to work for Spain and labour market participation for Croatia). Other Member States such as Bulgaria, Italy and Romania have a similarly low score in both sub-pillars; best practices and policies related to skills activation in top scoring Member States may inspire action in these three countries.

Table 6 shows the scores at the indicator level within the skills activation pillar. The indicators making up the transition to work sub-pillar show significant variations in performance among Member States (particularly in early leavers from training) and sizable room for improvement for Spain, Italy and Romania. Regarding early leavers from training, 26 out of 28 Member States reached the target set by the ET 2020 (European Commission, 2018b) for a similar indicator, while 11 out of 28 reached the target for recent graduates in employment. Within the labour market participation sub-pillar, Member States have lower activity rates for the younger cohorts (20 to 24), with an average score of 52 out of 100, than for the older ones (25 to 54), average 62 out of 100. This means that there is room for increasing the skills base in these Member States by integrating younger people into the labour market more. Exceptions are Ireland, Croatia, Malta and the UK, where activity rates for 20 to 24 year-olds are significantly higher than for 25 to 54 year-olds. At the same time, the EU needs a more highly educated labour force to face the new challenges related to automation. For this reason, lower activity rates for 20 to 24 year-olds are expected since this age group is expected to spend more time in higher education.

4.3. Small changes in skills activation

Figure 19 shows the changes in ranking over the investigation period (2014-16) within skills activation. There are a few more changes compared with those in the skills development ranking over the same period with some

Table 6. **Distribution of skills activation indicators**

Member State	Transition to work		Labour market participation	
	Early leavers from training	**Recent graduates in employment**	**Activity rate (aged 25-54)**	**Activity rate (aged 20-24)**
Belgium	60	66	51	21
Bulgaria	-	43	20	-
Czech Republic	76	79	89	34
Denmark	78	72	74	85
Germany	55	88	73	74
Estonia	74	55	78	70
Ireland	71	61	12	67
Greece	76	-	55	11
Spain	-	33	74	39
France	51	45	75	58
Croatia	99	44	20	46
Italy	8	-	-	14
Cyprus	80	46	68	58
Latvia	55	66	78	66
Lithuania	86	69	93	50
Luxembourg	90	76	72	21
Hungary	35	75	61	36
Malta	60	100	20	84
Netherlands	85	88	69	92
Austria	79	82	84	89
Poland	85	63	49	47
Portugal	44	47	91	45
Romania	2	36	19	11
Slovenia	85	54	100	39
Slovakia	58	62	76	34
Finland	65	56	63	78
Sweden	84	79	100	85
United Kingdom	59	74	61	96

NB: Dashed lines in the table mean that the score for the indicator is zero.
Source: Cedefop, ESI 2018.

Member States moving in ranking by two or three places (as with Croatia, Luxembourg, and Finland). Other Member States, particularly at the bottom of the ESI ranking (Greece, Spain and Italy) maintained their position through the period. Examples of Member States with significant variations are Cyprus, losing eight places in ranking, and Estonia, gaining six places. Cyprus is also one of the Member States that increased its skills development scores the most over the period (as shown in Figure 13 in Section 3.3) which raises questions about why the improvement was not matched in skills activation. Box 5 provides some insights.

Figure 19. **Skills activation change in ranking, 2014-16**
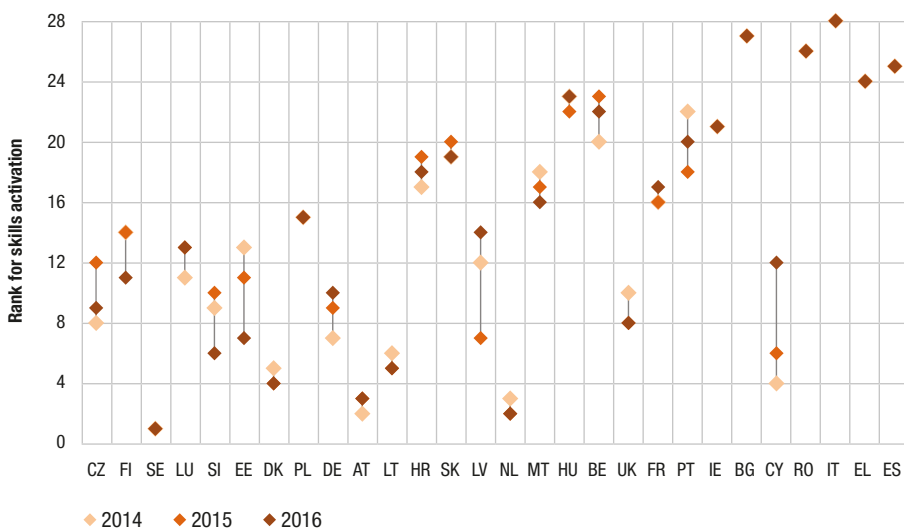
NB: Member States are sorted by overall ESI ranking.
Source: Cedefop, ESI 2018.

Box 5. **Worsening skills activation in Cyprus**

Figure 20 displays the scores for the indicators included in the skills activation pillar for Cyprus between 2014 and 2016. Over this period, the performance of Cyprus for all indicators except recent graduates in employment worsened. The employment rate of the population aged 20 to 64 decreased

considerably during 2009-15 as a consequence of the economic crisis. Regardless of the reduction in Cyprus' relative performance in this pillar from 2014 to 2015, it scores above the median in the skills activation pillar in 2016. Despite the percentage of recent graduates in employment improving significantly, there is still a lot of room for improvement in this indicator: Cyprus is still 54 points below the best achievable target. The activity rates of 20 to 24 year-olds in Cyprus have also fallen over time, and the percentage of early leavers from training (*), an indicator in which Cyprus was close to target in 2014, has increased. It has made an effort to increase participation in adult learning and VET but the participation in education and training is lower than the EU average (European Commission, 2017b). Training provision for the unemployed has become vitally important in recent years and resources have been redirected towards the prevention and reduction of unemployment. Targeted training provision has been offered to the unemployed and incentives to increase their participation in VET have been increased. To support young inactive workers, and so increase their activity rates, increased emphasis has been placed on introducing measures combatting youth unemployment, most of which are included under the Youth guarantee implementation plan (Korelli and Mourouzides, 2016).

All these measures may contribute to the increase in 'recent graduates in employment' indicator over the period in Figure 19.

Figure 20. **Cyprus: skills activation indicators score, 2014-16**
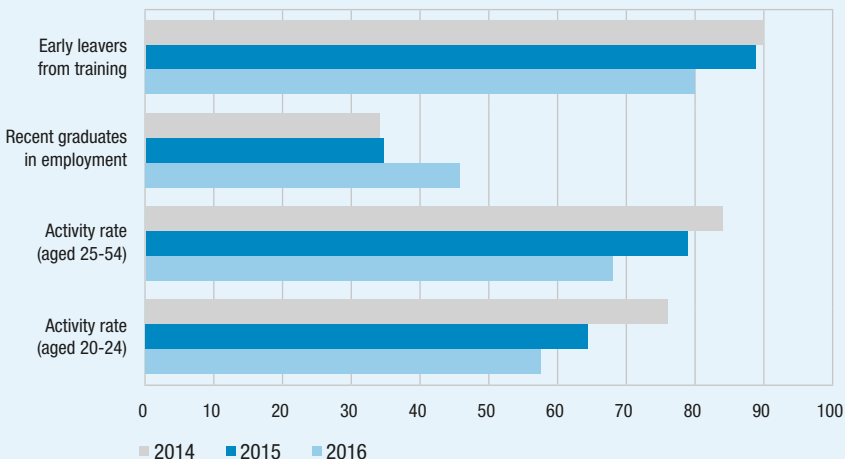
Source: Cedefop, ESI 2018.

(*) In Figure 20, the score of the indicator has decreased, since the aspirational target for this indicator is to have the lowest possible percentage of early leavers from training.

Source: Cedefop.

Of the 28 Member States, 20 improved their ESI scores in the skills activation pillar between 2014 and 2016, although some only marginally. Four of seven Member States in the low-achievers group experienced a fall, pointing to persistent difficulties in improving skills activation in these countries. Caution is required when interpreting the situation in Italy: it is an outlier, with a 72% increase, but this is simply the result of the country having a very low starting value. In conclusion, small changes were observed in scores and in ranking over the period 2014-16.

4.4. Policy implications

The skills activation pillar shows the extent to which Member States are capable of activating the skills of their labour forces in the labour market.

There are two dimensions to be considered. First, the transition to work part seems to be relatively well-functioning across the EU, with most Member States having rates of early leavers from training below the ET 2020 target of 10% for a similar (and more broad) ESI indicator ([11]), and with 11 of 28 Member States having reached the target of 82% for recent graduates in employment (European Commission, 2018b). There is, however, significant variation between Member States, with Spain, Italy and Romania having significant room for improvement. Austria and the Netherlands may be used as good examples for 'what works' policies on advancing skills activation in these countries.

Looking at the labour market participation sub-pillar, it is possible to see an imbalance between the activity rates of the two cohorts, with the younger one (20 to 24) having lower activity rates than the older one (25 to 54). It can be argued that the activity rate for the 20 to 24 age band is expected to be lower, because people in that age band are more likely to be studying or in training. Other things being equal, a high activity rate for 20 to 24 year-olds could imply a lower likelihood of people being inactive and not studying, and can signal good potential opportunities in the labour market for the younger cohort and those who are not in tertiary education. As can be seen in Figure 21, higher activity rates (20 to 24) are associated with higher scores

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([11]) In this report, the indicator 'early leavers from training' is considered for those with labour status 'not in employment', while the ET 2020 benchmark considers all labour market statuses.

in recent graduates in employment. Member States could create good job opportunities for the young cohort to be part of the labour market.

The skills development and activation pillars determine the available supply of skills in the system. In the theoretical framework, the first two pillars can be interpreted as the skills formation part of a skills system. In Figure 22, Member States can be analysed by classifying them in one of four categories based on their scores in skills development and activation:

(a) leaders in developing and activating: Austria, Finland and Sweden have significantly expanded the development area of their skills system and their labour force are able to find employment;

Figure 21. **Activity rates (20 to 24) versus recent graduates in employment**
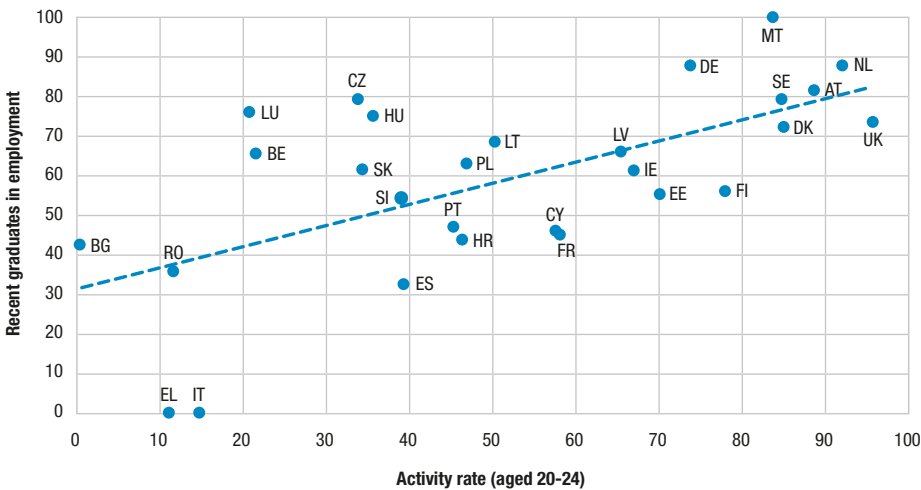
Source: Cedefop, ESI 2018.

(b) activating but not developing: Member States such as Cyprus still have significant room for improvement in the development of skills but are deploying a good share of their labour force across the economy;

(c) developing but not activating: better than average skills development but less than average in activating the skills in the economy. There are no Member States in this category;

(d) neither developing nor activating: Member States such as Bulgaria, Italy and Romania exhibit lower than average performance in both the skills development and skills activation areas of their skills system.

In Figure 22, the overall performance in the ESI has been added by distinguishing the Member States into the three groups: leaders, middle-achievers and low-achievers. All are either in the top-right or the bottom-left quadrants. Those classified as being in the leaders group (Figure 3) also belong to the 'leaders in developing and activating' group, top-right quadrant. The low-achievers group belong mostly to the bottom-left quadrant, 'neither developing nor activating'.

It is possible to see in Figure 22 a clear relationship between skills development and skills activation, with Member States performing better in the former also obtaining better results in the latter. This confirms the ESI theoretical framework that groups these two pillars as those influencing the supply of skills, effectively providing the skills formation part of the system. From a policy perspective, skills development and activation seem to work towards the same direction, so policies targeting the one aspect may well influence the other.

Figure 22. **Skills activation versus skills development**
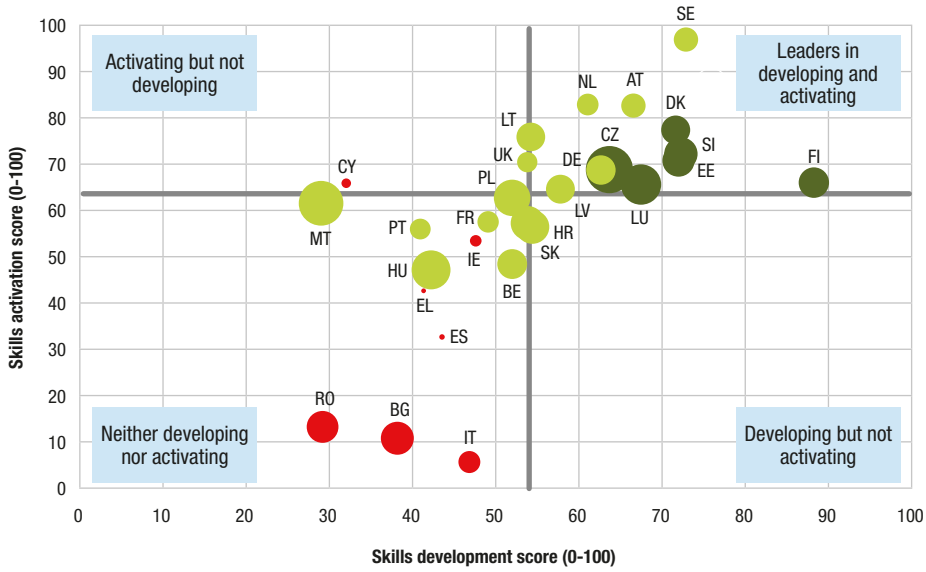
NB: The size of the bubble represents the score in the skills matching pillar.
Source: Cedefop, ESI 2018.

CHAPTER 5.

Skills matching

Skills matching considers the extent to which the skills developed and activated, are matched to the demand; it covers the outputs of a skills system. The skills matching pillar observes this dimension in the form of various mismatches, including long-term unemployment, underemployment, and underutilisation of skills in the labour market. Sub-pillars are included to distinguish skills utilisation and skills mismatches. The overview section presents the scores obtained by EU Member States on the skills matching pillar. Section 5.2 discusses the scores at the sub-pillar and indicator levels, highlighting the underlying drivers of the skills matching pillar. In Section 5.3, the analysis focuses on developments during 2014-16, considering changes in both ranking and scores. Section 5.4 considers the policy implications inferred from the skills matching pillar in-depth analysis.

5.1. Overview

Figure 23 shows the skills matching scores for each Member State. The dark blue bars represent the skills matching score, while the light blue bars show the room for improvement for each. The shorter the light bar, the closer the Member State is to the 'best' possible score in the skills matching aspect of the skills system (100).

The average skills matching score across Member States is 54 out of 100, with significant variations in performance and significant room for improvement in most Member States. The performance in skills matching does not reflect the performance in the overall index. The Czech Republic ranks first both in the overall index and in the skills matching pillar, but other Member States such as Bulgaria, Croatia, Hungary, Malta, Romania and Slovakia perform well in skills matching but much less so on the overall index. The worst performing Member State in skills matching is Greece, closely followed by Spain and Cyprus.

Figure 23. **Skills matching scores and room for improvement**
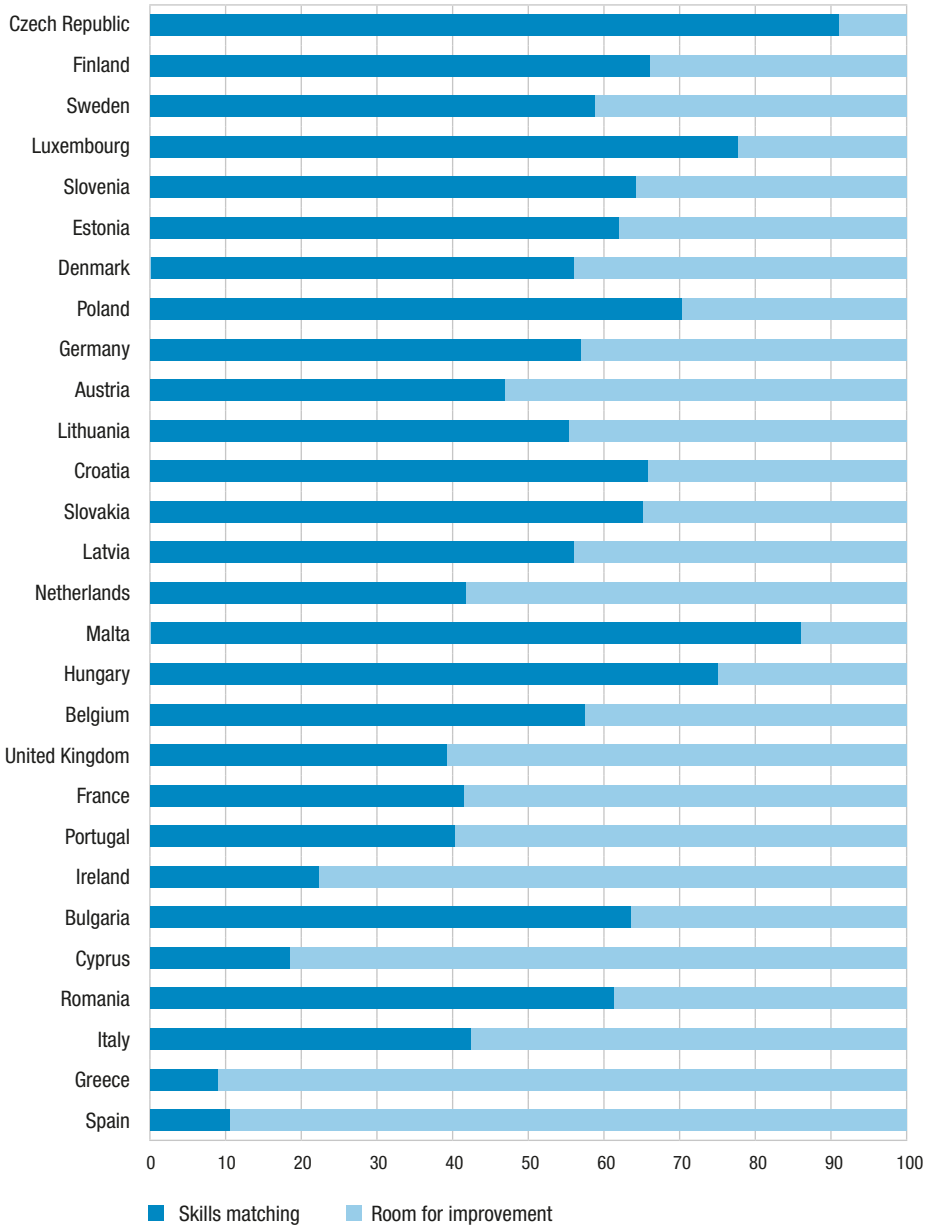
NB: Member States are sorted in ascending order by ESI score.
Source: Cedefop, ESI 2018.

5.2. Skills matching profile

Figure 24 shows the sub-pillars and the indicators making up the skills matching pillar.

Figure 24. **The structure of skills matching**
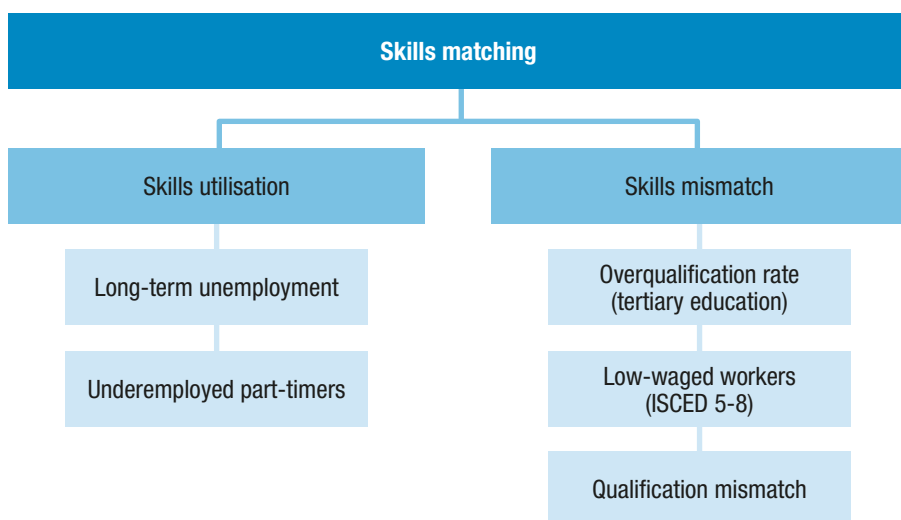
Source: Cedefop, ESI 2018.

The following indicators are included in the skills matching pillar:

(a) 'long-term unemployment' shows the share of the unemployed for more than 12 months as a share of the active population. A high value for this indicator signals mismatch insofar as the skills possessed by the unemployed do not meet the requirements of the labour market, resulting in long spells of unemployment;

(b) 'underemployed part-timers' shows the number of workers aged 15 to 74 who declare that they work part-time because they are unable to find full-time work, as a share of the active population. A high share of underemployed part-time workers implies underutilisation of skills because people able and willing to work more are forced into part-time jobs;

(c) 'overqualification rate' shows the share of the employed aged 25 to 34 qualified to ISCED levels 5 or 6 (tertiary level education) that occupy jobs not corresponding to ISCO 1, 2 or 3 (management, professional, and

associate professional). Expectation is that better-educated people have jobs that require their incumbents to be educated to ISCED levels 5 or 6. A high value for this indicator would imply skills not matched with the appropriate occupation level. Overqualification is featured in Box 6;

(d) 'low-waged workers' (ISCED 5 to 8) shows the proportion of low-wage earners of the employees with ISCED11 5 to 8 qualifications, where low wage is defined as being two-thirds or less of national median gross hourly earnings. Higher qualifications are typically expected to correspond to higher earnings, so a high value for this indicator implies a mismatch between skills acquired through education and the earnings received;

(e) 'qualification mismatch' shows the extent to which each employee's educational attainment matches the modal education attainment level for each occupation in each industry. It measures incidences of both underqualification and overqualification. A high value for this indicator suggests that workers end up in an occupation not matching their level of education.

The data used in the construction of this pillar are in Annex 2. The data sources and definitions for all these indicators are in Annex 3.

Box 6. **Overqualification rate among tertiary graduates**

There is no general agreement on the way to measure skills mismatches. Using European Union labour force survey data, Eurostat proposes measuring skills mismatch through the extent of education-occupation mismatch (Eurostat, 2018d). One way to measure skills mismatch is through overqualification rates. Overqualified workers are defined as those with tertiary education who are working in occupations for which such qualifications are not required (Eurostat, 2017).

Within the composition of the ESI, the overqualification rate indicator shows the share of young people (aged 25 to 34) who are tertiary level graduates (ISCED11 levels 5, 6, 7 or 8) employed in jobs other than managers (ISCO-08 major group 1), professionals (ISCO-08 major group 2), or technicians and associate professionals (ISCO-08, major group 3). When individuals with a tertiary level of educational attainment occupy jobs demanding lower skills (such as sales, crafts, agriculture, or elementary occupations), there is concern that knowledge, skills and competences acquired in higher education are not efficiently used in the labour market. There are individual costs, too. An overqualified tertiary graduate receives lower wages on average and has lower job satisfaction than a tertiary graduate employed in a matched graduate job.

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Caution over the interpretation of this indicator is required as the indicator assumes that all occupations in ISCO 4-9 categories do not require tertiary level education. Many young higher education graduates may be overqualified for a temporary period or choose their jobs for personal or other reasons. Even if overqualified, an individual may perform better in that job or transform it over time into one that requires tertiary level education.

The EU average for this indicator is 26%, meaning that on average across the EU, one in four individuals with tertiary level attainment works in a job requiring a lower qualification. Figure 25 shows that half of the Member States are above this EU average. In most, this indicator signals an excess of labour supply from workers with high qualifications and/or a shortage of labour demand for highly qualified workers. It is notable that *A new skills agenda for Europe* (European Commission, 2016a) is aware of the extent of skills mismatch in the EU and the need to ensure that supply better meets demand.

Source: Cedefop.

Figure 25. **Overqualified graduates (%) by age group 25 to 34 for high education level possessed across countries in 2015**
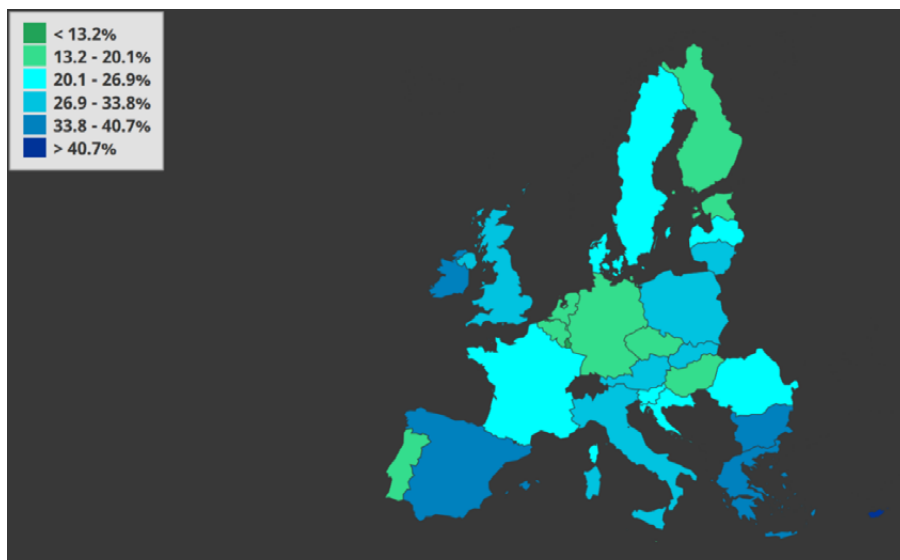
Source: Skills Panorama website.

Figure 26 shows the scores for the skills matching pillar and its two sub-pillars, skills utilisation and skills mismatch. The square represents the pillar score, while the two lines represent the sub-pillar scores (the darker colour for skills matching and the lighter one for skills utilisation). The score at the pillar level is the weighted average of the two sub-pillar scores.

Figure 26 may inspire Member State decisions on which area/sub-pillar of skills matching to prioritise. A few have similar scores in the two sub-pillars but, for many others, there is a significant performance gap between the two sub-pillars, usually with better performance on skills utilisation.

Figure 26. **Overview of skills matching and sub-pillars scores**
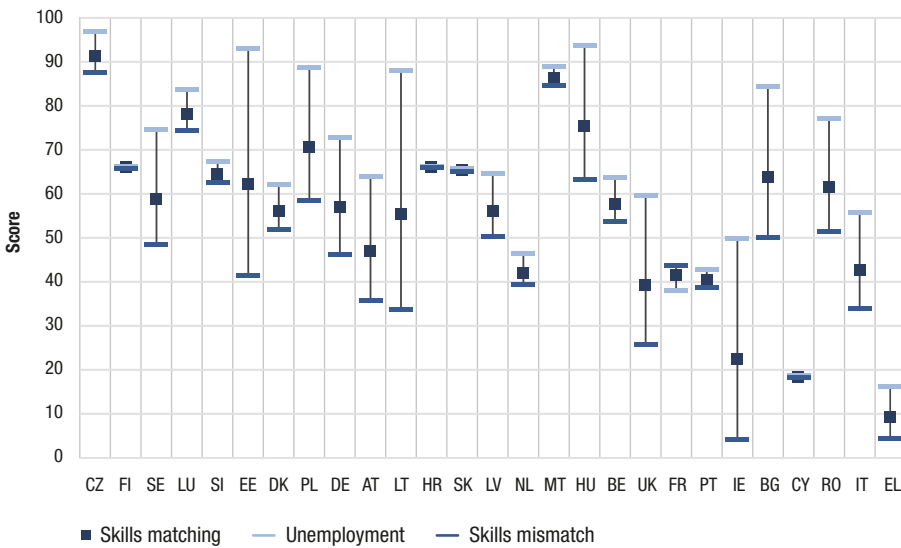
NB: Member States are sorted in ascending order by ESI ranking.
Source: Cedefop, ESI 2018.

Member States with similar skills matching performance have very different sub-pillar scores. For example, Lithuania has the same score as Denmark at the pillar level (represented by the square in Figure 26), but has a much bigger gap between the sub-pillar scores (see the length of the lines in Figure 26). One policy lesson may emerge here: Lithuania might learn from Denmark how to improve its skills mismatch, while Denmark might learn from Lithuania how to improve skills utilisation. Many Member States show

a significant performance gap between the two sub-pillars, with a poorer performance in skills mismatch for almost all Member States.

Table 7 shows the scores at the indicator level on the skills matching.

Table 7 shows in more detail the areas of skills matching that the Member States might look to improve in the first instance. Overall, Member States fare better in the indicators within skills utilisation, while many have considerable room for improvement in skills mismatch. Box 7 presents a more detailed discussion on the skills mismatch sub-pillar in the UK. Some Member States also need to improve the skills utilisation indicators, particularly in underemployed part-timers (Cyprus and the Netherlands). Qualification mismatch is an area where most Member States have the worst performance, with an EU average score of only 38 out of 100. There are exceptions: the Czech Republic, Poland and Slovakia, score 100, 75 and 86, respectively, on this indicator. The overqualification rate indicator shows mixed performances across Member States with an EU average of 50 out of 100. The indicator where countries perform best is long-term unemployment, with an EU average score of 69 out of 100 and with outliers such as Greece and Spain scoring only six out of 100.

Box 7. **Poor skills matching in the UK**

The UK ranks 24th in the skills matching pillar with very low levels of long-term unemployment coupled with a significant degree of mismatch in the labour market. Together with Sweden, the UK is the top performer in the long-term unemployment indicator, which points towards the existence of readily available job opportunities allowing workers to avoid long spells of unemployment. However, looking at the other indicators in this pillar, it can be seen that the readily available jobs are often either part-time and/or are not matched with workers' qualifications.

Figure 27 shows significant room for improvement in the indicator of underemployed part-timers, with labour underutilised among those already employed and willing to work more hours. Many educated workers find themselves in jobs that do not match their qualifications (see qualification mismatch and overqualification scores in Figure 27) or that pay less than expected for their level of education (see low score for low-waged workers (ISCED 5 to 8) indicator). The UK ranks 15th and eighth in the skills development and skills activation pillars respectively, indicating that reasonably good development and activation of skills does not necessarily translate into high-quality jobs. The UK could make significant effort to improve the mismatching aspect of its skills system, to match workers' skills with the occupations corresponding to their level of education.

Table 7. **Skills matching: indicators showing a high degree of skills mismatch**

Member State	Skills utilisation		Skills mismatch		
	Long-term unemploy-ment	Under-employed part-timers	Over-qualification rate	Low-waged workers (ISCED 5-8)	Qualification mismatch
Belgium	67	62	67	99	34
Bulgaria	61	100	23	66	69
Czech Republic	92	100	74	82	100
Denmark	96	40	63	85	37
Germany	92	60	71	57	24
Estonia	88	97	70	1	27
Ireland	64	40	7	6	1
Greece	6	23	-	45	-
Spain	6	13	-	64	9
France	60	23	51	74	32
Croatia	38	85	63	76	-
Italy	37	68	41	80	19
Cyprus	47	-	-	51	26
Latvia	67	63	63	17	47
Lithuania	78	95	42	17	31
Luxembourg	87	82	100	87	51
Hungary	84	100	75	76	51
Malta	90	88	87	75	-
Netherlands	83	22	72	15	18
Austria	90	47	35	60	31
Poland	87	90	41	45	75
Portugal	42	43	67	94	5
Romania	78	77	46	62	53
Slovenia	63	70	53	76	68
Slovakia	47	78	38	68	86
Finland	86	53	72	89	56
Sweden	97	60	66	92	26
United Kingdom	97	35	38	27	16

Source: Cedefop, ESI 2018.

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The evidence on the extent to which there are mismatches in the UK is ambiguous. On the one hand, there is evidence of wage returns increasing according to level of highest qualification held, with this relationship holding up over time. But there is increasing evidence that the returns are highest in relation to certain qualifications (Walker and Zhu, 2013; McIntosh and Morris, 2016). On the other hand, the employers skills surveys series tend to suggest that, at any one point, the number of vacancies that employers find hard to fill because of a shortage of applicants with the skills experiences and qualifications sought remains modest (Vivian et al., 2016). The UK labour market is configured in such a way that employment regulation results in a relatively high number of new jobs being created, many of which are relatively low paid, low-skilled ones, with labour market polices taking very much a 'work first' approach; out-of-work, economically active individuals are swiftly reconnected with the labour market. This may result in some degree of mismatch in that relatively high-skilled people can end up in relatively low-skilled jobs (at least temporarily). At the same time, there are pockets of skill shortages often related to specific disciplines/jobs which sometimes prove persistent (Gambin, et al., 2016).

Figure 27. **The UK: room for improvement in skills matching**
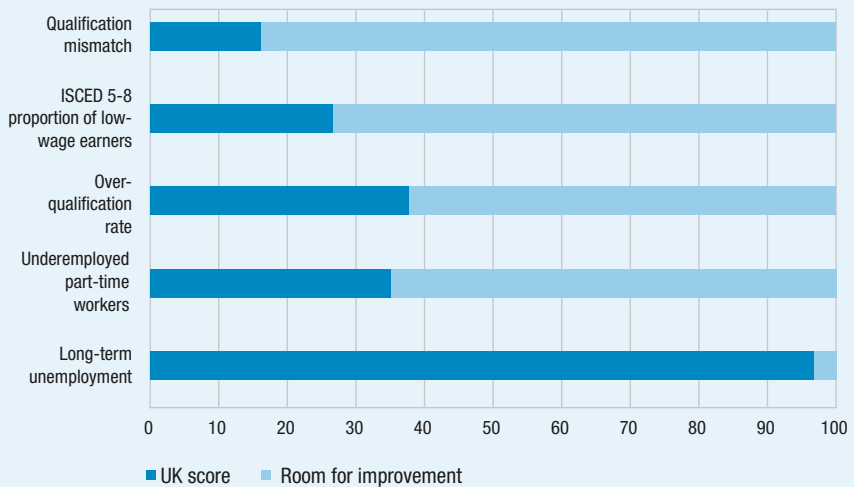
Source: Cedefop, ESI 2018.

Source: Cedefop.

5.3. Changes in skills matching

Figure 28 shows the changes in the ranking over the period the ESI has been estimated (2014-16) within skills matching. Some Member States kept their position throughout the period, and there has been limited change in the rankings (most changes are a move of one or two places). The notable exception is Denmark, dropping from seventh to the 17th place. The Czech Republic remained the top-performer for the whole of the period on matching.

Figure 28. **Skills matching change in ranking, 2014-16**

▲ 2014   ▲ 2015   ▲ 2016
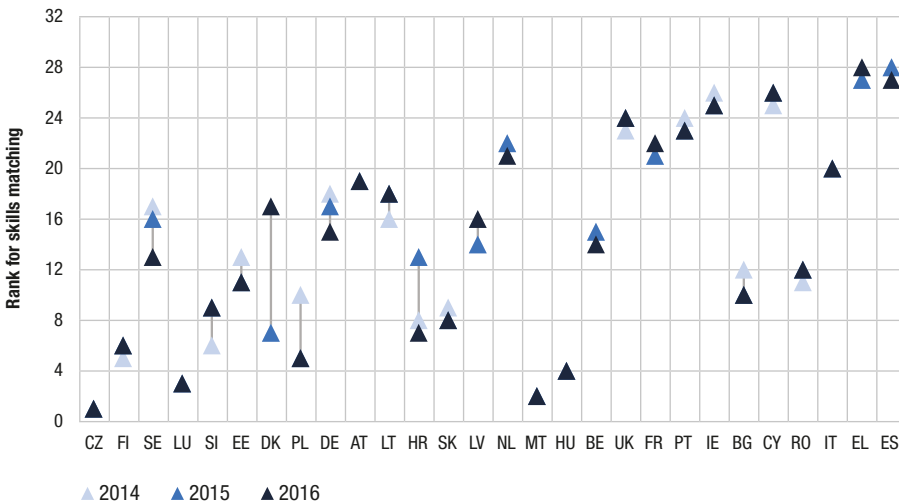
NB: Member States are sorted by ESI ranking.
Source: Cedefop, ESI 2018.

Score growth occurred in 20 of 28 Member States, pointing to some gradual improvements. Most Member States lie between a +20% and -20% range, no matter what their score in 2016. However, at the bottom of the ranking, Ireland, Spain and Cyprus experienced significant growth in the skills matching score; given their low starting point in 2014, small changes in absolute values can lead to such high growth. Member States that are higher in the ranking show less growth over the period. There are examples of rises score and falls among all the three groups of Member States (leaders, middle-achievers and low-achievers). The overall picture is

therefore mixed, with gradual improvements among some lower Member States in skills matching and difficulties in rising above already good levels in certain top-performing Member States. This situation is similar to that for the skills development pillar.

5.4. Policy implications

Skills matching looks at the effectiveness of the mechanism matching skills and jobs for each Member State. Several conclusions can be drawn.

First, many Member States have considerable room to improve the effectiveness of the skills matching mechanisms within their economies, and the individual performance in skills matching is not always connected to the performance in the overall index (and with the other two pillars). Second, many perform differently on the two sub-pillars, usually obtaining better results on skills utilisation compared with skills mismatch: scores are worse, on average, in the indicators within the latter sub-pillar, particularly on qualification mismatch, though there is significant room for improvement in skills utilisation indicators as well. Third, many Member States showed similar, mostly positive, growth rates in their skills matching scores between 2014 and 2016, so signs of efforts to resolve the mismatch within their labour markets are paying off.

The ability to match skills within an economy depends on both structural and cyclical factors affecting the supply of, and demand for, skills. Education systems might produce a workforce that is either underskilled or equipped with the wrong set of skills, while the structure of the economy might not offer enough opportunities to educated people, creating qualification and earnings mismatches. The economic cycle might also exacerbate skills mismatches: in a period of rising unemployment, highly educated workers might be forced into occupations which do not match their qualifications, or might be unable to find jobs for a prolonged period. Member States need to put in place skills anticipation measures to reduce the degree of mismatch, as measured by the skills matching pillar, resulting from structural and cyclical factors affecting the economy. One approach is forecasting the impact of macroeconomic policies, to see if likely job creation might match existing workforce qualifications.

Figure 29 shows the positive relationship between the skills matching score and the Eurostat job vacancy rate in industry, construction and

services (^{12}). The latter indicator measures the share of the jobs currently available in the economy due to newly created vacancies and s a proxy for the firms' demand for labour. Member States are grouped, based on the ESI score, into leaders, middle-achievers and low-achievers.

A clear upward relationship between skills matching and job vacancy rate can be seen in Figure 29, with indicators measuring the demand for skills from different perspectives. Some Member States, such as Poland, with good scores in skills matching have low values on the job vacancy rate, meaning that the few new jobs are well matched with the existing supply of skills. Others, such as Belgium and Romania, have similar skills matching scores but different job vacancy rates. The graph shows that, other things being equal, the more vacancies are created, the more it would be feasible to match them with the right set of skills. Other policies might be required to improve the overall skills matching system, given the difference in the job vacancy rate indicator between Member States with similar skills matching scores. Also, some in the Leaders group in the overall index have similar job vacancy rates and skills matching scores to those in the low-achievers group, highlighting the different nature (link to the demand side) of this pillar compared to the other two.

The need to improve skills matching was recognised by the New skills agenda adopted by the European Commission in 2016 (European Commission, 2016a). The agenda lists a set of actions aimed at improving skills through better formation, greater visibility, and more informed career choices. Among the various measures, it sets out a 'blueprint for sectoral cooperation on skills', which is a framework for strategic cooperation in a given economic sector between key stakeholders: business, trade unions, research, education and training institutions, and public authorities (European Commission, 2016a). The Blueprint will stimulate investment and encourage more strategic use of EU and national funding opportunities. The aim is to support an overall sectoral strategy and to develop concrete actions to address short and medium-term skills needs. Supported by data evidence from the ESI, the first step involves assessing skills gaps in the sector and their potential impact on growth, innovation and competitiveness.

(^{12}) These sectors were chosen based on the best data availability for this indicator in the Eurostat database.

Figure 29. **Better matching associated with more jobs created**
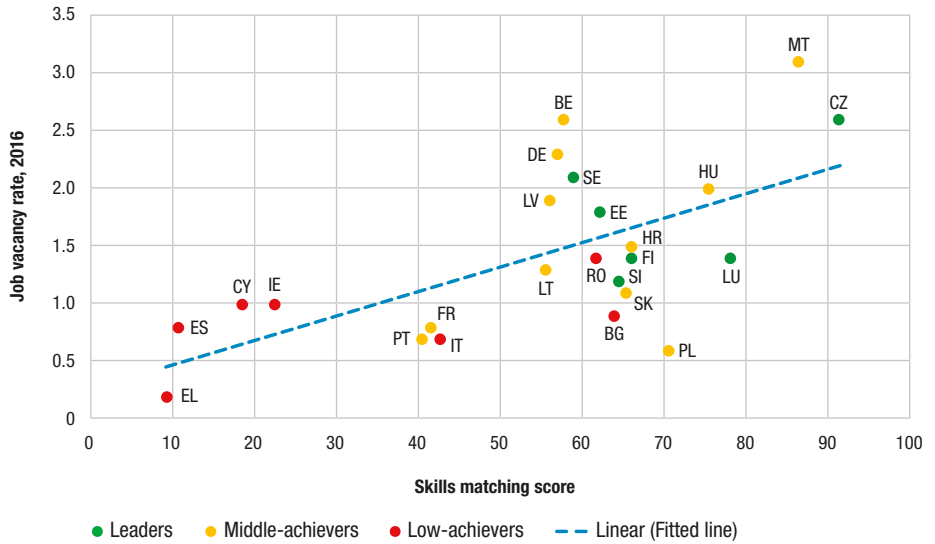
NB: Job vacancy data not available for DK, NL, AT and the UK.
Source: Cedefop, ESI 2018 and Eurostat [jvs_a_rate_r2].

CHAPTER 6.
Discussion and concluding remarks

The European skills index (ESI) provides, for the first time, a comprehensive measure of skills systems across European Union (EU) Member States. Adopting a human capital approach, three distinct aspects of a skills system have been identified for that purpose: skills development, activation, and matching. Ultimately, the hallmarks of a good skills system are those that develops the skills of the population in general (skills development), put in place the mechanisms to ensure those skills are available to the labour market (skills activation), and ensures that these skills are the ones for which there is a demand in the labour market (skills matching). This process is reflected in the design of the ESI, which was developed in such a way that overall improvements in the performance of a system can only be achieved through achieving a degree of balance across development, activation and matching. Concentrating on one area over another may improve certain aspects but may penalise the overall performance of a skills system.

Using the ESI as a single measure allows capturing, in a comparative way, how balanced European skills systems are. With increasing emphasis being placed on skills in both national and pan-European policy discourse, there is a need more than ever for the type of monitoring capability that the ESI provides. This is especially so in relation to skills mismatch, given the pace of technological change and the way this is affecting the demand for skills, and the massive investments in education – especially higher education – that governments and individuals have made over recent decades. There is a need to know that the investments in skills supply that have been, and are continuing to be, made are ones that find their way through to the labour market and are responsive to the changing demand for skills.

At EU level, the ESI highlights where there may be common problems calling for concerted action. At national level, the ESI shows where a Member State stands, relative to others, and provides the basis for identifying strengths and weaknesses. In doing this, it highlights areas in need of policy intervention. Shared policy learning is made possible by observing how some

countries have found a solution to a particular feature of a skills system, as reflected by a high score. Adoption of the distance-to-frontier approach allows monitoring over time, which is essential to capture current 'shocks'.

Nevertheless, a degree of caution is required when thinking about the policy implications that flow from the ESI. The index shows the relative position of Member States on a range of indicators, sub-pillars, and pillars and the general trend direction. In itself, this does not lead to detailed policy prescriptions. A skills system is a complex entity and needs to be considered within the overall socioeconomic context of a Member State, as even a high performance in one indicator may have implications that need to be carefully considered and analysed. Deeper investigation, coupled with local expert knowledge, is needed and the purpose of constructing the ESI is to establish a starting point for such an investigation. Further, the focus of the ESI has been on measuring outcomes of a skills system (as opposed to measuring intentions such as spending on education). Some aspects of quality (as for education offered) may not be explicitly captured as the focus of the ESI is on measuring the efficiency of skills system in terms of outcomes related to economic performance.

Analysis of the 2018 ESI shows skills development and activation to be in a good linear relationship. This comes as no great surprise as a better developed pool of potential workers is naturally expected to have a better transition to the world of work. The outcomes of skills development and activation determine the available supply of skills in the system. These two could be considered as a separate dimension, skills formation, which is more linked to structural factors. From a policy perspective, this suggests that common policies may be able to influence these two distinct aspects of a skills system. In contrast, skills matching is a separate aspect of a skills system, determined by the interplay of demand and supply and a more cyclical aspect of a skills system. At policy level, issues arising from skills matching would need separate attention as only limited, if any, actions can have an impact on all three pillars. Given the focus of most Member States on skills development (which also affects skills activation), skills matching is the pillar with the lowest scores in comparison.

At the index level, it is possible to identify three broad groups of performers: leaders, middle-achievers and low-achievers. The Czech Republic and Sweden belong to the first group, Austria and the UK the second, and Greece and Spain the third. Typically, Member States belonging to the first group have a well-balanced skills system and very good performance in all

three pillars. The second group mainly consists of countries that may score high on one or two pillars but lower on a third one.

Comparison of scores across skills formation and skills matching enables some initial observations. Four groups can be identified. The first is those that show good performance in both dimensions (Sweden and Finland). Such countries can be considered as 'role models' of overall skills systems, where good practices can be sought. The second group comprises countries where skills are efficiently developed and activated but poorly matched (such as the Netherlands and the UK). The skills systems of these countries are characterised by certain bottlenecks, as sufficient policies in developing and activating skills are narrowed down by the interaction between demand and supply. Specific policies targeting reducing skills mismatch would help these cases. In a third group matching is high but development and activation scores low (as in Romania and Bulgaria). While these systems are rewarded by efficient labour market matching and can possibly be used as good cases of matching practices, the low scores in skills formation can provide a signal of 'low skills equilibrium'; efficient matching is an outcome of poor demand for high skills. The fourth group includes countries where scores are low in both dimensions (as in Cyprus and Portugal). Better coordination is needed on both skills formation and matching.

Careful examination of the ESI, with its pillars and sub-pillars, highlights several issues in Member State skills systems. Although there is significant heterogeneity, the following priorities can be established:

(a) for skills development, Member States may take action on providing more opportunities for education beyond the compulsory level, fully embracing lifelong learning;

(b) for skills activation, Member States may take action on increasing activity rates of the younger cohort without prejudice to increasing their education and training level;

(c) for skills matching, Member States may take action on reducing the level of mismatch between workforce skills and available job opportunities, to ensure that workers will be able to find jobs corresponding to their level of education and training.

Basic education provides the foundation for future workers and should be improved, as seen in the scores in the reading, maths and science indicator, but education should not stop there. Adult learning has been recognised as a key source of individual development, particularly in the context of the

changing nature of work and of automation. Therefore, the low scores on recent training highlight an area for improvement at EU level, which could be complemented by modernised curricula in the provision of VET courses, where some Member States are still lagging compared to others.

An increase in the quality of the workforce might also bring an increase in the quantity, proxied by activity rates, because educated workers tend to enter more easily into the labour market. The positive relationship between skills development and skills activation corroborates this claim. Although activity rates largely depend on the state of the economy, there should be a focus on stimulating the activity rates of the cohort aged 20 to 24.

Policies targeting the demand side of the labour force should aim at better matching the skills available to the vacancy being created in the economy. Member States make considerable efforts to gain a thorough understanding of both the characteristics of their workforce and the demand for skills coming from enterprises. Gathering of labour market data and forecasting exercises, such as in Cedefop's skills forecast (Cedefop, 2018), remain valuable in this sense.

Analysis of the ESI over time has also made it clear that improving a skills system takes time. Setbacks will be inevitable, possibly due to unfavourable macroeconomic environments. For now, skills systems across Europe seem to be slowly improving. The performance of the Member States will change; new best (or worst) outcomes might be reached, affecting scores and ranking, and new strengths and weaknesses might be identified. The skills system landscape is continuously changing, and the ESI aims to help in understanding this process and supporting policy-makers. The best outcomes used to normalise the indicators are taken from historical data, meaning that some Member States, at a certain point over the past seven years, reached that outcome. Although there is a significant distance between the top and bottom performing Member States, there is no reason why each, with the right set of policies, could not reach or get closer to the desired target.

The ESI has been designed as a tool for capturing Member State skills system performance. The ESI itself is not constructed to provide the answers but is meant to act as a starting point for understanding the complexity of skills systems. Delving into such complexity is necessary in the quest for answers.

Abbreviations/Acronyms

ESI	European skills index
ET 2020	education and training 2020 (strategy)
EU	European Union
GDP	gross domestic product
ISCED	international standards classification of education
ISCED11	international standards classification of education adopted in November 2011
ISCO	international standard classification of occupations
ISCO-08	international standard classification of occupations endorsed in 2008
IVET	initial vocational education and training
JRC	Joint Research Centre
NEET	neither in employment nor in education and training
OECD	Organisation for Economic Cooperation and Development
PISA	programme for international student assessment
VET	vocational education and training

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ANNEX 1
Country profiles

Austria

Rank (out of 28)	10
Score (0-100)	62

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	36.1
GVA per hour worked, EUR/hour	40.3
Lower age limit of compulsory education	6
Upper age limit of compulsory education	15
Employment rate, %	71.5

Skills development

100
80
60
40
20
0

Skills matching   **Skills activation**

— Score   -- Min   — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	7	67			
1.1.	Basic education	12	63			
1.1.1	Pre-primary pupil-to-teacher ratio	17	54	13.3	6	
1.1.2	Upper secondary education (and above), %	9	76	80.4	90	
1.1.3	Reading, maths & science scores	14	61	492.2	525	
1.2.	Training and other education	5	70			
1.2.1	Recent training, %	8	48	14.9	30	
1.2.2	VET students, %	5	90	68.8	75	
1.2.3	High computer skills, %	6	69	34	46	
2.	Skills activation	3	83			
2.1.	Transition to work	6	80			
2.1.1	Early leavers from training, %	9	79	3.7	2	
2.1.2	Recent graduates in employment, %	4	82	87.6	95	
2.2.	Labour market participation	2	86			
2.2.1	Activity rate (aged 25-54), %	6	84	88.4	90	
2.2.2	Activity rate (aged 20-24), %	3	89	73.8	78	
3.	Skills matching	19	47			
3.1.	Skills utilisation	17	64			
3.1.1	Long-term unemployment, %	6	90	1.9	1	
3.1.2	Underemployed part-timers, %	19	47	4.2	1	
3.2.	Skills mismatch	21	36			
3.2.1	Overqualification rate, %	23	35	29.4	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	14	31	35.3	16	

Belgium

Rank (out of 28) 18
Score (0-100) 53

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	34.5
GVA per hour worked, EUR/hour	48.0
Lower age limit of compulsory education	6
Upper age limit of compulsory education	15
Employment rate, %	62.3

Skills development
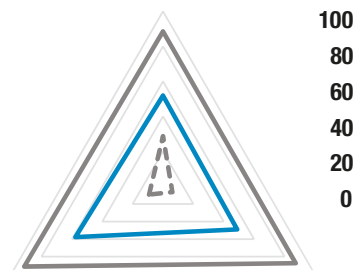
Skills matching   Skills activation

━━ Score ┅┅ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	16	52			
1.1.	Basic education	17	56			
1.1.1	Pre-primary pupil-to-teacher ratio	21	43	15.1	6	
1.1.2	Upper secondary education (and above), %	22	55	71.8	90	
1.1.3	Reading, maths & science scores	9	74	502.5	525	
1.2.	Training and other education	15	48			
1.2.1	Recent training, %	18	21	7	30	
1.2.2	VET students, %	9	76	59.6	75	
1.2.3	High computer skills, %	22	44	24	46	
2.	Skills activation	22	49			
2.1.	Transition to work	18	62			
2.1.1	Early leavers from training, %	16	60	5.2	2	
2.1.2	Recent graduates in employment, %	13	66	81.2	95	
2.2.	Labour market participation	23	36			
2.2.1	Activity rate (aged 25-54), %	21	51	85.1	90	
2.2.2	Activity rate (aged 20-24), %	23	21	48.1	78	
3.	Skills matching	14	58			
3.1.	Skills utilisation	18	64			
3.1.1	Long-term unemployment, %	16	67	4	1	
3.1.2	Underemployed part-timers, %	15	62	3.3	1	
3.2.	Skills mismatch	10	54			
3.2.1	Overqualification rate, %	10	67	19.8	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	12	34	34.5	16	

Bulgaria

Rank (out of 28)	23
Score (0-100)	33

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	6.0
GVA per hour worked, EUR/hour	6.5
Lower age limit of compulsory education	7
Upper age limit of compulsory education	16
Employment rate, %	63.4

Skills development
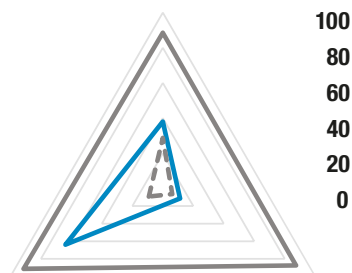
Skills matching　　　　**Skills activation**

━━ Score　‑ ‑ Min　━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	25	38			
1.1.	Basic education	21	45			
1.1.1	Pre-primary pupil-to-teacher ratio	12	61	12.3	6	
1.1.2	Upper secondary education (and above), %	15	70	78.1	90	
1.1.3	Reading, maths & science scores	26	0	439.6	525	
1.2.	Training and other education	23	31			
1.2.1	Recent training, %	27	4	2.2	30	
1.2.2	VET students, %	12	64	51.3	75	
1.2.3	High computer skills, %	27	21	15	46	
2.	Skills activation	27	11			
2.1.	Transition to work	25	13			
2.1.1	Early leavers from training, %	27	0	10.6	2	
2.1.2	Recent graduates in employment, %	24	43	72	95	
2.2.	Labour market participation	27	10			
2.2.1	Activity rate (aged 25-54), %	23	20	82	90	
2.2.2	Activity rate (aged 20-24), %	28	0	39.7	78	
3.	Skills matching	10	64			
3.1.	Skills utilisation	7	84			
3.1.1	Long-term unemployment, %	20	61	4.5	1	
3.1.2	Underemployed part-timers, %	1	100	0.7	1	
3.2.	Skills mismatch	14	50			
3.2.1	Overqualification rate, %	24	23	33.1	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	4	69	24.7	16	

Croatia

Rank (out of 28)	12
Score (0-100)	60

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	10.8
GVA per hour worked, EUR/hour	12.4
Lower age limit of compulsory education	6
Upper age limit of compulsory education	15
Employment rate, %	56.9

Skills development

Skills matching   Skills activation

━━ Score   ┅ Min   ━━ Max
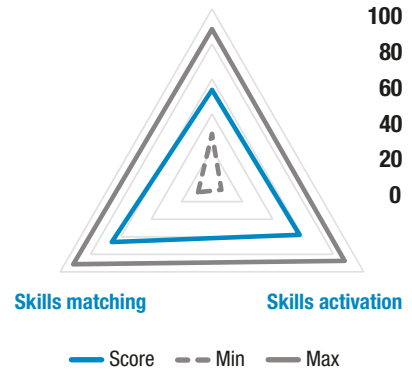
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	14	54			
1.1.	Basic education	14	60			
1.1.1	Pre-primary pupil-to-teacher ratio	11	63	12	6	
1.1.2	Upper secondary education (and above), %	12	74	79.4	90	
1.1.3	Reading, maths & science scores	20	42	475.4	525	
1.2.	Training and other education	16	48			
1.2.1	Recent training, %	25	7	3	30	
1.2.2	VET students, %	3	93	70.4	75	
1.2.3	High computer skills, %	25	38	22	46	
2.	Skills activation	18	58			
2.1.	Transition to work	4	82			
2.1.1	Early leavers from training, %	1	99	2.1	2	
2.1.2	Recent graduates in employment, %	23	44	72.5	95	
2.2.	Labour market participation	24	33			
2.2.1	Activity rate (aged 25-54), %	23	20	82	90	
2.2.2	Activity rate (aged 20-24), %	16	46	57.6	78	
3.	Skills matching	7	66			
3.1.	Skills utilisation	14	66			
3.1.1	Long-term unemployment, %	25	38	6.6	1	
3.1.2	Underemployed part-timers, %	8	85	1.9	1	
3.2.	Skills mismatch	4	66			
3.2.1	Overqualification rate, %	12	63	21.0	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	#N/A	0	#N/A	16	

Cyprus

Rank (out of 28)	24
Score (0-100)	32

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	21.3
GVA per hour worked, EUR/hour	23.4
Lower age limit of compulsory education	4.66
Upper age limit of compulsory education	15
Employment rate, %	63.7

Skills development

— Score -- Min — Max
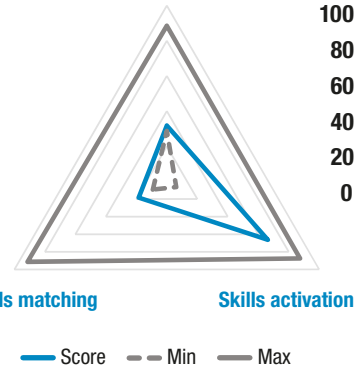
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	26	32			
1.1.	Basic education	24	40			
1.1.1	Pre-primary pupil-to-teacher ratio	19	50	14	6	
1.1.2	Upper secondary education (and above), %	16	65	76	90	
1.1.3	Reading, maths & science scores	26	0	437.5	525	
1.2.	Training and other education	27	24			
1.2.1	Recent training, %	19	20	6.9	30	
1.2.2	VET students, %	26	10	16.7	75	
1.2.3	High computer skills, %	24	41	23	46	
2.	Skills activation	12	66			
2.1.	Transition to work	12	70			
2.1.1	Early leavers from training, %	8	80	3.6	2	
2.1.2	Recent graduates in employment, %	21	46	73.4	95	
2.2.	Labour market participation	14	63			
2.2.1	Activity rate (aged 25-54), %	16	68	86.8	90	
2.2.2	Activity rate (aged 20-24), %	13	58	61.9	78	
3.	Skills matching	26	18			
3.1.	Skills utilisation	26	19			
3.1.1	Long-term unemployment, %	22	47	5.8	1	
3.1.2	Underemployed part-timers, %	28	0	7.8	1	
3.2.	Skills mismatch	25	18			
3.2.1	Overqualification rate, %	26	0	40.7	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	17	26	36.7	16	

Czech Republic

Rank (out of 28)	1
Score (0-100)	75

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	16.4
GVA per hour worked, EUR/hour	16.7
Lower age limit of compulsory education	6
Upper age limit of compulsory education	15
Employment rate, %	72

Skills development

Skills matching   Skills activation

— Score   -- Min   — Max
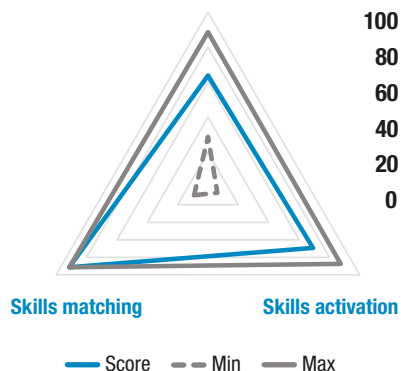
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	8	64			
1.1.	Basic education	10	67			
1.1.1	Pre-primary pupil-to-teacher ratio	18	53	13.5	6	
1.1.2	Upper secondary education (and above), %	1	94	87.6	90	
1.1.3	Reading, maths & science scores	16	60	490.8	525	
1.2.	Training and other education	8	60			
1.2.1	Recent training, %	13	27	8.8	30	
1.2.2	VET students, %	1	97	73.2	75	
1.2.3	High computer skills, %	16	51	27	46	
2.	Skills activation	9	69			
2.1.	Transition to work	8	77			
2.1.1	Early leavers from training, %	11	76	3.9	2	
2.1.2	Recent graduates in employment, %	5	79	86.7	95	
2.2.	Labour market participation	15	61			
2.2.1	Activity rate (aged 25-54), %	5	89	88.9	90	
2.2.2	Activity rate (aged 20-24), %	22	34	52.8	78	
3.	Skills matching	1	91			
3.1.	Skills utilisation	1	97			
3.1.1	Long-term unemployment, %	4	92	1.7	1	
3.1.2	Underemployed part-timers, %	1	100	0.5	1	
3.2.	Skills mismatch	1	88			
3.2.1	Overqualification rate, %	4	74	17.9	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	1	100	16.0	16	

Denmark

Rank (out of 28)	7
Score (0-100)	67

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	45.5
GVA per hour worked, EUR/hour	55.7
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	74.9

Skills development

Skills matching   Skills activation

— Score -- Min — Max
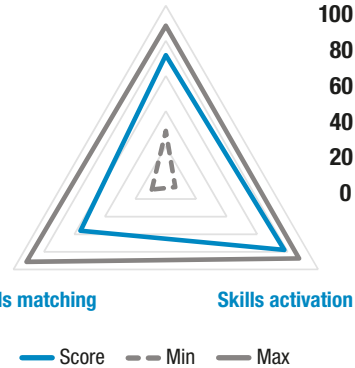
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	5	72			
1.1.	Basic education	8	71			
1.1.1	Pre-primary pupil-to-teacher ratio	4	77	9.7	6	
1.1.2	Upper secondary education (and above), %	19	58	73	90	
1.1.3	Reading, maths & science scores	7	76	504.3	525	
1.2.	Training and other education	3	73			
1.2.1	Recent training, %	2	92	27.7	30	
1.2.2	VET students, %	17	47	40.6	75	
1.2.3	High computer skills, %	3	82	39	46	
2.	Skills activation	4	78			
2.1.	Transition to work	9	76			
2.1.1	Early leavers from training, %	10	78	3.8	2	
2.1.2	Recent graduates in employment, %	10	72	83.9	95	
2.2.	Labour market participation	4	80			
2.2.1	Activity rate (aged 25-54), %	11	74	87.4	90	
2.2.2	Activity rate (aged 20-24), %	4	85	72.4	78	
3.	Skills matching	17	56			
3.1.	Skills utilisation	19	62			
3.1.1	Long-term unemployment, %	3	96	1.4	1	
3.1.2	Underemployed part-timers, %	21	40	4.6	1	
3.2.	Skills mismatch	11	52			
3.2.1	Overqualification rate, %	13	63	21.2	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	11	37	33.8	16	

Estonia

Rank (out of 28)	6
Score (0-100)	68

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	13.5
GVA per hour worked, EUR/hour	13.1
Lower age limit of compulsory education	7
Upper age limit of compulsory education	16
Employment rate, %	72.1

Skills development
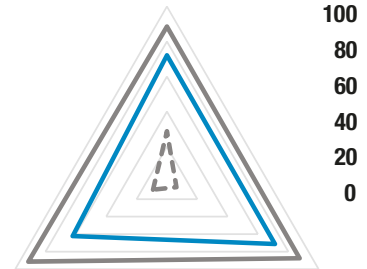
Skills matching　　　　**Skills activation**

━━ Score ╍╍ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	4	72			
1.1.	Basic education	1	88			
1.1.1	Pre-primary pupil-to-teacher ratio	2	84	8.6	6	
1.1.2	Upper secondary education (and above), %	6	83	83.3	90	
1.1.3	Reading, maths & science scores	1	99	524.3	525	
1.2.	Training and other education	10	56			
1.2.1	Recent training, %	7	51	15.7	30	
1.2.2	VET students, %	21	40	35.7	75	
1.2.3	High computer skills, %	5	77	37	46	
2.	Skills activation	7	71			
2.1.	Transition to work	14	68			
2.1.1	Early leavers from training, %	13	74	4.1	2	
2.1.2	Recent graduates in employment, %	18	55	77.1	95	
2.2.	Labour market participation	6	74			
2.2.1	Activity rate (aged 25-54), %	7	78	87.8	90	
2.2.2	Activity rate (aged 20-24), %	9	70	66.7	78	
3.	Skills matching	11	62			
3.1.	Skills utilisation	3	93			
3.1.1	Long-term unemployment, %	8	88	2.1	1	
3.1.2	Underemployed part-timers, %	4	97	1.2	1	
3.2.	Skills mismatch	18	41			
3.2.1	Overqualification rate, %	8	70	19.0	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	16	27	36.6	16	

Finland

Rank (out of 28)	2
Score (0-100)	72

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	34.5
GVA per hour worked, EUR/hour	39.4
Lower age limit of compulsory education	7
Upper age limit of compulsory education	16
Employment rate, %	69.1

Skills development
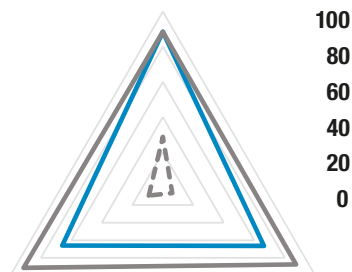
Skills matching   **Skills activation**

━━ Score   ┅ Min   ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	1	89			
1.1.	Basic education	2	83			
1.1.1	Pre-primary pupil-to-teacher ratio	6	75	10	6	
1.1.2	Upper secondary education (and above), %	8	79	81.4	90	
1.1.3	Reading, maths & science scores	2	97	522.7	525	
1.2.	Training and other education	1	94			
1.2.1	Recent training, %	3	88	26.4	30	
1.2.2	VET students, %	2	94	71.3	75	
1.2.3	High computer skills, %	1	100	46	46	
2.	Skills activation	11	66			
2.1.	Transition to work	17	62			
2.1.1	Early leavers from training, %	15	65	4.8	2	
2.1.2	Recent graduates in employment, %	17	56	77.4	95	
2.2.	Labour market participation	10	71			
2.2.1	Activity rate (aged 25-54), %	17	63	86.3	90	
2.2.2	Activity rate (aged 20-24), %	7	78	69.7	78	
3.	Skills matching	6	66			
3.1.	Skills utilisation	13	66			
3.1.1	Long-term unemployment, %	11	86	2.3	1	
3.1.2	Underemployed part-timers, %	18	53	3.8	1	
3.2.	Skills mismatch	5	66			
3.2.1	Overqualification rate, %	5	72	18.3	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	6	56	28.3	16	

France

Rank (out of 28)	20
Score (0-100)	48

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	31.8
GVA per hour worked, EUR/hour	46.9
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	64.2

Skills development

Skills matching   Skills activation

— Score   -- Min   — Max
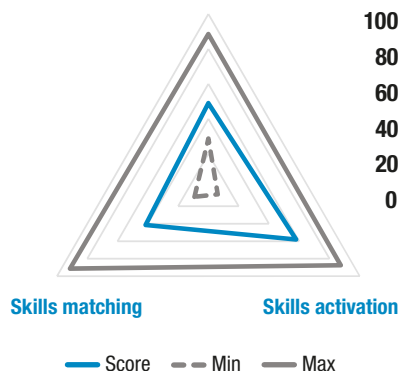
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	18	49			
1.1.	Basic education	25	39			
1.1.1	Pre-primary pupil-to-teacher ratio	27	3	21.5	6	
1.1.2	Upper secondary education (and above), %	18	61	74.5	90	
1.1.3	Reading, maths & science scores	13	66	495.7	525	
1.2.	Training and other education	9	59			
1.2.1	Recent training, %	4	61	18.8	30	
1.2.2	VET students, %	15	48	41.5	75	
1.2.3	High computer skills, %	9	67	33	46	
2.	Skills activation	17	58			
2.1.	Transition to work	22	49			
2.1.1	Early leavers from training, %	22	51	5.9	2	
2.1.2	Recent graduates in employment, %	22	45	73	95	
2.2.	Labour market participation	13	67			
2.2.1	Activity rate (aged 25-54), %	10	75	87.5	90	
2.2.2	Activity rate (aged 20-24), %	12	58	62.1	78	
3.	Skills matching	22	41			
3.1.	Skills utilisation	25	38			
3.1.1	Long-term unemployment, %	21	60	4.6	1	
3.1.2	Underemployed part-timers, %	24	23	5.6	1	
3.2.	Skills mismatch	17	44			
3.2.1	Overqualification rate, %	16	51	24.7	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	13	32	35.1	16	

Germany

Rank (out of 28)	9
Score (0-100)	62

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	34.5
GVA per hour worked, EUR/hour	43.2
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	74.7

Skills development

Skills matching   **Skills activation**

—— Score   - - Min   —— Max
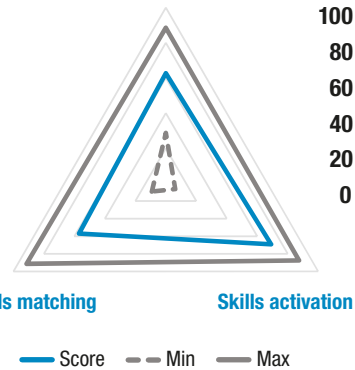
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	9	63			
1.1.	Basic education	5	77			
1.1.1	Pre-primary pupil-to-teacher ratio	4	77	9.7	6	
1.1.2	Upper secondary education (and above), %	10	76	80.2	90	
1.1.3	Reading, maths & science scores	5	80	508.1	525	
1.2.	Training and other education	17	48			
1.2.1	Recent training, %	14	26	8.5	30	
1.2.2	VET students, %	14	56	46.3	75	
1.2.3	High computer skills, %	13	59	30	46	
2.	Skills activation	10	69			
2.1.	Transition to work	15	65			
2.1.1	Early leavers from training, %	20	55	5.6	2	
2.1.2	Recent graduates in employment, %	2	88	90.1	95	
2.2.	Labour market participation	7	73			
2.2.1	Activity rate (aged 25-54), %	13	73	87.3	90	
2.2.2	Activity rate (aged 20-24), %	8	74	68.1	78	
3.	Skills matching	15	57			
3.1.	Skills utilisation	11	73			
3.1.1	Long-term unemployment, %	4	92	1.7	1	
3.1.2	Underemployed part-timers, %	16	60	3.4	1	
3.2.	Skills mismatch	16	46			
3.2.1	Overqualification rate, %	7	71	18.6	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	19	24	37.3	16	

Greece

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	17.1
GVA per hour worked, EUR/hour	19.4
Lower age limit of compulsory education	5
Upper age limit of compulsory education	15
Employment rate, %	52

Skills development

Skills matching   Skills activation

— Score -- Min — Max
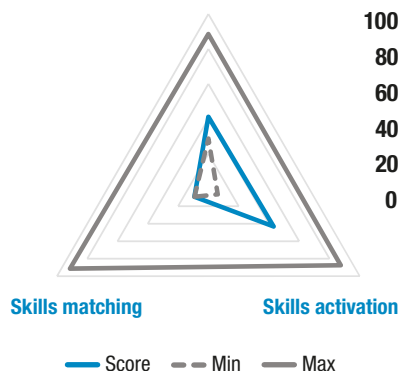
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	23	41			
1.1.	Basic education	20	47			
1.1.1	Pre-primary pupil-to-teacher ratio	10	64	11.8	6	
1.1.2	Upper secondary education (and above), %	24	50	70	90	
1.1.3	Reading, maths & science scores	25	22	458.5	525	
1.2.	Training and other education	22	35			
1.2.1	Recent training, %	23	10	4	30	
1.2.2	VET students, %	23	33	31.5	75	
1.2.3	High computer skills, %	13	59	30	46	
2.	Skills activation	24	43			
2.1.	Transition to work	21	53			
2.1.1	Early leavers from training, %	11	76	3.9	2	
2.1.2	Recent graduates in employment, %	27	0	49.2	95	
2.2.	Labour market participation	25	33			
2.2.1	Activity rate (aged 25-54), %	20	55	85.5	90	
2.2.2	Activity rate (aged 20-24), %	27	11	44.1	78	
3.	Skills matching	28	9			
3.1.	Skills utilisation	27	16			
3.1.1	Long-term unemployment, %	27	6	17	1	
3.1.2	Underemployed part-timers, %	24	23	5.6	1	
3.2.	Skills mismatch	27	4			
3.2.1	Overqualification rate, %	26	0	40.2	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	26	0	44.1	16	

Hungary

Rank (out of 28)	17
Score (0-100)	55

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	11.2
GVA per hour worked, EUR/hour	12.1
Lower age limit of compulsory education	5
Upper age limit of compulsory education	16
Employment rate, %	66.5

Skills development
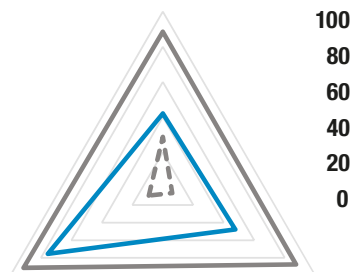
Skills matching   Skills activation

━━ Score   ╍╍ Min   ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	22	42			
1.1.	Basic education	16	57			
1.1.1	Pre-primary pupil-to-teacher ratio	13	60	12.4	6	
1.1.2	Upper secondary education (and above), %	14	71	78.2	90	
1.1.3	Reading, maths & science scores	22	40	474.4	525	
1.2.	Training and other education	24	27			
1.2.1	Recent training, %	21	18	6.3	30	
1.2.2	VET students, %	25	18	21.4	75	
1.2.3	High computer skills, %	22	44	24	46	
2.	Skills activation	23	48			
2.1.	Transition to work	23	47			
2.1.1	Early leavers from training, %	24	35	7.2	2	
2.1.2	Recent graduates in employment, %	8	75	85	95	
2.2.	Labour market participation	19	48			
2.2.1	Activity rate (aged 25-54), %	18	61	86.1	90	
2.2.2	Activity rate (aged 20-24), %	20	36	53.5	78	
3.	Skills matching	4	75			
3.1.	Skills utilisation	2	94			
3.1.1	Long-term unemployment, %	12	84	2.4	1	
3.1.2	Underemployed part-timers, %	1	100	1	1	
3.2.	Skills mismatch	7	63			
3.2.1	Overqualification rate, %	3	75	17.6	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	8	51	29.6	16	

Ireland

Rank (out of 28)	22
Score (0-100)	36

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	51.0
GVA per hour worked, EUR/hour	62.4
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	64.8

Skills development
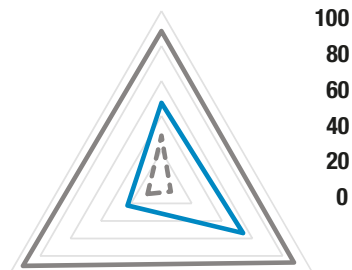
Skills matching   **Skills activation**

━━ Score ╍╍ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	19	47			
1.1.	Basic education	6	72			
1.1.1	Pre-primary pupil-to-teacher ratio	n/a	0	#N/A	6	
1.1.2	Upper secondary education (and above), %	17	64	75.4	90	
1.1.3	Reading, maths & science scores	4	81	509.0	525	
1.2.	Training and other education	28	23			
1.2.1	Recent training, %	20	19	6.4	30	
1.2.2	VET students, %	28	0	1.2	75	
1.2.3	High computer skills, %	18	49	26	46	
2.	Skills activation	21	54			
2.1.	Transition to work	13	68			
2.1.1	Early leavers from training, %	14	71	4.3	2	
2.1.2	Recent graduates in employment, %	16	61	79.5	95	
2.2.	Labour market participation	22	40			
2.2.1	Activity rate (aged 25-54), %	27	12	81.2	90	
2.2.2	Activity rate (aged 20-24), %	10	67	65.5	78	
3.	Skills matching	25	22			
3.1.	Skills utilisation	22	50			
3.1.1	Long-term unemployment, %	18	64	4.2	1	
3.1.2	Underemployed part-timers, %	21	40	4.6	1	
3.2.	Skills mismatch	28	4			
3.2.1	Overqualification rate, %	25	7	37.9	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	25	1	43.6	16	

Italy

Rank (out of 28)	26
Score (0-100)	25

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	25.9
GVA per hour worked, EUR/hour	32.8
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	57.2

Skills development
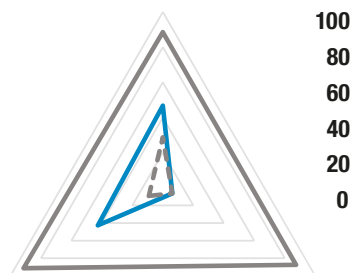
Skills matching　**Skills activation**

━━ Score　- - Min　━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	20	47			
1.1.	Basic education	22	44			
1.1.1	Pre-primary pupil-to-teacher ratio	16	55	13.2	6	
1.1.2	Upper secondary education (and above), %	25	21	58.4	90	
1.1.3	Reading, maths & science scores	18	53	485.0	525	
1.2.	Training and other education	14	49			
1.2.1	Recent training, %	15	25	8.3	30	
1.2.2	VET students, %	11	70	55.8	75	
1.2.3	High computer skills, %	18	49	26	46	
2.	Skills activation	28	6			
2.1.	Transition to work	28	5			
2.1.1	Early leavers from training, %	25	8	9.4	2	
2.1.2	Recent graduates in employment, %	27	0	52.9	95	
2.2.	Labour market participation	28	7			
2.2.1	Activity rate (aged 25-54), %	28	0	77.5	90	
2.2.2	Activity rate (aged 20-24), %	25	14	45.5	78	
3.	Skills matching	20	43			
3.1.	Skills utilisation	21	56			
3.1.1	Long-term unemployment, %	26	37	6.7	1	
3.1.2	Underemployed part-timers, %	13	68	2.9	1	
3.2.	Skills mismatch	22	34			
3.2.1	Overqualification rate, %	20	41	27.6	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	20	19	38.8	16	

Latvia

Rank (out of 28) 14
Score (0-100) 59

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	11.0
GVA per hour worked, EUR/hour	11.2
Lower age limit of compulsory education	5
Upper age limit of compulsory education	16
Employment rate, %	68.7

Skills development

— Score – – Min — Max
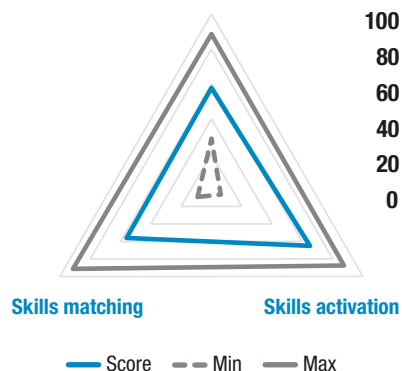
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	11	58			
1.1.	Basic education	7	72			
1.1.1	Pre-primary pupil-to-teacher ratio	7	74	10.2	6	
1.1.2	Upper secondary education (and above), %	5	88	85.1	90	
1.1.3	Reading, maths & science scores	17	55	486.8	525	
1.2.	Training and other education	19	43			
1.2.1	Recent training, %	17	22	7.3	30	
1.2.2	VET students, %	19	46	39.8	75	
1.2.3	High computer skills, %	13	59	30	46	
2.	Skills activation	14	65			
2.1.	Transition to work	20	58			
2.1.1	Early leavers from training, %	20	55	5.6	2	
2.1.2	Recent graduates in employment, %	12	66	81.4	95	
2.2.	Labour market participation	8	72			
2.2.1	Activity rate (aged 25-54), %	7	78	87.8	90	
2.2.2	Activity rate (aged 20-24), %	11	66	64.9	78	
3.	Skills matching	16	56			
3.1.	Skills utilisation	16	65			
3.1.1	Long-term unemployment, %	16	67	4	1	
3.1.2	Underemployed part-timers, %	14	63	3.2	1	
3.2.	Skills mismatch	13	50			
3.2.1	Overqualification rate, %	14	63	21.2	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	10	47	30.8	16	

Lithuania

Rank (out of 28)	11
Score (0-100)	61

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	12.0
GVA per hour worked, EUR/hour	12.0
Lower age limit of compulsory education	7
Upper age limit of compulsory education	16
Employment rate, %	69.4

Skills development
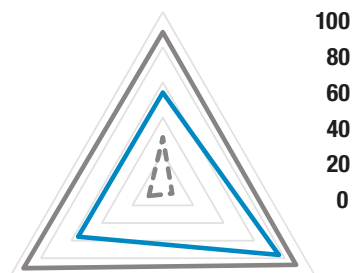
Skills matching **Skills activation**

━━ Score ┅ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	13	54			
1.1.	Basic education	9	70			
1.1.1	Pre-primary pupil-to-teacher ratio	8	73	10.4	6	
1.1.2	Upper secondary education (and above), %	1	94	87.6	90	
1.1.3	Reading, maths & science scores	21	42	475.4	525	
1.2.	Training and other education	20	39			
1.2.1	Recent training, %	22	17	6	30	
1.2.2	VET students, %	24	26	27.2	75	
1.2.3	High computer skills, %	6	69	34	46	
2.	Skills activation	5	76			
2.1.	Transition to work	5	81			
2.1.1	Early leavers from training, %	3	86	3.1	2	
2.1.2	Recent graduates in employment, %	11	69	82.4	95	
2.2.	Labour market participation	9	72			
2.2.1	Activity rate (aged 25-54), %	3	93	89.3	90	
2.2.2	Activity rate (aged 20-24), %	14	50	59.1	78	
3.	Skills matching	18	55			
3.1.	Skills utilisation	6	88			
3.1.1	Long-term unemployment, %	14	78	3	1	
3.1.2	Underemployed part-timers, %	5	95	1.3	1	
3.2.	Skills mismatch	23	34			
3.2.1	Overqualification rate, %	18	42	27.5	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	15	31	35.4	16	

Luxembourg

Rank (out of 28)	4
Score (0-100)	71

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	83.7
GVA per hour worked, EUR/hour	70.1
Lower age limit of compulsory education	4
Upper age limit of compulsory education	16
Employment rate, %	65.6

Skills development
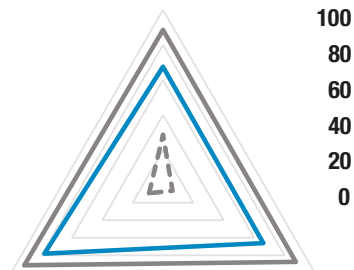
Skills matching   **Skills activation**

— Score -- Min — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	6	68			
1.1.	Basic education	13	60			
1.1.1	Pre-primary pupil-to-teacher ratio	9	70	10.8	6	
1.1.2	Upper secondary education (and above), %	22	55	71.8	90	
1.1.3	Reading, maths & science scores	19	51	483.3	525	
1.2.	Training and other education	2	75			
1.2.1	Recent training, %	6	54	16.8	30	
1.2.2	VET students, %	8	79	61.4	75	
1.2.3	High computer skills, %	2	90	42	46	
2.	Skills activation	13	66			
2.1.	Transition to work	2	86			
2.1.1	Early leavers from training, %	2	90	2.8	2	
2.1.2	Recent graduates in employment, %	7	76	85.4	95	
2.2.	Labour market participation	21	46			
2.2.1	Activity rate (aged 25-54), %	14	72	87.2	90	
2.2.2	Activity rate (aged 20-24), %	24	21	47.8	78	
3.	Skills matching	3	78			
3.1.	Skills utilisation	8	84			
3.1.1	Long-term unemployment, %	9	87	2.2	1	
3.1.2	Underemployed part-timers, %	9	82	2.1	1	
3.2.	Skills mismatch	3	74			
3.2.1	Overqualification rate, %	1	100	4.2	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	8	51	29.6	16	

Malta

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	20.1
GVA per hour worked, EUR/hour	19.3
Lower age limit of compulsory education	5
Upper age limit of compulsory education	16
Employment rate, %	65.8

Skills development
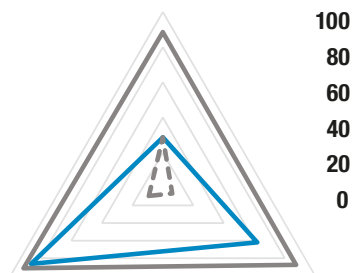
Skills matching   Skills activation

— Score -- Min — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	28	29			
1.1.	Basic education	27	32			
1.1.1	Pre-primary pupil-to-teacher ratio	13	60	12.4	6	
1.1.2	Upper secondary education (and above), %	27	0	49.4	90	
1.1.3	Reading, maths & science scores	23	27	463.4	525	
1.2.	Training and other education	25	25			
1.2.1	Recent training, %	16	22	7.5	30	
1.2.2	VET students, %	27	4	12.7	75	
1.2.3	High computer skills, %	18	49	26	46	
2.	Skills activation	16	62			
2.1.	Transition to work	11	72			
2.1.1	Early leavers from training, %	16	60	5.2	2	
2.1.2	Recent graduates in employment, %	1	100	96.6	95	
2.2.	Labour market participation	18	52			
2.2.1	Activity rate (aged 25-54), %	23	20	82	90	
2.2.2	Activity rate (aged 20-24), %	6	84	71.9	78	
3.	Skills matching	2	86			
3.1.	Skills utilisation	4	89			
3.1.1	Long-term unemployment, %	6	90	1.9	1	
3.1.2	Underemployed part-timers, %	7	88	1.7	1	
3.2.	Skills mismatch	2	85			
3.2.1	Overqualification rate, %	2	87	13.9	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	n/a	0	#N/A	16	

Netherlands

Rank (out of 28)   15
Score (0-100)   58

KEY FACTS, 2016

|	
GDP per capita, EUR 1 000/person	39.3
GVA per hour worked, EUR/hour	47.1
Lower age limit of compulsory education	5
Upper age limit of compulsory education	18
Employment rate, %	74.8

Skills development

Skills matching   Skills activation

— Score   -- Min   — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	10	61			
1.1.	Basic education	18	54			
1.1.1	Pre-primary pupil-to-teacher ratio	24	34	16.5	6	
1.1.2	Upper secondary education (and above), %	20	55	72.1	90	
1.1.3	Reading, maths & science scores	6	80	507.9	525	
1.2.	Training and other education	6	68			
1.2.1	Recent training, %	4	61	18.8	30	
1.2.2	VET students, %	6	90	68.5	75	
1.2.3	High computer skills, %	16	51	27	46	
2.	Skills activation	2	83			
2.1.	Transition to work	1	86			
2.1.1	Early leavers from training, %	4	85	3.2	2	
2.1.2	Recent graduates in employment, %	2	88	90.1	95	
2.2.	Labour market participation	3	81			
2.2.1	Activity rate (aged 25-54), %	15	69	86.9	90	
2.2.2	Activity rate (aged 20-24), %	2	92	75.1	78	
3.	Skills matching	21	42			
3.1.	Skills utilisation	23	46			
3.1.1	Long-term unemployment, %	13	83	2.5	1	
3.1.2	Underemployed part-timers, %	26	22	5.7	1	
3.2.	Skills mismatch	19	39			
3.2.1	Overqualification rate, %	6	72	18.4	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	21	18	39.0	16	

Poland

Rank (out of 28)	8
Score (0-100)	62

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	11.2
GVA per hour worked, EUR/hour	11.6
Lower age limit of compulsory education	5
Upper age limit of compulsory education	15
Employment rate, %	64.5

Skills development
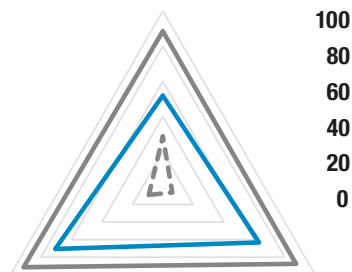
Skills matching · Skills activation

━━ Score ╌╌ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	17	52			
1.1.	Basic education	11	66			
1.1.1	Pre-primary pupil-to-teacher ratio	21	43	15.1	6	
1.1.2	Upper secondary education (and above), %	4	89	85.4	90	
1.1.3	Reading, maths & science scores	8	75	503.9	525	
1.2.	Training and other education	21	37			
1.2.1	Recent training, %	24	9	3.7	30	
1.2.2	VET students, %	13	63	51.1	75	
1.2.3	High computer skills, %	26	36	21	46	
2.	Skills activation	15	63			
2.1.	Transition to work	7	78			
2.1.1	Early leavers from training, %	4	85	3.2	2	
2.1.2	Recent graduates in employment, %	14	63	80.2	95	
2.2.	Labour market participation	20	48			
2.2.1	Activity rate (aged 25-54), %	22	49	84.9	90	
2.2.2	Activity rate (aged 20-24), %	15	47	57.8	78	
3.	Skills matching	5	71			
3.1.	Skills utilisation	5	89			
3.1.1	Long-term unemployment, %	9	87	2.2	1	
3.1.2	Underemployed part-timers, %	6	90	1.6	1	
3.2.	Skills mismatch	9	58			
3.2.1	Overqualification rate, %	19	41	27.6	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	3	75	23.0	16	

Portugal

Rank (out of 28)	21
Score (0-100)	45

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	16.9
GVA per hour worked, EUR/hour	17.7
Lower age limit of compulsory education	6
Upper age limit of compulsory education	18
Employment rate, %	65.2

Skills development

Skills matching **Skills activation**

━━ Score ┅ Min ━━ Max
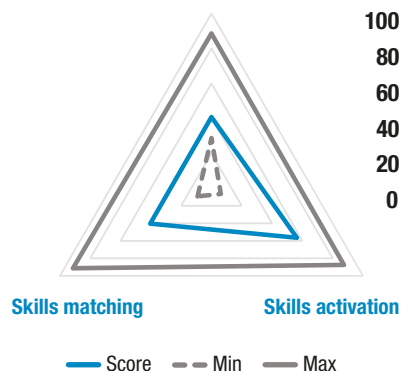
		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	24	41			
1.1.	Basic education	28	32			
1.1.1	Pre-primary pupil-to-teacher ratio	25	29	17.4	6	
1.1.2	Upper secondary education (and above), %	27	0	47.1	90	
1.1.3	Reading, maths & science scores	11	67	497.0	525	
1.2.	Training and other education	12	50			
1.2.1	Recent training, %	11	30	9.6	30	
1.2.2	VET students, %	16	48	41.2	75	
1.2.3	High computer skills, %	6	69	34	46	
2.	Skills activation	20	56			
2.1.	Transition to work	24	45			
2.1.1	Early leavers from training, %	23	44	6.5	2	
2.1.2	Recent graduates in employment, %	20	47	73.8	95	
2.2.	Labour market participation	12	68			
2.2.1	Activity rate (aged 25-54), %	4	91	89.1	90	
2.2.2	Activity rate (aged 20-24), %	17	45	57.2	78	
3.	Skills matching	23	40			
3.1.	Skills utilisation	24	43			
3.1.1	Long-term unemployment, %	24	42	6.2	1	
3.1.2	Underemployed part-timers, %	20	43	4.4	1	
3.2.	Skills mismatch	20	39			
3.2.1	Overqualification rate, %	9	67	19.8	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	24	5	42.7	16	

Romania

Rank (out of 28)   25
Score (0-100)   31

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	7.6
GVA per hour worked, EUR/hour	8.8
Lower age limit of compulsory education	6
Upper age limit of compulsory education	17
Employment rate, %	61.6

Skills development
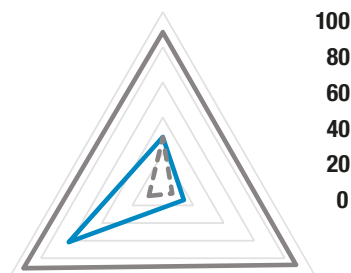
Skills matching   **Skills activation**

━━ Score   ┅ Min   ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	27	29			
1.1.	Basic education	26	33			
1.1.1	Pre-primary pupil-to-teacher ratio	23	41	15.5	6	
1.1.2	Upper secondary education (and above), %	21	55	72	90	
1.1.3	Reading, maths & science scores	26	0	437.5	525	
1.2.	Training and other education	26	25			
1.2.1	Recent training, %	28	1	1.2	30	
1.2.2	VET students, %	10	71	56.2	75	
1.2.3	High computer skills, %	28	0	7	46	
2.	Skills activation	26	14			
2.1.	Transition to work	26	12			
2.1.1	Early leavers from training, %	26	2	9.8	2	
2.1.2	Recent graduates in employment, %	25	36	69.3	95	
2.2.	Labour market participation	26	15			
2.2.1	Activity rate (aged 25-54), %	26	19	81.9	90	
2.2.2	Activity rate (aged 20-24), %	26	11	44.3	78	
3.	Skills matching	12	62			
3.1.	Skills utilisation	9	77			
3.1.1	Long-term unemployment, %	14	78	3	1	
3.1.2	Underemployed part-timers, %	11	77	2.4	1	
3.2.	Skills mismatch	12	51			
3.2.1	Overqualification rate, %	17	46	26.1	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	7	53	29.1	16	

Slovakia

Rank (out of 28)	13
Score (0-100)	59

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	14.5
GVA per hour worked, EUR/hour	17.6
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	64.9

Skills development
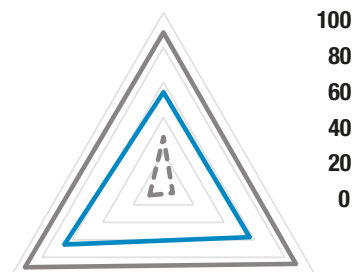
Skills matching   Skills activation

━━ Score ┅ Min ━━ Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	12	54			
1.1.	Basic education	15	59			
1.1.1	Pre-primary pupil-to-teacher ratio	13	60	12.4	6	
1.1.2	Upper secondary education (and above), %	3	89	85.7	90	
1.1.3	Reading, maths & science scores	24	27	462.8	525	
1.2.	Training and other education	13	50			
1.2.1	Recent training, %	26	7	2.9	30	
1.2.2	VET students, %	4	91	69	75	
1.2.3	High computer skills, %	21	46	25	46	
2.	Skills activation	19	57			
2.1.	Transition to work	19	59			
2.1.1	Early leavers from training, %	19	58	5.4	2	
2.1.2	Recent graduates in employment, %	15	62	79.6	95	
2.2.	Labour market participation	17	55			
2.2.1	Activity rate (aged 25-54), %	9	76	87.6	90	
2.2.2	Activity rate (aged 20-24), %	21	34	53	78	
3.	Skills matching	8	65			
3.1.	Skills utilisation	15	66			
3.1.1	Long-term unemployment, %	22	47	5.8	1	
3.1.2	Underemployed part-timers, %	10	78	2.3	1	
3.2.	Skills mismatch	6	65			
3.2.1	Overqualification rate, %	21	38	28.7	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	2	86	19.8	16	

Slovenia

Rank (out of 28)	5
Score (0-100)	69

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	18.4
GVA per hour worked, EUR/hour	20.3
Lower age limit of compulsory education	6
Upper age limit of compulsory education	15
Employment rate, %	65.8

Skills development
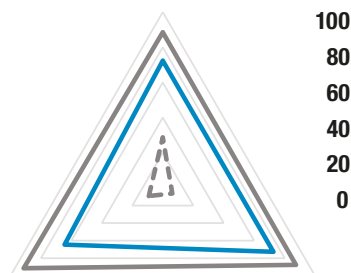
Skills matching   Skills activation

—— Score   - - Min   —— Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	3	72			
1.1.	Basic education	3	81			
1.1.1	Pre-primary pupil-to-teacher ratio	3	79	9.3	6	
1.1.2	Upper secondary education (and above), %	7	82	82.8	90	
1.1.3	Reading, maths & science scores	3	82	509.3	525	
1.2.	Training and other education	7	64			
1.2.1	Recent training, %	10	37	11.6	30	
1.2.2	VET students, %	7	90	68.4	75	
1.2.3	High computer skills, %	12	62	31	46	
2.	Skills activation	6	73			
2.1.	Transition to work	10	76			
2.1.1	Early leavers from training, %	4	85	3.2	2	
2.1.2	Recent graduates in employment, %	19	54	76.7	95	
2.2.	Labour market participation	11	69			
2.2.1	Activity rate (aged 25-54), %	1	100	90.5	90	
2.2.2	Activity rate (aged 20-24), %	19	39	54.8	78	
3.	Skills matching	9	64			
3.1.	Skills utilisation	12	67			
3.1.1	Long-term unemployment, %	19	63	4.3	1	
3.1.2	Underemployed part-timers, %	12	70	2.8	1	
3.2.	Skills mismatch	8	63			
3.2.1	Overqualification rate, %	15	53	24.2	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	5	68	25.0	16	

Spain

Rank (out of 28)   28
Score (0-100)   23

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	23.7
GVA per hour worked, EUR/hour	31.1
Lower age limit of compulsory education	6
Upper age limit of compulsory education	16
Employment rate, %	59.5

Skills development

100
80
60
40
20
0

Skills matching   **Skills activation**

— Score   -- Min   — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	21	43			
1.1.	Basic education	23	41			
1.1.1	Pre-primary pupil-to-teacher ratio	20	44	14.9	6	
1.1.2	Upper secondary education (and above), %	26	19	57.4	90	
1.1.3	Reading, maths & science scores	15	60	491.4	525	
1.2.	Training and other education	18	45			
1.2.1	Recent training, %	12	29	9.4	30	
1.2.2	VET students, %	22	38	34.8	75	
1.2.3	High computer skills, %	9	67	33	46	
2.	Skills activation	25	33			
2.1.	Transition to work	27	10			
2.1.1	Early leavers from training, %	27	0	11.4	2	
2.1.2	Recent graduates in employment, %	26	33	68	95	
2.2.	Labour market participation	16	57			
2.2.1	Activity rate (aged 25-54), %	11	74	87.4	90	
2.2.2	Activity rate (aged 20-24), %	18	39	54.9	78	
3.	Skills matching	27	11			
3.1.	Skills utilisation	28	10			
3.1.1	Long-term unemployment, %	27	6	9.5	1	
3.1.2	Underemployed part-timers, %	27	13	6.2	1	
3.2.	Skills mismatch	26	11			
3.2.1	Overqualification rate, %	26	0	40.1	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	23	9	41.5	16	

Sweden

Rank (out of 28)	3
Score (0-100)	72

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	42.5
GVA per hour worked, EUR/hour	47.0
Lower age limit of compulsory education	7
Upper age limit of compulsory education	16
Employment rate, %	76.2

Skills development
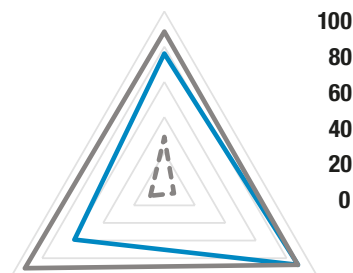
Skills matching — Skills activation

— Score -- Min — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	2	76			
1.1.	Basic education	4	80			
1.1.1	Pre-primary pupil-to-teacher ratio	1	98	6.4	6	
1.1.2	Upper secondary education (and above), %	13	72	78.9	90	
1.1.3	Reading, maths & science scores	12	66	495.8	525	
1.2.	Training and other education	4	72			
1.2.1	Recent training, %	1	99	29.6	30	
1.2.2	VET students, %	20	41	36.6	75	
1.2.3	High computer skills, %	4	79	38	46	
2.	Skills activation	1	87			
2.1.	Transition to work	3	82			
2.1.1	Early leavers from training, %	7	84	3.3	2	
2.1.2	Recent graduates in employment, %	5	79	86.7	95	
2.2.	Labour market participation	1	93			
2.2.1	Activity rate (aged 25-54), %	1	100	90.9	90	
2.2.2	Activity rate (aged 20-24), %	5	85	72.3	78	
3.	Skills matching	13	59			
3.1.	Skills utilisation	10	75			
3.1.1	Long-term unemployment, %	1	97	1.3	1	
3.1.2	Underemployed part-timers, %	16	60	3.4	1	
3.2.	Skills mismatch	15	48			
3.2.1	Overqualification rate, %	11	66	20.3	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	18	26	36.8	16	

United Kingdom

Rank (out of 28) 19
Score (0-100) 52

KEY FACTS, 2016

GDP per capita, EUR 1 000/person	31.4
GVA per hour worked, EUR/hour	34.5
Lower age limit of compulsory education	5
Upper age limit of compulsory education	16
Employment rate, %	73.5

Skills development

Skills matching   Skills activation

— Score -- Min — Max

		Rank (out of 28)	Score (0-100)	Value	Best value	Distance to best
1.	Skills development	15	54			
1.1.	Basic education	19	54			
1.1.1	Pre-primary pupil-to-teacher ratio	26	27	17.7	6	
1.1.2	Upper secondary education (and above), %	11	74	79.6	90	
1.1.3	Reading, maths & science scores	10	70	499.9	525	
1.2.	Training and other education	11	53			
1.2.1	Recent training, %	9	46	14.4	30	
1.2.2	VET students, %	18	46	40.1	75	
1.2.3	High computer skills, %	9	67	33	46	
2.	Skills activation	8	71			
2.1.	Transition to work	16	63			
2.1.1	Early leavers from training, %	18	59	5.3	2	
2.1.2	Recent graduates in employment, %	9	74	84.4	95	
2.2.	Labour market participation	5	79			
2.2.1	Activity rate (aged 25-54), %	18	61	86.1	90	
2.2.2	Activity rate (aged 20-24), %	1	96	76.5	78	
3.	Skills matching	24	39			
3.1.	Skills utilisation	20	60			
3.1.1	Long-term unemployment, %	1	97	1.3	1	
3.1.2	Underemployed part-timers, %	23	35	4.9	1	
3.2.	Skills mismatch	24	26			
3.2.1	Overqualification rate, %	22	38	28.7	10	
3.2.2	Low-waged earners (ISCED 5-8), %	#N/A	#N/A	#N/A	0	
3.2.3	Qualification mismatch, %	22	16	39.5	16	

ANNEX 2
Data table

	Pre-prima-ry pupil-to-teacher ratio	Upper secondary educa-tion (and above)	Reading, maths & science scores	Recent training	VET students	High computer skills	Early leav-ers from training	
BE	15.1	71.8	502.5	7.0	59.6	24	5.2	
BG	12.3	78.1	439.6	2.2	51.3	15	10.6	
CZ	13.5	87.6	490.8	8.8	73.2	27	3.9	
DK	9.7	73.0	504.3	27.7	40.6	39	3.8	
DE	9.7	80.2	508.1	8.5	46.3	30	5.6	
EE	8.6	83.3	524.3	15.7	35.7	37	4.1	
IE		75.4	509.0	6.4	1.2	26	4.3	
EL	11.8	70.0	458.5	4.0	31.5	30	3.9	
ES	14.9	57.4	491.4	9.4	34.8	33	11.4	
FR	21.5	74.5	495.7	18.8	41.5	33	5.9	
HR	12.0	79.4	475.4	3.0	70.4	22	2.1	
IT	13.2	58.4	485.0	8.3	55.8	26	9.4	
CY	14.0	76.0	437.5	6.9	16.7	23	3.6	
LV	10.2	85.1	486.8	7.3	39.8	30	5.6	
LT	10.4	87.6	475.4	6.0	27.2	34	3.1	
LU	10.8	71.8	483.3	16.8	61.4	42	2.8	
HU	12.4	78.2	474.4	6.3	21.4	24	7.2	
MT	12.4	49.4	463.4	7.5	12.7	26	5.2	
NL	16.5	72.1	507.9	18.8	68.5	27	3.2	
AT	13.3	80.4	492.2	14.9	68.8	34	3.7	
PL	15.1	85.4	503.9	3.7	51.1	21	3.2	
PT	17.4	47.1	497.0	9.6	41.2	34	6.5	
RO	15.5	72.0	437.5	1.2	56.2	7	9.8	
SI	9.3	82.8	509.3	11.6	68.4	31	3.2	
SK	12.4	85.7	462.8	2.9	69.0	25	5.4	
FI	10.0	81.4	522.7	26.4	71.3	46	4.8	
SE	6.4	78.9	495.8	29.6	36.6	38	3.3	
UK	17.7	79.6	499.9	14.4	40.1	33	5.3	
Update Date	**20.12.2017**	**21.12.2017**	**2015**	**21.12.2017**	**18.12.2017**	**20.12.2017**	**21.12.2017**	

Source: Cedefop, ESI 2018.

Recent graduates in employment	Activity rate (aged 25-54)	Activity rate (aged 20-24)	Long-term unemployment	Under-employed part-timers	Overqualification rate (tertiriary graduates)	Low-waged earners (ISCED 5-8)	Qualification mismatch
81.2	85.1	48.1	4.0	3.3	19.8	0.2	34.5
72.0	82.0	39.7	4.5	0.7	33.1	4.8	24.7
86.7	88.9	52.8	1.7	0.5	17.9	2.5	16.0
83.9	87.4	72.4	1.4	4.6	21.2	2.1	33.8
90.1	87.3	68.1	1.7	3.4	18.6	6.0	37.3
77.1	87.8	66.7	2.1	1.2	19.0	13.8	36.6
79.5	81.2	65.5	4.2	4.6	37.9	13.2	43.6
49.2	85.5	44.1	17.0	5.6	40.2	7.8	44.1
68.0	87.4	54.9	9.5	6.2	40.1	5.1	41.5
73.0	87.5	62.1	4.6	5.6	24.7	3.6	35.1
72.5	82.0	57.6	6.6	1.9	21.0	3.3	
52.9	77.5	45.5	6.7	2.9	27.6	2.8	38.8
73.4	86.8	61.9	5.8	7.8	40.7	6.8	36.7
81.4	87.8	64.9	4.0	3.2	21.2	11.6	30.8
82.4	89.3	59.1	3.0	1.3	27.5	11.6	35.4
85.4	87.2	47.8	2.2	2.1	4.2	1.9	29.6
85.0	86.1	53.5	2.4	1.0	17.6	3.3	29.6
96.6	82.0	71.9	1.9	1.7	13.9	3.5	
90.1	86.9	75.1	2.5	5.7	18.4	11.9	39.0
87.6	88.4	73.8	1.9	4.2	29.4	5.6	35.3
80.2	84.9	57.8	2.2	1.6	27.6	7.8	23.0
73.8	89.1	57.2	6.2	4.4	19.8	0.9	42.7
69.3	81.9	44.3	3.0	2.4	26.1	5.3	29.1
76.7	90.5	54.8	4.3	2.8	24.2	3.3	25.0
79.6	87.6	53.0	5.8	2.3	28.7	4.5	19.8
77.4	86.3	69.7	2.3	3.8	18.3	1.6	28.3
86.7	90.9	72.3	1.3	3.4	20.3	1.2	36.8
84.4	86.1	76.5	1.3	4.9	28.7	10.3	39.5
21.12.2017	**19.12.2017**	**19.12.2017**	**11.10.2017**	**19.12.2017**	**2015**	**07.08.2017**	**2014**

ANNEX 3
Source and definitions

The European skills index consists of three pillars: skills development, activation, and matching. These three pillars have been formed by aggregating 15 individual indicators which capture data available from international sources that are harmonised across all Member States. Table A1 lists each of the 15 indicators and gives their source, along with a short description.

Table A1. **Composition of indicators by pillars**

Indicator	Description	Pillar	Sub-pillar	Source
Pillar 1: Skills development, measures training and education activities				
Pre-primary pupil-to-teacher ratio	Ratio of pupils and students to teachers and academic staff at the pre-primary education level (ISCED11 level 0, 3 years to the start of primary education)	Development	Basic education	UNESCO/OECD/Eurostat joint data collection
Upper secondary education (and above)	Upper secondary attainment (and above) (ISCED11 level 3-8)	Development	Basic education	EU labour force survey
Reading, maths and science scores	Average PISA scores (15year-olds) for reading, maths and science	Development	Basic education	PISA, pro-gramme for internation-al student assessment
Recent training	Share of population aged 25-64 who stated that they received formal or non-formal education or training in the four weeks preceding the survey	Development	Training and other education	EU labour force survey
VET students	Share of the population at ISCED11 level 3 who are under-taking VET	Development	Training and other education	UNESCO/OECD/Eurostat joint data collection

Indicator	Description	Pillar	Sub-pillar	Source
High level computer skills	Share of 16-74 year-olds with high level computer skills (able to carry out five or six of the six tasks described in the survey)	Develop-ment	Training and other education	ICT surveys
Pillar 2: Skills activation, measures the transition of people into work, and participation in the labour market				
Early leavers from training	Early leavers from education and training (work status 'not in employment') as a share of the population aged 18-24 having attained ISCED level 0, 1, 2 and not receiving any formal or non-formal education or training in the four weeks preceding the survey	Activation	Transition to work	EU labour force survey
Recent graduates in employment	The share of employed people aged 20-34 having successfully completed upper secondary or tertiary education one to three years before the reference year of the survey and who are no longer in education or training	Activation	Transition to work	EU labour force survey
Activity rate (aged 25-54)	Activity rate of 25-54 year-olds	Activation	Activity rates	EU labour force survey
Activity rate (aged 20-24)	Activity rate of 20-24 year-olds	Activation	Activity rates	EU labour force survey
Pillar 3: skills matching, measures the degree of successful matching of skills, that is the extent to which skills are effectively matched in the labour market				
Long-term unemployment	Long-term unemployment (more than 12 months) as % of active population	Matching	Skills utilisation	EU labour force survey
Underemployed part-timers	Underemployed part-time work-ers aged 15-74 as share of ac-tive population. Persons working on an involuntary part-time basis are those who declare that they work part-time because they are unable to find full-time work.	Matching	Skills utilisation	EU labour force survey

Indicator	Description	Pillar	Sub-pillar	Source
Overqualification rate (tertiary graduates)	Percentage of employed people aged 25-34 with ISCED 5 and 6 that occupy jobs not corresponding to ISCO 1, 2 or 3.	Matching	Skills mismatch	EU labour force survey
Low-wage earners (ISCED 5-8)	The proportion of low-wage earners out of all employees of ISCED11 level 5-8 qualification level, where low wage is defined as 'those employees (excluding apprentices) earning two-thirds or less of the national median gross hourly earnings in that particular country'	Matching	Skills mismatch	EU structure of earnings survey
Qualification mismatch	The extent to which each employee's education attainment level matches the modal education attainment level for each occupation in each industry	Matching	Skills mismatch	OECD world indicators of skills for employment

Source: Cedefop, ESI 2018.

ANNEX 4
Technical notes

This section provides further details of the methodology used in the construction of the European skills index.

Country coverage

The index covers the 28 Member States of the EU, at the country level. The specific countries covered within the ESI are outlined in Table A2.

Table A2. **Country coverage**

Countries (country code)			
Belgium (BE)	Greece (EL)	Lithuania (LT)	Portugal (PT)
Bulgaria (BG)	Spain (ES)	Luxembourg (LU)	Romania (RO)
Czech Republic (CZ)	France (FR)	Hungary (HU)	Slovenia (SI)
Denmark (DK)	Croatia (HR)	Malta (MT)	Slovakia (SK)
Germany (DE)	Italy (IT)	Netherlands (NL)	Finland (FI)
Estonia (EE)	Cyprus (CY)	Austria (AT)	Sweden (SE)
Ireland (IE)	Latvia (LV)	Poland (PL)	United Kingdom (UK)

Source: Cedefop, ESI 2018.

Time coverage

The 2017 European skills index draws on annual data, up to 2016. The index is back-cast using 2014-15 data and the current methodology to gauge how countries have performed over recent history (see Chapter 2 for the discussion).

The last update date used for each indicator in the construction of the index is in the last row of the data table in Annex 2. Although it is desirable to

have up-to-date data for each indicator, index construction is a long process and a cut-off date for the update of original indicators is required to finalise the construction.

Missing data and imputation methods

A complete data set for the ESI for the latest year would mean 28 observations per indicator and 15 observations per country. Since the data set is not complete, cold deck imputation (last observation carried forward) is used, replacing missing values with those from a previous year. The lowest data availability by indicator is 93%, for qualification mismatch (Croatia and Malta have missing data).

For back-casting the index, linear interpolation is also used to fill in missing data for which data are available in preceding and subsequent years for the same indicator.

In determining whether additional imputation methods are necessary, some practical rules are followed:

(a) a requirement for at least 60-65% indicator, pillar and sub-pillar coverage per country. This can be relaxed or made stricter depending on the degree of correlation between indicators within a dimension; for example, for each country, if more than 20% of values in one dimension are missing, then the country may be removed;

(b) there is a requirement for at least 75 to 80% data coverage per indicator.

Once cold deck imputation is applied, no imputation approach is adopted thereafter. This is conceptually equivalent to imputing the missing value with the weighted mean of the values observed for that unit on the other indicators included in the same lower dimension (mean-row). This applies even if the indicators are assigned different weights

Treatment of outliers

Outliers can polarise the scores and bias the rankings. All variables are checked for absolute skewness greater than 2, and kurtosis greater than 3.5. 'Winsorisation' is only used for the value for 'long-term unemployment' for Greece.

Normalisation: distance to best achievable target

The distance-to-frontier normalisation method is a special case of distance from the best and worst performers, where a country's performance in a variable is compared with the value of a logical best case and that of a logical worst case. An alternative interpretation of the frontier and the worst case is that these values act as bounds for the indicator. As a result, the country's relative position can be captured by the generated distance-to-frontier scores. If the upper and lower bounds are time-invariant, this approach enables easier comparison of index scores over time. A country's distance-to-frontier score for each indicator is calculated using the formula:

$$\frac{Iij - lower\ bound}{Upper\ bound - lower\ bound} \tag{1}$$

where *Iij* is the raw value of country *i* in indicator *j*.

The normalised scores for every indicator calculated using the formula above range from zero to one.

In equation (1), the bounds, i.e. best case and worse case, adopted for each indicator are derived using statistical considerations. Some bounds could have been aligned with targets identified in policy papers at EU level, in instances where they exist and can provide a target that countries can aspire to. However, it was decided not to use policy targets because of difficulties in interpretation and statistical coherence issues. Statistical bounds are close to the maximum and minimum values observed at indicator level, across EU countries, and observed over 2010-16, in instances where data are available.

Table A3 presents the bounds used for each indicator in the index and as well as the rationale behind the choice of bounds, which is statistically computed bounds.

Table A3. **Upper and lower bounds**

Indicator (unit)	Rationale for bounds	Lower bound	Upper bound
Pre-primary pupil-to-teacher ratio (students per teacher)	There is no clear evidence on worst nor optimal student-to-teacher ratios. Bounds as the minimum and maximum across the years as the worst and best-case frontiers.	22	6
Upper secondary attainment (and above) (%)	Best outcome bound close to the maximum across the years. The ET 2020 target of 40% attainment for tertiary education (of 30-34 year-olds), so in the long-term we would expect that the share of population with at least upper secondary education should be at least higher than this target. It was rounded up to the nearest 10%, based on the fifth percentile of the past seven years.	50	90
Reading, maths and science scores (PISA score)	Bounds close to the (EU) minimum and maximum, in particular, and the fifth and 95th percentile scores rounded to the nearest 10.	440	550
Recent training (%)	This indicator corresponds to the ET 2020 target 6. Bounds as the seven-year minimum for worst outcome, and a number close to the seven-year maximum for the frontier.	1	30
VET students (%)	This indicator is monitored in the *Strategic framework: education and training 2020*. Bounds close to the minimum and maximum across the seven years.	10	75
High level computer skills (%)	Bounds close to the minimum and maximum across the seven years.	7	46
Early leavers from training (%)	This indicator corresponds to the ET 2020 target 1. It was decided for a number close to the maximum as the worst frontier across the years, and for the best frontier a figure close to the minimum scored across the years.	10	2
Recent graduates in employment (%)	This indicator corresponds to the ET 2020 target 5. The best and worst frontiers are figures close to the minimum and maximum across the years.	55	95
Activity rate (aged 25-54) (%)	Bounds close to the minimum and maximum across the seven years.	80	90
Activity rate (aged 20-24) (%)	Bounds close to the minimum and maximum across the seven years.	40	78
Long-term unemployment (%)	Bounds close to the minimum and maximum across the seven years.	10	1

Indicator (unit)	Rationale for bounds	Lower bound	Upper bound
Underemployed part-timers (%)	Bounds close to the minimum and maximum across the seven years.	7	1
Overqualification rate (tertiary education, %)	Bounds close to the minimum and maximum across the seven years.	40	10
Low-waged earners (ISCED 5-8) (%)	Bounds close to the minimum and maximum across the seven years.	14	0
Qualification mismatch (%)	Bounds close to the minimum and maximum across the seven years.	44	16

Source: Cedefop, ESI 2018.

Transformation

No transformations are applied to the normalised scores. Although some of the normalised indicators present left or right skewness, it is considered that a sample of 28 countries is prone to such types of distribution. Some of the indicators exhibit a median greater than or equal to 0.7 (after normalisation) and lower than or equal to 0.3 (after normalisation). However, since the mean was above 0.3 or below 0.7, it was decided not to proceed with transformation, which would make the interpretation of individual indicator scores more difficult for policy-makers.

Aggregation method

A mixture of weighted arithmetic and geometric means is used at different levels of the index.

The index score is computed as the weighted geometric average of three pillar scores. Pillar scores are derived by calculating the weighted arithmetic average of the sub-pillar scores. Sub-pillar scores are calculated as the weighted arithmetic average of the indicator scores.

The weighted arithmetic average method is easy to interpret but makes a key assumption of perfect compensability between indicators, as it assumes that the score in one indicator/sub-pillar can fully offset the score in another. At indicator and sub-pillar levels, interpretation of perfect compensability of scores is considered reasonable and adequate. The use of a weighted arithmetic average also has precedence in the creation of other composite indices in which a distance-to-frontier normalisation approach is chosen ([13]).

The decision to use the weighted geometric average to combine the three pillar scores into an index score stems from the consideration that perfect compensability at this level is more problematic. By using weighted geometric average, unbalanced profiles are penalised: with pillar scores of two and eight, the weighted geometric average would be four, while pillar scores of five and five would score higher (five).

Weighting method

In practice, the (normalised) indicators within any given pillar in a composite index are often given equal weights. This approach makes the assumption that each indicator is equally informative with respect to the theme covered by the pillar.

However, there are several cases where the weights would be expected to deviate from equal weights:

(a) theoretical basis: there may be a basis for considering certain indicators as being more important according to theory or relevant studies. As such, one may decide to increase the weight of these indicators/pillars relative to the other indicators/pillars;

(b) statistical basis: correlation analysis and loadings from principal components analysis (PCA) can indicate similarity of one or more indicators. The information (the factor loadings) from PCA can be used to adjust the weights so that they act as 'scaling coefficients' aiming to assign less weight to more correlated indicators, so that all indicators contribute in the same way to the index variance. An additional consideration is

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([13]) See for instance the World Bank Group report *Doing business 2018: reforming to create jobs* (World Bank Group, 2018) and the *Legatum prosperity index 2016* (Legatum Institute, 2016). The *Human development index* (HDI) of the United Nation Development Programme uses a simple arithmetic average at sub-pillar level and then a simple geometric average at pillar level. Learn more at: http://hdr.undp.org/en/content/human-development-index-hdi

that being multidimensional phenomena, the index, pillar and sub-pillar scores should not be driven by a single pillar, sub-pillar or indicator.

As a starting point, equal weights were assigned at all levels ([14]). The weights of each indicator were then adjusted (informed by PCA factor loadings calculated at sub-pillar level) as follows: the higher the PCA factor loading of an indicator, the lower the weights used, and vice versa. Then the correlation between the sub-pillar index and each indicator in the sub-pillar was checked so that no indicator is driving the sub-pillar and each indicator is significantly correlated ([15]) with its sub-pillar. The weights were then adjusted upwards/downwards to achieve these objectives. This check was repeated for the upper dimensions (sub-pillar, pillar and index), to ensure that sub-pillars correlate with their corresponding pillar, the individual indicators' correlate with their pillar, and finally with the index. Again, the weights were adjusted so that no indicator or sub-pillar would drive the score of the pillar or the index. The whole purpose of this exercise was to ensure that indicator, sub-pillar and pillar scores contribute as equally as possible to sub-pillar, pillar and index scores.

The ESI has also been back-cast. The variation of each indicator over time was reviewed; any indicators that are particularly volatile might cause low correlations and so warrant adjustment to the corresponding weight. No such adjustments to weights were made because none of the indicators were judged to show problematic volatility.

The final weights for each indicator and pillar are given in Table A4.

([14]) In previous versions of the index, engagement with thematic experts on possible weights concluded that no strong case could be made to assign greater or lesser weighting to any pillar, sub-pillar or indicator.

([15]) Significant Pearson's correlation at 1% level.

Table A4. **Pillar, sub-pillar and indicator weights**

Pillar/sub-pillar/indicator	Weights
Skills development	0.3
Basic education	0.5
Pre-primary pupil-to-teacher ratio	0.4
Upper secondary attainment (and above)	0.3
Reading, maths and science scores (aged 15)	0.3
Training and other education	0.5
Recent training	0.3
VET students	0.35
High level computer skills	0.35
Skills activation	0.3
Transition to work	0.5
Early leavers from training	0.7
Recent graduates in employment	0.3
Labour market participation	0.5
Activity rate (aged 25-54)	0.5
Activity rate (aged 15-24)	0.5
Skills matching	0.4
Skills utilisation	0.4
Long-term unemployment	0.4
Underemployed part-timers	0.6
Skills mismatch	0.6
Overqualification rate	0.4
Low-waged workers (ISCED 5-8)	0.1
Qualification mismatch	0.5

Source: Cedefop, ESI 2018.

2018
EUROPEAN
SKILLS INDEX

Cedefop's European skills index (ESI) is a composite indicator that measures the performance of a country's skills system. For the first time it is possible to gauge the relative performance of EU Member State skills systems and, in doing so, contribute to the policy discourse on skills, employment, and growth. Countries need to equip their workforce with the appropriate skills for their labour markets; to do so, they need the right policies. The ESI helps understand which policies work, highlighting trends shaping skills systems across the EU. It allows analysis of a skills system in three different areas: skills development, skills activation and skills matching. Skills development assesses the effectiveness of compulsory and post-compulsory education. Skills activation examines the transition from education to work. Skills matching shows to what extent skills are matched with an appropriate job. The report presents findings from the 2018 ESI update and provides in-depth analysis including individual Member State performances.

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