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**Training for Jobs of the Future:
Improving Access, Certifying Skills, and
Expanding Apprenticeship**

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ABSTRACT

Training for Jobs of the Future: Improving Access, Certifying Skills, and Expanding Apprenticeship*

Long run labor market trends in the American economy pose significant challenges. The employment-to-population ratio has steadily fallen. Growth in real money wages has been slow, with the most rapid gains taking place among workers at the top of the earnings distribution. One source of these trends is low starting wages, which suggests weak transitions from school to the labor market. Limited skills relative to the demands of employers also play a role. This paper proposes three major policy initiatives for upgrading and expanding worker training to bolster productivity and wages: 1) Improve access to in-demand training through better information, technology, and targeted funding; 2) Strengthen connections between career and technical education and training and employer needs through competency-based training, career pathways, and improved certification and verification of skills. 3) Build a robust apprenticeship system that emphasizes learning by doing in a context that involves apprentice contributions to production and culminates in a respected occupational credential. The strategies go beyond the “academic-only” approach commonly pursued in the US. They widen routes for young workers to rewarding careers, and help experienced workers adapt to changing labor markets with improved options over the life course for learning and documenting skills. By upgrading information and using approaches that recognize differences in learning styles, we believe the proposed policies will build, sustain, and recognize a diverse set of skills that will make the majority of American workers more productive and more resilient, strengthen the economy, the budget, and substantially raise living standards for tens of millions of Americans.

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Introduction

Long run labor market trends in the American economy pose significant challenges. The employment-to-population ratio has steadily fallen (Abraham and Kearney 2018). Growth in real money wages has been slow, with the most rapid gains taking place among workers at the top of the earnings distribution. A key result of these trends is low starting wages, which suggests weak transitions from school to the labor market (Güvenen 2018). Limited skills relative to the demands of employers also play a role.

Over recent decades, labor force participation and employment rates have been falling. Reduced labor force participation and obsolescence of workers' skills weighs down GDP growth, with predictable negative repercussions for living standards and federal revenue. Particularly concerning for the future are declines in participation of young people. Early work experience is important because it provides foundational skills and experience for later employment and careers. Even with today's low unemployment rate, only about 68 percent of 20 to 24-year-old men are working, down from nearly 80 percent in 1979. Forty percent of black 20 to 24-year-old men lack jobs (Ross and Svajlenka 2016).

During the next 10 years, low-wage jobs will continue to grow significantly. The Bureau of Labor Statistics estimates that of the 15 occupations predicted to add the most jobs from 2016 to 2026, only 5 pay annual wages higher than the national median (Bureau of Labor Statistics 2016). In addition to these trends, predictions of automation and increased use of technology bring concerns that many workers will need to learn new skills or change locations to find jobs as whole sectors are displaced. One study projecting the implications of automation in the US found that by 2030, 23 percent of current work activity hours could be automated with currently available technology. While the authors do not predict overall declines in employment, automation will likely mean as much as one-third of the workforce will need to change occupations by 2030 (Manyika et al. 2017). These transitions could result in workers facing periods of unemployment and reskilling. The dearth of promising career prospects falls hardest on workers without a bachelor's degree.

Simultaneously, many employers report having trouble finding workers. Since 2008, the share of workers with a college degree rose considerably, from about 39 to 46 percent of 25 to 29-year-olds. Despite increases in the population's average years of schooling, added government education spending, and the buildup of mountains of student debt, US employers report that they face a serious skills mismatch, especially in technical fields (Craig 2019). For example, one survey of a nationally representative sample of manufacturing companies found that "eighty-four percent of manufacturing executives agree there is a talent shortage in US manufacturing, and they estimate that 6 out of 10 open skilled production positions are unfilled due to the shortage" (Giffi, Dollar, Gangula, and Rodriguez 2015). Worker productivity depends heavily on occupational

competencies and employable skills such as communication, teamwork, the ability to efficiently allocate resources, problem solving, reliability, and responsibility (Packer 2014). The wide variation in the types of skills demanded by employers raises questions about the need to expand the focus of policymakers beyond traditional degrees and academic test scores.

These trends suggest the need for a major revamping of policies and programs that prepare people for careers and retrain people who must change careers. This system should match individual interests, aptitudes, and skills to in-demand jobs and make new training investments that are cost effective and valued by employers. Education and training for careers is often labeled “job training,” but we should also consider more traditional educational programs when the focus is on direct preparation for careers. The government already spends substantial amounts on education and training for careers—that is, training to develop occupational and technical skills tied to particular jobs. Nightingale and Eyster (2017) argue that public investments in training are designed to fill a “gap” in private training investments by supporting workers with lower skills and wages. Indeed, federal investments are dwarfed by business investment in education and training (Mikelson and Nightingale 2004). In addition, federal investment in education and training has declined over time (Barnow and Smith, 2015; Concord Coalition, 2018).

Determining exactly how much the federal government invests in occupational training is difficult. Widely publicized estimates (e.g. Government Accountability Office, 2019) need to be interpreted cautiously because they include funding on non-training activities such as employment services (assistance finding a job) and because they exclude large federal educational investments that support occupational training (such as Pell grants and career and technical education grants).¹ For example, Workforce Innovation and Opportunity (WIOA) obligations in fiscal year 2017 were just over \$2.8 billion serving over 1.7 million workers (GAO, 2019), but most of those funds supported employment services rather than training. WIOA does not directly report the breakdown in funding on these different activities. Using estimates of this breakdown from earlier research (Mikelson and Nightingale 2004), we estimate that approximately \$707 million of WIOA obligations are spent on training for almost 258,000 trainees, or \$2,744 per trainee.²

¹ Another issue is GAO (2019) reports that \$68 million is spent by the US Department of Labor on 533,607 apprentices. However, few apprentices receive any training funding at all from the federal government. Federal spending on apprenticeship training is usually concentrated on a small number of apprenticeship programs, and even in those cases there is little direct federal spending on training.

² Mikelson and Nightingale (2004) calculate training shares of total expenditures by WIA program (dislocated worker, youth, and adult). We use the average of the high and low estimate of program specific training shares of expenditures for 2002 from Exhibit 1 and apply it the WIOA program expenditures in GAO (2019) to get this estimate. To determine the number of trainees supported in fiscal year 2017, we use the trainee share of WIOA exiters by WIOA program (dislocated worker, youth, and adult) for the 2016-2017 program year reported to DOL

Other important federal training investments in fiscal year 2017 include \$1.6 billion on Job Corps, \$391 million on Trade Adjustment Assistance, and \$312 million on SNAP Education and Training, along with many other programs (GAO 2019). Many of these also fund a mix of activities, but the share receiving training is higher.³ Generally speaking, programs providing training to youth (Job Corps, YouthBuild, and National Guard Youth Challenge) are more expensive on a per-trainee basis, ranging from \$15,000 to \$33,000 per-trainee (GAO 2019).

Barnow and Smith (2015) estimate that over \$8 billion in Pell grants were used to pay for occupational degrees or certificates in the 2011-2012 school year, making it the largest source of funding for training.⁴ Although their estimate is dated, declining investments in training from other sources ensure that Pell continues to be the largest source of federal investment today. Another major federal investment in occupational training is the US Department of Education's Carl D. Perkins Career and Technical Education grants, with total expenditures of \$1.1 billion in fiscal year 2017.⁵ Combining these figures, we estimate that the federal government invests approximately \$13.2 billion in occupational training annually. These figures do not include federal costs of tax subsidies, which have historically been even more expensive than the Pell grant program (Pew Charitable Trusts 2017).

Are these expenditures worthwhile for taxpayers and participants? The record is mixed. Several evaluations have demonstrated that public training programs have led to only small gains in earnings. An experimental study of the Workforce Innovation Act (the precursor to WIOA) found that public-funded training did not yield enough benefits to offset program costs (Fortson et al. 2017). WIOA is the largest source of federal funding for job training that supports a variety of training providers, including community colleges, private vendors, and nonprofits. Similar weak results show up in rigorous evaluations of the expensive Jobs Corps program. Returns to community college students are positive for graduates but vary substantially by area of study. And approximately 70 percent of community college students do not complete a two-year degree. However, selected occupational programs including technical programs in some health care, information technology, high-demand occupations like welding, as well as apprenticeships yield substantially higher earnings and presumably productivity. Other successful models of training exist, including focused

(https://www.doleta.gov/performance/results/WIASRD/PY2016/PY_2016_WIOA_and_Wagner-Peyser_Data_Book.pdf) applied to participant numbers for fiscal year 2017 in GAO (2019).

³ GAO (2019) includes additional programs, such as Wagner-Peyser Act Employment Service spending, that are mostly used to fund employment services so are not included here.

⁴ They estimate that approximately \$5 billion goes towards occupational degree programs and \$3 billion goes towards occupational certificate programs. Barnow and Smith (2015) do not provide the number of trainees supported by Pell, which is difficult to track since Pell spending varies widely by participant.

⁵ https://s3.amazonaws.com/PCRN/docs/FY2017_Perkins_Supplemental_Grant_Awards-072318.pdf.

sectoral training programs such as YearUp (Fein and Hamadyk 2018) and WorkAdvance (Hendra et al. 2016), which have shown strong impacts through rigorous evaluations. Successful training must be for in-demand occupations, provide necessary supports for students, often include work-based learning and job experience, and adhere closely to the needs of employers.

Employers are also a major provider of skill training in the US. Though reliable data are limited, estimates suggest spending on employer-sponsored training substantially exceeds the amount spent on by federal and state governments (Mikelson and Nightingale 2004).⁶ Economic theory suggests that employers may not want to subsidize training for skills and credentials that workers can easily transfer to other employers, for fear of losing the return on their investment. However, research shows that workers receiving training are retained longer and the offer of employer tuition reimbursement may attract workers with an interest in learning (Cappelli 2004). Studies show that more educated workers and those at larger firms are more likely to get employer-sponsored training (Lerman 2015). Future trends for employer training, especially for entry-level workers looking to move-up, are unclear.

The combination of government-sponsored and employer-led training have not proved sufficiently robust to generate the productivity growth required to resolve our wage stagnation and budgetary problems. Since 2010, productivity growth has increased by only 0.8 percent per year, far below the 2.0 percent per year rate since 1960. While in the first quarter of 2019, productivity increased 1.5 percent, long-run trends are still a concern. One major explanation of low productivity is the limited skills of American workers. Research shows that improving skills can improve productivity. Several studies show positive impacts of occupational training on firms' productivity and profitability (Barrett and O'Connell 2001; Bassi and McMurrer 2004; Hanssen 2007). In Britain, for example, a sophisticated panel study found that a 1 percentage point increase in training is associated with about a 0.6 percent increase in industry productivity and a 0.3 percent increase in hourly wages. The productivity effect of training is twice as large as the wage effect, implying that existing studies have underestimated the benefits of training by focusing on wages. Moreover, the government generally gains by paying little for the training, while reaping tax benefits from the increased earnings of workers (Lerman 2015).

Wage and productivity stagnation and declining work experience are often framed as labor market problems, but they have significant implications for the federal budget. The Congressional Budget Office (CBO) expects an \$900 billion federal budget deficit in 2019 and expects the size of the deficit to grow over time, both in dollars and as a percent of GDP. As of the end of 2018 the federal debt had reached \$16.1 trillion and

⁶ Data on current employer expenditures for training are limited, relying on private survey efforts of individual companies and trade associations. The last nationally representative federal survey of employer-provided training was in the 1990s.

is expected to continue to grow in future years (CBO 2019). The most politically difficult approaches to reducing the deficit and paying off the debt are to raise taxes and cut spending. While these strategies need to stay on the table, an additional approach is to raise revenue by increasing workers' productivity. A more productive economy generates higher incomes that raise tax revenue. More productive workers are less reliant on a social safety net and are more likely to be net contributors to the federal coffers.

This paper proposes three major policy initiatives for maximizing worker training to bolster productivity and wages:

1. **Improve access to in-demand training** through better information, technology, and targeted funding.
2. **Strengthen connections between career and technical education and training and employer needs** through competency-based training, career pathways, and improved certification and verification of skills.
3. **Build a robust apprenticeship system** that emphasizes learning by doing in a context that involves apprentice contributions to production and culminates in a respected occupational credential.

These strategies go beyond the “academic-only” approach commonly pursued in the US. They widen routes for young workers to rewarding careers, and help experienced workers adapt to changing labor markets with improved options over the life course for learning and documenting skills. By upgrading information and using approaches that recognize differences in learning styles, we believe the proposed policies will build, sustain, and recognize a diverse set of skills that will make the majority of American workers more productive and more resilient, strengthening the economy, the budget, and substantially raise living standards for tens of millions of Americans.

Improving Access to Relevant Training: Better Information, Technology, and Targeted Funding

Education and training providers and their partners can maximize the value of public training dollars by improving access to training for skills that employers demand and that match workers' aptitudes and interests. When workers have broad access to training for jobs that suit their situation, they can maximize their contribution to the workforce and will be more inclined to persist in their programs. This section presents three ways to improve access: providing better information to help students select training, using technology to make training available to a broader array of students, and promoting ways to increase employer funding for training, an approach that helps align training with employer needs.

Improving Access Through Information

Students interested in pursuing additional education and training at the sub-baccalaureate level need clear and easily accessible information on what skills are in demand by employers, how programs connect to an individual's existing skills and interests, and how to access education and training to gain skills.

Currently, adults can turn to public workforce programs or college advisors for this type of information. Under federal law, state public workforce agencies are charged with developing strategies to support the use of career pathways— high quality education, training, and services that help individuals understand and progress through steps towards careers and align with the needs of industry.⁷ State workforce systems are working on development and implementation of these strategies. The US Department of Labor and state and regional agencies put out information on jobs, wages, occupations, and indicators of labor demand. These agencies continue to work on new ways of providing this information, so it is useful to individuals. For example, the US Department of Labor has put out a mobile app that provides local labor market information.⁸ Some community colleges have implemented similar efforts to streamline information for students on labor demand and career pathways to earn a specific credential or to enter or move up in a specific career (Community College Research Center 2015). To provide timely and accurate information on skills and labor demand, education and training institutions must collaborate with employers. In the future, adoption of competency-based hiring and education (discussed in next section), can help streamline and simplify information for adult learners on what skills they may want to attain. It could also lead to more common language that eases navigating which institutions provide these skills and credentials.

There is a government role in promoting information on the performance of educational institutions and types of programs to help individuals choose where to build skills. These efforts include the US Department of Education's College Scorecard which provides data on student outcomes by college. More information on returns to specific programs and credentials within and across institutions is needed and should be reported in ways individuals can understand and use. Another government safeguard is limiting use of federal student aid to programs that prepare students for "gainful employment in a recognized occupation" where specific formulas based on program cost relative to eventual earnings are used to define gainful employment (Hiler and Whistle 2017). Similar government efforts to signal effective programs could go beyond the student aid setting. Nongovernmental efforts to promote information exist as well. One example is Credential Engine, an effort using technology to create a centralized registry of all credentials offered in the US.

⁷ The exact definition of career pathways in the Workforce Innovation and Opportunity Act can be found in H.R. 803 Sec. 3 (7).

⁸ See the Department of Labor website at <https://blogs.bls.gov/blog/2018/10/18/new-bls-local-data-app-now-available/>

Those interested in obtaining more education and training, particularly adults already in the labor market, can benefit from assessments that help them identify their current skill set and levels, and learn how these relate to new training or employment opportunities. Many employers use online assessments in hiring to assess job applicants' skills, aptitudes, and personality (Lennon and Steinberg 2018). Broader availability of online skill assessments and career matching for workers to use in decision making could provide critical information on types of training or careers that are in demand and match existing skills and aptitudes. Some existing online tools and assessments such as the U.S. Department of Labor's "mySkills myFuture" website, help low and moderate-skilled workers make these links. Broader dissemination and refinement of similar assessments and tools, including use by training institutions and community colleges, could benefit more workers.

Increased Access Through Online Technology

Technology that makes online or hybrid learning approaches possible offers the promise of easier access to skill-building opportunities at a lower cost. This could help adults who are working, face transportation challenges, live far from training providers, or are balancing family responsibilities (Rosenboom and Blagg 2018). Online education or distance learning has boomed over the last decade and continues to grow (Seaman, Allen and Seaman 2018). New technologies are emerging that can potentially create personalized learning approaches that tailor the pace of instruction and assessments to students, whether used in distance learning or as a supplement to the classroom.⁹ Over time, more educational institutions, trade associations, unions, and employers, could use technology and online models to offer workers nondegree credentials and ways to gain specific competencies.

Some employers are partnering to offer online education benefits to their employees. One example is Southern New Hampshire University (SNHU)'s College for America (CfA). SNHU reports on its website that more than 120 companies are partnering with CfA, including large employers such as McDonald's, Aetna, Gap, and Dunkin Donuts, to provide online degree and certificate programs to their employees. CfA is a competency-based educational institution, the first university in the nation to be approved for federal financial aid under the US Department of Education's direct assessment provisions, independent of traditional credit hours. Competency-based hiring evaluations for workers and online educational platforms that

⁹ Several institutions and companies are exploring ways to use technology to create "personalized learning" experiences, some of which are used in classrooms and some online. For more information on what personalized learning is and how it is used, see the Educause Learning Initiative series on the topic retrieved at <https://library.educause.edu/~media/files/library/2015/9/eli7124-pdf.pdf>.

promote development of these competencies while working could enhance skill development in ways that are largely tuition free to employees. There is very limited evidence on the returns to this type of online education provision through employers (whether skills based or traditional credit based). The Lumina Foundation with Accenture has conducted a series of five case studies on the return on investment (ROI) to tuition reimbursement in several companies. These generally show positive ROI with the highest returns being generated by reductions in turnover in frontline positions, but are not focused on particular methods of providing the training.¹⁰ While presumably online education is less costly than in-person education, the question remains as to what the returns are to individuals from this training and how useful will it be for obtaining in-demand skills in the future.

To fully take advantage of increased access, online learning approaches must provide quality learning experiences and produce desired outcomes of completion and subsequent employment. Research suggests at least some online learning experiences are not meeting these goals. Several studies report that online learning delivers worse outcomes in terms of learning and persistence to completion than in-person classes (Protopsaltis and Baum 2019, Bettinger et al. 2017, Xu and Jagers 2012). Outcomes may be worse for less-prepared or low-income students. Reasons include technical difficulties, a sense of social isolation and disconnectedness from instructors and students, and the lack of structure in online courses (Jagger 2011). Use of online learning is also dependent on individuals' access to reliable and affordable internet connection. In addition, there are basic questions about how to best structure online learning and provide appropriate student-teacher interaction. Current debates about how to determine whether students in online classes are eligible for federal student aid highlight the importance of using taxpayer funds responsibly (Protopsaltis and Baum 2019).

Increased Access Through Changes in Funding Sources

For workers without access to employer-sponsored training who are seeking to improve skills (including those displaced from their jobs), paying for training and education or paying back student loans can be a barrier. Much of the focus of this discussion has been on the cost and debt of postsecondary degree programs, but it is also important to consider the costs of shorter-term credentials. Although less costly than four-year degrees in absolute terms, it can still be a barrier for some workers, particularly if they fail to complete their program and find a well-paying job in their field of study (Baum 2016). Three possible solutions to address this issue include expansion of the government role in tuition aid for students, establishing lifelong learning accounts to

¹⁰ For discussion and links to studies see <https://www.luminafoundation.org/news-and-views/the-case-for-talent-investment>.

support saving for education and training, and extension of government assistance for displaced workers through programs such as WIOA and the Trade Adjustment Assistance Act (TAA).

Currently, Pell grants are the largest source of government assistance for higher education, with expenditures of roughly \$30 billion a year. These funds help low-income students defray their costs of earning degrees and credentials. But Pell grants are poorly targeted to the technical training demanded by employers due to the program's minimum hours requirement. Currently, Pell eligibility is limited to programs that are the equivalent of two-thirds of an academic year (600 clock hours, or 16 credit hours). Many credential training programs that are focused on helping individuals get onto the "first rung" of a career ladder (often offered through community and technical colleges) are relatively short (one semester or less). Even the relatively low cost of these programs is a barrier for some low-income workers trying to invest in new skills. One idea is to expand eligibility for Pell grants to students in short-term credential programs, including apprenticeships. A proposal from the American Association of Community Colleges calls for this type of expansion capped at 2 percent of an institution's prior year Pell grant awards.

Lifelong learning accounts are another way to dramatically reshape the delivery of education and training. These are tax-preferred savings vehicles for individuals to save to pay for education or training, involving contributions from government, workers or employers. Although proposals vary on how lifelong learning accounts could be structured, they allow for flexibility in the type of institutions where students can enroll, and an easy way for employers to support workers' ongoing training. The Aspen Institute proposed a configuration for a federal lifelong learning account, which they estimate 23 million Americans would contribute to over 10 years, costing the federal government roughly \$25 billion. In this proposal, the government would match individuals' contributions at a declining match as income grows (starting at 50 percent for low-income workers). Employers could also make contributions up to a limit that would be excluded from taxable income for low-income workers. Their simulations suggest that most of the benefits will go to low-income households (Fitzpayne and Pollack 2018). A demonstration of one configuration of lifelong learning accounts conducted by the Council for Adult and Experiential Learning in three cities found increased savings and education. However, this pilot included a 3:1 match of employee contributions from employers and foundation funds, and provided career planning counseling. Several states have introduced legislation to establish lifelong learning accounts, and Maine currently has such a policy. If workers can use these savings for nondegree, short-term credentials or skill building, a relatively small amount of savings could be helpful for workers seeking additional skills. The matching contribution aspect of these proposals may affect low-income workers the most, many of whom do not have high enough income to owe taxes.

In addition to tuition, funding for other supports can be important to enable successful completion of training and education outside of the workplace. These include child care and transportation assistance. For

parents, especially of young children, lack of access to child care is a barrier to enrolling and completing postsecondary training and education (Adams et al. 2015). While some public funding for child care is available to low-income parents, expanded use of current funds to support those in training as well as additional funding could serve more individuals. Access could also be improved by assisting those entering training to find child care potentially through active partnerships with public child care subsidy agencies, or public workforce agencies and creation of informational resources for parents.

Finally, changes can be made to increase employer investment in training, an approach that does well in matching training opportunities to employer requirements. One way is to change the accounting treatment of employer training investments. Like most investments, the cost of training is incurred in one year, but the benefits accrue over several years. Currently, accounting rules allow the cost of physical investments to be spread over time while the costs of training must be expensed in the year they are incurred. This means training is not reflected on company balance sheets as an asset and reported accounting profits are lower than what they would be based on a measure treating this human capital investment like other physical investments. To the extent that stock prices depend on accounting profits, the market currently underestimates future gains in high training firms (Lerman 2017). While it may be difficult for the accounting board to require firms to amortize human capital investments, the board could at least mandate that firms report the amounts and types of training that may yield long-term benefits. This would increase the incentives for managers to offer significant levels of training. In late 2018, the International Organization of Standards created a standard to provide guidelines for internal and external human capital reporting.

Employers have also long assisted workers in gaining new skills through tuition reimbursement for training provided by an outside institution. Employers can deduct these grants as a business expense from taxes up to a certain annual cap. According to the American Society for Training and Development, tuition subsidies made up about 11 percent of employer training dollars in 2013 (American Society for Training and Development 2013). These policies can serve as an additional benefit to attract workers (Capelli 2004). Some employers restrict the subsidy to education and training that is related to jobs at the employer. Traditionally, tuition benefits have been used primarily for degree programs. Employers can do more to support lifelong learning by extending benefits to short-term credential programs and to all workers (including entry-level hourly workers). In addition, employers could help workers choose how best to use their tuition benefits to learn skills that enhance their value to the firm and their overall productivity. Some employers are extending access to tuition benefits in response to tight labor markets. For example, in May 2018, Walmart announced it will pay for tuition for workers (part time, full time, and salaried) who have been with the company for 90 days, allowing them to work toward a degree in business or supply chain management through online

programs with three partner universities.¹¹ Walmart is requiring workers to pay only \$1 a day for the duration of their studies. An advantage of the program is it does not require workers to pay any costs up front, while many employer tuition-assistance programs reimburse employees for costs at the successful completion of courses. Paying the cost upfront can be a barrier to training for lower-wage workers.

Earning Credentials vs. Certifying Skills

A skills policy that supports the real needs of employers requires an approach to verification and hiring that reflects their priorities and provides reliable information on the skills of job seekers. Scaling employer-based training and apprenticeship cannot translate into higher wages for workers if hiring practices continue excessively relying on degrees as indicators of productivity, rather than using direct measures of skills and competencies. Fuller et al. (2017) refer to this overreliance on degrees as “degree inflation,” and identify it as one of the major impediments to the efficient matching of employers and workers. The second component of our vision of training for jobs of the future is to scale practices that certify skills. We highlight three promising approaches to certifying skills:

- A “verified resume” chronicling a worker’s skills through the endorsements of past employers and educators.
- Increased reliance on competency-based education that measures skills rather than seat time.
- The development, validation, and promotion of a broader ecosystem of stackable skills-oriented credentials such as microcredentials, badges, and short-term certificates.

Although these approaches would provide a dramatically different system for documenting and communicating workers’ human capital investments, they can also be implemented and promoted through existing education and training systems.

College degrees are valuable credentials that document important achievements, but they do not capture the breadth of skills that are valued in the labor market. Degree inflation is rooted in a genuine and growing demand for talent, but the solution of unrealistic college degree requirements in job postings is poorly suited to solving the problem. Scott and Nightingale (2018) show that the extent of the degree inflation problem varies considerably by metropolitan area, indicating greater urgency for a skills certification policy in some parts of the country than others. Rising educational costs and poor preparation in many primary and secondary schools also put college degrees out of reach for many Americans; thus, overreliance on degrees

¹¹ Washington Post, May 30, 2018. Abha Batthari. *Walmart to offer employees a college education for \$1 a day.*

has a disparate impact, harming less advantaged workers. Our plan for maximizing worker training for the jobs of the future includes moving past such an exclusive reliance on college credentials to document workers' skills and embrace new approaches to certifying skills. Certification of skills developed on the job not only empowers workers, it also gives them incentives to put more effort into acquiring new skills (Acemoglu and Pischke 2000). Skills can be certified by employers, educational institutions, or other organizations. Employers are often referred to as practicing "skills-based hiring" if they are sensitive to the overemphasis on degrees and the difficulties of certifying skills and embrace alternative approaches to hiring.

One of the greatest obstacles to implementing a broader vision of certifying relevant skills is the confusion about the rapid proliferation of credentials in the United States. A lack of confidence and knowledge about what skills specific credentials are certifying prevent those credentials from serving the needs of workers and employers. Because employers understand (or think they understand) what a high school diploma or college degree signifies about a worker, traditional diplomas and degrees remain the dominant credentials in the labor market. While centralized control of nondegree credentials is not necessarily required to dispel this confusion, some convergence among stakeholders is necessary. Several initiatives to make the proliferation of credentials more coherent have been spearheaded by the Lumina Foundation. The most recent is Credential Engine, a nonprofit organization focused on promoting transparency in the credential marketplace.

Heckman, Humphries, and Kautz (2014) and Caplan (2018) argue that a significant portion of the added value of a degree or diploma comes from the signal that it sends to employers about a job applicant's perseverance and noncognitive skills. Workers without diplomas and degrees need opportunities to acquire and document these "soft skills" to be competitive in the labor market. We believe that verified resumes, competency-based education, and stackable skills-oriented certifications can fill this signaling problem by capturing employability skills and other noncognitive skills, particularly for students and workers without a high school diploma.

The Verified Resume

The verified resume is a concept developed and promoted by Arnold Packer, formerly of Johns Hopkins University. A verified resume is a document that records the skills and knowledge that people acquire through their lives, both as students and workers. Packer describes the verified resume as "midway between LinkedIn and a credential." Interest in verified resumes has grown in recent years with developments in blockchain technology that can reliably document skill verification by a distributed network of actors. Verification of skills can be provided by educators, community-based organizations, or employers. A highly formalized verified

resume could restrict responsibility for skill verifications to parties with proper training to apply uniform rubrics or assessments. Alternatively, the resume could impose fewer restrictions on employers or educators that want to verify a worker's skills, allowing market forces to determine the value of an individual verifier's endorsement; unreliable verifiers would be trusted and valued less than consistently reliable verifiers.

What little we know about verified resumes comes from a 2010 pilot program in Baltimore and Montana directed by Arnold Packer and funded by the Kellogg Foundation and the Open Society Institute. Community-based organizations were involved in a broader effort to teach soft skills to youth and document skill acquisition in verified resumes. Packer tested the extent to which employers and youth mentors agreed in their ratings of soft skills on their verified resumes. He found a high level of agreement in ratings on soft skills. Employers and mentors agreed at the highest level on "responsibility" ratings, where the average rating was identical on a five-point scale. Ratings of "team player" and "creativity" showed the greatest differences, both at 0.57 points on a five-point scale.

In recent years, several patents have been granted for blockchain-based verified resume technology. Blockchain addresses the core problem posed by the verified resume: how to get a widely-dispersed network of schools, employers, and nonprofits to reliably document skills in a way that is resistant to uncertainty and fraud. Blockchain technology also allows for the compensation of parties that make the effort to verify a worker's skill or credential. For example, the Project Spring Foundation has outlined a protocol for using blockchain to verify workers' skills and compensate users with a history of reliable verifications by giving those users broader access to the platform's verified resumes. Blockchain is already used to document the credentials earned by students at Southern New Hampshire University (SNHU) and Central New Mexico Community College (Harrison 2018).

The various blockchain-based approaches to verification don't necessarily imply a skills-based approach to hiring, but they would help to facilitate richer documentation. Merely using blockchain technology to verify past employment or degree completion would represent little added value over the current approach to verification. Blockchain's real value in skill certification would be the documentation and reliable transmission of information on skills that are certified by a widely-distributed set of actors, including mentors, individual instructors, supervisors, or certifying and licensing agencies.

One barrier to broader adoption of the verified resume is the inertia of existing verification systems used by employers. Vranjes (2014) highlights the belief of many human resources executives that even if they received a "verified resume," it wouldn't be considered verified until the company conducted its own verification screening using its own procedures. Scaling the verified resume concept would need broader

acceptance in human resources departments, which may require endorsements from industry associations like the Society for Human Resources Management or adoption by large labor market intermediaries.

Competency Based Education

Competency-based education is conceptually related to the verified resume concept. While the verified resume is a specific vehicle for communicating a worker’s skills to an employer, competencies are a method for ensuring that progress through an education and training program depends on mastery and demonstration. A student that masters competencies quickly will advance through the program more rapidly than a student that needs more time to master competencies. This accomplishes two principal goals. First, instruction in a competency-based program is by its nature closely tied to skills that students actually learn. Second, since students can progress at their own pace, advanced students are not bored in class and slower students have the opportunity to take more time to demonstrate competency. By allowing completion to be both accelerated and accommodating depending on circumstances, competency-based education should improve completion rates.

Competency-based education has made inroads into K–12 education, postsecondary education, and apprenticeship training. Among federal government agencies, the Department of Labor has made the most substantial effort to promote competency-based education through its various grant initiatives and contracts, including the award of \$175 million in American Apprenticeship Grants. Beginning in 2001, the Department of Labor supported the development of standards for new competency-based apprenticeship programs in healthcare, manufacturing, and information technology (see Lerman et al. 2010 for a discussion of these earlier efforts to produce competency-based frameworks). This work continues today and includes a contract with the Urban Institute to develop competency-based occupational frameworks.¹² The Department of Labor’s efforts to jump start competency-based programs by dramatically reducing planning and design costs could easily be replicated by other federal agencies that support education and training. Competency-based education has grown slowly but steadily in registered apprenticeship, with 168 occupations that currently offer the option of competency-based apprenticeship training.¹³

Several colleges currently offer competency-based education—most famously Western Governors University (WGU) and SNHU. Although competency-based education does not need to be delivered online

¹² See <https://www.urban.org/policy-centers/center-labor-human-services-and-population/projects/competency-based-occupational-frameworks-registered-apprenticeships>

¹³ <https://www.doleta.gov/OA/occupations.cfm>.

(apprenticeship programs, for example, operate on site), both WGU and SNHU's programs are operated online. Online delivery helps to reduce costs and reach a much broader range of students. One obstacle to broader use of competencies in postsecondary education is the difficulty in using state educational funding outside a traditional credit hour program (Anderson 2018).

Competency-based education ensures that students with verifiable skills are not artificially held back by the calendar in an education or training program. A related solution is the prior learning assessment (PLA), which verifies students' skill sets when they enter an education or training program and gives them credit for skills and knowledge that they've already obtained. Unlike competency-based education, PLAs are tied to the credit-based system, but allow students to advance by demonstrating mastery of certain skills and concepts. PLAs can reduce college costs by \$1,600 to \$6,000, because the cost of an assessment is considerably less than a normal credit hour (Klein-Collins 2010). Frequently, use of PLAs is hampered by restrictions on using federal financial aid to pay for assessments. The US Department of Education is currently experimentally testing the effect of waivers of these restrictions on student completion and cost of attendance (Plumlee and Klein-Collins 2017).

Stackable Credentials and Career Pathways

Verified resumes and competency-based education can help to support career pathways composed of stackable skills-oriented credentials. Career pathways are a series of education and training programs that help students advance to increasingly better paying jobs in a career ladder over time. Career pathway models require considerable support services and guidance to ensure that students continue to advance in their program of study. A key element of career pathway programs is a framework of stackable credentials documenting progress in skill acquisition. This can help to overcome degree inflation by breaking a prohibitively long degree program into a series of smaller certificates, or other credentials that build on each other. Stackable credentials benefit students by not penalizing program noncompletion as harshly and offering credit and certifications for obtaining intermediate skills.

Career pathways are typically associated with occupational training programs where students become increasingly competent in a particular field. Since career pathways incorporate multiple related occupations and may vary depending on the needs of local labor markets, they are often organized by "career clusters" or industry sectors. In this sense, they fit well into sector-based approaches to workforce development. The credentials that are incorporated into a career pathway program can also certify workplace readiness skills that are in high demand by employers. One example of this type of credential is the ACT National Career Readiness Certificate (NCRC), which is based on ACT's WorkKeys assessment. WorkKeys includes assessments

on skills that are valued across a wide range of jobs, including applied math, graphic literacy, and workplace document reading (all of which are included in the NCRC), as well as applied technology, business writing, workplace observation, fit, and talent assessments.

An example can serve to illustrate how these three approaches to skill certification can be adopted and scaled. Consider a high school graduate that goes to work in a retail position after graduation. She does not want to work in this job for the rest of her life but did not apply to college and needs to earn money. Using a verified resume template or verified resume platform using blockchain technology, she can have her employer verify soft skills she demonstrates on the job, IT skills developed by working with the employer's computer system, and substantive knowledge gained about the industry. After a few years, the worker may decide to take IT classes that are taught using a competency-based framework at her local community college. Some competencies could be quickly assessed, satisfied by the IT skills documented in her verified resume. Other competencies demonstrated in the classroom could be added to her verified resume by her college instructor. If she leaves the program before completing, her verified resume would still reflect the skills she has developed, opening the door to IT jobs that could top off her missing skills through additional on-the-job training. Without a verified resume and a skills and competency-based approach to education and training, she would have fewer opportunities for career advancement because all an employer would know about her is that she worked at an entry-level retail job and had no degree.

Beneficiaries of Certifying Skills

Verified resumes, competency-based education, and a broader ecosystem of skills certifications will provide benefits for all workers, including college-educated workers. In 2015, only 55 percent of college-educated Americans reported that their job was closely related to their highest degree, suggesting that many of the skills these college graduates use on the job are not certified in a reliable or consistent way by their degree (Kuehn and Hecker 2018). Workers without college degrees are served even more poorly by the current degree-driven education and training system. People involved in the justice system, workers with low basic skill levels, and veterans would be particularly well served by an alternative certification system and approach to obtaining skills, because they have largely been left behind by the college-for-all model.

Veterans returning from service are typically well trained by the US military in some technical skill and have strong noncognitive skills, but may lack certifications that document these skills in ways that are widely recognized in the civilian labor market. Innovations like the virtual resume could help ensure that skills developed in the military are described and certified in a way that employers recognize. Prior learning assessments could also help certify veterans' skills. Competency-based education would provide the

opportunity for veterans to demonstrate their competencies and have them certified on an accelerated timeline. Currently, the largest sponsor of registered apprenticeships is the US Military Apprenticeship Program (USMAP), which offers apprenticeship opportunities to service members in the Coast Guard, Navy, and Marine Corps. USMAP could use an expanded certification system to assure employers that the skills learned and documented in military apprenticeships are those used by civilian employers (Lerman et al., 2015).

People involved with the justice system are also likely to benefit from hiring practices that emphasize skills rather than degrees. These individuals typically have much lower levels of educational attainment than the average worker, but may have other valuable skills. Competency-based training programs in prisons that result in industry-recognized credentials that certify skills will not erase a criminal record, but they can provide important advantages in the labor market. Employers and educators are typically in the best position to certify skills, but judges or the state can also certify the skills of people involved with the justice system. Many states have provisions for certifying the employability of ex-offenders who meet certain requirements and demonstrate good behavior. These “certificates of qualification for employment” (CQE) signal an ex-offender’s employability to an employer and may remove licensing restrictions or limit an employer’s liability for negligent hiring practices (Leasure and Anderson 2016; Collateral Consequences Resource Center 2018). Leasure and Anderson (2016) find that ex-offenders with CQEs in Ohio can expect to receive almost three times as many job interviews as ex-offenders without the certificates who had the same qualifications for the job.

Many adults with low basic skills lack the most fundamental credential in the American economy, a high school diploma. In some cases, they hold only a high school equivalency like a GED that is nominally equivalent to a diploma but is worth much less in the labor market. Like individuals involved in the justice system or veterans, individuals with low basic skills are disadvantaged by a hiring culture that relies so exclusively on degrees and fails to certify skills. Some of these individuals may have adequate occupational skills, while others could develop stronger basic and occupational skills in programs that are better suited to their learning style than traditional degree programs. Low basic skills are a major barrier to college access and completion because students must spend time and money in developmental education courses before receiving any substantive training.

One of the most promising strategies for advancing workers with low basic skills is the “integrated career pathway.” Integrated career pathways combine basic skills training and employer-driven occupational skills training in a structured educational program that typically includes stackable credentials. Prominent examples of integrated career pathway programs include Washington state’s Integrated Basic Education and Skills Training program and the Accelerating Opportunity program. Evaluations of the integrated career pathway

model find that this combination of stackable credentials and skills-oriented training positively affects credential attainment and other educational outcomes, but has much smaller, mixed effects on employment and earnings (Zeidenberg, Cho, and Jenkins 2010; Anderson et al., 2017). Strategies to better communicate the value of the skills developed in these pathway programs to employers would likely improve students' performance in the labor market.

The greatest obstacle to scaling skills certification and skills-based hiring is convincing a critical mass of employers and educators to adopt these practices. One reason employers and educational institutions fail to adopt the skills certification approach is that they are not persuaded that there is a credible system of assessment and certification. Human resources policies for hiring government workers could embrace these skill-based approaches. Reemployment service providers could be provided with incentives to create verified resumes for their clients or assist them in accessing a verified resume platform. Workers utilizing reemployment services often do not have college degrees, but typically have enough skills that a skills-based approach to writing their resume and searching for a job would be beneficial. Employment service agencies often have strong relationships with local employers. These existing relationships could be leveraged to broaden acceptance of skills-based hiring practices. Federal grant programs could provide training and support for the development of verified resumes for high school and college guidance counselors. Even federal hiring and contracting practices could be adjusted to be more skills-based.

Expanding Apprenticeship

Apprenticeship is the most widespread and cost-effective approach to learning relevant academic, occupational, and employability skills. Apprenticeships are fundamentally a mode of high-level learning. They emphasize work-based learning in an employment context alongside academic/theoretical instruction to gain high-level competence in an occupational area. Apprentices are paid and contribute to production while learning. Employers must offer an apprenticeship position before an apprenticeship materializes. Since an apprenticeship is a job, the model guarantees an alignment of individuals' aptitudes and interests with the skills that are in demand by employers.

Apprenticeship programs improve the learning process (as students directly apply what they learn), encourage student engagement, increase incentives for students to perform well in academic courses, improve the match between workers' skills and labor market demands, encourage employers to upgrade their mix of jobs, and widen access to rewarding careers for workers who prefer learning by doing over traditional classroom and four-year college models. An apprenticeship credential documents a worker's competence in a profession and provides apprentices with a deep sense of pride when they complete their program. In

Switzerland, where about 70 percent of each cohort goes through an apprenticeship, 95 percent of 25-year-olds have attained either a BA or gained an apprenticeship qualification.

Apprenticeships are distinctive in that they enhance both the worker (supply) side and the employer (demand) side of the labor market. On the supply side, the financial gains to apprenticeship are strikingly high. Studies of US programs indicate that apprentices do not sacrifice earnings during their education and training, and that their long-term earnings benefits exceed the gains to completing a degree at a community college (Hollenbeck 2008). Recent reports from the state of Washington indicate that the gains to earnings from apprenticeship programs far surpass the gains to all other alternatives (Washington State Workforce Training and Education Coordinating Board 2014). A broad study of apprenticeship in 10 US states also documents large and statistically significant earnings gains from participation in apprenticeship programs (Reed et al., 2012).

These results are consistent with many studies of apprenticeship training in Europe showing high rates of return for workers. Fersterer, Pischke, and Winter-Ebmer (2008) find that apprenticeship training raised wages for Austrian apprentices by about 4 percent per year of training. For workers completing a three- to four-year apprenticeship, post-apprenticeship wages were 12–16 percent higher than the wages of those who did not complete an apprenticeship.

Noneconomic outcomes are more difficult to quantify, but evidence from Europe suggests that vocational education and training in general is linked to higher confidence and self-esteem, improved health, higher citizen participation, and higher job satisfaction (Cedefop 2011). These relationships hold even after controlling for income. An Australian study found that quality apprenticeships improve mental health (Buchanan 2016).

On the demand side, employers can feel comfortable raising the skill requirements and the complexity of tasks that new hires are expected to accomplish, knowing that their apprenticeship programs will ensure an adequate supply of well-trained workers. Firms reap several additional advantages from their apprenticeship investments (Lerman 2014). They save significantly in the form of reduced recruitment and training costs, reduced errors in placing employees, and reduced costs when the demand for skilled workers cannot be quickly filled. Other benefits of apprenticeship for firms include reliable documentation of appropriate skills, increased worker productivity, higher morale, and a reduction in safety issues.

Another benefit to firms, rarely captured in studies, is the positive impact of apprenticeship on innovation. Well-trained workers are more likely to understand the complexities of a firm's production processes, and to identify and implement technological improvements, especially incremental innovations that improve existing products and processes. A study of German establishments documented this connection

and found a clear relationship between the extent of in-company training and subsequent innovation (Bauernschuster, Falck, and Heblich 2009).

Employers often achieve positive returns on their investments in apprenticeship. After reviewing several empirical studies, Muehlemann and Wolter (2014) conclude that:

in a well-functioning apprenticeship training system, a large share of training firms can recoup their training investments by the end of the training period. As training firms often succeed in retaining the most suitable apprentices, offering apprenticeships is an attractive strategy to recruit their future skilled work force. (p. 1)

In the United States, surveys of more than 900 employers indicate that the overwhelming majority believe their apprenticeship programs are valuable and produce net gains (Lerman, Eyster, and Chambers 2009). Nearly all sponsors reported that their apprenticeship program helps meet their skill demands. Eighty-seven percent reported they would strongly recommend registered apprenticeships; an additional 11percent recommended apprenticeship with some reservations. A recent US study found 40–50 percent returns for two expensive apprenticeship programs (Helper, Noonan, Nicholson, and Langdon 2016).

Apprenticeships are also a useful tool for enhancing youth development. They integrate what young people learn in the classroom with their on-the-job experiences, which benefits hands-on, nontraditional learners. Early apprenticeships can help engage youth and build their identities (Halpern 2009). Youth who participate in apprenticeships early in their careers also benefit from a longer period of economic returns to training and a lower probability of developing bad work habits.

Apprentices work with adult mentors (Halpern 2009). These mentors and other supervisors not only teach occupational and employability skills, but also offer encouragement and guidance, provide immediate feedback on performance, and impose discipline. Unlike community colleges or high schools, where one counselor must guide hundreds of students, each mentor deals with only a few apprentices. Mentors are therefore able to be attentive to apprentices' specific interests and aptitudes and tailor their training accordingly.

A government role in expanding apprenticeship makes sense economically and socially. Like other public investments in career-focused education and training, apprenticeships lessen credit constraints for students, generate productivity gains not fully captured by students or firms, and lower the excess burdens and administrative costs of transfers. As a cost-effective method for subsidizing preparation for careers, apprenticeships lower political pressures to increase government funding for higher education and to impose market distortions (such as increasing the minimum wage). From a social perspective, apprenticeships are

likely to increase mobility and reduce inequality by improving career prospects for those who learn best by doing.

The experiences of Australia, Canada, and England demonstrate that scaling apprenticeship is possible. While none of these countries have the strong apprenticeship tradition seen in countries like Austria, Germany, or Switzerland, they have nonetheless developed significant programs. In fact, if apprenticeships as a share of the US labor force reached the levels already achieved in Australia, Canada, and England (on average), the US would attain over 4 million apprenticeships, about nine times the current number of registered apprenticeships in the civilian sector.

A high-quality apprenticeship system requires several elements, such as extensive direct marketing to employers, creating and maintaining occupational standards, and certifying quality. We focus on four policies that can be undertaken in the short run.

Develop an Apprenticeship Brand

The federal and state governments should create a distinctive and quality brand. South Carolina chose to link apprenticeship with local pride by using “Apprenticeship Carolina” as its brand name. The government in Britain has now established a copyright for the term “Apprenticeship” so that employers cannot claim to offer an apprenticeship without meeting the terms of the established program.

Once a brand name has been selected, political officials, business leaders, and the media should highlight apprenticeship as a high-quality career option in all types of occupational areas. Videos of successful employers and apprentices should be widely featured. Establishing a brand requires persistence and marketing but does not require substantial annual costs.

Establish a Public-Private Entity to Develop Occupational Frameworks

Occupational frameworks should reflect both employer needs and long-term skill requirements. Consensus frameworks are especially important if the public sector provides funding for the general skills component of apprenticeships (for example, for skills that have value outside the training firm). Employers rarely have the time to develop such frameworks, nor do all employers in the same industry always share a common vision. To ensure that American apprenticeship remains a quality brand and to simplify the implementation process,

Congress should establish the American Apprenticeship Standards Institute (AASI), which would be tasked with researching, creating, and updating apprenticeship competency frameworks for a broad range of occupations.

Working with industry associations and individual public and private employers, the AASI would produce frameworks with potential job titles, occupational pathways, certification and licensure requirements, salary ranges, and employment opportunities. The frameworks should be limited to no more than 500–600 occupations to avoid frameworks that are too narrow for mobility.

Each framework should describe the following:

- cross-cutting competencies, including personal effectiveness (such as reliability, initiative, interpersonal skills, and adaptability)
- academic competencies
- workplace competencies (such as planning, teamwork, scheduling, problem solving, and working with tools)

Support for the Direct Marketing and Organizing of Apprenticeships

Branding and broad marketing will not suffice without a well-developed system for selling and organizing apprenticeships. This key task is often overlooked, especially where most employers are unfamiliar with apprenticeships and their value. Marketing apprenticeship as a partial solution to the talent management efforts of individual employers is not easy and typically requires several face-to-face encounters. Employers whose interest is piqued by an advertisement must have a resource they can access quickly and easily for more information about developing and implementing an apprenticeship program. Working with a company to organize apprenticeships requires determining the most suitable occupations, developing a plan to combine work-based and academic instruction, and filling out the forms and other materials required for registering apprenticeships.

The US government, again in partnership with industry, should establish incentives for intermediaries (private or public) to market directly to, and organize apprenticeships for employers. The incentives should be structured to ensure apprentices receive the appropriate training and work-based learning experiences and achieve high completion rates. Funding should go only to those intermediaries that stimulate apprenticeships that follow the official occupational frameworks.

Britain managed to scale apprenticeship scale from about 150,000 to over 850,000 in about 8 years, largely through the efforts of 850 employment and learning providers. Australia achieves high levels of apprenticeship partly through private, often nonprofit, Group Training Organizations.

Evidence suggests that effective marketing and organizing of apprenticeships could be achieved at a cost of about \$2,000 for each apprentice who completes the first 60 days of a program, along with an additional \$2,000 for each apprentice who completes the program in full. The payments could vary with the long-term returns to occupations. One reason for expecting modest per-apprentice costs is that once employers establish an apprenticeship program, most are likely to continue the program over time, with less effort by intermediaries. Assuming intermediaries stimulate half a million new apprenticeships a year, the initial costs of the incentives would total about \$1 billion. In equilibrium, if the intermediaries successfully generated 900,000 new participants and 675,000 completers a year, the costs of the incentives would reach about \$3.15 billion a year. Along with intermediary incentives, the federal government should establish an independent auditing system to assure program quality and to avoid fraud, thus increasing the credibility of the apprenticeship system.

A significant share of the long-term costs of apprenticeship programs will be borne by the employer in the form of apprentice wages and the costs of work-based training. The foregone earnings of apprentices will be modest since they will receive wages during their training. Firms, meanwhile, will recover a significant share of their costs during the apprenticeship itself. The costs to the government will come largely in the form of setup costs and contributions to off-job training.

At scale, the stock of apprentices in any given year would reach well over two million. Since about three-fourths or more of the occupational and employability training for these apprentices would take place at worksites (at no public cost), full public support for the off-job training could be about \$8 billion, raising the overall costs to \$11.15 billion. For the sake of comparison, were these apprentices to attend community college full time instead, the costs for instruction and services would amount to at least \$32 billion a year. That is about three times the cost of the apprenticeship route. Moreover, some of the costs of off-job training would offset spending on community colleges and other training schemes. Over time, the costs of incentives to intermediaries could fall as employers adopted apprenticeships without intermediaries and intermediaries lowered their costs by gaining repeat business.

Federal, state, and local governments could show leadership and credibility by also creating apprenticeship positions in the public sector. Many state and local employees work in occupations that could be filled through apprenticeships, in positions in information technology, accounting, health care, administration of parks and courts, and security (including police and fire). Kentucky recently launched a

program for social care apprenticeships. Such a step would be feasible and cost effective. Britain now requires government agencies to fill 2.3 percent of their jobs with apprentices.

Use Existing Funding for Off-Job Training and Incentives

Theoretically, skills learned in the off-job courses related to apprenticeships can be applied not only to a current employer, but to many other employers. For this reason, the employer who provides the training will not necessarily recoup the benefits. But the worker will, and the government shares in these gains in the form of higher taxes and reduced transfers. Federal, state, and local governments already spend tens of billions of dollars on an array of education and training programs. The effectiveness of government dollars would be far higher if at least some of these funds were made available for off-job apprenticeship training. Encouraging this shift in priorities, however, will require detailed analysis of each funding source.

In some cases, government funds could be substituted directly for employer funding, while in other cases existing government training funds could be made accessible for apprenticeship. For example, the TAA program provides about \$740 million in funding to those who lose their jobs due to trade impacts. Participants receive support for training, often in a community college program, and cash income support in the form of extended unemployment insurance while training. TAA could be changed in ways that increase funding for the off-job training in apprenticeships and for organizations to sell and organize apprentice programs with employers. WIOA programs are already required to work with apprenticeship programs, but WIOA staff are ill equipped to help scale up apprenticeships. Some of WIOA's over \$3 billion could be directed toward the intermediary incentive program. Training WIOA business services staff to sell and organize apprenticeships could also defray some of the costs of the incentive program.

Some of the \$1.8 billion now allocated to Job Corps and YouthBuild could also be redirected to apprenticeship initiatives or made available to local program operators to market and organize apprenticeships. These two programs are expensive, cover only about 56,000 participants a year, and yield modest or no gains in earnings. Although apprenticeships have demonstrated far higher earnings gains than existing programs, including Job Corps and YouthBuild, any diversion of funds should be accompanied by a renewed effort to target disadvantaged youth for participation in apprenticeships.

Funding for the Carl D. Perkins Career and Technical Education Act of 2006 has supported career and technical education in high schools and colleges. Some of the \$1.7 billion annual outlays on the program could also subsidize the cost of off-job training for apprentices. Pell grant funding is another potential source of funding for apprenticeships. Currently, over half of Pell recipients are in public two-year or for-profit colleges,

often in career-focused education programs. Loan programs that are very costly to the federal government also support students in these programs. Helping students use Pell grants for apprenticeship would save significant sums and generate higher earnings gains. Although Pell grants are currently not well suited for apprenticeship, eligibility criteria could easily be modified to allow apprentices to use prorated Pell grants for the off-job component of their training.

State governments could encourage more apprenticeships with the use of their existing subsidies to community colleges. States commonly reimburse community colleges for some of the cost of a full-time equivalent (FTE) student. Suppose the reimbursement rate were 60 percent of the costs of a FTE but that much of the actual and accredited learning (say, 70 percent) for an occupation program took place at the work site in an apprenticeship. If the costs of the community college instruction fell to only 40 percent of the normal costs of a FTE, but the state continued the 60 percent subsidy, then colleges could provide the classroom component of apprenticeship at no cost to employers. They could use the remaining 20 percent to sell employers on, and help them organize, apprenticeships.

The GI Bill already provides housing benefits and wage subsidies for veterans in apprenticeships, but funding levels for college and university expenses are far higher than for apprenticeship. Offering up to one-half of the GI Bill's per-recipient college benefit to reimburse employers for the off-job education and training when hiring a veteran into an apprenticeship program could be accomplished by amending the law. However, unless the liberalized uses of Pell grants and GI Bill benefits are linked with the intermediary incentive campaign to sell and organize apprenticeships, the take up by employers is likely to be limited.

Another way of financing the off-job education of apprentices is to link the intermediary incentive program with youth apprenticeships in high schools. Since high school CTE courses, and some college courses within high schools, are already an entitlement, the funds to complement work-based learning in apprenticeships would be readily available.

Policymakers should consider starting such a policy at “career academies”—schools within high schools that have an industry or occupational focus—and at regional career and technical education (CTE) centers. Over 7,000 career academies operate in the United States in fields ranging from health and finance to travel and construction. Career academies and CTE schools already include classroom-related instruction and sometimes work with employers to develop internships. Because a serious apprenticeship involves learning skills at the workplace, at the employer's expense, these school-based apprenticeship programs could reduce the costs of teachers relative to a full-time student. For example, if a student spent two and a half days a week (or 50 percent of their time) in a paid apprenticeship, the school should be able to save at least 15–30 percent of the costs of educating a traditional, full-time student. Those are big numbers, as anyone familiar with this

professional niche knows. Applying these funds to selling and organizing apprenticeships should allow the career academy or CTE program to stimulate employers to provide apprenticeship slots.

Conclusion

High and rising federal debt is set to impose serious burdens on living standards and economic growth in the future, as expenditures continue to outpace revenues. Investing in worker productivity is one strategy for reducing the federal deficit by increasing revenues and reducing workers' reliance on the safety net. All types of workers can benefit from training investments to improve skills and therefore productivity, but entry-level, low-skill, and disconnected workers are poorly served by the current degree-focused education and training system.

We have outlined a three-pronged approach to improving worker productivity through maximizing worker training. The first approach is to improve access to in-demand training through better information, technology, and targeted funding. This set of strategies would allow workers to better select training opportunities that meet employer needs and match their skills, thus reducing waste of time and money. Access would be improved by using technology to provide modes of learning that make sense for workers in different situations across the life cycle, such as online learning. Finally, alternate funding strategies, including increasing employer investments, could increase training access.

A second approach is to promote a culture of skills certification and skills-based hiring in contrast to the existing system's overreliance on college degrees. Promising skills-based strategies include the verified resume, career pathways with stackable credentials, and competency-based education. The third approach is to scale registered apprenticeship, an employer-driven training model with an evidence-based track record of raising workers' productivity and wage while creating value for employers. The most important obstacle to scaling apprenticeship is persuading employers to offer sufficient apprenticeship slots to meet workers' demand for training. To accomplish this, the federal government can continue to invest in the development of occupational frameworks, the marketing of apprenticeship to employers, and the development of intermediaries to organize and promote apprenticeship.

If these policy changes are to be successful in reducing the federal deficit, they need to be able to deliver their deficit-reduction benefits without substantially increasing expenditures. Although the policies proposed for scaling registered apprenticeship would have a gross cost in federal expenditures (as much as \$11.15 billion per year for two million apprenticeships), the impact on the deficit could be minimized by shifting other spending on education and training towards apprenticeship, particularly for programs in which evaluation evidence shows weak impacts on participants. Moreover, apprenticeships are far less expensive than

community college training; the overall cost of educating two million students in community colleges amounts to approximately \$32 billion per year. Much of the cost of registered apprenticeship is borne by employers, not the federal government, which also relieves budget pressures. Helper and colleagues (2016) found that US employers that sponsor apprenticeship programs experience high rates of return as apprentices contribute to production, returns that justify employer outlays on training.

Cultivating a skills-based hiring culture and promoting training access can be supported by federal expenditures either for direct support of career pathway programs or incentives to design and promote competency-based educational programs. However, these changes in employer practices will come about through changes in the culture of hiring and a broader acceptance of skills-based education and training. The federal government can take the lead in moving toward the shift in hiring culture by creating frameworks for skills-based education and training, providing seed money or incentives, and altering its own hiring practices. Changes such as lifelong learning accounts or the tax reporting or treatment of employer investments in training, would not require large additional federal outlays or programming. Incorporating promising approaches like integrated career pathway models or competency-based education into already existing funding streams for education and training can improve training effectiveness and worker productivity without changing existing expenditure levels.

Employers are already the largest funders of training in the US, and most worker training occurs on the job. The federal government should look for opportunities to support and facilitate this approach to education and training by offering incentives for appropriate innovations that can transform our systems to better meet future employer and worker needs.

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