

Chapter 10

Restoring Opportunity by Expanding Apprenticeship

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Abstract Restoring opportunity requires jobs that can generate middle class incomes. Notwithstanding concerns about the declining share of middle-wage jobs, this chapter argues that building a robust apprenticeship system in the U.S. can sharply increase earnings and the share of American workers entering rewarding careers. By emphasizing “learning by doing” as a paid employee, apprenticeships are especially effective in preparing workers to gain a valued occupational qualification. They enhance youth development by providing a more engaging experience than schooling does and by linking young people to mentors. They encourage employers to upgrade jobs and develop job ladders. Apprenticeships currently represent a much smaller share of the workforce in the U.S. than in most other advanced countries. This chapter contends that expanding apprenticeship is feasible and a highly cost-effective strategy for restoring opportunity.

Keywords Apprenticeship • Labor market • High-skill jobs • Middle-skill jobs • Low-skill jobs • Job training • Unemployment • Wages • Occupations • Community colleges • Career academies • Career and technical education (CTE) • Licensing • Certification

Introduction

Central to concerns about opportunity in America is the erosion of middle class jobs. Economist David Autor (2010) highlights the polarization in the U.S. labor market, with computerization eliminating middle-skill jobs while shifting low-skill workers into poorly paid and difficult-to-automate service professions.

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A *Financial Times* report¹ on the United Kingdom found that, “Jobs are being created at the top and bottom of the skills scale, while those in the middle tier—including office administrators and blue-collar process operators—are losing out. The trend is intensifying the ‘hour glass economy,’ where new technologies increase low-skilled jobs but eliminate many in the middle that require intermediate skills.” High youth unemployment rates in the U.S. and especially in Europe exacerbate these trends by keeping many workers from gaining initial work experience. According to *The Economist*, rapid technological change is lowering the costs of replacing workers with robots and wages are stagnating even as economic growth has resumed.²

Opportunity is becoming increasingly difficult to sustain in the context of widening educational divides that increase the supply of workers without a college education who need jobs. Although rates of high school graduation have increased in general, including for less advantaged groups, the majority of all workers and the vast majority of young minority male workers leave school without any qualification beyond high school. Low proficiency in literacy and numeracy is the norm for high school graduates (with no college), according to data from the Organisation for Economic Co-operation and Development’s (OECD) Programme for the Assessment of Adult Competencies (PIAAC) (Holzer and Lerman 2015). The vast majority of high school graduates attend college, but as of 2014, only about 46 % of 25- to 34-year-old Americans had achieved an associate’s (A.A.) or bachelor’s (B.A.) degree. Young men, especially minority men, are particularly at risk, with only a modest share graduating either a two- or four-year college. Among 25- to 34-year-olds, 29 % of African-American and 19 % of Hispanic men had attained an A.A. or B.A. degree as of March 2014.³

The lack of work experience among youth is another major concern. Only one in three Black 18- to 22-year-old men held a job in March 2014; more than half had no work experience at all in 2013. Because work experience contributes substantially to career success, the high rates of joblessness of young people can weaken their long-term opportunities.

Are these trends inevitable and impervious to policy? Or can wise skill development approaches help engage young people and expand their job opportunities, partly by preserving middle class jobs? This chapter considers the potential of robust apprenticeship systems for increasing opportunity by raising skills, productivity, and wages, thereby increasing the chances for young people to find and hold jobs providing middle class incomes.

¹Weitzman, Hal, and Robin Harding. “Skills Gap Hobbles US Employers,” *Financial Times*, December 13, 2011.

²“The Economics of Low Wages: When What Goes Down Doesn’t Go Up.” *Economist*, May 2, 2015.

³These figures come from the author’s tabulations of the March 2014 Current Population Survey (CPS). The estimates may overstate the share of Black men with high levels of education as the data exclude men in jail or prison. In addition, the CPS is likely to undercount Black men just as the decennial census does, and these men probably have lower levels of education than men counted in the CPS.

The chapter begins by defining apprenticeship and describing why apprenticeship should be a central component of the nation's approach to preparing people for careers. Next, we consider whether apprenticeships, or any training, can restore opportunity in the context of a hollowing out of the middle of the distribution of jobs. Specifically, we describe skill requirements and alternative approaches to preparing and upgrading the skills of individuals for these occupations. Programs of academic education and apprenticeship programs emphasizing work-based learning have often competed for the same space, but the full picture reveals they can complement each other significantly. Then, we show how apprenticeship can affect the demand side of the market, encouraging firms to transform jobs into high-skill career positions. We consider the evidence on the costs and effectiveness of apprenticeship training in several countries. Of particular interest is the evidence on the impacts of apprenticeship on firms and new findings on whether apprenticeship training locks workers into specific occupations and limits their occupational mobility. The analysis examines the costs and benefits of apprenticeship versus school-based alternatives aimed at preparing young people for careers. We go on to discuss recent policy developments in the United States and the implications for the feasibility of expanding apprenticeship. The concluding section answers the question on the role of apprenticeship systems in rebuilding middle class jobs.

Defining Apprenticeship and Explaining Its Advantages

Apprenticeship training is a highly developed system for raising the skills and productivity of workers in a wide range of occupations, with demonstrated success abroad and scattered examples of success domestically. Apprentices are employees who have formal agreements with employers to carry out a recognized program of work-based and classroom learning as well as a wage schedule that includes increases over the apprenticeship period. Apprenticeship prepares workers to master occupational skills and achieve career success. Under apprenticeship programs, individuals undertake productive work for their employer; earn a salary; receive training primarily through supervised, work-based learning; and take academic instruction that is related to the apprenticeship occupation. The programs generally last from 2 to 4 years. Apprenticeship helps workers to master not only relevant occupational skills but also other work-related skills, including communication, problem solving, allocating resources, and dealing with supervisors and a diverse set of co-workers. The course work is generally equivalent to at least 1 year of community college.

In Austria, Germany, and Switzerland, extensive apprenticeships offer a way of upgrading the quality of jobs, especially in manufacturing, commercial, and managerial positions.⁴ In these countries, apprenticeships begin mostly in the late high

⁴For a list of occupations using apprenticeships in several countries, see the occupational standards section of the American Institute for Innovative Apprenticeship website at www.innovativeapprenticeship.org

school years, absorbing 50–70 % of young people on their way to valued occupational qualifications (Hoffman 2011). OECD reports (2009, 2010) highlight the role of a robust apprenticeship system in limiting youth unemployment.

Apprenticeships within the U.S. and elsewhere show how construction occupations can reach high wages and high productivity. The question is whether the model can be extended and attract firms to upgrade other occupations. Apprenticeship expansion holds the possibility of substantially improving skills and careers of a broad segment of the U.S. workforce. Completing apprenticeship training yields a recognized and valued credential attesting to mastery of skill required in the relevant occupation.

Apprenticeships are a useful tool for enhancing youth development. Unlike the normal part-time jobs of high school and college students, apprenticeships integrate what young people learn on the job and in the classroom. Young people work with natural adult mentors who offer guidance but allow youth to make their own mistakes (Halpern 2009). Youth see themselves judged by the established standards of a discipline, including deadlines and the genuine constraints and unexpected difficulties that arise in the profession. Mentors and other supervisors not only teach young people occupational and employability skills but also offer encouragement and guidance, provide immediate feedback on performance, and impose discipline. In most apprenticeships, poor grades in related academic courses can force the apprentice to withdraw from the program. Unlike community colleges or high schools, where one counselor must guide hundreds of students, each mentor deals with only a few apprentices.

Apprenticeships are distinctive in enhancing both the worker supply side and the employer demand side of the labor market. On the supply side, the financial gains to apprenticeships are strikingly high. U.S. studies indicate that apprentices do not have to sacrifice earnings during their education and training and that their long-term earnings benefits exceed the gains they would have accumulated after graduating from community college (Hollenbeck 2008). The latest reports from the state of Washington show that the gains in earnings from various education and training programs far surpassed the gains to all other alternatives (Washington State Workforce Training and Education Coordinating Board 2014). A broad study of apprenticeship in 10 U.S. states also documents large and statistically significant earnings gains from participating in apprenticeship (Reed et al. 2012).

These results are consistent with many studies of apprenticeship training in Europe, showing high rates of return to workers. One recent study managed to overcome the obstacle that such studies tend to face where unmeasured attributes explain both who is selected for an apprenticeship and how well apprentices do in the labor market (Fersterer et al. 2008); the authors did so by examining how an event unrelated to the apprenticeship (the firm staying in or going out of business) caused some apprentices to have full apprenticeships while others found their apprenticeships cut short. The estimates indicated that apprenticeship training raises wages by about 4 % per year of apprenticeship training. For a three- to four-year apprenticeship,

post-apprenticeship wages ended up 12–16 % higher than they otherwise would be. Because the worker’s costs of participating in an apprenticeship are often minimal, the Austrian study indicated high overall benefits relative to modest costs.

On the demand side, employers can feel comfortable upgrading their jobs, knowing that their apprenticeship programs will ensure an adequate supply of well-trained workers. Firms reap several advantages from their apprenticeship investments. They save significant sums in recruitment and training costs, reduced errors in placing employees, avoiding excessive costs when the demand for skilled workers cannot be quickly filled, and knowing that all employees are well versed with company procedures. Because employers achieve positive returns to their investments in apprenticeship, the worker and the government can save significantly relative to conventional education and training. After reviewing several empirical studies, Muehlmann 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...”

One benefit to firms rarely captured in studies is the positive impact of apprenticeships on innovation. Well-trained workers are more likely to understand the complexities of a firm’s production processes and therefore identify and implement technological improvements, especially incremental innovations to 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 et al. 2009). Noneconomic outcomes are 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.

In the United States, evidence from surveys of more than 900 employers indicates that the overwhelming majority believe their programs are valuable and involve net gains (Lerman et al. 2009). Nearly all sponsors reported that the apprenticeship program helps them meet their skill demands—87 % reported they would strongly recommend registered apprenticeships; an additional 11 % recommended apprenticeships with some reservations. Other benefits of apprenticeships include reliably documenting appropriate skills, raising worker productivity, increasing worker morale, and reducing safety problems.

While apprenticeships offer a productivity-enhancing approach to reducing inequality and expanding opportunity, the numbers in the U.S. have declined in recent years to about one-tenth the levels in Australia, Canada, and Great Britain. Some believe the problems are inadequate information about and familiarity with apprenticeship, an inadequate infrastructure, and expectations that sufficient skills will emerge from community college programs. Others see the main problem as an unwillingness of U.S. companies to invest no matter how favorable government subsidy and marketing policies are. In considering these explanations, we should remember that even in countries with robust apprenticeship systems, only a minority

of firms actually hires apprentices. Because applicants already far exceed the number of apprenticeship slots, the main problem today is to increase the number of apprenticeship openings that employers offer. Counseling young people about potential apprenticeships is a sensible complementary strategy to working with the companies, but encouraging interest in apprenticeship could be counterproductive without a major increase in apprenticeship slots.

The high levels of apprenticeship activity in Australia, Great Britain, and Canada demonstrate that even companies in labor markets with few restrictions on hiring, firing, and wages are willing to invest in apprenticeship training. While no rigorous evidence is available about the apprenticeship's costs and benefits to U.S. employers, research in other countries indicates that employers gain financially from their apprenticeship investments (Lerman 2014).

Although apprenticeship training can prepare workers for a wide range of occupations, including medicine and engineering, apprenticeships are perhaps most appropriate for skilled positions that do not require a B.A. degree. A key question is whether these are the very jobs the country is losing and, if so, whether sufficient jobs amenable to apprenticeship will remain.

Patterns and Trends of Middle-Level Occupations

What are the mid-level or skilled sub-B.A. occupations that are most amenable to apprenticeship and significantly affected by the “hollowing out” of the middle class? Classifying mid-level occupations by a single distribution (say, by educational attainment or a score on a cognitive test) fails to capture the wide variety of skills required to master and be productive at specific jobs or occupations. One approach is to use wage as a proxy for skill in the particular job or occupation. Wages may be viewed as incorporating the skill levels along various dimensions together with the market valuation of those skills. However, wages reflect not only skill but also the riskiness, job satisfaction, responsibility, status, and flexibility of jobs and occupations. A second issue is that skill requirements and expertise required in an occupation might not change, but the wage return to the occupation might. Third, wages sometimes are a reward for tenure on the job; seniority often matters. Fourth, wage differences can come about from differences in bargaining power of workers in various fields. For example, the pay of longshoremen can depend on the ability of their representatives to gain strong returns because of the high costs of strikes relative to wage increases. Fifth, wages for the same occupation often differ widely across geographic areas, partly because of area differentials in the price of housing. Sixth, classifying occupations by mean wages can miss the wage variability within occupations.

A major proponent of the hollowing-out thesis ranks detailed occupations by their average wages in a base period (Autor 2010). Middle-skill jobs are in occupations in the middle segment of the average wage distribution in that period. Using his approach, Autor finds that middle-skill occupations are declining rapidly relative

to high- and low-skill positions. One of the main reasons is the increased power of computers to automate routine tasks that many middle-skill positions have long undertaken. Similar trends are apparently occurring in other countries. A paper by Goos et al. (2009) finds that middle-wage occupations declined as a share of employment in 16 countries.

The Autor approach provides a useful perspective but is subject to several limitations. One is the failure to capture the often wide distribution of wages within detailed occupations. Many sub-B.A. occupations can generate high wages at the top levels of quality and productivity. For example, the differences in wage levels, skill, and status are substantial between the occupations “cook at a restaurant” and “chefs and head cooks.” Cooks are low paid, but chefs command a median wage that is about 25 % higher than the overall national median. Despite their limited formal education (only 13 % have a B.A. or higher), the top 25 % of chefs earn as much as or more than the median wage of four out of 10 college occupations (50 % or more with B.A. degrees). Were cooks and lower-level chefs upgraded to a status of high quality and productivity, earnings for a noncollege occupation could compete with earnings of many college occupations.

Occupations with above-average earnings and with a majority of workers without a B.A. cover a wide range of fields. Among them are construction managers, buyers and purchasing agents, lodging managers, appraisers, court reporters, various types of technicians, aircraft mechanics, police officers, police supervisors, and operators of gas plants.

In another approach to examining occupational trends, Holzer and Lerman (2009) use U.S. Bureau of Labor Statistics (BLS) estimates of education and training requirements to classify broad occupational categories. High-skill occupations are those in the professional/technical and managerial categories, while low-skill occupations are those in the service and agricultural categories. Middle-skill occupations are all the others, including clerical, sales, construction, installation/repair, production, and transportation/material moving. With this classification, middle-skill jobs show a decline but still make up roughly half of all employment today. In a 2013 article, Autor and Dorn predict middle-skill jobs will survive when they embody such human skills as interpersonal interaction, adaptability, and problem solving. Among other jobs, they cite medical paraprofessionals; plumbers; builders; electricians; heating, ventilation, and air-conditioning installers; automotive technicians; customer-service representatives; and even clerical workers who are required to do more than type and file.

A key question raised by Autor and others is how to characterize jobs that require “... situational adaptability, visual and language recognition, and in-person interaction.” On one hand, preparing meals and driving a truck through city traffic are difficult to automate. Because these jobs need only modest training and attributes common across the population (dexterity, good eyesight, and language recognition), Autor sees them as commanding only low wages. But even these jobs could in principle involve pathways to reach “artisan” status.

Several occupations requiring a middle level of skills and good wages have increased a good deal since 1986, including medical therapists (such as respiratory,

recreational, and radiation therapists) by 30 %, carpenters (20 %), heavy vehicle maintenance specialists (25 %), and heating and air conditioning positions (21 %).

Taking Education, Training, and Labor Market Interactions into Account

The idea that education and training institutions should prepare people for current and future jobs raises several questions: Do jobs simply materialize from a single technology or family of technologies that effective employers eventually implement? Or, do employers confront a range of technologies, all of which can allow the company or public employer to remain competitive? Moreover, how does the choice of technology interact with the system of preparing or retraining workers?

An older literature (Piore and Doeringer 1971), now rarely cited, looked closely at segmented labor markets, where some employers choose to train, hire from within, and keep workers for long periods, while others operate mostly on the spot market, hiring and firing frequently and providing little training. Subsequently, many authors have highlighted that businesses have the choice to become “high road” vs. “low road” employers. For example, Osterman and Shulman (2011) insist that “firms have choices about how to organize work.” They find examples of firms producing the same good or service using technologies that generate more or fewer skilled jobs paying good wages. In a landmark article providing a theoretical rationale for employer occupational training, Acemoglu and Pischke (1999) demonstrated how firms might optimize their hiring and training strategies in several ways, depending on the structure of the labor market and the potential permanence of the jobs.

Actual jobs and compensation vary widely within occupations, suggesting that the nature of work may depend on institutional settings that can lead different firms to choose different technologies to produce the same good or service. Given that production may be undertaken using a variety of skill distributions, the key policy questions become: 1) what are the skills within occupations that raise long-term wages and productivity, and, 2) what are the best approaches to educating and training workers to reach high levels of productivity and wages?

Skill Requirements for Workers to Reach Middle Class

The skills required for middle-level occupations are far from obvious. One issue is the appropriate level of generic academic skills. Another is the appropriate level of specificity in occupational skills. A third is the role of generic, nonacademic skills, such as communication, motivation, and responsibility. Some of all three types of skills are required for nearly all jobs, but the levels vary across occupations.

In the case of general academic requirements, U.S. education reformers have boldly claimed that "... *all* students — those attending a four-year college, those planning to earn a two-year degree or get some postsecondary training, and those seeking to enter the job market right away—need to have comparable preparation in high school" (Achieve 2005). Despite strong evidence against this proposition (Lerman 2008), this idea is taken seriously and has led to the creation of the Common Core standards at the high school level. The curriculum is in the process of implementation and is likely to crowd out occupation-based programs.

The evidence strongly suggests that occupational and nonacademic skills are far more significant from the employer perspective than are exposure to high-level academic courses. For example, data from a survey asking a representative sample of U.S. workers what skills they use on the job (Handel 2007) indicate that only 19 % use the skills developed in Algebra I, only 9 % use the skills for Algebra II, and less than 15 % of workers ever write anything five pages or more. On the other hand, upper blue-collar and even lower blue-collar workers need to know how to read and create visuals, such as maps, diagrams, floor plans, graphs, or blueprints—skills typically learned in occupation-specific courses. Moreover, certain nonacademic skills are clearly critical. Workers report the importance of problem-solving and communication skills, teaching and training other workers, dealing with people in tense situations, supervising other workers, and working well with customers.

One useful categorization of these skills comes from the 1992 Secretary's Commission on Achieving Necessary Skills (SCANS) report in the U.S. After researching the literature, consulting with experts, and conducting detailed interviews with workers and/or supervisors in 50 occupations, SCANS identified five groups of workplace competencies: the ability to allocate resources (time, money, facilities); interpersonal skills (such as teamwork, teaching others, leadership); the ability to acquire and use information; understanding systems; and working well with technology. The key personal qualities highlighted by SCANS and many surveys of employers include responsibility, self-esteem, sociability, self-management, and integrity and honesty. Hanover Research (2011) provides an updated analysis of lists of various twenty-first century generic skills.

In a survey of 3,200 employers that focused on four large metropolitan areas in the U.S., the responses indicated that such personal qualities as responsibility, integrity, and self-management are as important as basic skills or more so (Holzer 1997). In another large survey undertaken in the mid-1990s of 3,300 businesses (the National Employer Survey), employers ranked attitude, communication skills, previous work experience, employer recommendations, and industry-based credentials above years of schooling, grades, and test scores (Zemsky 1997). In a 2007 survey of employers in Washington state, about 60 % of employers reported difficulty in hiring (Washington State Workforce Training and Education Coordinating Board 2008). They experienced less difficulty finding workers with adequate reading, writing, and math skills than with appropriate occupational, problem solving, teamwork, communication, and adaptability skills as well as positive work habits and a willingness to accept supervision. Punctuality, reliability, and avoidance of drug and alcohol abuse are also critical. In a 2002 survey of 27,000 employers in the United

Kingdom, 23 % of employers reported a significant number of their staff were less than fully proficient in their jobs. Skill shortfalls were most common in communication, teamwork, other technical and practical skills, customer handling, and problem solving and least common in numeracy and literacy (Hillage et al. 2002).

Evidence confirming the importance of noncognitive/nonacademic skills has been accumulating in academic literature as well. Heckman et al. (2006) find that except in the case of college graduates, noncognitive skills (as measured by indices of locus of control and self-esteem) exert at least as high an impact—and probably a higher one—on job market outcomes than do cognitive skills (word knowledge, paragraph comprehension, arithmetic reasoning, mathematical knowledge, and coding speed as measured by the Armed Forces Vocational Aptitude Battery).

In a recent study, Lindqvist and Vestman (2011) document the differential impacts of cognitive and what they term as noncognitive skills on the earnings of Swedish men. They used special data on a representative sample of the Swedish male population matched with education, earnings, and information on cognitive and noncognitive skills obtained in the military enlistment process through interviews with psychologists. Persistence, social skills, and emotional stability were the key noncognitive skills measured and scored from the interview. Lindqvist and Vestman found that cognitive and noncognitive skills are both positively related to employment and earnings. In the low to mid ranges of skills, noncognitive skills exert a higher impact on wages than do cognitive skills.

The sociocultural approach provides some revealing examples of how skills are used in context and how nonacademic skills are often developed and used as part of a “community of practice” (Stasz 2001). Nelsen (1997) points out that workplaces not only require formal knowledge—facts, principles, theories, math, and writing skills—but also informal knowledge—embodied in heuristics, work styles, and contextualized understanding of tools and techniques (Nelsen 1997). In her revealing case study of auto repair workers, Nelsen argues that social skills of new workers are very important for learning the informal knowledge of experienced workers, such as captured in stories, advice, and guided practice. Unfortunately, according to Nelsen, the social skills learned at school are not necessarily the same as the ones most useful at work.

What about occupational skills? Often, firms, labor representatives, and government reach agreement on what is required for a qualification that will allow employers to have confidence in the capabilities of their young workers. In several countries, skill requirements for occupations develop through the operation of apprenticeship programs and other training programs. Sometimes, the occupational qualifications fit within a broad framework of national vocational qualifications running from basic to intermediate to advanced levels (for a review of national qualification frameworks in Europe, see Cedefop 2012).

Taking a Look at Other Nations

In the United Kingdom, the National Vocational Qualification (NVQ) system specifies requirements for proficiency that vary widely across types of occupations and over levels within occupations.⁵ It is a modular system that recognizes workplace learning and competence based on evidence of performance at the workplace. The NVQ system takes skill gradations in each defined field into account and allows workers to gain documentation for each level, whether attained with one employer or many. The ultimate goal is that employers place a value on attaining a qualification level, giving workers an incentive to learn on the job. Although this system has not worked as effectively as planned (Eraut 2001), the NVQ approach offers one example of how certifying the attainment of skills can provide the basis for measuring the heterogeneity of skills.

One effort to develop occupational or industry standards in the U.S.—the National Skill Standards Board (NSSB)—failed to develop relevant, rigorous, portable, and well-recognized skill standards to guide training and provide reliable signals to worker and employers. However, occupation-specific skills standards exist in the U.S. through state-level licensing and certification. These forms of occupation qualifications are expanding. Today, about one in five workers requires a state license to practice his or her occupation, up from less than 5 % in the early 1950s (Kleiner 2006). Much of this increase has resulted from rapid growth in traditionally licensed occupations such as physicians, dentists, and attorneys. But the number of licensing laws has been increasing as well. In the U.S., licensing rules vary widely across states, with many states regulating occupations as varied as alarm contractor, auctioneer, manicurist, and massage therapists. Although licenses ostensibly offer some quality assurance to consumers among all providers, Kleiner finds evidence of licensure playing more of a role in raising prices than assuring quality.

School-based and dual work-based/school-based systems try to ensure that occupational qualifications are widely accepted by employers. In primarily school-based programs, decisions about what is necessary to prepare young people for particular careers are often made by the faculty of postsecondary institutions. Often, training colleges—such as U.S. community colleges and for-profit schools—decide themselves (sometimes in consultation with potential employers) what constitutes qualifications in quite detailed occupations, such as domestic air conditioner and furnace installer, medical receptionist, and medical coder.⁶ Other standards directly involve employers and government entities.

Occupational standards are prerequisites for the functioning of apprenticeship programs, which involve work- and school-based learning leading to a credential

⁵For an overview on NVQ and other qualification systems in the United Kingdom, see material provided by the Qualifications and Learning Authority at <http://www.qca.org.uk>

⁶Curricula for certificates in these occupations appear in the catalog for the Kentucky technical college system. See http://kctcs.edu/en/students/programs_and_catalog.aspx

documenting the individual's occupational qualifications. This issue has been tackled abroad in a variety of ways. Australia has developed the national Training Package (collections of competency standards gathered into qualifications) for all industry areas, while previously qualifications were only available in a limited range of occupations and industries (Smith 2012). The development of Training Packages is one activity of the nation's ten national Industry Skills Councils. In Canada, the Interprovincial Standards Red Seal Program helps develop occupational standards that allow for effective harmonization of apprenticeship training and assessment in each province and territory (Miller 2012). The Red Seal program's standards incorporate essential skills (reading, document use, writing, numeracy, oral communication, thinking, digital technology, and lifelong learning), common occupational skills (that apply to a small range of occupations), and specific occupational skills.⁷

In England, the Sector Skills Councils and their employers design the content of each apprenticeship using the design principles of a national Apprenticeship Blueprint (Miller 2012). The secretary of state appoints and Sector Skills Councils commission an Issuing Authority to promulgate standards for specific apprenticeships. As of 2012, there were 200 operating apprenticeship frameworks and an additional 118 under development. At the same time, employers have considerable flexibility in implementing their apprenticeship programs. France uses Apprenticeship Training Centers to help design and deliver the classroom-based components of apprenticeship, with skill standards often developed by Professional Consultative Committees (Dif 2012). They operate under frameworks established by the National Commission for Vocational Qualifications.

In Switzerland, the Federal Office for Professional Education and Technology, together with cantons, employers, trade associations, and unions, participate in framing the occupational standards for about 250 occupations (Hoeckel et al. 2009). The canton vocational education programs implement and supervise the vocational schools, career guidance, and inspection of participating companies and industry training centers. Professional organizations develop qualifications and exams and help develop apprenticeship places. Occupational standards in Germany are determined primarily by the "social partners," including government, employer, and employee representatives (Hoeckel and Schwartz 2009). The chambers of commerce advise participating companies, register apprenticeship contracts, examine the suitability of training firms and trainers, and set up and grade final exams.

The content of skill requirements in apprenticeships includes academic courses and structured work-based training. In each field, the requirements are to complete the coursework in a satisfactory manner and demonstrate the apprentice's ability to master a range of tasks. In some systems, there are a set of general tasks that apply to a family of occupations (say, metalworking) and tasks that apply to a specific occupation (say, tool mechanics or metal construction and shipbuilding). While the tasks vary widely across occupations, all involve the application of concepts and academic competencies.

⁷ See the documents linked at <http://www.red-seal.ca/tr.1d.2@-eng.jsp?tid=51> for examples.

The coverage of occupational standards for apprenticeship extends well beyond the traditional construction crafts. In the U.K., for example, specific apprenticeships are available within such broad categories as business, administration and law; arts, media, and publishing; health and public services; retail and commercial enterprise; and information technology and communication. Common apprenticeships in Switzerland include information technology specialists, commercial employees, pharmacy assistants, and doctor's assistants. German standards cover over 300 occupations, including lawyer's assistants, bank staff workers, industrial mechanics, industrial managers, retail workers, commercial sales, and computer networking. While much of the training is specific to the occupation, nearly all fields learn skills in closely related occupations. For example, apprentices in industrial management learn accounting, procurement, production planning, staffing, and logistics.

The ability to raise the quality of jobs and workers across occupations appears to help achieve relatively low levels of wage inequality. The enhanced occupational skills and productivity result in increased wages for workers who in other societies have low or average wages. As of the mid-1990s, the evidence showed wage inequality was especially low in countries that used apprenticeships extensively, including Austria, Germany, and Switzerland (Martins and Pereira 2004).

The Timing and Flexibility of Apprenticeship Training

Countries have developed a variety of approaches for training workers to become effective in intermediate level occupations—those that require considerable skill but not a B.A. degree. Systems vary with respect to the level and duration of general education, the timing of occupation-specific education and training, and the split between classroom- and work-based learning. Waiting too long to incorporate occupation-focused education and training runs the risk of high levels of disengaged students and forcing a highly academic approach on many students who would do better in a more concrete setting that emphasizes applications. This argument is especially strong to the extent that school requirements are poorly matched to the job market opportunities facing most young people.

On the other hand, beginning an occupation-focused program too early might trap youth in unrewarding fields and limit their adaptability and upward mobility. Work-based learning is appealing, but critics worry that the training will be too specific and firms will fail to offer sufficient positions. Still, several countries train skilled craftsmen through apprenticeships. However, for many other occupations, some systems rely entirely on school-based systems and some on work-based apprenticeship models that incorporate some classroom instruction.

Although discussions of skill preparation systems generally focus on the work- vs. school-based distinction, the quality, depth, and portability of what students or apprentices learn are at least as important. The skills learned in school-based programs are not necessarily of greater general applicability than those learned in apprenticeship programs. It depends on the specifics of what is being taught and the

likelihood that the worker will stay with the training occupation or an adjacent occupation. Depending on the program's content, workers may or may not be able to sustain the gains from training when moving to another firm with the same occupation or in other occupations.

The portability of the skills learned in occupation-specific programs is a common concern about apprenticeships or any occupation-specific training. Several questions are relevant. How likely is the worker to stay in the occupation and/or with the firm? Will the worker be able to sustain the gains from training when moving to another firm but staying in the same occupation? How transferable are the skills learned to other occupations? How do the earnings gains of workers trained in occupation-specific programs compare with those of workers receiving only general postsecondary education?

How skill portability varies with the mode of learning and the curricula is unclear, *a priori*. As Geel and Gelner (2009) point out, learning even a highly specific skill can yield benefits outside the narrow occupation.

For example, an adolescent who wants to become a clockmaker should not necessarily be considered poorly equipped for future labor market requirements, even though his industry is small and shrinking. Rather, he is well equipped because his skill combination is very similar to skill combinations of other occupations in a large and growing skill cluster, which includes, for example, medical technicians or tool makers. Despite a seemingly very narrow and inflexible skill combination in his original occupation, he is nonetheless very flexible and well prepared for future labor market changes due to the sustainability of his acquired skills and his current skill cluster.

To operationalize the concept of skill specificity, Geel and Gelner (2009) and Geel et al. (2011) begin with an insight borrowed from Lazear (2009) that all skills are general in some sense, and occupation-specific skills are composed of various mixes of skills. The authors compile the key skills and their importance for nearly 80 occupations. They then use cluster analysis to estimate how skills are grouped within narrow occupations. This approach recognizes that skills ostensibly developed for one occupation can be useful in other occupations. It identifies occupational clusters that possess similar skill combinations within a given cluster and different skill combinations between clusters. Next, indices for each narrow occupation measure the extent to which the occupation is relatively portable between occupations within the same cluster and/or relatively portable between the initial occupation and all other occupations. The authors use these indices to determine how portability affects mobility, the wage gains and losses in moving between occupations, and the likelihood that employers will invest in training.

The authors test their hypotheses on the basis of empirical analyses of German apprentices. One finding is that while only 42 % of apprentices stay in their initial occupation, nearly two-thirds remain with either the occupation they learned as an apprentice or another occupation in the cluster using a similar mix of skills. Second, those trained in occupations with more specific skill sets are most likely to remain in their initial occupation or move to occupations within the same cluster. Third, apprentices actually increase their wages when moving to another occupation within

the same cluster but lose somewhat when moving to another cluster. Fourth, as Geel et al. (2011) show, employers are especially likely to invest in apprenticeships with the most specific skill sets.

Other strong evidence of the high returns and transferability of German apprenticeship training comes from Clark and Fahr (2001). They examine the returns to apprenticeship for those who remain in the original apprentice occupation as well as losses that do or would occur from transferring to another occupation. The overall rates of return to each year of apprenticeship range from 8 to 12 % for training in firms of 50 workers or more and from about 5.5 to 6.5 % for firms of two to 49 workers. Transferring to another occupation can offset these gains, but the reduction is zero for those who quit and only 1.7 % for those who are displaced from their job and shift to another occupation.

As found by Geel and Gellner (2009), the wage penalty varies with the distance from the original occupation. There is no penalty at all from displacement into a somewhat related occupation. Göggel and Zwick (2012) show the net gains or losses from switching employers and occupations differ by the original training occupation, with apprentices in industrial occupations actually experiencing wage advantages, while those in commerce, trading, and construction see modest losses. Finally, Clark and Fahr (2001) present workers' own views on their use of skills learned in apprenticeship training on their current jobs. Not surprisingly, 85 % of workers remaining within their training occupation use many or very many of the skills they learned through apprenticeship. This group constitutes 55 % of the sample. But, even among the remaining 45 %, about two of five workers reported using many or very many of the skills from their apprenticeship and one in five used some of the skills. Overall, only 18 % of all former apprentices stated they used few or no skills learned in their apprenticeships.

The findings show that the skills taught in German apprenticeship training are often general. Even when bundled for a specific occupation, the skills are portable across a cluster of occupations. Moreover, apprentices are quite likely to remain in occupations that use the skills they learned in their initial occupation. Apprenticeship skills do vary in terms of specificity and portability. But when the skills are less portable, firms are more likely to make the necessary investments and workers are less likely to change occupations significantly.

The general component of training is presumably stronger in school-based programs, because they are financed by government and/or individuals themselves. For this reason, some favor school-based systems, arguing that firm-based apprenticeship training limits mobility and adaptability (Hanushek et al. 2011). Yet, it is far from clear that these programs, especially the purely academic tracks in U.S. secondary schools and U.S. community colleges, offer more mobility. A high percentage of students drop out of both academic secondary and community college programs. Also, many of the community college programs are at least as specific as apprenticeship programs. Certificate programs within community colleges are almost entirely devoted to learning a narrow occupational skill, such as courses to become a phlebotomist, childcare assistant, or plastics-processing worker. Many U.S. school-based programs take place in for-profit colleges offering narrow

programs, such as truck driving, medical assistant, and medical insurance billing and coding. Furthermore, skills often erode when they go unused. To the extent students learn general skills but rarely apply them and wind up forgetting them, their training is unlikely to offer upward mobility.

While community college and private for-profit students often take highly specific occupational courses, apprentices all take some general classroom courses. Thus, apprentice electricians learn the principles of science, especially those related to electricity. In most countries, collaboration takes place between public vocational schools and apprenticeship programs. In the U.S., apprentices often take their required “related instruction” in classes at community colleges or for-profit colleges (Lerman 2010). From this perspective, apprenticeship programs should be viewed as “dual” programs that combine work- and school-based learning, albeit with an emphasis on work-based learning.

In the case of other OECD countries, the mix of school- vs. employer-based programs used to prepare young people for careers varies widely (OECD 2009, 2010). Secondary school students in Belgium and Sweden participate at high rates in vocational education but have very low rates of participation in work-based programs. In contrast, most of the vocational education in Germany, Switzerland, and Denmark revolves around work-based learning, including apprenticeships.

Apprenticeship training is attractive in limiting the gaps between what is learned at school and how to apply these and other skills at the workplace. An extensive body of research documents the high economic returns to workers resulting from employer-led training (Bishop 1997). Transmitting skills to the workplace works well with supervisory support, interactive training, coaching, opportunities to perform what was learned in training, and keeping the training relevant to jobs (Pellegrino and Hilton 2012). These are common characteristics of apprenticeships. Employer-based training like apprenticeship often bears fruit in the form of higher levels of innovation (Bauernschuster et al. 2009), net gains to firms that train during and soon after the training, and externalities, such as benefits for other employers and the public when workers are well trained to avoid the consequences of natural or manmade disasters. Generally, apprenticeships and other forms of employer-based training are far less costly to the government. Moreover, the government generally gains by paying little for the training while reaping tax benefits from the increased earnings of workers.

What Policies Can Encourage Firms to Adopt Apprenticeship in the U.S.?

Today, apprenticeships make up only 0.2 % of the U.S. labor force, far less than the 2.2 % in Canada, 2.7 % in Britain, and 3.7 % in Australia and Germany. In addition, government spending on apprenticeships is tiny compared with spending by other countries as well as compared with what it costs to pay for less effective career and

community college systems that provide education and training for specific occupations. While total government funding for apprenticeship in the U.S. is only about \$100 to \$400 per apprentice annually, federal, state, and local government spending annually per participant in two-year public colleges is approximately \$11,400 (Cellini 2009). Not only are government outlays sharply higher, but the cost differentials are even greater after accounting for the higher earnings (and associated taxes) of apprentices compared to college students. Given these data, we can attribute at least some of the low apprenticeship penetration to a lack of public effort in promoting and supporting apprenticeship and to heavy subsidies for alternatives to apprenticeship.

However, the historical reasons for apprenticeship's low penetration in the U.S. are less important than the potential for future expansion.⁸ Recent experience in Britain and in selected areas in the U.S. suggests grounds for optimism, but the barriers to expansion are significant.

One is limited information about apprenticeship. Because few employers offer apprenticeships, most employers are unlikely to hear about apprenticeships from other employers or from workers in other firms. Compounding the problem is both the difficulty of finding information about the content of existing programs and the fact that developing apprenticeships is complicated for most employers, often requiring technical assistance that is minimal in most of the country. Experiences in England and South Carolina demonstrate that effective marketing is critically important for expanding the number of firms offering apprenticeships.

Another barrier is employer misperceptions that apprenticeship will bring in unions. There is no evidence that adopting an apprenticeship program will increase the likelihood of unionization, but reports about such close links persist. An additional barrier is the asymmetric treatment of government postsecondary funding, with courses in colleges receiving support and courses related to apprenticeship receiving little financial support. Policies to reduce the government spending differentials between college subsidies and apprenticeship subsidies can help overcome this barrier.

Another significant complication to developing more apprenticeships is that U.S. apprenticeships are categorized in three different ways: registered apprenticeships with the Department of Labor's Office of Apprenticeship (OA), unregistered apprenticeships, and youth apprenticeships. Official data generally fail to track unregistered apprenticeships; evidence suggests their numbers exceed registered apprenticeships.⁹ Small youth apprenticeship programs operate in a few states. Tiny budgets and an excessive focus on construction have hampered expansion of the registered apprenticeship system. The federal government spends less than \$30 million annually to supervise, market, regulate, and publicize the system. Many states

⁸For a detailed look at the barriers to expanding apprenticeship in the U.S., see Lerman (2013).

⁹Data from the combined 2001 and 2005 National Household Education Surveys indicate that 1.5 % of adults were in an apprenticeship program in the prior year (NCES 2008). If these data were accurate, the number of unregistered apprentices would far exceed registered apprenticeship.

have only one employee working under their OA. In sharp contrast, Britain spends about one billion pounds (or about \$1.67 billion) annually on apprenticeship, which would amount to nearly \$8.5 billion in the U.S., after adjusting for population.

Unlike programs in Austria, Germany, and Switzerland, the U.S. apprenticeship system is almost entirely divorced from high schools and serves very few workers under 25. Only a few states, notably Georgia and Wisconsin, now operate youth apprenticeship programs that provide opportunities to 16- to 19-year-olds. State funding pays for coordinators in local school systems and sometimes for required courses not offered in high schools. In Georgia, 143 of 195 school systems currently participate in the apprenticeship program and serve a total of 6,776 students. These apprentices engage in at least 2,000 h of work-based learning as well as 144 h of related classroom instruction. The Wisconsin program includes one- to two-year options for nearly 2,000 high school juniors or seniors, requiring from 450 to 900 h in work-based learning and two to four related occupational courses. The program draws on industry skill standards and awards completers with a certificate of occupational proficiency in the relevant field. Some students also receive technical college academic credit. In Georgia, the industry sectors offering apprenticeships range from business, marketing, and information management to health and human services and technology and engineering. The Wisconsin youth apprenticeships are in food and natural resources, architecture and construction, finance, health sciences, tourism, information technology, distribution and logistics, and manufacturing.

Bipartisan Initiatives and New Proposals

Both the administration and some members of Congress have proposed expanded funding for apprenticeship. President Obama included \$500 million per year for 4 years in his fiscal year 2015 budget. Senators Tim Scott (Republican from South Carolina) and Cory Booker (Democrat from New Jersey) have proposed providing tax credits to employers hiring apprentices.

In December 2014, the Obama administration issued a competitive grant announcement that will allocate about \$100 million to expand apprenticeship.¹⁰ The administration used its discretion to apply funds from the user fees paid by employers to hire foreign workers as part of the H-1B temporary immigration program. As a result, the grants are oriented toward expanding apprenticeships in occupations that often use H-1B workers from abroad. The industry areas include advanced manufacturing, business services, and health care. Competitors for the grant will have access to funding of \$2.5 million to \$5 million over 5 years. The key goal is to increase apprenticeship options for workers, but other goals include reaching out to underrepresented groups.

¹⁰ See U.S. Department of Labor, Employment and Training Administration, Notice of Availability of Funds and Funding Opportunity Announcement for the American Apprenticeship Initiative, 2015 at <http://www.dol.gov/dol/grants/FOA-ETA-15-02.pdf>

Whether to emphasize apprenticeships beginning in late high school or after high school involves tradeoffs. High school programs improve the likelihood of government funding for academic courses related to apprenticeships. Given the consensus that the government should fund students through secondary school, paying for the related instruction of high school apprentices becomes a nondiscretionary part of budgets. When apprentices are beyond high school, government funding for related instruction must come out of discretionary expenses. International experience demonstrates the feasibility of youth apprenticeships; youth are able to attain serious occupational competencies while completing secondary education.

Apprenticeships in the late teenage years improve the nonacademic skills of youth at a critical time. In countries with little or no youth apprenticeship, structured work experience is less common, limiting the ability of youth to develop critical employability skills such as teamwork, communication, problem solving, and responsibility. Early apprenticeships can help engage youth and build their identity (Halpern 2009; Brown et al. 2007). Apprentices work in disciplines that are interesting and new; they develop independence and self-confidence through their ability to perform difficult tasks. Youth try out new identities in an occupational arena and experience learning in the context of production and making things.

From an economic perspective, apprenticeships for youth can be less costly for employers. Wages can be lower partly because youth have fewer medium- and high-wage alternatives and partly because youth have fewer family responsibilities, allowing them to sacrifice current for future income more easily. While Swiss firms invest large amounts of dollars in their apprenticeship programs, they pay their young apprentices very low wages during the apprenticeship period. Another economic advantage is that starting earlier in one's career allows for a longer period of economic returns to training.

For the U.S., scaling apprenticeship in the last years of high school is difficult. The aversion to tracking students too early into an occupational sequence is a common objection to youth apprenticeship. Importantly, high school officials are generally averse to adding youth apprenticeship to their already extensive agenda, including implementing Common Core standards and school and teacher accountability standards as well as dealing with charter schools and vouchers. In the early 1990s, opposition to youth apprenticeship in the U.S. came from unions and others who worried about eroding the apprenticeship brand with less intensive training programs.

To build a robust apprenticeship system in the U.S., even with new resources, the strategies will require branding at the state and/or federal levels and marketing at both the general and the firm level. I suggest five strategies: two could be accomplished at the state level, and three would be the responsibility of the federal government.

The State Role

Develop High Level and Firm-Based Marketing Initiatives

Britain's success in expanding apprenticeships from about 150,000 in 2007 to over 850,000 in 2013 offers one example for how to create successful national and decentralized marketing initiatives. Alongside various national efforts, including the National Apprenticeship Service and industry skill sector councils, the British government provided incentives to local training organizations to persuade employers to create apprenticeships. A similar model could be developed in the U.S. state governments could build a state marketing campaign together with incentives and technical support to community colleges and other training organizations to market apprenticeships at the individual firm level. However, simply marketing to firms through existing federal and state agencies may not work if the staff lacks the marketing dynamism, sales talent, and passion for expanding apprenticeship. Pay for performance is recommended: Technical education and training organizations would earn revenue only for additional apprenticeships that each college or organization managed to develop with employers.

Every apprenticeship slot stimulated by the college/training organization increases the work-based component of the individual's education and training and reduces the classroom-based component. Assume the work-based component amounts to 75 % of the apprentice's learning program and the school-based courses are only 25 % of the normal load for students without an apprenticeship. By allowing training providers to keep more than 25 % of a standard full-time-equivalent cost provided by federal, state, and local governments in return for providing the classroom component of apprenticeship, the community colleges and other training organizations would have a strong incentive to develop units to stimulate apprenticeships. State and local governments could provide matching grants to fund units within technical training organizations to serve as marketing arms for apprenticeships. The marketing effort should encourage government employers as well as private employers to offer more apprenticeships.

South Carolina's successful example involved collaboration between the technical college system, a special unit devoted to marketing apprenticeship, and a federal representative from the Office of Apprenticeship. With a state budget for Apprenticeship Carolina of \$1 million per year as well as tax credits to employers of \$1000 per year per apprentice, the program managed to stimulate more than a sixfold increase in registered apprenticeship programs and a fivefold increase in apprentices. Especially striking is that these successes—including 4000 added apprenticeships— took place as the economy entered a deep recession and lost millions of jobs. The costs per apprentice totaled only about \$1250 per apprentice calendar year, including the costs of the tax credit.

Build on Youth Apprenticeship Programs

State government spending on youth apprenticeship programs amounts to about \$3 million in Georgia and \$2 million in Wisconsin. Although these programs reach only a modest share of young people, the U.S. could make a good start on building apprenticeship if the numbers in Georgia could be replicated throughout the country. The focus would be on students who perform better in work- than purely school-based settings and are less likely than the average student to attend college or complete a B.A. degree. To create about 250,000 quality jobs and learning opportunities, the gross costs of such an initiative would be only about \$105 million, or about \$450 per calendar year, or about 4 % of current school outlays per student-year. Moreover, some of these costs would be offset by reductions in teaching expenses, with more students spending greater amounts of time in work-based learning and less time in high school courses. Having fewer students have to repeat grades will save costs as well. In all likelihood, the modest investment would pay off handsomely in the form of increased earnings and associated tax revenues as well as reduced spending on educational and other expenditures.

Good places to start are career academies—schools within high schools that have an industry or occupational focus—and regional career and technical education (CTE) centers. Over 7,000 career academies operate in the U.S. in fields ranging from health and finance to travel and construction (Kemple and Willner 2008). 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 programs would be able to reduce the costs of teachers relative to a full-time student. If, for example, a student spent two days per week in a paid apprenticeship or 40 % of time otherwise spent in school, the school should be able to save perhaps 15–30 % of the costs. Applying these funds to marketing, counseling, and oversight for youth apprenticeship should allow the academy or other school to stimulate employers to provide apprenticeship slots. Success in reaching employers will require talented, business-friendly staff who are well trained in business issues and apprenticeship.

To implement this component, state governments should fund marketing and technical support to career academies to set up cooperative apprenticeships with employers, either using money from state budgets or federal dollars. The first step should be planning grants for interested and capable career academies to determine who can best market to and provide technical assistance to the academies. Next, state governments should sponsor performance-based funding to units in academies so they receive funds for each additional apprenticeship. Private foundations should offer resources for demonstration and experimentation in creating apprenticeships within high school programs, especially career academies.

The Federal Role

Extend Use of Current Postsecondary and Training Subsidies to Apprenticeship

In nearly all other countries, the government is responsible for the classroom-based component of apprenticeship. One approach to making this jump in the U.S. is to use existing postsecondary programs to finance or at least subsidize the classroom portion of apprenticeships. Already, localities can use training vouchers from the Workforce Investment Act for apprenticeship. To encourage greater use of vouchers for apprenticeship, the federal government could provide one to two more vouchers to Workforce Investment Boards for each training voucher used in an apprenticeship program. Another step is to encourage the use of Trade Adjustment Act (TAA) training subsidies to companies sponsoring apprenticeships just as training providers receive subsidies for TAA-eligible workers enrolled in full-time training. In addition, policies could allow partial payment of TAA's extended unemployment insurance to continue for employed individuals in registered apprenticeship programs.

Allowing the use of Pell grants to pay at least for the classroom portion of a registered apprenticeship program makes perfect sense as well. Currently, a large chunk of Pell grants pays for occupationally oriented programs at community colleges and for-profit career colleges. The returns on such investments are far lower than the returns to apprenticeship. The Department of Education already can authorize experiments under the federal student aid programs (Olinsky and Ayres 2013), allowing Pell grants for some students learning high-demand jobs as part of a certificate program. Extending the initiative to support related instruction (normally formal courses) in an apprenticeship could increase apprenticeship slots and reduce the amount the federal government would have to spend to support these individuals in full-time schooling.

The GI Bill already provides housing benefits and subsidizes wages for veterans in apprenticeships. However, funding for colleges and university expenses is far higher than for apprenticeship. Offering half the GI Bill college benefits to employers hiring veterans 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 an extensive marketing campaign, the take-up by employers is likely to be limited.

Designate Best Practice Occupational Standards for Apprenticeships

To simplify the development of apprenticeships for potential employers, a joint Office of Apprenticeship-Department of Commerce team should designate one or two examples of good practice with regard to specific areas of expertise learned at work sites and subjects learned through classroom components. The OA-Commerce

team should select occupational standards in consultation with selected employers who hire workers in the occupation. Once selected, the standards should be published and made readily accessible. Employers who comply with these established standards should have a quick and easy path to registration of the program. In addition, workforce professionals trying to market apprenticeships will have a model they can sell and that employers can adopt and/or use with modest adjustments. Occupational standards used in other countries can serve as starting points to the Labor-Commerce team and to industry groups involved in setting standards and in illustrating curricula.

Develop a Solid Infrastructure of Information, Peer Support, and Research

The federal government should sponsor the development of an information clearinghouse, a peer support network, and a research program on apprenticeship. The information clearinghouse should document the occupations that currently use apprenticeships not only in the U.S. but also in other countries along with the list of occupation skills that the apprentices master. It should include the curricula for classroom instruction as well as the skills that apprentices should learn and master at the workplace. Included in the clearinghouse should be up-to-date information on available apprenticeships and applicants looking for apprenticeships. The development of the information hub should involve agencies within the Department of Commerce as well as the OA.

The research program should cover topics especially relevant to employers, such as the return to apprenticeship from the employer perspective and the net cost of sponsoring an apprentice after taking account of the apprentice's contribution to production. Other research should examine best practices for marketing apprenticeship, incorporating classroom and work-based learning by sector, and counseling potential apprentices.

Conclusions

Expanding apprenticeship is a potential game-changer for improving the lives of millions of Americans and for preventing further erosion of the middle class. Apprenticeships widen routes to rewarding careers by upgrading skills, including occupational skills but also math, reading, and employability skills. Taking math, reading, and writing in the context of using these competencies in the workforce will increase the motivation of many workers and the efficacy of the delivery process. Given the ability of workers to learn more, remain well motivated, and notice how to make innovations at the workplace, firms will have an increased incentive to adopt "high road" strategies and make them work. Such an approach may be one of the only ways the firm can attract and sustain workers.

Apprenticeships can also increase the efficiency of government dollars spent on developing the workforce. Instead of spending over \$11,000 per year on students in community college career programs, why not shift resources toward far more cost-effective apprenticeship programs? Apprenticeship programs yield far higher and more immediate impacts on earnings than community or career college programs yet cost the student and government far less. Community college graduation rates, especially for low-income students, are dismally low. Even after graduating, individuals often have trouble finding a relevant job. For students in postsecondary education, foregone earnings are one of the highest costs. In contrast, participants in apprenticeships rarely lose earnings and often earn more than if they did not enter an apprenticeship. Further, apprentices are already connected with an employer and can demonstrate the relevant credentials and work experience demanded by other employers. Another advantage is the net gains flowing to employers from apprenticeship programs.

The key question is not whether the shift in emphasis from community and/or career colleges toward apprenticeships is desirable but whether it is feasible. Although some argue that the free U.S. labor market and the weak apprenticeship tradition pose insurmountable barriers to scaling apprenticeship, the dramatic increases in apprenticeship in Britain offer strong evidence that building a robust apprenticeship program in the U.S. is possible.

We are well along with the task of persuading policy makers about the desirability and feasibility of apprenticeship. With the Obama administration's grants for the American Apprenticeship Initiative, as of this writing, we were expecting a mix of approaches beginning in the summer of 2015 aimed at expanding apprenticeship. In addition, employers would learn about the returns to apprenticeship as a result of their own experience and expected evaluations. Still, structural barriers remain that limit the development of a robust apprenticeship system in the U.S.

It is past time for federal and state governments to make a genuine effort to build an extensive and high value apprenticeship system. Without such an effort, we will never know whether U.S. employers will follow the patterns of other countries, create a significant number of apprenticeship slots, and recognize the gains to firms from such investments if we do not try. Institutional change of this magnitude is difficult and will take time but will be worthwhile in increasing earnings of workers in middle-skill jobs, widening access to rewarding careers, enhancing occupational identity, increasing job satisfaction, and expanding the middle class.

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