BRINGING AMERICA UP TO SPEED: AN EVALUATION OF APPRENTICESHIP EDUCATION METHODS

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Abstract

Rapid developments in technology and the increased use of computers in the workforce have led to many changes in the American job market, leaving some workers without a market for their skills. This paper evaluates the effectiveness of apprenticeship programs in preparing youth to enter the modern workplace. To do so, this study examines whether apprenticeship programs increase job opportunities and salaries for workers when compared with other routes of preparing for the workforce. It also discusses whether the government and private industries should promote apprenticeships as a main option for continuing education. Ultimately, this study finds that apprenticeship programs provide increased employment and salary options for workers. It thus concludes with several recommended measures to expand these programs in America.

Introduction

The American workforce is in the midst of a swift and somewhat painful transition to the new digital economy of the 21st century. From the ghostly remains of abandoned car factories in Detroit, to the empty caverns of the West Virginia and Pennsylvania coal mines, to the crumbling walls of former steel mills in New York, the monuments of an abandoned age remain. Hendrickson, Muro, and Galston (2018) argued that "[t]he 2016 election revealed a dramatic gap between two Americas—one based in large, diverse, thriving metropolitan regions; the other found in more homogeneous small towns and rural areas struggling under the weight of economic stagnation and social decline" (para. 1). Many parts of America are beginning to feel left behind in the rapidly modernizing economy of the 21st century. Innovation and globalization have closed certain job markets where employees used to be able to make a good living and provide for their families. Rural America is not the only region of the United States that has felt the impact of the shifting markets. Factory jobs are being replaced by robotic equipment, and many companies are looking to open factories overseas where labor is cheaper and regulations are fewer than in the United States. Mireya Solís noted that "[a]utomation has transformed the American factory, rendering millions of low-skilled jobs redundant. Fast-spreading technologies like robotics and 3D printing will exacerbate this trend" (Cocco, 2016, para. 8). This trend is not likely to be reversed anytime soon as automation dramatically increases efficiency throughout the economy (Cocco, 2016).

While the trend towards modernization and automation casts a bleak picture for many older job markets, it also offers a brighter future of increased efficiency and wealth for employees who can keep up with the markets. A bachelor's degree has often been seen as a route to success in the workforce. By 2016, over one-third of America's adult workforce had earned a bachelor's degree (United States Census Bureau, 2017). This is a significant increase from when the Current Population Survey began in 1940, at which point only 4.6% of the US population had a bachelor's degree (United States Census Bureau, 2017). But while that number has increased, the average member of today's workforce still does not have a bachelor's degree (United States Census Bureau, 2017). Robert Reich, a labor secretary in the Clinton administration, said, "We desperately need to revive a second route to the middle class for people without four-year college degrees, as manufacturing once was" (Lohr, 2017, para. 7). In order to prepare for modernization, some private and public sector organizations and agencies have launched apprenticeship programs that are designed to equip American students with the necessary skills to enter the workforce. These programs provide paid, practical training and give students a head start in a specific industry, providing students with an alternative to the traditional college route.

President Trump has expressed strong support for apprenticeship programs as a means of helping workers gain marketable skills in areas that have a demand for labor. Trump signed an executive order to increase the amount of apprenticeship programs in the nation by doubling federal funding to these initiatives (Lorenzo, 2017). America currently has approximately 585,000 apprentices enrolled in over 23,400 apprenticeship programs ("FAQ," 2018). Many other educational systems throughout the world have placed a much higher priority on promoting and cultivating apprenticeship programs (Lorenzo, 2017). The effectiveness of these programs will help determine if the parts of America that have struggled with modernization will successfully adapt to allow a booming digital market to thrive and provide jobs for their populations. This study explores whether apprenticeship programs increase job opportunities and salary options for students when compared with other routes of preparing for the workforce. This study hypothesizes that apprenticeship programs fill a vital role in the economy by training workers for in-demand jobs. It further predicts that over the course of their career, workers whose only post-secondary education was an apprenticeship program will have more career and salary options than workers who did not pursue any post-secondary education but less options than workers with college degrees.

Literature Review

The educational systems of the United States currently face the challenge of preparing students for a rapidly digitalizing 21st-century workforce environment. Finding and keeping jobs now requires a deeper knowledge of technology and new skills. Muro, Liu, Whiton, and Kulkarni (2017) explored the data that shows the rapid digitalization of the American marketplace. From 2002 to 2016, the percentage of jobs that require high levels of technical skills rose from 5% to 23%, jobs that require medium levels of technical skills rose from 40% to 48%, and low digital skill jobs dramatically fell from 56% to 30% (Muro et al., 2017). Their study also reported that "[t]he mean annual wage for workers in high-level digital occupations reached $72,896 in 2016, whereas workers in middle-level digital jobs earned $48,274 on average, and workers in low-level digital occupations earned $30,393 on average" (Muro et al., 2017, para. 12).

With rapid digitalization and many other changing factors affecting the marketplace, some regions, especially in rural America, are lagging in technical skill and educational quality. While the loss of some jobs to robotic equipment or increased computer efficiency may hurt some workers' incomes, Atkinson (2018) argued that America should still embrace this new wave of technology. He contended that the benefits of increased efficiency are too valuable to limit and that governments should assist employees in keeping up with the new technology instead

of placing restrictions on the use of technology (Atkinson, 2018). Hendrickson et al. (2018) noted the disparity between geographical regions of the United States and offered several potential solutions. They recommended prioritizing digital workforce training, spreading broadband access to more regions, and focusing investments in "growth pole" cities that would serve as hubs of economic and educational opportunity (Hendrickson et al., 2018). The study recommends choosing 10 or so medium-sized metropolitan areas to compete for major federal investment and designation as a "Rising Tech Hub" (Hendrickson et al., 2018).

The federal government and private enterprises have launched several programs that could increase technical education opportunities for Americans. Under the Obama Administration, the White House developed the TechHire initiative that resulted in the following:

> (1) More than 20 communities with over 300 employer partners signed on to pilot accelerated training strategies; (2) large private-sector companies and national organizations committed to providing tools to support these TechHire communities; and (3) the President pledged $100 million in federal grant funding. (The White House, n.d., para. 1)

On the state level, Arkansas launched the Computer Science Initiative aimed at preparing students for a computer focused marketplace (Arkansas Division of Elementary and Secondary Education, 2019). Microsoft also offers technical training to students and teachers at accredited educational institutions (Wisconsin Department of Public Instruction, 2016).

Many studies find that apprenticeship programs help students prepare for this new economy. Gordon (2014) noted that "[t]he extensive use of apprenticeships helps reduce disparities in employment and earnings between young college graduates and young people with less education" (p. 15). Steinberg (2013) showed that students who go through apprenticeship programs earn more money, graduate with less debt, and enter the workforce faster than students in 4-year degree programs. Such programs thus help American businesses better compete with businesses from other nations.

However, other studies remain skeptical of the long-term benefits of an apprenticeship education versus a college education. Hanushek and Woessmann (2017) conducted research indicating that the benefits of apprenticeship programs could be limited when compared with other educational programs. They warned that "[i]n a knowledge-based economy, early employment gains with vocational training may lead to later problems when specific skills become obsolete and workers lack the

ability to adjust to a changed economic environment" (Hanushek & Woessmann, 2017, para. 2).

In evaluating the costs and benefits to companies supporting an apprenticeship program, Lerman's (2014) research indicated that companies generally recuperate their costs of running an apprenticeship program and quickly benefit from the investment. Some companies even recover their costs within the apprenticeship period (Lerman, 2014). Overall, most companies appear to receive a net benefit from each apprentice they train.

Data and Methods

This study will consider a mixture of qualitative and quantitative data. The qualitative data will include stories of how apprenticeship programs work in the lives of certain students and how the public, government, and business sectors generally view apprenticeship programs in the United States. However, the core of the research will rely on quantitative data about apprenticeship programs, in particular emphasizing employment rates and salary numbers. This data will be compared with students who have gone through a traditional college, those who have received only employer-based training, and those who have not pursued any continuing education after high school. The study will look for trends on a national level but will also compare these statistics on a statewide, regional, or international basis when applicable. There is significantly more data on an international level because of the further extent to which apprenticeship programs have been developed in European nations. For this reason, much of this study will rely on data collected from international sources.

This study adopts the United States Department of Labor's (2019a) definition of apprenticeship as an education that "[a]n individual employer, group of employers, labor organization, education institution or an industry association can sponsor…a set of structured standards that include requirements for related (classroom) instruction and paid on-the-job learning experiences" (para. 1). The apprenticeship program must be approved by the Department of Labor's Office of Apprenticeship or a State Apprenticeship Agency (Reeves & Guyot, 2017). An apprenticeship must also result in an industry recognized certification ("FAQ," 2019). General education refers to secondary or tertiary education that focuses on skills beyond just one specific trade, while vocational education refers to secondary or tertiary education that is tailored specifically towards one trade. Apprenticeship programs can be either secondary or post-secondary education systems as specified by the study. Traditional college is defined as the pursuit of an associate degree or a bachelor's degree.

Research

Relevant Industries

Apprenticeships are utilized in a variety of professions and arenas. According to the U.S. Department of Labor, the two industries that utilize apprenticeship positions the most are construction and the military (Reeves & Guyot, 2017). Other industries that utilize apprenticeships are manufacturing, public administration, transportation, and utilities (Reeves & Guyot, 2017). The top four positions for apprenticeships are electrician with 43,814 apprentices, carpenter with 25,921, construction craft laborer with 15,612, and plumber with 14,471 (United States Department of Labor/Employment and Training Administration, 2019). Most apprenticeships are in the skilled trade sector; however, other sectors of the economy also can utilize apprenticeships, as demonstrated by Britain's new apprenticeship programs in business administration and retail (Steinberg, 2013).

Information Technology

One potential area for expansion is in the field of information technology (IT). The field of software development had 1.3 million open jobs in 2016 and 512,720 in early 2017 (Swartz, 2017). The U.S. Bureau of Labor Statistics predicted that in 2020 there will be 1.4 million more jobs in IT fields than there will be people who can fill them (Swartz, 2017).

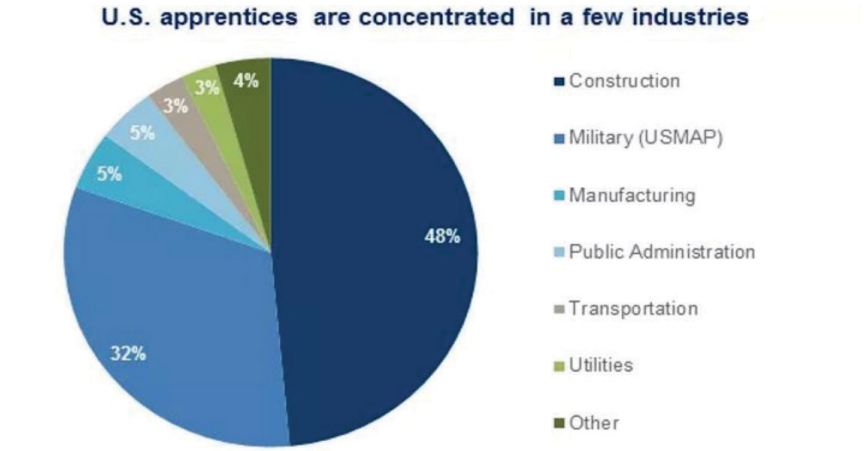

Figure 1. Pie chart of which industries utilize apprenticeship programs in the U.S. (Reeves & Guyot, 2017).

According to a study conducted by LinkedIn, employers look for the following skills in the marketplace:

Hard Skills

- Cloud Computing Expertise
- Data Mining and Statistical Analysis
- Smartphone App Development
- Data Storage Engineering and Management
- User Interface Design
- Network Security Expertise

Soft Skills

- Communication
- Curiosity
- Adaptability
- Teamwork
- Empathy
- Time Management
- Open-Mindedness (Lohr, 2017)

All the top hard skills are based on computer proficiency, making IT an obvious area of opportunity for apprenticeship programs. Technology companies, non-profit organizations, governments, and schools have recognized the potential benefits of increasing technical training options for students and have launched several initiatives in support of that goal (Lohr, 2017). Starting with the Obama administration, the federal government has given $150 million in grants to 39 partnering organizations through the TechHire Partnership (The White House, n.d.). These partnerships provide funding for initiatives that train workers looking to enter targeted fields of information technology. TechHire gives money to traditional university programs; however, they also provide funding for different routes such as "coding boot camps" and high-quality online courses intended to "rapidly train workers for well-paying middle-and high-skilled and high-growth jobs across a diversity of industries such as IT, healthcare, advanced manufacturing, financial services and broadband" (United States Department of Labor, 2019b, para. 1).

Potential Areas for Apprenticeship Expansion

In their study, Fuller and Sigelman (2017) identified natural areas for the expansion of apprenticeship programs by examining the skills demanded in over 23 million job openings. Occupations were identified as optimal areas for apprenticeships provided they required a relatively narrow cluster of skills, required only a high school diploma or an associate degree, provided above-average worker stability, paid

a living wage ($15 per hour or more), and were not being heavily licensed (Fuller & Sigelman, 2017). The study found that the number of occupations commonly filled with apprentices could be tripled from 27 to 74 occupations and that the number of job openings attainable via apprenticeship could be expanded eightfold to around 3.2 million jobs (Fuller & Sigelman, 2017). These new opportunities could unlock high value careers to more workers and create a supply of workers for traditionally hard to fill positions (Fuller & Sigelman, 2017).

Fuller and Sigelman highlighted two categories of potential areas for growth: expanders and boosters. Expander areas are occupations that meet all the criteria outlined above, while booster areas meet the criteria but are generally filled by people with bachelor's degrees (Fuller & Sigelman, 2017). Expander areas have a 15% average employment growth rate overall and include occupations such as welders, computer-controlled machine tool operators, tax preparers, and customer service representatives (Fuller & Sigelman, 2017). Expander occupations have a median wage of $34,542, which is lower than the median wage for the current core of apprenticeships (Fuller & Sigelman, 2017). Booster occupations include claims adjusters, insurance underwriters, human resource specialists, graphic designers, and database administrators (Fuller & Sigelman, 2017). These occupations have a median advertised wage of nearly $55,000, which makes them a viable route into the middle class without a college degree (Fuller & Sigelman, 2017).

Compensation

The rate of compensation that graduates receive in their careers after completing an apprenticeship program is a major indicator of the success or failure of these programs. According to Steinberg (2013):

> Workers who complete an apprenticeship earn an average starting salary of $50,000. Researchers have found that workers who complete an apprenticeship make an average of $240,037 more than comparable job seekers in their lifetimes; if nonwage benefits are included, that number jumps to $301,533. (para. 7)

Steinberg (2013) noted that apprenticeships are likely to bring the most benefits to young workers, since they are more likely to have lower paying jobs than older workers. Apprenticeship students may also benefit from a decreased amount of student loans and time spent in school (Steinberg, 2013). Hanushek, Schwerdert, Woessmann, and Zhang (2017) found that students who pursued a general education typically started out with lower incomes than students who took apprenticeship courses, but eventually the students with a general education surpassed the wages of apprenticeship students. The study compared 11 different countries' data from the

International Adult Literacy Survey (IALS). Most of the data focused on European nations where the apprenticeship method has been firmly implanted and can therefore be studied in greater depth. The authors specifically focused on the results in Switzerland, Germany, and Denmark. The lifetime earnings for vocational or apprenticeship students were higher than the lifetime earnings of students with a general education in Switzerland; however, in Germany and Denmark, the normal trend prevailed, and the lifetime earnings for vocational tracked students were lower (Hanushek et al., 2017). The authors found that the wage advantage between the two types of educational systems shifted to students with a general education at age 30 and flattened off around age 50 (Hanushek et al., 2017).

Long-Term Skill Value and Employment Rates

The long-term effectiveness of apprenticeship programs should also be considered. This long-term preparedness includes the ability to advance in a chosen career or to change careers as workers adapt to fluctuations in the marketplace. Students going through apprenticeship programs should seek to determine whether the skills they learn will depreciate over time or will continue to be generally applicable in the modern workforce.

In their study, Hanushek & Woessmann (2017) compared the long-term trends of employment rates of workers from countries across the world who went through a vocational education with those who went through a general education. They found that workers who had a vocational education were more likely to find a point of entrance into the workforce than workers who had a general education (Hanushek & Woessmann, 2017). However, over the life of the workers, the skills of those who went through apprenticeship programs depreciated with age, and the average employment rate decreased to below that of those with a general education (Hanushek & Woessmann, 2017). Overall, individuals with a general education were 6.9% less likely to be employed than individuals with a vocational education at the outset, but this gap narrowed by 2% every ten years (Hanushek & Woessmann, 2017). By age 50, the average employment rate for individuals with a general education was higher than for those who graduated from an apprenticeship program (Hanushek & Woessmann, 2017). Hanushek and Woessmann (2017) suggested that this reversal in employment advantage could be because individuals who received a general education are more likely to receive ongoing career training than those who graduated from an apprenticeship program.

There were also varying results between countries: graduates from apprenticeship programs did not have a universal advantage in finding jobs when compared to students with a general education (Hanushek & Woessmann, 2017). According to the study:

> Employment patterns are most pronounced in the "apprenticeship countries" with combined school and work-based education programs (Denmark, Germany, and Switzerland in our data) and least noticeable in the countries with no formal system of vocational education such as the United States. (Hanushek & Woessmann, 2017, para. 9)

Acceptance by Private Industries

In order to maintain or expand their growth rate, these programs must be recognized as legitimate institutions by businesses looking to hire workers. As private businesses are often the sponsors of apprenticeships, businesses will want to consider whether the benefits of training apprentices outweigh the costs.

Some companies and business leaders are embracing the apprenticeship method as a viable path of education to train their future employees. CEO of Salesforce, Marc Benioff, is an especially strong example of a business leader who is enthusiastic about expanding apprenticeship courses for American workers. Benioff asserted that American companies "are some of the best universities in the world" (Mann, 2017, para. 4). In a meeting with President Trump, Benioff encouraged the President to set a goal of making 5 million apprenticeship positions within America over the next five years (Meredith & Cutmore, 2017).

Other companies, such as IBM, Microsoft, Amazon, and Zurich Insurance are using apprenticeship programs to expand their base of talent recruitment. This reflects a shift from the normal use of apprenticeship programs in blue-collar lines of work to new fields of white-collar work, providing a new entrypoint for many workers (Huhman, 2018). Sam Ladah, IBM's vice president for talent, said that hiring workers based on skills and not necessarily based on college degrees "makes sense for [their] business, for the job candidates and for the communities" (Lohr, 2017, para. 33). Microsoft also actively supports apprenticeship programs through grants; for instance, Microsoft gave a $25 million grant to the Skillful program that enables students to succeed in the labor market without obtaining a four-year degree (Lohr, 2017). While technology companies are facing a lack of skilled employees, even companies in industries that are not facing a significant labor shortage are interested in developing apprenticeship programs. The Illinois-based company Zurich Insurance looked to create an apprenticeship program to develop a more diverse base of talent (Cheney, 2017). Al Crook, Head of HR Business Partners at Zurich Insurance, commented:

> We weren't exactly having trouble finding people, but we realized that people of all ages weren't necessarily aiming for insurance as a career. We saw apprenticeship as a way to introduce our industry

> and the range of jobs and opportunities available. In doing so, more people might see it as an attractive career option. And we would create a diverse pipeline of candidates for the future. (Cheney, 2017, "State Of Apprenticeship," para. 12)

In the field of technology, many hiring managers are showing a willingness to hire workers who may not have a traditional college degree. The company Indeed conducted a survey of 1,000 HR managers and tech recruiters in American companies of various sizes to gauge whether they thought that students who only went through coding "boot camps" instead of traditional college were adequately prepared as workers ("What Do Employers," 2017). These coding boot camps are short-term, intensive courses that provide core coding skills for students at a quicker rate than most computer science degrees (Eggleston, 2018). The Course Report 2018 found that "there are 95 in-person bootcamp providers and 13 online bootcamp providers. As of June 1, there are coding bootcamps in 86 US cities and 44 states" (Eggleston, 2018, "Key Findings," para. 5). These camps graduated over 20,000 students in 2018 (Eggleston, 2018). The survey reported that 72% of the recruiters said that graduates of coding boot camps were just as prepared as degree holders, 17% said they were less prepared, and 12% thought that they were more prepared ("What Do Employers," 2017). Around 80% of the people surveyed have hired a coding boot camp graduate, and 99.8% of those who did so would do it again ("What Do Employers," 2017).

Lerman (2014) studied the returns that 1,825 German firms and 1,471 Swiss companies received from their investments in apprenticeship programs and found that most companies realized a net benefit from their apprenticeship programs. The costs that private companies expend on their programs include "apprentice wages, the wages of trainer specialists for the time they oversee apprentices, and the costs of materials and additional space required for the apprenticeship" (Lerman, 2014, p. 3). The potential benefits of apprenticeship programs include enhanced productivity, lower turnover rates, and savings on other hiring and recruiting costs (Lerman, 2014). Average yearly costs were €15,500 (~$21,080) for German firms and about €18,000 (~$24,480) for Swiss firms (Lerman, 2014). Even though they spent more per apprentice, the Swiss recouped €19,000 a year during the apprenticeship, while German firms only recouped €8,000 a year during the apprenticeship (Lerman, 2014). However, in Switzerland, only 36% of apprentices remained with the firm that provided the apprenticeship training, while 64% of apprentices in West Germany stayed with the business that trained them (Lerman, 2014). This higher retention rate allowed the German companies to regain their expenditures they lost during the apprenticeship programs (Lerman, 2014). Overall, most of these programs recouped their own costs.

Government Programs

While the United States continues to lag far behind European nations in the number of apprenticeship programs, governments at the federal and state levels have begun to boost the resources they are directing towards apprenticeship programs. Both the Obama and Trump administrations have been proponents of the apprenticeship approach. The TechHire initiative, the LEAP Act, and Trump's task force on apprenticeships are all federal initiatives that have been proposed or launched within the last decade. The Obama administration launched the TechHire initiative, using grants to expand educational opportunities for workers looking to enter technical fields, including those who pursue alternate educational paths (The White House, n.d.). Since its inception in 2015, TechHire has grown into a network of 237 training partners and 1300 employee partners and has placed over 4000 employees ("TechHire," 2019).

The Trump administration has touted apprenticeships as a means of restoring America's workforce and ensuring that workers are not left behind in the modern economy. On June 15, 2017, President Trump issued an executive order directing the federal government to investigate ways to expand and encourage apprenticeship programs. The order also created a specific taskforce on apprenticeship expansion. Some have expressed concerns regarding the executive order's directions for the Departments of Labor, Education, and Commerce to "determine how qualified third parties may provide recognition to high-quality apprenticeship programs (industry-recognized apprenticeship programs)" (Exec. Order No. 13,801, 2017, § 4(a)(1)). This directive could lead to relaxed standards for apprenticeship programs, which could have both positive and negative outcomes. Relaxed standards could allow more apprenticeship programs to launch, but they could also lead to more substandard schools that would not adequately train workers. The Center for American Progress contended that "loosened certification requirements and training structure requirements undermine the quality assurance of apprenticeship programs meeting federal standards, thus weakening the credibility and skill portability of federally Registered Apprenticeships to businesses nationwide" (Lorenzo, 2017, para. 9).

In accordance with this executive order, the U.S. Department of Labor announced in 2018 that it would grant $150 million in H-1B funds to support apprenticeship programs in key industries that were largely reliant on workers with H-1B visas (United States Department of Labor, 2019a). The Department of Labor said that the grants were designed "to increase access to apprenticeship among all Americans, particularly veterans, military spouses, service members re-entering the civilian workforce, and underrepresented populations in apprenticeship – including women, people of color, and ex-offenders" (United States Department of Labor, 2019a, para. 7).

In 2014, Senators Tim Scott and Cory Booker introduced The Leveraging and Energizing America's Apprenticeship Programs (LEAP) Act into Congress ("Facts About the LEAP Act," n.d.). This act would give a federal tax credit to employers who hired apprentices for their companies and is designed to encourage employers to hire younger employees. The tax credit would be $1,500 for employees under 25 years old and $1,000 for employees over 25 years old ("Facts About the LEAP Act," n.d.).

Conclusion

While they are only now beginning to gain traction in the United States, apprenticeship programs offer a viable route to a successful career for many outside of the traditional collegiate education model. The initial data from international sources and within the United States generally supports the finding that students who go through apprenticeship programs are well-equipped to find high-paying jobs. However, the study by Hanushek et al. (2017) shows that the skills learned in an apprenticeship program can diminish more rapidly than the skills learned in a more general education program at the secondary and tertiary level. That being said, the apprenticeship students in the sampled countries generally earned higher wages and had a higher chance of being employed up until age 30 (Hanushek et al., 2017). Continuing education programs could potentially enable apprenticeship program graduates to capitalize on this head start. The eventual depreciation of skills gained through the apprenticeship programs could also be combated by including more general education options within apprenticeship programs or during the time of employment after an apprenticeship program. Educational institutions and companies should look to develop this hybrid approach that would meld the strengths of both the general and apprenticeship methods.

American companies and the U.S. government have both shown great interest in expanding apprenticeship programs; however, the United States must devote significantly more resources to developing apprenticeship programs in order to make the apprenticeship path a normal route for students looking to enter a variety of fields. In particular, efforts to expand apprenticeship programs should focus on jobs in information technology and in other booster and expander fields. Public relation campaigns should be launched to help redefine apprenticeship programs as legitimate routes towards many sustainable careers rather than merely towards manual labor jobs.

Further research should be conducted on the extent to which apprenticeship programs should be regulated. Ideally, regulations will strike a balance between ensuring a quality education and allowing institutions to develop programs without much red tape. Studies should especially look at the viability of industry-based

standards developed by companies as opposed to the current patchwork of state and federally administered apprenticeship programs. Regardless of the future regulations that may be needed, apprenticeships appear to provide a paid and relatively rapid route to the middle-class for many Americans.

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