

DAY ONE PROJECT

Investing in Apprenticeships to Fill Labor-Market Talent and Opportunity Gaps

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FAS

Summary

The cost of college has skyrocketed over the last 20 years, with tuition costs far outpacing wage growth. At the same time, many employers complain that they are unable to find high-quality talent, in part due to excessive focus on the signaling effect¹ conferred by college degrees. Although the last three presidential administrations have expanded and added pathways to high-earning jobs through apprenticeship programs, such programs remain under-utilized and have significant growth potential. To maximize the potential of apprenticeship programs, the federal government should develop a cohesive approach to supporting apprenticeships in key talent-starved industries, including technology and cybersecurity, healthcare, and advanced manufacturing. These apprenticeships are characterized by high pay and upward mobility and are designed to support economic growth and serve vital national interests. To maximize the benefits of expanding high-quality apprenticeships, the federal government should (1) develop a national strategy to coordinate and direct resources, and (2) work with Congress to allocate federal funding for apprenticeships and related programs in nationally strategic areas.

Challenge and Opportunity

Much recent discourse around higher education has revolved around the concept of “canceling student debt.” Less attention has been given to the spiraling cost of college as the underlying driver of exorbitant student debt. Tuition at four-year universities has risen by 37% in the last decade alone,² a rate that has far outpaced inflation and has left students with an average debt load of \$27,000 by graduation. Amid rising college costs, policymakers increasingly recognize the potential of non-degree training — particularly apprenticeships, which mix on-the-job training with acquisition of targeted academic skills. Typically lasting between a few months and 2 years, apprenticeships enable an individual in a high school or tertiary education program to work with an employer such that the individual earns a wage while developing skills that may lead to a permanent position or enhance future employability. President Obama spent \$260 million on apprenticeship training, while the Trump administration spent \$1 billion.³ President Biden’s campaign platform was even more ambitious, calling for [\\$50 billion](#) to support programs that lead directly to “ready to be filled” jobs.⁴

Despite these efforts, apprenticeships in America remain vastly underutilized relative to some of our peer economies. In Germany, 1.3 million adults⁵ are enrolled in

¹ Signaling effects are indicators of broader value conferred by an individual’s ownership of an asset. In education, individuals who have higher levels of degree attainment are assumed to be more intelligent, hard-working, and capable than individuals with lower degrees of education. These value judgments are not always true at an individual level and can create negative externalities in labor market outcomes.

² Mitchell, M.; Leachman, M.; Saenz, M. (2019). [State Higher Education Funding Cuts Have Pushed Costs to Students, Worsened Inequality](#). Center on Budget and Policy Priorities. October 24.

³ Jacobey, T.; Haskins, R. (2020). [Kentucky Fame: Fulfilling the Promise of Apprenticeship](#). Opportunity America; the Brookings Institution. October.

⁴ The White House. (2014). [FACT SHEET: Ready to Work At a Glance: Job-Driven Training and American Opportunity](#). July 22.

⁵ Apprenticeship Toolbox. (2019). [Apprenticeship System in Germany](#). October 4.

apprenticeship programs across 330 occupations.⁶ By contrast, the United States has [roughly half as many apprentices](#)⁷ despite enrolling 7.5 times⁸ as many college students. Moreover, apprentices in America are overwhelmingly learning to be electricians, machinists, plumbers, and similar types of workers. Apprenticeships are far scarcer in other industries. One reason for this is that American employers have put a significant premium on college degrees, while ascribing little value to other types of credentials. Research from the Harvard Business School⁹ highlights the pervasiveness of “degree inflation”. As illustrated below, a large “degree gap percentage” — the difference between the percentage of job descriptions requiring a college degree and the percentage of job holders holding a college degree — exists in many middle-skill, well-paying jobs.

OCCUPATIONS	DEGREE GAP %
Supervisors of Office Administrative Support Workers	37%
Bookkeeping, Accounting, and Auditing Clerks	27%
Secretaries and Administrative Assistants, Except Legal, Medical, and Executive	17%
Sales Representatives, Wholesales, and Manufacturing	27%
Executive Secretaries and Executive Administrative Assistants	47%
Supervisors of Production and Operations Workers	51%
Supervisors of Retail Sales Workers	22%
Supervisors of Food Preparation and Serving Workers	26%
Supervisors of Construction Trades and Extraction Workers	44%
Sales Representatives, Services, All Other	22%
Supervisors of Mechanics, Installers, and Repairers	35%
Inspectors, Testers, Sorters, Samplers, and Weighers	25%
Childcare Workers	20%
Computer User Support Specialists	19%
Billing and Posting Clerks	21%

Figure 1. Degree gap percentage in select jobs.⁸

⁶ Expatrio. (n.d.). [German dual apprenticeship system](#).

⁷ U.S. Department of Labor. (2020). [Registered Apprenticeship National Results Fiscal Year 2020](#). Employment and Training Administration.

⁸ Deutsche Real Estate Funds. (n.d.). [Student Numbers in Germany](#).

⁹ Fuller, J.B.; Raman, M.; et al. (2017). [Dismissed by Degrees](#). Accenture; Grads of Life; Harvard Business School. October.

Overemphasis on college degrees has impeded broader national adoption of apprenticeships. However, attitudes are changing towards apprenticeships as more employers realize their versatility and applicability to a variety of industries. The staffing agency Adecco found that 89% of employers believe that corporate apprenticeship programs would alleviate skills gaps.¹⁰ A consortium of blue-chip employers led by Aon recently announced a national technology-focused apprenticeship program with the goal of enrolling 10,000 apprentices by the end of 2030.¹¹ The time is right for federal, state, and local officials to capitalize on this momentum and create a coherent, cohesive national strategy — one that promotes and supports apprenticeships as a tool to fill labor-market talent and opportunity gaps.

Plan of Action

While apprenticeships can benefit many — if not all — sectors, policymakers should prioritize support for apprenticeships in roles that meet the following criteria:

- (1) Essential to economic growth. Roles that are frequently employed in high-growth industries, or else required to improve the future general productivity of businesses.
- (2) Necessary to protect American interests. Roles that have broader implications for American national interests, including economic competitiveness, national security, green energy, and public health.
- (3) Middle-skill and do not require college degrees. While pursuing higher education is generally desirable, college is neither a suitable nor affordable option for all individuals. Many middle-skill roles can and should embrace workers possessing alternative credentials. Apprenticeships for such roles can provide Americans with pathways into the middle class that do not demand excessive education debt burdens.
- (4) High current job shortages. Demand for roles far exceeds current labor supply.

Under these criteria, there are at least three areas in which the United States has clear, pressing needs that apprenticeships could help fill.

- (1) Technology and cybersecurity. A shortage of over 1.2 million tech workers¹² in the United States is projected to cost the American economy \$160 billion per year in lost revenue per year by 2030.¹³ Cyberattacks alone cost the American economy \$100 billion,¹⁴ which can be partially addressed by eliminating the

¹⁰ Adecco. (2016). [The American Skills Gap is Real](#). June 7.

¹¹ Aon. (n.d.). [Aon to Invest 30 Million and Create 10,000 Apprenticeships Nationwide by 2030](#).

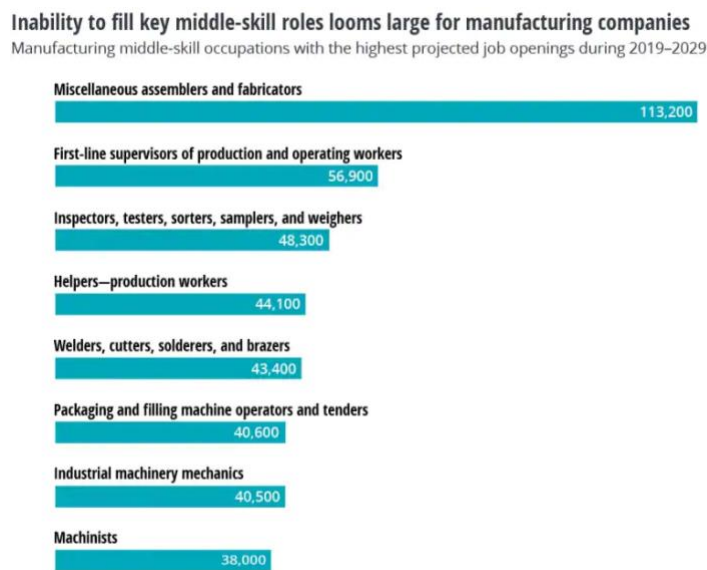
¹² Daxx. (2021). [The Software Developer Shortage in the US and the Global Tech Talent Shortage in 2021](#).

¹³ English, L. (2021). The Tech Talent War Has No End In Sight. Here's What You Need To Know. *Forbes*, June 1.

¹⁴ Argonne National Laboratory. [Cyber Defense Competition 2016](#). Newswire, DOE Science News Source, April 20.

existing talent shortage of 350,000 cybersecurity professionals.¹⁵ In addition, 50% of the federal tech workforce is over the age of 50 and just 20% is under the age of 40,¹⁶ indicating that the government technology sector is likely to approach a large “retirement cliff” in the near to medium term.

- (2) Healthcare. The COVID-19 pandemic highlighted the importance of healthcare workers, especially nurses and non-MD staff, in keeping Americans safe and healthy. Worryingly, though, the U.S. healthcare system is projected to be short over 500,000 nurses¹⁷ by 2030. Our nation also suffers from a lack of healthcare educators. Nearly 80,000 qualified nursing applicants are turned away each year due to a lack of training capacity.¹⁸ While many critical healthcare roles (e.g., RNs and NPs) require at least a bachelor’s degree, apprenticeships are a great way to increase the pipeline of lower-level medical staff (e.g., medical assistants, CNAs, LVNs), who can then be upskilled into higher roles.
- (3) Advanced manufacturing. There are currently more than 500,000 unfilled manufacturing jobs in the United States (Figure 2).¹⁹ The gap is projected to grow to 2.1 million unfilled jobs by 2030 if left unaddressed. Cumulatively, this talent shortage could reduce American GDP by \$1 trillion. The manufacturing labor shortage is most acute for a handful of roles, including assemblers, production supervisor, inspectors, and welders. Apprenticeships could train people to fill these roles, empower the advanced manufacturing revolution, and fully utilize American industrial potential.



Note: Only those jobs considered where at least 50% are employed by manufacturing industry.

Figure 2. Labor shortages in the manufacturing sector.¹⁸

¹⁵ CIO Council. (2020). [Future of the Federal IT Workforce Update](#). May.

¹⁶ Ibid.

¹⁷ Zhang, X.; et al. (2018). [United State Registered Nurse Workforce Report Card and Shortage Forecast: A Revisit](#). *American Journal of Medical Quality*, 33(3): 229–236.

¹⁸ Tancino Law, P.C. (2021). [Foreign Nurses Can Help Solve US Hospital Staff Shortages During COVID And Beyond](#). February 17.

¹⁹ Wellener, P.; et al. (2021). [Creating pathways for tomorrow's workforce today](#). Deloitte Insights, May 4.

Policy Recommendations

The Biden Administration should pursue a following two-part approach to maximize the potential of apprenticeship programs in technology and cybersecurity, healthcare, advanced manufacturing, and other strategic areas.

Part 1. Develop a national apprenticeship strategy.

The Departments of Labor and Education (DOL and DOE) should jointly lead development of a national strategy for increasing apprenticeships and similar blended work-learn programs in essential roles and industries. The strategy should be renewed every five years and outline key roles, skills, technologies, and training pedagogies that merit greater attention. The DOL and DOE should begin by establishing a “Strategic Apprenticeships” task force comprised primarily of representatives from other government agencies (e.g., the Department of Defense, the Department of Commerce, the Department of the Treasury, and the Federal Reserve) with clear mandates for improving worker outcomes that are tied directly to national strategic priorities. The task force should:

- (1) Cooperate with the [Advisory Committee on Apprenticeships](#). The Advisory Committee on Apprenticeships is a body convened by the DOL that comprises representatives of labor unions, community colleges, and other institutions. The task force should work with the Committee to develop the national strategy, as well as to propose funding levels for federal programs supporting apprenticeships and to set short-, medium-, and long-term priorities for apprenticeships.
- (2) Create standards for apprenticeship programs that qualify for federal funding. The [Registered Apprenticeship Program](#) provides a repository of federally or state validated apprenticeships. However, occupations in cybersecurity and software development remain highly under-represented compared to roles in “traditional” industries such as manufacturing. The task force should work with industry certifications and associations, such as the [ISC\(2\)](#) and [ISSA](#), to develop skill acquisition standards that will form the backbone of new apprenticeship programs.
- (3) Create a set of competency-based standards that equate on-the-job activities with classroom learning. Such standards will create clear pathways for students in apprenticeships who want to later receive an associate’s or bachelor’s degree. While this applies to all apprenticeships (and is a defining feature of the very successful Swiss and German systems), creating federal learning standards will improve the appeal of apprenticeship programs in strategic sectors while giving individuals a path to higher credentials in the future.
- (4) Adopt a “whole of government” approach. When appropriate, the task force should engage representatives from other stakeholder institutions, as well as representatives of bodies with deep domain expertise on apprenticeships. Concerted engagement will ensure that proposed standards and structures for

apprenticeships are appropriately designed and implemented. The task force should also consider how, at the state and local levels, elected officials can work with local chambers of commerce, community colleges, universities, and alternative education providers (such as organizations that host “coding bootcamps”) to translate learning standards into apprenticeship opportunities, course credits, and pathways to an associate’s or bachelor’s degree. The task force should also consider how local officials can engage with nonprofits and other service organizations to provide wraparound support structures (such as career coaching, financial planning, and mental-health resources) that have been shown to improve persistence and outcomes.

Part 2. Work with Congress to commit federal funds for apprenticeships.

Funds should be prioritized to support apprenticeships in technology and cybersecurity, healthcare, and advanced manufacturing. Once appropriated, funds would be allocated to federal agencies, led by the DOL, in alignment with the national strategy. At least 50% of funds should be directed towards apprenticeships that demonstrably (a) provide strong pathways into middle-class jobs, and (b) address pressing economic and strategic shortages in the U.S. economy. The following points are relevant to federal funding for apprenticeships.

- (1) Apprenticeships have broad bipartisan appeal. Bipartisan support for apprenticeships is evidenced by the fact that both the Obama and Trump administrations increased funding for apprenticeship programs. The Jumpstart Our Businesses by Supporting Students Act of 2019 (H.R. 3497), which was eventually brought to the Senate floor by Tim Kaine (D-VA) and Rob Portman (R-OH), called for Pell Grants to be used for certain short-term learning programs. New legislation can go one step further by adding funding for short-term programs in the key strategic areas outlined above. To further strengthen the bipartisan appeal of apprenticeships, apprenticeship programs can be designed to directly improve U.S. competitiveness with China (e.g., by enhancing cybersecurity) — a national goal around which there is also increasing bipartisan consensus.
- (2) Policies for funding apprenticeships should incorporate other economic-, social-, and racial-justice priorities. For instance, the DOL recently committed \$87.5 million to expand diversity in registered apprenticeship programs.²⁰ In addition to increasing the amount of funding targeted at women and individuals of color, the federal government could create funds that help former apprentices of color enter quality four-year degree programs that build on acquired skills and expertise and further enhance earning potential. Such funds would advance President Biden’s racial-justice agenda while providing a vehicle to meaningfully raise living standards and economic opportunity.

²⁰ U.S. Department of Labor. (2021). [US Department of Labor Announces Availability of \\$87.5M in Funding to States to Expand, Diversify Registered Apprenticeship Programs](#). March 18.

- (3) Apprenticeship funding should largely transition away from proposal-style “contests” towards a more consistent and predictable schedule of funding. Current federal funding for apprenticeships through the DOL is allocated through competitive proposals submitted by state Departments of Labor and sometimes large nonprofits. Going forward, apprenticeship funding, particularly funding for apprenticeships in key strategic areas, should be a consistent budget line item with clear paths towards funding renewal. The DOL, working with the Strategic Apprenticeships Task Force, should develop guidelines and milestones (e.g., for skill development and program-completion rate) that institutions must meet to continue receiving funding.
- (4) The DOL should consider launching an “ARPA for Labor” that supports cutting-edge approaches to workforce development.²¹ This publicly supported innovation fund would catalyze new approaches and technologies for workforce training (for example, virtual reality training that uses neurologic signals to provide training in advanced manufacturing).

To ensure that funding is only provided to high-quality education providers, the DOE should reinstate the Gainful Employment Rule for apprenticeship programs.²² This rule stipulated that any programs whose typical graduates’ debts exceeded 8% of their total income or 20% of their discretionary income would lose access to federal financial aid. While the specific percentages could be adjusted, the Gainful Employment Rule generally helps protect students from predatory practices while ensuring that federal funds are not wasted on high-cost programs.

Conclusion

The two-part approach outlined above constitutes a coordinated national effort to maximize the potential of apprenticeships in the United States. Adopting this approach will help advance economic, social, and racial justice by providing more and better opportunities for individuals to acquire good, well-paying jobs. Strengthening the U.S. apprenticeship system will also benefit all Americans by closing labor gaps in industries and roles of critical national importance.

Frequently Asked Questions

1. Why are apprenticeships less common in the United States than in Europe? How can they be adopted to fit the American labor market?

Apprenticeships are more common in Europe because major European corporations are more likely to cooperate with local and provincial governments on labor training and development. Moreover, unlike in America, workers sit on the boards of directors of many European-based companies. For example, in Germany, workers comprise nearly half the supervisory boards for companies with over 2,000 employees and one-

²¹ Schoop, J.; et al. (2021). [Creating an Advanced Research Projects Agency \(ARPA-L\) for the Department of Labor](#). Day One Project.

²² Higher Ed Not Debt. (2019). [What to Know About the Gainful Employment Rule](#). August.

third of the supervisory boards for companies with 500–2,000 employees. As a result, European employers are more likely to take a long-term view of talent development and are more willing to invest in apprenticeships as part of the talent-development ecosystem.

2. Are apprenticeships just another term for vocational education? What impact might this have on long-term earnings potential?

While apprenticeships have been traditionally applied to fields that most people would associate with “vocational” roles such as electricians or construction work, they are also increasingly used in “new economy” roles such as IT and software development. When properly designed, apprenticeships have excellent earning potential. For instance, Kentucky’s FAME program prepares students for careers in advanced manufacturing. Program graduates enjoy average earnings of nearly \$100,000 within five years of program completion.²³

3. Can’t we solve labor shortages by simply paying workers more?

Paying more would alleviate labor shortages in some sectors, such as nursing, where the challenges of the job demand adequate compensation to attract workers. However, there are still critical shortages at the *front* of many labor pipelines (for example, helping individuals acquire nursing credentials). Intelligent deployment of apprenticeship policy can play a major role in reducing the upfront barriers and entry costs for skilled jobs.

4. Do apprenticeships limit students’ ability to later receive a bachelor’s degree?

No. Individuals who have completed apprenticeship programs can always pursue a bachelor’s degree at a later point. In some cases, the academic or work components of an individual’s apprenticeship may translate into collegiate credit. The apprenticeship-to-university pathway is currently more common in Europe than in the United States, given the former region’s greater use of apprentices in non-trade roles.

5. What is the typical return on investment for an employer when they employ an apprentice?

Employers generally enjoy a strong ROI for apprenticeships. Employers who employed registered apprentices in industrial manufacturing, for instance, received \$1.47 of benefits for every \$1.00 that they invested in apprenticeships.²⁴ Returns generally come in the form of improved productivity and reduced waste. Depending on the upfront investment amount, the duration of the apprenticeship, and the time

²³ The Lane Report. (2020). [National report shows KCTCS earn-and-learn program, KY FAME, has outstanding outcomes](#). October 26.

²⁴ Jobs for the Future. (2020). [IMT Apprenticeship Provides Positive Return on Investment for Employers. Center for Apprenticeship & Work-Based Learning](#). August 18.

required to recoup productivity gains and cost efficiencies, the typical internal rate of return (IRR) for private investment in apprenticeships ranges between 5 and 25%.²⁵

6. What is the social return on investment for apprenticeships?

Again, this depends on the subsidy amount and the specific apprenticeship in question. International studies suggest, however, that the IRR percentage for public investment in apprenticeships ranges between [5 and 12%](#).²⁶ This meets or exceeds many comparable uses of federal funding (e.g., for agricultural subsidies).

7. Why aren't apprenticeships more popular? Shouldn't the private sector self-organize their own apprenticeship programs?

In the case of skilled trades, industry has largely self-organized around apprenticeships because “learning by doing” is the best way to ensure that an individual has verifiable skills on the job—for example, a welder may need to show that he or she can operate while suspended from a harness in the air. In most other sectors, though, employers have found it easier in the short term to rely on signals such as college degrees to sort through applicants, or simply feel that the time and money invested in apprenticeships results in too uncertain of an outcome (e.g., the apprentice isn't as productive as desired or leaves) relative to the risk level. Public support for apprenticeships is needed to bridge the gap between individual employer incentives and social returns regarding apprenticeships, particularly in high-need roles and geographies.

²⁵ Koch, J.V. (2017). [Rates of Return on Investments in Apprenticeships: Summary of the Empirical Evidence](#). American Institute for Innovative Apprenticeship, March.

²⁶ Ibid.

About the Author



Jan Jaro is an MBA student at the Wharton School at the University of Pennsylvania and holds significant experience in both the private and social-impact sectors. In addition to spending two years in consulting and two years in private-equity investing, Jan has worked at Opportunity@Work, a DC-based nonprofit that helps underserved individuals transition into middle-class tech roles, and Stride Funding, a mission-driven startup that provides student-friendly non-loan financing and career services to individuals enrolled in STEM and healthcare programs. He is deeply interested in using apprenticeships and other work-and-learn programs to promote affordability and access to education and employment.

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