The Center for
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What Works in Reskilling? Evaluating Alternative Education Options

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Introduction

The economy is far from static, and as it shifts away from certain industries, affected workers find themselves without jobs. Technological advancements are often at least a partial cause of those economic shifts. An often-cited historical example is that low-skill manufacturing jobs have declined in recent decades as technology that can perform tasks more efficiently was developed.[1] Much of today's discourse on the subject revolves around how AI and automation could disrupt job markets across the economy.[2]

A McKinsey report estimated that up to a third of American workers could be displaced by automation by 2030, but that new jobs would be created in their place.[3] Many of these new jobs would require an entirely different skill set. Other workers, while not directly displaced by technology, seek to leave low-wage fields for better economic opportunities.[4]

To find a higher-paying or more stable career, many workers will invest in learning a new set of skills to qualify for work in a different industry. This is known as reskilling. Reskilling programs include vocational schools, coding bootcamps, and apprenticeships, among others. All can provide good career preparation, provided they prepare students with verifiable, career-relevant skills.

In this Research in Focus, we answer the question: What works in reskilling? To do so, we review the literature surrounding three types of reskilling programs: apprenticeships, trade schools, and coding bootcamps. These are commonly seen as alternatives to a traditional college education, which can be inaccessible to many students. We then identify their strengths and weaknesses and explore what makes them effective.

Reskilling is often undertaken with the goal of finding better career opportunities. As such, we examine which reskilling programs maximize career benefits through increased wages or employment rates. Our research indicates that career-focused

curriculums, transparent employment outcomes, and industry-recognized credentials are key aspects of successful reskilling programs.

Apprenticeships

An apprenticeship is a program in which a trainee is hired directly by an employer to be trained on the job. Trainees also receive additional classroom-based training, which usually takes place at a trade school or community college.[5] Apprenticeships are most common in skilled trades like plumbing, welding, and construction.

Apprenticeships are one of the most effective reskilling programs because trainees are immersed in the work environment from day one. They are trained by professionals who are familiar with the industry and what it requires. Most of the problems that apprentices learn to solve with their growing skills are not scripted by teachers but arise naturally through day-to-day operations. Finally, apprentices are paid while receiving this applied training, reducing the financial burden of leaving the workforce or taking on debt to be trained.

The success of the apprenticeship approach is shown in its employment outcomes. In 2015, the Department of Labor (DOL) began the American Apprenticeship Initiative (AAI) to support the development of apprenticeships in a variety of industries, including those where they are less common. The Urban Institute issued a report detailing the effectiveness of the program. They found that between a year before the start of the program and two and a half years later, the average apprentice saw wage growth of forty-three percent. Comparable workers in the same industries who did not complete an apprenticeship only had wage growth of sixteen percent.[6] These results indicate that the highly relevant training received through an apprenticeship pays off quickly. According to the manufacturing trade group DVIRC, ninety percent of registered apprentices in the US retain their employment after they complete their training.[7]

Employers who offer apprenticeships have the option of registering them with the Department of Labor. Doing so is optional but has benefits for both employers and workers. The DOL requires employers to meet instruction and on-the-job training time requirements, to align the curriculum with industry standards, and to tie wage increases to skill development.[8] These are intended to primarily benefit the apprentice but also open up a growing number of state and local grant or tax credit opportunities to help employers fund the training of their apprentices. South Carolina, for example, offers a yearly $1,000 tax credit for each registered apprentice a company employs.[9] These incentives offset the economic strain of training apprentices on employers, who typically pay apprentice salaries and other training costs out of their own pocket, just as they would for any other employee.

Labor economist Michael Farren suggests an interesting alternative to direct government funding of these programs.[10] The current tax code prevents businesses from claiming money spent to train a new worker as a business expense. A simple change to the tax code, however, could allow businesses to deduct training expenses from their taxes. To do so, the tax code would need to treat spending on a company's human capital in the same way as spending on physical assets like equipment. This approach would encourage more businesses to invest in training the workers they need, hiring an apprentice or another trainee if they can't otherwise find a qualified candidate.

Despite the resounding success and growing support for apprenticeships, formal programs are highly concentrated in select industries. DOL data indicates that nearly two-thirds of apprenticeships are in construction.[11] It is rare to find the same training model used elsewhere. Apprenticeships could feasibly work well in many other industries, but they aren't being implemented on a large scale. A Harvard paper describes the mindset of many employers who expect their workforce to come at least partially pre-trained. They often require bachelor's degrees even though the skills required could be learned on the job.[12] This phenomenon is likely strengthened by the fact that, as economist Michael Farren points out, employee training expenses are not tax deductible.

There are also regulatory barriers to expanding apprenticeships. Occupational licensing requirements increase the barriers to entry for workers to begin working in a new industry. These requirements are meant to protect consumers by preventing untrained workers from operating in an industry. This helps to explain why apprenticeships in clinical healthcare are uncommon. However, there is a growing movement to loosen these restrictions, at least in certain circumstances. For example, Utah and Minnesota have recently begun allowing for nursing apprenticeships, albeit in combination with a traditional nursing degree program.[13] In addition to expanding job opportunity for individuals, allowing apprenticeships in more industries could also help more workers move into industries with large labor shortages.

Another barrier to expanding apprenticeships is the risk that an apprentice might take the skills they learn to a competing company when the program ends. In a piece published by the

Manhattan Institute, author Oren Cass discusses this dilemma. On one hand, stronger skill sets allow job seekers to command higher wages, which is an incentive to look elsewhere for work. On the other hand, an investment in an employee's career could also build company loyalty.[14] In a minority of programs, such as those offered by trucking companies to help new drivers earn a CDL, trainees are contracted to work for the company for a specified period after their training is completed or repay the company for the training if they leave early.[15]

The typical registered apprenticeship program doesn't impose post-program work requirements on participants. Still, the majority of former apprentices continue to work for their employers after the program ends. This continued employment suggests that, in general, employers and trainees are pleased with the arrangement.

Increasing apprenticeship adoption has been a goal of the last three presidential administrations. Hundreds of millions of dollars have been allocated to expand apprenticeship programs through federal grants to local governments, schools, and labor organizations.[16] The DOL reported a sixty-four percent increase in the number of apprentices from FY 2012 to 2021.[17] While that growth is impressive, it's worth considering if this investment has been cost-effective.

A full cost-benefit analysis is outside of the scope of this piece, but a 2012 study by Mathematica Policy Research found that the net social benefits of investments in registered apprenticeship (RA) programs were positive. The study then explores the implications for funding of apprenticeship programs. The authors suggest that even if the net benefits are positive, this does not necessarily warrant government investment. They state, "it is possible that all the benefits of RA are due to the private investment. Put differently, without the government RA program, private sponsors and employers might run apprenticeships with equally strong outcomes."[18]

Regardless, if government funds are to be used to fund apprenticeships in the future, steps should be taken to ensure that the investment is being used properly. In a report evaluating the AAI, the Urban Institute found that the performance of apprenticeship program providers varied widely.[19] Many programs exceeded their new apprentice forecasts, while others fell short. The report notes that under the AAI, grantees were paid in advance based on their target number of new registered apprentices, not the number they actually registered and trained. The report suggests that in the future, funds should be allocated using a "pay-for-performance" system, granting funds based on the actual number of apprentices registered.

A positive reform would be to reward programs based on the number of apprentices that complete their training. One way to do this would be to provide half of the grant upon registration of an apprentice and the other half upon completion of the program. This shift would represent a more efficient use of public resources, rewarding those who exceed their targets and encouraging others to adopt more effective recruiting and training practices, rather than merely incentivizing them to set unachievable goals.

Trade Schools/Career Certificates

While apprenticeships are primarily based in the workplace, trade school students conduct most of their training in the classroom at a technical or community college. Programs that are accredited have access to federal funding, making them more easily accessible to students.[20] While the student is not paid for the training, trade school is still relatively inexpensive when compared with a traditional college degree. The annual cost to attend a trade school varies by program, but the US average tuition for a public two-year vocational program was $3,860 in 2022-2023.[21]

Trade schools offer credentials in the form of career certificates, which employers can easily verify. In general, they have a wider range of program options than are typically offered through apprenticeships. Commonly offered programs include welding, plumbing, medical/dental assisting, and IT, among others.

As primarily classroom-based programs, trade school curriculums typically lack the applied training from which apprentices benefit. Literature on US-based vocational school programs is surprisingly sparse. A study of the German labor market, where vocational training plays a much larger role than in the US, found that while their wages were similar upon graduation, former apprentices had lower unemployment rates than those of trade school graduates.[22] It's unclear if this dynamic also takes place in the United States, as vocational education is far more prominent and standardized in Germany.

In recent years, many vocational schools have partnered with universities to offer career certificates as "stackable credentials." Students can start by getting a career certificate, which is accepted by the partner university as partial credit towards an associate's or bachelor's degree. This partnership enables students to quickly gain the education needed to start work in a new industry through a certificate. They then have the flexibility to decide if they would like to further their education by using the certificate as credit toward a degree rather than starting their university education from scratch.[23]

While this flexibility is immensely valuable in theory, stackable credential tracks are still new and relatively uncommon. A study by the Community College Research Center at Columbia University did not find conclusive evidence that stacking credentials had inherent labor market value. The data on both university degrees and career certificates showed positive

earnings gains but "no clear evidence on the earnings gains explicitly from stacking these credentials."[24] This is an area that could use increased attention from the research community, especially as stackable credentials become more common.
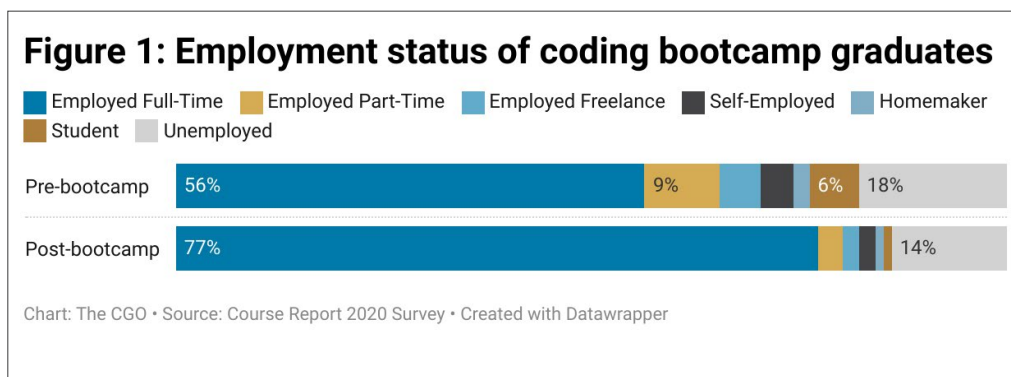
Coding Bootcamps

A coding bootcamp is a short-term, high-intensity training program that teaches computer programming and other IT skills. They are typically offered by private, for-profit organizations. Their purpose is to quickly help people gain the skills necessary to find a career in the tech industry without the time and expense of a traditional four-year computer science degree.

Bootcamps are rarely longer than six months, and most last three months or less, with students spending about forty hours per week on their training. Given this short time frame, the programs focus primarily on teaching practical skills through projects. This contrasts with computer science university programs, which spend a great deal of time on theory or information systems programs, which focus teaching on the business application of IT skills. As one group of researchers put it, bootcamp graduates are the tech equivalent of construction workers, while computer science graduates could be compared to architects.[25]

As it turns out, construction workers are exactly what many employers in tech want. Available evidence suggests that graduates are being hired and employers are pleased with their bootcamp-trained staff. A 2017 survey of employers by Indeed found that seventy-two percent of employers consider bootcamp graduates just as prepared as computer science graduates to be high performers. Twelve percent thought they were more prepared than computer science grads.[26] In a study by researchers at the College of Charleston and ETR Associates, employers praised the up-to-date skill set and practical ability of bootcamp graduates.[27] They are typically able to work on a real-world project straight out of school. However, other employers voiced concern that a lack of theoretical training may inhibit the bootcamp graduates' abilities if the industry shifts away from the languages in which they were trained.

Employment outcomes for bootcamps are good. According to a study of bootcamp graduates by Course Report, seventy-nine percent of graduates use their new programming skills at work, with an average salary of $69,079 per year. The number of graduates working full-time increased from fifty-seven percent before the program to seventy-eight percent after the program.

Figure 1: Employment status of coding bootcamp graduates (%)

Figure 1: Employment status of coding bootcamp graduates

Legend: ■ Employed Full-Time ■ Employed Part-Time ■ Employed Freelance ■ Self-Employed ■ Homemaker ■ Student ■ Unemployed

Pre-bootcamp: 56% | 9% | 6% | 18%
Post-bootcamp: 77% | 14%

Chart: The CGO • Source: Course Report 2020 Survey • Created with Datawrapper

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Interestingly, the number of unemployed graduates only decreased from eighteen percent to fourteen percent.[28] This could suggest that employers expect bootcamp graduates to have some prior work experience, even if it isn't related to IT. Alternatively, it could indicate that many unemployed students need additional job-finding support.

A primary draw of bootcamps for students is the low cost relative to university tuition. According to Course Report, the average cost of a coding bootcamp in 2020 was $14,214.[29] The average annual tuition and fees at a public in-state university was $22,290 that year.[30] For a four-year degree, that's a total of $89,160.

Despite the lower cost of coding bootcamps, students might still find university education more accessible because it is relatively easy to find federally subsidized grants and loans to reduce out-of-pocket costs. Bootcamps, as unaccredited institutions, generally do not have similar subsidies available. One exception is that veterans can use GI benefits to pay for tuition with select bootcamps.[31] This means most students must either fund their education entirely out-of-pocket, use private loans, find a scholarship, or enter into an income share agreement (ISA) with the institution. ISAs allow the student to pay back a percentage of post-graduation income to the school once they make more than a specified minimum annual salary.

Occasionally, bootcamps partner with an accredited university, but this doesn't make the program eligible for federal student aid. For example, Utah State University has a partnership with Fullstack Academy to offer programs in programming, cybersecurity, and data analytics. However, the partnership has no effect on the funding options available to students.[32]

Another drawback to the lack of accreditation is that essentially anyone, including bad actors, can set up and run a coding bootcamp. A bootcamp in West Virginia promised students an apprenticeship-like experience, including paid training and real-world projects.[33] The pay failed to materialize, and the curriculum often changed, leaving many students in precarious financial situations with poor training. Stories like these have contributed to some skepticism of the coding bootcamp industry more broadly.

To help inform students of their options, a private sector organization called the Council on Integrity in Results Reporting publishes reports from several prominent bootcamps detailing their students' graduation, employment, and salary outcomes.[34] The reports are easy to understand and give potential students a good idea of what outcome to expect when choosing a program. A program that publishes a report, whether through a third-party organization or on its own, certainly makes a stronger case that it is legitimate and can help students get a job. The programs that voluntarily publish this information are setting an example that all bootcamps would do well to follow.

Metrics for Success

To be successful, a program must teach skills that make students employable.

The most important aspect of a reskilling program is the specific

training it provides. For a worker to get a new, better job, they need to learn the skills that the position requires. The incentives faced by educators are crucial when they design training curriculums. Apprenticeships align incentives particularly well because the employer also serves as the educator. A well-designed curriculum directly benefits them as it enables the apprentice to create more value for the company. Other types of training programs could greatly benefit from a tighter connection between the employer and the educator.

An analysis of national reskilling data by Deloitte found that "customized training, which are programs tailored to meet the specific requirements of an employer or a group of employers, had the highest impact on employment and wages."[35] Some literature suggests that more unique skills are often the most valuable. Boston University's James Bessen's work points out that uniquely, highly skilled workers have wages that grow significantly faster than those of other workers in the same industry. The example he gives is that of graphic designers. Few have experience in web or mobile design, despite the high demand for these skills. Designers with these unique skills have an edge in the job market as opposed to those who specialize only in print design. As Bessen writes, "the wages of the top 10% of designers have risen strongly; the wages of the average designer have not."[36]

Highly skilled workers will always have an advantage, especially in times of economic uncertainty. Research from MIT has found that employers tend to increase the skills requirements for jobs during recessions and other periods of financial stress. Companies are able to become more selective as the supply of talent increases during these times.[37]

To identify which skills will be most in demand for their students, reskilling programs need to collaborate closely with employers. They know best which skills a new worker in their industry will need. For many careers targeted through reskilling programs, on-the-job experience is incredibly beneficial, which is why apprenticeships are so successful. While other program types don't have the same levels of hands-on training, they could mimic a work environment through case studies and projects. They should maintain communication with employers who hire their students to ensure that they have been adequately trained.

Upskilling, which is the process of adding to an existing skill set within a role, can also help workers stay relevant. A Gallup study found that workers who participated in upskilling programs within the last year, whether employer or self-directed, make 8.6% more on average than those who did not. A habit of regularly refreshing skill sets serves workers well.[38]

Employment outcomes must be transparent and strong.

For a worker to make an informed decision about their reskilling choices, they need to have reliable information about their career outlook. Applicants need to know how enrollment in a particular program could impact their job prospects and how much they should expect to make. A study from the Brookings Institution states, "supporting these workers mandates intentional, systemic effort to move beyond equating education with financial

success and instead pair specific educational programming with tangible vocational prospects. There are few experiences more disempowering than the dogged pursuit of education that does not translate into economic opportunity."[39]

This is particularly important for unaccredited programs. Accreditation often acts as an assurance to both the student and employer that the education received is legitimate. For career-oriented programs, strong overall employment outcomes could also fill that role, helping students to avoid programs like the West Virginia bootcamp discussed above. While outcomes could help identify legitimate programs, they shouldn't be seen as guarantors of student success. As discussed above, many short-term unaccredited programs are quite rigorous. Underprepared students might still struggle, despite a program's generally good employment outcomes.

Reskilling programs should provide an industry-recognized credential.

A worker can be among the best in an industry, but if they cannot signal that to employers, their skills matter little in terms of career usefulness. As Richard West writes in a paper for the Center for Growth and Opportunity (CGO), credentials function as signals in an economic context. "Credentials help employers and workers understand what the worker can do, and help educators know what they are expected to teach."[40] In the context of the career-oriented programs discussed in this piece, credentials also serve as signals of valuable personal traits of a prospective employee, such as discipline and the ability to keep pace with the workflow of the industry.

It is difficult to verify a job applicant's skill level before they begin work at the company. Employers use credentials as a heuristic to make reliable hiring decisions. If newly trained workers want to communicate their skills to an employer, a credential can help them do so. Credentials are also helpful for experienced workers, but these workers can also point to their past experience and project portfolio as evidence of their skillset. In addition, if educators expect their students to find success in their careers, they must prepare their students with the skills that employers expect someone with their credentials would have.

Perhaps the most reliable credentials are university degrees, which are formalized and easy to understand. Other credentials, such as completion certificates or licenses, can also provide valuable information about a worker's skills. For more granular, individual skills, micro-credentials and digital badges are growing in use and show some promise.[41]

Again, formal accreditation is helpful here but is not necessarily a requirement. Many employers are happy with workers they have hired from unaccredited programs. Credentials from these programs still function, given they adequately communicate that the graduate has the requisite skills to fill a position.

Policy Implications

In a dynamic economy with constantly changing technology, workers need to adapt.

Reskilling programs are an important part of the U.S. education system that allow workers to learn new skills and stay competitive. Good reskilling programs can lift vulnerable workers into better, more fulfilling careers. Policymakers have a key role to play in clearing roadblocks to success for reskilling programs. Here are a few steps they can take:

- **Adopt a "pay-for-performance approach."** Government support for apprenticeship programs should adopt a "pay-for-performance" approach to help ensure that funds are producing results. Programs should be rewarded for having successfully trained workers rather than for merely predicting that they can do so.

- **Amend the tax code to treat spending on worker training as tax-deductible business expenses.** This would encourage more businesses to start training programs of their own. This is ideal since employer-led training aligns the incentives of the teacher and the student since the employer directly benefits from the trainee's growing productivity.

- **Direct the Department of Education (ED) to experiment with making unaccredited programs eligible for federal funding.** The Department of Education sets standards to determine which programs are eligible for federal student aid funding. Typically, a program must be accredited to be eligible. The ED could experiment with making certain unaccredited programs, like coding bootcamps, eligible for federal funding, provided the programs publish satisfactory graduation and employment statistics. This provides a low-risk method of evaluating the effects of federal aid on these programs and the outcomes of their students.

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