

**Adjusting to Automation:
Public Policy and the “Future of Work”
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Today, the third-largest retailer in the world has [warehouses with no pickers](#), [stores with no cashiers](#), and may soon [deliver packages by drone](#). Startups like Otto promise to soon be able to ship freight without truck drivers, while others like X.ai already offer a virtual assistant that automates scheduling for busy executives.

Machine learning, augmented intelligence, and robotics have the ability to significantly redefine work—including many tasks that have been categorized in the past as decidedly “human.” One [Oxford University study](#) estimates the next wave of digital technologies could automate as many as 47 percent of today’s jobs—many concentrated within lower-earning jobs. (Eighty percent [of the at-risk jobs](#) identified earn under \$20 per hour.)

At a time when many people already feel economically disaffected, such drastic change will only increase anxiety. The rise in global elections of populist and protectionist platforms promising to “restore jobs” highlights the social implications as technological progress creates “winners and losers.” But policies that stop or slow investments in machines in an attempt to preserve existing jobs are not the answer. They would only “make the pie smaller” and leave the U.S. less competitive as other countries make similar investments.

Instead, the U.S. should develop a strategic approach to the workforce disruptions created by digital automation – creating both the permission and workforce capabilities for businesses to take advantage of its [potential](#). Doing so requires a coherent set of policies that not only help workers develop know-how and skill sets that enable them to adapt to the future of work, but that also allow them to access the work opportunities that they have retrained for without having to move to a new state or endure a large cut in pay. The U.S. should, in short, adopt a strategy to help the U.S. workforce adjust to the future of work.

Why do we need public policy to help workers adjust?

In a sense, this is not a new challenge: the next wave of digital technologies resembles previous industrial revolutions, and historical experience suggests that market dynamics will naturally evolve. “The idea of automation stealing jobs — it’s a fallacy. It’s a recurring panic that happens every 25 or 50 years ... and it never happens,” as venture capitalist Marc Andreessen [recently argued](#). Economist David Autor [agrees](#): “Journalists and even expert commentators tend to overstate the extent of machine substitution for human labor,” –particularly since the new types of jobs created are often simply harder to observe as they emerge. [And we have navigated previous structural changes](#) in the workforce without significant government intervention – for example, the simultaneous advent of telephones, automobiles, electricity, and indoor plumbing at the turn of the twentieth century (which, as our Northwestern colleague Robert Gordon observes, may represent an even greater transition).

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But this similarity to the previous century is *exactly* why we're worried. While technological advance makes us better off as a nation, the U.S. does not have a good record of response to technological unemployment. Farm machinery, cars, and computers, for example, have all produced huge benefits for consumers and wealth for companies but also hard times for displaced workers. "The concern is not that robots will take away human jobs and render humans unemployable; the traditional economic arguments against that are borne out by centuries of experience," [says Jason Furman](#), former chair of the Council of Economic Advisors, "The concern is that the process of adjustment could lead to sustained periods of time with a large fraction of people not working."

In this regard, the impact of automation is likely to be similar to that of global trade over the past quarter-century: an uneven distribution of impact across income levels, demographics, and geographies. And it will be occurring at a time when the most vulnerable members of the U.S. workforce are especially exposed. For example, [men lacking a high school diploma](#) already participate in the labor force at a lower rate than they did in earlier generations. "If current trends continue, it could well be that a generation from now a quarter of middle-aged men will be out of work at any moment," [claims](#) former Treasury Secretary Lawrence Summers. And this economic pain disproportionately impacts some communities more than others—and in lasting ways. An economic research paper titled "[The China Shock](#)" found that China's entry into the World Trade Organization had negative, long-lasting effects on employment, labor force participation, and wages in communities whose economies were exposed to import competition from China. And as workers compete against even lower-cost—in fact, "zero-cost"—automation, technology can and in some cases already does act as a similar shock to local labor markets.

Autor summarizes the challenge well: "Our chief economic problem will be one of distribution, not scarcity."

What's the problem with current policy?

Unfortunately, America's our current adjustment programs—including the Trade Adjustment Assistance (TAA)— are [insufficient](#) to address these challenges. TAA is funded at too low a level—0.11 percent of GDP, the lowest of any developed country and half of what it was compared to 30 years ago. With only \$2,000 per person for job training, displaced workers are unable to retool for high-skill roles involving more intensive education. Moreover, the training provided is often [uncorrelated with availability](#) of skills or positions. Only 37 percent of TAA participants who received training found employment in the occupation for which they were trained. And as [the Brookings Institution](#) observes, geography has proven to be a stubborn anchor, and "government should do more to help people who want to physically move to areas with more opportunity."

Of course, the coming era of digital automation may differ in important ways, but these differences only promise to exacerbate the challenges of current U.S. adjustment policy. First, the jobs created in the transition are likely to be *more skilled*—for workers to adapt, they will have to quickly [develop creative and social skills](#) that require even more (expensive) education and training from an underfunded program. Second, as [Klaus Schwab has noted](#), the digital revolution may differ in its combination of "scope, speed, and systems impact," so where previous economic overhauls impacted one industry (e.g. agriculture or manufacturing), this one will likely be broader. Targeting retraining to available opportunities will be even more important to avoid training for jobs that are being eliminated. Finally, the shift from labor to machines suggests "[capital-biased technological change](#)" where, as [Erik Brynjolfsson and Andrew McAfee](#) describe, "the winner-take-most nature of high-tech markets means

that ... the large economic gains from artificial intelligence (AI) could accrue to a select few.” While long-run economies from AI may eventually create a more favorable equilibrium with labor, [research](#) suggests that a burst in robotic productivity would enrich one generation of capital owners at the expense of workers.

None of these challenges are insolvable, however, and policy choices can have a major impact on how technology affects the American workforce. Current adjustment programs and the unique features of the digital economy have spawned a resurgence of radical policy proposals—from [universal basic income](#) (UBI) to [Bill Gates’ proposal for a robot tax](#). In fact, very similar remedies have been proposed consistently since Lyndon Johnson’s Great Society. AI and automation may be less of an impetus for radical overhaul, and more of a call to action to double down on questions we should already be working to answer.

What should we do?

Effective policy proposals to address the changes in labor market structure as a result of AI and automation will have to address three key challenges. First, they will need to provide retraining opportunities that overcome the limitations of community college today—in particular, rising costs (for the same return) and the disconnect between training and job availability. Second, they must keep that training from becoming meaningless due to a lack of good earning opportunities. Third, policies should achieve these goals in a way that respects the social ties workers and their families have to their communities.

Below we propose a strategy to address these challenges. It involves policies to up-skill displaced workers—digital access and apprenticeship—and that provide financial resources to enable affected workers to pursue new career opportunities—entrepreneurial capital and wage insurance.

Access to the digital economy. Infrastructure investments—like roads and airports—helped workers access economic activity in the 20th century, and a similar investment in digital infrastructure and bandwidth can help workers access both technological training and the jobs linked to it. The rise of massive open online courses (MOOCs) offers to democratize education, reducing the need to replicate programs geographically at local community colleges and bringing down the cost for skills training that brings less of an educational premium. But as a 2015 [Brookings Institution report](#) notes “today’s ability to get training in digital technology is limited by uneven access to computers and high-speed internet.” As fields like software development become more commoditized (evidenced by the sentiment that [coding is the next blue-collar job](#)) access to these resources can level the playing field. Similarly, communities with bandwidth will also have access to opportunities to use these skills through the growing gig economy, which will allow companies to tap into labor pools outside of major cities.

Estonia offers a stunning [case study](#) of the power of such investment in bandwidth: betting on technology, it made internet access a basic right (2000), installed pervasive wi-fi (2002), and implemented digital education models. As a result, a bleak post-Soviet economy was able to transition to the high-tech birthplace of Skype and home to more than 150 European tech companies.

Many U.S. communities could be transformed in a similar way as localities make investments in high speed internet access for underserved areas. Nonprofits such as [EveryoneOn](#) are already working to eliminate this digital divide, offering digital literacy training, discounted internet access through

partnerships with ISPs, and refurbished devices. As an estimate for what this might cost, EveryoneOn estimates that one in five Americans lack internet access, and that it costs roughly \$120 per year to provide it. This would translate to annual funding levels of roughly \$3 billion to cover service provider fees. As the current administration considers infrastructure investment projects, supporting the expansion of broadband installation and subsidizing service provision (perhaps through Community Development Block Grants) would give these nascent efforts even more momentum.

Apprenticeship-based training. Investments in training and education will have higher returns when there's a close alignment between the curricula and the job, and apprenticeships can help sync both this skills alignment and the volume of demand. As Brynjolfsson and McAfee note, "it's important that schools not train students for jobs that won't exist in the future ... the system is doing a pretty good job turning out the kinds of workers we needed 50 years ago." Apprenticeships help to make sure the training received is directly applicable to the job, and they can even reduce the length of the training.

In New Hampshire, for example, [Dartmouth-Hitchcock hospital](#) system offers a 15-month apprenticeship program that helps train medical assistants and pharmacy technicians, addressing a local shortage through up-skilling. Dartmouth-Hitchcock needs to hire as many as 500 people for these positions in the next five years to serve an aging customer base, in a region where a very small portion of the population is choosing to independently pursue medical assistant degree programs that take two years and can cost students up to \$20,000. As an alternative, they worked with the U.S. Department of Labor to build a program that combines an 11-week intensive, accelerated education and a year of on-the-job training and mentoring. "We teach them our processes and give a sense of engagement to our mission," says [Sarah Currier](#), the health system's director of workforce development. "They know the people, the machines ... other new hires often don't have the same level of competence."

One might question why government should subsidize apprenticeship programs; after all, they primarily benefit the private organizations hiring the apprentices. But we believe an important role for government exists. Startup costs for apprenticeship programs are high, and with corporate executives often focused on mainly quarterly returns, many companies would not normally consider investing in apprentice-based employment. Such programs may also generate social benefits by offering a under-employed workers a less costly option than pursuing specialized vocational programs. Subsidies such as the \$1.2 million grant Dartmouth-Hitchcock received from the Department of Labor can help make private employers, workers, and society at large better off by jump-starting the creation of a more robust apprenticeship program similar to [what Germany offers](#). For example, one [analysis](#) suggests that Dartmouth-Hitchcock's program faced a difference of roughly \$12,000 between total costs and benefits during the training program, while a similar program at Siemens has a \$14,000 difference between costs and discounted short-term productivity gains (assuming a 5-year career).

And as in Germany, the standards for training across the industry and the integration with the education system help prioritize and infuse training to address emerging trends, just as Germany has done for advanced manufacturing through its *Industrie 4.0*. Particularly in areas like machine learning, where the most effective algorithms anticipate the nuances of the data and information being analyzed, the industry depth and context offered by apprenticeships become incredibly valuable. As one German educator [notes](#), "In the future, there will be robots to turn the screws, we don't need workers for that. What we need are people who can solve problems."

Financing for entrepreneurship and small business. Not all jobs will require up-skilling, however; in fact, many of the tasks in demand may be relative low-skill, and for these roles, policy should focus on offering options for ownership and entrepreneurship. Many of the jobs available will be in the service sector, favoring [social and creative skill sets](#). Already, we see “platforms” like Taskrabbit emerging to support a contract-based gig economy for this type of work – but the U.S. can go further.

Instead of giving people the skills for a new job (as in an apprenticeship), adjustment programs could offer them the tools and training to support themselves and the access to capital to do so. Sharing capital could be particularly effective at allowing workers and their communities to capture the full value they create rather than simply returning profits to corporate owners in other cities, and microfinancing for small business (small-scale grants and loans) can help serve as a form of effective redistribution in a time of capital-biased change.

Financing local entrepreneurs can also help with some of the “sticky problems” tied to physical location and worker mobility. Where high cost of moving or strong family and interpersonal ties may keep people from relocating, microfinance offers an alternative to pre-defined training that may be sub-par (good trainers are not available), duplicative (a rural county doesn’t need 50 welders or HVAC technicians), or irrelevant (someone getting training in can’t find a job in that field).

North Carolina’s [Institute for Rural Entrepreneurship](#) has piloted entrepreneurial financing in their Growing America Through Entrepreneurship (GATE) and New Generation Ventures programs. These programs help laid-off workers and unemployed 18 to 30 year-olds explore options for starting their own businesses, including free, one-on-one coaching, help in developing business plans, and scholarships for business or vocational training. And a microloan fund—bootstrapped with over \$6 million in federal (Small Business Administration), corporate, and foundation grant funding—offers qualifying applicants small loans to put these plans into action. GATE clients started 200 businesses and created over 500 jobs from 2009-2013, while New Generation Ventures helped launch 32 businesses and create 77 new jobs in its first year.

North Carolina’s Rural Center that ran both programs required a budget of roughly \$25 million a year; broadly assuming replication across all fifty states, this policy would require \$1.25 billion in annual funding.

Wage insurance to encourage retraining and job seeking. Perhaps one of the most stubborn challenges for adjustment policies is providing the right incentives to retrain or to start a business. Someone developing new skills will seldom create the same value for a new company that they did with deeper expertise in a prior role. The resulting difference in wages may keep some from taking other jobs, but offering payments tied to working provides strong incentives for workers to be willing to take a short-term pay cut as they get on-the-job training in the new role that restores the value they create for the company (and in return, their earning potential). As President Obama described it in his last State of the Union, “Say a hardworking American loses his job—we shouldn’t just make sure he can get unemployment insurance; we should make sure that program encourages him to retrain for a business that’s ready to hire him. If that new job doesn’t pay as much, there should be a system of wage insurance in place so that he can still pay his bills.”

And by incentivizing work, wage insurance also offers the social benefit of addressing what Arthur Brooks calls the [“dignity deficit,”](#) giving people a sense of purpose usually found in work. And in the

event that workers cannot find available jobs, wage insurance could even be extended to volunteerism. Imagine someone in their late 50s, who may not have sufficient time horizon to realize enough return on new training or starting a business, engaged in volunteer activities with direct social benefits, such as mentoring high school students or helping to tend a community garden. In the United Kingdom, for example, volunteering counts as “looking for work” so people can use those activities to qualify for national insurance credits. *The Atlantic*’s Derek Thompson has even proposed a [“national online marketplace of work.”](#)

Economist Lori Kletzer [suggests](#) that a wage insurance program that restored 50 percent of wages up to \$10,000 per year over three years would have cost \$3 billion dollars in 1999, when the unemployment rate was roughly 4 percent. Assuming a higher unemployment rate in a time of greater transition—say, double the 4 percent natural unemployment rate estimated by the Federal Reserve—translates to roughly \$9 billion in today’s dollars.

Funding mechanisms. The programs we propose would have a total annual cost of roughly \$25 billion. To put this in perspective, a financial transactions tax with rates just one quarter those proposed by [economist Dean Baker](#) would be enough to raise the amount of revenue needed. Alternatively, [reforms to the taxation of capital](#) along the lines proposed by the Center for Equitable Growth would raise more than enough revenue to finance the programs we’ve laid out here.

Conclusion

Seen individually, these policies may seem like an iteration of existing proposals. They certainly are not as “viral” as policies such as UBI that propose more significant changes to our social contract. But taken together, we believe that these policies would form a national strategy tailored to the modern context of robotics and high-tech enabled workplaces that is just as coherent as Estonia’s Digital Economy initiative or Germany’s *Industrie 4.0*. To be clear, we are not recommending that the U.S. become Estonia, Germany, or the U.K.—we face a different scale and national context—but we should develop a similar economic vision to guide policy choices.

Today our political discussion (across both parties) retains much of the same language, ideology, and platforms developed during the past century’s industrial upheaval, but without the same objectives and in a very different context. Not only have the tactics of our current adjustment policies such as TAA fallen short, the underlying strategy itself is no longer cohesive.

Perhaps this is why this topic is so interesting to us at a school of management. As technological advances continue to challenge our intertwined political and economic realities, one of the top jobs of policymakers in the next decade will not just be to enact one-off programs but to develop public policies that are consistent with the principles of [good strategy](#)—grounded in a diagnosis of key challenges, animated by a guiding approach to address those challenges, and designed to fit together as a coherent whole—and with the cultural DNA of the U.S.