

The Research Challenges of the AI Labor Market Challenges



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Technology-driven economic disruption has been a feature of modern economies since the early days of the Industrial Revolution. Technological advances in the economy present both challenges for firms and workers tied to outmoded production methods and great opportunities for those able to adapt. There is, however, reason to believe that the current wave of technological disruption may differ qualitatively from past waves in both the scope and speed of change. In particular, the increasing application of artificial intelligence (AI) across the economy has the potential to dramatically transform work across sectors. The World Economic Forum estimates that AI technology could displace 75 million jobs worldwide, while creating 133 million new roles to complement the new technology (World Economic Forum, 2018a). How market forces will deliver these outcomes and how government policies can ease the costs and improve the outcomes of technology-driven economic change are open questions.

The economy is evolving; firms and workers will need to adapt. As technological advances dictate the skills firms need for production, education and training will likely determine how successfully workers can transition to the “jobs of the future.” While new firms can readily hire workers with the specific skill combinations to fit their needs, existing firms face different challenges as they experience technological change. Existing firms will find workers to fill new jobs through a combination of searching in the labor market and training their existing workforce in new skills. How firms choose to adopt new technologies and adapt to changes will have significant implications for their existing workforce. Even if the number of new jobs created by technology exceeds the number destroyed, there may be significant disruption and distributional impacts when displaced workers are not selected for the newly created jobs.

The unstoppable march of technology raises a number of urgent questions about natural market forces, the evolution of firm and individual reactions to change, and about whether governmental actions can improve the outcomes. Unfortunately, existing research is short on many answers.

Labor market disruption on the horizon

Advances in technology will determine the jobs firms seek to fill and the skills workers need to fill them. Technological change has been, and likely will continue to be, skill-biased. As firms increasingly leverage technology to complete routine tasks, the complexity of tasks for workers operating the technology generally increases (Spitz-Oener, 2006). Thus, technology has the potential to displace jobs with tasks easily performed by machines and change the skill requirements for jobs complementary to or augmented by technology. Workers around the world have begun to feel their skills falling behind. For example, a 2016–2017 Organisation for Economic Co-operation and Development survey of workers found that 33.5% of respondents in the United States and 35.7% of all OECD respondents perceived a mismatch between their skills and the skills required by their jobs (OECD, 2016).

As societies face an increasingly turbulent labor market, it is natural to consider whether the necessary adjustments will occur organically through market mechanisms or whether government policies can help to ease the burden of these long-run changes on individuals. At this time, there are many crucial but unanswered questions. We seek to understand the cost-benefit decisions firms and individuals are making and the roles for firms, governments, and workers to prepare for technology-driven labor market changes.

Firms are solving a cost-benefit problem.

Firms may benefit from actively training their existing workers rather than hiring new workers. First, training reduces the time and resources a firm devotes to recruiting new employees. These search costs can be especially high in an already tight labor market and when high-demand skills are in low supply in the labor pool (Mühlemann & Leiser, 2018). Second, a firm's existing employees already possess firm-specific skills and institutional knowledge that would be costly to develop in a new employee. Third, firms can retain existing workers' social capital when they choose to keep and reskill their workers rather than fire them (Cappelli, 2004)¹. Fourth, there is some evidence that

announcements of layoffs can harm a firm by decreasing remaining employees' morale and productivity, or lowering public opinion and, therefore, stock prices (De Meuse et al., 1994).

Finally, firms have an information advantage when sourcing from their existing pool of employees. To the extent that firms observe and evaluate existing employees, a company likely already knows about an employee's motivation, personality, social skills, and leadership qualities — components of a successful employee often unobservable on a CV or in an interview. Hence, the informational advantage of sourcing from a firm's existing workers versus outside hires could justify retraining at least a subset of those workers.

Weighing against the benefits, a large-scale firm-sponsored retraining initiative has the potential to be extremely expensive. Absent a guarantee that the investment will pay off, firms may reasonably be skeptical of the value of such an initiative. Workers at risk of displacement tend to be workers whose skills and on-the-job experience might not translate easily into the skills needed for future work. These workers may struggle to transition into new roles, have a shorter work life than new workers, and be hard to retrain. Moreover, human resource departments don't seem to have good systems in place to evaluate existing skills in the company, nor to predict skills demanded in the near future. And to the extent that firms select only their top employees to participate in retraining programs, the workers not selected for retraining will be the workers who struggle most to find new jobs.

Currently, firms seem generally reluctant to invest in retraining and upskilling their existing workers. This trend is especially true in the United States. As a recent example, an Accenture survey of 1,200 CEOs and executives working with AI shows that only 3% of respondents planned to significantly increase training budgets over the next three years, while more than half of the respondents cited growing skill gaps as a significant business concern (Accenture, 2018). Externally hiring new talent still seems to be the default strategy for many US firms.

Ultimately, we need continued research to better understand who can be retrained, which skills are easiest to train in existing workers, and which “old skills” best complement “new jobs.” Researchers are beginning to study skill similarities across different jobs and occupation transitions (World Economic Forum, 2018b,

Alabdulkareem et al., 2018), but actionable recommendations for employers, policymakers, and educators alike are still sparse.

A role for government intervention?

To the extent that firms may not internalize all of the benefits of investing in worker retraining, they may lack the incentives to sponsor training programs of a scale needed to temper technology-driven economic disruption.² However, the public incentives to help at-risk workers transition to new jobs are clear. Job displacement and layoffs impose externalities on the broader economy, including increased reliance on social benefits, spillovers to local economies, and substantial long-term unemployment. Meanwhile, at-risk workers may lack either the information or liquidity to invest in retraining before a costly displacement. These cracks in the market suggest a role the government can potentially play in promoting and sponsoring training programs.

The track record in the United States for public worker training/retraining programs, however, is not encouraging. Participants often struggle to complete time-intensive and expensive retraining programs. Those who complete the programs struggle to recoup earnings lost during them. Meanwhile, state and federal worker training tax credits have generally been ineffective, largely due to low participation by firms.³

Public expenditures on labor market programs in the United States, such as worker training/retraining, are the second-lowest among OECD countries, comprising only 0.26% of GDP. Many European countries spend 2–3% of GDP on labor market programs (OECD, 2017), with stronger (although somewhat mixed) results.⁴

In pursuit of lifelong learning

Concerns about worker retraining issues and skill obsolescence precede recent concerns about the AI revolution. A common banner for these issues, which are particularly intense in Europe, has been the call for lifelong learning. Advocates see lifelong learning as a pathway for acquisition of skills that helps individuals adapt to new labor market demands and insulates them from the shocks of new technology. While there are many descriptions of the goals of lifelong learning and a wide range of approaches for firms and individuals, there is much less evaluation of the outcomes of existing programs, and

there are relatively few empirically based conclusions about broadly successful approaches.

For example, as part of the EU2020 initiative, the European Commission proposed guidelines for lifelong learning programs that characterize effective lifelong learning programs as being flexible in where/how participants can access trainings⁵; focused on high-demand skills, such as literacy, numeracy, and digital skills; and offering regular feedback for the participants (European Commission, 2019). Similarly, analysis by a team at McKinsey identifies the integration of multimedia instructional methods, building training around specific skills required for on-the-job success, regular evaluation with feedback, and instruction adaptive to student strengths/weaknesses as some of the best practices in adult learning programs. The analysis describes the need to pair high-quality training with support services for participants, including compensation for lost or delayed wages, to ensure participants are able to complete the training program (McKinsey & Company, 2017). Presently, however, we are not aware of any evaluations of these or similar initiatives, nor of any case studies that could be instructive of how to implement these practices.

Many existing programs, meanwhile, rely on outmoded training methods. The bulk of on-the-job training consists of unstandardized experiential learning that is not easily evaluated and, therefore, poorly understood (McKinsey & Company, 2015), while many publicly sponsored training programs effectively provide training vouchers for community college courses (McCall et al., 2016). These models may be particularly ineffective for experienced workers who have spent many years learning on the job.

We are particularly interested in initiatives that proactively train workers at risk of future displacement. Waiting to train workers until they have been displaced increases both the cost (lost wages while unemployed) and challenge (more to learn to catch up to skills expected in labor market) of training. Moreover, existing research suggests that retraining programs for displaced workers generally do not pay off for participants (McCall et al., 2016). The alternative would seem to be continuing education and training throughout a worker's career, particularly when concerns of skill obsolescence emerge (OECD, 2019). How to best implement such ideas on a broad scale for workers at the greatest risk of displacement remains an open question.

The individual side of the market

When discussing workforce training, the focus is largely on firm behavior, but individual workers are obviously a key element of any analysis of skills and adaptability. A large part of the long-run solution to the overarching concerns of technology-driven economic disruption will be the education individuals get before entry to the labor market. Over the next few decades, however, we must find solutions for the current workforce, whose formal schooling is (mostly) finished.

The existing evidence indicates that workers with more prior education make larger investments in training over their work life (Hanushek et al., 2017). Unfortunately, we have little evidence about the kinds of training currently employed workers receive, particularly training that involves developing new skills. There is substantial evidence about on-the-job training as it relates to firm-specific skills, but this work has said little about adaption to significant changes in skill demands akin to those coming from integration of new AI-intensive technologies.

Our initial questions in this area pertain to the kinds of training that facilitate transitions to new jobs, how heterogeneous skills development is, and how it might respond to varying incentives.

Firms are beginning to adopt some altered practices.

A number of large firms have announced efforts to integrate new training methods for existing employees. While the impacts of these new initiatives are currently unknown, they serve as interesting practical examples of some of the issues that we described above. As Walmart, the largest private employer in the United States, introduces self-scanning robots and truck-unloading conveyor systems, it is reorienting the role of its employees to complement the automation technology. In particular, Walmart is updating its employee training to shift focus from rote math and stocking skills that are more easily automated to softer, human-oriented skills, such as empathy and leadership.

In 2018, Walmart introduced the Live Better U tuition assistance program for full- and part-time employees. Eligible employees can pursue degree and certificate programs in fields that will help workers adapt to an automated workplace, including computer science and supply chain management. Participants receive full tuition support, application assistance, and degree coaching through Guild Education for a buy-in of \$1 per day. The Live Better U program offers flexibility through online courses while

proactively training employees in fields Walmart believes will be valuable in the next generation of its business model (Walmart, 2019). In its first year, 7,500 Walmart employees enrolled in the Live Better U program; Walmart expects as many as 68,000 employees to participate over the next ten years (Thomas, 2019). Two questions come out of this: How successful is the program in providing new skills, and how does the scale of the program compare to the relevant group of “endangered” employees?

Although only recently announced, the Amazon Upskilling 2025 initiative will be one of the first and most prominent large-scale implementations of many of the practices advocates of lifelong learning reform have proposed. Launched in July 2019, the Upskilling 2025 initiative pledged a \$700 million investment through 2025 in a suite of training programs for Amazon’s existing workforce in skills complementary to its evolving business model. Amazon hopes to retrain at least a third of the 300,000 employees eligible to participate in the program. Many of the training programs will be designed by Amazon engineers. Participants will earn credit through an internal credentialing system that Amazon can use to transition non-technical employees into technical roles, including IT and software engineering (Amazon, 2019). Again, it will be important to consider how successful this program is and whether it provides a model for other firms.

In conclusion

Technological change brings both challenges and opportunities for firms and workers adapting to the economy of the future. While we expect technology to shift skill demand for firms, technology will also be a tool in training workers to develop these skills.

Neither firms nor individuals alone will achieve the socially optimal outcome: meeting the skill demands of the future economy without leaving anyone behind. It will almost certainly require mutual efforts of policymakers, researchers, education systems, entrepreneurs, and individuals to navigate the challenges on the horizon in the labor market. We aren’t there yet.

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*Learn more about the **Golub Capital Social Impact Lab** at Stanford Graduate School of Business.*

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Footnotes

¹ For example, their social networks and relations with other workers, customers or other work relations.

² This is particularly the case for firms that demand workers with skills in relative abundance in the labor pool.

³ For example, between FYs 2010–2017, an average of seven firms per year claimed Virginia’s worker retraining tax credit. During this period, less than 10% of the budget for the credit was claimed by businesses (JLARC, 2018).

⁴ For an example of recent meta-analyses, see McCall et al. 2016 and Card et al. 2015.

⁵ Using online training tools or mobile apps to complement classroom instruction is one example.

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