10-1-2019

Is a Driverless Future Also Jobless?

Erica L. Groshen
Cornell University ILR School and Upjohn Institute

W.E. UPJOHN INSTITUTE

SEPTEMBER 2019

POLICY BRIEF

Is a Driverless Future Also Jobless?

Erica L. Groshen, John Paul MacDuffie, Susan Helper, and Charles Carson

BRIEF HIGHLIGHTS

- *The advent of autonomous vehicles (AVs) would change the nature of work throughout the economy, with potential harm for some workers, their communities, and families.*
- *Effects on workers would likely mount slowly and peak between the late 2040s and early 2050s, raising the U.S. unemployment rate by 0.06–0.13 percentage points and causing average wealth losses of $80,000–$120,000 per displaced worker.*
- *Workforce costs could be reduced by addressing gaps that slow transitions: skills, geography, worker voice, and investment.*
- *To avoid costly layoffs, employers can actively retain and retrain workers, and policymakers can strengthen the workforce development system by improving data, coverage, flexibility, reliance on evidence, efficiency, and employer engagement with worker representatives.*
- *Policymakers and employers have time to invest to avoid AVs' otherwise consequential costs to workers and their communities. In so doing, they will also lessen resistance to future U.S. innovation.*

For additional details, see see https://research.upjohn.org/up_technicalreports/36/.

Over a dozen companies are developing autonomous vehicles (AVs) for commercial, transit, and personal use. We've seen some in action in videos or on city streets. When we see them, our first concern may be safety, but next is often fear of lost jobs. AVs have the potential to lower the costs of goods and services, generate new jobs, and even build new industries. However, a transition to AVs will create challenges: changes in the nature of work in transportation and beyond will likely harm some workers and their communities.

The U.S. labor market is resilient, and workers have proven their ability to learn new skills over time. AVs will catalyze many new jobs, the nature, location, and timing of which we can't precisely anticipate. The flip side is that some tasks, particularly driving, will become less necessary.

To grapple with these issues, we have designed a framework to clarify the nature of AVs' workforce impacts. We have reviewed past innovations for lessons, gauged the size and timing of the coming disruptions, and advanced policy recommendations.

We find that the workforce impacts of adopting AVs will be consequential but far from catastrophic. All told, 1.3–2.3 million workers may be displaced due to adoption of AVs. Layoffs will likely mount gradually, with a peak between the late 2040s and early 2050s under current deployment forecasts. At peak, this will add between 0.06 and 0.13 percentage points to the U.S. unemployment rate.

Now isn't the time to panic, but policymakers and business leaders cannot afford complacency either. This impact is similar in size to the recent "China shock" to U.S. manufacturing jobs.

Smart choices can help close four gaps that impose costs on workers and interfere with employers finding the workers they need: 1) skills, 2) geography, 3) worker voice, and 4) investment. Specifically, employers can actively retain and retrain workers to avoid costly layoffs. Policymakers can strengthen our workforce development system by improving data, coverage, flexibility, reliance on evidence, and engagement with employers. Both should use available time to invest in the workforce to avoid AVs' otherwise consequential costs and, in so doing, promote U.S. innovation going forward.

Lessons from History and Framework for AVs' Workforce Impact

Labor market impacts of previous disruptive changes can provide lessons for the current situation. Importantly, in our dynamic economy, losing one set of jobs does not lower employment permanently. New jobs are often created when others are lost. For example, although farm jobs have dropped from 50 percent of the total at the turn of the 20th century to just 2 percent today, the majority of Americans are still employed, and we produce more food than in the past. Technological change can thus lead to large social benefits in the long run.

Yet, benefits can be long delayed and the change can impose significant costs on displaced workers and their communities. Hence, there are two reasons for concern about the impending adoption of AVs. First, losses tend to accumulate before widespread gains, substantially affecting particular people and geographic and demographic communities more than others, with uncertainty about impacts in advance. These

The central risk from large disruptions stems not from a permanent decline in jobs but from costs imposed on displaced workers.

consequential losses are largely uncompensated and can fuel unrest and resistance to innovation. Second, the size and distribution of benefits are also difficult to predict. In particular, wage stagnation, even in the face of significant productivity gains over recent decades, casts doubt on whether the benefits of a technology like AVs would indeed be shared, and causes worry among those who already believe they are just getting by. During the Industrial Revolution, U.S. real wages fell for 50 years—reversed only by policy steps, including collective bargaining laws, child-labor laws, public high school, and extended voting rights.

In addition, we cannot rule out the possibility that the advent of AVs and, more generally, artificial intelligence technology will result in a different mix of effects than in the past. In particular, artificial intelligence may lead to greater automation of high-skilled work and thus adversely affect higher-paying jobs and skills.

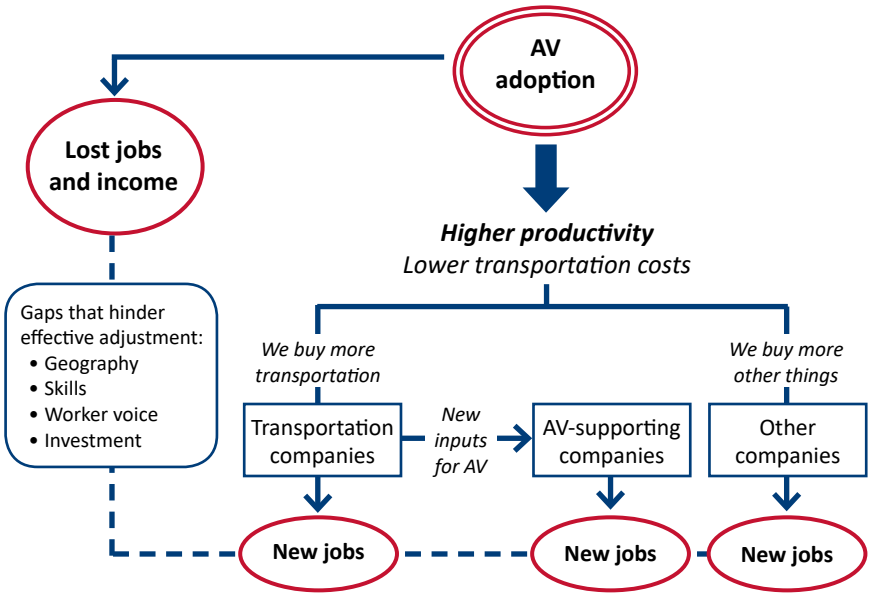
Figure 1 establishes a framework to help trace the labor market impacts of AVs, drawing on both historical experience and economic theory. It clarifies that the central risk from large disruptions stems not from a permanent decline in jobs but from costs imposed on displaced workers and potentially slow adjustments to the disruption. Eventually, new jobs will return the economy to full employment after the job losses from AV adoption. Three forces create new jobs:

1) People will use more transportation when it becomes less expensive and safer.
2) Suppliers of AV-related goods and services will expand to meet demand.
3) Consumers will increase purchases of other goods and services with money saved when transportation becomes safer and cheaper.

However, an eventual return to full employment misses the heart of the matter. How large are losses to workers, how long will adjustments take, and what can we do to mitigate the costs? The framework points to four gaps that make workers' adjustments slower and costlier:

1) Displaced workers may not have the skills needed for new jobs.
2) They may not live in the same areas where new jobs arise.

Figure 1 Impact of Adoption of Autonomous Vehicles on the Labor Market



SOURCE: Authors, inspired by Joss Fong, "Why the rise of the robots won't mean the end of work," Vox, November 13, 2017.

Technology alone does not determine outcomes such as the quality of new jobs.

3) Lack of worker voice, bargaining power, and supportive institutions could mean that workers' losses are exacerbated.
4) Firms may lack the ability or will to invest because of poor economic conditions or other impediments.

The historical cases we reviewed demonstrate that technology alone does not determine outcomes such as the quality of new jobs. We have not managed past transitions well. The average displaced American worker loses significant lifetime wealth (1.5–2.0 years of predisplacement earnings) from lost work time and lower hours and wages after reemployment.

Simulation of Impacts

We use our framework to simulate key impacts of AV adoption over the next few decades. We consider four adoption scenarios developed by Securing America's Future Energy:

1) Cars-Personal: Passenger vehicles owned by households, as is now the case
2) Cars-Fleet: Passenger vehicles owned by fleets, where a set of transportation service providers own and operate most cars and light trucks
3) Trucking-Slow: Commercial trucking with slow adoption, taking about 30 years to move from driver-assisted autonomous vehicles to trucks that do not need drivers at all
4) Trucking-Fast: Commercial trucking with aggressive adoption, proceeding to full autonomy much more quickly

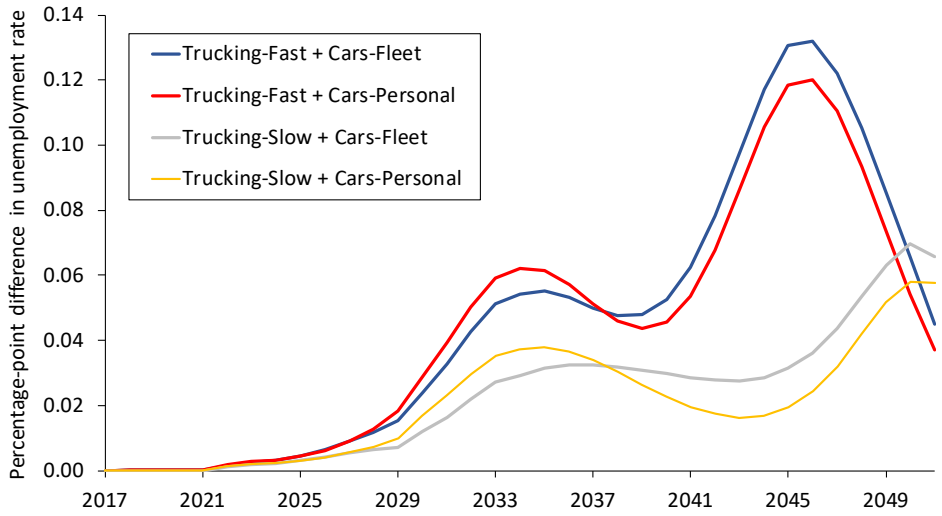
We base our simulations on the experiences of recently displaced workers, data on the occupations likely affected, and estimated earnings losses from displacement. We follow previous studies in identifying at-risk occupations, building on occupational classifications identified as "driving related" by the U.S. Commerce Department. In consultation with industry experts, we set the percentage of workers in each occupation who are at risk of layoff under each AV scenario. These include truck and bus drivers, taxi and other personal transport employees, and other drivers. We consider other job losses from the adoption of AVs, such as automobile insurance adjusters, auto repair mechanics, and police patrol officers. We adjust these job losses for projected occupational turnover (workers leaving occupations for reasons other than the rise of AVs) to produce estimates of displacement.

From recent U.S. Bureau of Labor Statistics Displaced Worker Surveys we construct the likely path followed by a cohort of displaced workers, who can shift between three possible labor force states (employed, unemployed, or out of the labor force) in the years after displacement.

With this information, for each of the four scenarios, we simulate how AV adoption will affect the number of unemployed workers and labor force exits over the coming decades. We find that the introduction of AVs could directly eliminate between 1.3 and 2.3 million workers' jobs over the next 30 years, depending on the adoption scenario followed. Figure 2 shows the consequences for the unemployment rate by year for combinations of the four scenarios. Effects on workers will likely grow gradually, with peak unemployment impacts expected between the late 2040s and early 2050s under current deployment forecasts. AV-related displacement is expected to add 0.06–0.013 percentage points, at peak, to the U.S. unemployment rate.

Displaced workers stand to lose an average of about $80,000–$120,000 each in lifetime earnings from lost work hours and lower subsequent wages. Aggregated across the next several decades as AVs deploy, this would translate into wealth losses of $100–$200 billion for the AV-affected workforce and their families and communities—or up to $300 billion if the job losses happen during a recession.

Figure 2 Autonomous Vehicles' Impact on Additional Unemployment, by Year and Adoption Scenario



SOURCE: Authors' calculations.

We also find that another 7.7 million workers are likely to see their duties change because they are in occupations with secondary, driving-related duties (such as home health aides, building contractors, visiting nurses, and real estate agents). AVs should increase productivity in these occupations, but the impact on wages and number of jobs is very uncertain.

While it is tempting to view these figures as small relative to the workforce as a whole, the displacements are concentrated among professional drivers and in certain geographic areas. The magnitude of the impact and its concentration is similar to the recent "China shock" to U.S. manufacturing jobs in the past two decades.

Policy Recommendations

Ignoring likely labor disruptions from AVs could fuel a backlash against acceptance of AVs and future innovations. Thus, to help at-risk communities, policymakers may be tempted to stall the deployment of AVs to provide greater time for workforce adaptation. Such efforts may prove counterproductive. Not only will a lag in deployment delay the societal benefits of AVs, but the United States risks ceding global leadership in this industry.

Unlocking AVs' benefits and mitigating long-lasting impacts to the U.S. workforce require moving forward on AV technology while simultaneously addressing our workforce development infrastructure and encouraging retention and retraining. Many policy options are available. With robust workforce statistics, communication among stakeholders, program evaluations, and an enhanced workforce development system, the task is manageable but requires attention as soon as possible. The economic benefits of AVs, which some have estimated at nearly $1 trillion per year, should provide adequate resources for such policy intervention.

The authors gratefully acknowledge funding from Securing America's Future Energy (SAFE), a nonprofit group focused on reducing U.S. oil dependence. Although we focus on labor market impacts of AVs, SAFE reports have shown that other benefits and costs could also be large.