

Automation, Labor Market Institution, and the Middle Class -- December 12, 2019

Automation: A Guide for Policymakers

James Bessen, Boston University Technology and Policy Research Initiative

Maarten Goos, Utrecht University School of Economics

Anna Salomons, Utrecht University School of Economics

Wiljan van den Berge, CPB Netherlands Bureau for Economic Policy

Businesses are increasingly adopting technologies that can partially or fully automate tasks performed by humans, causing concerns that work may become increasingly scarce in the future and, in the extreme, that there will be mass unemployment and social instability. Even if the most dire predictions of the effect of automation on the labor market do not emerge, it will undoubtedly be disruptive. Many workers will need to transition across jobs, often requiring them to acquire new skills, join new industries, and possibly move to new places. Bessen, Goos, Salomons, and van den Berge draw upon existing literature and new data describing the experiences of workers and firms in the Netherlands to study how workers are affected by automation.

Reviewing existing evidence on the employment effects of automation, Bessen et al. argue that the best empirical evidence contradicts claims that automation is causing absolute declines in employment levels. Rather, the evidence points to heterogeneous effects across industry sectors: manufacturing employment typically tends to suffer but other areas such as service-oriented employment tends to improve.

They draw on complementary empirical work that focuses on these employment effects of “spikes” in automation investment using unique data on firms in the Netherlands. They compare workers at firms who made substantial investments in automation with similar workers at firms that made such investments at a later point finding:

- Workers at automating firms lose, on average, 11% of a year’s earnings
- These workers are more likely to switch industries, enter self-employment, or retire early
- Older workers experience larger income losses and longer spells of unemployment
- Overall, there is little evidence of mass layoffs or large net losses in employment.

They note, of course, that these relatively short-run measured effects may not reflect long-run employment outcomes as the automating technologies continue to improve.

Given the relatively weak evidence that automation is causing large losses in employment at this point, Bessen et al. argue that policy makers should focus their efforts on the challenges facing workers affected by automation today rather than devising policy for a world with mass unemployment. Providing income support, training, and possibly relocation assistance to workers transitioning across jobs may go a long way in mitigating potential harms associated with automation. In addition, they argue that policies that reduce frictions for workers such as noncompete agreements may lead to better outcomes.

A Tale of Two Workers: The Macroeconomics of Automation

Nir Jaimovich, University of Zurich and CEPR

Itay Saporta – Eksten, Tel Aviv University and UCL

Henry Siu, University of British Columbia and NBER

Yaniv Yedid-Levi, Interdisciplinary Center, Herzliya

Employment growth in recent decades has been weighted toward the upper- and lower-tails of the wage distribution, resulting in a “hollowing out” of the share employed in the middle-third. Noting that this drop is generally attributable to routine occupations whose tasks are more susceptible to automation technologies, Jaimovich, Saporta – Eksten, Siu, and Yedid – Levi build a macroeconomic model to study the aggregate and distributional effects of automation and then explore the potential impact of several policies currently under consideration in many industrialized countries.

Their analysis proceeds in two stages. They first apply machine-learning (ML) techniques to micro-level Current Population Survey (CPS) data to better understand which prime-age workers typically would have been in occupations characterized by routine tasks in a pre-automation era. Then they apply this classification approach to a modern workforce and determine differences in the distribution of worker type in terms of the types of jobs they are in, labor force participation rates, and unemployment rates. They use these as “stylized facts” to build a heterogeneous agent macro model incorporating occupational choice that they will use as their laboratory to conduct several policy experiments.

The authors use their model to study several distinct policies financed by increased tax collection: a “retraining program” targeted at the low skilled and transfer policies aimed at improving wellbeing and reducing inequality. They also examine the effects of a more progressive tax system. Several key findings can be summarized as follows:

- Implementing the retraining policy results in both an increase in overall economic growth, productivity growth, and increases in labor force participation
- Increasing unemployment insurance (UI) leads to increased redistribution of income to lower-skilled workers and higher wages for lower-skilled workers but no real change in output overall
- Universal Basic Income (UBI) policies have similar effects as increased UI on lower-skilled workers, but distortions due to increased taxations ultimately lead to decreases in labor force participation and GDP
- Reducing labor tax rates on unskilled workers increases labor force participation of the unskilled, but reduced transfers to this group does not outweigh the reduction in tax revenues. Resulting increases in tax rates on higher skill workers reduces their labor supply. These counteracting effects cancel each other, resulting to roughly no change in output

The authors’ results highlight potential tradeoffs associated with policies proposed to tackle some of the inequitable effects of automation on different sets of workers. They also illustrate how proper quantitative macroeconomic modeling of these policies may serve as a useful complement to more specialized micro-level studies.

**Automation, Organized Labor, and the Employment Trajectories of Workers in Routine Jobs:
Evidence from U.S. Panel Data**

Zachary Parolin, Columbia University

Job polarization in the context of automation has been generally associated with the decline of routine middle – skill occupations – a phenomenon called routine-biased technological change (RBTC). While there is little consensus on how to measure these effects, there is general agreement that technological change contributes to the declining employment share of routine occupation, leading to important consequences for the economic wellbeing of adults without a college degree. But where do the workers in routine jobs go when their work is made redundant? Do they compete for lower-pay, service sector jobs, or are they able to move into higher-pay, professional occupations? And, does union membership affect the employment and earnings trajectories of workers in routine jobs?

Zachary Parolin argues that organized labor affects the pace and consequences of technological change. Using individual - level Panel Study of Income Dynamics (PSID) data, he studies how union membership affects the likelihood that a routine worker (1) remains employed in a routine job for a longer duration of time, (2) avoids unemployment, and (3) achieves higher earnings over time relative to non-unionized routine workers.

Employing difference– in differences, propensity-score matching, and event study empirical strategies, Parolin’s key findings suggest:

- There is a positive effect of unionization on the employment stability of workers in routine jobs
- 60 percent of unionized workers remained in routine jobs at 10 years following the start of their routine employment. In contrast, only 36 percent of non-unionized routine workers remained in routine jobs after 10 years.
- Non-unionized routine workers were twice as likely to be unemployed, but also 1.5 times more likely to be working in a non-routine occupation requiring higher cognitive skills
- Unionized workers are less likely to have low earnings relative to non-unionized routine workers

Parolin notes that while technological innovation may be inevitable, its effects on the financial wellbeing of the workers in routine occupations is in large part a product of policy, politics, and power relations. While focusing exclusively on the role of worker power in shaping the pace and consequences of technological change, it is likely that other labor market and welfare state institutions—such as minimum wage policies, access to education or job training, and social insurance/assistance programs for jobless adults—could similarly help cushion the blow of labor market change for adults working in routine jobs.

The Evolution of Technological Substitution in Low-Wage Labor Markets

Daniel Aaronson, Federal Reserve Bank of Chicago

Brian J. Phelan, DePaul University

Daniel Aaronson and Brian Phelan, in an extension to their 2017 study, examine how minimum wage induces technological substitution in *low-wage labor markets* prior to and after the recent financial crisis using data on employment and wages. Classifying occupations by their task content using O*Net data on tasks, they use variation in minimum wages to measure technological substitution across occupation types, geography, and demography.

Key findings include:

- Job losses in low-wage occupations requiring both cognitive and manual tasks have grown in the post-financial crisis period
- Increases in interpersonal jobs are smaller than losses of routine jobs in the post-financial crisis period, resulting in a net decrease in employment in low-wage markets
- Among workers with a high school diploma or less, the estimated loss of routine jobs and gain of interpersonal jobs is twice as large compared to the full sample (meaning that lower-educated workers may be more likely to experience job *change* as a result from automation).
- Among this less-educated group, the results appear to be driven by the young (less than 30), minorities, and men. The authors find especially large job loss estimates for less-educated minority workers.
- The impact of automation in rural areas is generally larger than the corresponding effects in larger metropolitan areas.

Their paper complements recent work that focuses on the impact of automation on middle-skill routine employment. The results on net-employment losses in the low-wage labor market attributable to automation suggest that offsetting employment growth in other sectors may not be enough.