Does COVID-19 Accelerate Automation?

Federal Reserve Bank of Philadelphia

September 17, 2020
12:00 noon–1:15 p.m. ET
Thank You to Our Cohosts:

Does COVID-19 Accelerate Automation?
The information, analyses, and conclusions set forth are those of the presenters and do not necessarily reflect the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System.
Housekeeping

- The webinar is being recorded.
- Recording and presentations will be posted online afterward.
- All participants are muted.
- Type your questions into the Q&A box at any time.
Today’s Panelists

**Ashley Putnam,** Director, Economic Growth and Mobility Project, FRB Philadelphia

**David H. Autor,** Professor, MIT

**Lei Ding,** Senior Economic Advisor, FRB Philadelphia

**Anne Gemmell,** Founder, Future Works Strategy; formerly Director of Special Initiatives, City of Philadelphia

Moderator: **Susan Wachter,** Codirector, Penn Institute for Urban Research, University of Pennsylvania

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**Does COVID-19 Accelerate Automation?**
The Nature of Work After the COVID Crisis: Too Few Low-Wage Jobs

David Autor and Elisabeth Reynolds

MIT Department of Economics and Task Force on the Work of the Future
MIT Industrial Performance Center and Task Force on the Work of the Future

September 17, 2020
Four Durable Effects of COVID Crisis on Labor Market

1. Telepresence
2. De-densification
3. Firm concentration
4. Automation forcing
• Share of work done from home certain to be greater going forward
  • Telecommuting, virtual reality business meetings, distance medicine, remote learning U.S. employers project tripling of share of working days from home (Altig, Barrero, Bloom, Davis, Meyer, Mihaylov, and Parker 2020)

• Increase primarily among top quartile of higher-educated workers (Dingel and Nieman 2020)
Telepresence could lead to declines in low-wage end of “barbell economy”
- One in four U.S. jobs accounted for by workers without postsecondary credentials who provide personal and business services
- Permanent decline in time spent outside home, business travel, will threaten these jobs

Reallocation out of low-wage occupations is not good news in disguise
- Decline in low-wage work will not raise demand for middle-paid jobs
- Absence of high-pressure labor markets will stymie economic recovery
### Occupations with Most Projected New Jobs, 2018–2028

Concentrated in Typically Low-Paid In-Person Services

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Number of New Jobs (Projected), 2018–28</th>
<th>2018 Median Pay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal care aides</td>
<td>881,000</td>
<td>$24,620 per year</td>
</tr>
<tr>
<td>Combined food preparation and serving workers, including fast food</td>
<td>371,500</td>
<td>$21,280 per year</td>
</tr>
<tr>
<td>Registered nurses</td>
<td>304,000</td>
<td>$35,200 per year</td>
</tr>
<tr>
<td>Home health aides</td>
<td>291,000</td>
<td>$28,520 per year</td>
</tr>
<tr>
<td>Cooks, restaurant</td>
<td>241,500</td>
<td>$22,820 per year</td>
</tr>
<tr>
<td>Software developers, applications</td>
<td>176,000</td>
<td>$32,180 per year</td>
</tr>
<tr>
<td>Waiters and waitresses</td>
<td>165,000</td>
<td>$19,930 per year</td>
</tr>
<tr>
<td>General and operations managers</td>
<td>159,800</td>
<td>$26,120 per year</td>
</tr>
<tr>
<td>Janitors and cleaners, except maids and housekeeping cleaners</td>
<td>154,900</td>
<td>$33,810 per year</td>
</tr>
<tr>
<td>Medical assistants</td>
<td>148,100</td>
<td>$35,880 per year</td>
</tr>
<tr>
<td>Construction laborers</td>
<td>144,000</td>
<td>$28,260 per year</td>
</tr>
<tr>
<td>Laborers and freight, stock, and material movers, hand</td>
<td>139,200</td>
<td>$31,290 per year</td>
</tr>
<tr>
<td>Market research analysts and marketing specialists</td>
<td>135,400</td>
<td>$28,460 per year</td>
</tr>
<tr>
<td>Nursing assistants</td>
<td>118,300</td>
<td>$30,300 per year</td>
</tr>
<tr>
<td>Management analysts</td>
<td>102,200</td>
<td>$32,490 per year</td>
</tr>
<tr>
<td>First-line supervisors of food preparation and serving workers</td>
<td>106,400</td>
<td>$29,600 per year</td>
</tr>
<tr>
<td>Landscaping and groundskeeping workers</td>
<td>104,700</td>
<td>$17,390 per year</td>
</tr>
<tr>
<td>Financial managers</td>
<td>98,700</td>
<td>$41,680 per year</td>
</tr>
<tr>
<td>Heavy and tote trailer truck drivers</td>
<td>96,400</td>
<td>$21,780 per year</td>
</tr>
</tbody>
</table>

**These 20 jobs**

- Account for 4.6M of projected 8.4M net jobs
- That’s 55%

**Concentrated in**

- Health aides
- Food and cleaning services
- Laborer occupations

**Mostly**

- Non-college
- Below median wage

Does COVID-19 Accelerate Automation?
Rapid Growth in High-Paid and Low-Paid Occupations

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Urban De-Densification
Since 1980, Most Urban Non-College Job Growth Concentrated in Personal Services

Occupation Shares among Workers with Some College or Less Education
(Level Relative to 1980 Mean)

Low Pay: Services, Transport Construction, & Laborers
Mid Pay: Production Clerical, Admin & Sales
High Pay: Professional Technical & Managerial


Does COVID-19 Accelerate Automation?
Does COVID-19 Accelerate Automation?

- COVID-induced changes in work patterns will alter character of cities
  - Long-term reductions in office occupancy and commuting will affect economic structure of urban life
  - Disruptions will fall heavily on urban low-paid workers in personal services occupations
- COVID crisis will moderate — rather than reverse — economic trends over past 30 years
  - Rise in urban rents
  - Relocation of corporations to both marquee and mid-sized cities
  - Shift in GDP toward a handful of superstar cities (Glaeser 2011; Hsieh and Moretti 2019)
- Texture of suburban life may also change in opposite direction
Four Durable Effects of COVID Crisis on Labor Market

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Large Firms Have Lower Labor Shares (i.e. Are More Capital-Intensive) and Account for a Rising Share of Value-Added

Figure 1: The Changing Distributions of Labor Shares and Value Added

<table>
<thead>
<tr>
<th>Year</th>
<th>Share of Value Added</th>
<th>No. of Establishments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1967</td>
<td><img src="image1.png" alt="Distribution" /></td>
<td><img src="image2.png" alt="Distribution" /></td>
</tr>
<tr>
<td>2012</td>
<td><img src="image1.png" alt="Distribution" /></td>
<td><img src="image2.png" alt="Distribution" /></td>
</tr>
</tbody>
</table>

*Note: The solid black line (right axis) reflects the raw cross-establishment distribution of labor shares, while the distribution of value added is represented by the gray bars (left axis). The labor share on the x-axis is expressed as a decimal.*

Kehrig and Vincent, 2020

COVID Crisis Will Increase Economic Weight of Large Firms

- This will further depress labor’s share of national income
- That share has fallen 5% to 7% since 2000

Does COVID-19 Accelerate Automation?
• COVID crisis likely to disproportionately cull the ranks of small firms
  • Small businesses lack liquidity and access to credit markets (Walsh 2020)
  • Months of inactivity could lead to wave of business closures

• Will accelerate trend of rising dominance of large firms (Rose 2020)
  • Reallocation of economic activity from small and mid-size businesses to large firms

• Will reinforce reduction in labor’s share in U.S. since 2000 (Autor, Dorn, Katz, Patterson, and Van Reenen 2020)
  • Large firms tend to pay a smaller share of earnings to workers
  • Implies a rise in earnings inequality as well as greater concentration of aggregate income
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Automation Forcing

MIT Warehouse Disinfecting Robot

Many Examples of Automation-Forcing

1. Drones delivering medical supplies
2. Warehouse disinfecting robots
3. Human temperature checking drones
4. Meat-packing
5. Labor-saving reorganization

Does COVID-19 Accelerate Automation?
• Firms have discovered new ways to accomplish more with less human labor
• Not all innovations are technological in conventional sense
  • Reconfiguration of manufacturing lines (MIT Work of the Future Task Force)
• Firms will not unlearn labor-saving methods from COVID crisis
  • Labor surplus following crisis may temporarily blunt this adjustment
  • But labor-saving innovations will be waiting when labor markets eventually tighten again
1. Likely change in demand for services
   • Reduced business travel (decline in hospitality sector)
   • More telecommuting (reduced cleaning, security, food service)
   • Shrunken retail sector

2. Reduced centrality of cities for “knowledge” work (?)

3. Reallocation of sales + value-added towards large firms

4. Slack job market: ↓ wage pressure in low-paid services

5. One wildcard: A rise in early retirement?

Lei Ding and Julieth Saenz Molina

Federal Reserve Bank of Philadelphia
September 17, 2020
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Anecdotal Evidence of Automation

- Pennsylvania laid off 500 toll collectors after the interstate system went cashless since COVID-19
- Tyson turns to robot butchers, spurred by coronavirus outbreaks
Preview of Findings

• Pandemic likely accelerated automation by leading more job losses in automatable occupations, exposing them at an elevated risk of being permanently automated
• The pandemic put more automatable jobs held by minority workers at a higher risk of permanent losses
• Losses of automatable jobs could become permanent, similar to what happened during the recovery from the Great Recession
• Forced automation could create unprecedented need for government interventions to support the jobless and a massive job reallocation
Potential Channels

Short-term:
• The pandemic led more job losses in automatable occupations; machinery and software become more attractive than rehiring the displaced workers during the pandemic (e.g., toll collectors, front desk receptionists)
• Constraint on labor supply incentivizes firms to use technology to substitute for workers (e.g., cleaning sanitizing jobs, meatpacking factory workers)
• Recession reduces the adjustment costs associated with automation, leading to a deepening of automation across sectors

Long-term:
• Threat of future pandemics and the massive technological transition into the virtual world could induce more automation
Larger Job Losses in Automatable Occupations

- By August, technically automatable occupations lost 4.2 more jobs per 100 than low risk ones, equivalent to 2.6 million precrisis jobs.
- Examples of automatable jobs: hotel desk clerks, shuttle drivers, retail salespersons, parking attendants, toll collectors, waiters and waitresses.

Note: “At-risk” or “automatable” jobs: jobs with a 70 percent or greater likelihood of being automated in the next 10–20 years, defined in Frey and Osborne (2017).
Larger Job Losses in Automatable Occupations

Note: “At-risk” jobs: jobs with a 70 percent or greater likelihood of being automated in the next 10–20 years, defined in Frey and Osborne (2017)

Does COVID Accelerate Automation?
• Automatable jobs are generally
  • Less likely to permit remote work
  • More likely to be in the most affected sectors

• High risk of virus transmission and inability to telework led to larger and more persistent job losses in automatable occupations
  • Example: automatable occupations that do not allow remote work lost 5.7 more jobs per 100 by August than less automatable ones

• Most losses are expected to be temporary but could become permanent because of automation or shift in demand
Experience of Vulnerable Workers

By Gender

- Female
  - Male

By Race

- Minority
  - Non-hispanic white

By Education

- HS and below
  - Some College
  - Bachelor and above

By Age

- ≤25
  - 25-34
  - 35-54
  - 55+

Does COVID Accelerate Automation?
The pandemic put more minorities at an elevated risk of automation (minority workers lost 7 more jobs in technically automatable occupations; non-Hispanic whites lost 1.9 more only)

The pattern for other vulnerable populations is still unclear
Lessons from the Great Recession

- Almost all job losses in automatable occupations during Great Recession became permanent (e.g., Autor, 2010; Hershbein and Kahn, 2018; Jaimovich and Siu, 2018)
- The nature and duration of COVID-19 crisis are different, but losses of automatable jobs could become permanent if it evolves into a prolonged economic crisis

Note: “At-risk” jobs: jobs with a 70 percent or greater likelihood of being automated in the next 10-20 years defined in Frey and Osborne (2017)
Summary of Findings

• Pandemic likely accelerated automation by leading more job losses in automatable occupations, exposing them at an elevated risk of being permanently automated
• The pandemic put more automatable jobs held by minority workers at a higher risk of permanent losses
• Losses of automatable jobs could become permanent, similar to what happened during the recovery from the Great Recession
• Forced automation could create unprecedented need for government interventions to support the jobless and a massive job reallocation
How to Create a Future-Proof Region

Anne Gemmell

Future Works Strategy
September 17, 2020
Future-Proofing Is Hard

Does COVID Accelerate Automation?
Future-Proofing Is Hard

Does COVID Accelerate Automation?
Prediction Is Nearly Impossible

Does COVID Accelerate Automation?
Future-Proofing Pillars

INNOVATION

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Thank You!