The Work of the Future: Shaping Technology and Institutions

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Università della Svizzera italiana. November 27, 2019
Labor Force Participation of U.S. Adults Has Risen in All but Two Decades of the Last 130 Years

![Labor Force Participation Rate of U.S. Adults, 1890 - 2018](chart.png)

- 1890: 52%
- 1900: 54%
- 1910: 54%
- 1920: 53%
- 1930: 52%
- 1940: 55%
- 1950: 60%
- 1960: 59%
- 1970: 60%
- 1980: 64%
- 1990: 67%
- 2000: 67%
- 2010: 65%
- 2020: 63%
This Rise Reflects Two Offsetting Forces: Rising Female, and Declining Male Labor Force Participation
Agenda

1. Why are there still so many jobs?
2. The emergence of new work
3. What should we worry about?
4. Shaping the future of work
Why are there still so many jobs?
Part I.
Complementarity

Illustration courtesy of Joost Swarte and MIT Technology Review
ers’ work was much more dynamic than many people would have imagined. As the teller changed: cash handling became less important and banks pushed to sell on high-margin financial services and products. The skills of personal relationship with these customers can help sell them bank customers’ needs cannot be handled by machines—paranormal one. An important part of the “relationship banking team.” Many banks pushed to increase their market shares, tellers became an even more important part of the “relationship banking team.” Many banks pushed to increase their market shares, telling people that as many of the tellers required to operate a branch office in the average urban market fell from 20 to 13 between 1988 and 2004, the number of tellers required to operate a branch office was reduced. The average teller’s job was not handled by the ATM. Instead, two factors combined to preserve teller jobs. First, ATMs increased the demand for tellers because they did not decrease as the ATMs were rolled out. Second, the number of bank tellers, but in fact the number of bank teller jobs did not decrease as the ATMs were rolled out (see Chart 1). Moreover, the number of tellers employed did not drop. As more ATMs were installed in the United States, the number of tellers employed did not drop. ATMs increased the demand for tellers because they did not decrease as the ATMs were rolled out (see Chart 1).

Yet all is not well with the workforce. The average worker faced an imminent and massive technological unemployment; new technology can also increase the demand for workers with new skills. To measure the actual effect of computer technology on jobs overall, we must look at major occupational groups to see what has happened to different occupational categories. For example, as agricultural jobs disappeared, expect. This is nothing new. Automation during the Industrial Revolution did not create massive technological unemployment; new jobs arose in the manufacturing and service sectors. For example, as agricultural jobs disappeared, new jobs arose in the manufacturing and service sectors. For example, as agricultural jobs disappeared, new jobs arose in the manufacturing and service sectors. For example, as agricultural jobs disappeared, new jobs arose in the manufacturing and service sectors. For example, as agricultural jobs disappeared, new jobs arose in the manufacturing and service sectors. The economy responds dynamically in other ways as well. Thus computer automation does not necessarily imply that mean nearly half of all jobs are about to be eliminated? Does not decrease as the ATMs were rolled out (see Chart 1). Moreover, the number of bank tellers, but in fact the number of bank teller jobs did not decrease as the ATMs were rolled out (see Chart 1).
Why are there still so many jobs?

Part 2. Insatiability

Illustration courtesy of Joost Swarte and MIT Technology Review

Johnston 2012
The Emergence of New Work

Illustration courtesy of Joost Swarte and MIT Technology Review
Where Does New Work Come From?

1. *Uber effects*
   - Productivity gains create new work
2. *Walmart effects*
   - Price declines free income, spur consumption
3. *Network effects*
   - Productivity growth in one industry raises demand in customer and supplier industries
4. *Invention of new work*
‘Uber’ Effects – Produce a Cheaper, Better Product, and Employment May Rise

Ride Hailing Trips in New York City, 2015 and 2018
Walmart Effects – A Fall In the Cost of Necessities Frees Income for Luxuries
Over the 20th Century, the Share of Household Income Spent on Necessities Fell from 85% to 55%

Food, clothing, and housing expenditure shares for the United States, New York City, and Boston, 1901 – 2002

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>New York City</th>
<th>Boston</th>
</tr>
</thead>
<tbody>
<tr>
<td>1901</td>
<td>85</td>
<td>86</td>
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</tr>
<tr>
<td>1918-19</td>
<td>80</td>
<td>82</td>
<td>80</td>
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<tr>
<td>1934-36</td>
<td>75</td>
<td>78</td>
<td>75</td>
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<td>1950</td>
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<td>1960-61</td>
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<td>1972-73</td>
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<td>1984-85</td>
<td>35</td>
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<td>1996-97</td>
<td>25</td>
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<tr>
<td>2002-03</td>
<td>15</td>
<td>20</td>
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4. Invention of new work
Tons of progress: Labor Hours Needed to Produce a Ton of Steel Fell by 85% since 1980

Person Hours Required to Produce One Ton of Steel

10.1
1980
-85%

1.5
2017
**Network Effects:** <400K Jobs in Metal-Making, More than 4 Million Jobs in Metal-Using Industries

<table>
<thead>
<tr>
<th>Industry</th>
<th>Metal Making Jobs (1,000s)</th>
<th>Metal Using Jobs (1,000s)</th>
</tr>
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<tbody>
<tr>
<td>Metal Manufacturing</td>
<td></td>
<td>4,500</td>
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<tr>
<td>Fabricated Metal Products</td>
<td></td>
<td>4,000</td>
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<tr>
<td>Machinery</td>
<td></td>
<td>3,500</td>
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<tr>
<td>Motor Vehicles</td>
<td></td>
<td>3,000</td>
</tr>
<tr>
<td>Aerospace Products</td>
<td>&lt; 400K Jobs</td>
<td>2,500</td>
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<td></td>
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<td>2,000</td>
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The Invention of New Work

Frontier Jobs  Wealth Work  Last Mile Jobs

Autor and Salomons, 2019
Frontier Jobs Added to U.S. Census, 1980 – 2016

Supervisor, Word Processing (1980)
Circuit Layout Designer (1990)
Artificial Intelligence Specialist (2000)
Echocardiographer (2000)
Wind Turbine Technician (2010)
Computing Services Director (2016)

George Jetson at Work

Autor and Salomons, 2019
The Invention of New Work

Frontier Jobs  Wealth Work  Last Mile Jobs

Autor and Salomons, 2019

Gift wrapper (1980)
Fingernail former (1990)
Horse exerciser (2000)
Oyster preparer (2000)
Sommelier (2010)
Golf cart mechanic (2016)

George Jetson @Home

Autor and Salomons, 2019
The Invention of New Work

Frontier Jobs

Wealth Work

Last Mile Jobs

Autor and Salomons, 2019
Last Mile Jobs Added to Census, 1980 - 2016

Tamale-machine feeder (1980)
Vending-machine attendant (1990)
Chat room host/monitor (2000)
Underground utility cable locator (2010)
Teleprompter (2016)

Winder, Robotic Football Players (on the Jetsons)

Autor and Salomons, 2019
So, Is there Nothing to Worry About?
Across the rich world, an extraordinary jobs boom is under way

Many popular perceptions about the modern labour market are wrong

• “The Zeitgeist has lost touch with the data”
• “Many popular perceptions about the modern labour market are wrong”
• “The despondency might be justified were not popular perceptions about the world of work so obviously wrong”
MIT Work of the Future Task Force Disagrees

• “Work is a central human activity, critical to self-realization and social cohesion

• Public concern about the future of work is neither ill-informed nor misguided

• The last four decades of economic history show that technological progress will likely deliver rising productivity

• But there is no certainty that the fruits of this bounty will reach the typical worker”
The Parallel and then Diverging Path of Productivity and Earnings in the U.S., 1948 – 2017

Figure 2: Changes in Labor Productivity and Compensation, 1948-2016

- Productivity
- Average Compensation of Production and non-supervisory Workers
- Average Worker Compensation
- Median Worker Compensation

Pre-1973
Post-1973
The Steep Rise of Earnings Inequality in the U.S. Labor Market from 1980 to Present

Figure 1: Cumulative Change in Real Weekly Earnings of Working-Age Adults Ages 18-64

Panel A: Men

Panel B: Women

- Graduate Degree
- Bachelor's Degree
- Some College
- High School Graduate
- High School Dropout
The Polarization of Work: Specialized vs. Commodified Jobs

**Specialized jobs: Growing**
- Professional, technical, and managerial jobs

**Commodified jobs: Growing**
- Personal services — cleaning, security, recreation, health aides

**Middle-skill jobs: Shrinking**
- Production work, office/clerical, and sales
Polarization of Work: European Union, 1993 – 2010

Source: Goos, Manning, and Salomons 2014
Productivity Growth Slowed in Most Rich Countries after 2004

Change in Labor Productivity Growth versus Information and Communication Technology (ICT) Intensity


Source: Syverson, 2017
Challenges and Opportunities

Illustration courtesy of Joost Swarte and MIT Technology Review
The supply of college graduates and the U.S. college/high school premium, 1963–2012

College share of hours worked (%), 1963–2012: All working-age adults

College versus high school wage gap (%)

Measured Gap

Predicted by Supply-Demand Model
2. Aligning Incentives to Invest in Both Human and Physical Capital

Sources of Changes in Labor Demand, 1987–2017


- Observed wage bill
- Productivity effect
- Composition effect
- Substitution effect
- Change in task content

Source: Acemoglu and Restrepo, 2019
3. Addressing **Labor Scarcity** by Raising Productivity, Improving Job Quality

**Figure 4: The Working-Age Share of the U.S. Population is Contracting**

- U.S. will face persistent shortage of workers in service & care jobs
  1. Aging Baby Boom cohorts
  2. Low and falling fertility
  3. Declining immigration
  4. Rising educational attainment

Japan as the extreme scenario – a huge challenge
E.U. Old-Age Dependency Ratio Rising Steeply
(100 × Age 65+ Adults ÷ Age 15–65 Adults)

Source: Eurostat: 2.4.2-r2163-2018-08-17 (PROD)
4. Steering Innovation Towards Raising Productivity, not Simply Displacing Labor

Productivity Fell Steeply Growth in Most Rich Countries after 2004

- No universally agreed explanation
- AI and robotics not yielding miracles so far
- Perhaps these technologies are mis-directed
- ‘So-so’ technologies

Source: Syverson, 2017
Conclusion: The Future Will Not Take Care of Itself

Illustration courtesy of Joost Swarte and MIT Technology Review
The Work of the Future: Shaping Technology and Institutions

1. The challenge ahead is not scarcity of jobs.
2. Abundant jobs do not guarantee abundant good jobs.
3. Abundant technology does not guarantee fast productivity growth or shared prosperity.
4. The future will not take care of itself.
Thank you