Do not fear the robots: The challenge is good jobs at good wages

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Economic Policy Institute
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What are the issues?

Automation is a large topic. Robots are a smaller topic: capital replacing human labor and possibly eroding the total number of jobs and the skill composition of jobs.

1. **Number of Jobs**: Will automation (i.e., Robots!) slow aggregate job growth, raise unemployment?

2. **Wage Inequality**: Will automation (i.e., Robots!) create only high-skilled, high-wage jobs, leaving non-college-educated workforce behind?
Let’s be clear about ‘technology’: Automation ≠ Technology

Types of technology:
• Consumer products: your phones, TVs, stoves, etc. improve;
• Communications: Wi-Fi, internet
• Automation: in workplace the substitution of capital (equipment/software) for labor
Impact of automation/robots?

**Joblessness**
- Past
  - Recent, 1999-2016
  - Post WWII
- Future
  - Immediate
  - Decades away

**Inequality**
- Past
  - Recent, 1999-2016
  - Post WWII
- Future
  - Immediate
  - Decades away
Where can we look for evidence?

• **Recent past, 1999-2007 and 2007-14:** 2MA claims trends are already evident. If not, then why do we think the future will reflect their story?

• **Projections:** ‘Oh wow’ stories? Examine various projections.

• **AI in some uncertain future time**
A jobless future? Given did not happen in the past!

Automation eliminates jobs in specific occupations and industries but does it lead to overall joblessness?

• Why have we not seen ever-rising unemployment over last century or more?
• Or, how did unemployment drop from 10% to under 5% since 2010 if we’re in a job-killing automation surge?
Ok, automation happens but then what?

• Only done to cut costs, right?
• When costs drop then what? **Lower prices, higher incomes, some combo of higher profits and higher wages**
• Those who bought automated good or service in future will buy more of that item, or of other items. Higher incomes spent.
• Unless we have run out of ‘needs’ and capitalists fail to know how to satisfy them, even invent some;
• Poof: more jobs created.
• **Will next time be different? Why not?**
Where’s the Footprint of accelerated automation?
Average annual growth of labor productivity and capital stock, 1973–2016

Growth in labor productivity and the capital stock have decreased in recent periods

<table>
<thead>
<tr>
<th>Period</th>
<th>Labor Productivity</th>
<th>Capital Investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1947–1973</td>
<td></td>
<td></td>
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<tr>
<td>1973–1995</td>
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<tr>
<td>1995–2002</td>
<td></td>
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<tr>
<td>2002–2007</td>
<td></td>
<td></td>
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<tr>
<td>2007–2016</td>
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</tbody>
</table>

Note: Using latest available data, 2016 measure includes data from 2015Q4–2016Q3.

Source: EPI analysis of data (xls) compiled by John Fernald of the Federal Reserve Bank of San Francisco
Average annual growth rate of information equipment and software, 1973–2016

Capital investment in information technology has also slowed

Note: Using latest available data, 2016 measure includes data from 2015Q4–2016Q3.

Source: EPI analysis of data (xls) compiled by John Fernald of the Federal Reserve Bank of San Francisco
Change in occupational employment shares, by decade, 1940–2015

* Converted to decade rate by multiplying by two.

**Source:** Authors’ analysis of data from Atkinson and Wu (2017)
If not now, in future?

• Scale of impact
• Time frame
• First order impact only?
• Measured against past trends
Does automation, SBTC, create wage inequality?
Why the ‘Skills Deficit’ Explanations Fails

1. The 2000’s Do Not Fit the Stories being Told
2. A Clear Slowdown in Growth of Relative Demand for ‘Skill’/Education
Two Stories

1. **Education**—need for college graduates—driven by technology/computers

2. **Occupations**—job polarization: computers erode *middle*, expand relative demand for non-routine, cognitive skills expands at *top* and do not affect routine, manual work at *bottom*
Two stories about wage inequality

1. **Education**—need for college graduates—driven by technology/computers

2. **Occupations**—job polarization computers erode *middle*, expand relative demand for non-routine, cognitive skills expands at *top* and do not affect routine, manual work at *bottom*
Polarization?

Occupational employment polarization can’t possibly explain wage trends since 1999

1. Silent on top 1.0%;
2. Polarization not present since 1999;
3. Occupational employment patterns unrelated to relative wage trends.
Technology

Changes in occupation employment shares

Changes in occupation wages

Changes in overall wage distribution
Figure 7.
Smoothed Employment Changes by Occupational Skill Percentile, 1979 – 2012

Smoothed Employment Changes by Skill Percentile Among All Workers

100 \times \text{Change in Employment Share}

0

Skill Percentile (Ranked by Occupation's 1979 Mean Log Wage)

1979–1989
1989–1999
1999–2007
2007–2012
Figure 3: Index of Changing Work Tasks in the U.S. Economy 1960-2009

Source: Reproduced from Levy and Murnane (2013)
FIGURE HC

Change in log occupation wage by change in log employment share, 2000–2007

\[ y = -0.027x + 0.0233 \]

(0.0236) (0.0036)

\[ R^2 = 0.0132 \]

n = 100

Note: The regression line is from a simple linear regression of change in log occupation wage on change in log employment share. Observations are the 100 occupation percentiles. Standard errors are in parentheses.

Source: Author’s analysis of Current Population Survey Outgoing Rotation Group microdata
Why the ‘Skills Deficit’/Education Explanation Fails

1. College (4 year) wage premium flattened after mid-90s, but wage gap still grew strongly;
2. College wages flat, at best, for many years
3. No explanation for the top 1%
Wages for men with more education continued to pull ahead in 2016 as high school and some college wages were lower than in 2000.

Cumulative percent change in real average hourly wages of men, by education, 2000–2016

Note: Sample based on all workers age 18–64.

Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata
For women at all levels of education, wages were higher in 2016 than in 2000
Cumulative percent change in real average hourly wages of women, by education, 2000–2016

Note: Sample based on all workers age 18–64.
Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata
Cumulative percent change in real hourly wages of college graduates, by wage percentile, 2000–2016

Note: Sample based on all workers age 18–64 with a bachelor’s degree. The xth-percentile wage is the wage at which x% of wage earners earn less and (100 - x)% earn more.

Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata
College wage premium

College wage premium, by gender, 1979–2015

Note: The college wage premium is the percent by which wages of college graduates exceed those of otherwise equivalent high school graduates, regression adjusted.

Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata
The college wage premium cannot explain growing wage inequality since 2000

*Regression-adjusted college wage premium using log hourly wages.

Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata
Gig Economy, Self-Employment are not Future of Work!

“At a ‘Future of Work’ conference the gig economy or freelancing deserves workshops, not a plenary”
Self-employed share of employment, 1995-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Self-employed, no employees</th>
<th>Self-employed with employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>7.9%</td>
<td>11.8%</td>
</tr>
<tr>
<td>1997</td>
<td>7.6%</td>
<td>11.5%</td>
</tr>
<tr>
<td>1999</td>
<td>7.3%</td>
<td>10.8%</td>
</tr>
<tr>
<td>2001</td>
<td>7.2%</td>
<td>10.6%</td>
</tr>
<tr>
<td>2005</td>
<td>7.8%</td>
<td>11.1%</td>
</tr>
<tr>
<td>2014</td>
<td>7.7%</td>
<td>10.1%</td>
</tr>
<tr>
<td>2015</td>
<td>7.6%</td>
<td>10.0%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
<th>Percent of Employment</th>
<th>Change 2005-15</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1995</td>
<td>2005</td>
</tr>
<tr>
<td>All alternative work arrangements</td>
<td>10.0</td>
<td>10.7</td>
</tr>
<tr>
<td><em>Independent contractors</em></td>
<td>6.3</td>
<td>6.9</td>
</tr>
<tr>
<td><em>On-call workers</em></td>
<td>1.6</td>
<td>1.7</td>
</tr>
<tr>
<td><em>Temporary help agency workers</em></td>
<td>1.0</td>
<td>0.9</td>
</tr>
<tr>
<td><em>Workers provided by contracting firms</em></td>
<td>1.3</td>
<td>1.4</td>
</tr>
</tbody>
</table>

**Memo:**

Work through online intermediary 0.0 0.0 0.5 0.5

Source: Katz and Krueger, September 2016
# Scaling Uber and gig employment

<table>
<thead>
<tr>
<th>Estimate Source</th>
<th>Uber Drivers</th>
<th>Hrs/wk</th>
<th>Uber FTE</th>
<th>U.S. FTE*</th>
<th>Uber share of FTE</th>
<th>Total Gig FTE</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Krugger-Hall end, 2014</em></td>
<td>160,000</td>
<td>20.0</td>
<td>80,000</td>
<td>129,971</td>
<td>0.062%</td>
<td>0.09%</td>
</tr>
<tr>
<td><em>Plouffe end, 2015</em></td>
<td>400,000</td>
<td>18.0</td>
<td>180,000</td>
<td>132,681</td>
<td>0.136%</td>
<td>0.20%</td>
</tr>
</tbody>
</table>

*Full-time equivalents in thousands.

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Scaling Uber and Gig wages paid

Uber driver pay, 2015
• Annual pay: $4.70 Billion
• Pay net of expenses: $3.76 Billion

Uber pay relative to economy:
% private wages 0.06%, (i.e. .0006 of total)
% private compensation 0.05%

Uber is two-thirds of gig economy, so Gig Economy was about 0.1% of private wages in 2015
The Wage Patterns to be Explained
Productivity-pay gap

Disconnect between productivity and a typical worker’s compensation, 1948–2015

Note: Data are for average hourly compensation of production/nonsupervisory workers in the private sector and net productivity of the total economy. "Net productivity" is the growth of output of goods and services minus depreciation per hour worked.

Source: EPI analysis of data from the BEA and BLS (see technical appendix of Understanding the Historic Divergence Between Productivity and a Typical Worker’s Pay for more detailed information)
The Productivity-Pay Gap

1. Stagnant Compensation (wages & benefits) stagnation not due to failure of economy to expand productivity. There was lots of income and wealth produced.

2. Gap primarily due to rising inequality, especially in 2000s:
   a. Inequality of compensation
   b. Decline of labor’s share
Decomposing Productivity-Median Hourly Compensation Gap

Growth of productivity, real average compensation (consumer and producer), and real median compensation, 1973–2014

Note: Data are for all workers. Net productivity is the growth of output of goods and services minus depreciation, per hour worked.

Source: EPI analysis of data from the BEA, BLS, and CPS ORG (see technical appendix for more detailed information)
Cumulative percent change in real annual wages, by wage group, 1979–2014

Source: EPI analysis of Kopczuk, Saez, and Song (2010, Table A3) and Social Security Administration wage statistics
50-10 wage ratios, by gender, 1979–2016

Note: Sample based on all workers age 18–64.

Source: EPI analysis of Current Population Survey Outgoing Rotation Group microdata

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Wage gap between the 95th and 50th percentiles, by gender, 1973–2014

*Ratio of workers’ wages at the 95th earnings percentile to wages at the 50th percentile

Source: EPI analysis of Current Population Survey Outgoing Rotation Group (ORG) microdata
Policy choices, on behalf of those with most wealth and power, that have undercut wage growth of a typical worker:

1. Excessive unemployment;
2. Fissured economy/Corporate Legal Disruption
3. Weakened labor standards;
4. Globalization;
5. Eroded institutions: collective bargaining
6. Top 1.0% wage/income growth
Raising America’s Pay

• Full Employment
• Restrain top 1% incomes (Finance, Executive pay)
• Restore labor standards (min wage, OT, wage theft, misclassification, forced arbitration, undocumented workers)
• Modernize labor standards (earned sick leave, family leave, fair work week/scheduling)
• Rebuild collective bargaining

See: http://www.epi.org/pay/
End
Visit www.epi.org