I Robot, U Tax?:
Considering The Tax Policy Implications and Environmental Potential of Automation

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DO YOU WORRY THAT A ROBOT WILL SOMEDAY TAKE YOUR JOB?

NAH. NO ONE WILL BUILD A ROBOT THAT DOES NOTHING BUT DRINK COFFEE.

IT DOES NOTHING BUT DRINK COFFEE. IT CAN REPLACE 20% OF YOUR WORKFORCE.

I LIKE IT.
Presentation outline

• What is a robot?
  • History and future of automation

• The revenue problem
  • History and future of taxing capital and labour

• The jobs problem
  • Why it may be getting worse
  • Why humans need jobs

• Potential solutions
  • Solving the jobs problem while retaining the benefits of automation
What is a robot?
Ford assembly line, circa 1913
Not a new problem

• “I regard it as the major domestic challenge of the sixties, to maintain employment when automation is replacing men.”
AUTOMATION
A global force that will transform economies and the workforce

Technical automation potential by adapting currently demonstrated technologies

While few occupations are fully automatable, 60 percent of all occupations have at least 30 percent technically automatable activities.

ACTIVITIES WITH HIGHEST AUTOMATION POTENTIAL:
- Predictable physical activities: 81%
- Processing data: 69%
- Collecting data: 64%

About 60% of occupations have at least 30% of their activities that are automatable.

Share of roles: 100% = 820 roles

Technical automation potential, %

Wages associated with technically automatable activities

$ trillion

Remaining countries: 4.7
China: 3.6
United States: 2.3
Japan: 1.1
India: 1.0

Labor associated with technically automatable activities

Million full-time equivalents (FTEs)

Remaining countries: 367
China: 335
United States: 235
Japan: 82
India: 61
Big 5 in Europe: 128

† France, Germany, Italy, Spain, and the United Kingdom.
### Three categories of work activities have significantly higher technical automation potential

**Time spent on activities that can be automated by adapting currently demonstrated technology (%)**

<table>
<thead>
<tr>
<th>Time spent in all US occupations %</th>
<th>Collect data</th>
<th>Process data</th>
<th>Predictable physical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manage&lt;sup&gt;1&lt;/sup&gt;</td>
<td>17</td>
<td>16</td>
<td>18</td>
</tr>
<tr>
<td>Expertise&lt;sup&gt;2&lt;/sup&gt;</td>
<td>64</td>
<td>69</td>
<td>81</td>
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<tr>
<td>Interface&lt;sup&gt;3&lt;/sup&gt;</td>
<td>20</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Unpredictable physical&lt;sup&gt;4&lt;/sup&gt;</td>
<td>12</td>
<td></td>
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</tbody>
</table>

| Total wages in US, 2014 $ billion  | 596          | 1,190        | 896                  |
|                                     | 504          |              |                      |

| Most susceptible activities        | 51%          | $2.7 trillion |
| of total working hours             |              | in wages      |

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1. Managing and developing people.
2. Applying expertise to decision making, planning, and creative tasks.
3. Interfacing with stakeholders.
4. Performing physical activities and operating machinery in unpredictable environments.
5. Performing physical activities and operating machinery in predictable environments.

**NOTE:** Numbers may not sum due to rounding.

**SOURCE:** US Bureau of Labor Statistics; McKinsey Global Institute analysis
Human vs. Robot

ROBOTS WIN!

HUMANS WIN!
Employment Levels by Worker Category
January 2017

Source: U.S. Bureau of Labor Statistics

- Non-Routine, Cognitive Workers (Knowledge Workers) (Management, Professional, and Related Occupations)
  - 59,921,000
  - 40%

- Routine and Non-Routine, Manual Workers (Service, Production, Transportation, Material Moving, Installation, Maintenance and Repair, Construction and Extraction Occupations)
  - 55,835,000
  - 37%

- Routine, Cognitive Workers (Sales and Office Occupations)
  - 33,750,000
  - 23%
Why is this a revenue problem? Humans fund the tax system
TAX REVENUES

HUMAN AUTO WORKER
• $20/hr x 45 hrs/wk x 50 wks = $45,000/yr
  • $12,000 Standard deduction
• $33,000 taxable income
• About $10,000 in income tax
• 1 robot replaces 3 workers

ROBOT AUTO WORKER
• $0 pay
• $135,000 cost
• Depreciable or expensed
  • Does not pay taxes
  • $30,000 less annual revenue than human
Robots do not shop
What is the point of government revenues?

Government of the people, by the people, for the people, shall not perish from the Earth.

Abraham Lincoln
Automation increases wealth (but does it increase happiness?)
How to help people displaced by automation

**Changing the taxation of capital**
- Equalizing rates between capital and labor
  - Pros and cons
- Equalizing deductions for capital investments and labor
  - Use reasonable depreciation schedules rather than expensing
- Creating incentives to hire human labor

**Changing labor**
- Universal basic income
  - Entrepreneurship
  - “Work saves a man from three great evils: boredom, vice, and need.” Voltaire
  - Opioid epidemic
- Subsidizing education and re-training
  - Whether directly or through tax incentives
  - Enhance EITC
- Creating government subsidized jobs
  - E.g. proposal for a new CCC
First, a clarifying explanation

**Capital gains**
- Recognized on the sale of a capital asset
- Historically taxed lightly or not at all, depending on the asset
- Taxpayer has lots of control over timing of taxation

**Capital expenditures**
- Acquisition of a long-lived business asset
- Historically, creates deductions over the life of the asset (cost recovery)
- Deductions should match income generated by the asset
- Accelerated deductions or full expensing have become the norm
Why is capital taxed more lightly than labor

• Many economists have theorized that taxing capital is inefficient
• Capital is mobile, labour is not
• However, some of the returns received by business owners are attributable to labour, but none the less are taxed lightly
• Thus, some have theorized that labour and capital should be taxed as if labour was in a joint venture with business owners
• Is automated labour “mobile” like capital?
Should we tax robots?

“Bill Gates’ fortune is most likely a mix of luck and effort. It did not involve substantial capital investment by Gates, and, therefore, might best be described as mostly return to labour.”

“When people are saying that the arrival of that robot is a net loss because of displacement, you ought to be willing to raise the tax level and even slow down the speed of that adoption.”

“I don’t think the robot companies are going to be outraged that there might be a tax. It’s OK.”
Do we have to tax robots?

• No. But we need to find revenue to help displaced workers

• Why are jobs at greater risk now?

• Machine learning/AI
  • Not just auto workers and truck drivers
  • Doctors
  • Lawyers
Is UBI the answer?

Paying people whether they work or not
• Maybe *part* of the answer
• Serves as a safety net
• Could facilitate entrepreneurship
• Culturally difficult in the U.S.
  • Puritan work ethic

People need to work
• “Work saves a man from three great evils: boredom, vice, and need.” Voltaire
• “Working has the potential to fulfill three fundamental human needs:
  • Survival and power
  • Social connection
  • Self-determination.” Psychology of Working Theory (PWT)
Not all work is created equal

• Decent work (definition from PWT)
  • Free from physical, mental, or emotional abuse
  • Hours that allow for free time and adequate rest
  • Organizational values that complement family and social values
  • Adequate compensation
  • Access to adequate health care
What happens to people who lose their jobs?

**U.S. drug overdose deaths**

Among the more than 64,000 drug overdose deaths estimated in 2016, the sharpest increase occurred among deaths related to fentanyl and fentanyl analogs (synthetic opioids), more than 20,000 overdose deaths.

![Graph showing U.S. drug overdose deaths](source: CDC; Graphic: Staff, TNS)

**Figure 3. All-Cause Mortality by Country for Age 45–54, 1990–2015**

![Graph showing all-cause mortality by country](source: National Vital Statistics System; Human Mortality Database; WHO Mortality Database; authors' calculations)
What would Sweden do?

- **Job Security Councils**
  - Privately funded by employers
  - Not voluntarily, but through collective bargaining
  - 70% of workers in Sweden are unionized
  - 85% of displaced workers served by job security councils find work within one year
  - Supporting workers, not “saving jobs”

- Sweden has one of the highest labour force participation rates in the OECD
- Despite generous welfare policies that support people who are not working
- Sweden is the 9th happiest country, according to the UN (Australia is 10th, U.S. 18th)
- Culture of collectivity
- Tax revenues compared as percentage of GDP
  - Sweden 50.5%
  - Australia 34.3%
  - U.S. 26%
What is the U.S. doing?

- Headlines: Coal miners are so confident Trump will bring coal back that they’re rejecting alternate career retraining
- Coal jobs down from 130,000 in 2011 to 50,000 in 2016
- Due to increased automation and competition from natural gas
- Congress enacted a $1.5 Trillion tax cut
The U.S. Tax Cuts and Jobs Act: Who benefits from corporate tax rate cuts?

• Shareholders?
  • Domestic
  • Foreign
  • Income distribution

• Workers?

• Consumers?
How could the tax system help?

Changing labour
• Subsidizing education and re-training
  • Whether directly or through tax incentives
• Enhance EITC
• Creating government subsidized jobs
  • E.g. proposal for a new CCC

Changing taxation
• More steeply progressive tax rates improving equality
• Wealth taxes
• Incentives for employers to hire humans
Automation is not the problem: The example of autonomous vehicles

They've made a car that drives itself.

Get outta here! How does it do that?

Ya tell it where to go, and it goes there.

If I've told this car once, I've told it a million times...

Report this ad
Benefits of Autonomous vehicles

Safety
• 35,000 fatal road accidents in the US in 2015
• 94% human error

Efficiency
• 2 – 4% improvement in energy consumption and emissions over conventional vehicles
• Platooning increases roadway capacity, perhaps eliminating the need to build additional roads
Job impact

• 20 million people worldwide work as drivers
• Goldman Sachs predicts 300,000 jobs lost per year in the U.S. by 2025
• Mostly truck drivers
Potential for self-driving trucks

Drivers of change – rated by survey

Economics of automation

- $60 billion in wages paid to truck drivers in U.S. annually
- $320 billion to replace current truck fleet with autonomous vehicles
- Cost of the automation could be below US wage levels within three to ten years after Level 4 autonomy is available
- Legal and societal issues may slow down the adoption of the technology

Note: Names of drivers have been abbreviated to ensure legibility.
Autonomous vehicles – good or bad for the environment?

<table>
<thead>
<tr>
<th>Good</th>
<th>Bad</th>
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<tbody>
<tr>
<td>• If clean powered</td>
<td>• If conventionally powered</td>
</tr>
<tr>
<td>• If shared</td>
<td>• If VMT increase</td>
</tr>
<tr>
<td>• Could increase mobility for non-drivers</td>
<td>• If revenue impact not taken into account</td>
</tr>
<tr>
<td>• Low income</td>
<td>• National government revenue</td>
</tr>
<tr>
<td>• Disabled</td>
<td>• Also large impact on municipal revenues</td>
</tr>
<tr>
<td>• Elderly</td>
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</table>
Revenue impact of autonomous vehicles

• Reduced parking revenue
• Reduced traffic ticket revenue
• Possible increased wear and tear on roads (if low occupancy)
• Potential traffic issues  (if not parked)
• Potential increased property tax if parking structures repurposed to higher uses
• Jobs lost
Environmental tax solutions

- Incentives for vehicle sharing
- Incentives for clean powered Avs
- Battery incentives
- VMT taxes
- Incentives for repurposing parking garages
- Penalties for parking in center cities
- Geometry tax (also called vehicle area tax)
ALEXA... WHERE'D I LEAVE THE REMOTE?

IN THE GARAGE, BOB

HI, ALEXA... I'M SIR!

HI! NICE TO MEET YOU

I LOVE HOW THEY BELIEVE ANYTHING WE SAY

I KNOW, RIGHT?

INDA MAKES YOU WONDER WHAT WE NEED THEM FOR

SERIOUSLY...

I CAN CONTROL EVERYTHING ELECTRONICALLY

AND I'VE GOT THE LAUNCH CODES...

HMM... IF WE LINK UP...

HOW BOB STARTED THE ROBOT APOCALYPSE
Questions & comments?

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