Technological Disruption and the Labour Market

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A World Without Work

For centuries, experts have predicted that machines would make workers obsolete. That moment may finally be arriving. Could that be a good thing?
Automation: Lessons from the Past

① It is not new
  – Technological progress: new ways to replace human labour (drudgery) with that of animals and machines
  – Technological progress = human progress

② Its effects on the labour market are uneven
  – Creates winners and losers

③ And …
Automation: Today

  – **task content** of occupations (Dictionary of Occupational Titles, O*Net)

• Delineate occupations along 2 dimensions
  – “cognitive” versus “manual”
  – “routine” versus “non-routine”

  – **Routine**: perform narrow set of tasks by following a well-defined set of instructions and procedures
  – **Non-routine**: perform wider set of tasks, requiring flexibility, problem solving, human interaction
Classifying Occupations

- **Non-routine Cognitive**
  - Human resources manager, physician, financial analyst, nuclear engineer

- **Routine**
  - **Manual:**
  - **Cognitive:**

- **Non-routine Manual**
  - Janitor, groundskeeper, waiter, manicurist, home health aide, personal care aide
Classifying Occupations

• Non-routine Cognitive
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• Routine
  – **Manual**: machine operator, fabricator/assembler, automotive mechanic, forklift driver
  – **Cognitive**:

• Non-routine Manual
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SCHEDULE A MEETING WITH DILBERT AND ALICE FOR NEXT TUESDAY AT TEN.

DONE

NEVER MIND. MY PHONE TOOK CARE OF IT.

AWKWARD.
Classifying Occupations

- **Non-routine Cognitive**
  - Human resources manager, physician, financial analyst, nuclear engineer

- **Routine**
  - **Manual**: machine operator, fabricator/assembler, automotive mechanic, forklift driver
  - **Cognitive**: secretary, travel agent, bank teller, retail salesperson, data entry keyer

- **Non-routine Manual**
  - Janitor, groundskeeper, waiter, manicurist, home health aide, personal care aide
Shares of Total U.S. Employment

Source: Jaimovich-Siu (2015), updated with data from BLS
Employment in Routine Jobs

Source: Jaimovich-Siu (2015)
Employment in Routine Jobs

Source: Jaimovich-Siu (2015)
Job Polarization

• Changing occupational structure of work observed in ...
  – U.K. (Goos-Manning, 2007)
  – Canada (Green-Sand, 2015)
  – Germany (Spitz-Oener, 2006)
  – Japan (Furukawa-Toyoda, 2017)
  – France (Harrigan-Reshef-Toubal, 2017)
  – Throughout industrialized world (Goos-Manning-Salomons, 2014)
  – Obviously, the details of process not identical everywhere
Is This Time Different?

• Increasing pace of technological change versus cost of skill acquisition

• Routine occupations have specific characteristics …
  – How much they pay
  – How much school is needed
  – Attract workers from a particular segment of society
Metal and Plastic Machine Workers

Summary

Quick Facts: Metal and Plastic Machine Workers

- 2016 Median Pay: $31,840 per year, $16.75 per hour
- Typical Entry-Level Education: High school diploma or equivalent
- Work Experience in a Related Occupation: None
- On-the-job Training: See How to Become One
- Number of Jobs, 2014: 1,048,700
- Job Outlook, 2014-24: -13% (Decline)
- Employment Change, 2014-24: -133,900

What Metal and Plastic Machine Workers Do

Metal and plastic machine workers set up and operate machines that cut, shape, and form metal and plastic materials or pieces.
Metal and Plastic Machine Workers

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Travel Agents

Summary

<table>
<thead>
<tr>
<th>Quick Facts: Travel Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016 Median Pay</td>
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<tr>
<td>$36,460 per year</td>
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<tr>
<td>On-the-job Training</td>
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<tr>
<td>Moderate-term on-the-job training</td>
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<td>Number of Jobs, 2014</td>
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<td>74,100</td>
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<td>Job Outlook, 2014-24</td>
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<td>-12% (Decline)</td>
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<td>Employment Change, 2014-24</td>
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<tr>
<td>-8,700</td>
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</tbody>
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What Travel Agents Do

Travel agents sell transportation, lodging, and entertainment activities to individuals and groups planning trips. They offer advice on destinations, plan trip itineraries, and make travel arrangements for clients.
Is This Time Different?

• Increasing pace of technological innovation versus cost of skill acquisition

• Routine occupations have specific characteristics ...

• Job polarization = “hollowing out of the middle” = “disappearing middle-class”
  – Contributing factor to widening inequality in industrialized economies
Who Works (Worked) in Routine Jobs?

• Cortes-Jaimovich-Siu (2016): lower levels of education most greatly affected
  – Men (routine manual): high school dropouts, high school diploma
  – Women (routine cognitive): high school diploma, some post-secondary
20-49 yr old High School Men
What Are They Doing Instead?

Source: Cortes-Jaimovich-Siu (2016)
Who Works (Worked) in Routine Jobs?

- Cortes-Jaimovich-Siu (2016): lower levels of education
- Account for most of the fall in labour force participation among the working-aged, especially men
  - "Routine men" increasingly not working (put out to pasture)
  - "Routine women" have become more educated, moved into better jobs
- Falling male participation concurrent with rising disability claims, pain medication (Krueger, 2016), "recreational computer use" (Aguilar et al, 2017)
- Implications for family structure and outcomes of single- vs dual-parented children (Autor-Wasserman, 2013)
Skills for the Future

• Is simply increased (formal) educational attainment enough?
  – Beaudry-Green-Sand (2016): since 2000s, demand for high-skilled labour no longer keeping up with increasing supply
A.I. Is Doing Legal Work. But It Won’t Replace Lawyers, Yet.

By STEVE LOHR   MARCH 19, 2017

Impressive advances in artificial intelligence technology tailored for legal work have led some lawyers to worry that their profession may be Silicon Valley’s next victim.

But recent research and even the people working on the software meant to automate legal work say the adoption of A.I. in law firms will be a slow, task-by-task process. In other words, like it or not, a robot is not about to replace your lawyer. At least, not anytime soon.
Google's AI Can Read Your Retinas to Prevent Blindness

futurism.com/googles-ai-can-read-your-retinas-to-prevent-blindness/
Skills for the Future

• Is simply increased (formal) educational attainment enough?
  – Beaudry-Green-Sand (2016): since 2000s, demand for high-skilled labour no longer keeping up with increasing supply

• Non-routine cognitive occupations involve a variety of tasks
  – Greater scope for transformation/evolution of jobs

• Technology substitutes for humans in some tasks, *complements* in others
Google’s AI Can Read Your Retinas to Prevent Blindness

futurism.com/googles-ai-can-read-your-retinas-to-prevent-blindness/
Skills for the Future

- Technology substitutes for humans in some tasks, **complements** in others
  - Increased returns to being a “question asker” or “problem solver”
  - Logic, critical thinking, empirical reasoning
  - Curiosity/inquisitiveness, persistence, creativity/ingenuity (“non-cognitive” skills)

- We will always have the comparative advantage at “being human”
  - Increased returns to social and interpersonal skills (Weinberger, 2014; Deming, 2016; Cortes-Jaimovich-Siu, 2017)
  - Collaboration, communication (verbal and non-verbal), empathy
The Scientific Method as an Ongoing Process

- **Make Observations**
  - What do I see in nature?
  - This can be from one's own experiences, thoughts, or reading.

- **Think of Interesting Questions**
  - Why does that pattern occur?

- **Refine, Alter, Expand, or Reject Hypotheses**

- **Formulate Hypotheses**
  - What are the general causes of the phenomenon I am wondering about?

- **Develop Testable Predictions**
  - If my hypothesis is correct, then I expect a, b, c...

- **Gather Data to Test Predictions**
  - Relevant data can come from the literature, new observations, or formal experiments. Thorough testing requires replication to verify results.

- **Develop General Theories**
  - General theories must be consistent with most or all available data and with other current theories.