AI and the Economy
How can we grow our prosperity through automation without leaving people lacking income or purpose?

Erik Brynjolfsson
MIT

“The human worker will go the way of the horse”
– Wassily Leontief
Nobel Prize, 1973
We are being afflicted with a new disease of which some readers may not yet have heard the name, but of which they will hear a great deal in the years to come—namely, \textbf{technological unemployment}.

-- John Maynard Keynes, 1930

When there's no other dude in the car, the cost of taking an Uber anywhere becomes cheaper than owning a vehicle.

-- Travis Kalanick \textit{CEO, Uber}
Why not?

1. The Argument from History

“There are more net jobs in the world today than ever before, after hundreds of years of technological innovation and hundreds of years of people predicting the death of work.”

– Marc Andreessen, 2016
Why not?

2. Challenge the Lump of Labor Fallacy

“By reducing the costs of production and thereby lowering the price of a particular good in a competitive market, technological change frequently leads to increases in output demand: greater output demand results in increased production, which requires more labor.”

- National Academy of Sciences, 1987

The Law of Demand

![Diagram showing the Law of Demand](image)
### Why not?

#### 3. Human Needs are Infinite

“Human wants and desires are countless in number and very various in kind”
- Alfred Marshall, 1890

“Invention is the mother of necessity.”
- Thorstein Veblen, 1914

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#### 4. Essential Human Skills

“There are more bank tellers, sales clerks and receptionists and secretaries in 2009 than in 1999, according to the Bureau of Labor Statistics. The reason: demand.”
- Jim Bessen, Boston University
Why not?

5. Humans can change the rules

“A final important difference between horses and humans will become clear: humans can revolt.”
- Erik Brynjolfsson and Andrew McAfee, 2015

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The Robot Revolution has Barely Begun

![Image of a warehouse with robots]

World-wide industrial robot shipments

- 400 thousand
- 300
- 200
- 100
- 0

1995 2000 '05 '10 '15

Note: 2015 and later are projections.
Source: International Federation of Robotics
“The economic effects of AI on cognitive human jobs will be analogous to the effects of automation and robotics in manufacturing jobs.”
– AI100 Report, 2016
The Great Decoupling

Source: OECD Stat
Digital progress makes the economic pie bigger.

But there is no economic law that everyone, or even most people, will benefit.

Key Concept: *Biased Technical Change*
1. Skill-biased Technical Change


Source: Acemoglu and Autor

2. Capital-biased Technical Change

Non-Farm Labor and Corporate Profits Share of GDP, 1950-2016

Source: Bureau of Economic Analysis, Bureau of Labor Statistics; CEA calculations
3. Superstar-biased Technical Change

Share of income going to top 0.01% (including capital gains)

Source: Piketty and Saez (2003), data update as of June 2016.

What’s Changed since BAI ‘15?
From Lonely Voices to a Growing Chorus

- “I don’t think that globalisation is anywhere near the threat that robots are.”
  - Angus Deaton, 2016 Nobel Prize winner

- “Over the long haul, clearly automation’s been much more important — it’s not even close”
  - Larry Katz, Editor of *Quarterly Journal of Economics*

- According to our estimates, each additional robot reduces employment by about seven workers, and one new robot per thousand workers reduces wages by 1.2% to 1.6%
  - Daron Acemoglu and Pascual Restrepo, 2016

- Our simple model illustrates the range of things that smart machines can do for us and to us. Its central message is disturbing. Absent appropriate fiscal policy that redistributes from winners to losers, smart machines can mean long-term misery for all.
  - Jeff Sachs et al., 2016

What’s New in Economics of AI since BAI’15?

**National Academy on Sciences, Engineering and Medicine**
- Forthcoming report on IT and the Workforce

**White House**
- Two Reportson AI
- Four workshops on AI

**AI 100 committee**
- Report on AI in 2030
- Index of AI Progress

**MIT Initiative on the Digital Economy**
- 35 research projects
- Inclusive Innovation Challenge 2016, 2017
- Open Letter on the Digital Economy
- Workshop AI Disruption and Solutions, March 8, 2017

**AAAS, AAAI, IJCAI, Rice, NBER, AEA,**
- AEA Session at on AI and Economics right now

**Growing set research papers**
- Assembling a list at [http://digital.mit.edu](http://digital.mit.edu)
Unconditional Optimism

Mindful Optimism
The Economic Grand Challenge

• AI and digital technologies will continue to accelerate
• Our skills, organizations and institutions are lagging
• Business as usual won’t solve this problem

How can we create prosperity for the many, not just the few?

Design Parameters for Mindful Optimists

• Universal Basic Income
• Earned Income Tax Credit
• Minimum Wage
• Education Investment
• Educational Transformation
• Anti-trust and Competition Policy
• Intellectual Property Protection
• Progressive Income Taxes
• Wealth Taxes
• Property Taxes
• Distributed Capital (Robot) Ownership
• R&D investment
• Infrastructure and Public Goods
• Privacy and Surveillance
• Federalism
• Trade policies
• Occupational licensing
• Etc.