

# AI and the Economy

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

**Erik Brynjolfsson**  
**MIT**



MIT  
INITIATIVE ON THE  
DIGITAL ECONOMY

**The  
Economist**

JANUARY 12TH - 18TH 2013

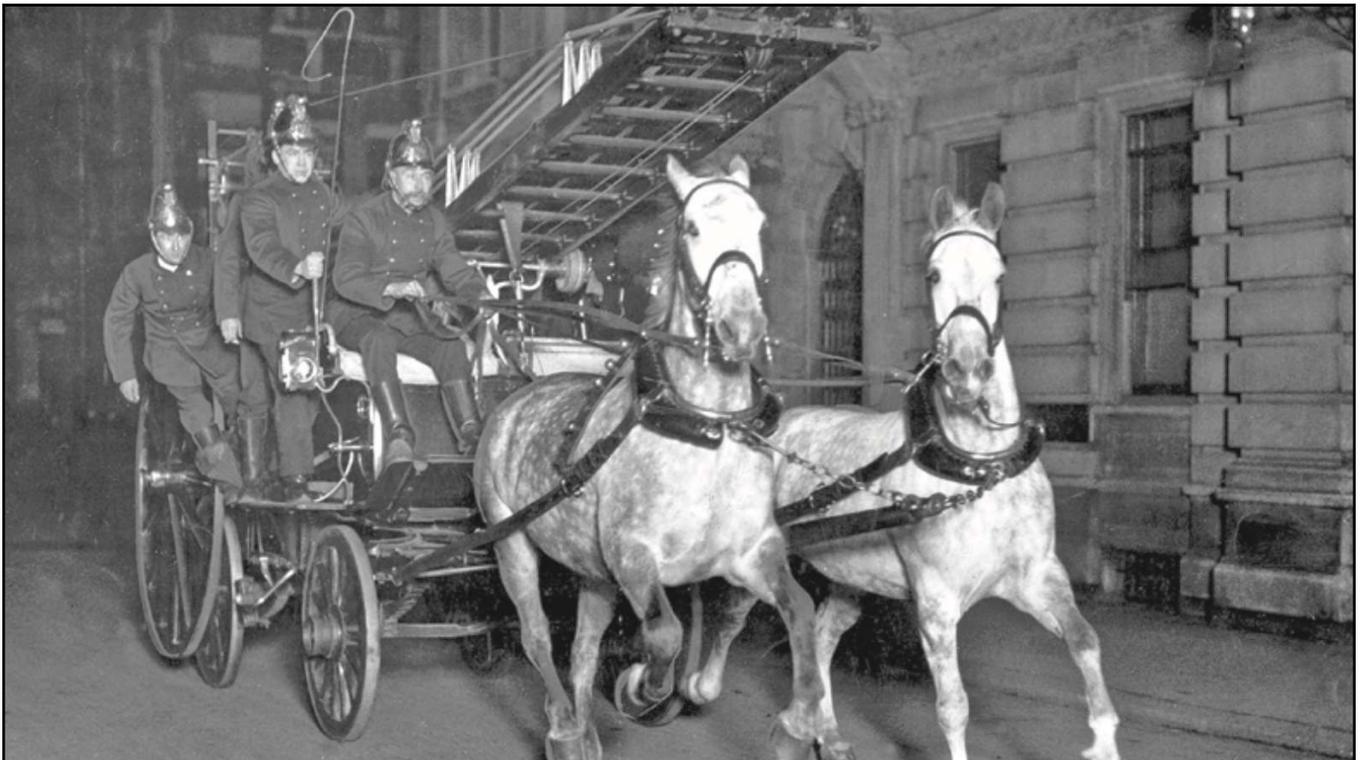
ECONOMIST.COM

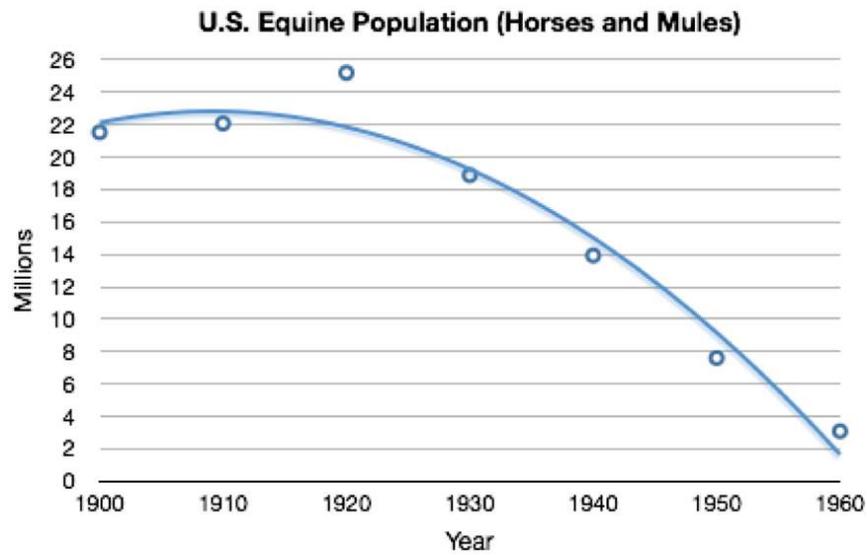
Obama's controversial new men  
Pressure for change builds in China  
Men close the longevity gap  
The ghastry gurus of personal finance  
Microchipping your children

**Will we ever  
invent anything this  
useful again?**

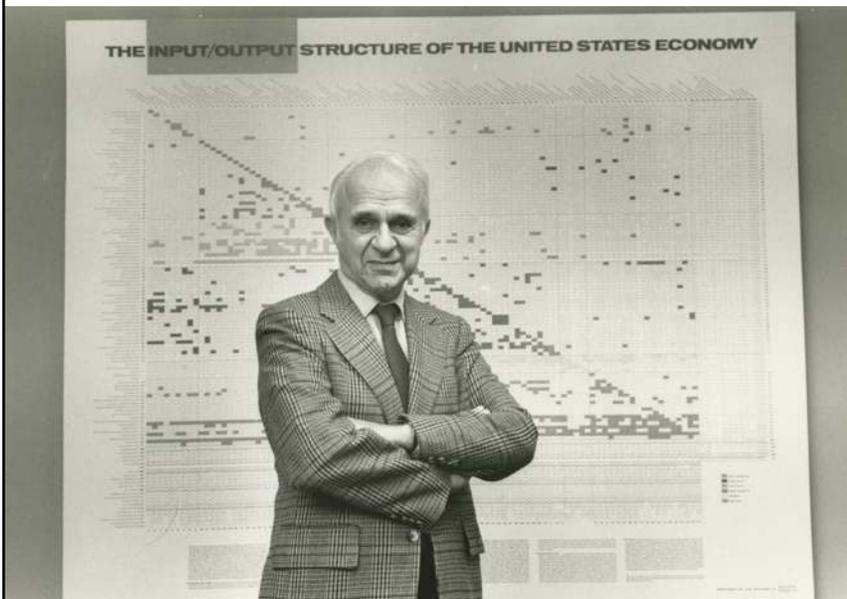


The growing debate about  
dwindling innovation

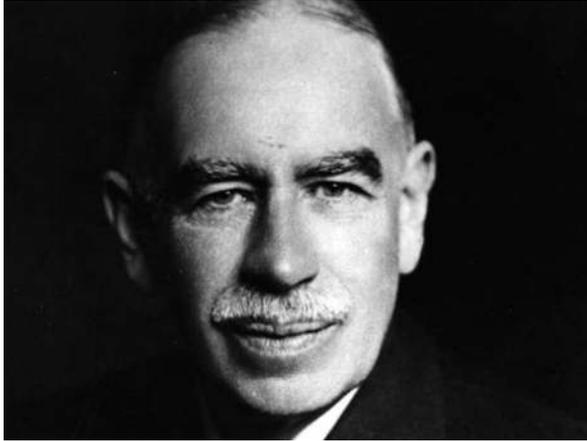




Sources: Kilby, 2007, Wisdom, 2014.



“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, **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 CEO, Uber*

# Why not?

# Why not?



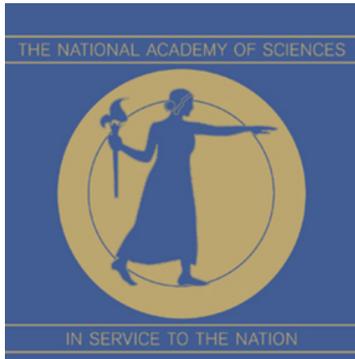
## 1. The Argument from History

“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?

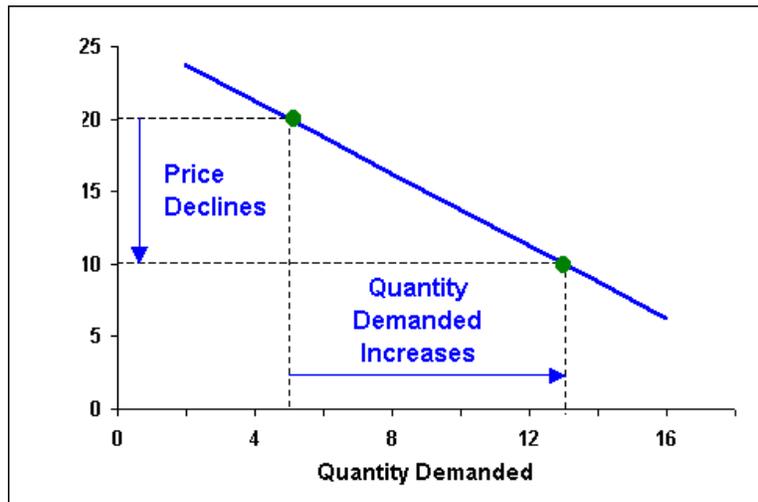
## 2. Challenge the Lump of Labor Fallacy



“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

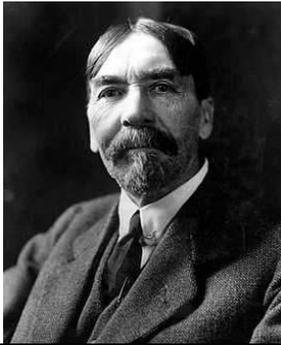
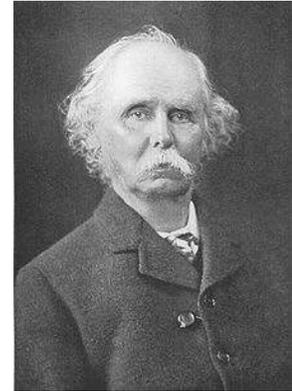


## Why not?

### 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

## Why not?

### 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

**BREXIT**



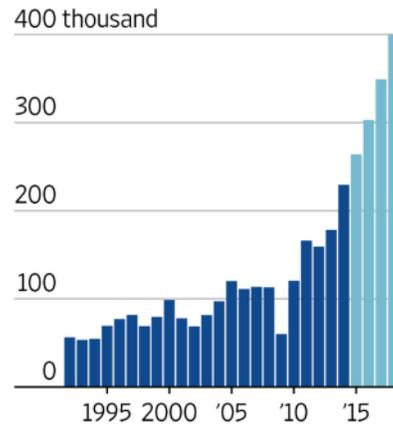
When there's no other dude in the car, the cost of taking an Uber anywhere becomes cheaper than owning a vehicle.

-- *Travis Kalanick CEO, Uber*

# The Robot Revolution has Barely Begun



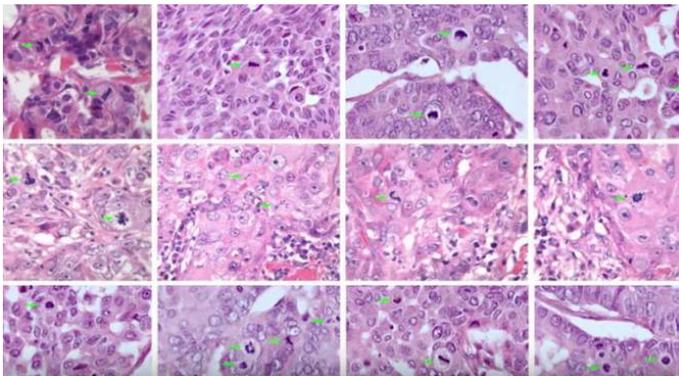
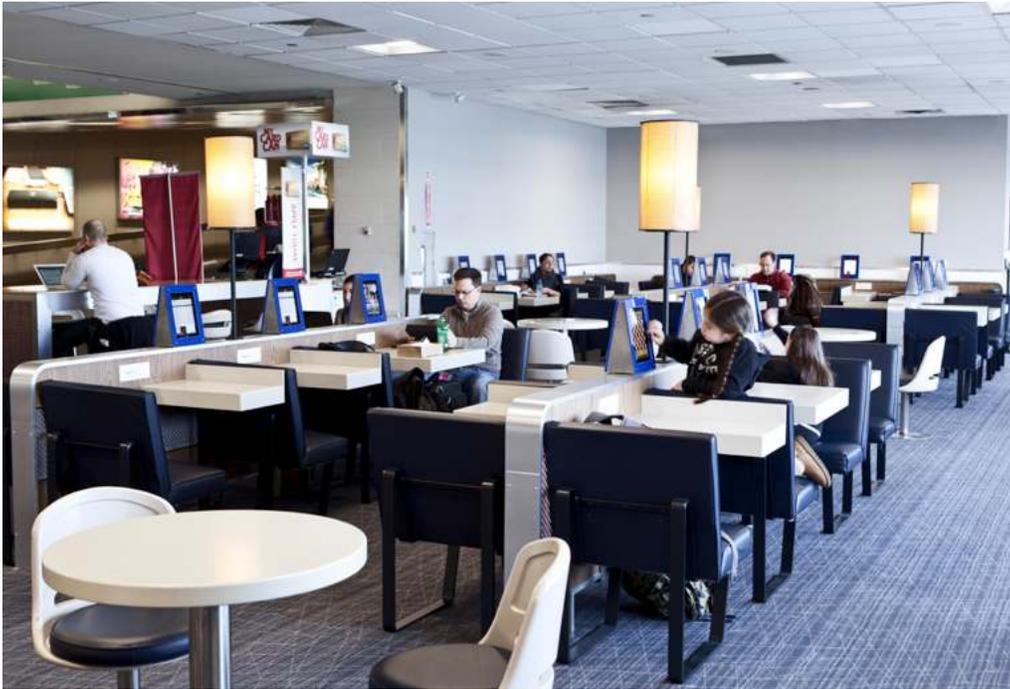
World-wide industrial robot shipments



Note: 2015 and later are projections.

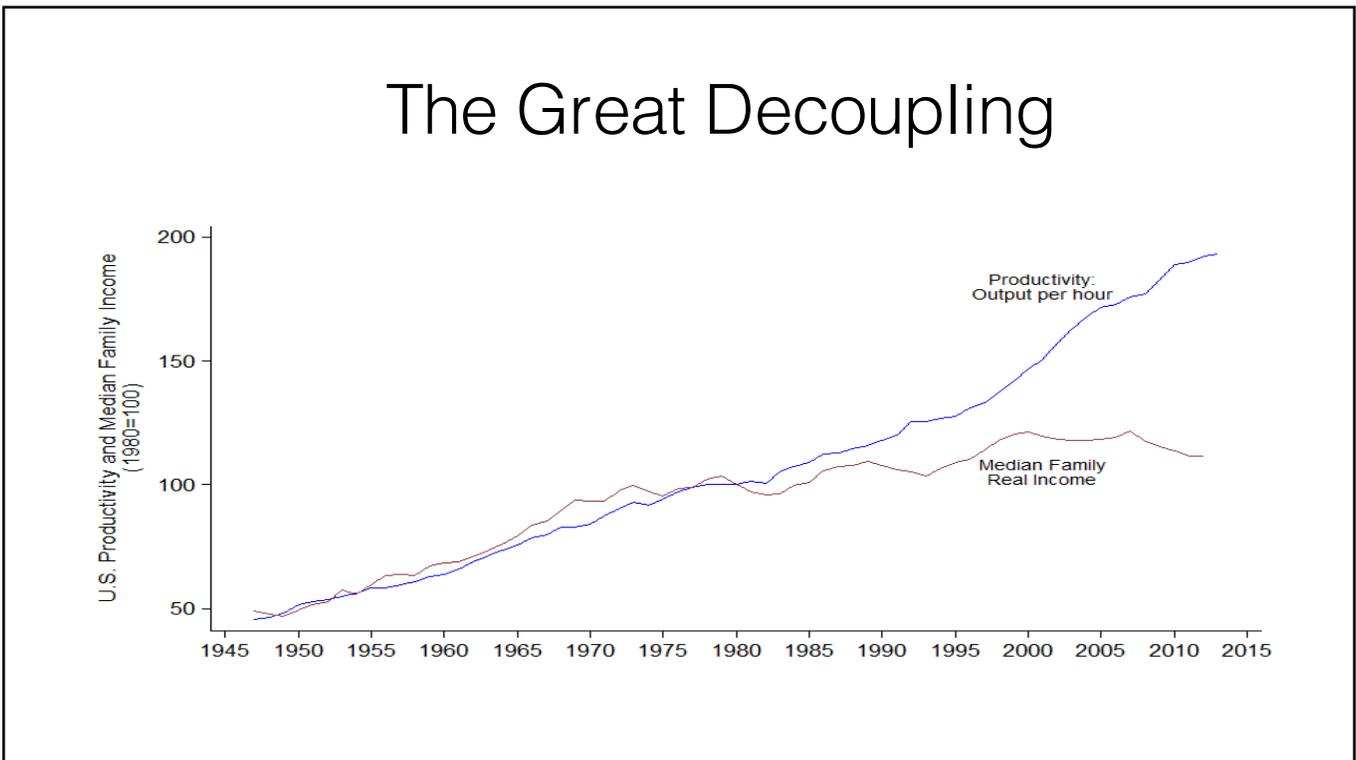
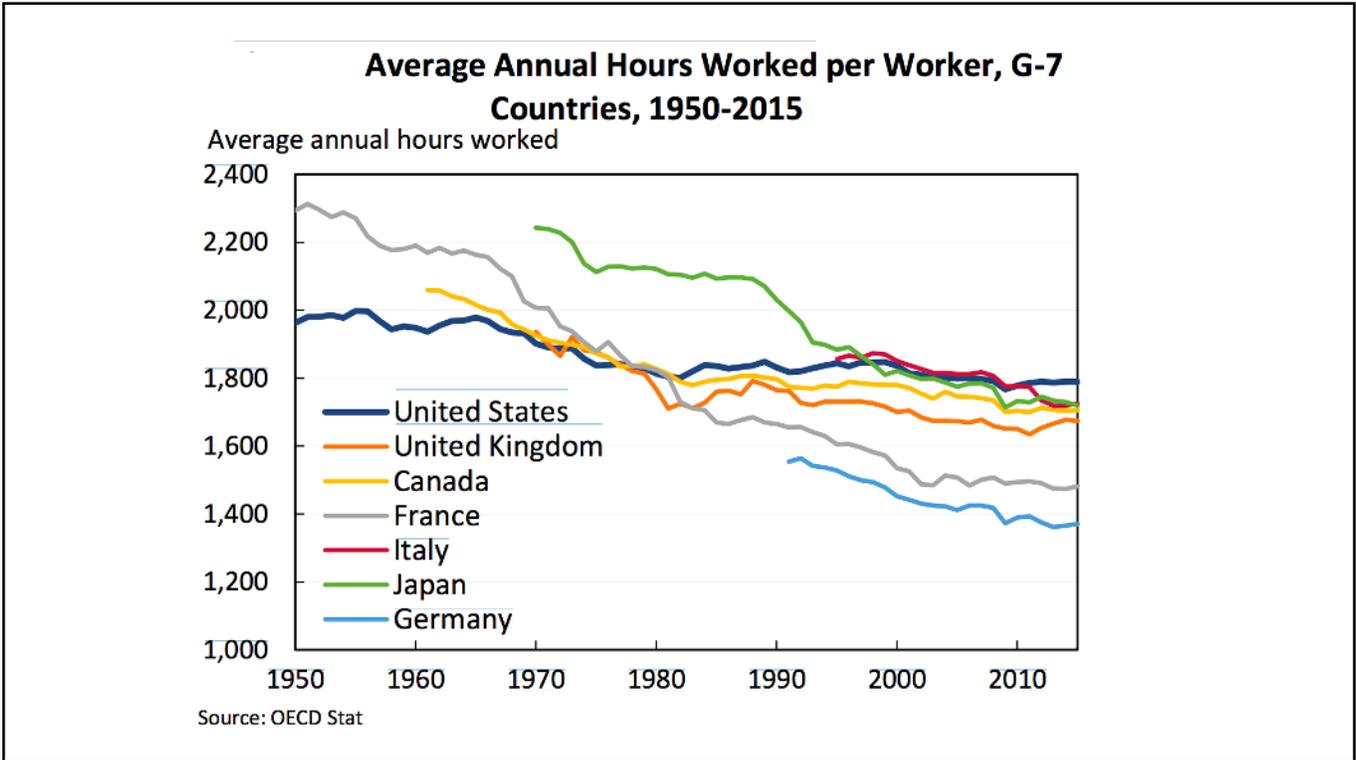
Source: International Federation of Robotics





“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 Hard Truth

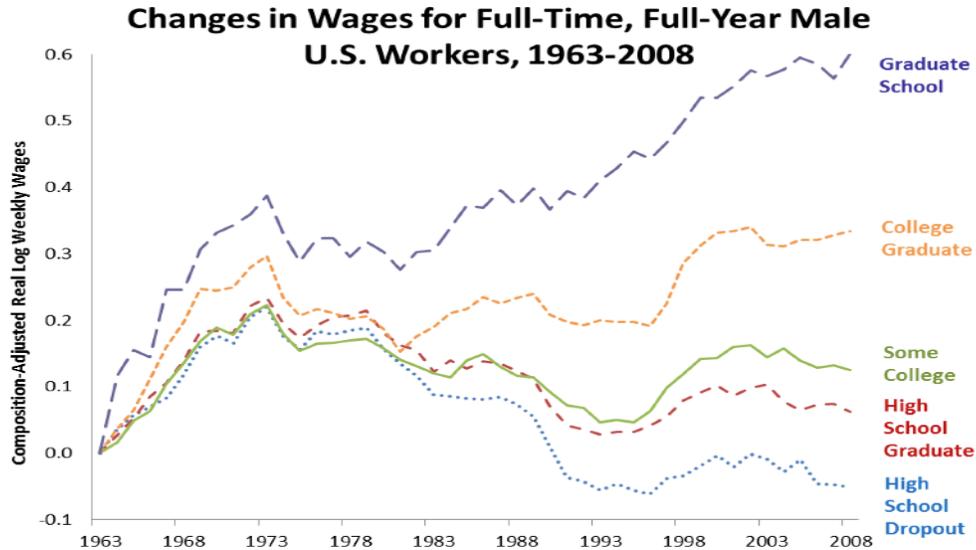


Digital progress makes the economic pie bigger.

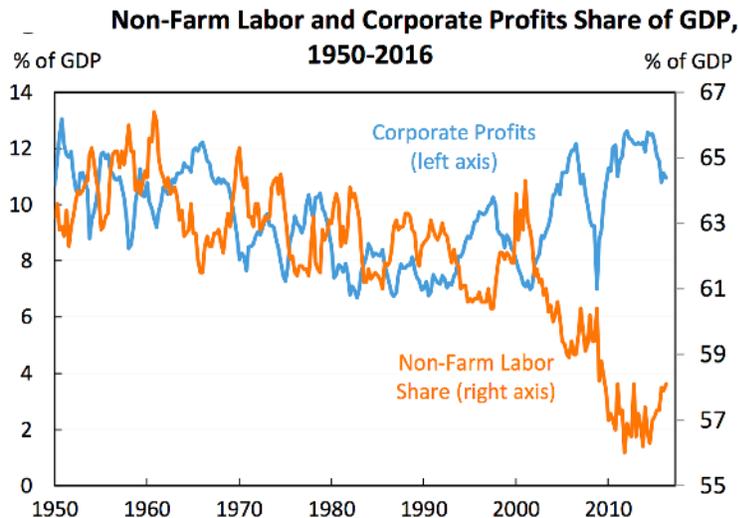
But there is no economic law that everyone, or even most people, will benefit.

Key Concept:  
*Biased Technical Change*

# 1. Skill-biased Technical Change

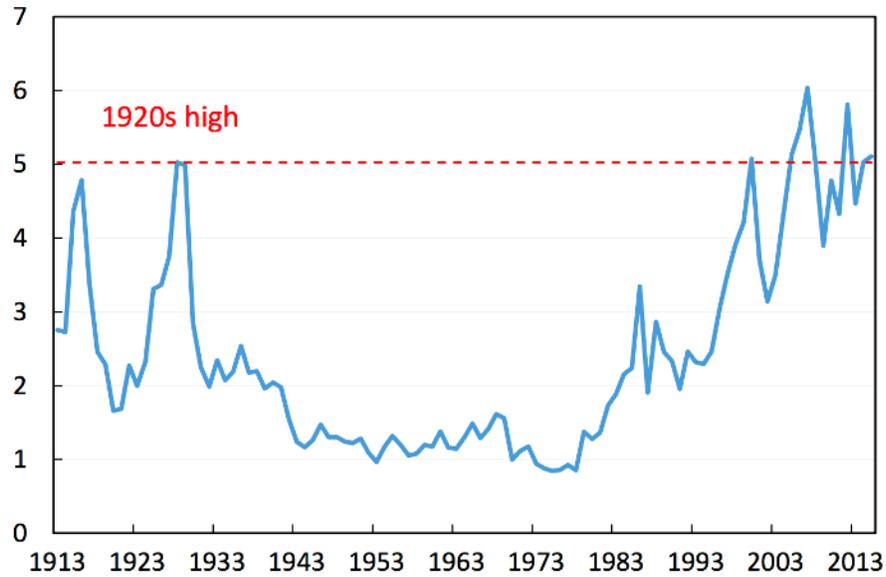


# 2. Capital-biased Technical Change



### 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 Economic*
- 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 Reports on 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, AAI, 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>

## 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.