

AI, Robotics and the Future of Work

Dr. Robert D. Atkinson
President, ITIF

March 23, 2017



@RobAtkinsonITIF

About ITIF

- One of the world's top science and tech policy think tanks
- Formulates and promotes policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress
- Focuses on a host of issues at the intersection of technology innovation and public policy:
 - Innovation processes, policy, and metrics
 - Science policy related to economic growth
 - E-commerce, e-government, e-voting, e-health
 - IT and economic productivity
 - Innovation and trade policy

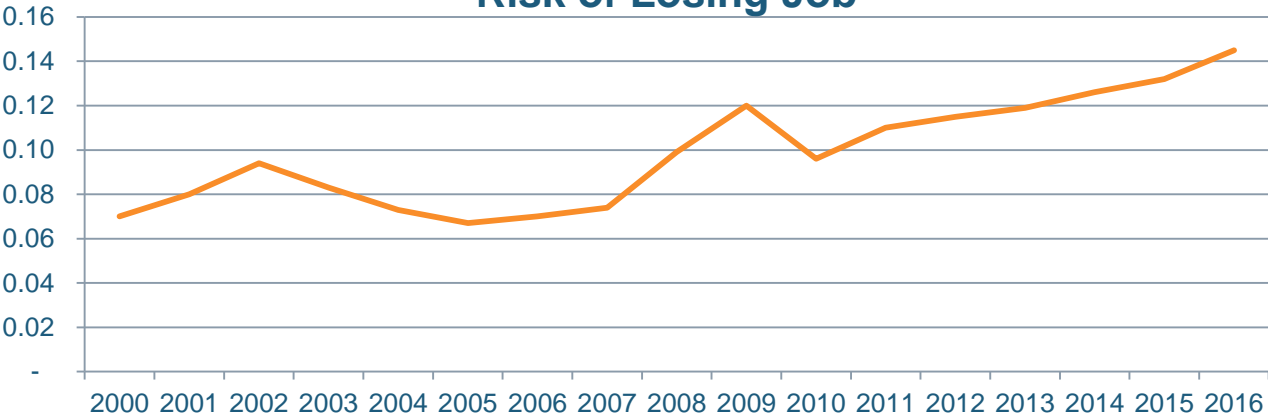
Today's Presentation

- 1 Signs we've entered the 4th Industrial Revolution
- 2 Why AI-Robotics technology will destroy jobs
- 3 Why the pace of change will only accelerate
- 4 The solution: tax robots and establish universal basic income

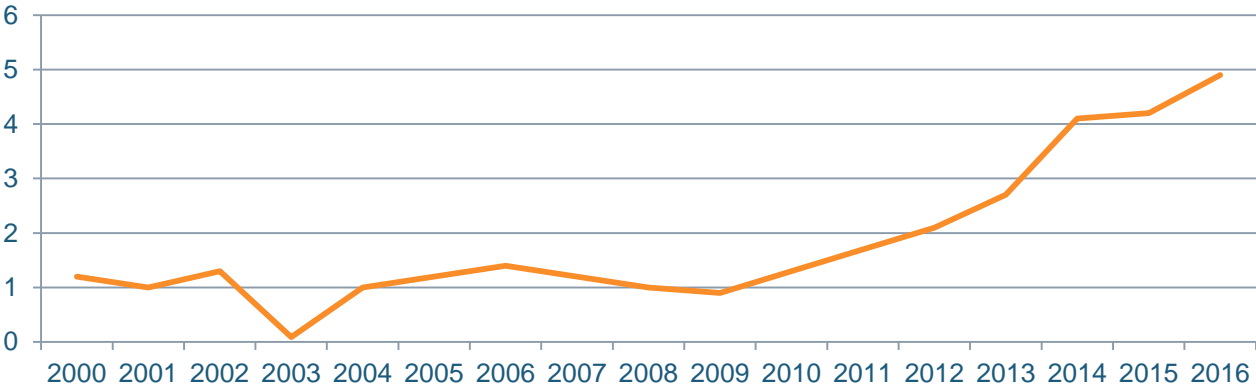
Unprecedented Change and Risk



Risk of Losing Job

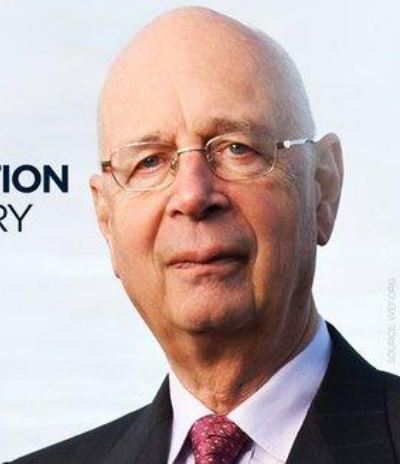


U.S. Labor Productivity

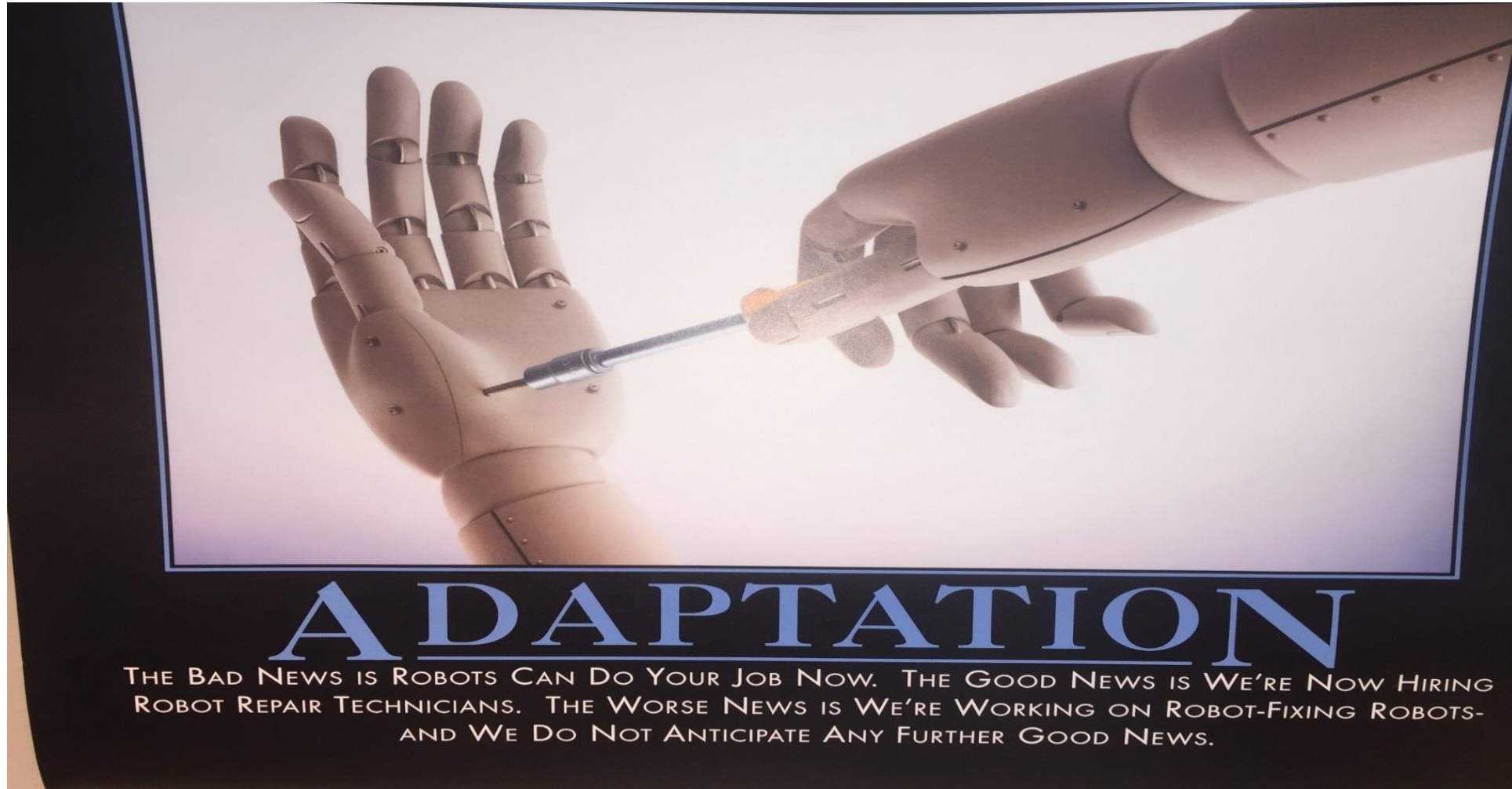


“**THE FOURTH INDUSTRIAL REVOLUTION** WILL AFFECT THE VERY ESSENCE OF OUR HUMAN EXPERIENCE.”

KLAUS SCHWAB
FOUNDER & EXECUTIVE CHAIRMAN,
WORLD ECONOMIC FORUM



Many Share This Anxiety



Today's REAL Presentation

1 We aren't in the midst of a 4th Industrial Revolution

2 Employment loss projections are wrong

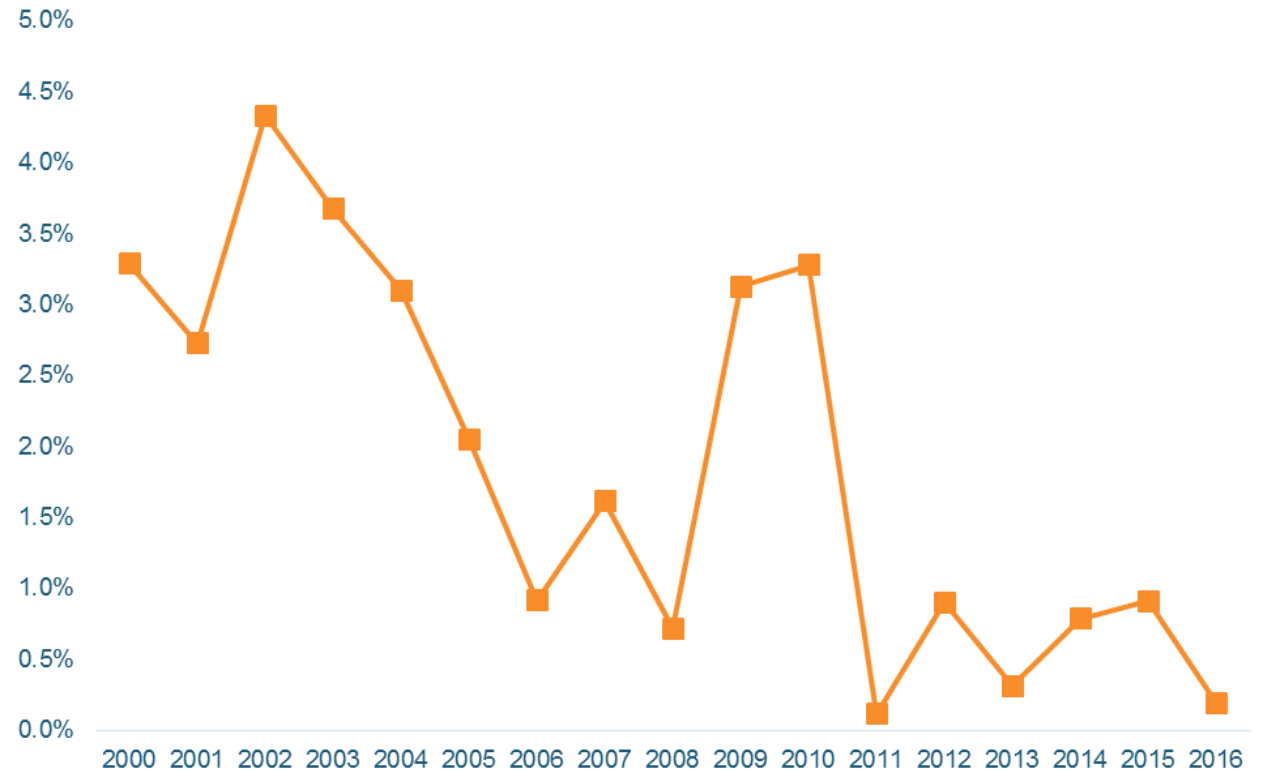
3 We shouldn't panic

4 Privacy concerns are overblown

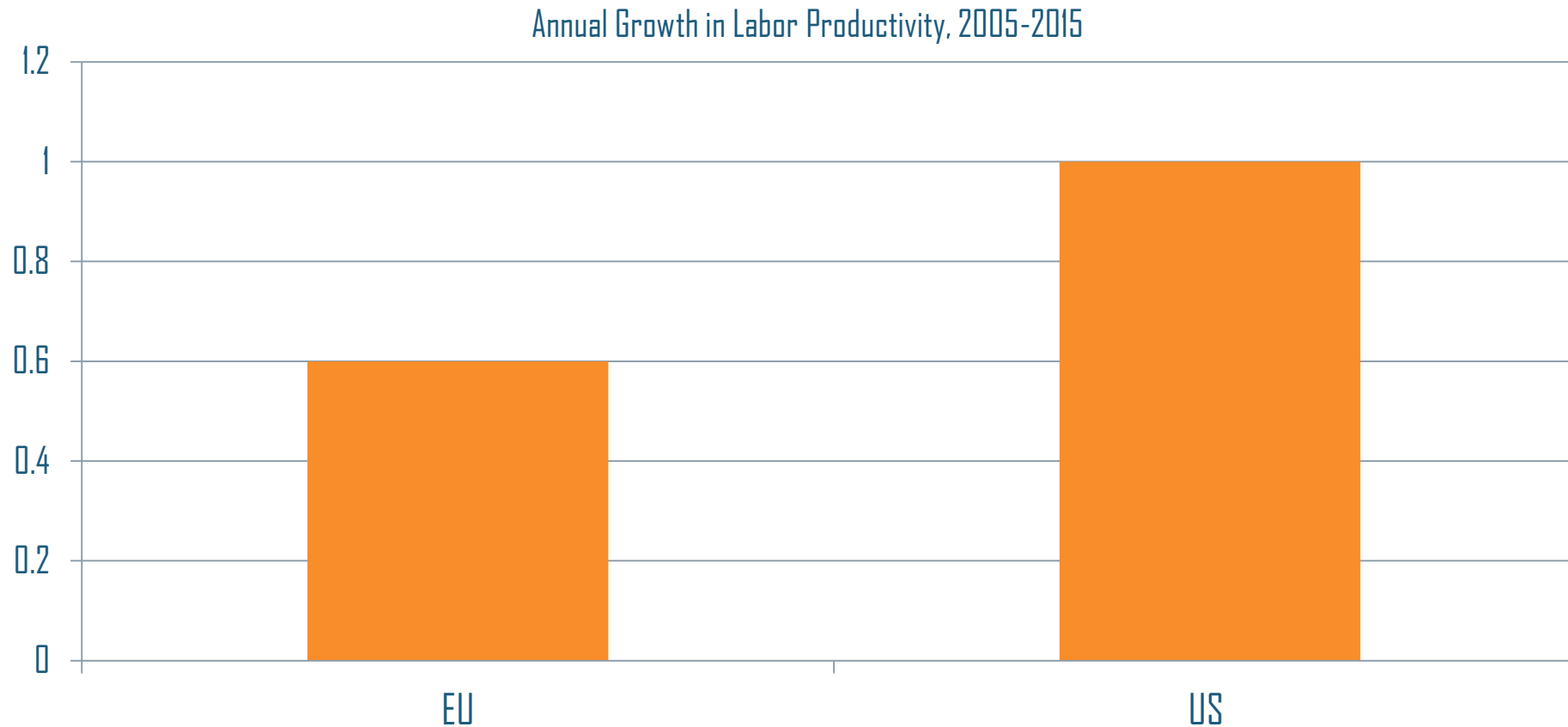
5 What to do

Actually Productivity Growth Rates Have Fallen

- Since 2008 U.S. productivity growth was half the rate from 1995 to 2008. (1.2%).

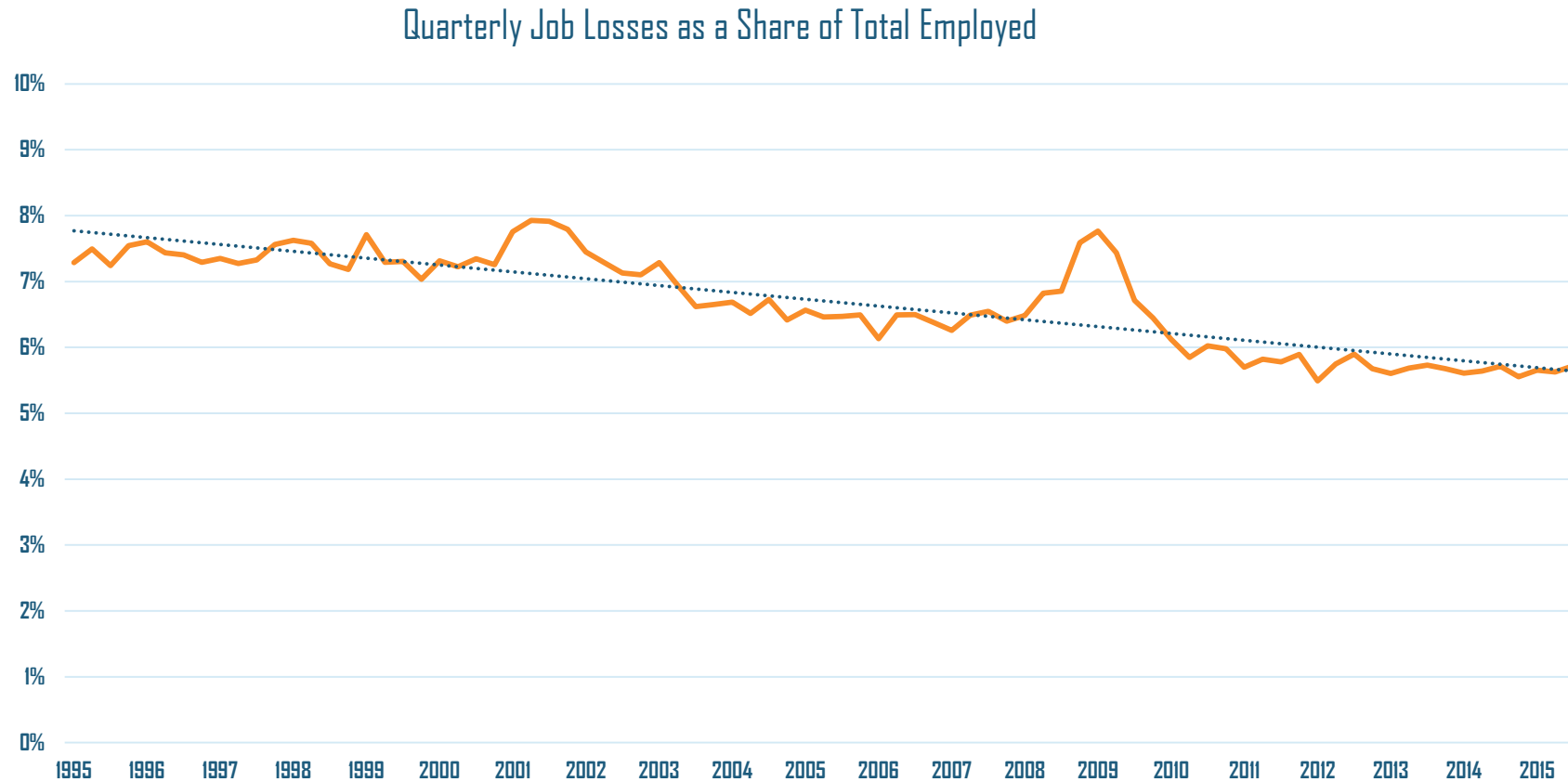


EU Productivity Growth is Even Slower



Source: Conference Board, "Total Economy Database," Labor productivity per person employed in 2014 US\$

U.S. Worker Dislocation Rates Have Actually Fallen



Source: Bureau of Labor Statistics, Business Employment Dynamics (gross jobs gains, seriesBDS00000000000000000110001LQ5)

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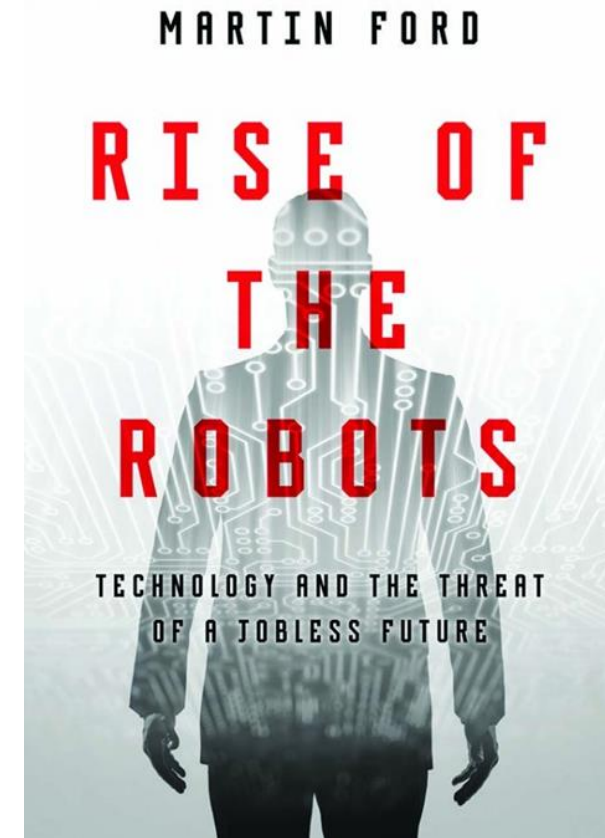
Past Predictions of Employment Doom Have Been Wrong

- Marvin Minsky (1970): "in from 3 to 8 years we will have a machine with the general intelligence of an average human being."
- Gail Garfield Schwartz (1982): "perhaps as much as 20% of the work force will be out of work in a generation."
- Nil Nilson (1984): "We must convince our leaders that they should give up the notion of full employment. The pace of technical change is accelerating."



Current Ones Are Either Inconsequential or Wrong

- World Economic Forum's predication of 5 million jobs lost from AI-robots equals 0.25% of jobs (1 out of every 400 workers).
- Frey and Osborne's estimates that technology will eliminate 47% of U.S. jobs are vastly overstated.

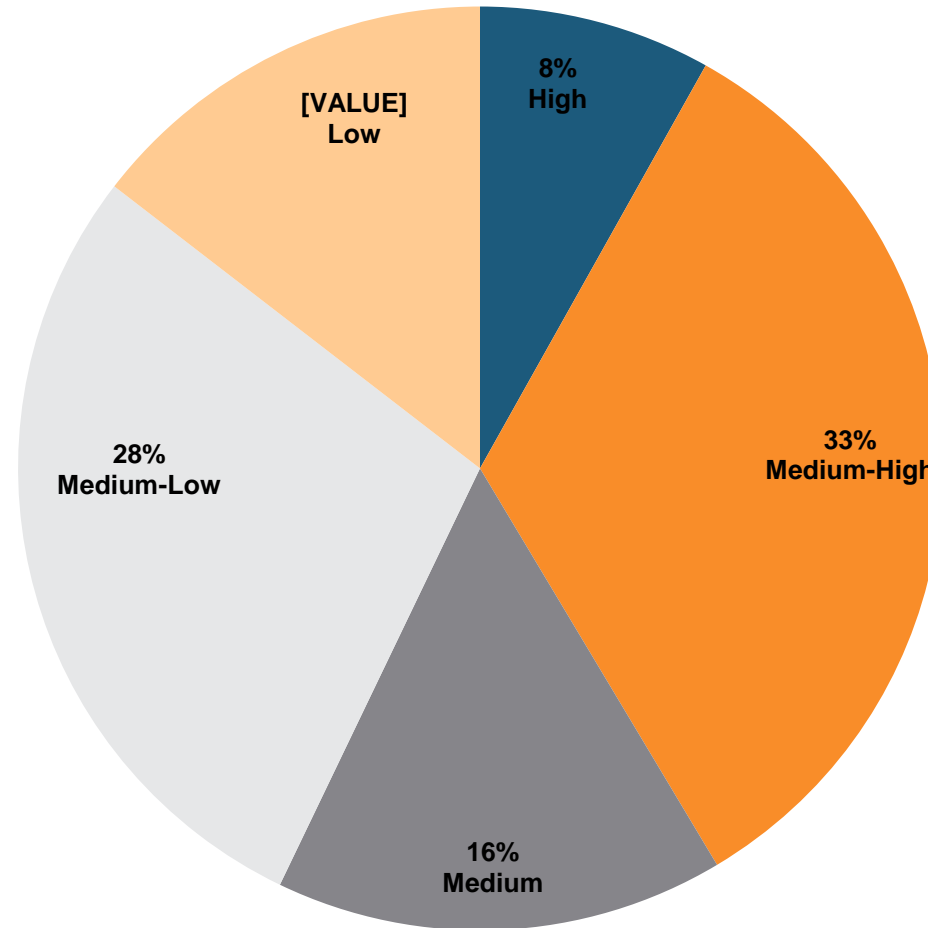


Occupations at High Risk According to Frey and Osborne

- Dental technicians
- Models
- Manicurists and pedicurists
- Bicycle Repairers
- Radio and Cellular Tower Installers and Repairers
- Fence Erectors
- Electrical and Electronics Installers
- School Bus Drivers
- Terrazo Workers and Finishers
- Carpet Installers
- Veterinary Assistants and Laboratory Animal Caretakers
- Insulation Workers
- Property, Real Estate and Community Association Managers
- Barbers
- Shoppers
- Drywall and Ceiling Tile Installers
- Aircraft Mechanics



A More Accurate Picture: Fewer Than 9% of Jobs At Risk



Source: ITIF analysis of U.S. Bureau of Labor Statistics Occupational Data.

Most Occupations Are Actually Very Hard to Automate

- Brick masons and block masons
- Machinists
- Cartographers and photogrammetrists
- Dental laboratory technicians
- Social science research assistants
- Firefighters
- Pre-school teachers
 - (Randomly selected U.S. occupations)



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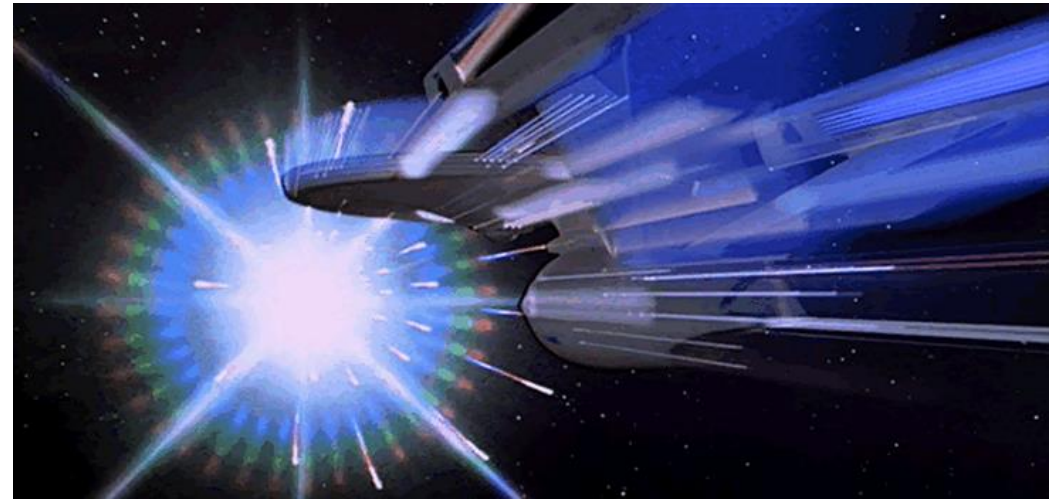
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Technological Change Has Always Been Gradual

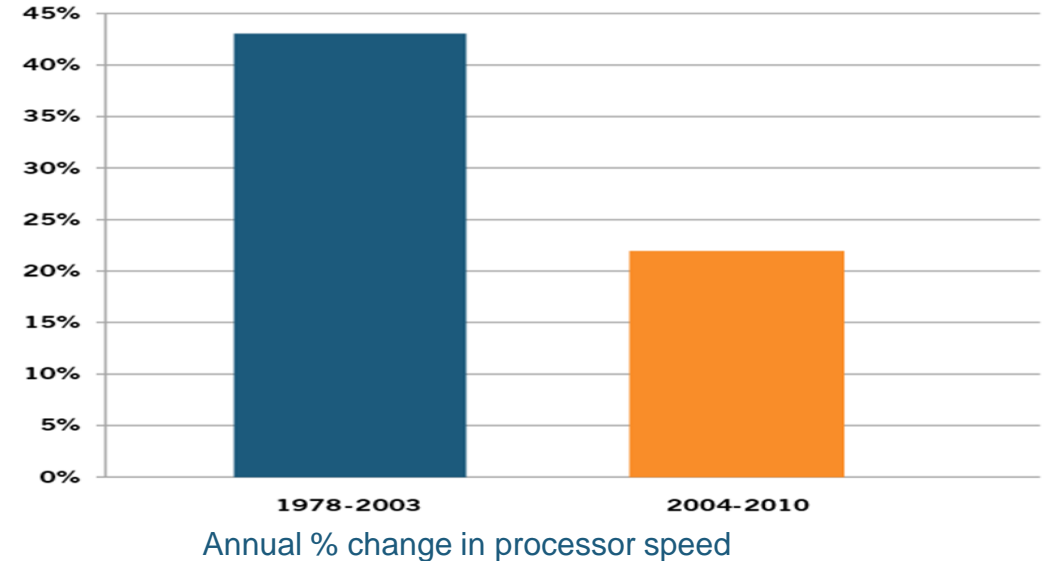
- “Misled by suitcase words, people are making category errors in fungibility of capabilities—category errors comparable to seeing the rise of more efficient internal combustion engines and jumping to the conclusion that warp drives are just around the corner.”

— *(Rodney Brooks, MIT)*



Moore's Law is Not a Law

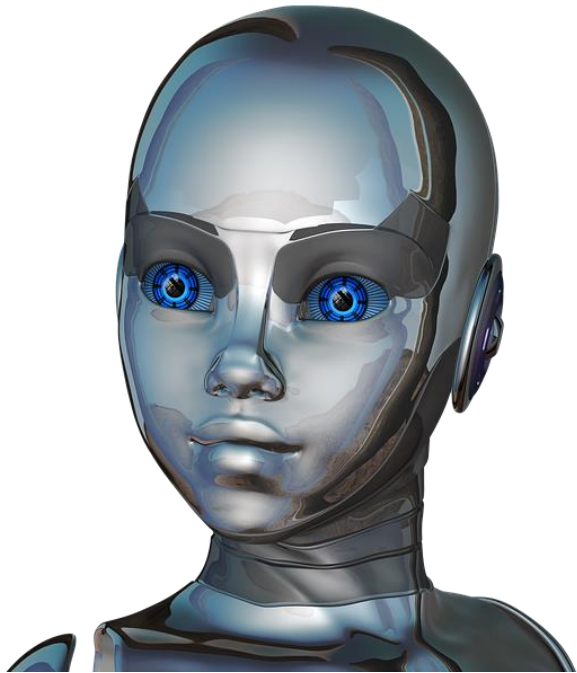
- Speed increases are slowing, while transistors per dollar are decreasing.
- Even Gordon Moore's says his law "can't continue forever. The nature of exponentials is that you push them out and eventually disaster happens."



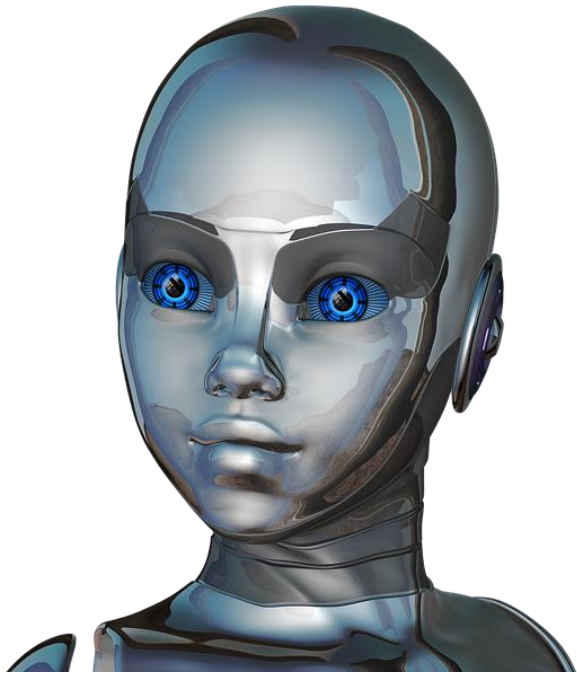
Our Robot Overlords Are Not Here Yet



No



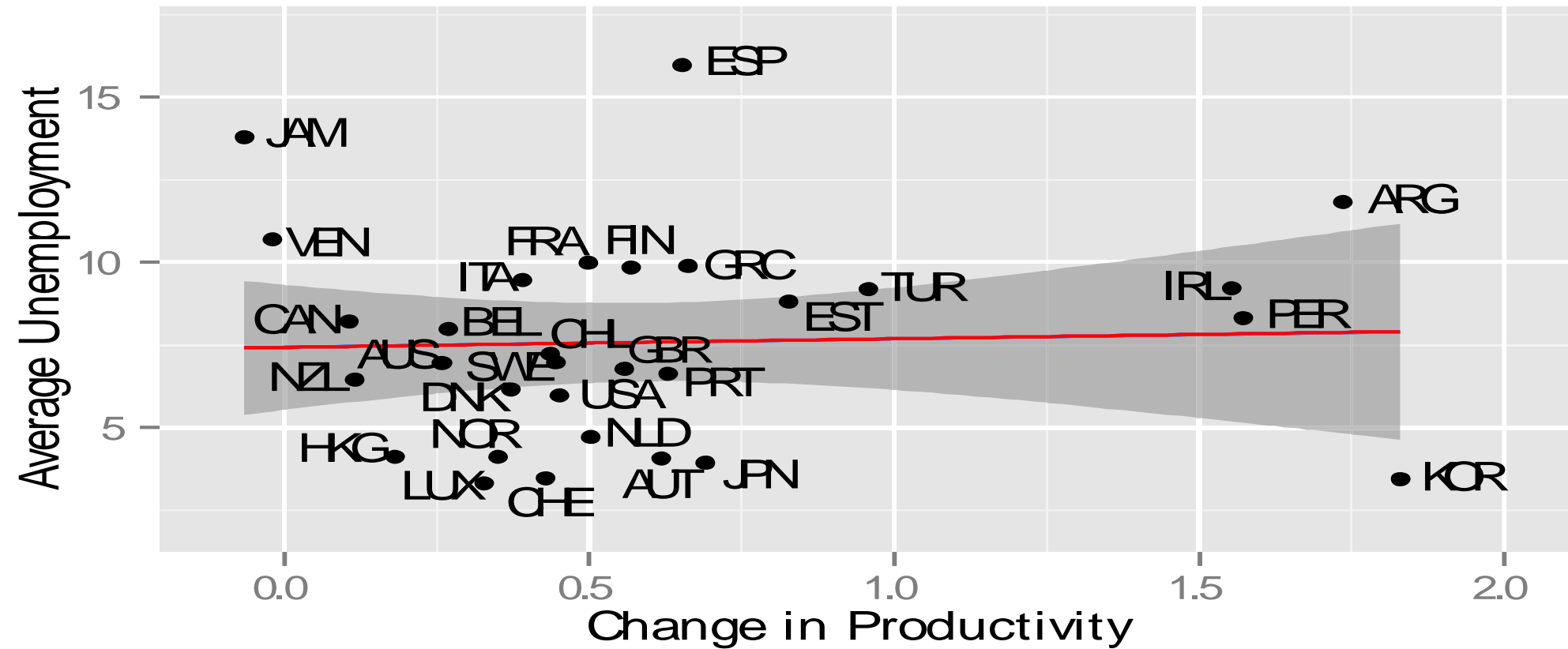
Yes



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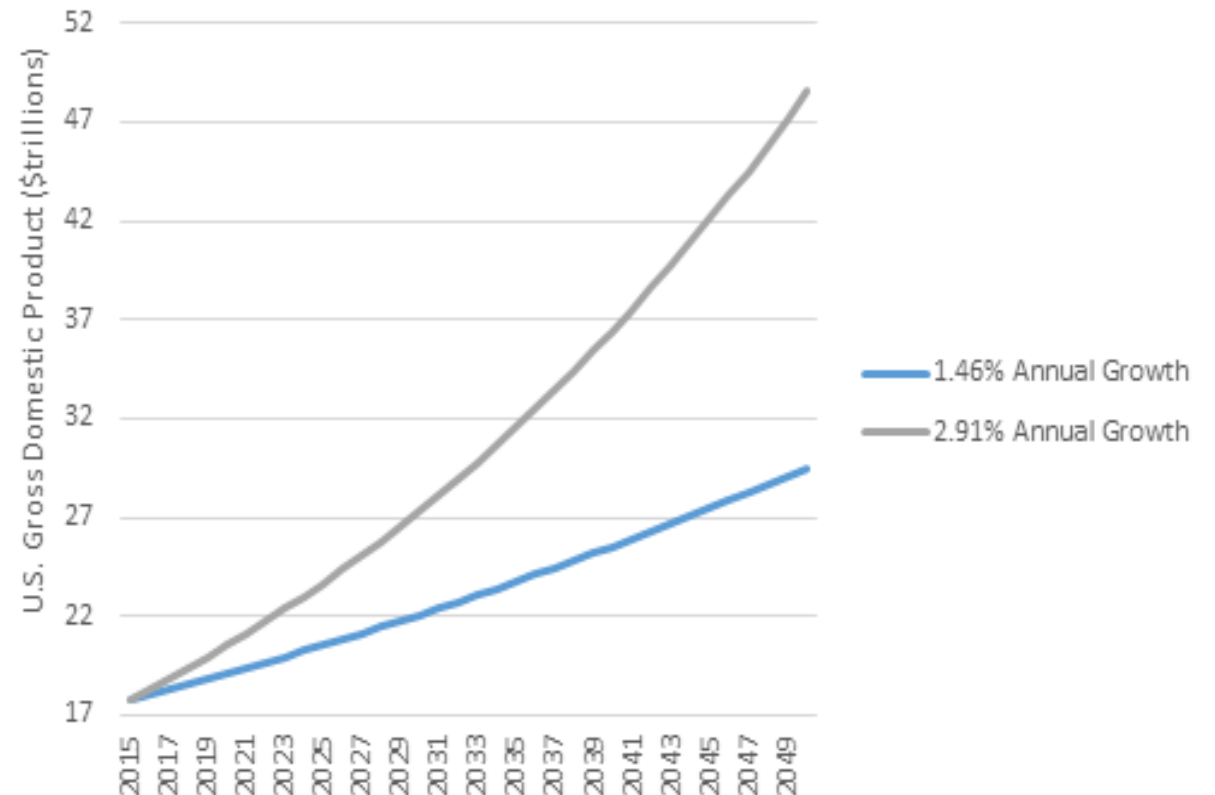
No Correlation Between Productivity Growth and Unemployment



Average unemployment rate and total change in productivity in select nations, 1990-2011 (%) (World Bank and Penn World Tables)

US and EU Need More Productivity

- Every 1 percentage point increase in productivity adds \$500 billion to U.S. federal budget.
- EU working age-to-old person ratio drops from 3.5 to 2.2 by 2040. Productivity would have to increase 13% to keep after-tax incomes from declining.



Increased Productivity Creates Demand Which Creates Jobs

- U.S. Bureau of Labor Statistics shows that automation lowers prices which increases demand for products.
 - Savings are spent.
 - Spending creates demand.
 - Demand creates jobs.



Can You Order the Occupation By U.S. Job Change: 2010-2015?

- Network and Computer Systems Administrators
- Computer Operators
- Economists and market researchers
- Taxi Drivers & Chauffeurs
- Reservation and Transportation Ticket Agents and Travel Clerks
- Shoe and Leather Workers and Repairers

Can You Order the Occupation By U.S. Job Change: 2010-2015?

■ Shoe and Leather Workers and Repairers	27%
■ Taxi Drivers & Chauffeurs	17%
■ Reservation and Transportation Ticket Agents and Travel Clerks	4%
■ Network and Computer Systems Administrators	-11%
■ Economists and market researchers	-17%
■ Computer Operators	-34%

Many Workers Want Better Jobs

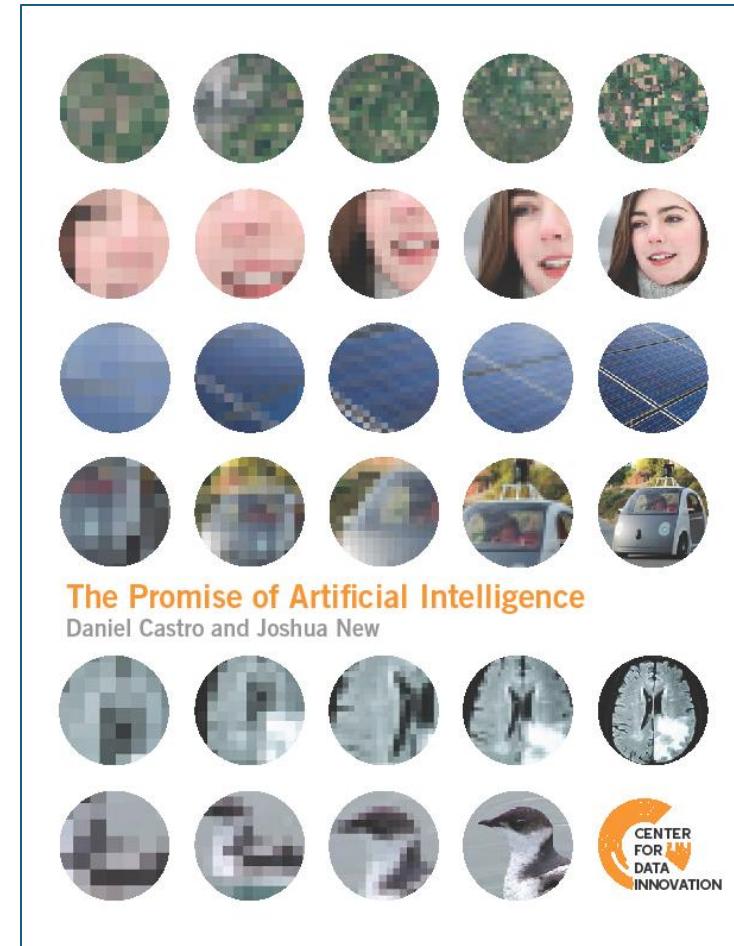
- 40% of EU workers are overqualified.

—European Commission, Skills Panorama, "Skills under-utilisation across countries in 2014."



Much of AI Will Boost Quality, **Not** Eliminate Jobs

- Health care diagnosis
- Fraud prevention
- Student feedback
- Disability access
- Reduced human trafficking



Human Wants and Needs Are Far From Being Satisfied



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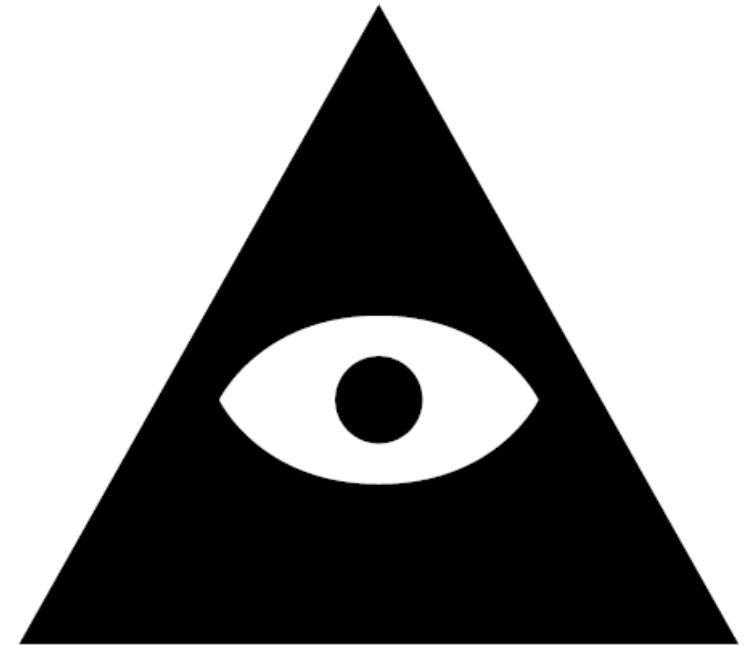
Myth: AI Will Destroy Privacy

- AI systems “could be tuned to listen for a few hundred key words, which would increase the effective surveillance power of any single human monitor by orders of magnitude.”

—Daniel Crevier

- “AI can be said to threaten privacy according to a specific pattern: AI substitutes for humans at various stages of observation or surveillance, allowing such activity to reach a previously impracticable scale.”

—W Ryan Calo



Reality: AI Will be Bound by Laws and Regulations

- Lots of data is already “out there.” AI doesn’t change that.
- Companies using AI will be bound by rules already covering existing data.
- Governments don’t need AI to spy.
- Technologies can de-identify data. And companies are working on privacy-preserving deep learning.



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Speed Development of AI/Robotics

- Embrace the innovation principle. Bringing AI and robotics to market is risky; preemptive regulation raises risks and lowers return.
- Increase government support of AI/robot research.
- Be agnostic to nationality of AI/robot firms.
- Help workers adjust.

Thank You!

Robert D. Atkinson | ratkinson@itif.org | [@RobAtkinsonITIF](https://twitter.com/RobAtkinsonITIF)