The Next Production Revolution and Employment

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About ITIF

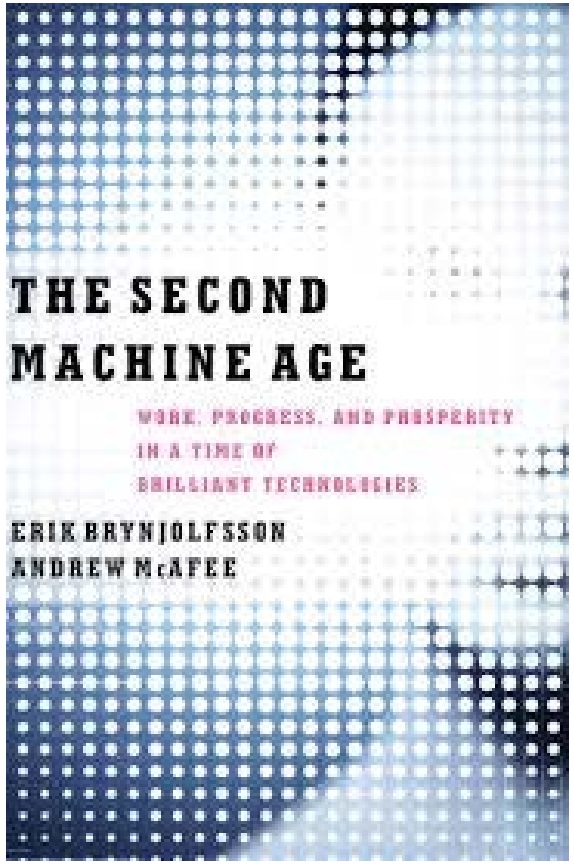
- The leading science and tech policy think tank in the Americas
- Formulates and promotes policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress
- Focuses on a host of issues at the intersection of technology innovation and public policy:
  - Innovation 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

ITIF Publication Highlights

Next Technologies

- AI
- Robotics
  - IOT
  - Autonomous systems
  - Blockchain
  - Genetic innovation

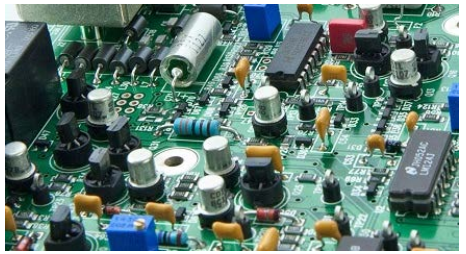
So, Are We Poised for Epochal Transformation?



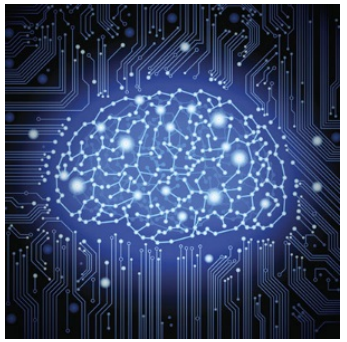
No: General Purpose Technologies Progress Along S-Curves

Electro-Mechanical Tech System

Digital Electronic Tech System



AI-Robotics Tech System



Takeoff	Installation	Slowdown	Takeoff	Installation	Slowdown	Takeoff	Installation
1945-58	59-74	74-92	93-2000	2001-2008	2009-21	2022-33	2039-??

Audience Survey Question

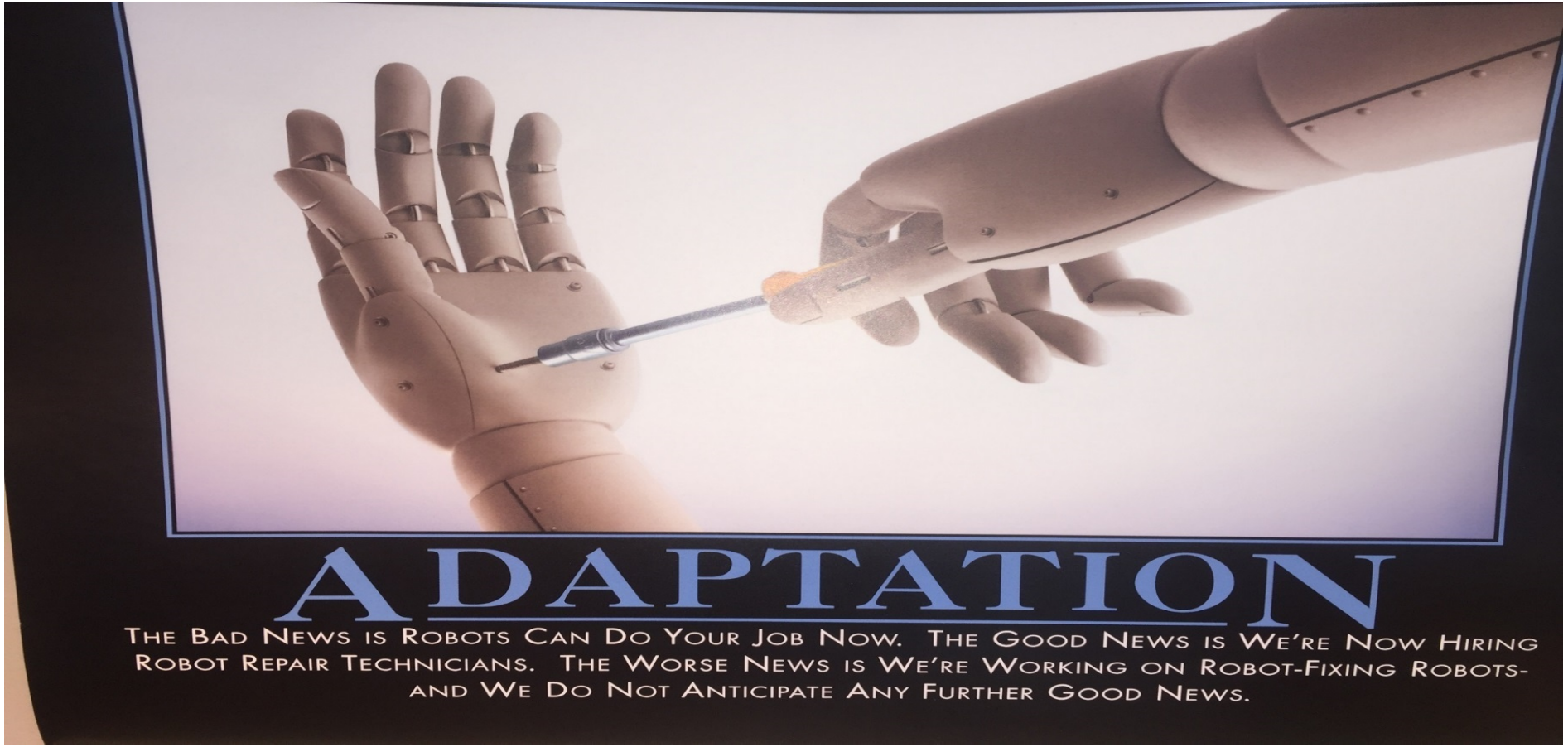
- The next production revolution will lead most American workers in a decade to be:

  a) worse off

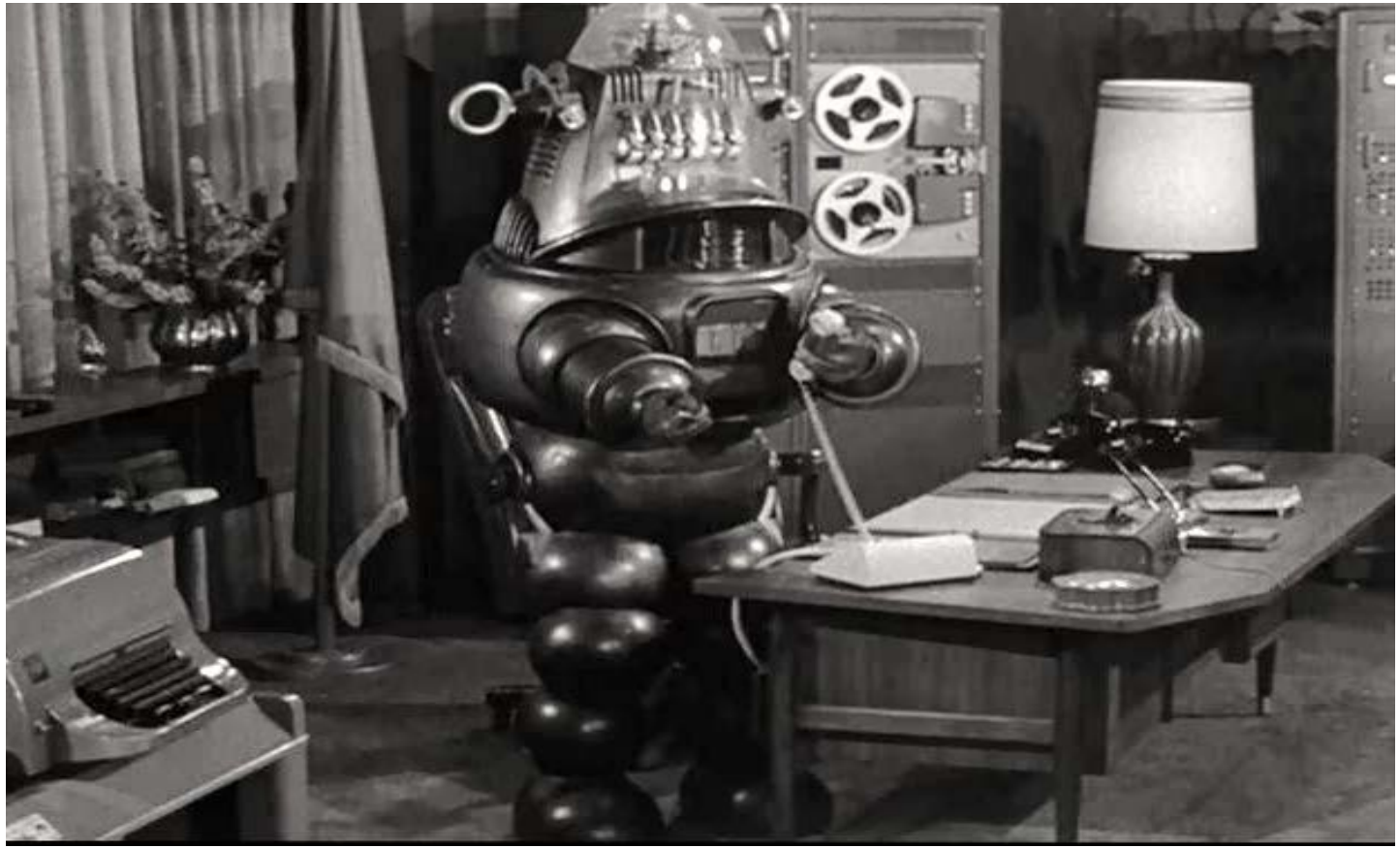
  b) about the same as they would be without it

  c) better off

Impact on Jobs: Many Share This Anxiety

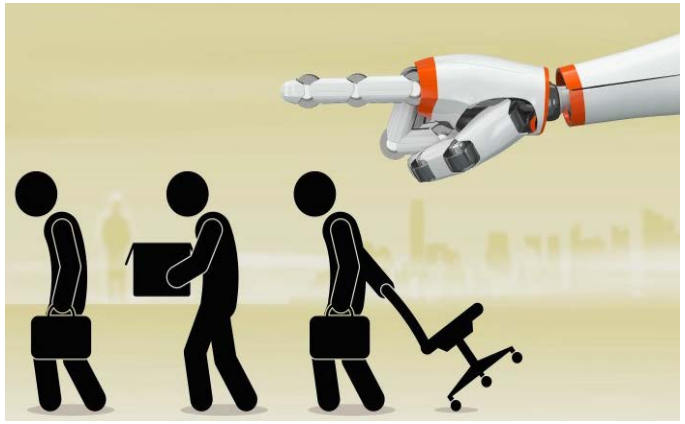


Past Predictions of Employment Doom Have Been Wrong

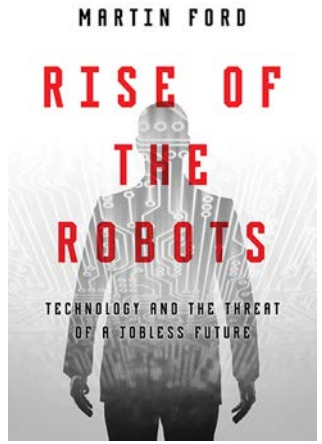


But is "This Time is Different?"

- "…half the jobs … might be eliminated by innovations such as self-driving vehicles, automatic checkout machines and expert systems. (Larry Summers)



- "Brain work may be going the way of manual work." (*The Economist)*



- 47% of U.S. jobs eliminated by 2035 (Osborne and Frey).

No, Most Occupations Are 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)

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

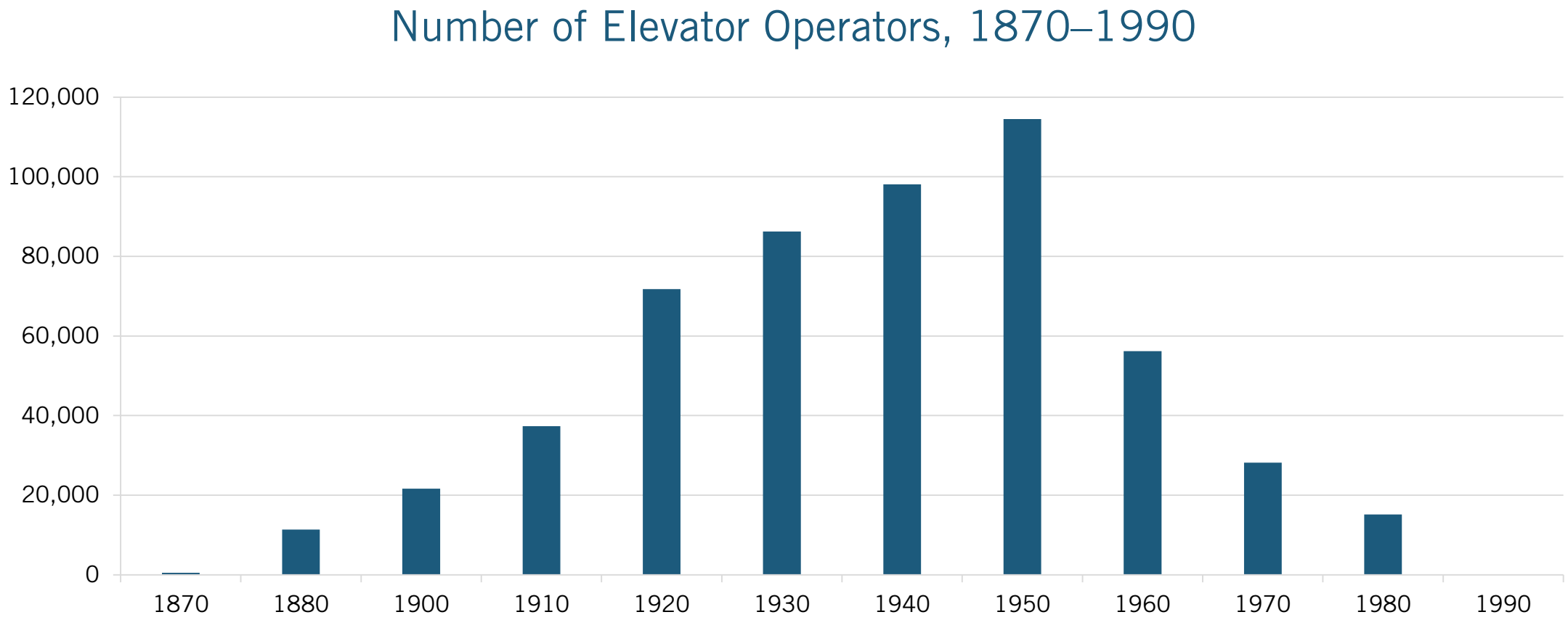
Can You Order the Occupation By U.S. Job Change: 2010-2015?

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%

So, Impacts Will Be Manageable

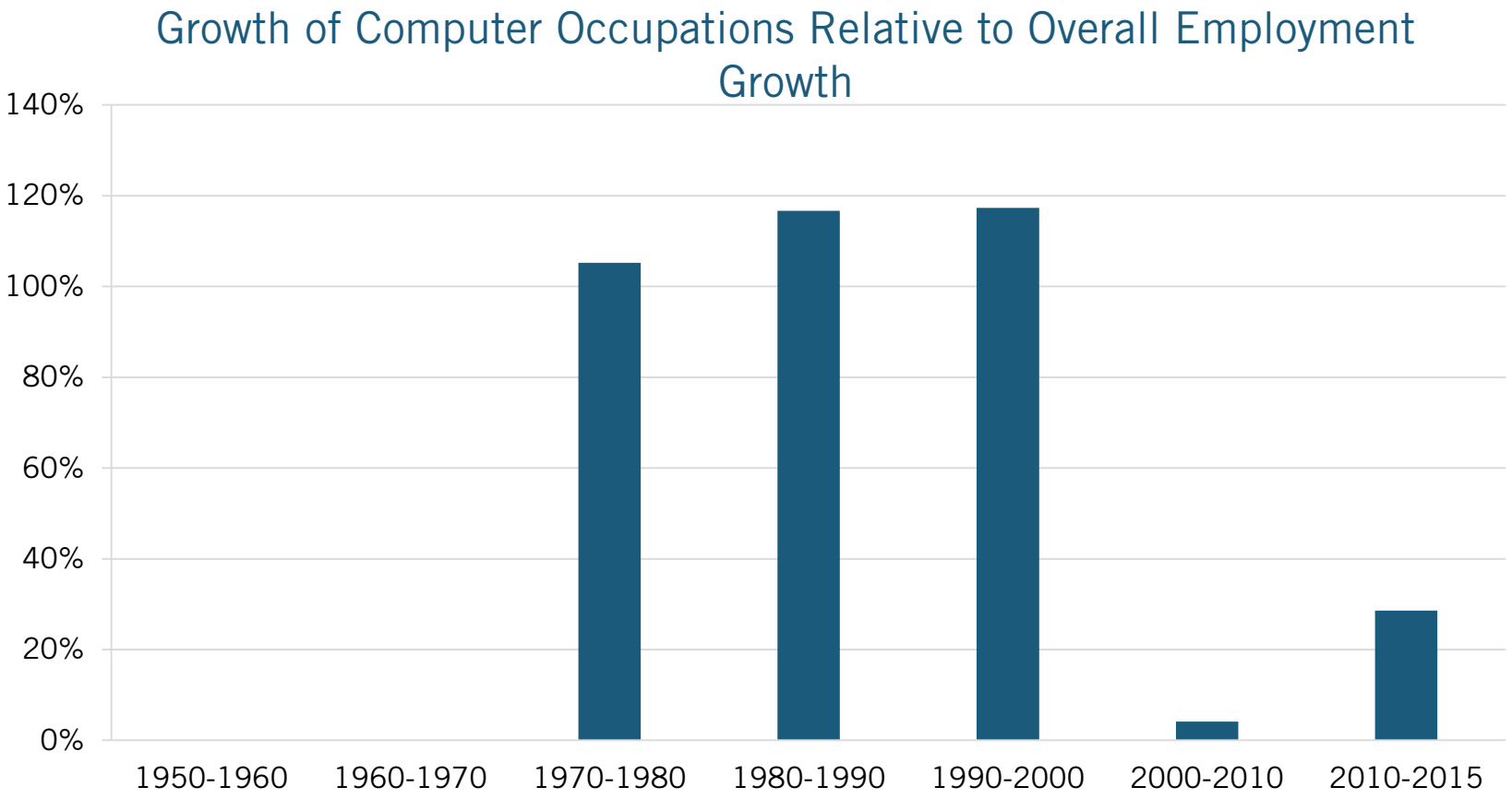
- The OECD estimates around 15 percent of U.S. jobs will be lost to automation over the next 15 years.
- ITIF estimates 20 percent
- McKinsey Global Institute estimates around 25 percent

Besides, Tech-Based Occupational Change is Often a Long Process



Source: ITIF analysis of IPUMS occupation data.

Technology Also Creates Jobs



Source: ITIF analysis of IPUMS occupation data.

And Increased Productivity Creates Jobs

- Automation lowers prices which increases demand. (BLS)

Savings are spent

↓

Spending creates demand

↓

Demand creates jobs

Not All Workers/Jobs Will be Impacted the Same

- Occupations employing more younger workers and more lower-wage and less-skilled workers are more likely to be automated.

Audience Survey Question

- The next production revolution will require most American workers to have in a decade or so:

  a) significantly better and different skills

  b) about the same type and skills as today

  c) fewer skills than today?

Workers Will Need Different Skills

- As Manuel Trajtenberg wrote in a study of the NPR and workers, “the skills employers desire and demand are poorly related to the competencies taught in school. Employers want workers with strong analytical, creative, and adaptive capabilities, which are competencies few secondary or collegiate schools impart.”

  (Trajtenberg, Manuel. 2018, “AI as the Next GPT: A Political-Economy Perspective” Working Paper 24245, Nation Bureau of Economic Research)

21st Century Skills Needed

- **“type I”: analytical, creative, adaptive**
- critical & creative thinking
- analytical & research
- sense making
- novel adaptive thinking
- design mindset

- **“type II”: interpersonal, communication**
- effective communication
- interpersonal relationships/abilities
- social intelligence
- virtual collaboration

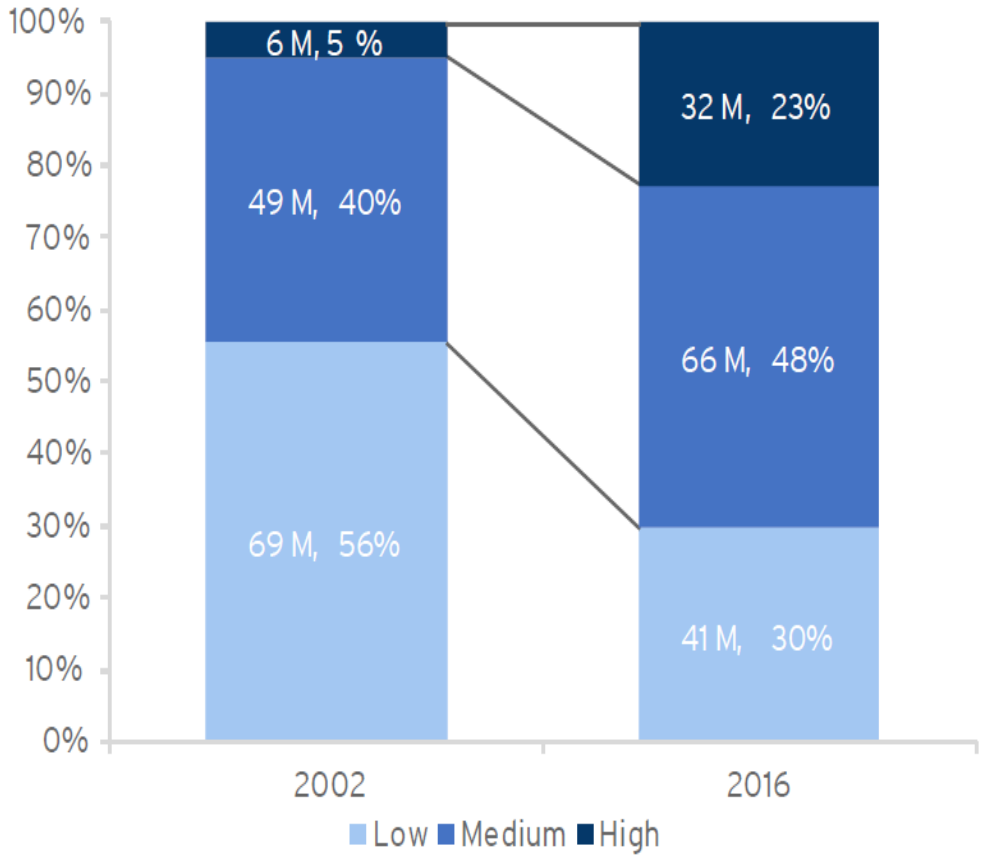
- **“type III”: emotional, self confidence**
- self-awareness
- empathy
- coping w/stress
- manage cognitive load
- coping w/emotions

Workers Will Increasingly Need Double Deep Skills

- "Double-deep" employees: "those individuals who know both their job – be it marketing, engineering, accounting, and so on – as well as the IT relevant to that job."

(David Moschella, Leading Edge Forum)

Employment by Levels of Job Digitalization



Source: Brookings Analysis of O*NET and OES Data

Schools Are Underperforming

- More California students take pottery than take computer science.
- 87% of U.S. high school students pass a geometry class, but just 7.7% pass statistics.

Colleges Need to Do Better

- On the Collegiate Learning Assessment 45% of students did not demonstrate any gains over their first two years of college, and 36% had not gains over 4 years. (Richard Arum and Josipa Roksa)

- Among 2nd semester seniors of four-year colleges, just 38%, 40%, and 34% were proficient in prose, document, and quantitative literacy, respectively.

- 34% of U.S. business leaders believe that higher education institutions are not graduating students with the skills and competencies needed by their firms.

What Should Policy Makers Do? First, Don't:

- Panic,
- Slow the rate of innovation and automation (e.g., robot tax), or
- Put in place Universal Basic Income

What Should Policy Makers Do?

- Speed the development and adoption of tech-based automation.
- Reduce the risk from job loss (e.g., universal health coverage, better, unemployment insurance).
- Improve worker training (e.g., worker training tax credit, industry-led skills alliances, apprenticeships, credentials)
- Embrace more fundamental education and training reforms.

Thank You

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