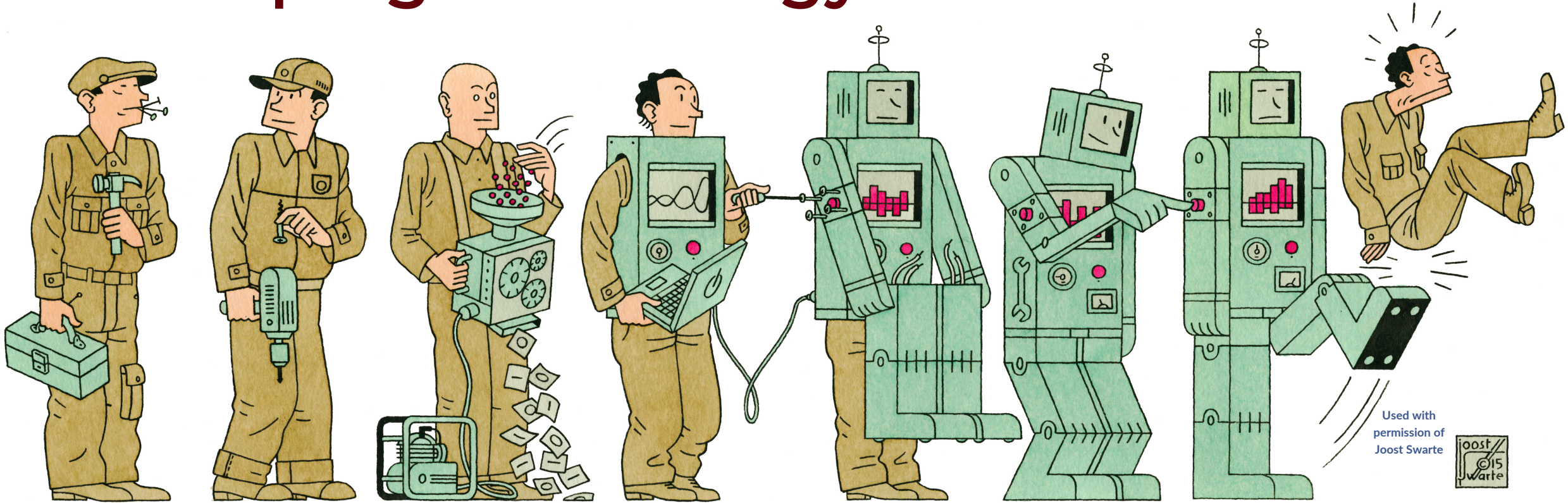


The Work of the Future: Shaping Technology and Institutions



David Autor, Ford Professor of Economics, MIT

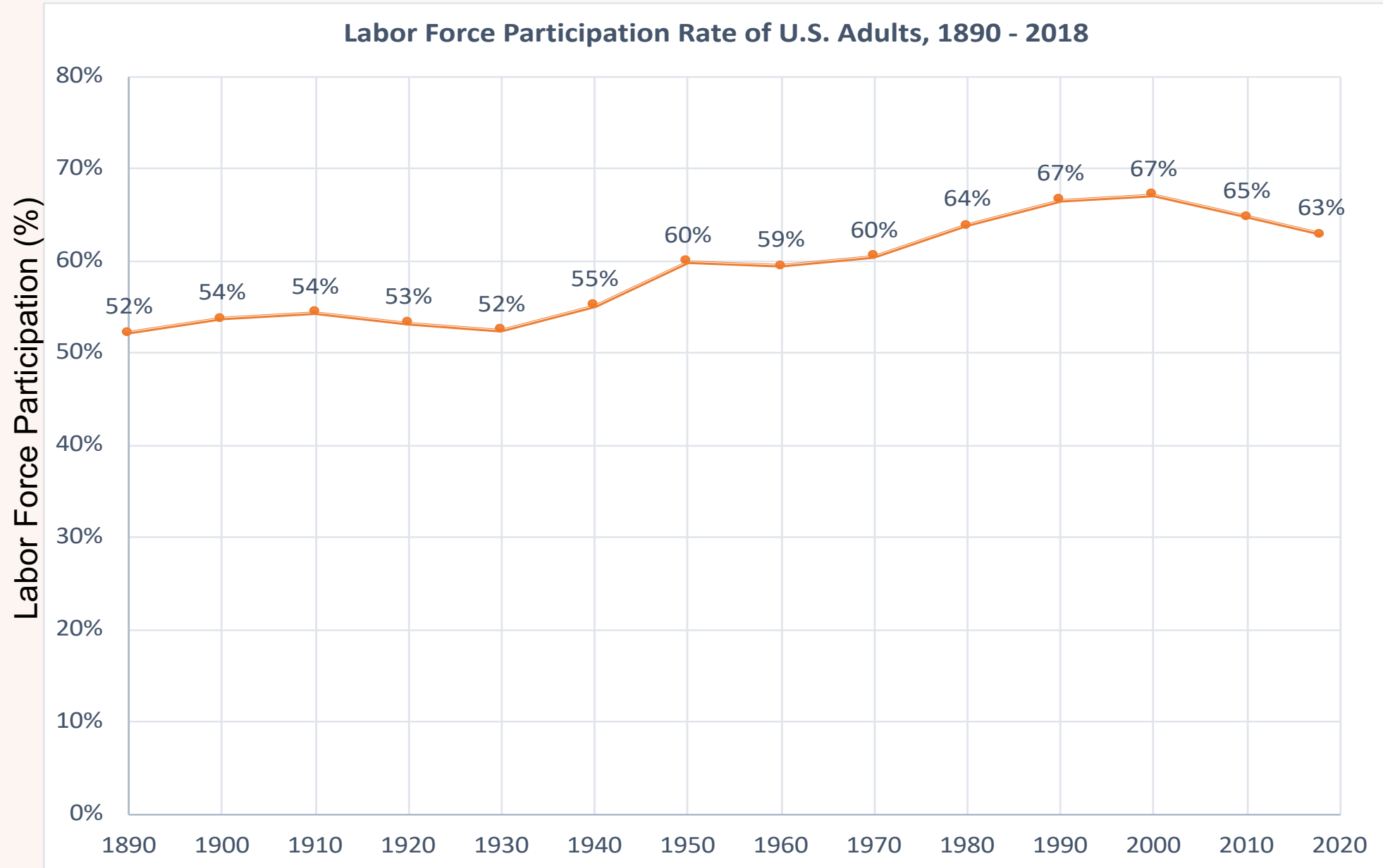
Work in the Future Conference

Future Work Forum and SNS, Nov 13, 2019

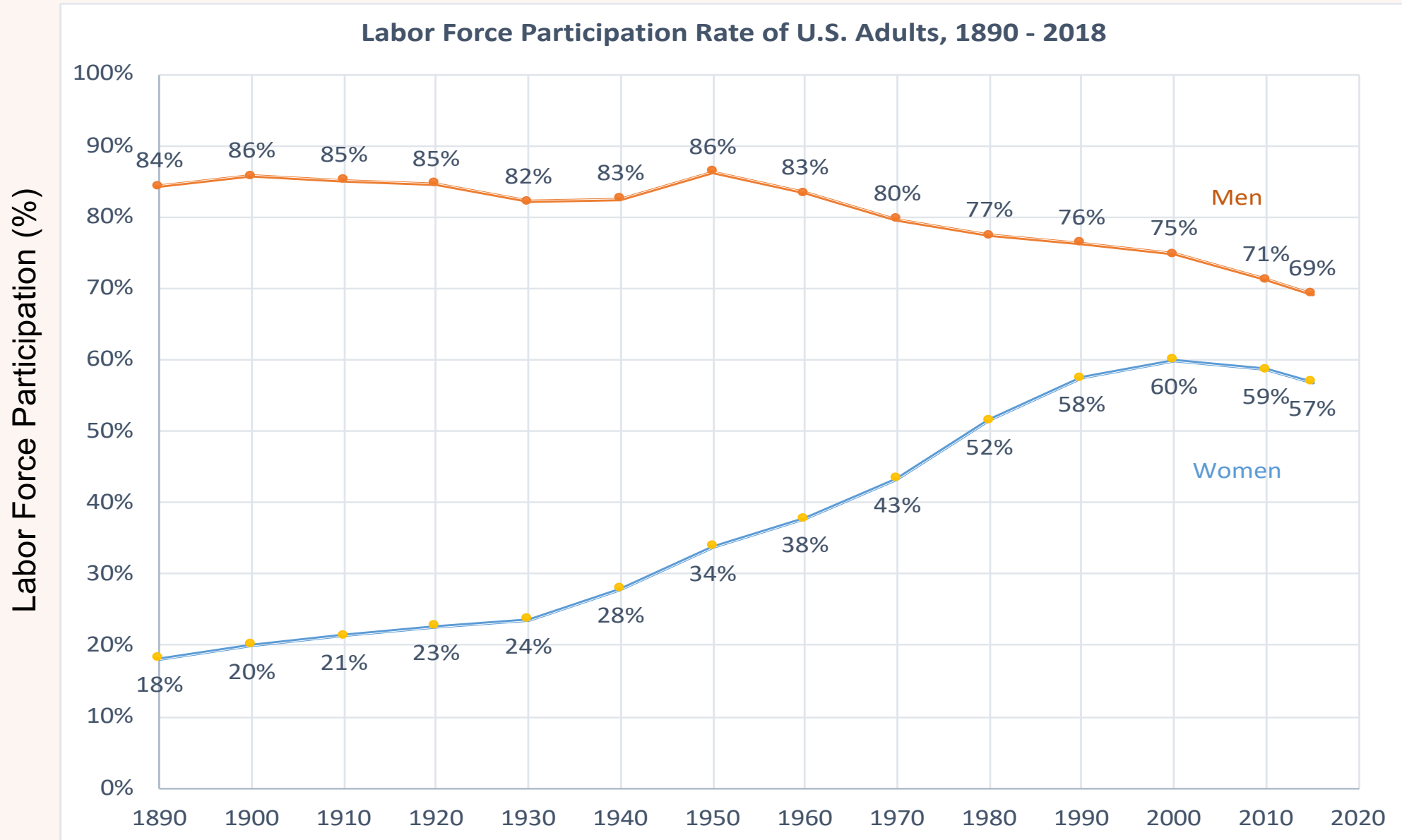


Handwritten text, possibly a date or location, in the top left corner of the first photograph.

Labor Force Participation of U.S. Adults Has Risen in All but Two Decades of the Last 130 Years



This Rise Reflects Two Offsetting Forces: Rising Female, and Declining Male Labor Force Participation



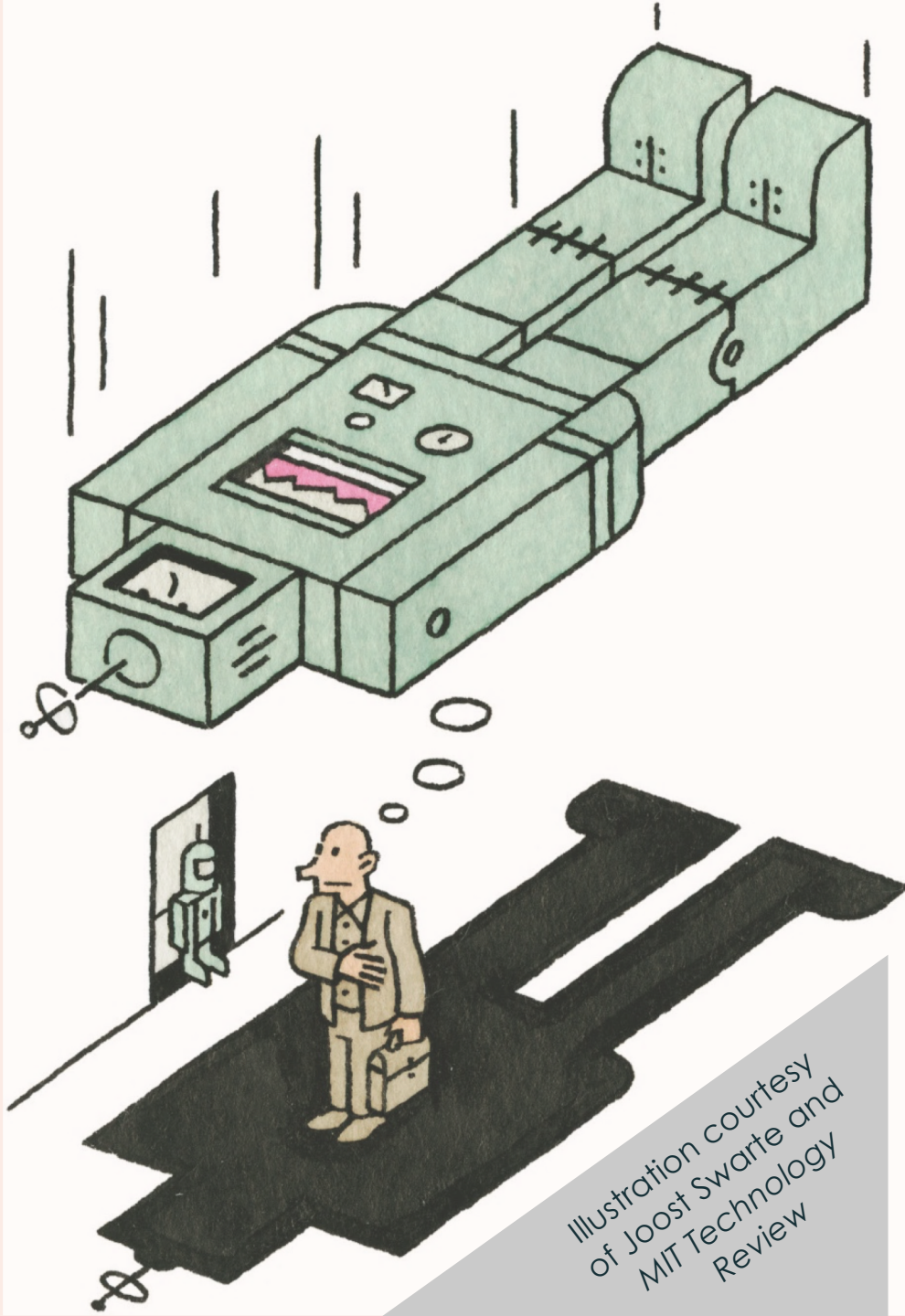


Illustration courtesy
of Joost Swarte and
MIT Technology
Review

Agenda

1. Why are there *still* so many jobs?
2. The emergence of new work
3. What *should* we worry about?
4. Shaping the future of work

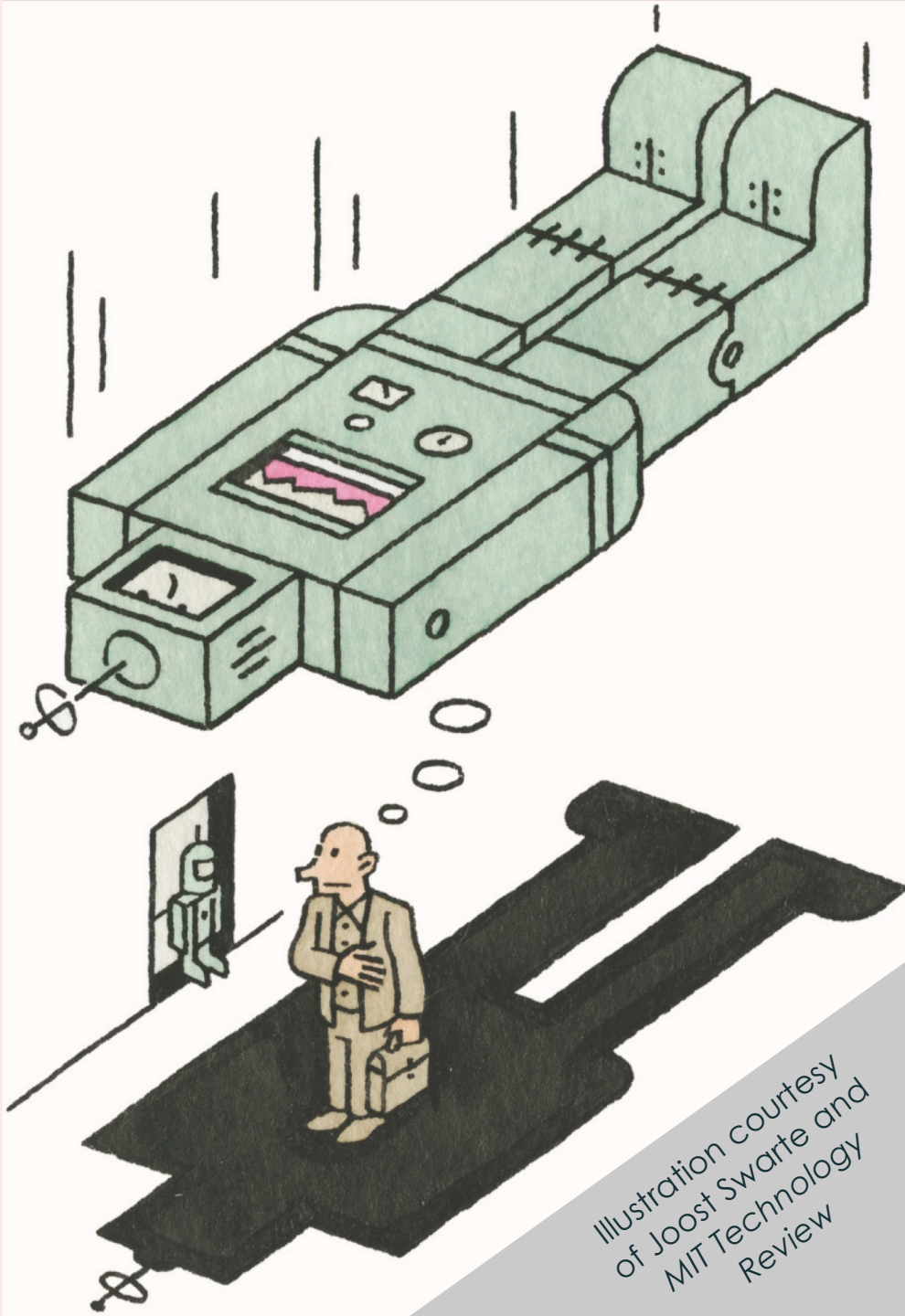


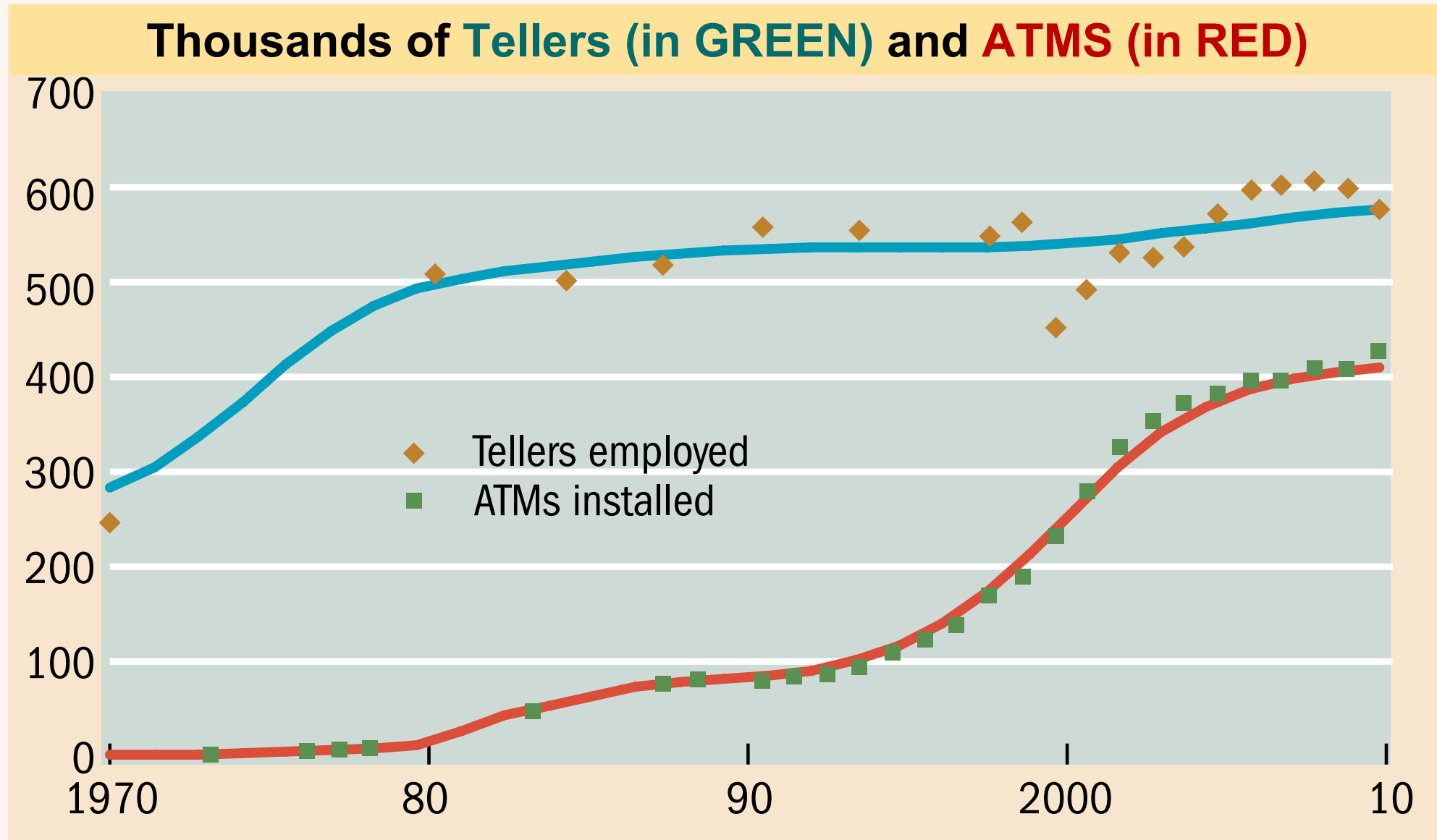
Illustration courtesy
of Joost Swarte and
MIT Technology
Review

**Why are there still so
many jobs?**

Part I.

Complementarity

Bank Tellers Employment **Rose** as ATMS Rolled Out



Source: James Bessen, 2015

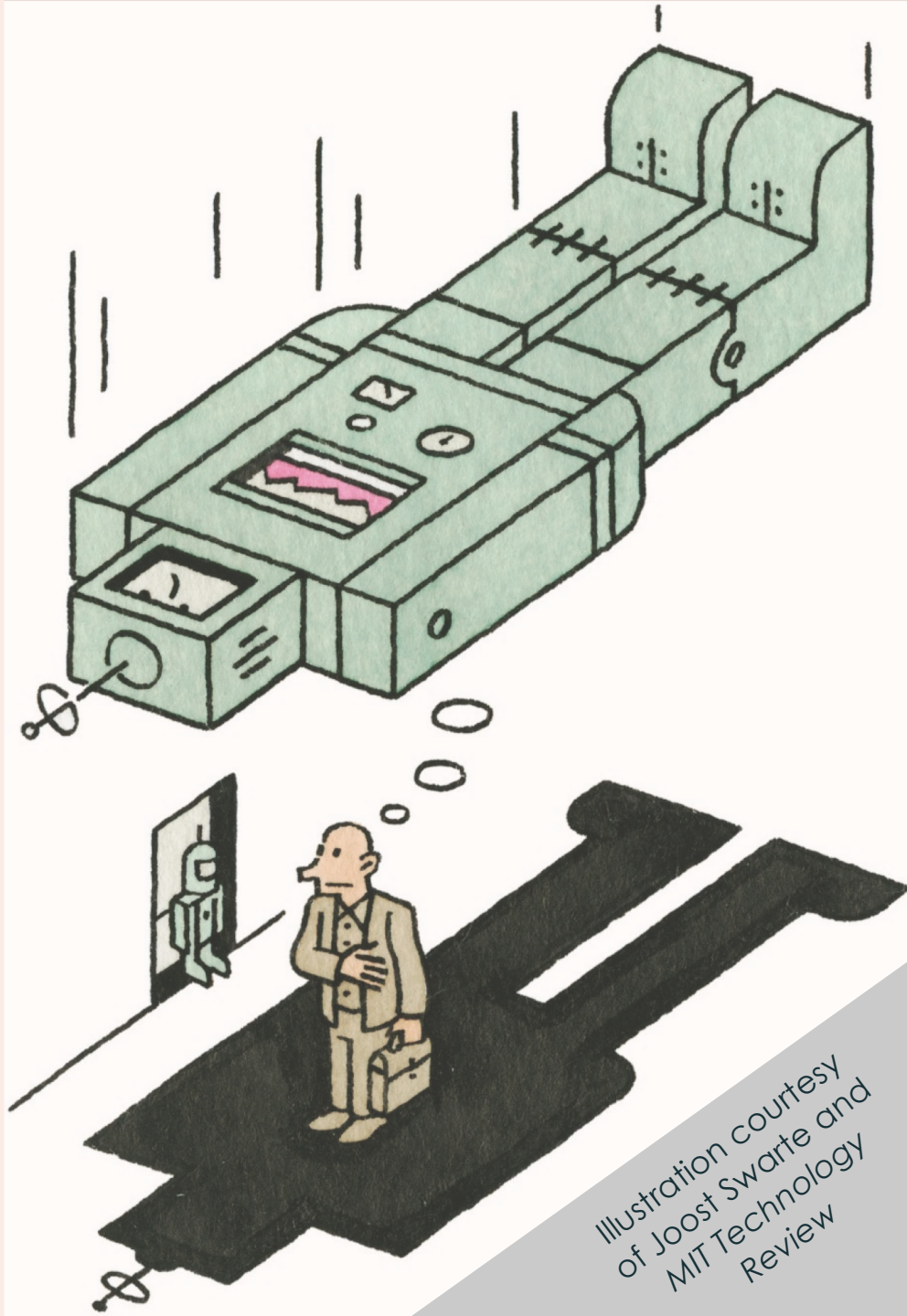
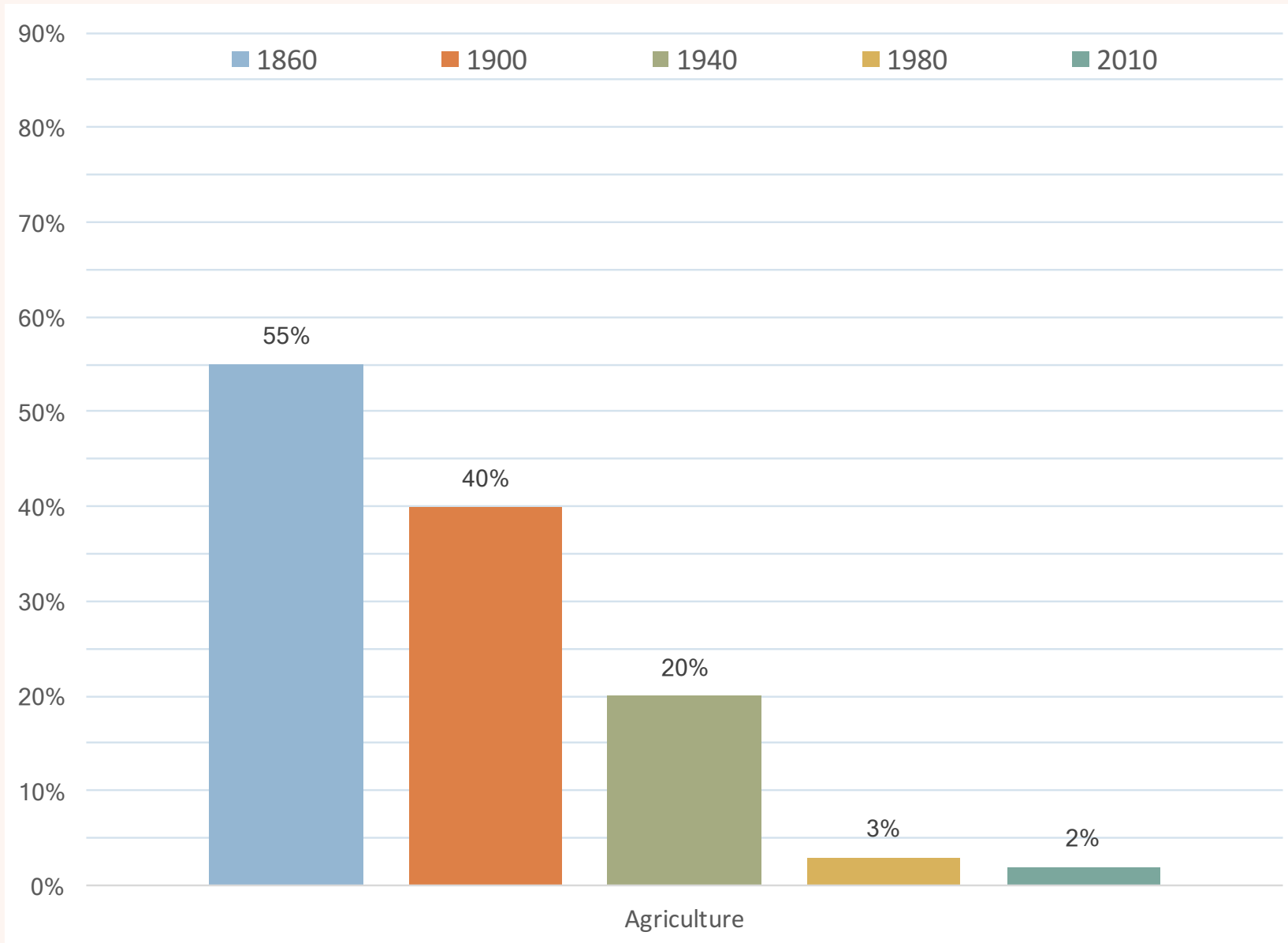


Illustration courtesy
of Joost Swarte and
MIT Technology
Review

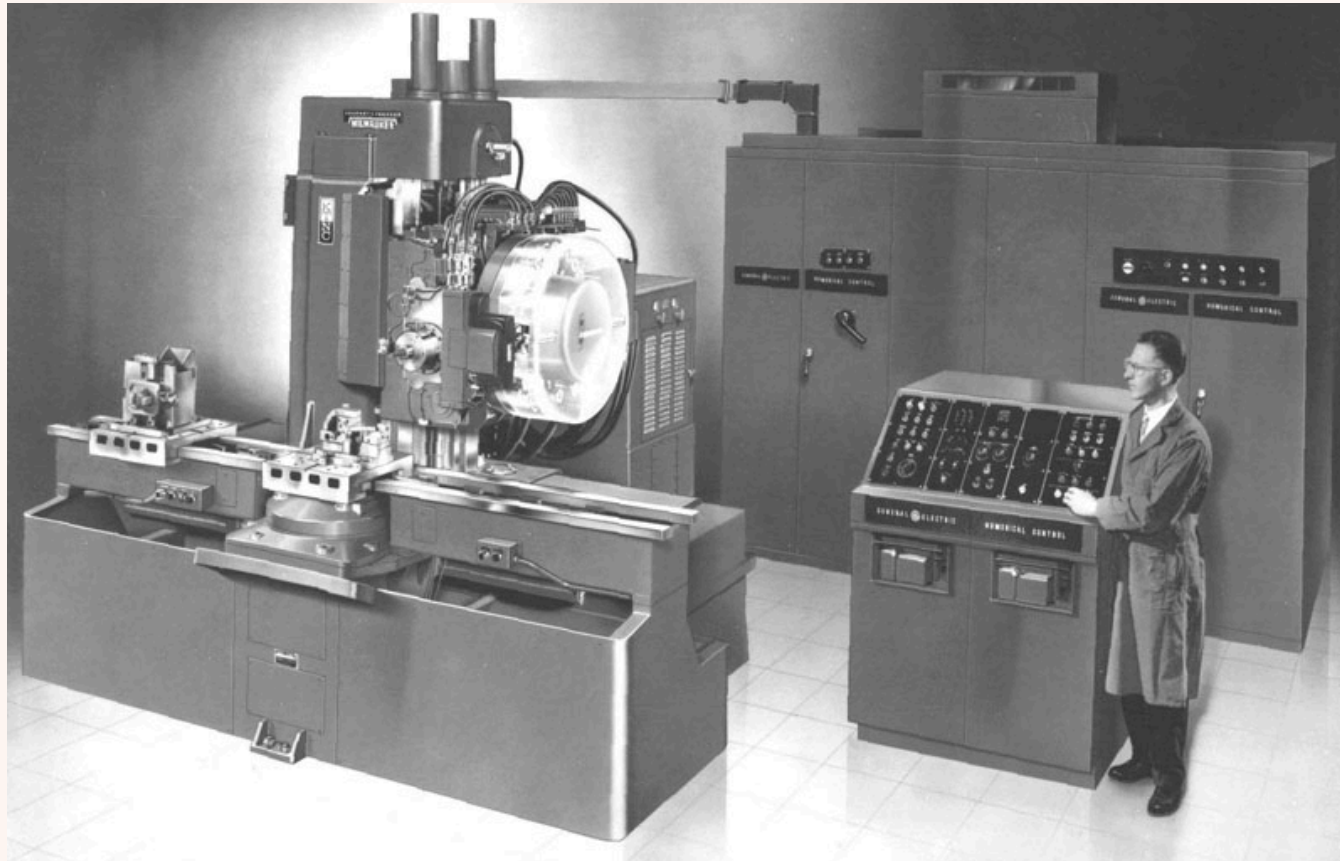
Why are there still so many jobs? Part 2. Insatiability

Harvesting Productivity: Falling U.S. Agricultural Employment Share, 1860 – 2010



The 'Productivity Problem' of 1964

President Johnson's Blue-Ribbon National Commission on Technology, Automation, and Economic Progress



The Milwaukee-Matic industrial machining tool, 1963

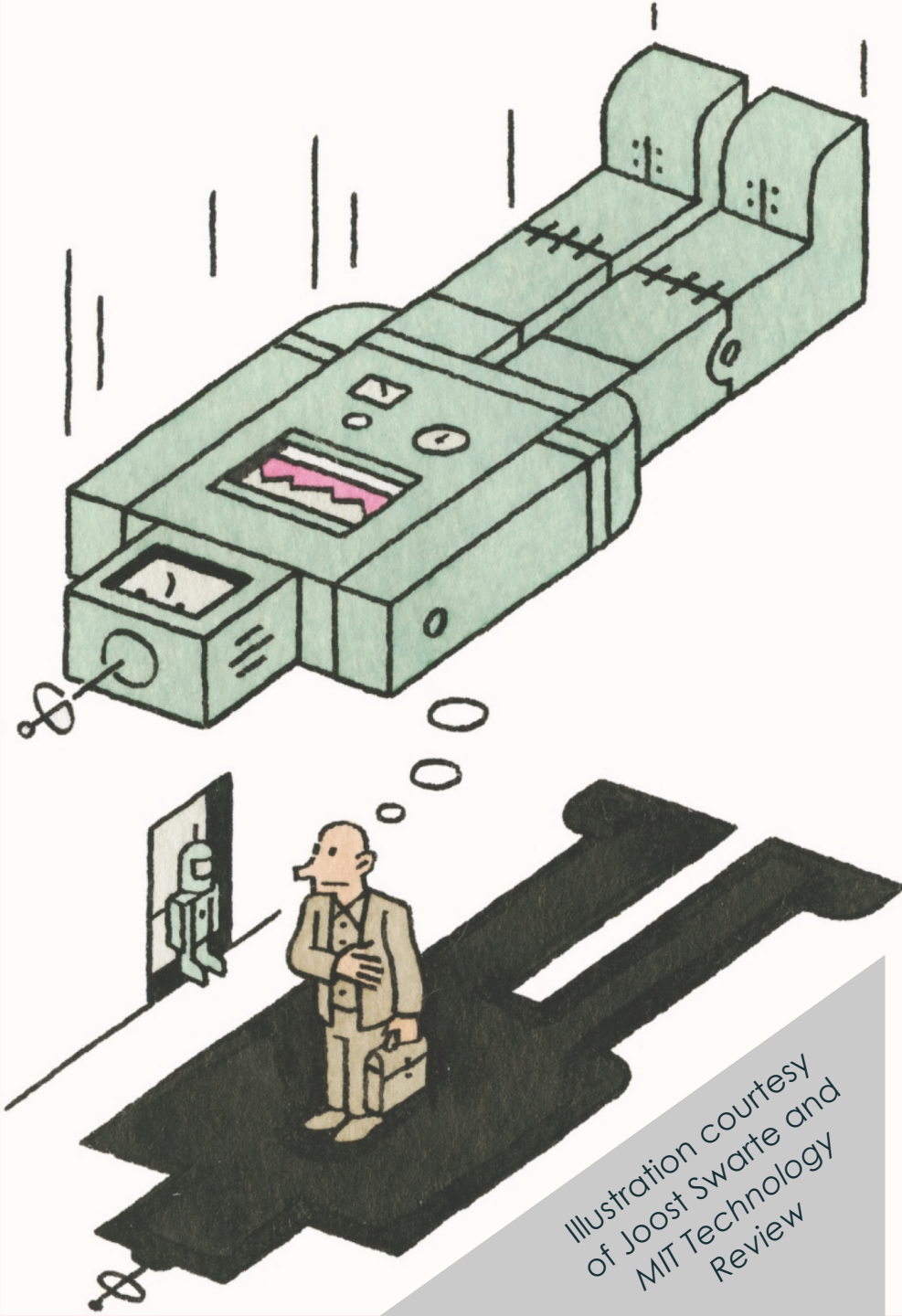


Illustration courtesy
of Joost Swarte and
MIT Technology
Review

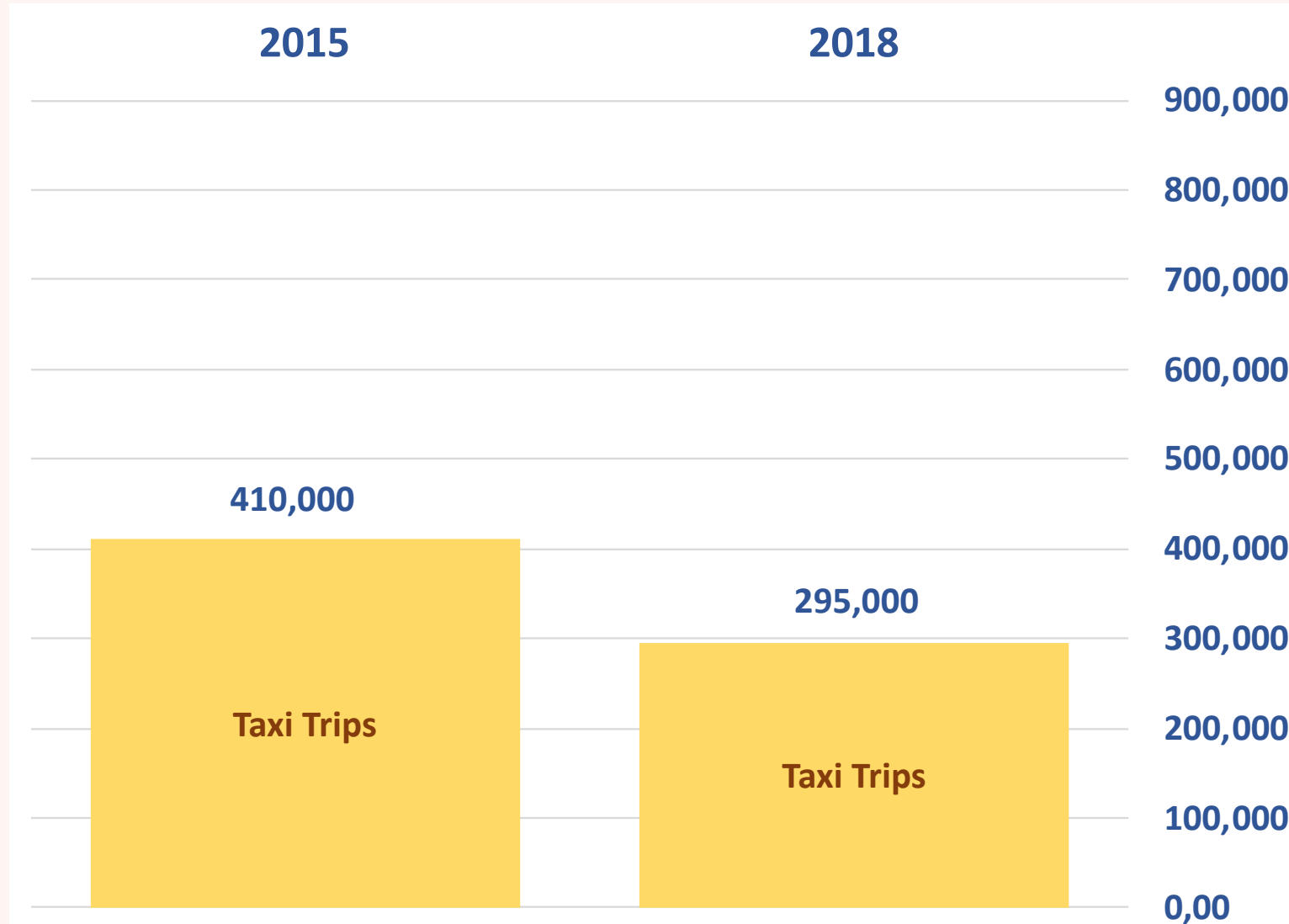
The Emergence of New Work

Where Does New Work Come From?

1. **Uber effects**
2. Walmart effects
3. Network effects
4. Invention of new work

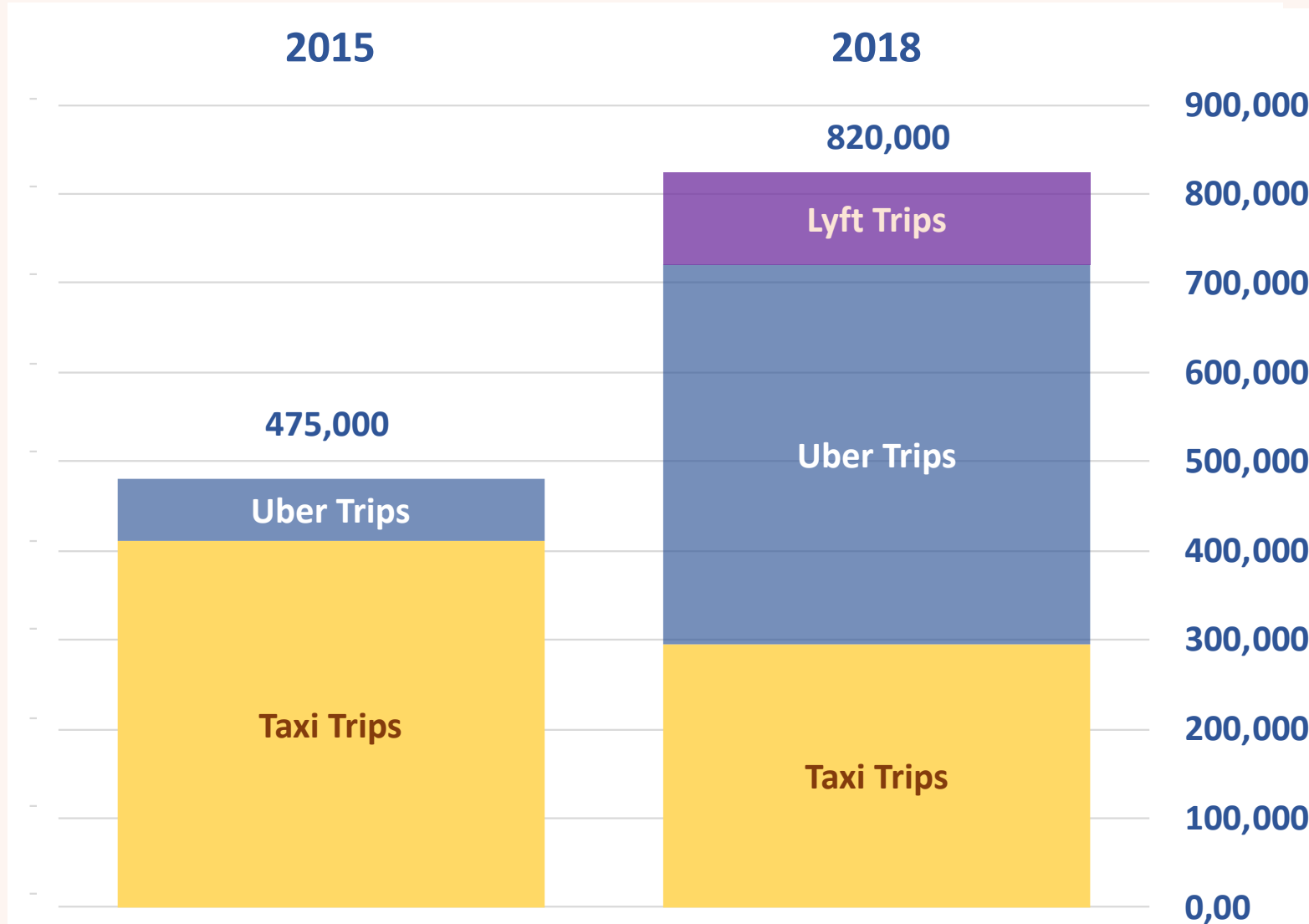
'Uber' Effects – Produce a Cheaper, Better Product, and Employment May Rise

Ride Hailing Trips in New York City, 2015 and 2018



'Uber' Effects – Produce a Cheaper, Better Product, and Employment May Rise

Ride Hailing Trips in New York City, 2015 and 2018



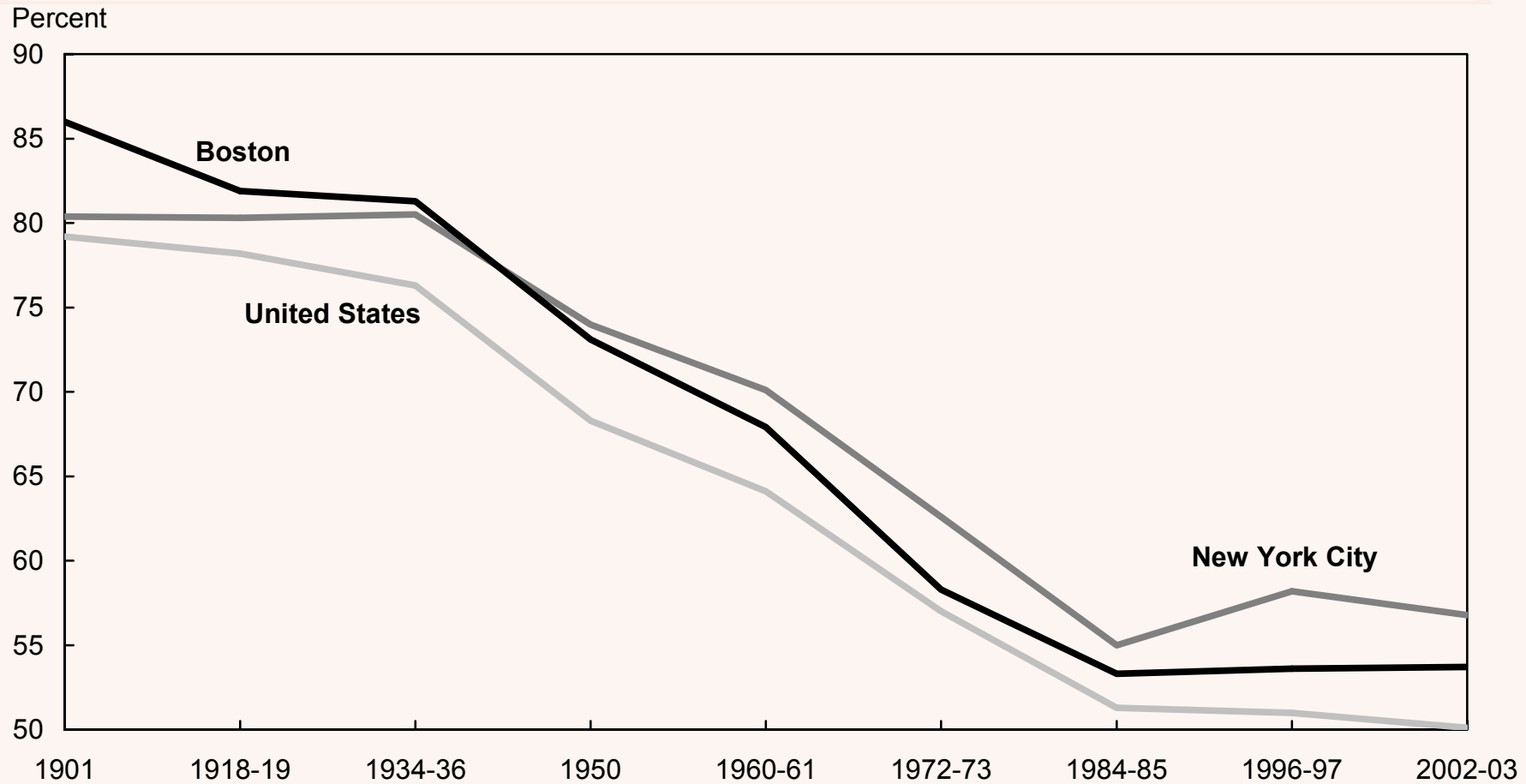
Walmart Effects – A Fall In the Cost of Necessities Frees Income for Luxuries

Walmart
Save money. Live better.



Over the 20th Century, the Share of Household Income Spent on Necessities Fell from 85% to 55%

Food, clothing, and housing expenditure shares for the United States, New York City, and Boston, 1901 – 2002

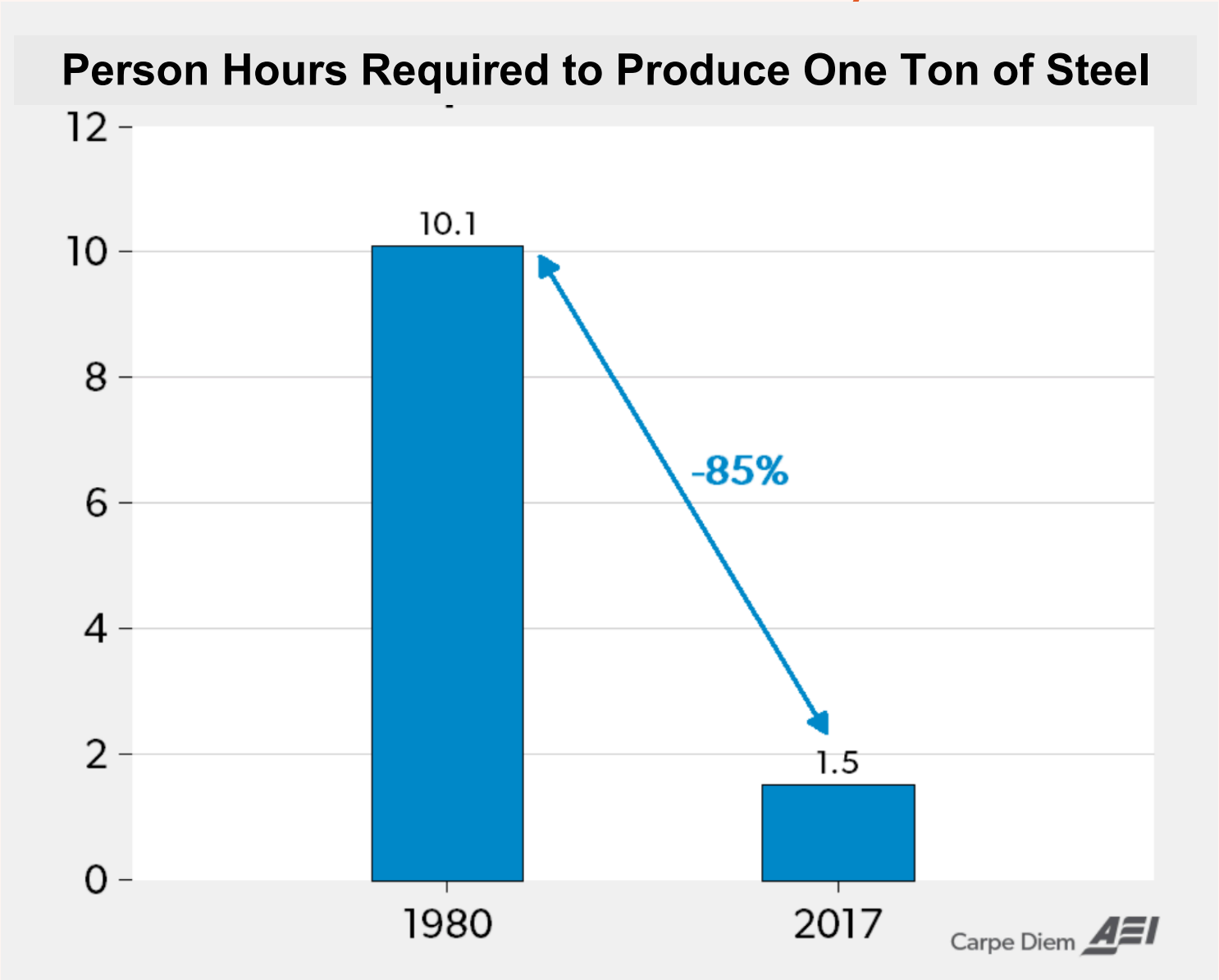


SOURCE: U.S. Bureau of Labor Statistics, Consumer Expenditure Survey

Where Does New Work Come From?

1. Uber effects
2. Walmart effects
3. **Network effects**
4. Invention of new work

Tons of progress: Labor Hours Needed to Produce a Ton of Steel Fell by 85% since 1980



Network Effects: <400K Jobs in Metal-Making, More than 4 Million Jobs in Metal-Using Industries



The Invention of New Work



Frontier Jobs



Wealth Work



Last Mile Jobs

Frontier Jobs Added to U.S. Census, 1980 – 2016

Supervisor, Word Processing (1980)

Circuit Layout Designer (1990)

**Artificial Intelligence Specialist
(2000)**

Echocardiographer (2000)

Wind Turbine Technician (2010)

**Computing Services Director
(2106)**

George Jetson at Work



The Invention of New Work



Frontier Jobs



Wealth Work



Last Mile Jobs

Wealth Work Jobs Added to U.S. Census, 1980 – 2016

Gift wrapper (1980)

Fingernail former (1990)

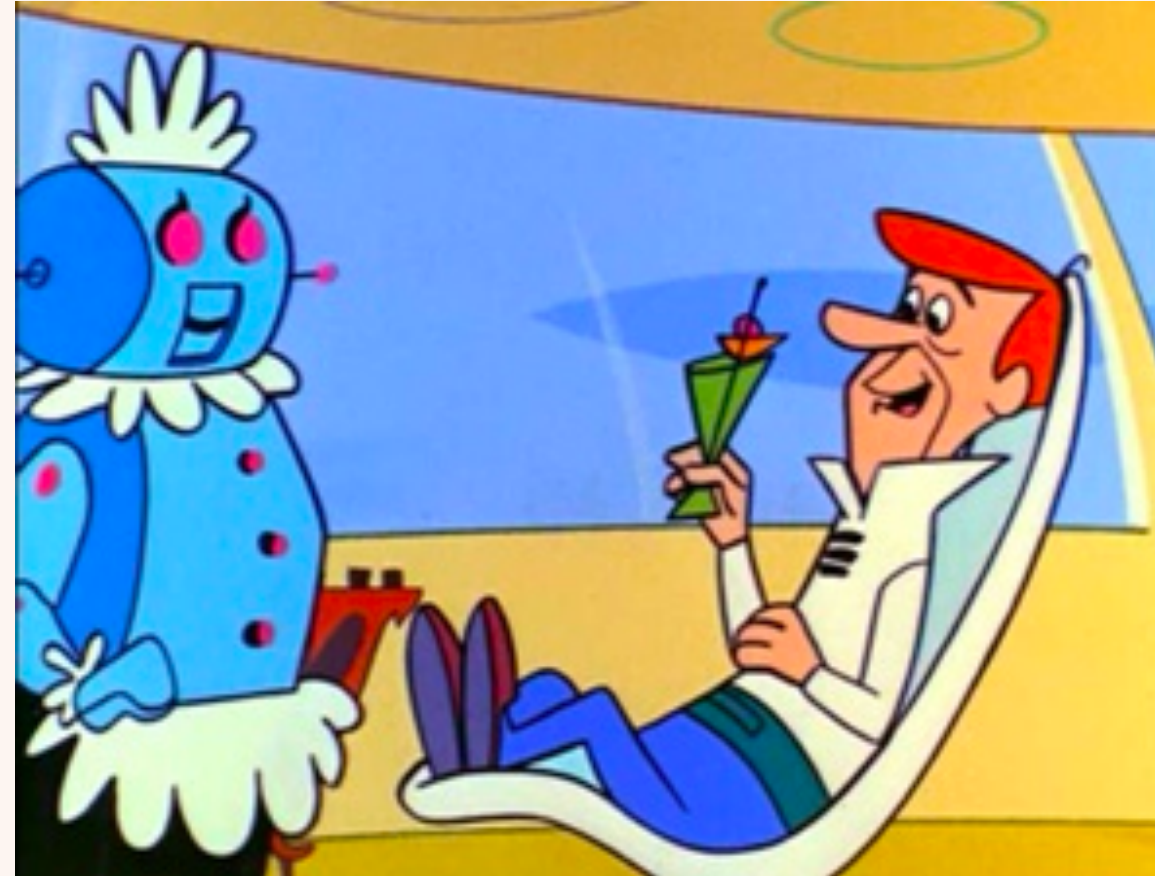
Horse exerciser (2000)

Oyster preparer (2000)

Sommelier (2010)

Golf cart mechanic (2016)

George Jetson @Home



The Invention of New Work



Frontier Jobs



Wealth Work



Last Mile Jobs

Last Mile Jobs Added to Census, 1980 - 2016

Tamale-machine feeder (1980)

**Vending-machine attendant
(1990)**

Chat room host/monitor (2000)

**Underground utility cable locator
(2010)**

Teleprompter (2016)

**Winder, Robotic Football
Players (on the Jetsons)**



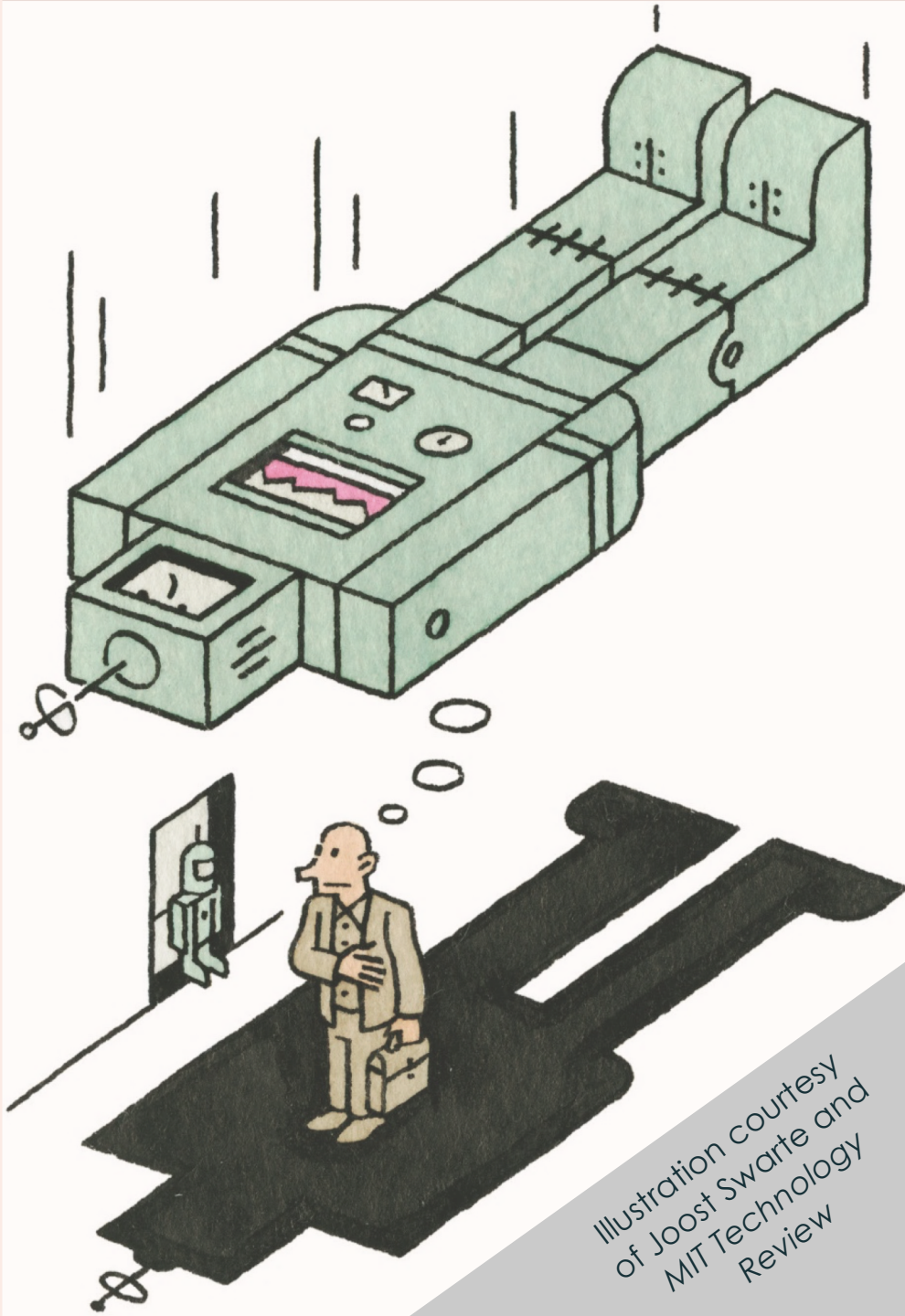


Illustration courtesy
of Joost Swarte and
MIT Technology
Review

**So, Is there Nothing
to Worry About?**

The *Economist* Says: Nothing to Worry About!

The
Economist

Working it

Across the rich world, an extraordinary jobs boom is under way

Many popular perceptions about the modern labour market are wrong

- “The Zeitgeist has lost touch with the data”
- “Many popular perceptions about the modern labour market are wrong”
- “The despondency might be justified were not popular perceptions about the world of work so obviously wrong”



MIT Work of the Future Task Force *Disagrees*

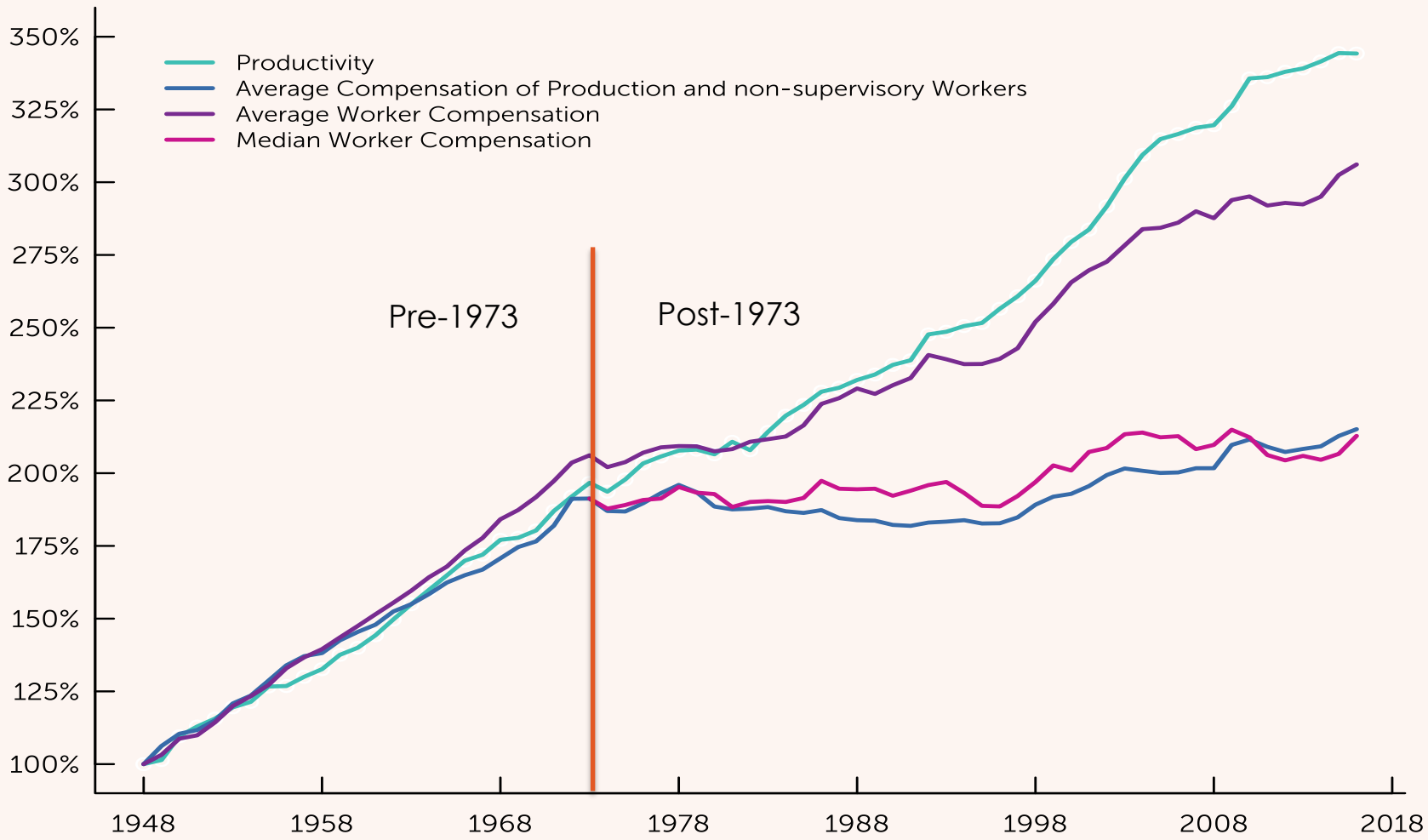
- “Work is a central human activity, critical to self-realization and social cohesion
- Public concern about the future of work is neither ill-informed nor misguided
- The last four decades of economic history show that technological progress will likely deliver rising productivity
- But there is no certainty that the fruits of this bounty will reach the typical worker”

The Work of the Future:
Shaping Technology and Institutions



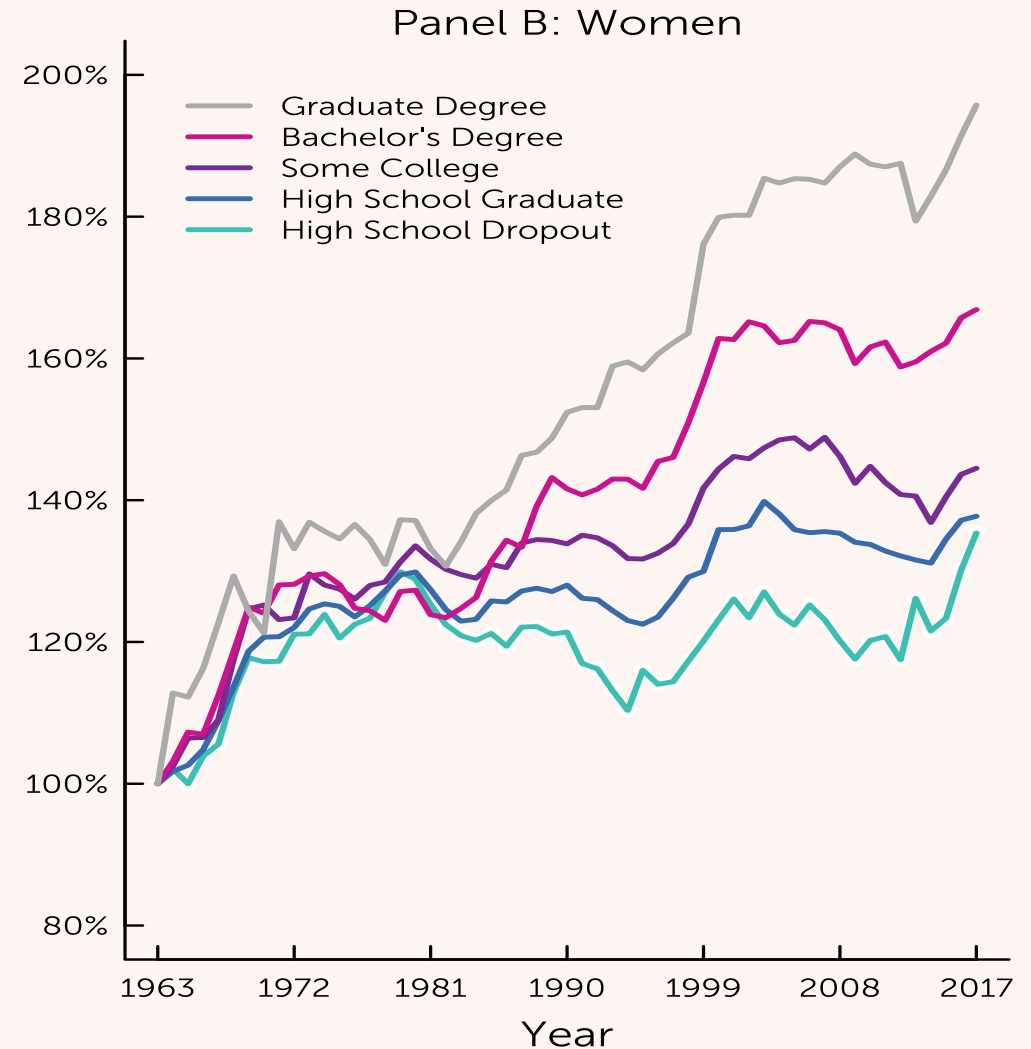
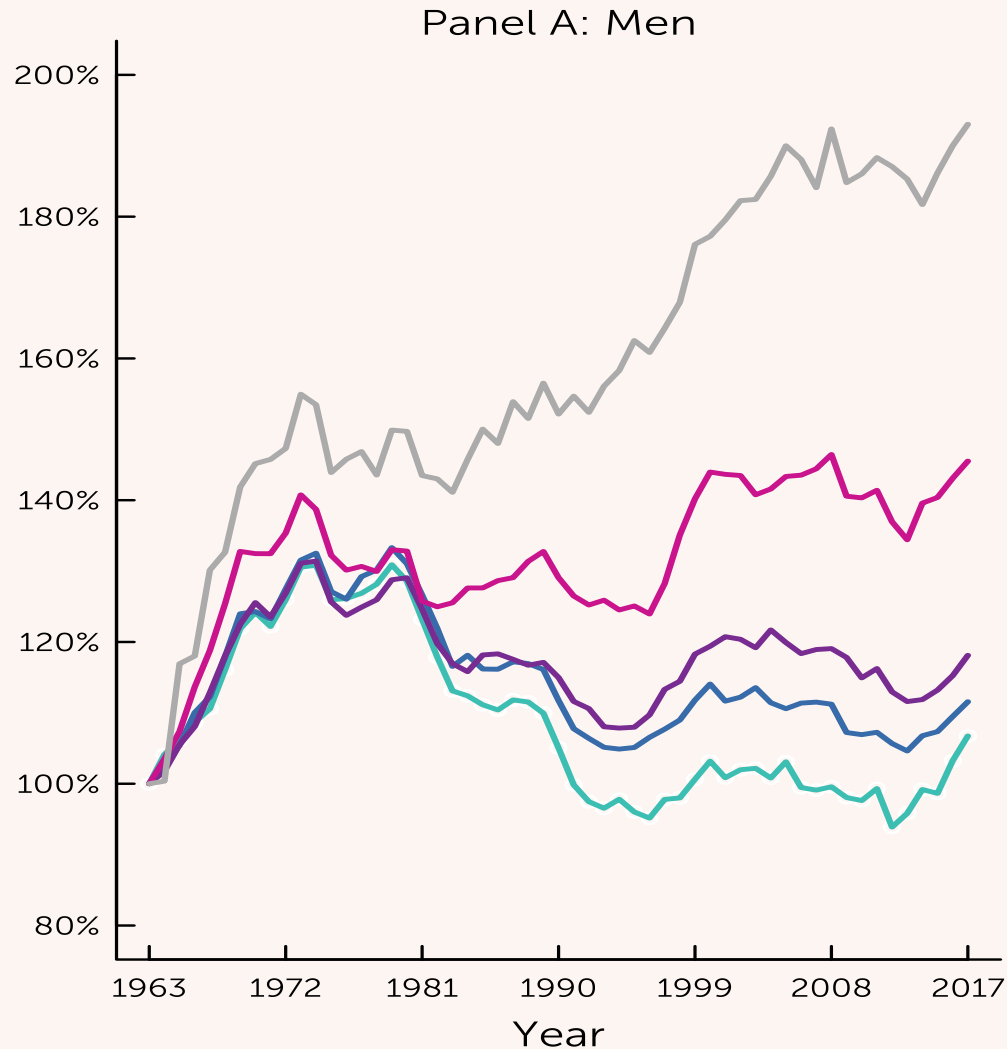
The Parallel and then Diverging Path of Productivity and Earnings in the U.S., 1948 – 2017

Figure 2: Changes in Labor Productivity and Compensation, 1948-2016

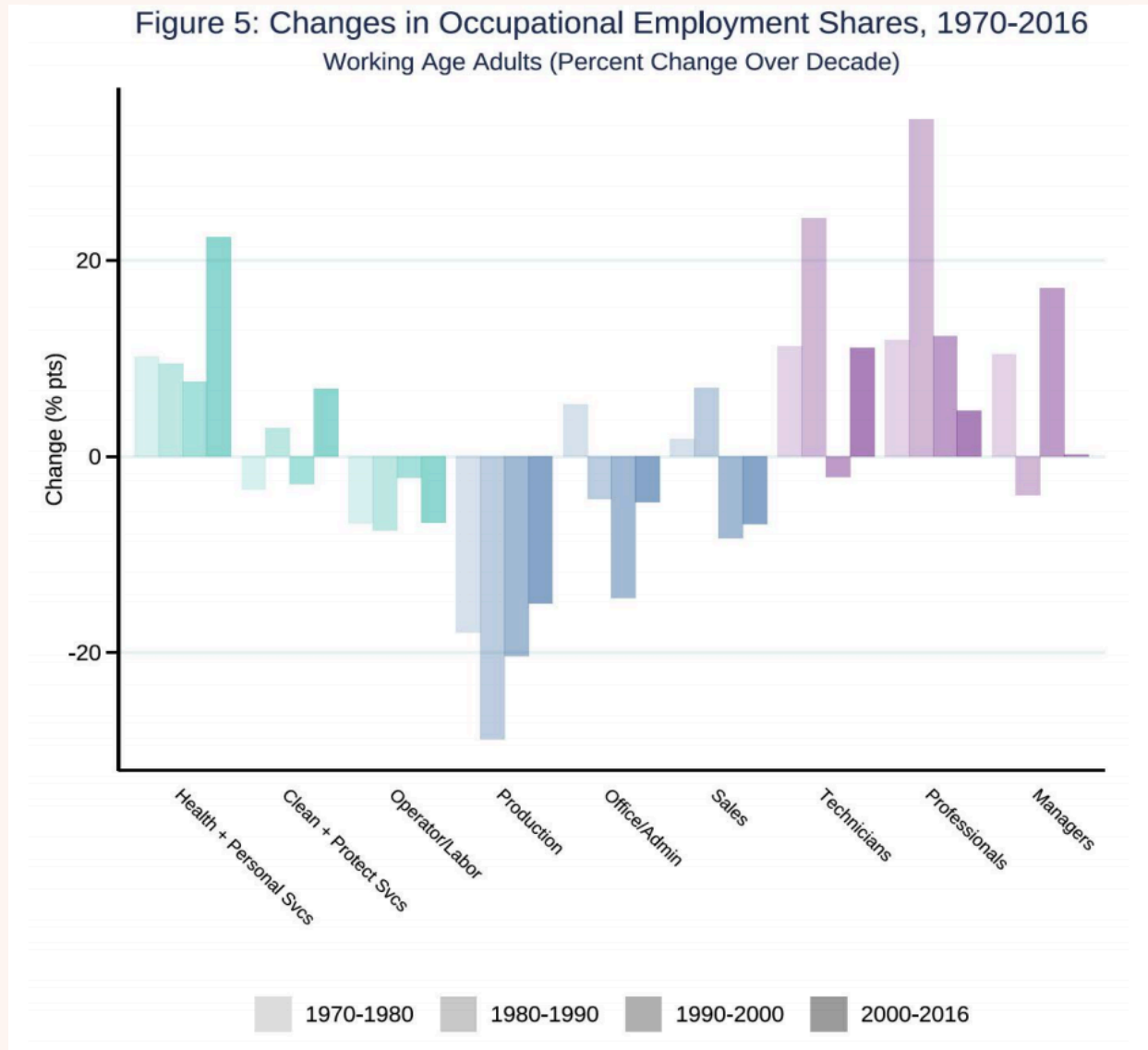


The Steep Rise of Earnings Inequality in the U.S. Labor Market from 1980 to Present

Figure 1: Cumulative Change in Real Weekly Earnings of Working-Age Adults Ages 18-64



The Polarization of Work: Specialized vs. Commodified Jobs



Specialized jobs: *Growing*

- Professional, technical, and managerial jobs

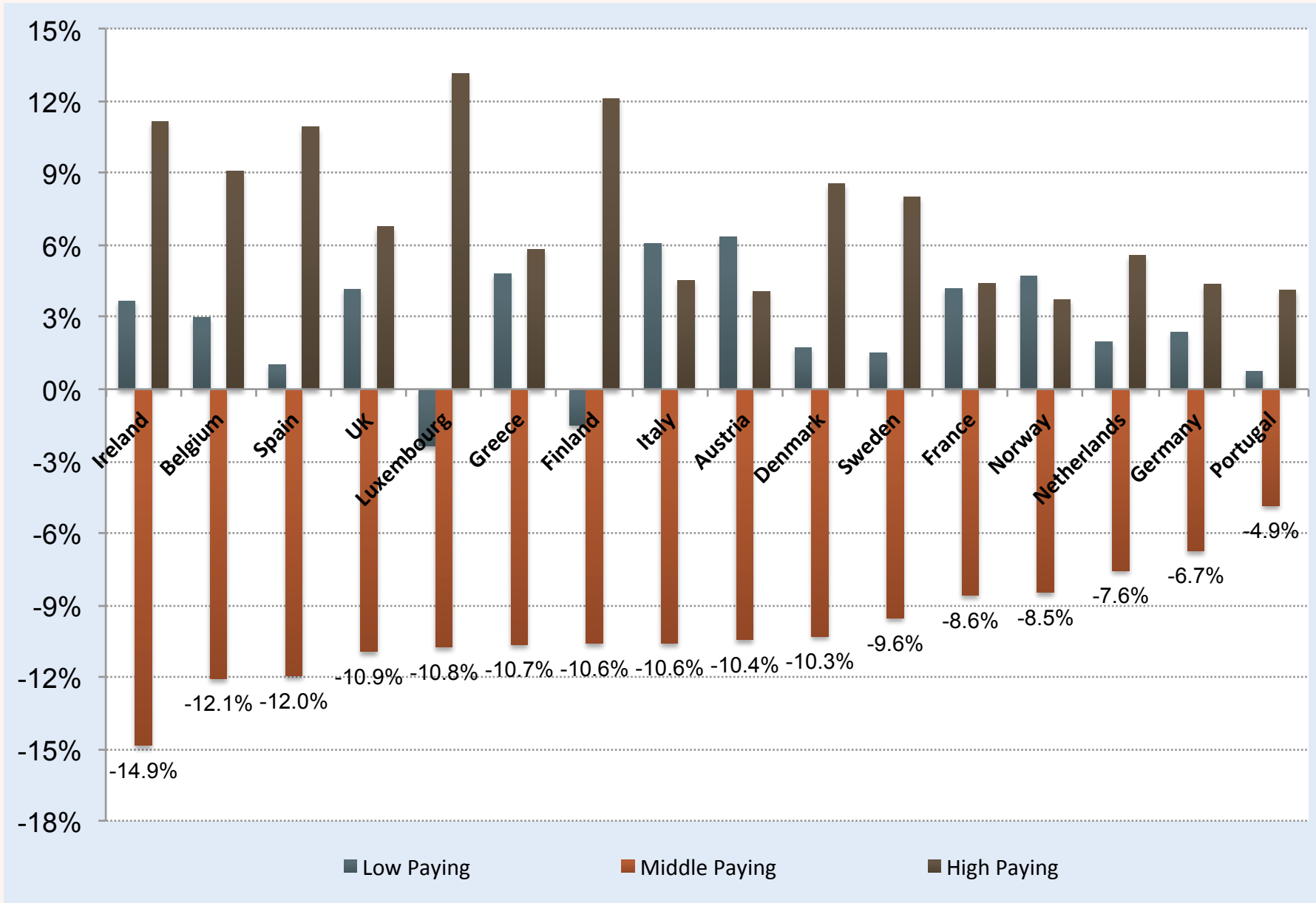
Commodified jobs: *Growing*

- Personal services — cleaning, security, recreation, health aides

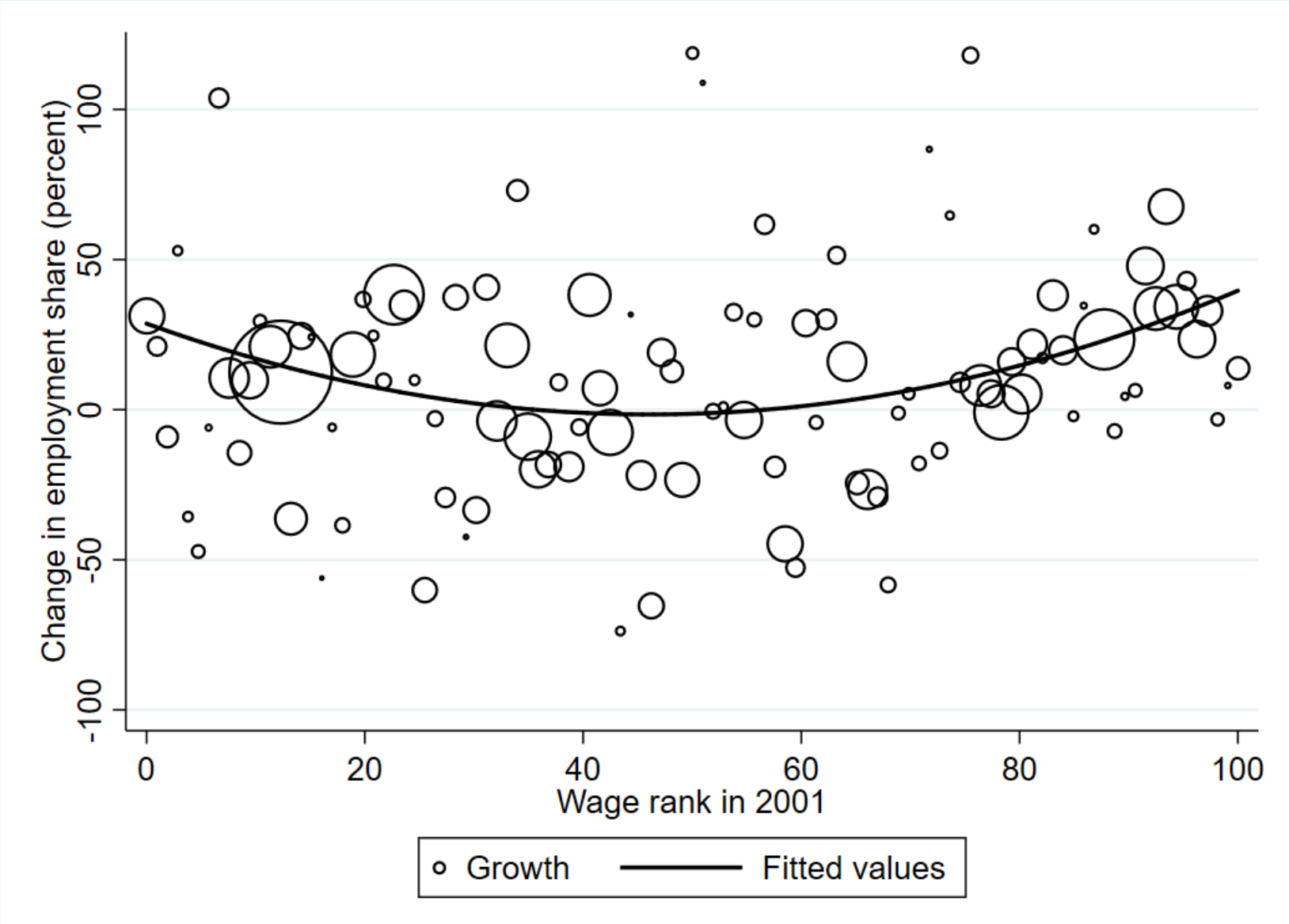
Middle-skill jobs: *Shrinking*

- Production work, office/clerical, and sales

Polarization of Work: European Union, 1993 – 2010



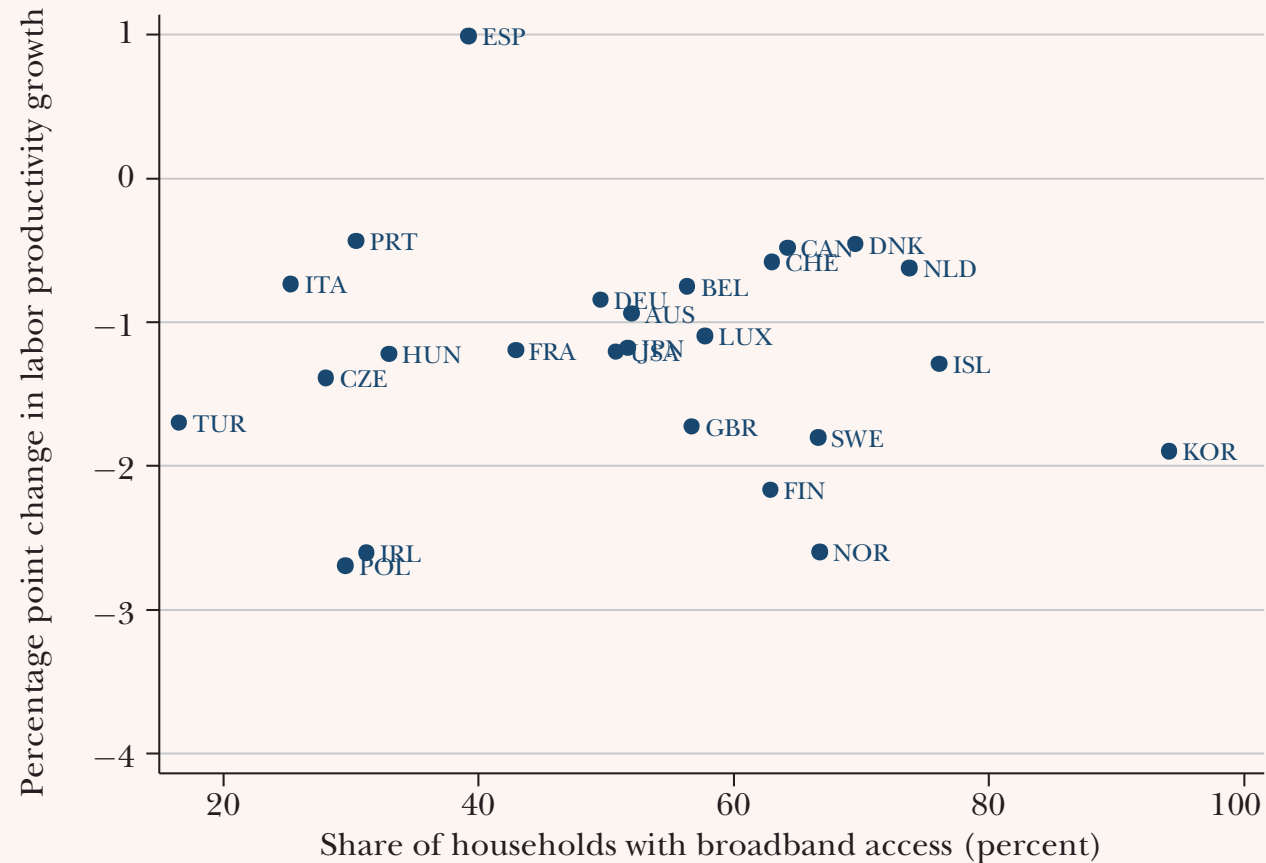
Polarization of Work: Sweden, 2001 – 2013



Productivity Growth **Slowed** in Most Rich Countries after 2004

Change in Labor Productivity Growth versus Information and Communication Technology (ICT) Intensity

A: Labor Productivity Growth Change between 1995–2004 and 2005–2015 versus Share of Households with Broadband Access ($N = 25$ OECD countries)



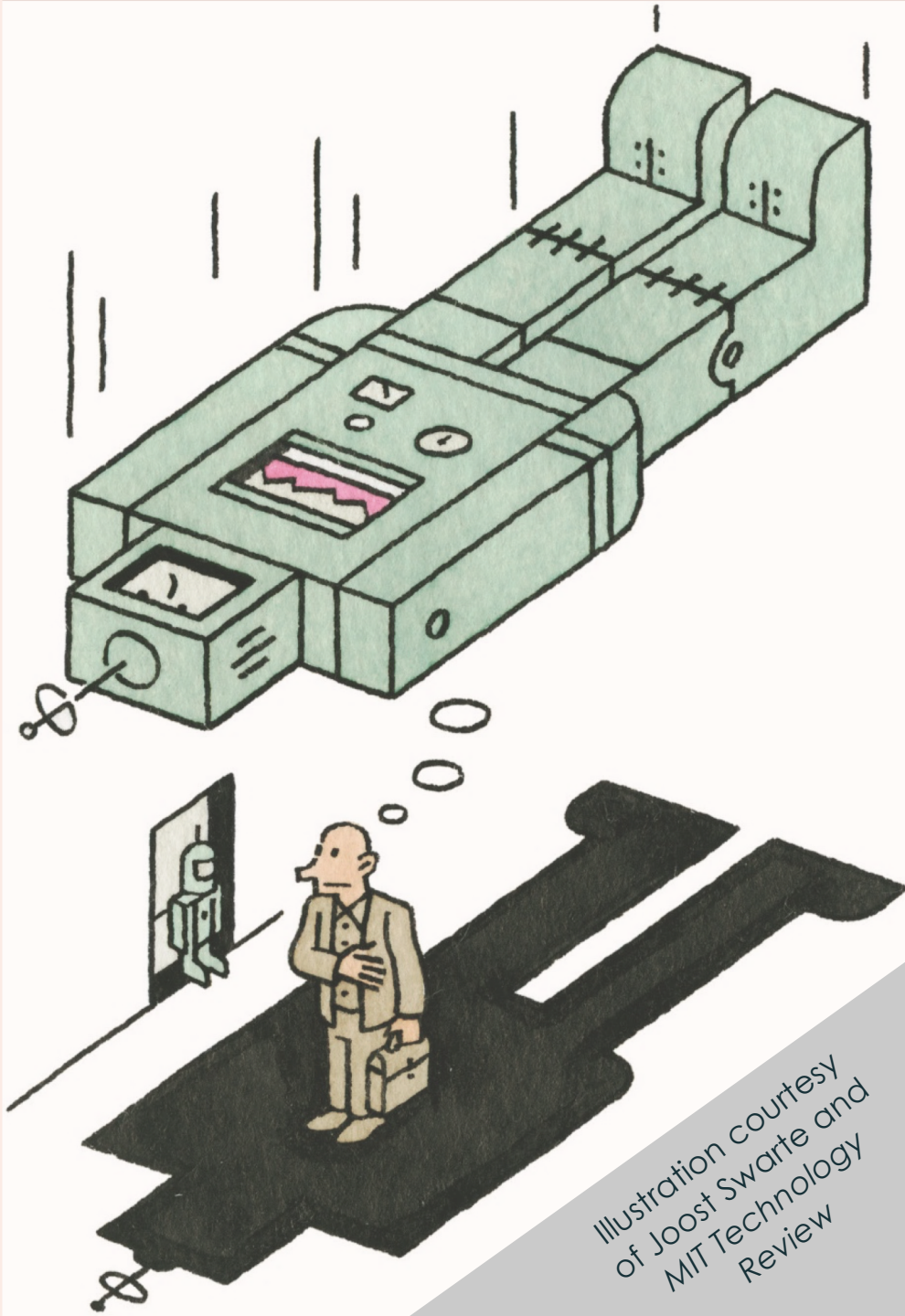


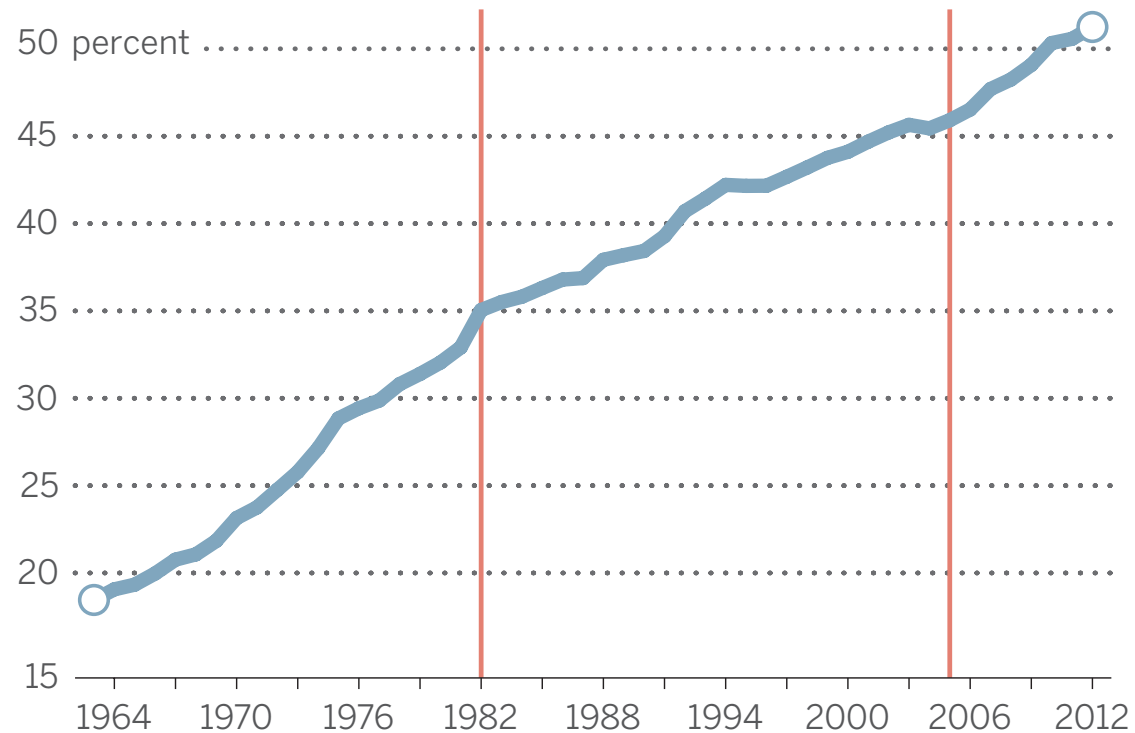
Illustration courtesy
of Joost Swarte and
MIT Technology
Review

Challenges and Opportunities

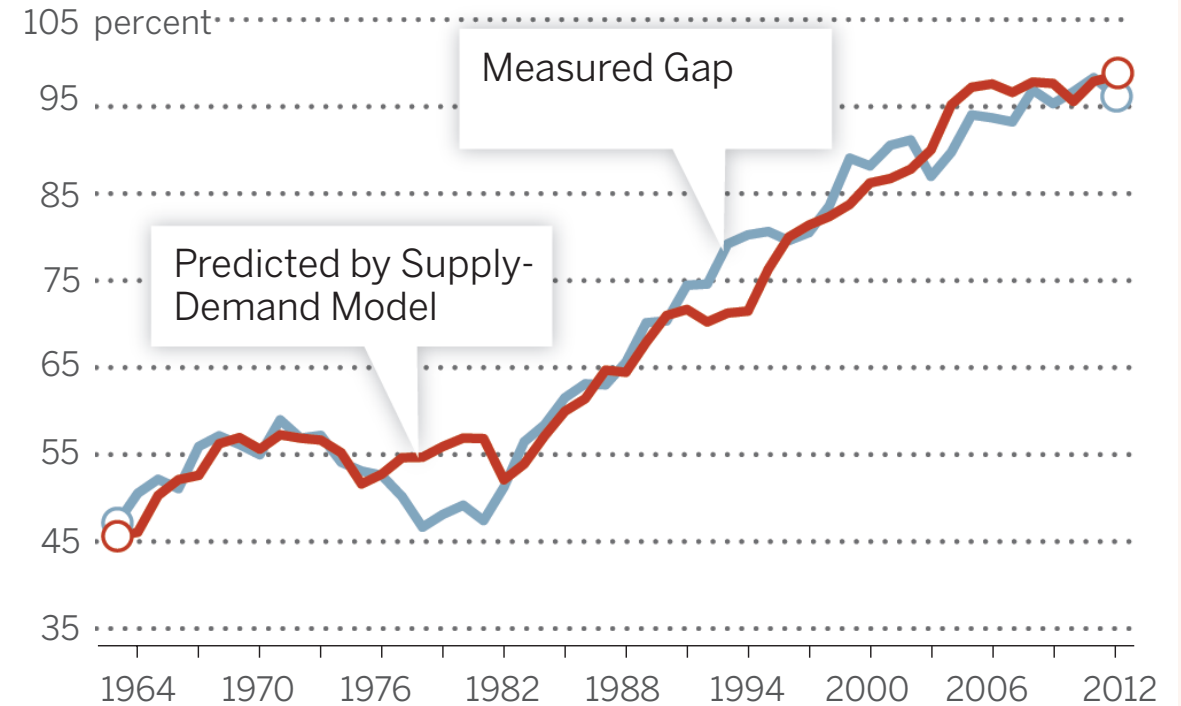
1. Raising Skills at the Pace of Technological Advancement

The supply of college graduates and the U.S. college/high school premium, 1963–2012

College share of hours worked (%), 1963–2012:
All working-age adults



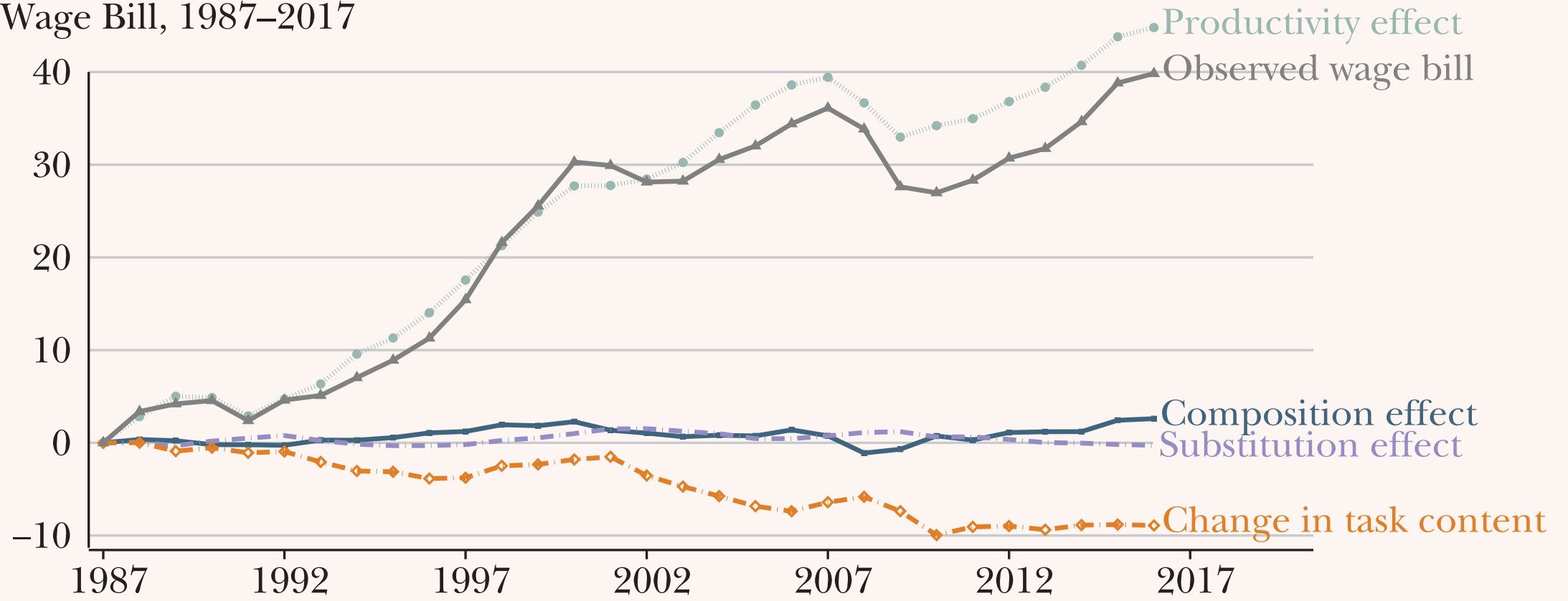
College versus high school wage gap (%)



2. Aligning Incentives to Invest in **Both** Human **and** Physical Capital

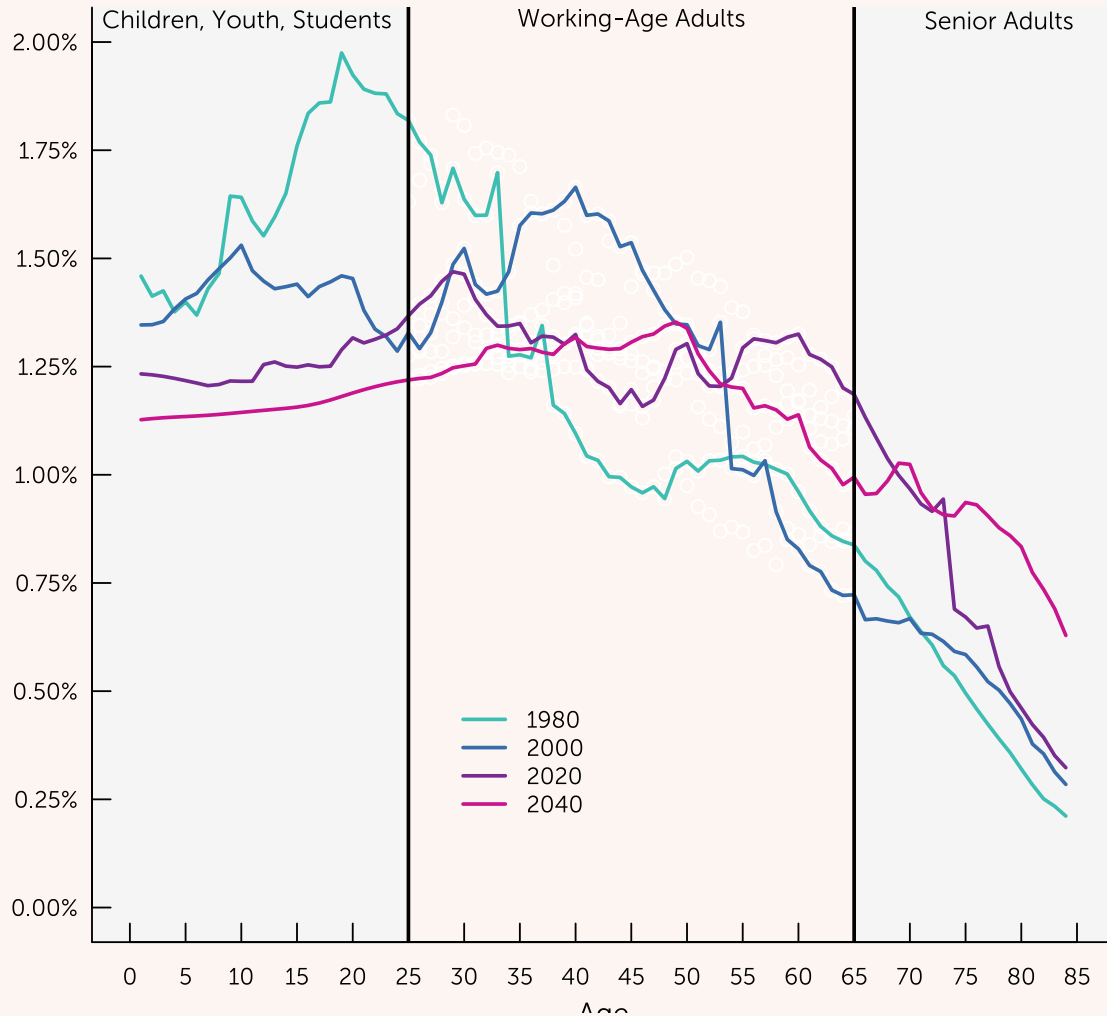
Sources of Changes in Labor Demand, 1987–2017

A: Wage Bill, 1987–2017



3. Addressing **Labor Scarcity** by Raising Productivity, Improving Job Quality

Figure 4: The Working-Age Share of the U.S. Population is Contracting



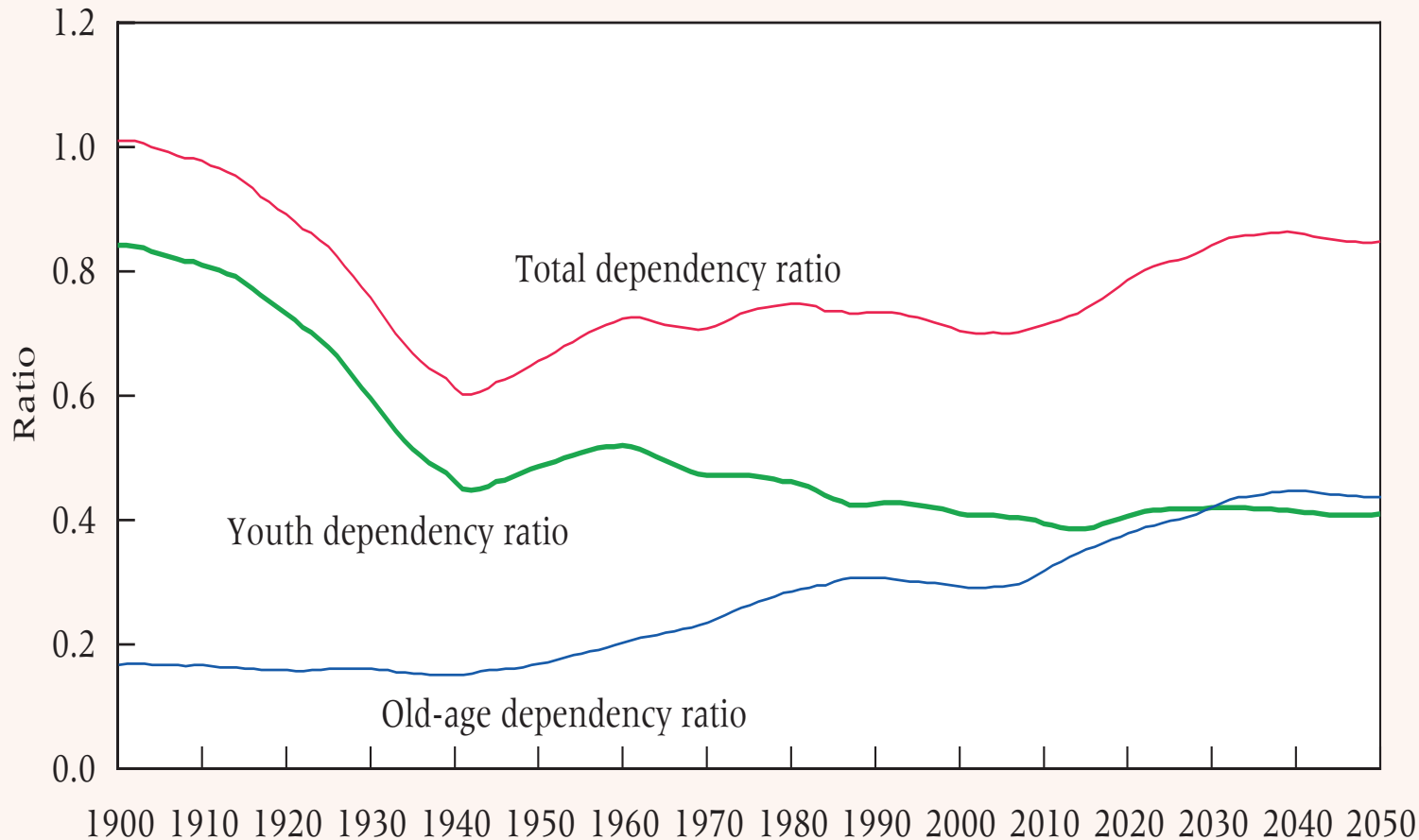
U.S. will face persistent shortage of workers in service & care jobs

1. Aging Baby Boom cohorts
2. Low and falling fertility
3. Declining immigration
4. Rising educational attainment

Japan as the extreme scenario
– a huge challenge

3. Addressing **Labor Scarcity** by Raising Productivity, Improving Job Quality

FIGURE 1 Young-age, old-age, and total dependency ratios for persons aged 20–65 years, Sweden 1900–2008 and estimates to 2050



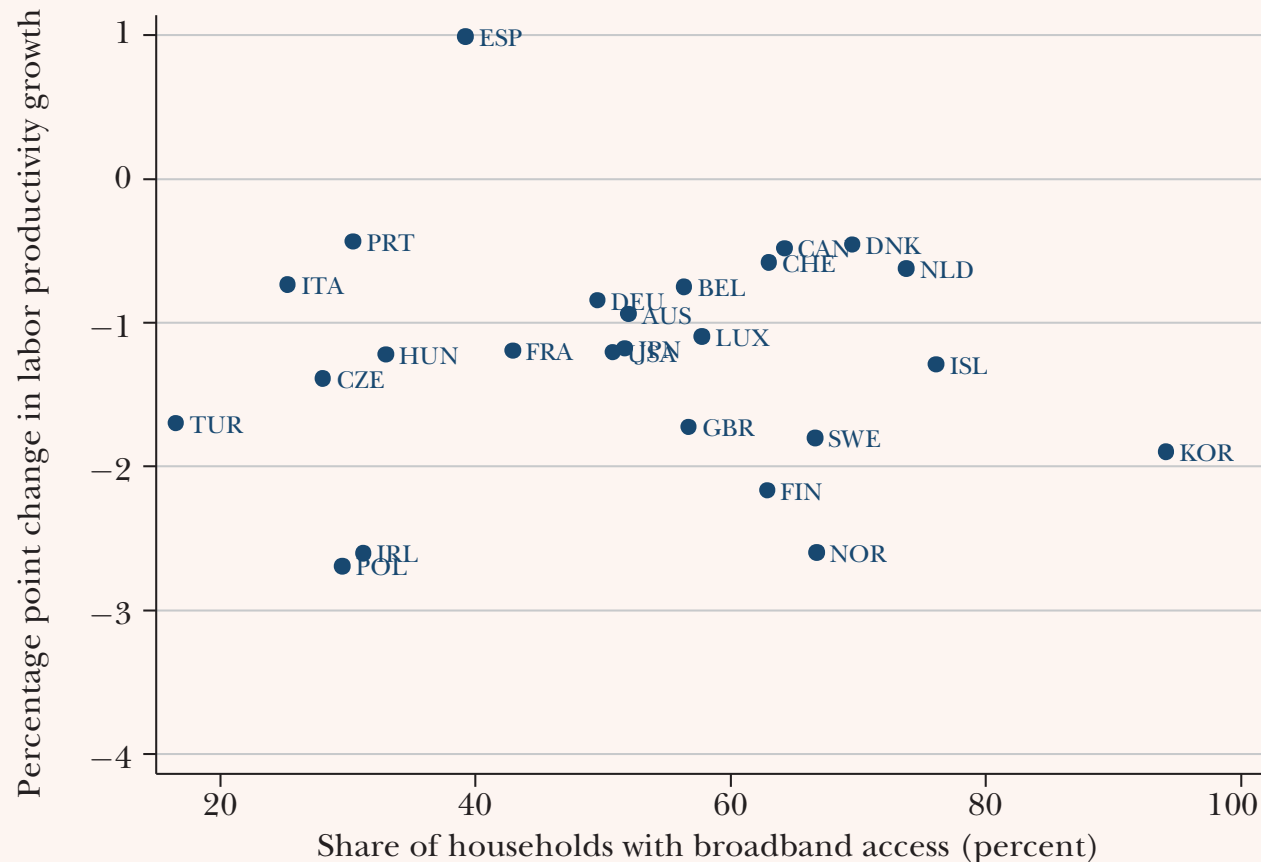
In Sweden, as in *Many* Developed Countries, Old-Age Dependency Ratio is Rising

Source: Statistics Sweden 2004;
Bengtsson and Scott 2011

4. Steering Innovation Towards Raising Productivity, not Simply Displacing Labor

Change in Labor Productivity Growth versus Information and Communication Technology (ICT) Intensity

A: Labor Productivity Growth Change between 1995–2004 and 2005–2015 versus Share of Households with Broadband Access ($N = 25$ OECD countries)



Productivity Fell Steeply Growth in Most Rich Countries after 2004

- No universally agreed explanation
- AI and robotics not yielding miracles so far
- *Perhaps these technologies are mis-directed*
- 'So-so' technologies

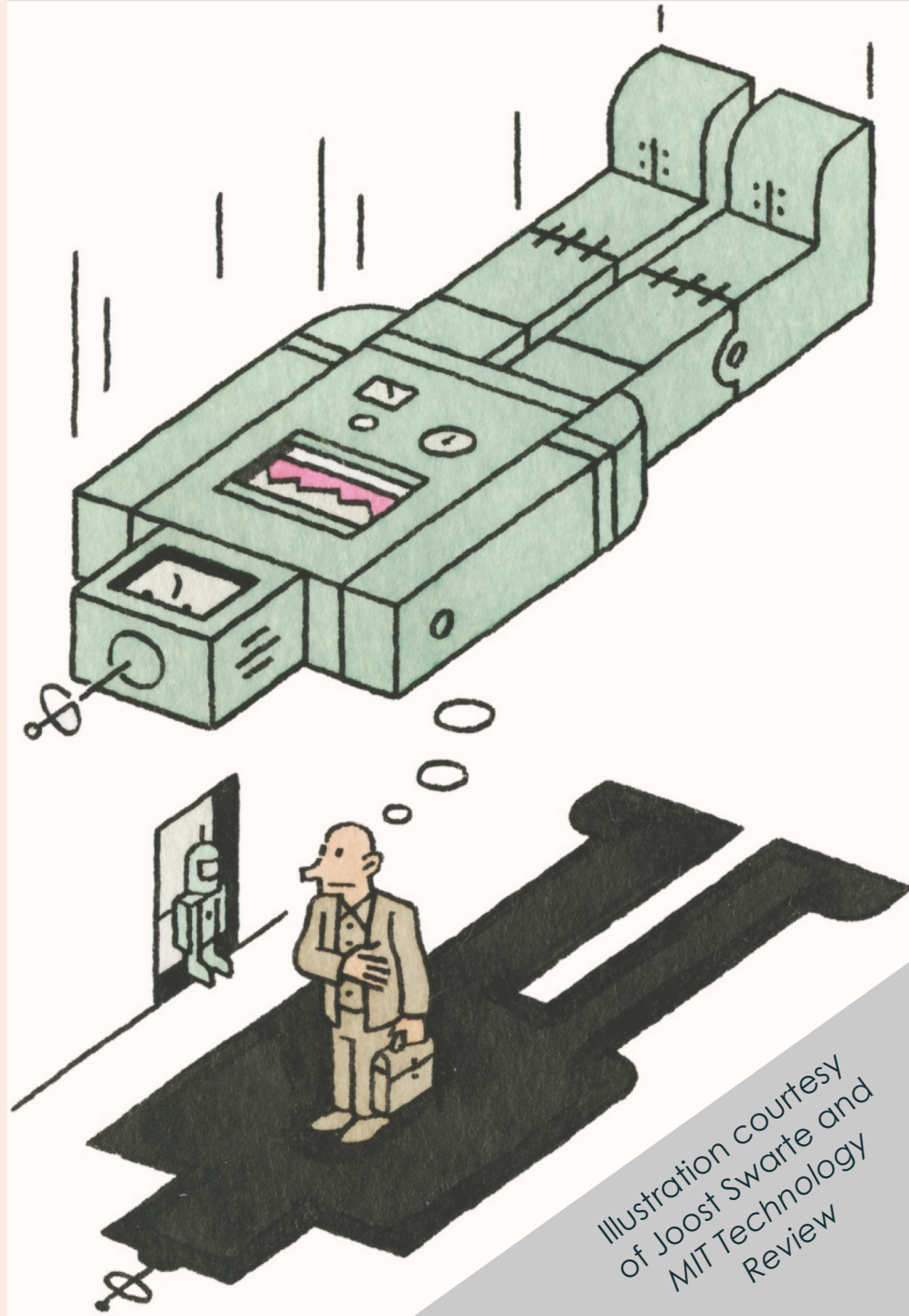


Illustration courtesy
of Joost Swarte and
MIT Technology
Review

Conclusion:
*The Future Will Not
Take Care of Itself*

The Work of the Future: Shaping Technology and Institutions

1. The challenge ahead is *not* scarcity of jobs
2. Abundant *jobs* do *not* guarantee abundant *good* jobs
3. Abundant technology does *not* guarantee fast *productivity growth* or *shared prosperity*
4. The future will not take care of itself!

Thank you