Using Technology to Address Labor Shortages

May 28, 2019

Some of the critical questions and issues we will be answering today

- How quickly have companies managed to use technology to replace workers in recent years?
- In what occupation categories has the most progress been made?
- How does this compare to predictions made by others?
- How will these trends change in the future?
- What are some of the challenges businesses face in adopting labor replacing technology?

Today's Presenters

Michael Chui, Ph.D.
Partner
McKinsey Global Institute

Gad Levanon, Ph.D.
Chief Economist, North America
The Conference Board

Brian Schaitkin (Moderator)
Senior Economist
The Conference Board

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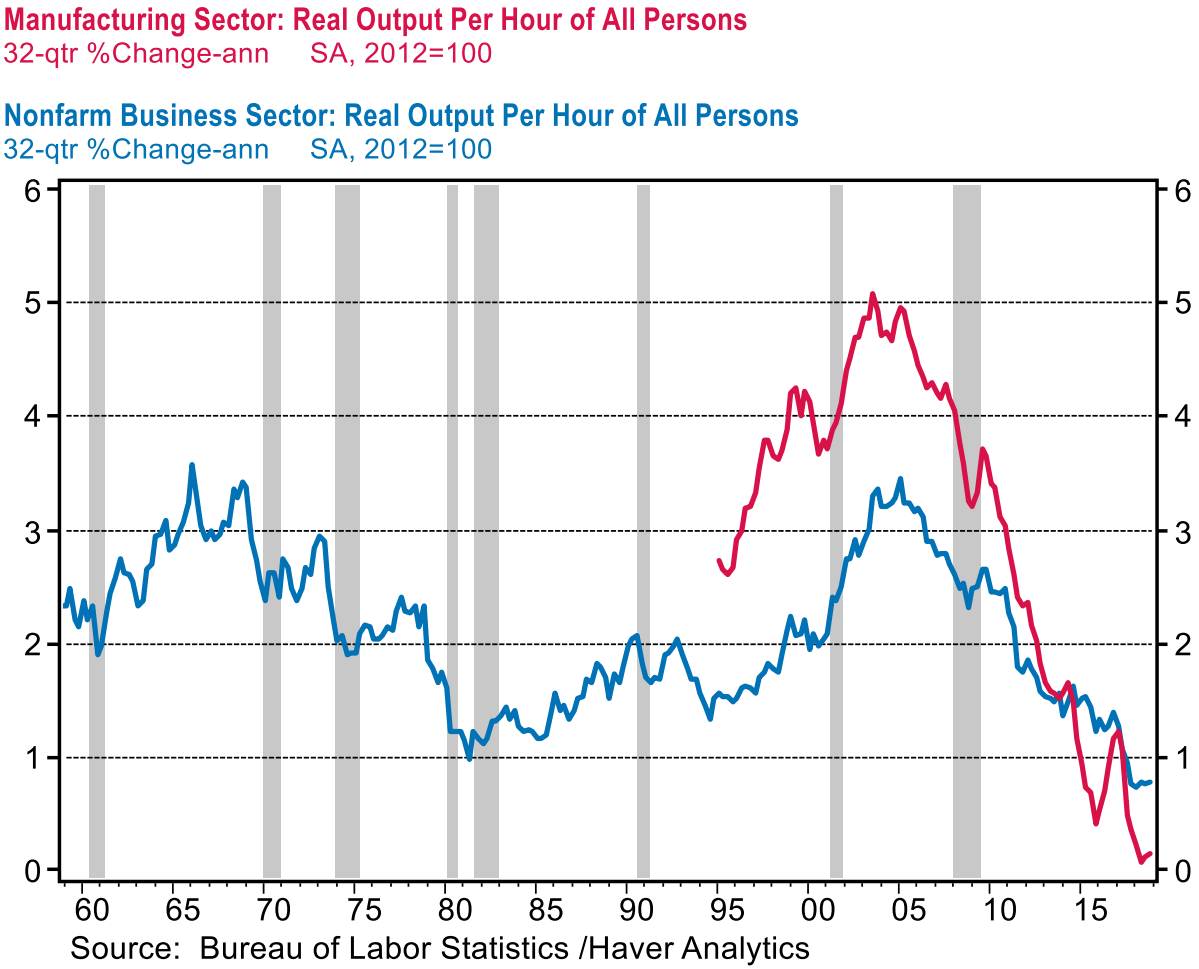
Tight labor markets create incentive for companies to look to technology as a solution to labor shortages

- Labor shortages are a major business problem now, and may get more severe in the future, as baby boomers continue to retire
- Especially for blue-collar and low-paid service workers
- Employers are staring to react to the growing labor shortages
- Automation represents a potential solution for many jobs where qualified workers are increasingly difficult to find
- However, the period since the great recession has been a disappointing one for technologically driven job displacement
- In this project we study the current and future potential for automation to solve labor shortages

What can companies and governments do to address present and future labor shortages?

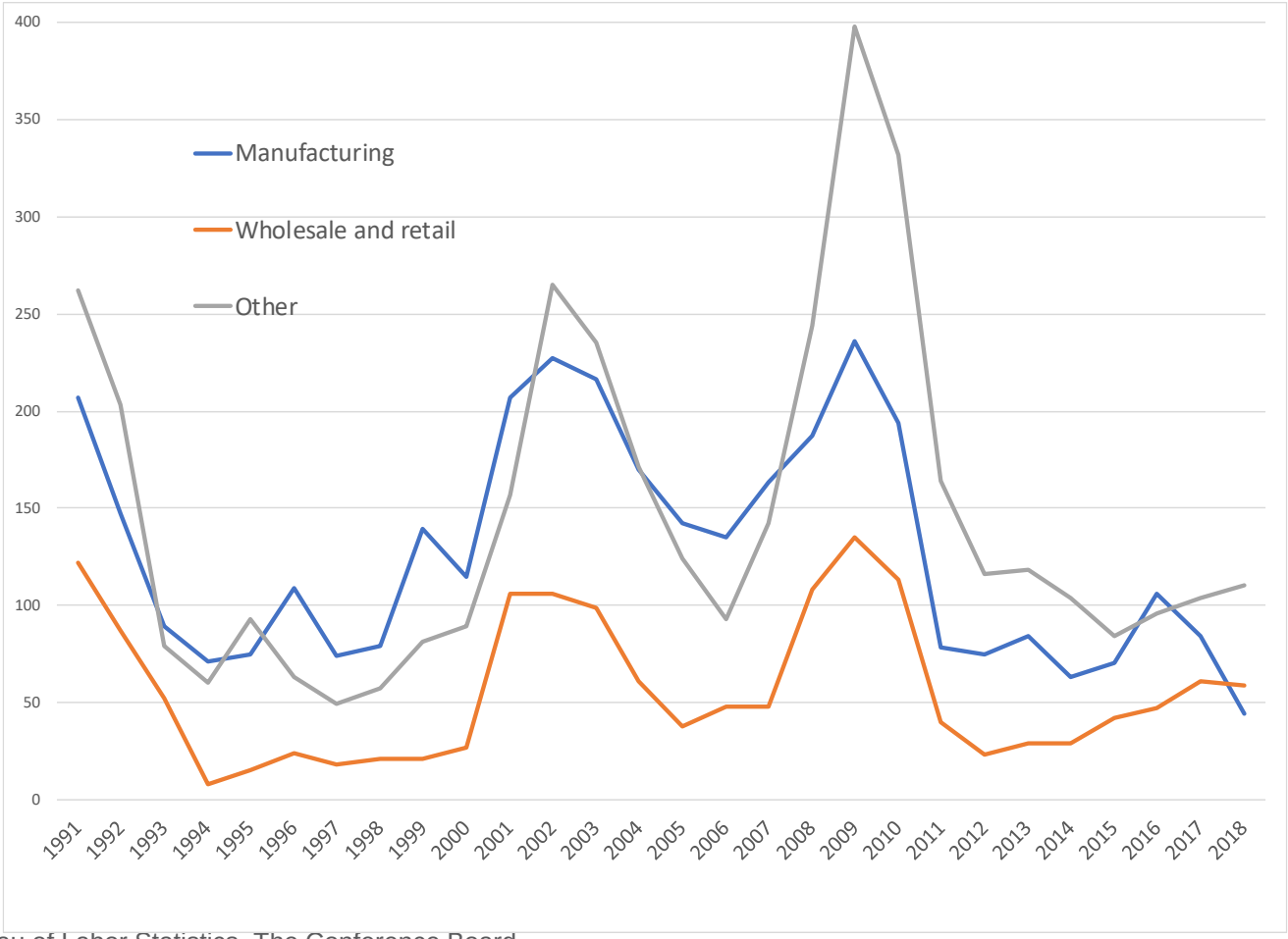
- Expand recruiting efforts:
  - ✓ Less educated workers – and increase training
  - ✓ Women
  - ✓ Minorities
- When possible, relocate to areas with higher labor availability
- Raise compensation
- **Automate**

Productivity growth has been historically weak in the last decade – little job displacement by technology



In manufacturing it is now harder to further cut employment

Number of industries seeing declining employment



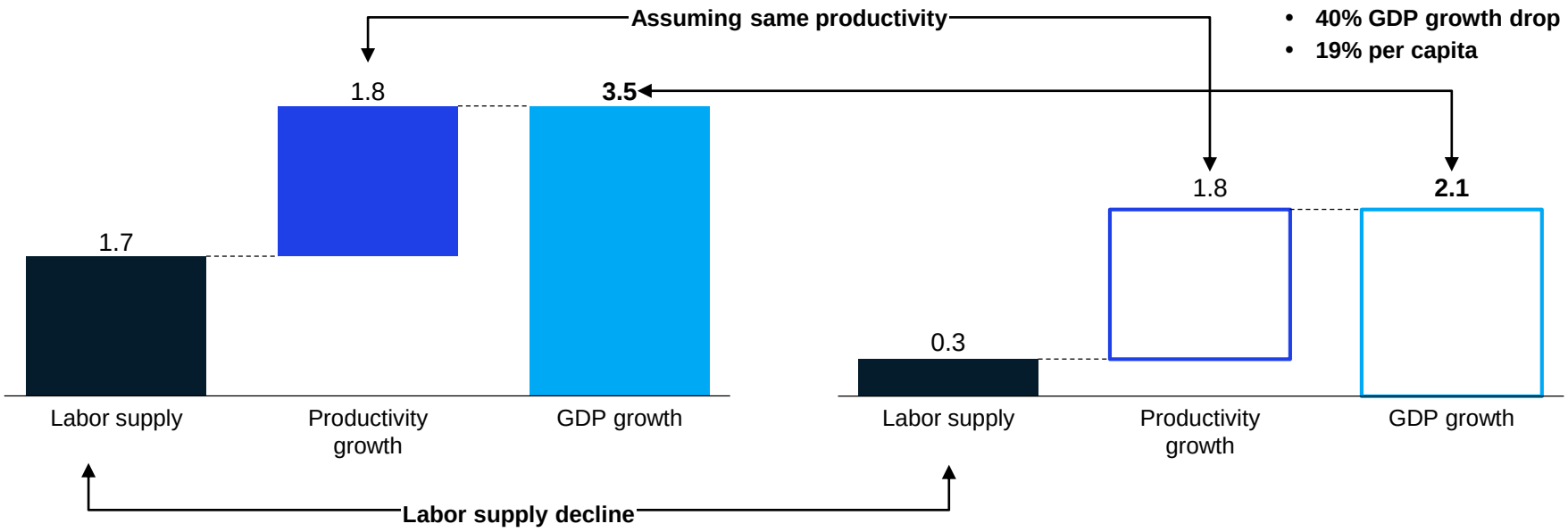
Source: Bureau of Labor Statistics, The Conference Board

How will demography affect economic growth?

Productivity matters… and will only matter more as the world's population ages

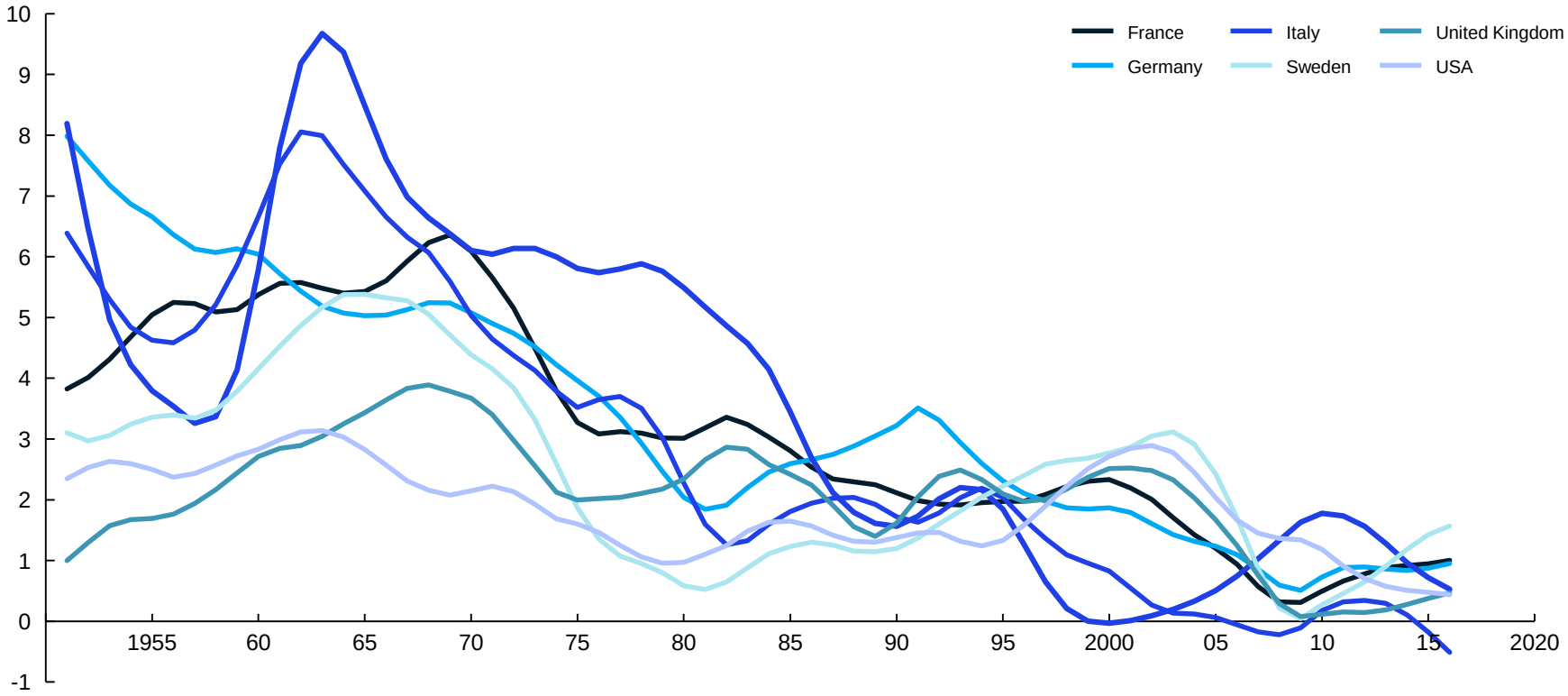
Last 50 years of growth,
1964-2014 CAGR for G19+Nigeria %

Next 50 years of growth
CAGR for G19+Nigeria, %



Productivity growth has been declining since the 1960s across developed economies and stands at historic lows in most economies

Labor productivity growth, % year over year



Will there be enough work to keep people employed as more AI, robots and automation are deployed?

Analyze the effects of AI, robotics and automation at the level of individual activities, not just occupations

Occupations

1. Retail sales-people
2. Food and beverage service workers
3. Teachers
4. Health practitioners
- ...
- …
- …

~800 occupations

Activities
(retail example)

- Greet customers
- Answer questions about products and services
- Clean and maintain work areas
- Demonstrate product features
- Process sales and transactions
- ...
- …
- …

~2,000 activities assessed across all occupations

Capability requirements

Physical
- Fine motor skills/dexterity
- Gross motor skills
- Navigation
- Mobility

Sensory
- Sensory perception

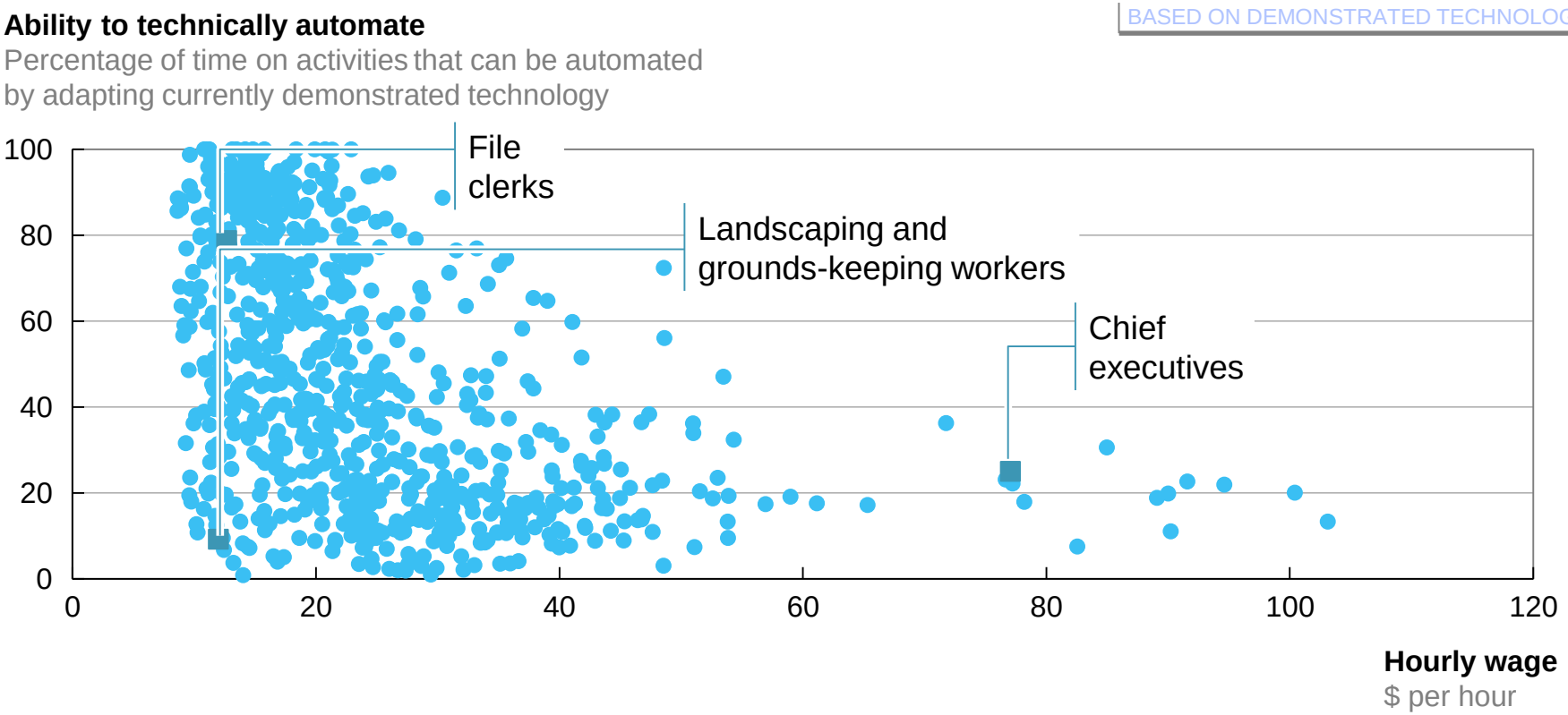
Cognitive
- Retrieving information
- Recognizing known patterns / categories (supervised learning)
- Generating novel patterns / categories
- Logical reasoning / problem solving
- Optimizing and planning
- Creativity
- Articulating/display output
- Coordination with multiple agents

Natural language processing
- Understanding natural language
- Generating natural language

Social
- Social and emotional sensing
- Social and emotional reasoning
- Emotional and social output

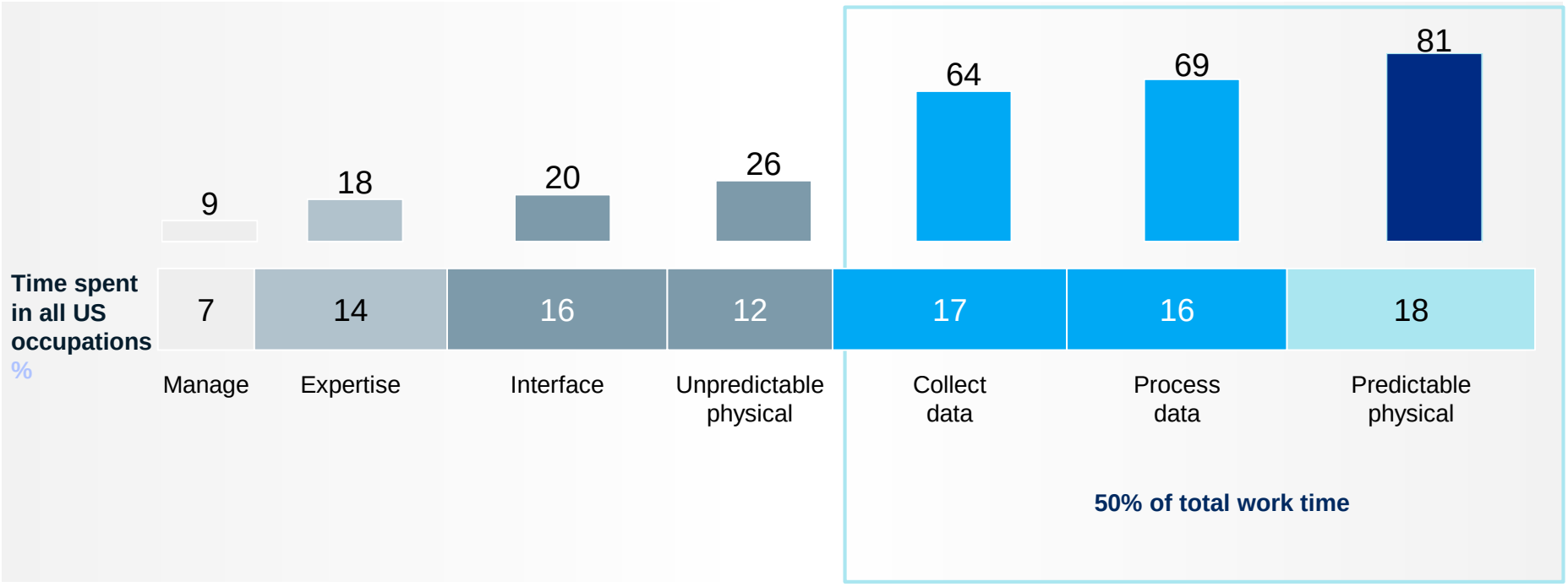
Technology has the potential to impact a significant percentage of most occupations

BASED ON DEMONSTRATED TECHNOLOGY

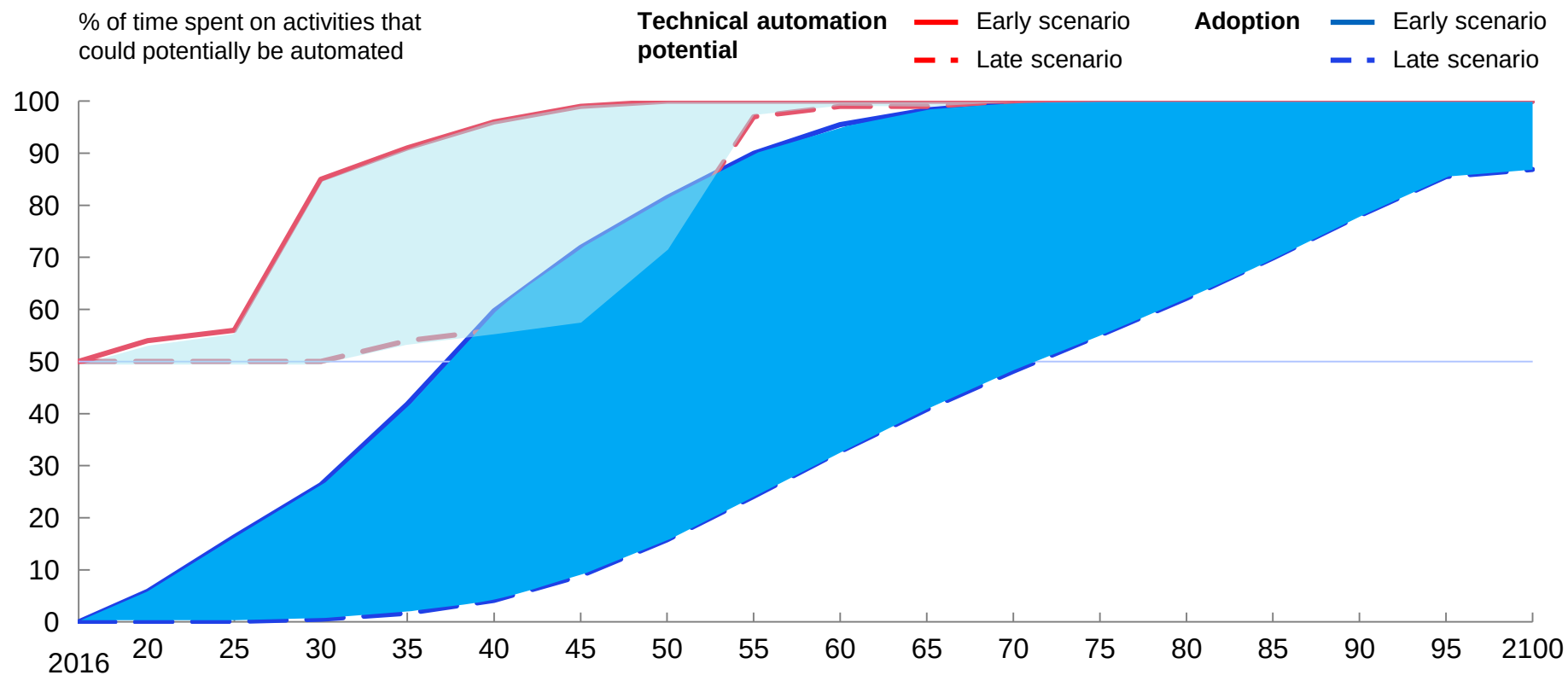


Three types of activities have the highest technical potential for automation

Time spent on activities that can be automated by adapting currently demonstrated technology
Percent



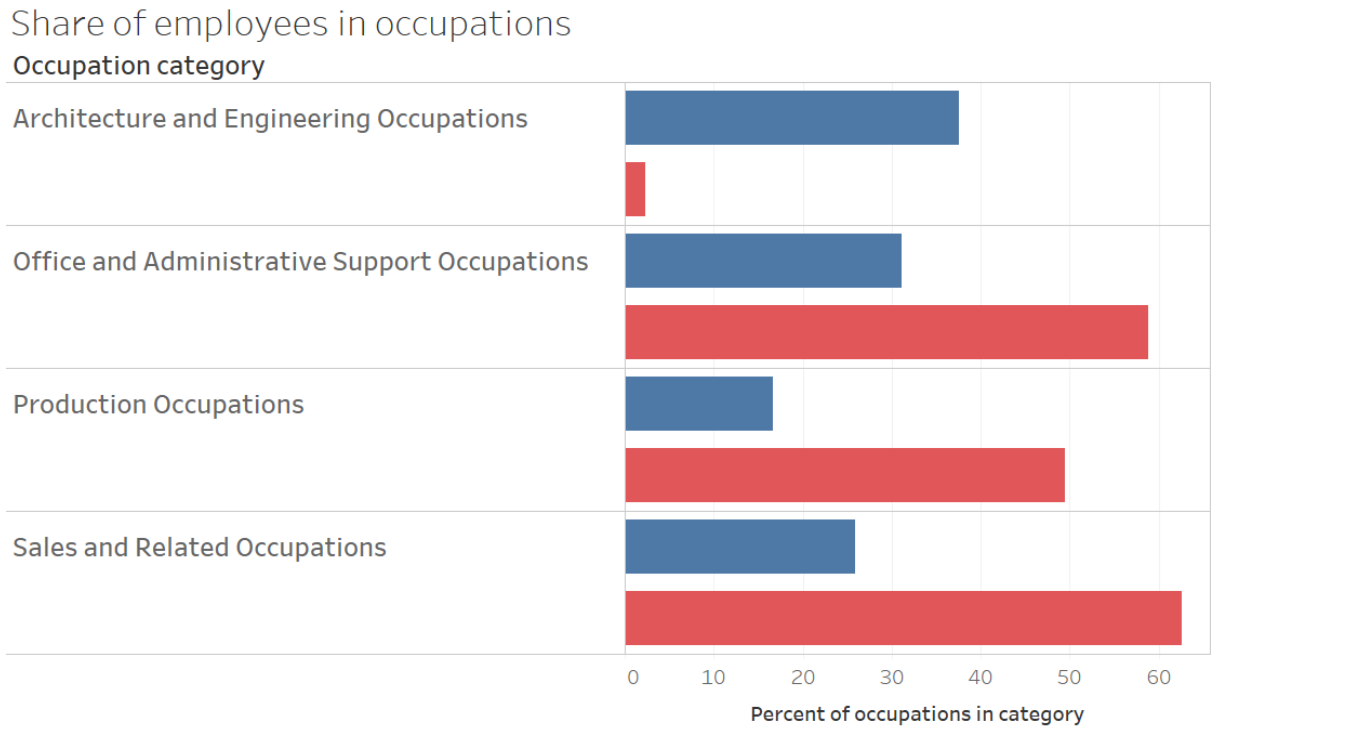
Slow in macro, fast in micro: Automation of existing activities will take decades across economy



Examining post-recession job data for clues about recent automation trends

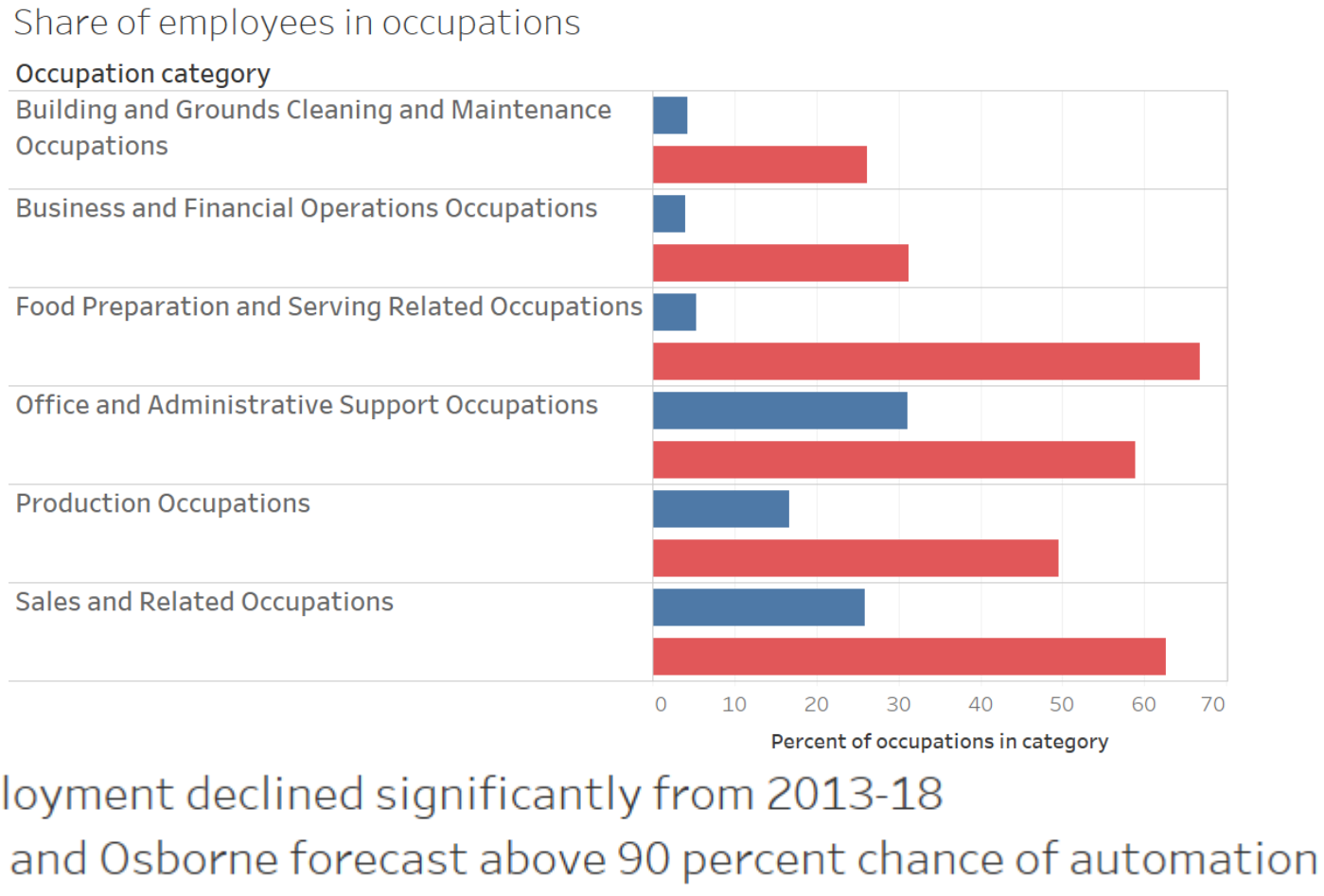
- Use OES data to identify occupations where employment has significantly declined between 2013-18
- Through this process we identified more than 200 occupations, with a large concentration in several categories including:
  - ✓ Office and administration
  - ✓ Sales
  - ✓ Some production categories
  - ✓ Architectural and engineering technicians
- A well known 2013 study by two University of Oxford economists, finds high risks automation risks in **food preparation**, **business and financial**, and **transportation** as well
- Some employment declines may also reflect offshoring and consumer preference trends

In some select occupations a large portion of workers are in jobs with declining recent employment numbers



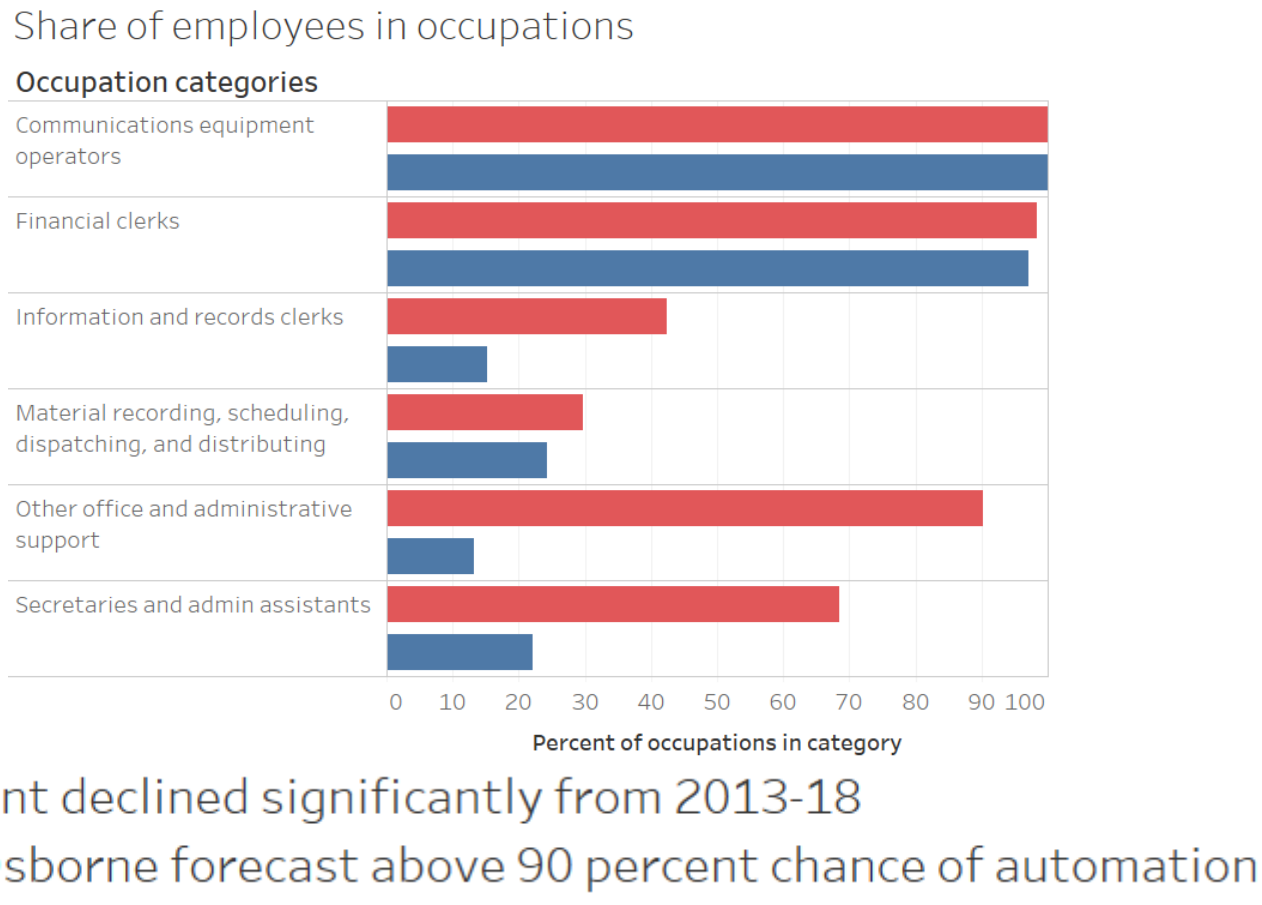
Source: Frey and Osborne (2013), Bureau of Labor Statistics, The Conference Board

In categories where predicted automation was high, only office and sales jobs have seen broad recent declines



Source: Frey and Osborne (2013), Bureau of Labor Statistics, The Conference Board

Within office and administration jobs, functions requiring data collection, data processing, and repetitive physical tasks are most vulnerable to automation

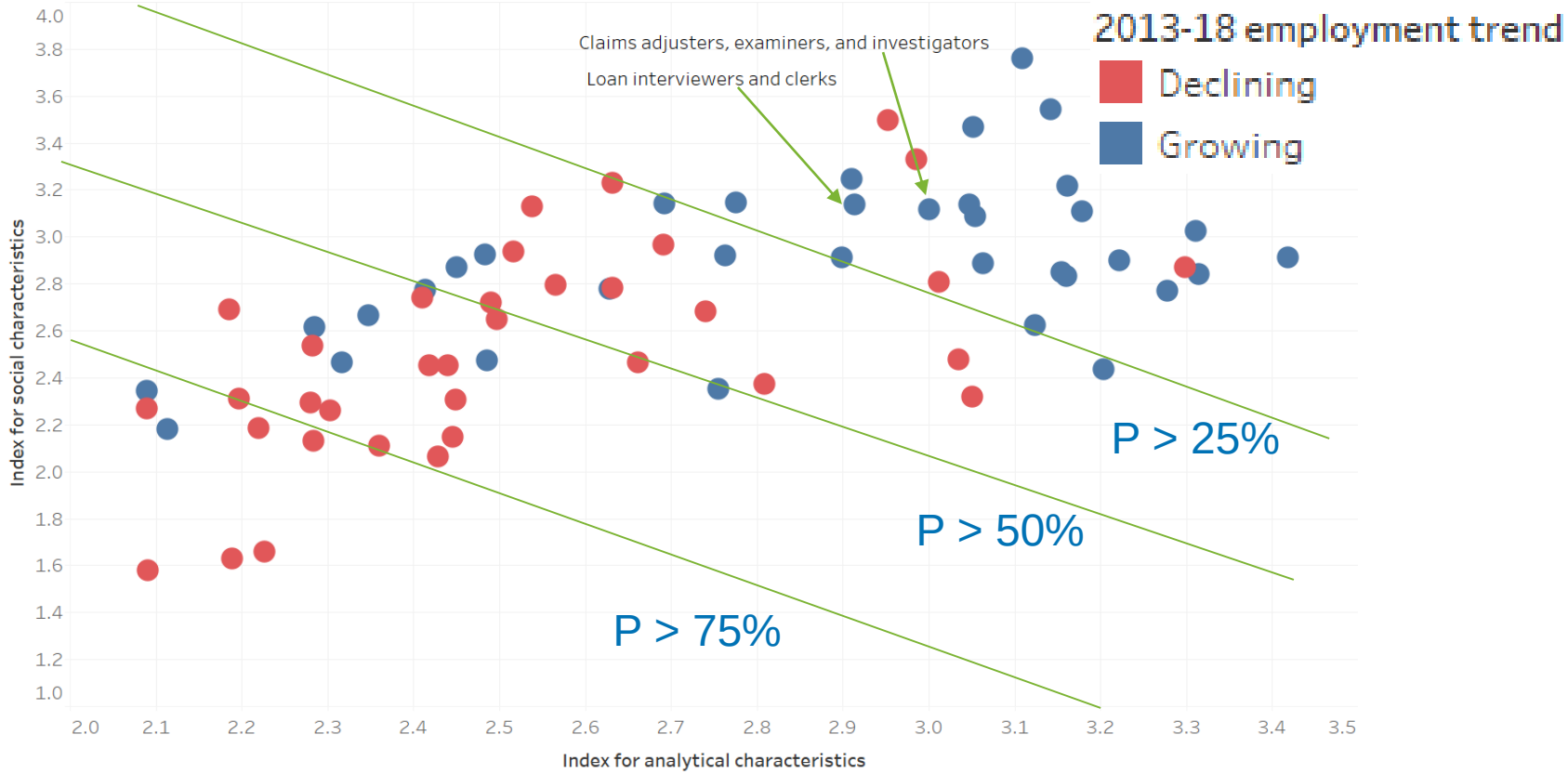


Source: Frey and Osborne (2013), Bureau of Labor Statistics, The Conference Board

Social and analytical characteristics represent barriers to automation of many occupations

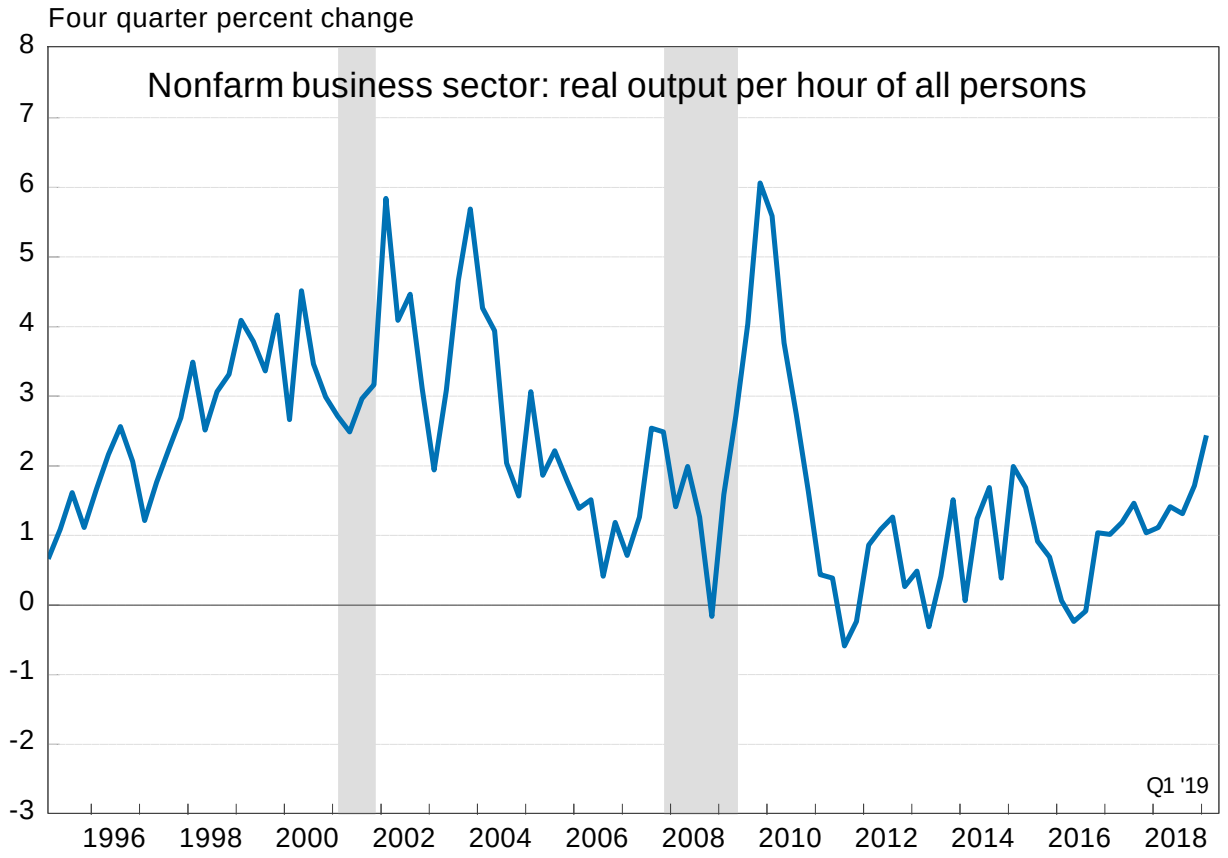
- Two indexes based on how occupations are rated according to O*NET social and analytical characteristics
  - ✓ Social
    - Communicating with people outside the organization
    - Negotiation
    - Performing for or working directly with the public
    - Persuasion
    - Speaking
  - ✓ Analytical
    - Critical thinking
    - Deductive reasoning
    - Inductive reasoning
    - Active learning
    - Originality

Within business and office jobs, communications operators and financial clerks are most vulnerable to automation



Source: Bureau of Labor Statistics, O*Net, The Conference Board

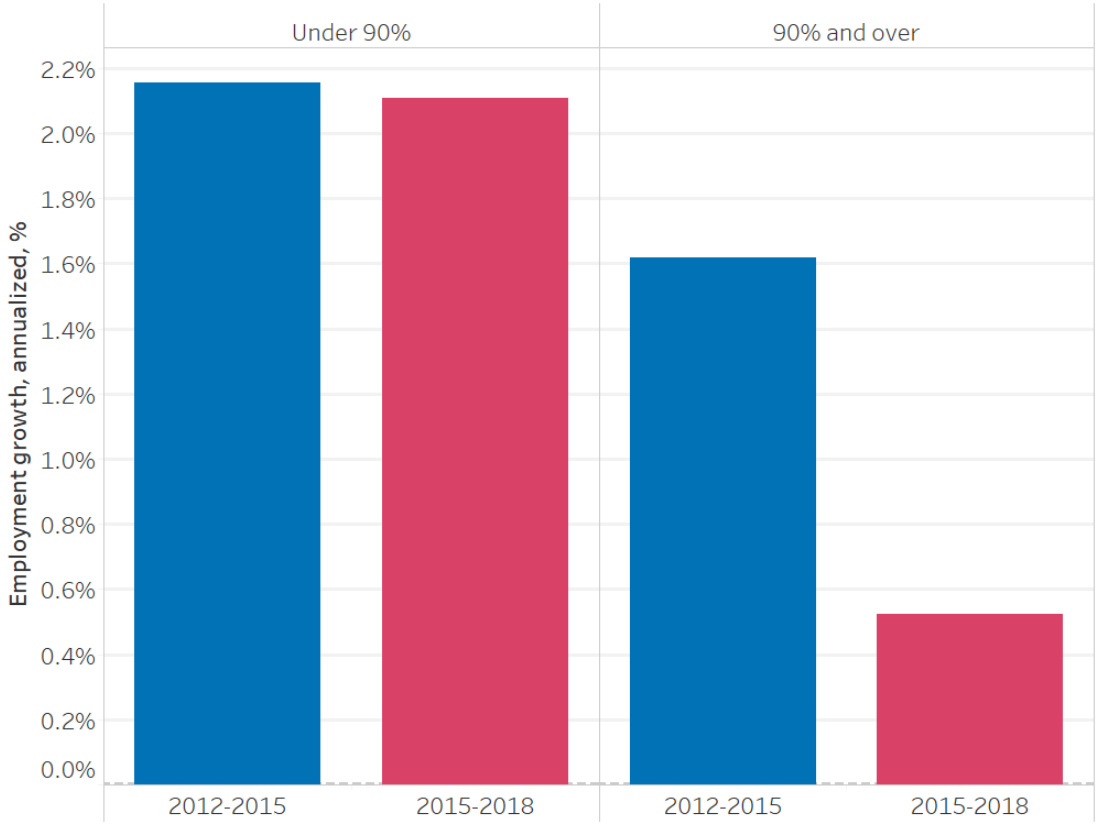
Has productivity growth reached a turning point?



Source: Bureau of Labor Statistics

In recent years, employment growth has decelerated for occupations that were projected to be automated

Employment growth, annualized, grouped by Frey-Osborne projections of automation for occupations, percentage chance



Source: The Conference Board calculations on data from Frey-Osborne (2013) and the BLS Occupational Employment Statistics.

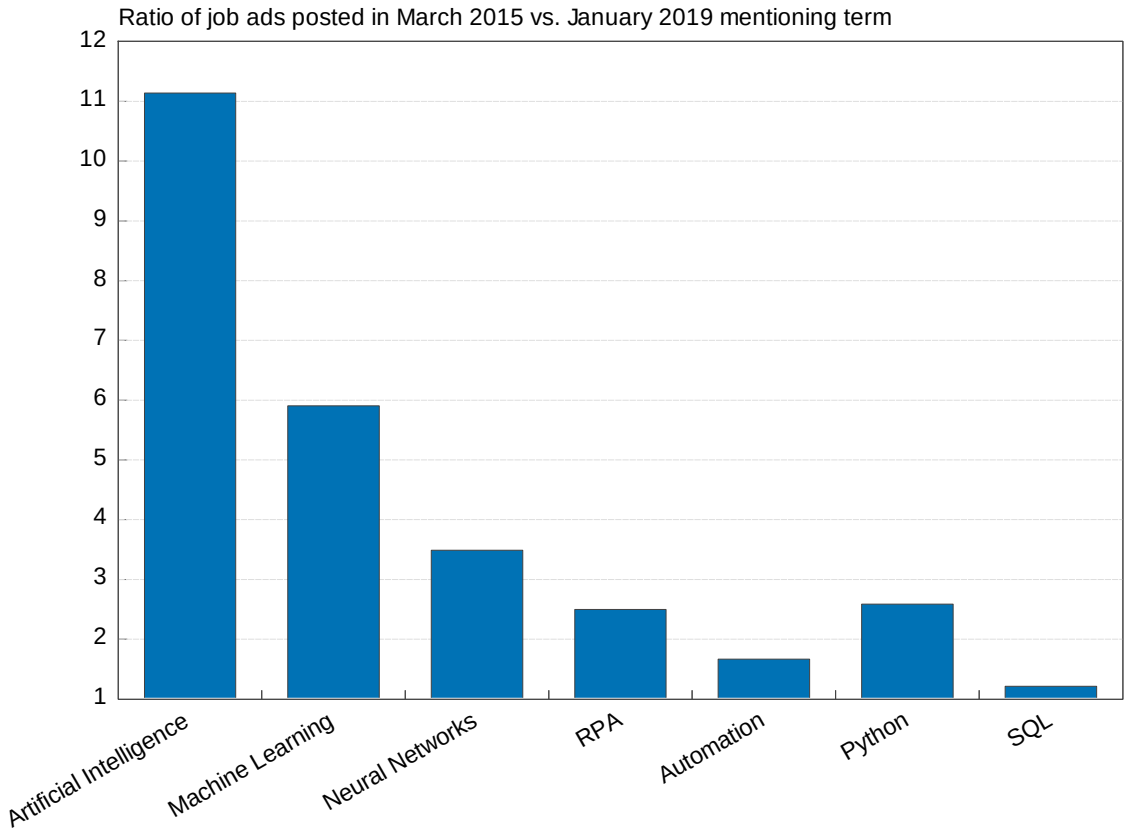
Automation sounds good in theory but can be difficult to implement as a solution to labor shortages

- Inventing new technology
- Hiring workers with the skills to operate it
- Organizational buy in
  - ✓ And not just from those workers whose jobs would be at risk
- Regulatory barriers
- Customer acceptance

But member companies are making major commitments

- Production
- Financial reporting and human capital management systems
- Scheduling and resource management in industries like warehousing, hospitality, and transportation

Firms may be ramping up investments in labor-displacing technology whose impact we are only starting to see



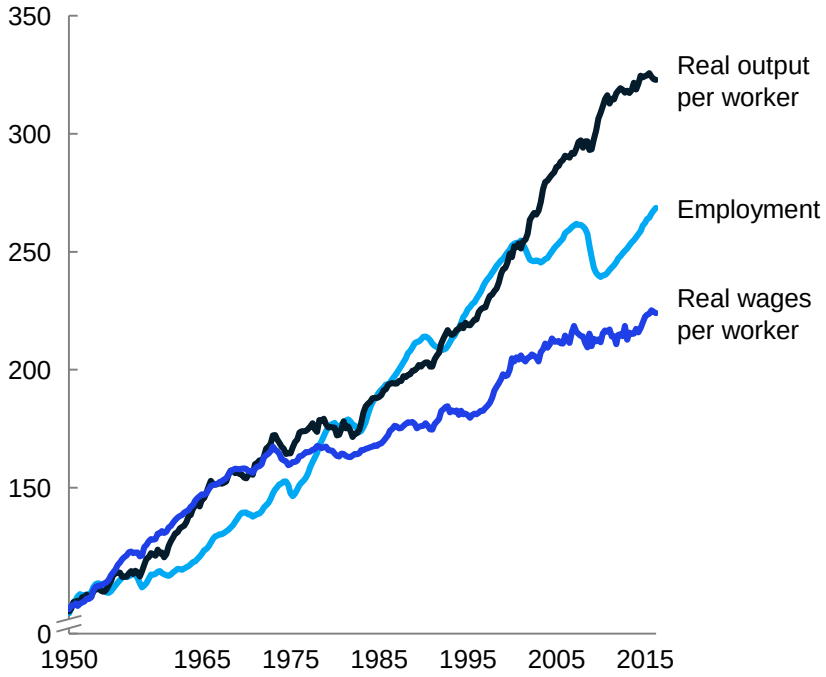
Source: The Conference Board Help-Wanted Online Database

What are the challenges to inclusive growth?

Labor share declining and productivity decoupling from wages

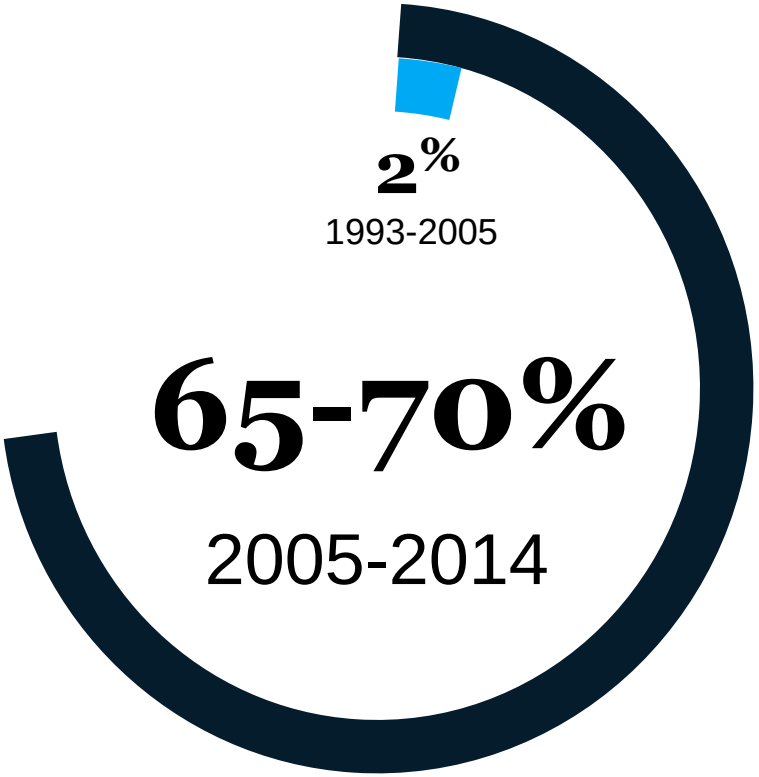
Adjusted labor share of income
%

Productivity, employment, and real wages in United States
Index, 1950 = 100



Wage stagnation:
Previous generations expected to advance

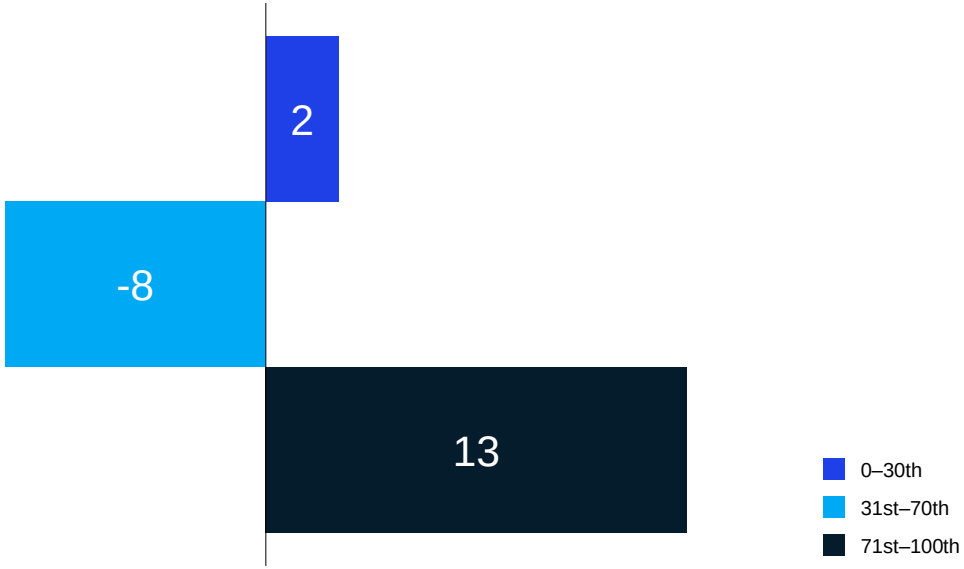
Numbers of households with flat or falling income from wages and capital before taxes in advanced economies



Potential for wage impacts and more polarization

Net job change by wage tercile, % ± change from 2030 labor supply due to automation and labor demand catalysts

United States



Wage impacts driven by:

Occupation mix shift

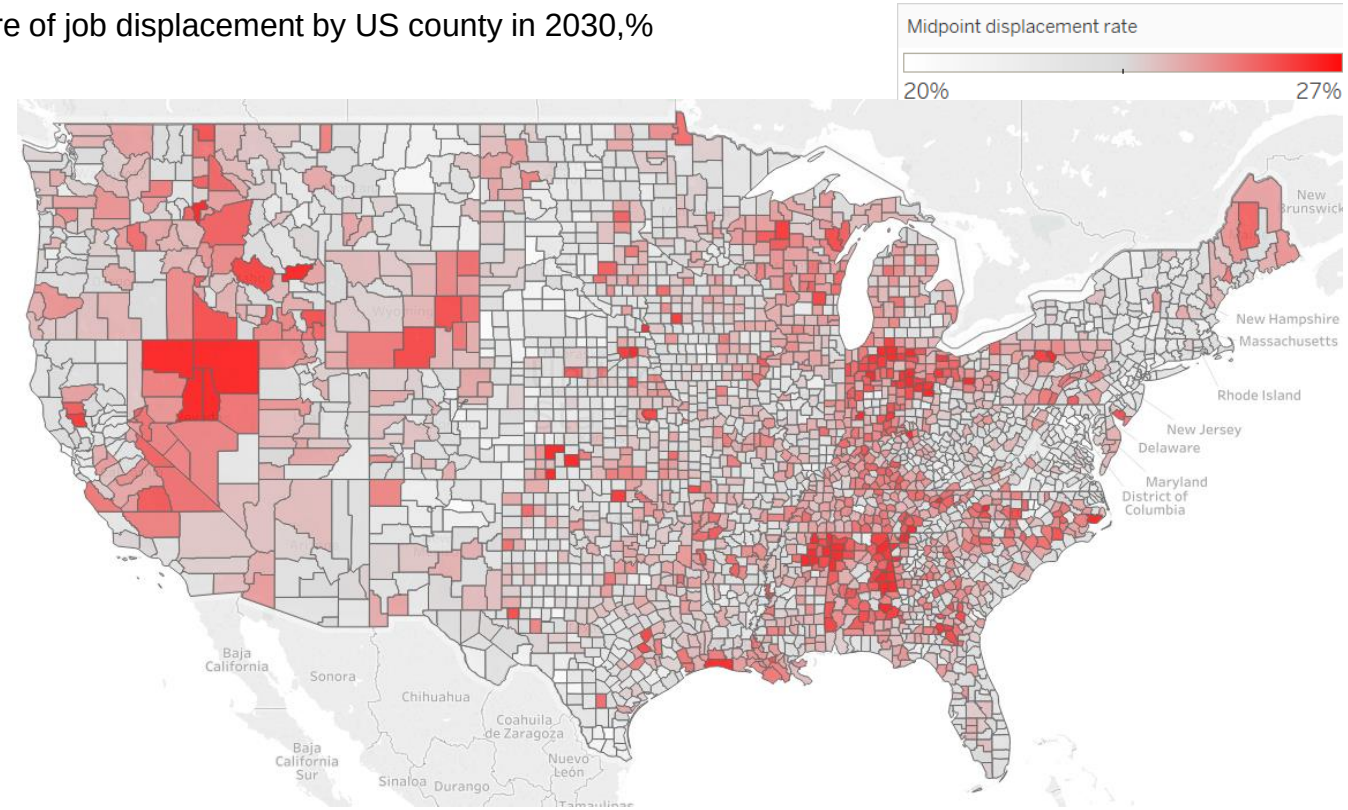
Wage structure for different skills

Other factors incl. skill (and un-skill) bias technical change

Labor supply-demand dynamics

Pattern of Jobs Lost (and Jobs gained) will vary within counties

Potential share of job displacement by US county in 2030,%



The use of existing technologies may revolutionize labor markets, but so far this revolution is mostly theoretical

- Labor saving and augmenting technologies have advanced more slowly during the past decade than most observers anticipated
- Progress has been faster in office and administrative jobs where routine cognitive tasks make up a large share of the workload
- Business and finance specialist jobs will be hard to fully automate but contain a large amount of routine cognitive task content that can be performed with less human input
- Firms have made large recent investments in digital technologies designed to boost labor productivity
- There is some evidence that these investments are already paying off both in terms of faster recent productivity growth and labor market trend shifts since 2015

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