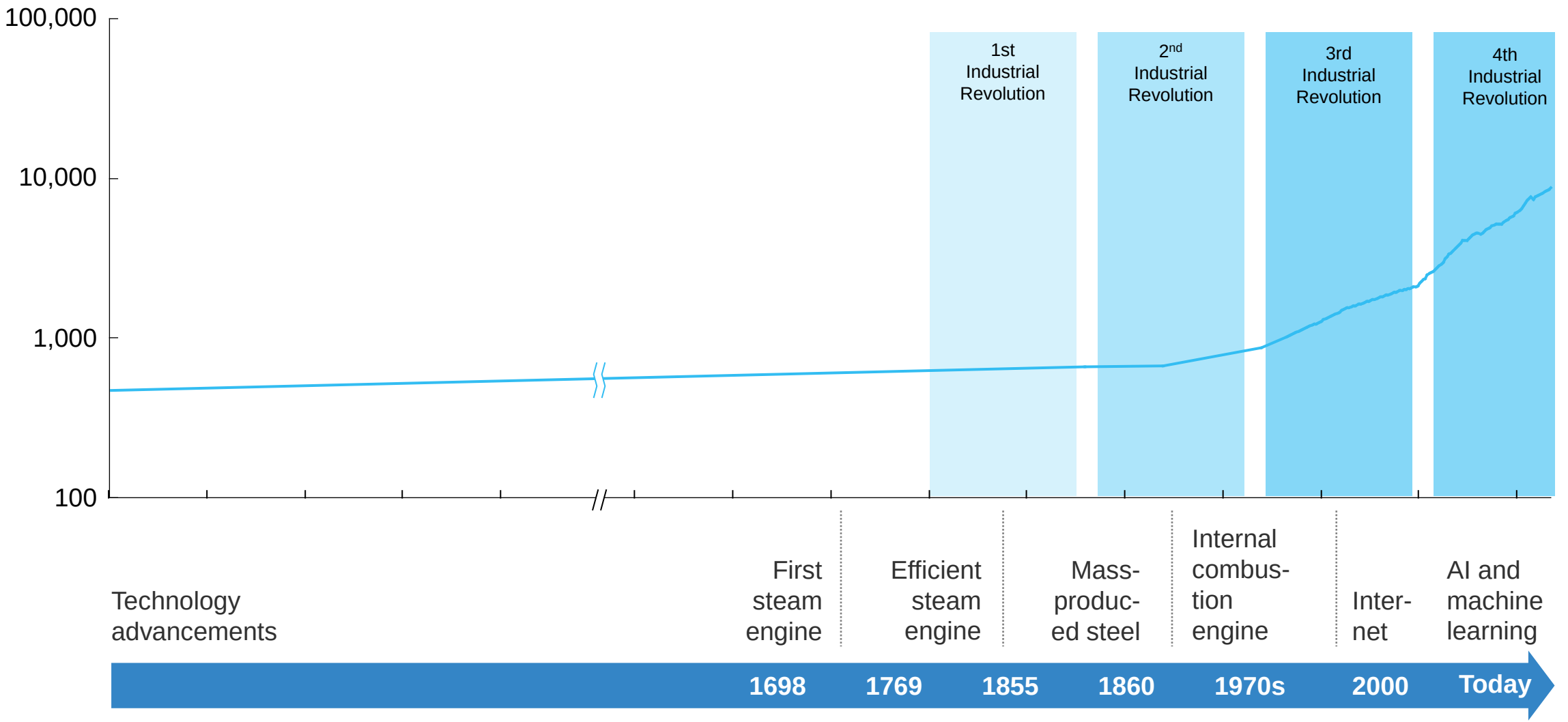
McKinsey&Company

The future of work

Nav Singh
Managing Partner, Boston
McKinsey & Company

Since the Industrial Revolution, innovation has fueled economic growth

Estimated global GDP per capita, $



SOURCE: Angus Maddison, "Statistics on World Population, GDP and Per Capita GDP, 1–2008 AD," the Maddison Project database; McKinsey Global Institute analysis

Twelve potentially economically disruptive technologies

Mobile Internet

Increasingly inexpensive and capable mobile computing devices and Internet connectivity

Automation of knowledge work

Intelligent software systems that can perform knowledge work tasks involving unstructured commands and subtle judgments

The Internet of Things

Networks of low-cost sensors and actuators for data collection, monitoring, decision making, and process optimization

Cloud technology

Use of computer hardware and software resources delivered over a network or the Internet, often as a service

Advanced robotics

Increasingly capable robots with enhanced senses, dexterity, and intelligence used to automate tasks or augment humans

Autonomous and near-autonomous vehicles

Vehicles that can navigate and operate with reduced or no human intervention

Next-generation genomics

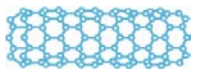
Fast, low-cost gene sequencing, advanced big data analytics, and synthetic biology (“writing” DNA)

Energy storage

Devices or systems that store energy for later use, including batteries

3D printing

Additive manufacturing techniques to create objects by printing layers of material based on digital models



Advanced materials

Materials designed to have superior characteristics (e.g., strength, weight, conductivity) or functionality

Advanced oil and gas exploration and recovery

Exploration and recovery techniques that make extraction of unconventional oil and gas economical

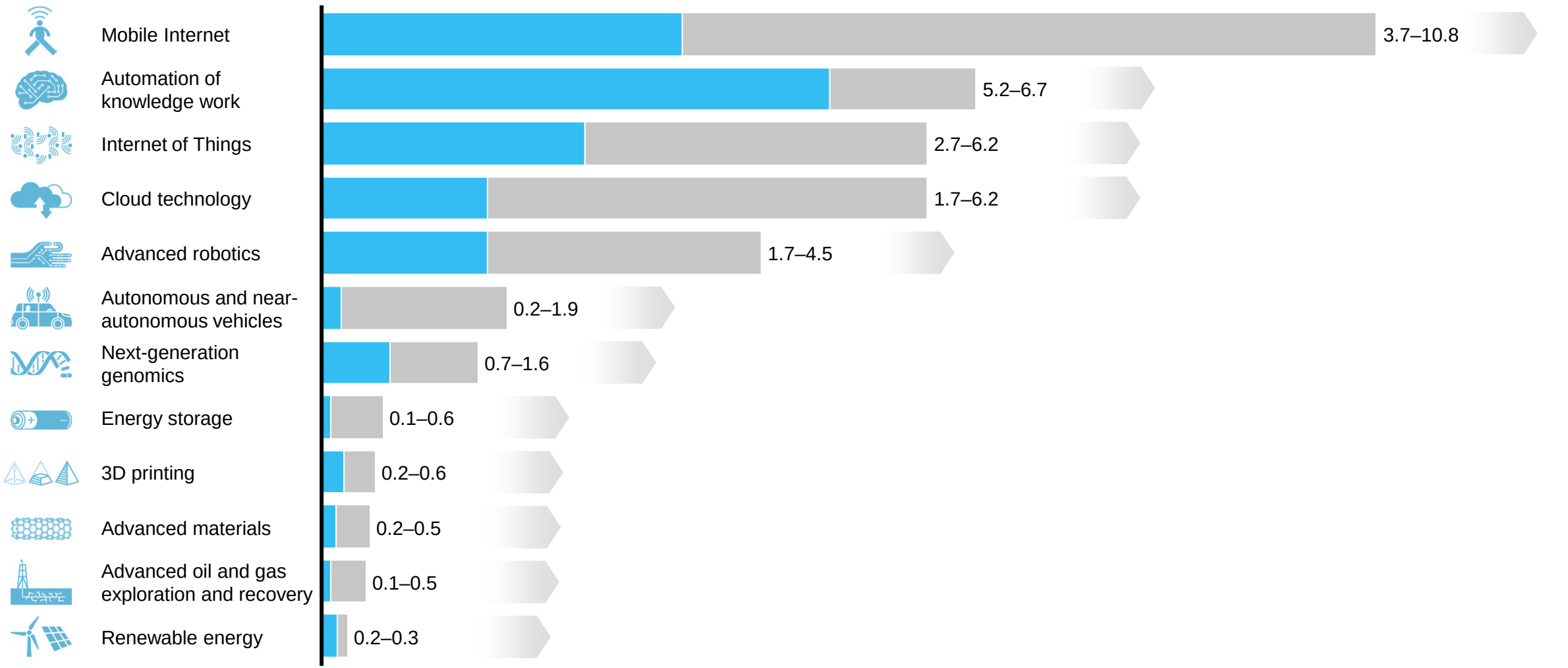
Renewable energy

Generation of electricity from renewable sources with reduced harmful climate impact

SOURCE: McKinsey Global Institute analysis

The potential economic impact of these disruptive technologies could be substantial

$ trillion, annual

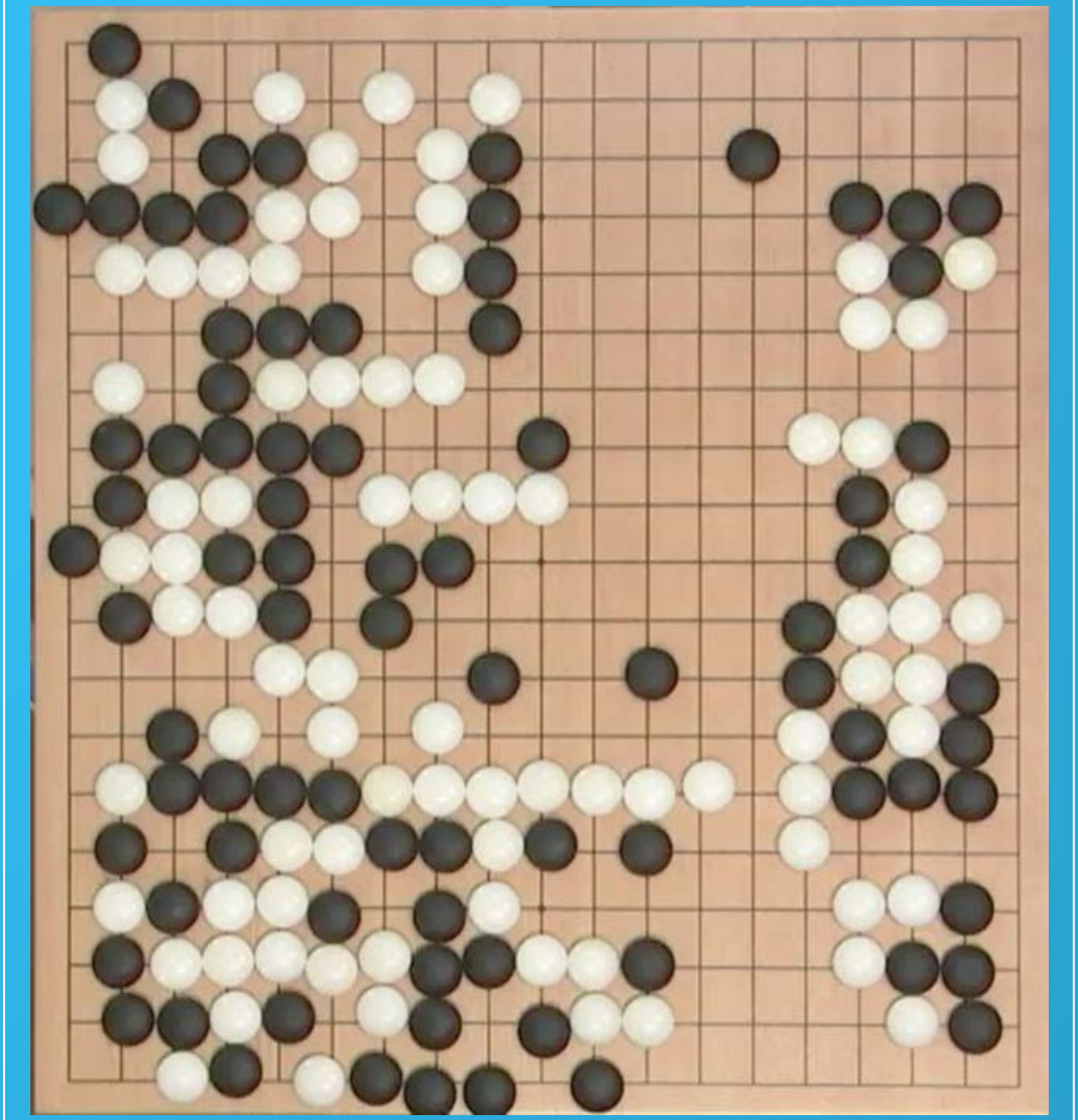


SOURCE: McKinsey Global Institute analysis


OTTO
PROUDLY BREWED.
SELF-DRIVEN.
Budweiser
OTTO


LipNet
Sentence: Place blue in m 1 soon
LipNet:

AlphaGo

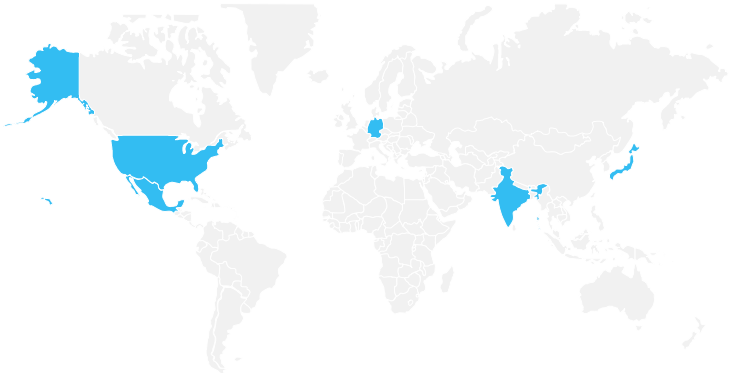


Lee Sedol

Will there be enough jobs and what will be the impact on GDP growth?

Our approach

90% Global GDP coverage



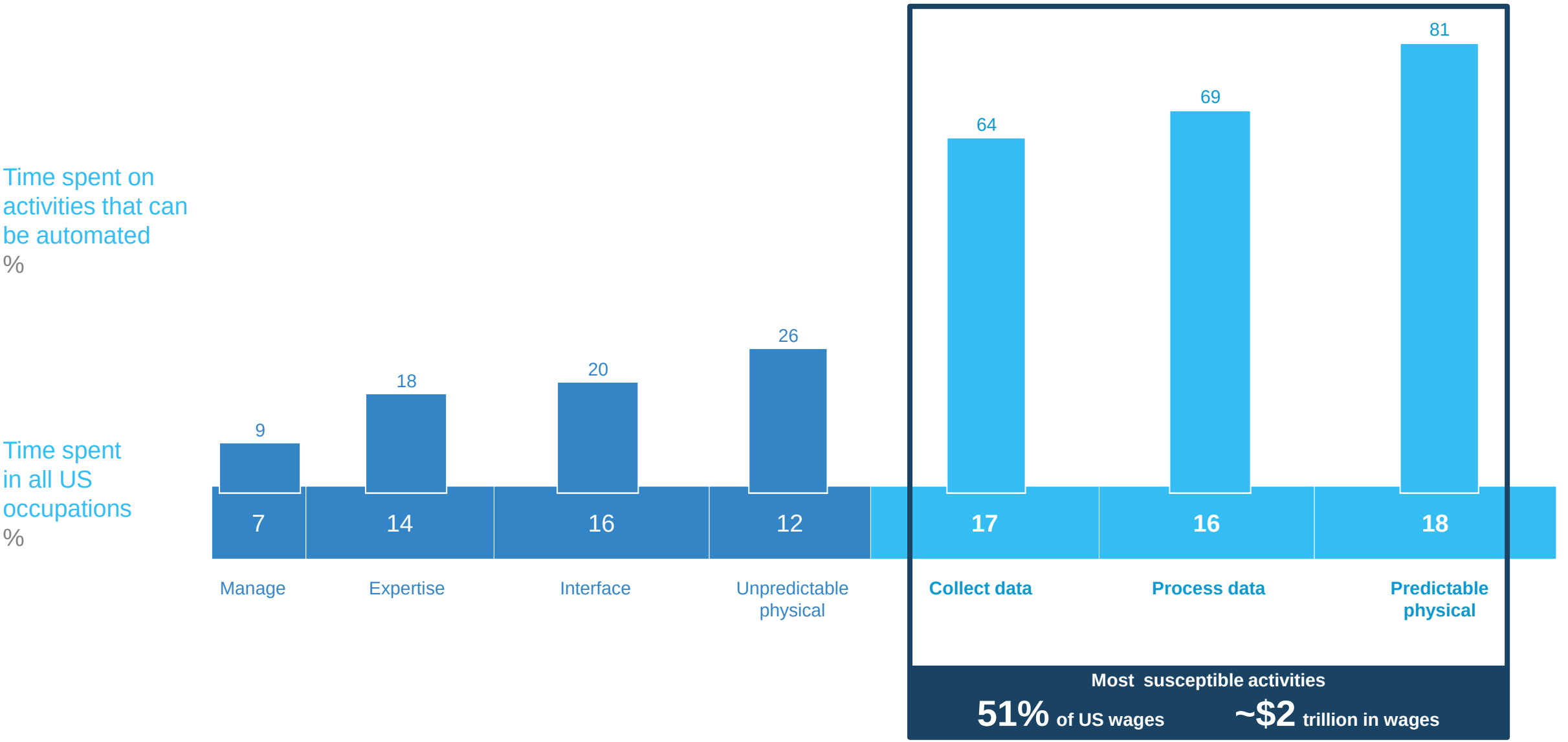
800 Occupations

2000 Activities

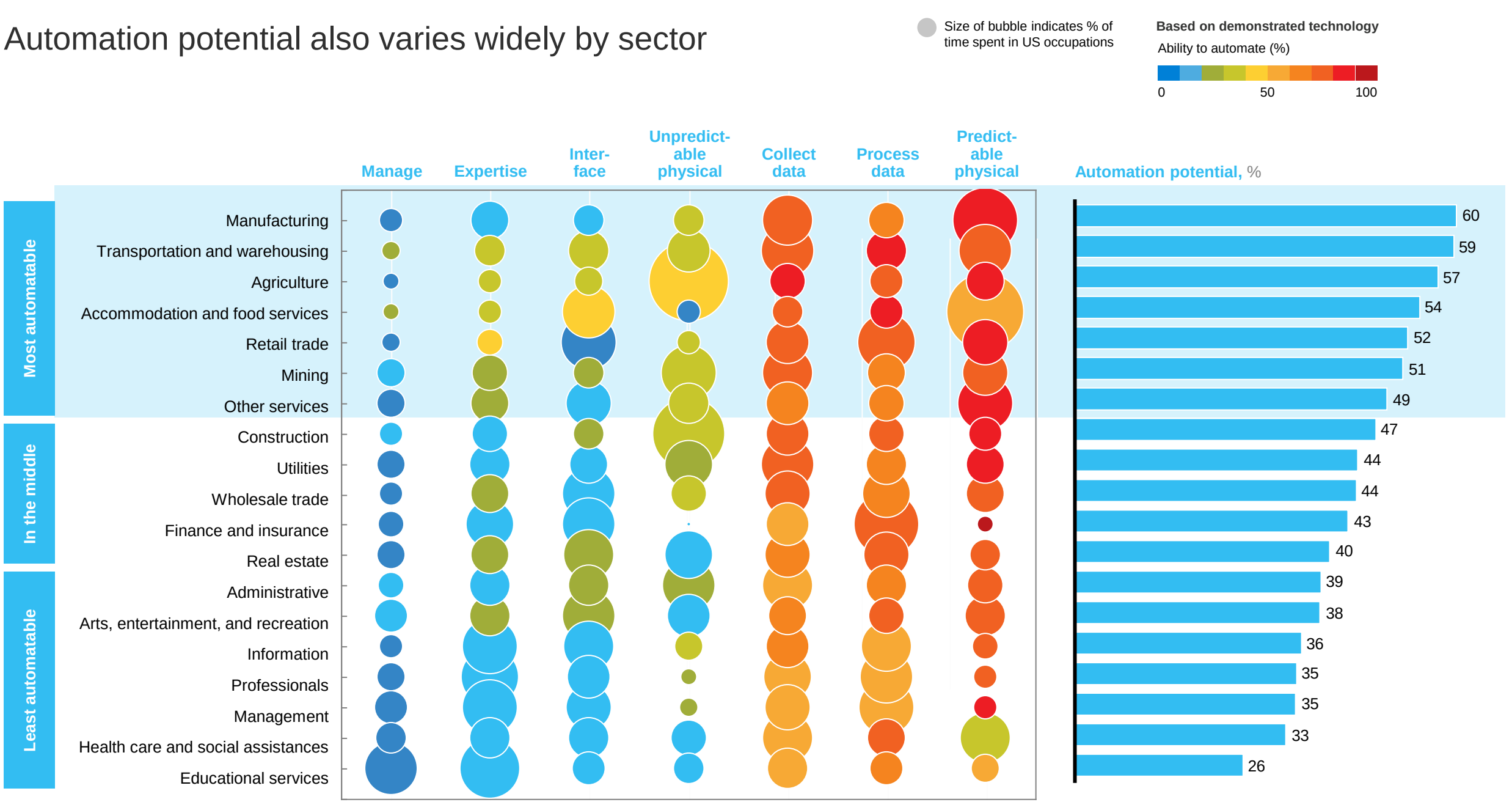
Certain activities have more potential for automation

BASED ON CURRENTLY DEMONSTRATED TECHNOLOGIES

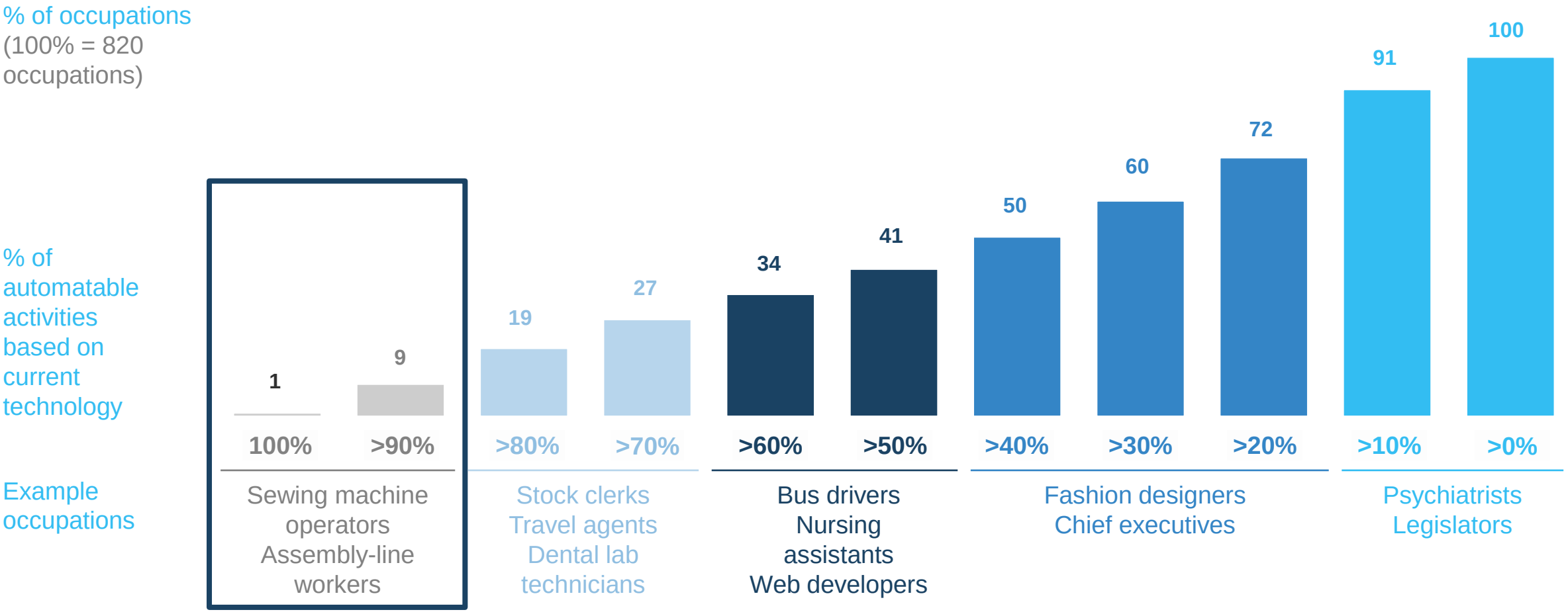
Automation potential across activity categories based on currently demonstrated technologies



Automation potential also varies widely by sector



A small share of occupations are fully automatable, many more are partially automatable



While about

~10% of occupations have **>90%** of tasks automatable …

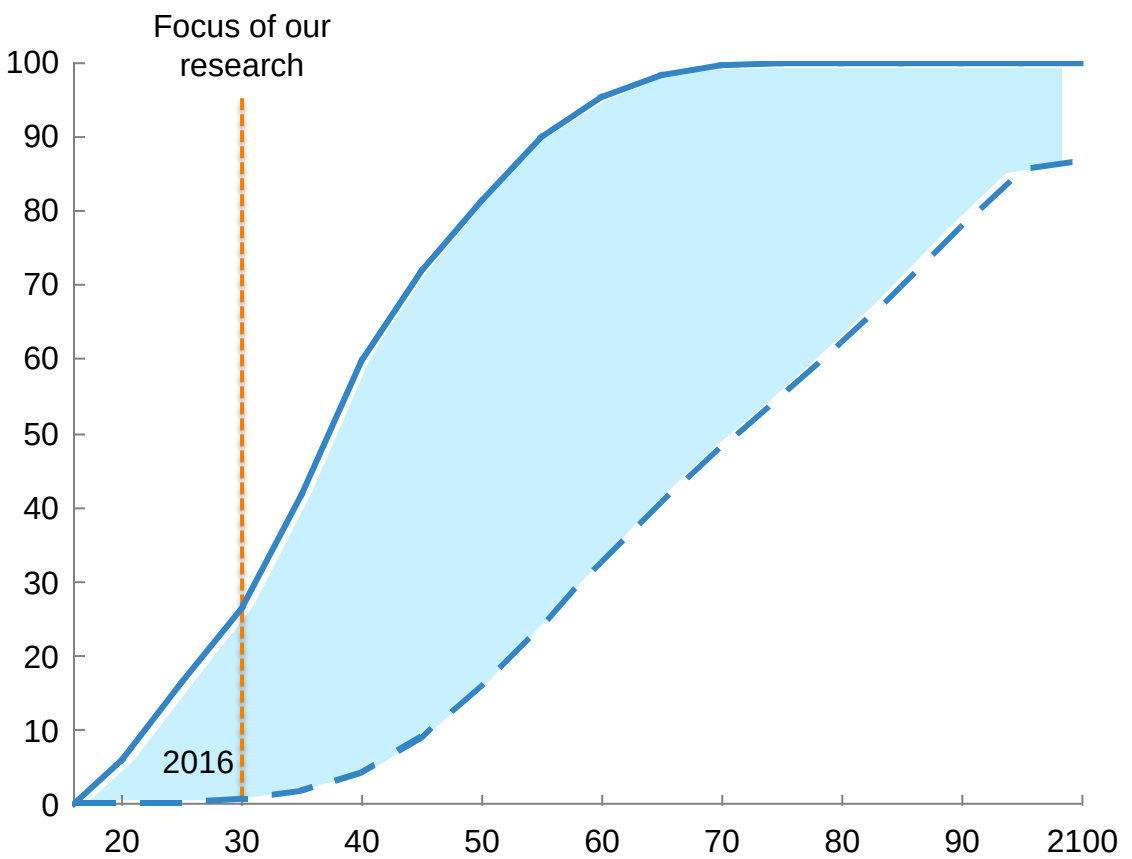
Most occupations will have portions of their tasks automated

~60% of occupations have **~30%** of tasks automatable

On Employment, we modeled scenarios for the pace of automation adoption and new job creation

Pace of adoption

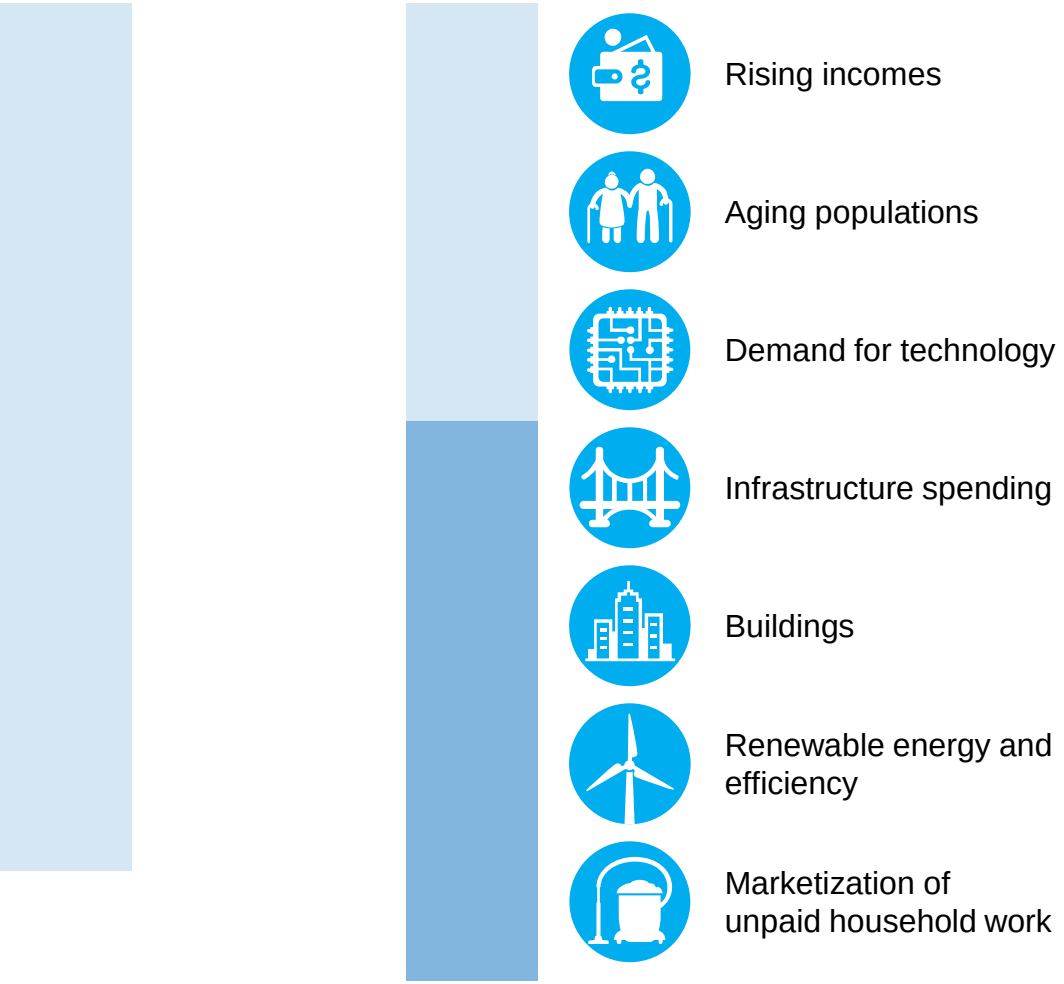
Pace of the automation, global
% of time spent on activities that will potentially be automated



Demand for labor

Trendline scenario

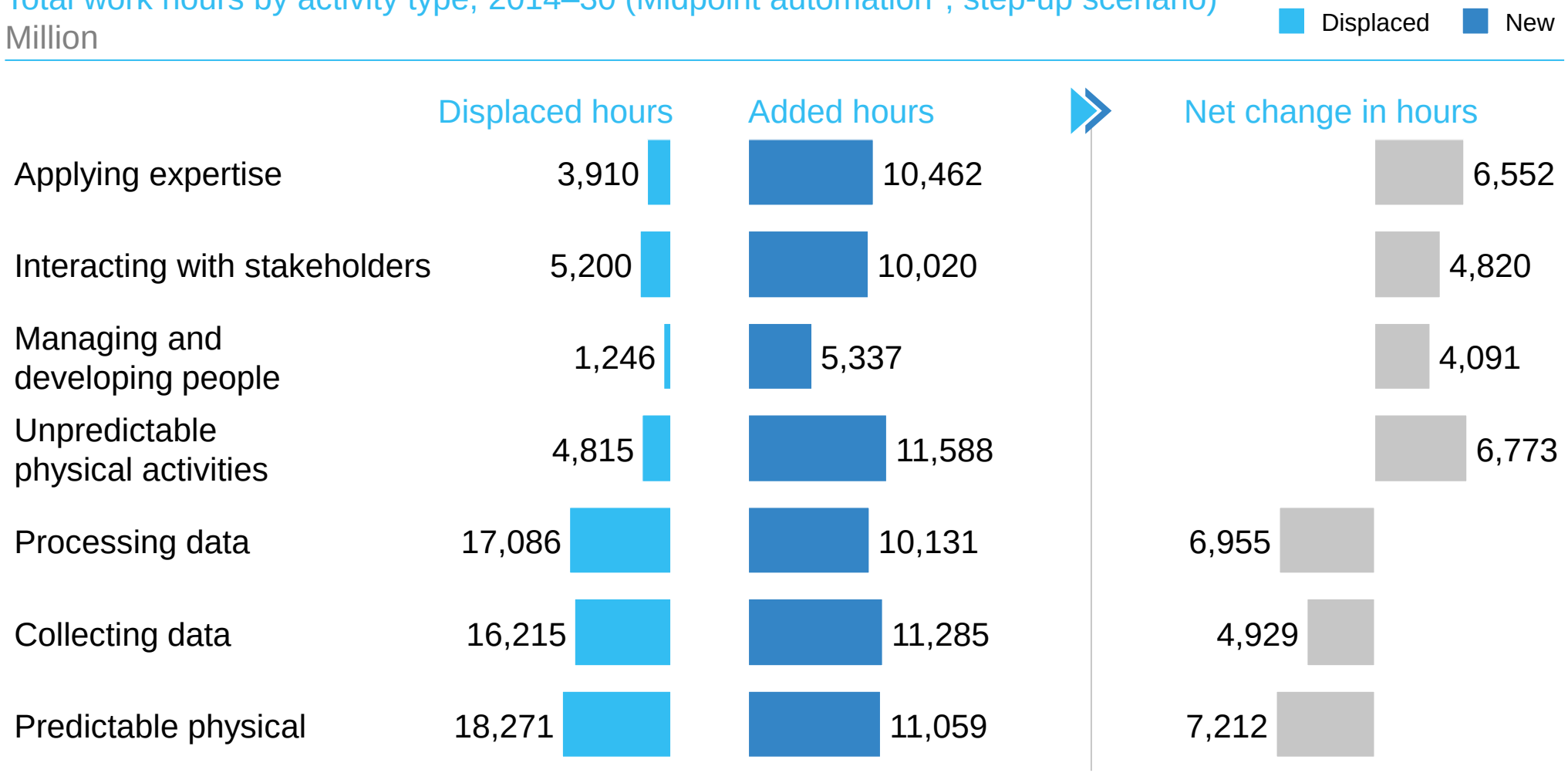
Step-up scenario



The types of activities workers engage in will change

Total work hours by activity type, 2014–30 (Midpoint automation[1], step-up scenario)

Million



1 Midpoint of earliest and latest automation adoption in the "step-up" scenario (i.e., high job growth).

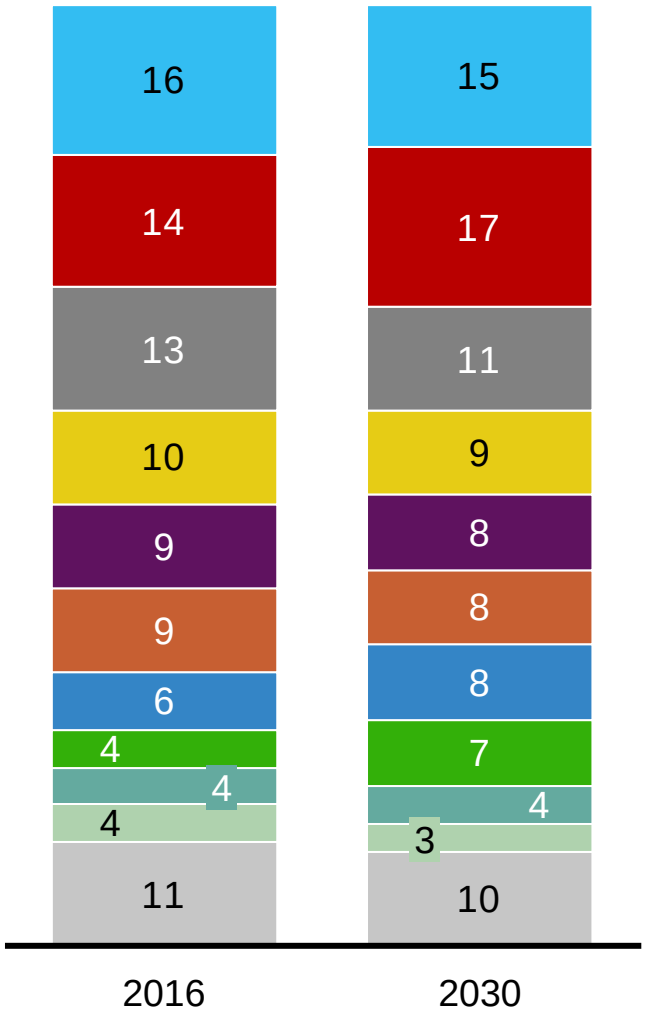
SOURCE: ONET skill classification, MGI Automation Model, Jobs Lost Jobs Gained December 2017; McKinsey Global Institute analysis

Not all occupations and age groups will be winners

Midpoint automation scenario

Sector shifts by 2030

Sector share of labor force, %

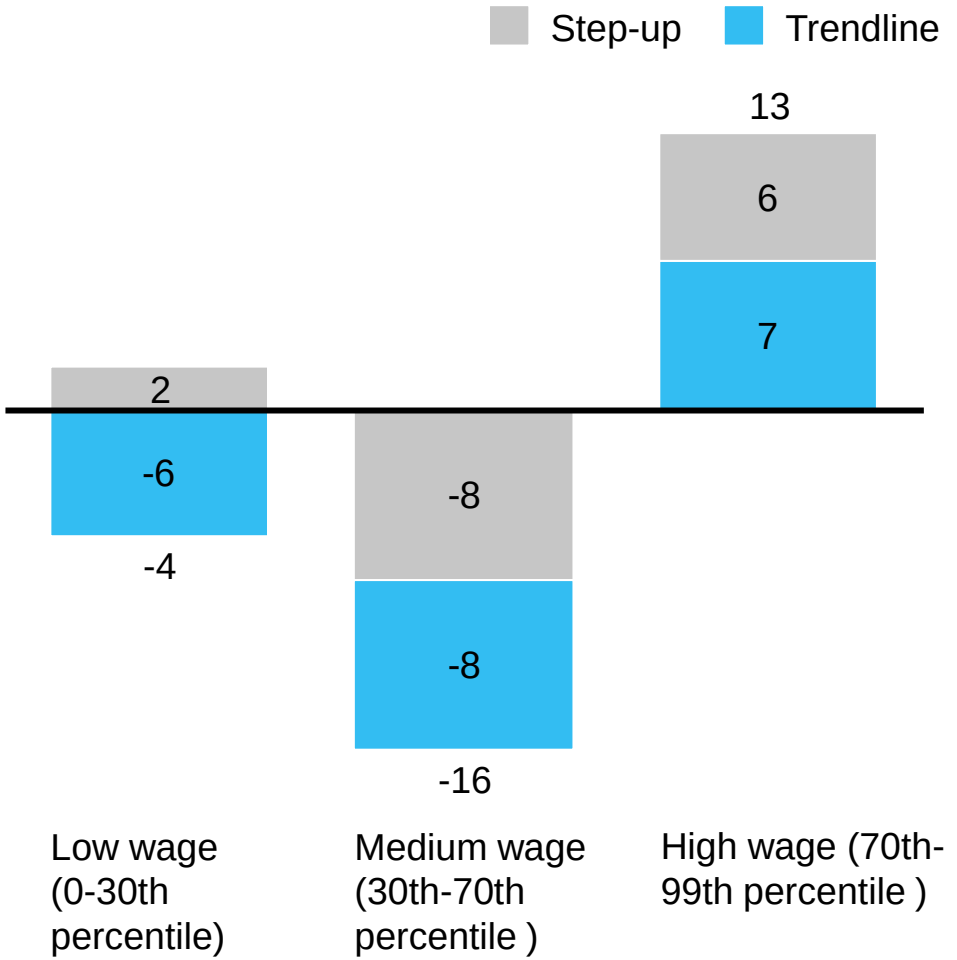


Additions, net of automation, Million

Retail wholesales trade	0
Health care	+5
Government	-4
Education	-1
Accommodation and food services	-2
Manufacturing	-1
Professional services	+2
Construction	+5
Finance	0
Transportation	-2
Other	-1

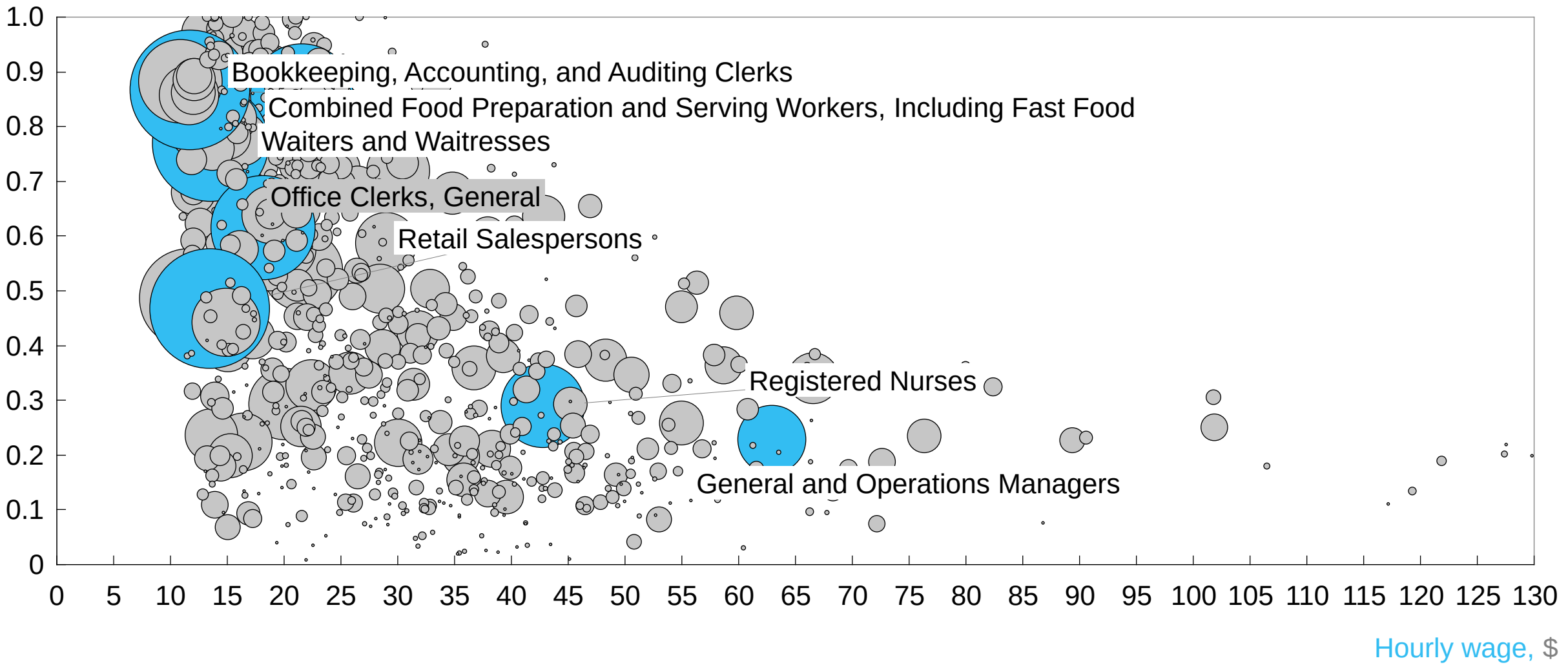
Job changes by wage level by 2030

Change in employment share by wages tercile, % of jobs



The potential to automate impacts both low and high-wage occupations in Massachusetts

Size of bubble represents potential FTE automated



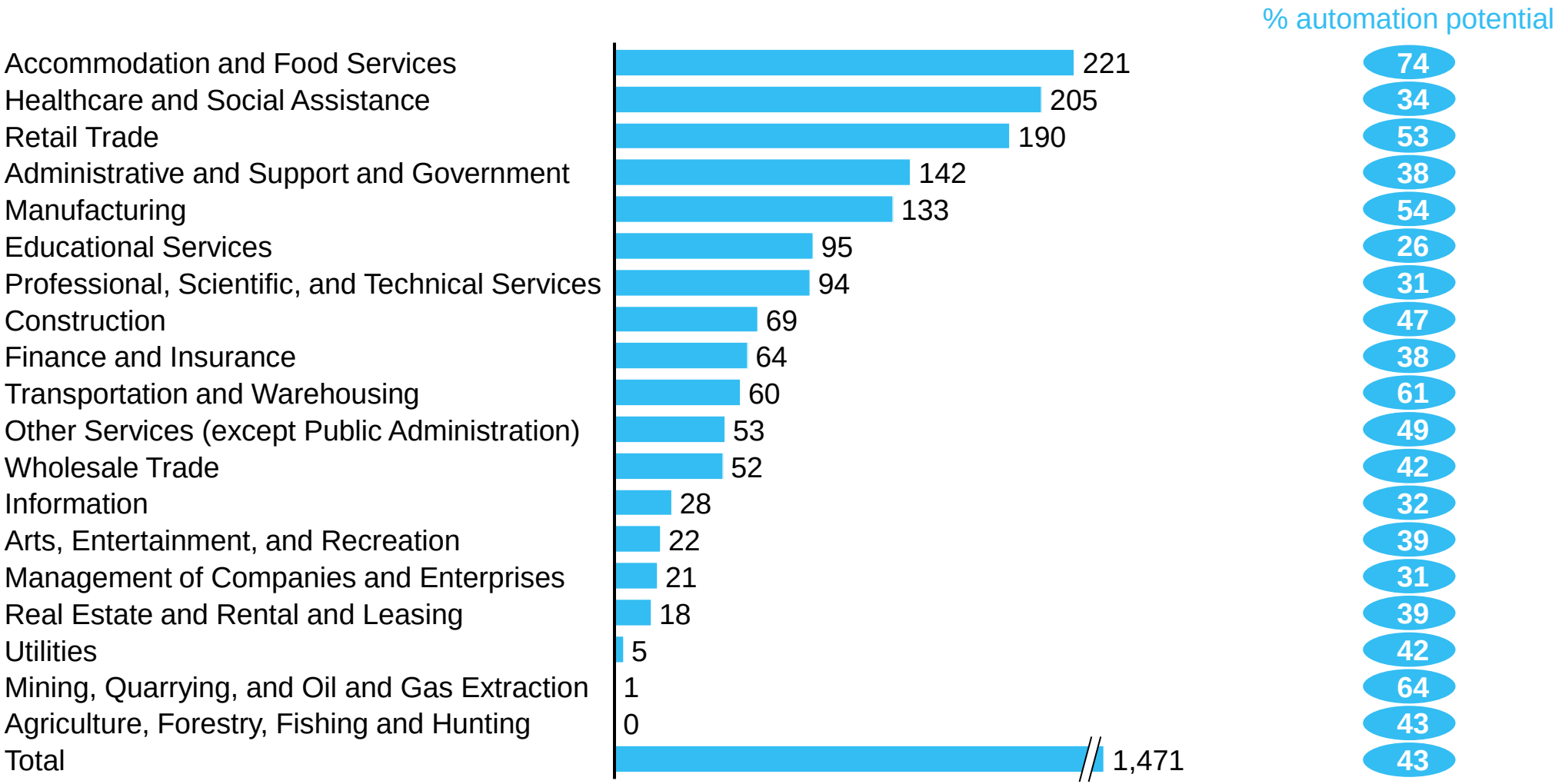
1 Our analysis used "detailed work activities," as defined by O*NET, a program sponsored by the US Department of Labor, Employment and Training Administration.
Note: 711 occupations included in Massachusetts

SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

Accommodation & food services and healthcare are most susceptible to automation in Massachusetts

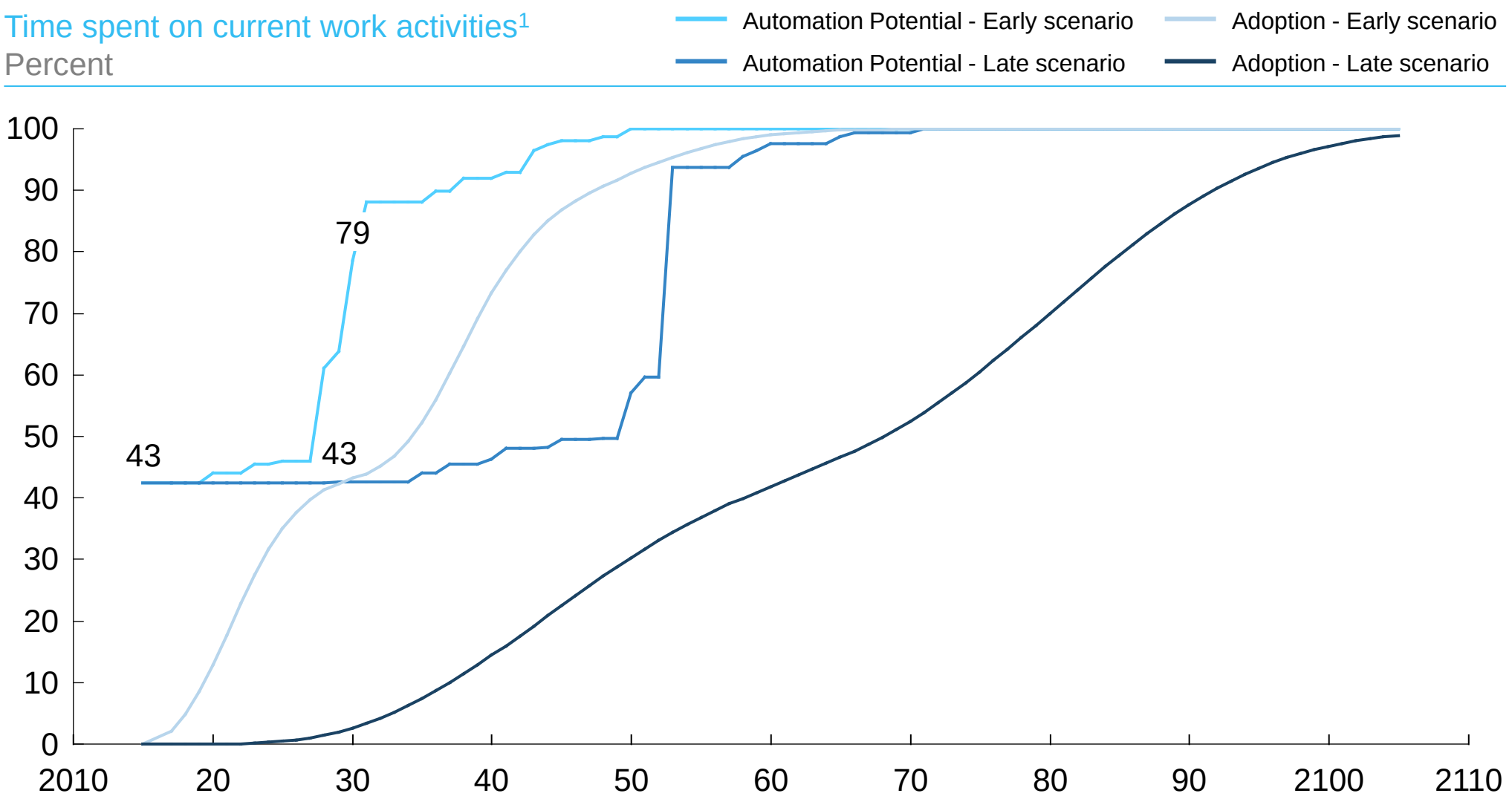
Potential jobs impacted by industry in 2016

2016, Thousands



SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

Automation potential in Massachusetts is expected to increase from 43% today to 79% by 2030 in an early scenario, with the adoption rate gradually increasing to 43%



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Note 711 occupations included in Massachusetts

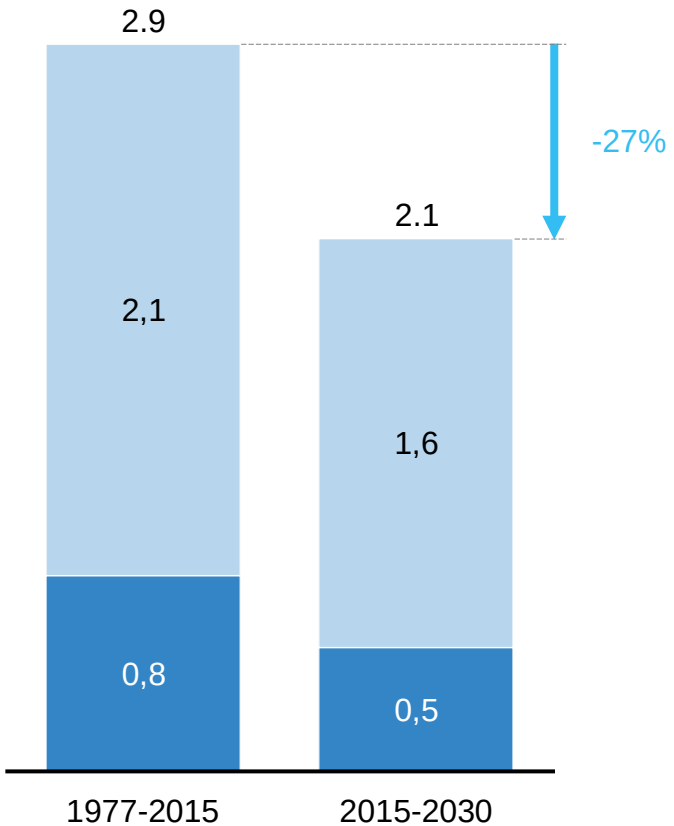
SOURCE: US Bureau of Labor Statistics; McKinsey Global Institute analysis

With decelerating employment and productivity growth, automation can fill the gap through increasing productivity and help with GDP Growth, if implemented early

MASSACHUSETTS

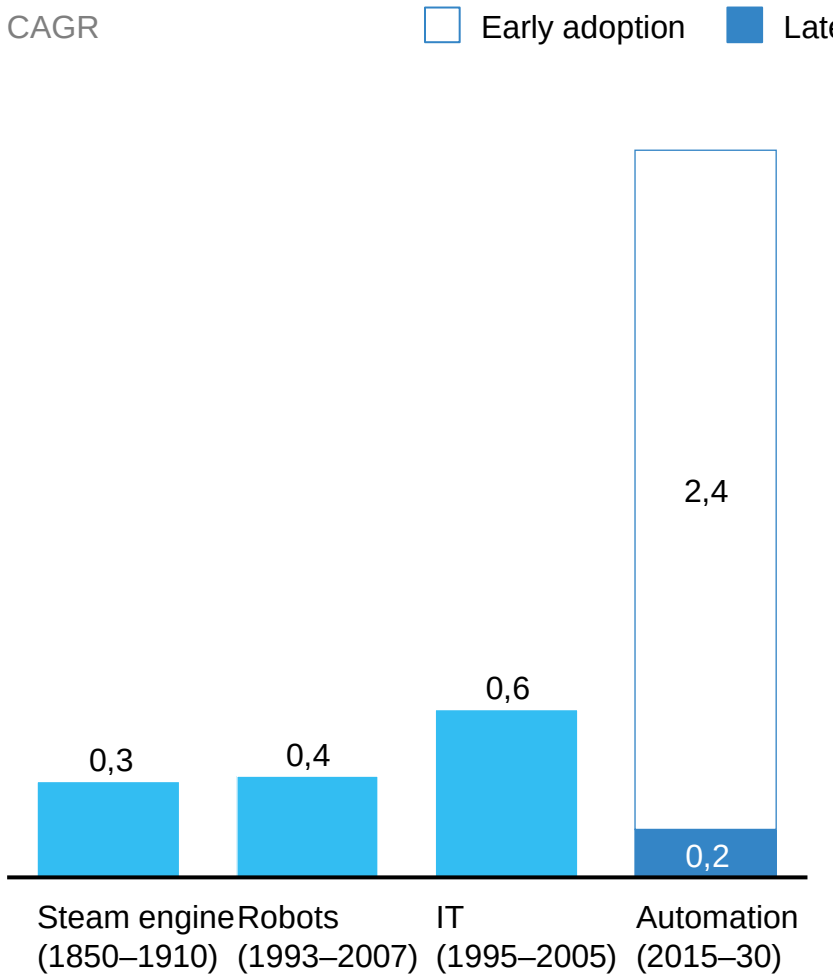
GDP growth is expected to fall despite an expected pickup in productivity as employment growth declines

GDP, 2010 Prices, CAGR



Automation could increase productivity significantly more than other major technologies if adopted early

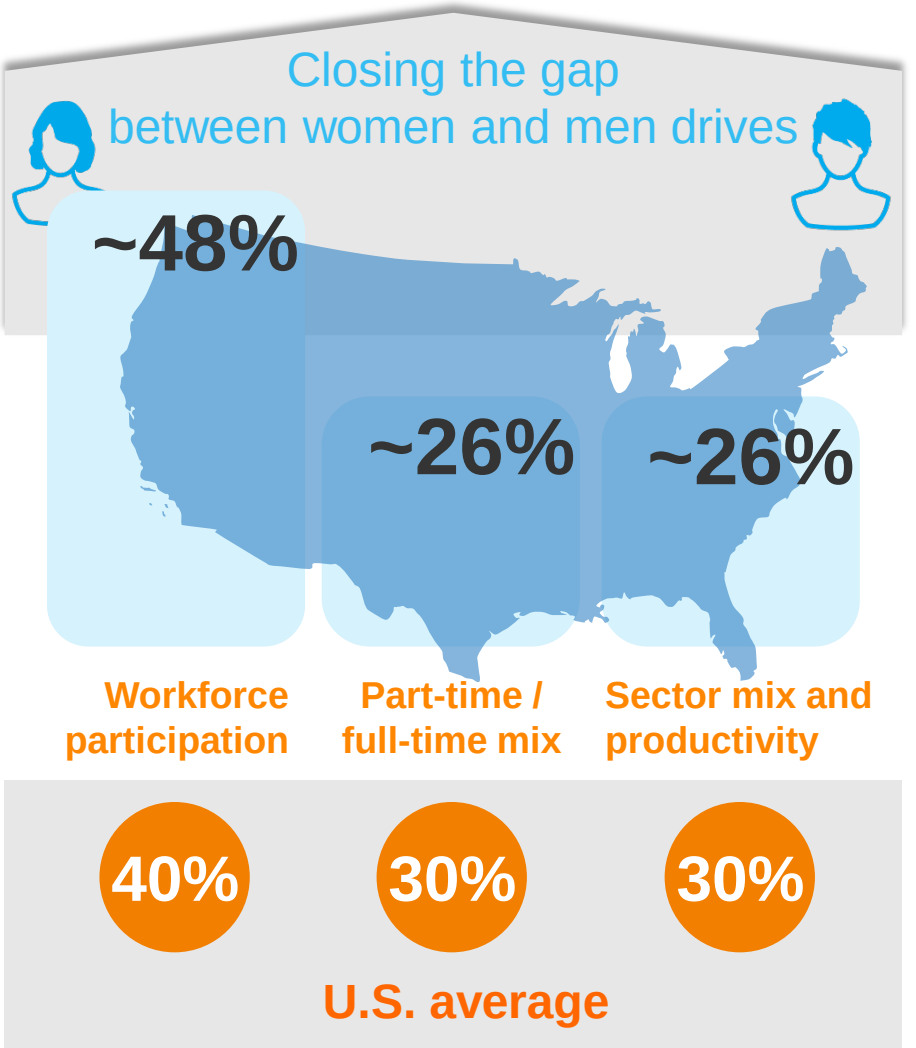
Productivity, CAGR



SOURCE: Nicholas Crafts, "Steam as a general purpose technology: A growth accounting perspective," Economic Journal, volume 114, issue 495, April 2004; Mary O'Mahony and Marcel P. Timmer, "Output, input, and productivity measures at the industry level: The EU KLEMS database," Economic Journal, volume 119, issue 538, June 2009; Georg Graetz and Guy Michaels, Robots at work, Centre for Economic Performance discussion paper 1335, March 2015; McKinsey Global Institute analysis; BEA; BLS; Moody's

Closing Massachusetts' gender gap represents an opportunity to add an incremental $73-155B to GDP in 2025

~12% increase in 2025 Massachusetts GDP from 3 key things:



1 Best-in-class scenario is the incremental 2025 GDP based on fastest improving states on individual workforce metrics
2 Full potential scenario is the incremental 2015 GDP based on completely closing the gender gap

We need to preprare!!