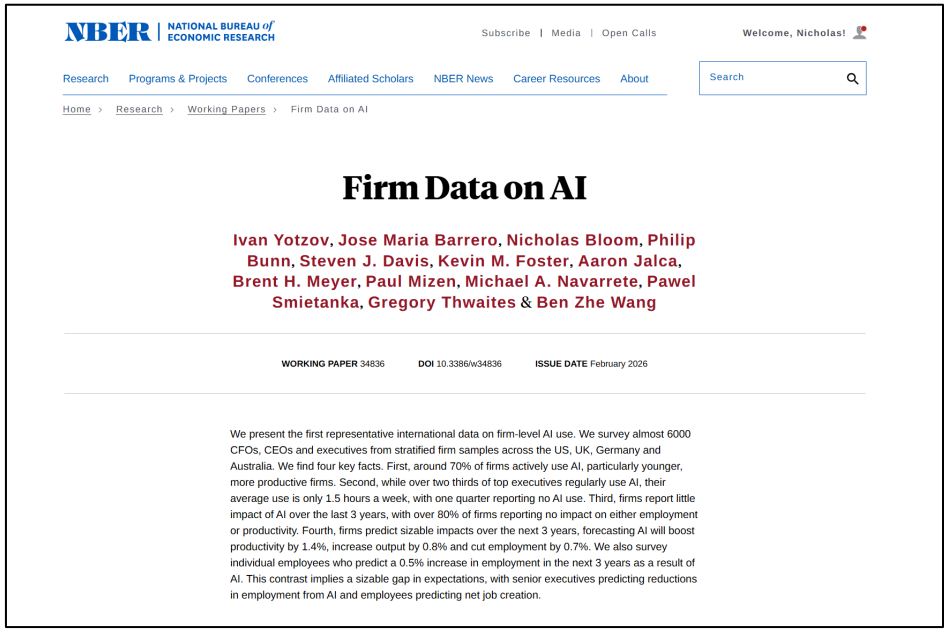
The Impact of AI on Productivity

Ivan Yotzov, Jose Maria Barrero, **Nicholas Bloom**, Philip Bunn, Steven Davis, Kevin Foster, Aaron Jalca, Brent Meyer, Paul Mizen, Michael Navarrete, Pawel Smietanka, Gregory Thwaites & Ben Wang

Atlanta Fed, Bank of England, Bundesbank, Kings, Macquarie, Nottingham & Stanford

March 2026, San Francisco Fed



Start by embarrassing my kind host, Huiyu Li ☺

Productivity growth has been slowing down over the last 75 years

American Economic Review 2020, 110(4): 1104–1144
https://doi.org/10.1257/aer.20180338

Are Ideas Getting Harder to Find?†

By Nicholas Bloom, Charles I. Jones, John Van Reenen, and Michael Webb*

Long-run growth in many models is the product of two terms: the effective number of researchers and their research productivity. We present evidence from various industries, products, and firms showing that research effort is rising substantially while research productivity is declining sharply. A good example is Moore's Law. The number of researchers required today to achieve the famous doubling of computer chip density is more than 18 times larger than the number required in the early 1970s. More generally, everywhere we look we find that ideas, and the exponential growth they imply, are getting harder to find. (*JEL* D24, E23, O31, O47)

This paper applies the growth accounting of Solow (1957) to the production function for new ideas. The basic insight can be explained with a simple equation, highlighting a stylized view of economic growth that emerges from idea-based growth models:

$$\underset{\text{e.g., 2\% or 5\%}}{\text{Economic growth}} = \underset{\downarrow\text{(falling)}}{\text{Research productivity}} \times \underset{\uparrow\text{(rising)}}{\text{Number of researchers}}.$$

Economic growth arises from people creating ideas. As a matter of accounting, we can decompose the long-run growth rate into the product of two terms: the effective number of researchers and their research productivity. We present a wide range of empirical evidence showing that in many contexts and at various levels of disaggregation, research effort is rising substantially, while research productivity is

* Bloom: Department of Economics, Stanford University, and NBER (email: nbloom@stanford.edu); Jones: Graduate School of Business, Stanford University, and NBER (email: chad.jones@stanford.edu); Van Reenen: Department of Economics, MIT, LSE, and NBER (email: vanreene@mit.edu); Webb: Department of Economics, Stanford University (email: mww@stanford.edu). Emi Nakamura was the coeditor for this article. We are grateful to three anonymous referees for detailed comments. We also thank Daron Acemoglu, Philippe Aghion, Ufuk Akcigit, Michele Boldrin, Ben Jones, Pete Klenow, Sam Kortum, Peter Kruse-Andersen, Rachel Ngai, Pietro Peretto, John Seater, Chris Tonetti, and seminar participants at Bocconi, the CEPR Macroeconomics and Growth Conference, CREI, George Mason, Harvard, LSE, MIT, Minneapolis Fed, NBER growth meeting, the NBER Macro across Time and Space conference, the Rimini Conference on Economics and Finance, and Stanford for helpful comments. We are grateful to Antoine Dechezlepretre, Keith Fuglie, Dietmar Harhoff, Wallace Huffman, Brian Lucking, Unni Pillai, and Greg Traxler for extensive assistance with data. The Alfred Sloan Foundation, SRF, ERC, and ESRC have provided financial support. Any opinions and conclusions expressed herein are those of the authors and do not necessarily represent the views of the US Census Bureau. All results have been reviewed to ensure that no confidential information is disclosed. Data and replication files can be found at http://doi.org/10.3886/E111743V1.

† Go to https://doi.org/10.1257/aer.20180338 to visit the article page for additional materials and author disclosure statements.

☆ Nonfarm Business Sector: Labor Productivity (Output per Hour) for All Workers (PRS85006092)

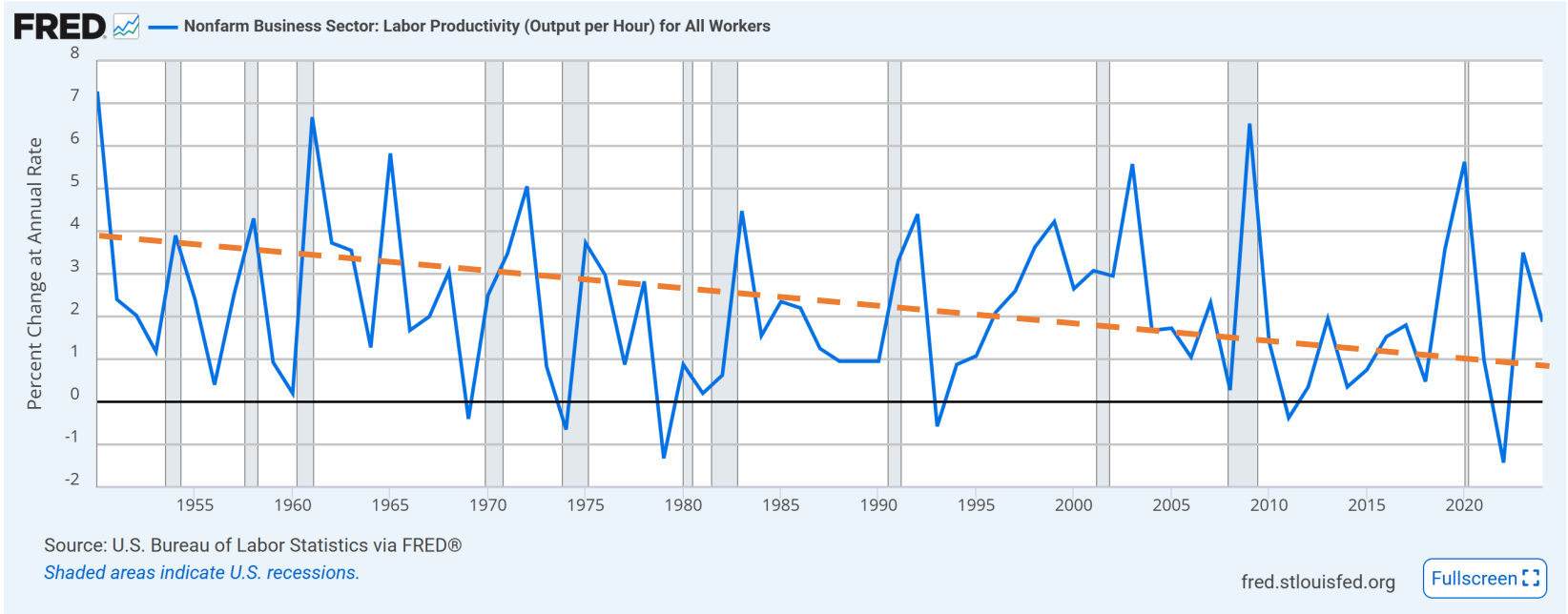
Observations
2024: **1.9**
Updated: Jan 8, 2026 7:38 AM CST
Next Release Date: Mar 5, 2026

Units:
Percent Change at Annual Rate,
Seasonally Adjusted

Frequency:
Annual,
Average

1Y | 5Y | 10Y | Max
1950-01-01 to 2024-01-01

Edit Graph
Download



Source: U.S. Bureau of Labor Statistics via FRED®
Shaded areas indicate U.S. recessions.

fred.stlouisfed.org
Fullscreen

But could AI change all of this – reverse 75 years of slowing growth?

Dario Amodei

The Adolescence of Technology

Confronting and Overcoming the Risks of Powerful AI

January 2026

economic growth. In *Machines of Loving Grace*, I suggest that a 10–20% sustained annual GDP growth rate may be possible.

The Simple Macroeconomics of AI
Daron Acemoglu
NBER Working Paper No. 32487
May 2024
JEL No. E24,J24,O30,O33

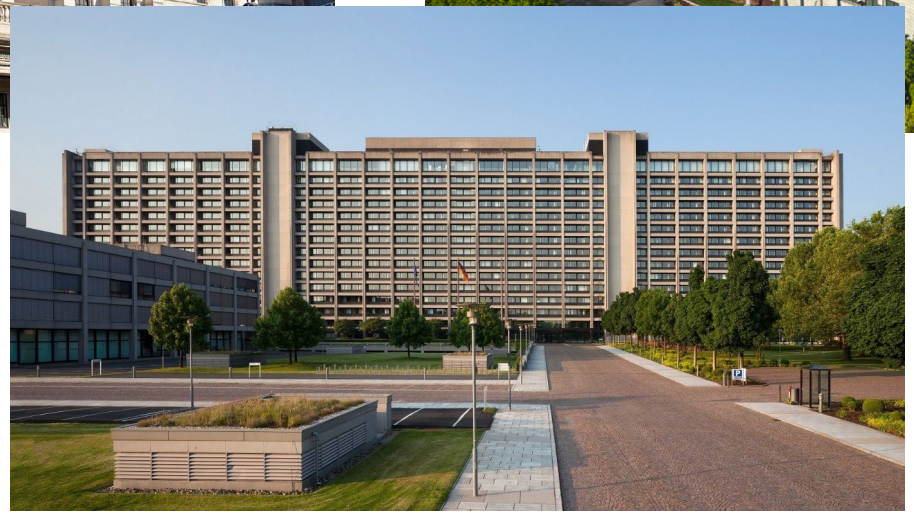
ABSTRACT

This paper evaluates claims about large macroeconomic implications of new advances in AI. It starts from a task-based model of AI's effects, working through automation and task complementarities. So long as AI's microeconomic effects are driven by cost savings/ productivity improvements at the task level, its macroeconomic consequences will be given by a version of Hulten's theorem: GDP and aggregate productivity gains can be estimated by what fraction of tasks are impacted and average task-level cost savings. Using existing estimates on exposure to AI and productivity improvements at the task level, these macroeconomic effects appear nontrivial but modest—no more than a 0.66%increase in total factor productivity (TFP) over 10 years. The paper then argues that even these estimates could be exaggerated, because early evidence is from easy-to-learn tasks, whereas some of the future effects will come from hard-to-learn tasks, where there are many context-dependent factors affecting decision-making and no objective outcome measures from which to learn successful performance. Consequently, predicted TFP gains over the next 10 years are even more modest and are predicted to be less than 0.53%. I also explore AI's wage and inequality effects. I show theoretically that even when AI improves the productivity of low-skill workers in certain tasks (without creating new tasks for them), this may increase rather than reduce inequality. Empirically, I find that AI advances are unlikely to increase inequality as much as previous automation technologies because their impact is more equally distributed across demographic groups, but there is also no evidence that AI will reduce labor income inequality. Instead, AI is predicted to widen the gap between capital and labor income. Finally, some of the new tasks created by AI may have negative social value (such as design of algorithms for online manipulation), and I discuss how to incorporate the macroeconomic effects of new tasks that may have negative social value.

For monetary policy critical to know if it's 10%, 1% or 0.1% impact

Team Central Banks collected AI data from Nov 2025-Jan 2026 from 6k CFO/CEOs

First large representative international firm survey - one way to predict impact of AI



>>>> Current AI data

>>>> Our Survey Process

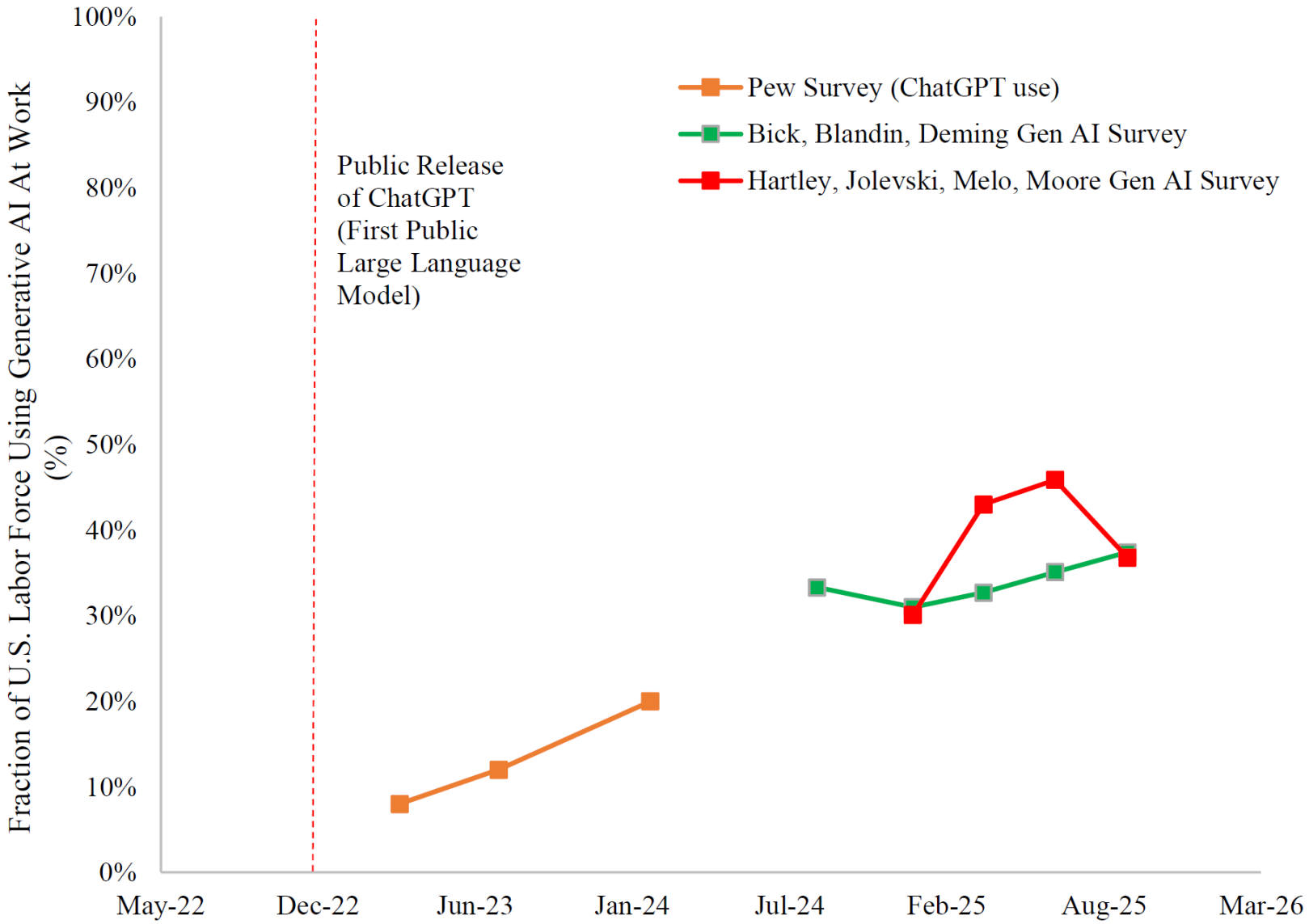
>>>> Results

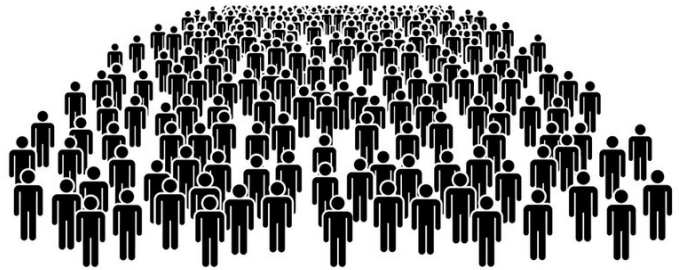
Two types of AI use data

Individual People

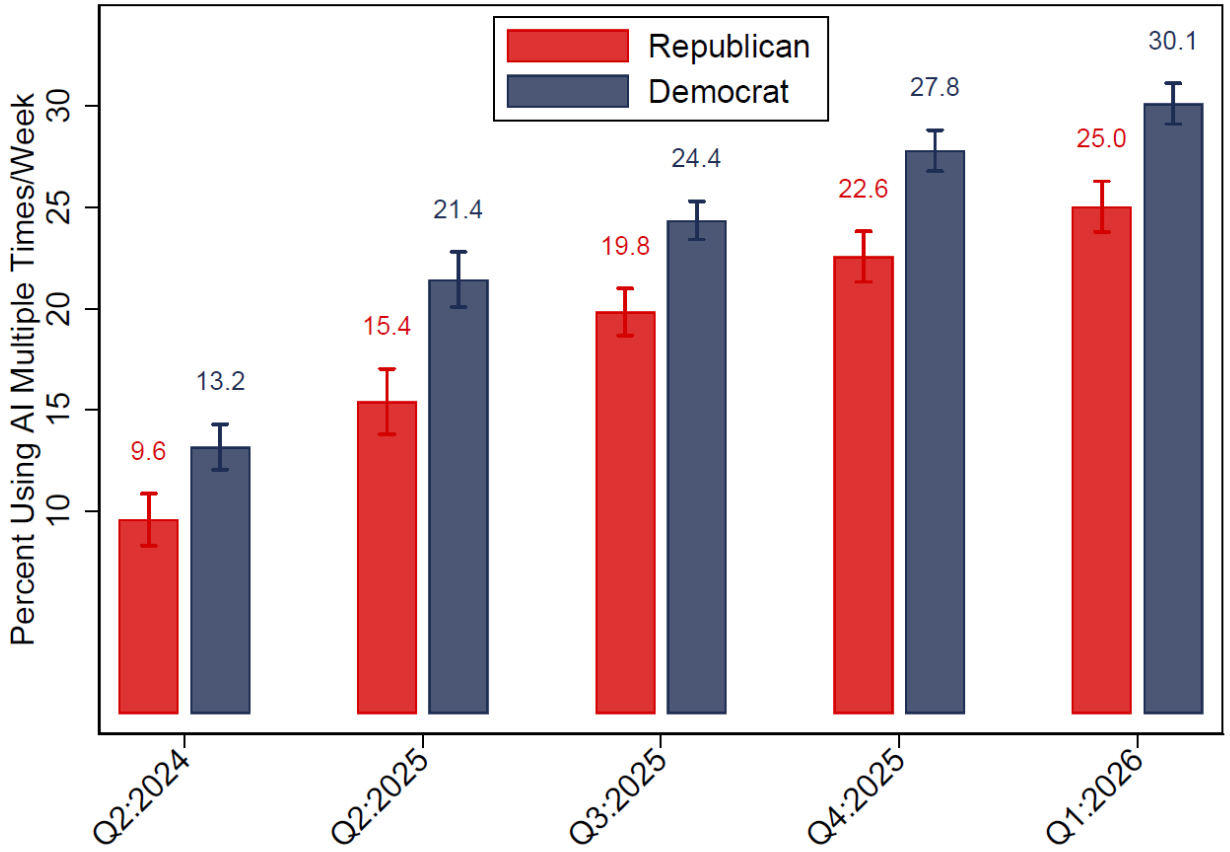
Firms

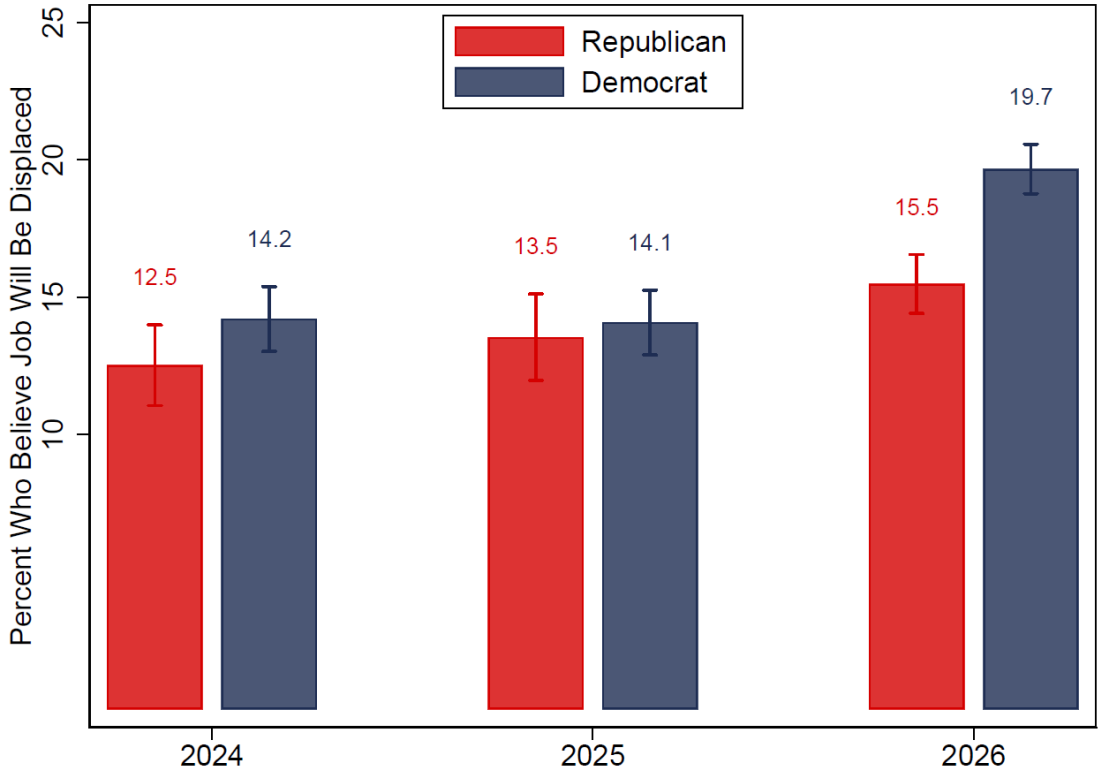
Data on AI use by individuals shows adoption rising to 30% or 40%





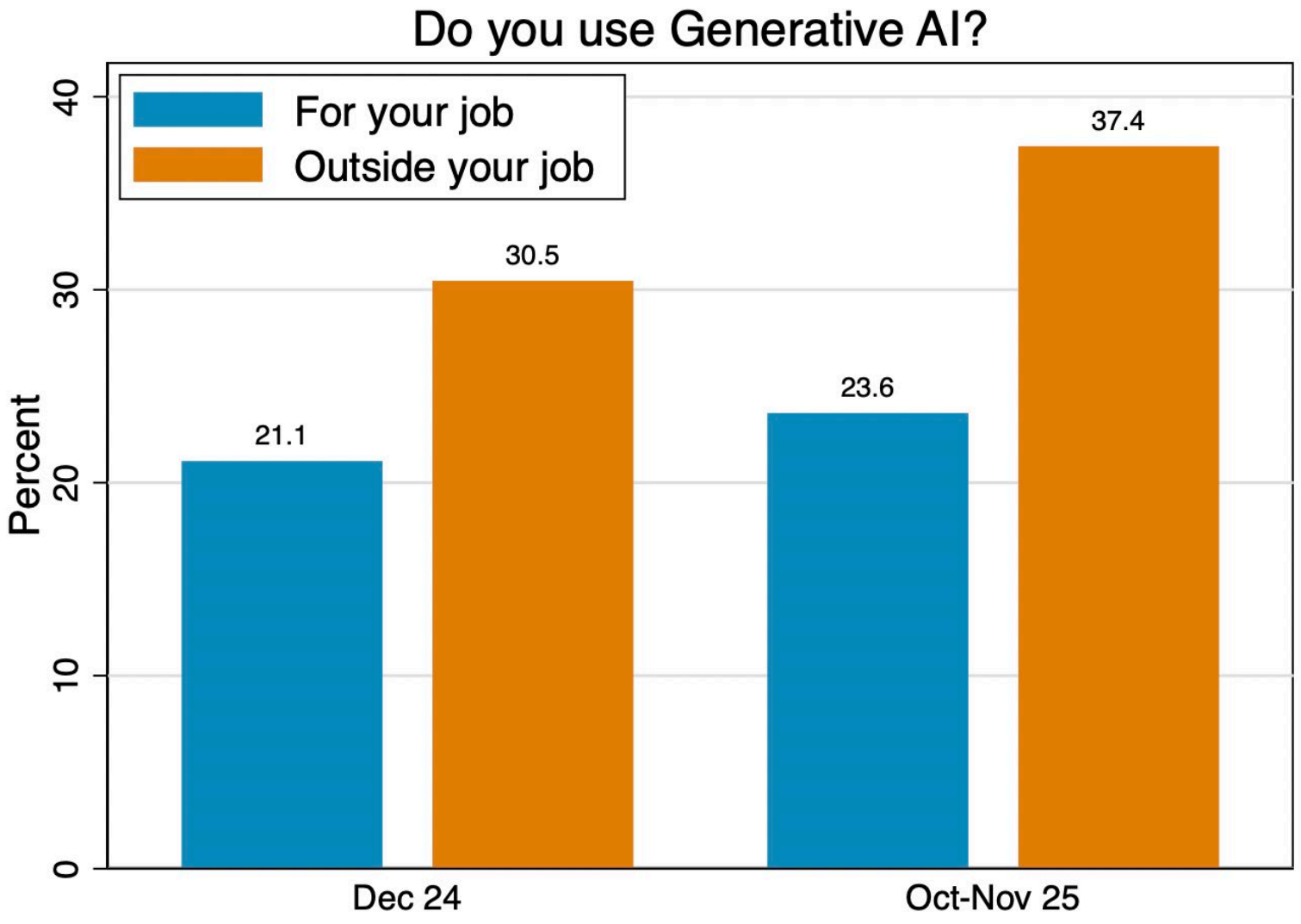
This AI use has political differences in adoption and concerns





Note: Sourced from Gallup Workforce Panel, analyzed in Bloom and Makridis (2026) “The politics of AI” https://www.nber.org/papers/w34813

This AI is used by individuals more at home than at work



Responses to the Questions:

- *Had you heard about Generative AI before this survey?*
- *Do you use Generative AI for your job?*
- *Do you use Generative AI [outside your job?*

Notes: The sample includes all respondents aged 20 to 64 who answered the December 2024 or October 2025 **SWAA** waves, including individuals who did not earn at least $10,000 the prior year. We record a respondent as not using generative AI if they report not having heard of it prior to the survey. We reweight the raw survey responses to match the 2010-2019 Current Population Survey by age, sex, education, and earnings cells. Source Barrero, Bloom and Davis (2025) SWAA survey.

N = 14,347 (for your job)
N = 18,120 (outside your job)

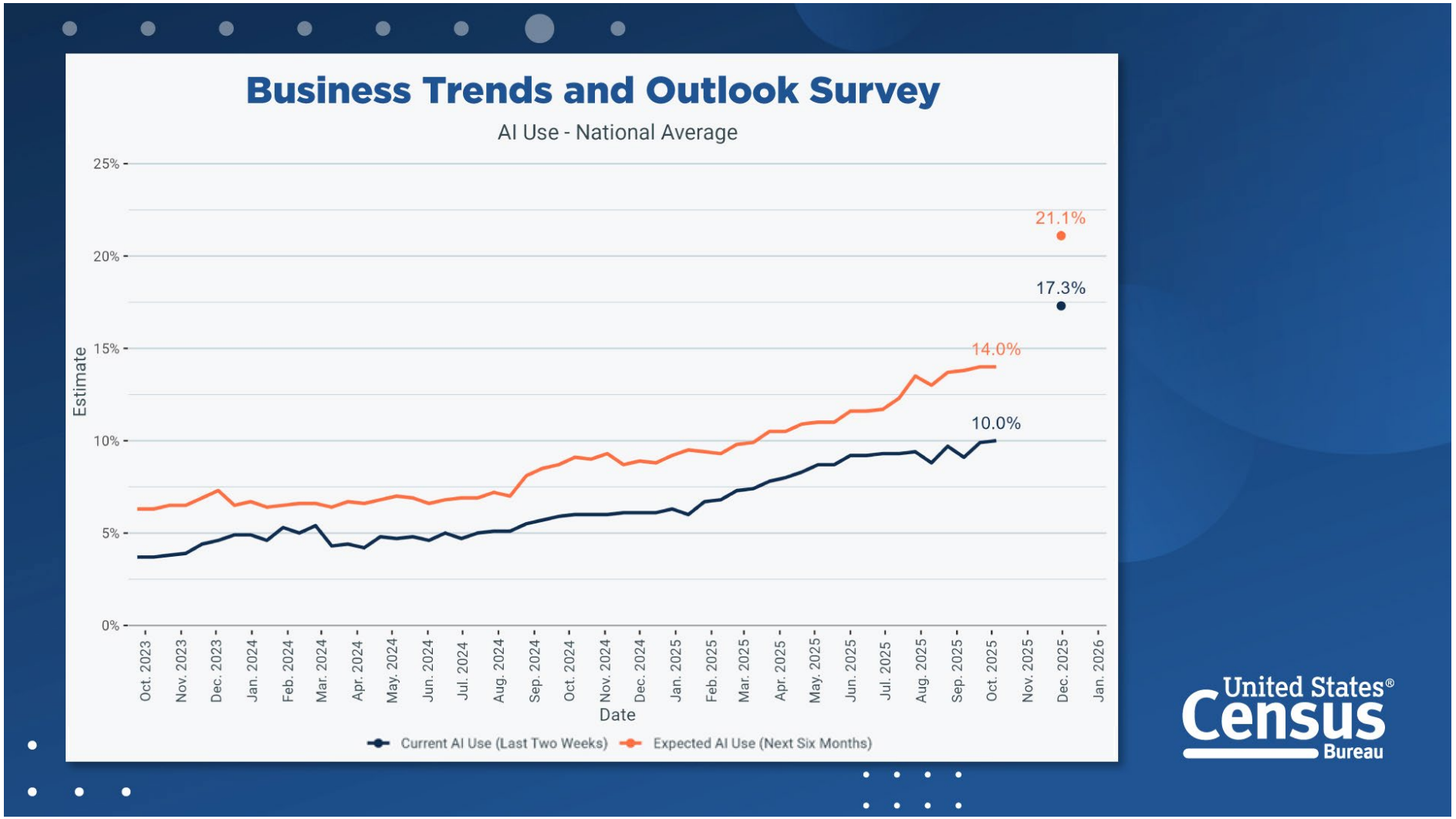
Source: Survey of Workplace Attitudes and Arrangements www.wfhresearch.com

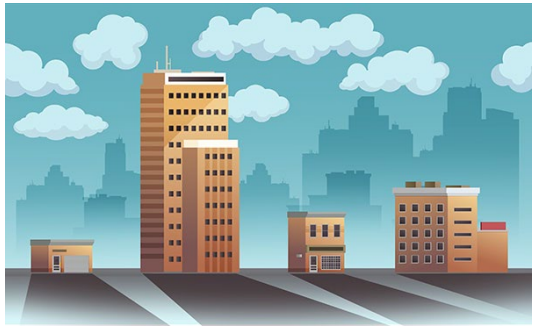
Two types of AI use data

Individual People

Firms

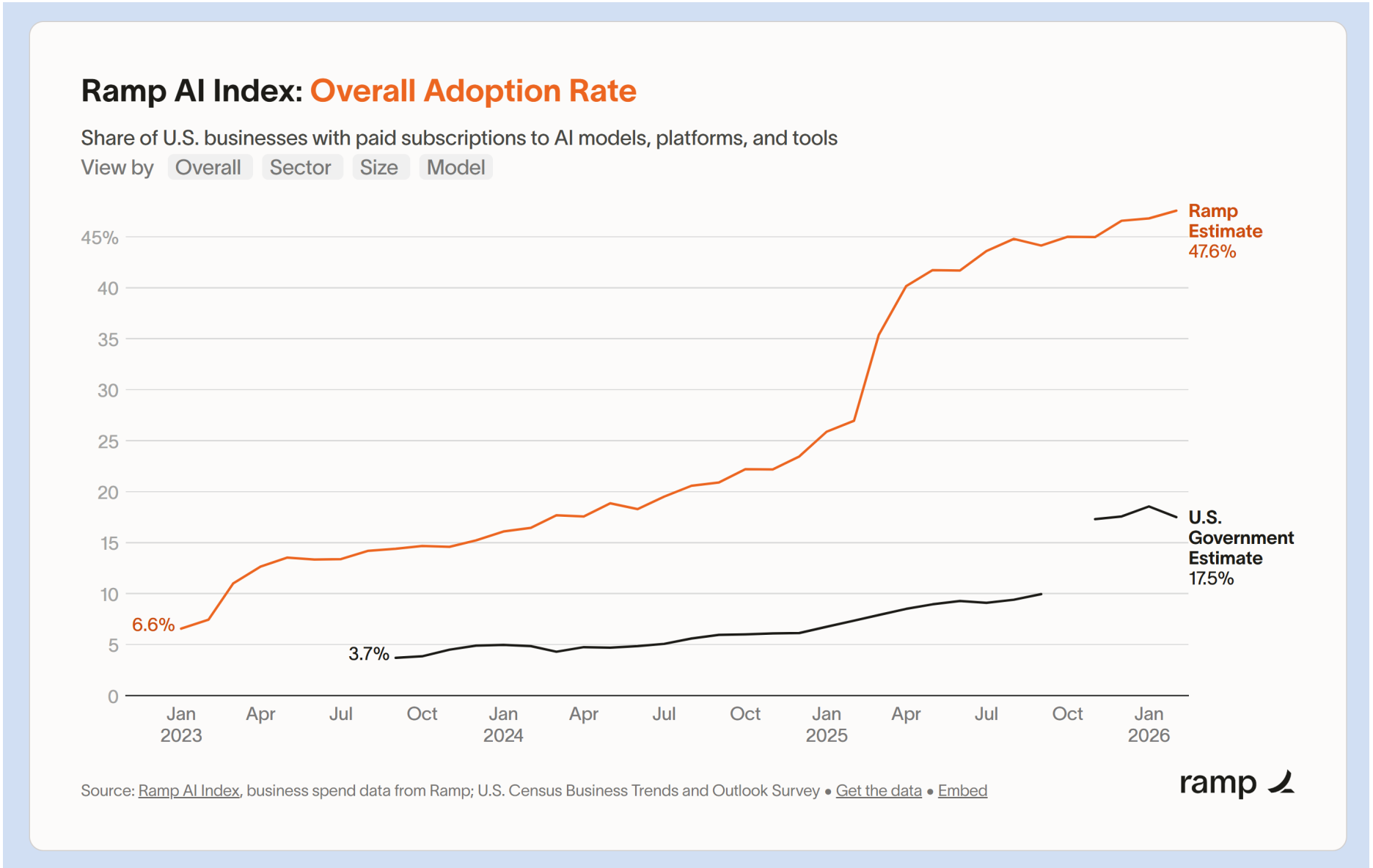
Census data on AI use in firms – oddly low and flat (less than 20%)?





Issue: who is responding – relative junior folks who may not know?

Ramp data shows higher AI use, but narrower measure of AI and samples their customers

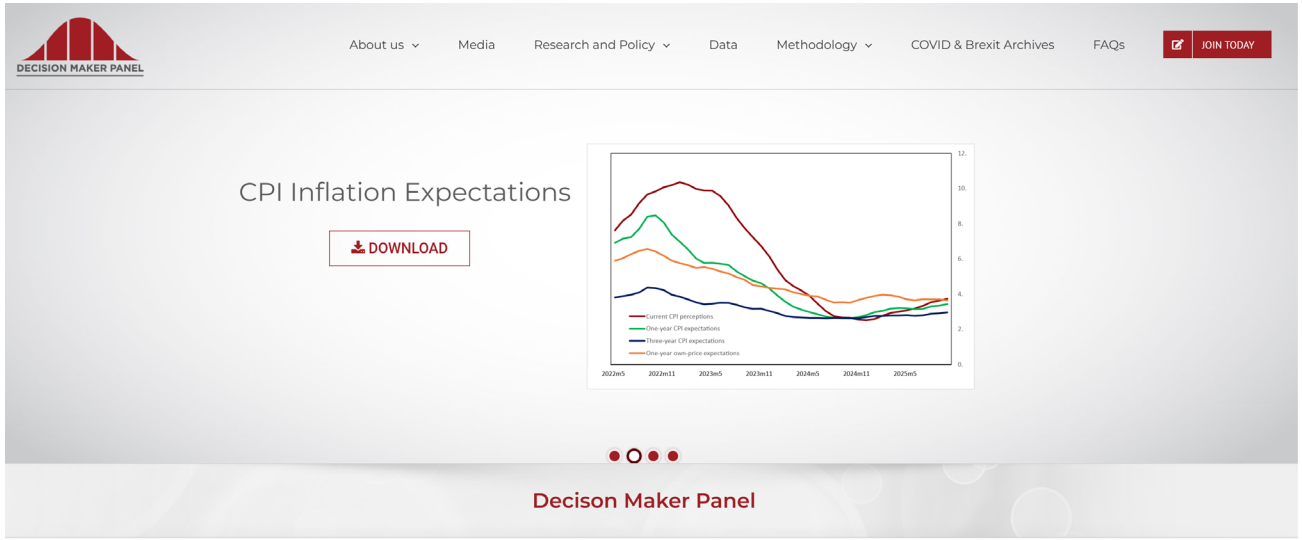


>>>> Current data

>>>> Our Survey Process

>>>> Results

Use existing firm survey panels in US, UK, Germany and Australia



Next month's Decision Maker Panel data will be published Thursday 4th December 2025

DECISION MAKER PANEL

LATEST DATA – OCTOBER 2025

SIGN UP FOR NOTIFICATIONS

The DMP was set up in August 2016. It provides direct insight into business expectations and uncertainty, for example Covid-19, Brexit and Inflation. Our panel draws information from Financial Officers in UK companies operating in a broad range of industries and is designed to be representative of the population of UK businesses.

BANK OF ENGLAND GOVERNOR'S LETTER TO DMP MEMBERS

Survey of Business Uncertainty

SBU Survey of Business Uncertainty

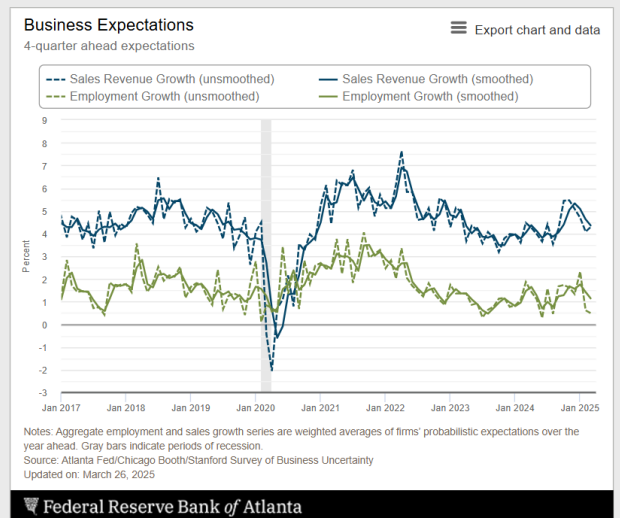
The Survey of Business Uncertainty (SBU) is an innovative panel survey that measures one-year-ahead expectations and uncertainties that firms have over their own employment and sales. The sample covers all regions of the U.S. economy, every industry sector except agriculture and government, and a broad range of firm sizes. The SBU was created in consultation with Steven Davis of the Hoover Institution and Nicholas Bloom of Stanford University.

External researchers can now request SBU microdata that have had identifying characteristics removed. To initiate a request, please complete this form.

Latest Data & News | Findings & Results | Researcher Biographies | About the Survey | About the Panel | SBU in the Media

Select a chart: Business Expectations

Download aggregate data | Special questions archive | Request microdata



Our New Chart Pack Has Arrived!

Click here or download in the Findings tab

Latest Media Mentions

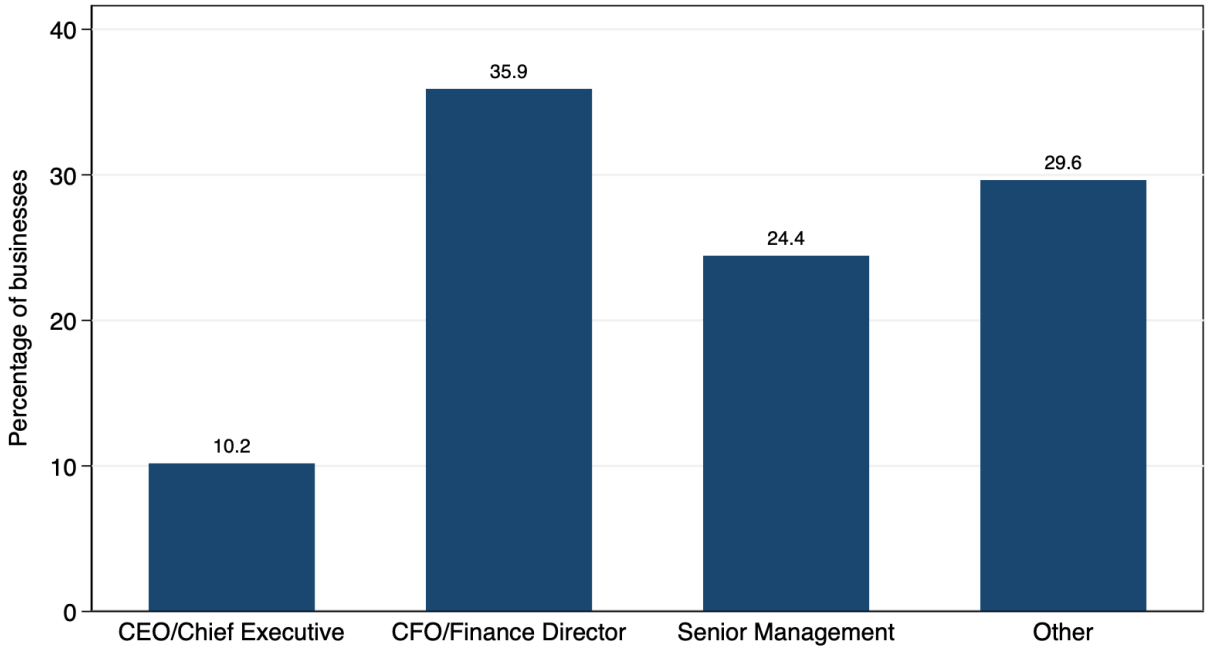
- "There's no magic in a 4-day workweek," The Hill, 24 January 2024.
- "Even as companies crack down, execs predict a rise in remote work," The Business Journals, 29 August 2023.
- "What Impact Does Remote Work Have On Inflation?," Forbes, January 19, 2023.
- "How technology is redrawing the boundaries of the firm," The Economist, 8 January 2023.
- "Getting Rid of Remote Work Will Take More Than a Downturn," New York Times, 7 January 2023.
- "Remote work may be an unlikely ally in Federal Reserve's inflation fight," CNBC, 15 July 2022.
- "Why requiring workers to spend more days in the office could backfire," CNN Business, 13 July 2022.
- "Companies are letting you work from home so they can pay you less – and so you'll be happier," Business Insider, 12 July 2022.
- "Remote Work Leads to Slower Wage Growth

These Surveys Panels Phone Recruit Execs and Then Move them to an Online Panel (So You Know It's a Real Exec Answering….)

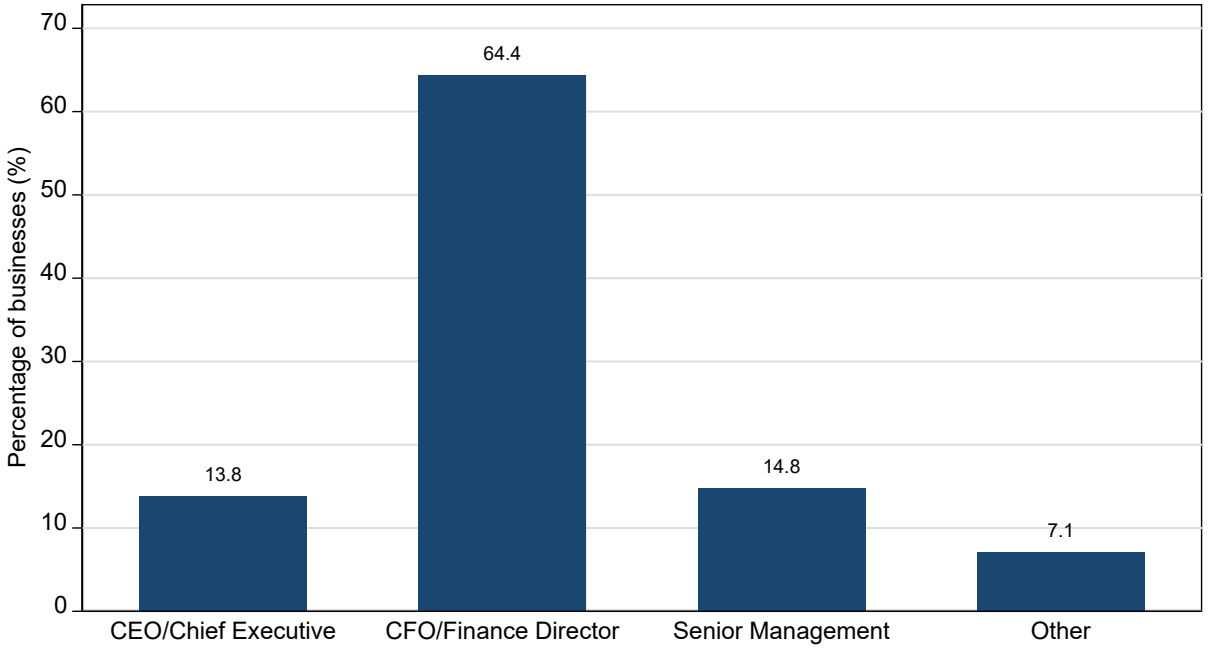
Random sampling from population of firms with 10+ employees (median ≈250)

Our Recruitment Team Targets CFOs, CEOs and Senior Execs

US Firms



UK Firms



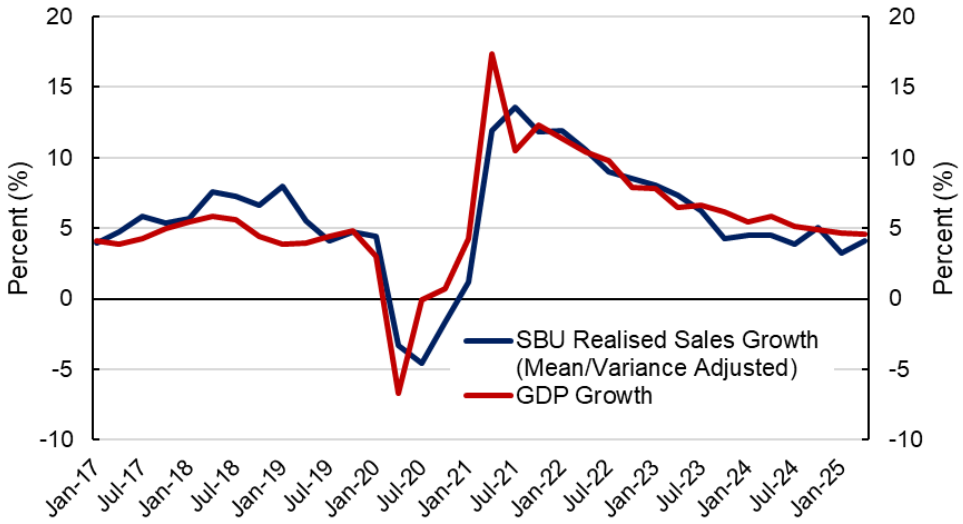
***Notes**: This figure shows the position of survey respondents. Panel A shows data from the US Survey of Business Uncertainty (SBU), averaged over January 2017 to January 2025. Panel B shows data from the UK Decision Maker Panel (DMP), averaged over 2017-2025.*

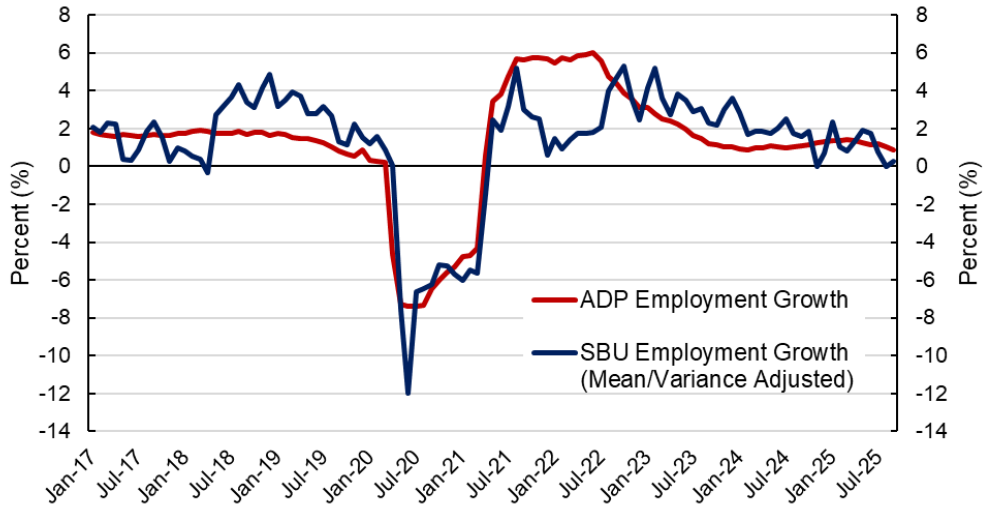
Data Quality Check: Historic Data Aligns with Macro Data

Panel A Sales growth

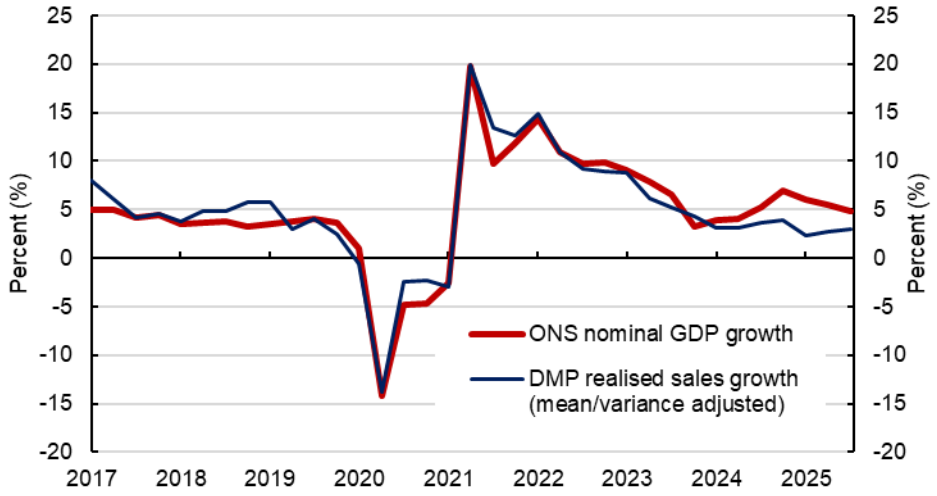
Panel B Employment growth

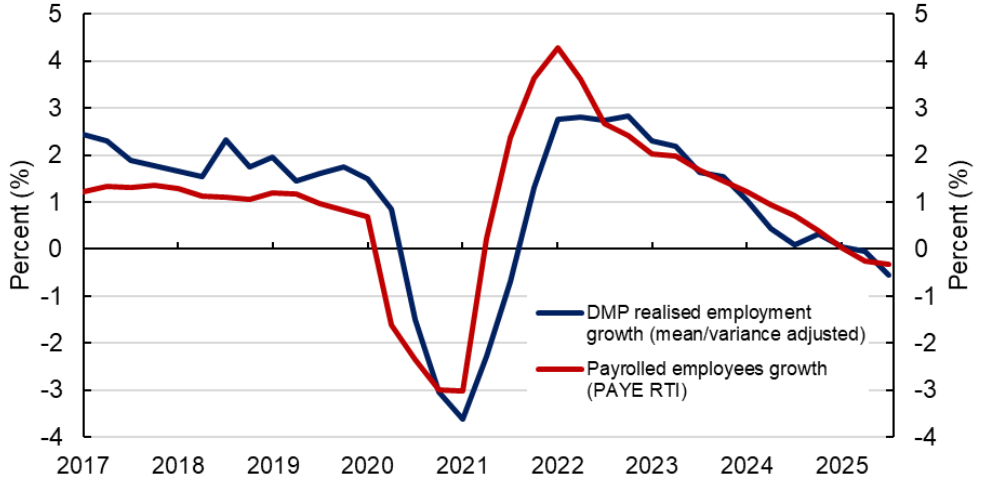
US Firms (SBU)





UK Firms (DMP)





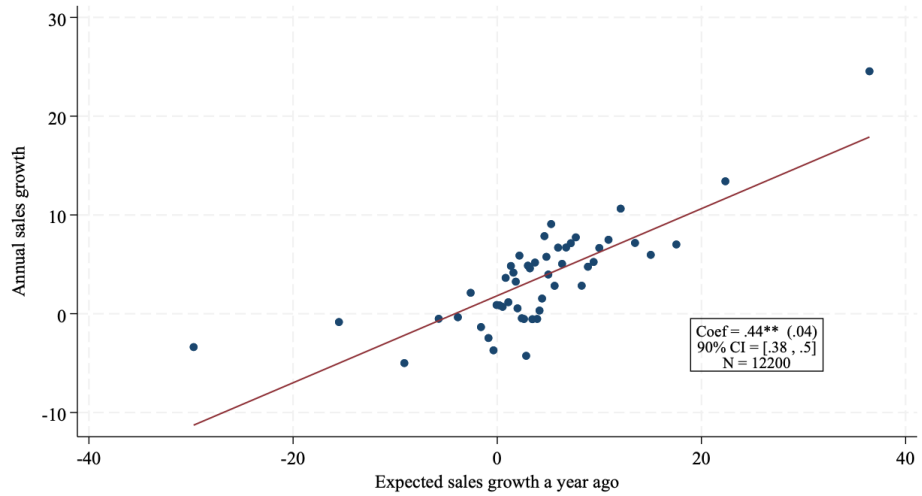
***Sources**: SBU; ADP; BEA; DMP; ONS; HMRS and authors' calculations. **Notes**: SBU sales data are compared to GDP growth from the BEA. SBU employment growth data are compared to ADP employment growth. DMP sales data are compared to whole economy nominal GDP growth at current market prices. DMP employment (for the private sector) is compared to ONS/HMRC data on the number of payrolled employees. DMP and SBU data are adjusted to match the mean and variance of growth in the corresponding ONS, HMRC, GDP, and ADP series over the time period shown on each chart.*

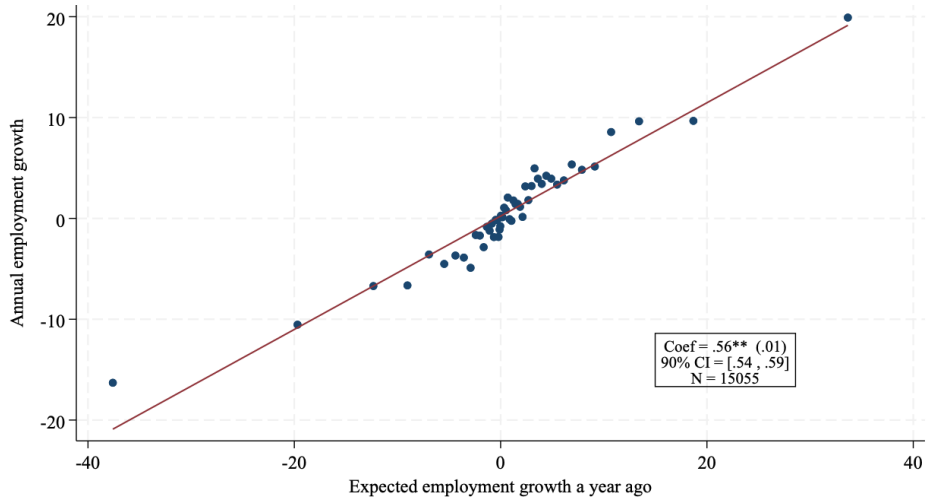
Data Quality Check: Sales and Employment Forecasts Look Good

Sales growth

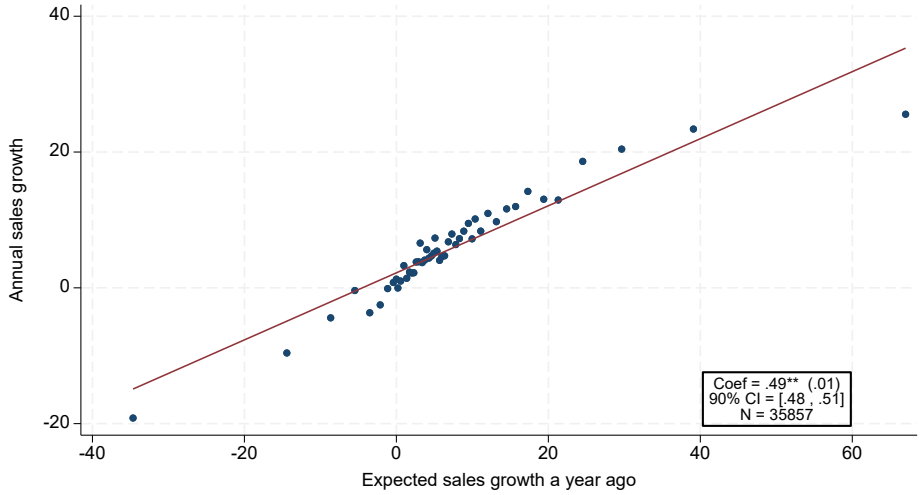
Employment growth

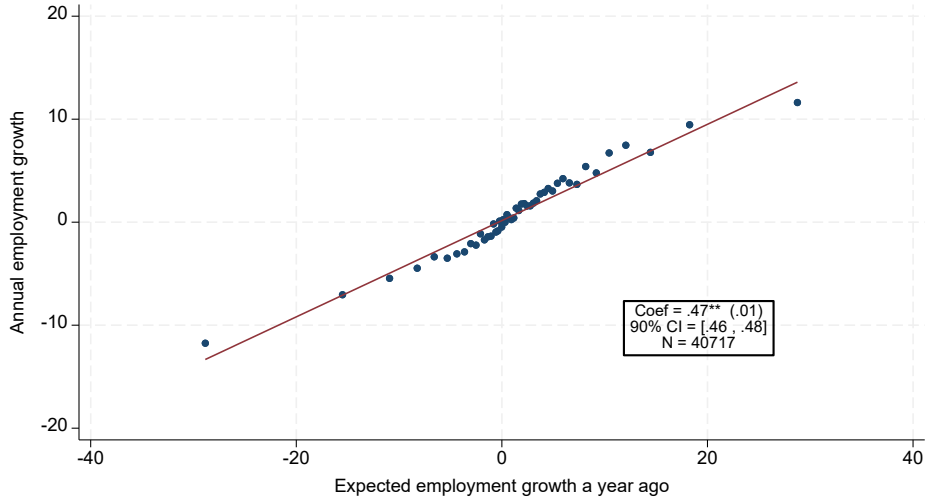
US Firms (SBU)





UK Firms (DMP)





***Notes**: This figure shows binned scatter plots of the relationship between expected year-ahead sales growth and annual sales growth a year later at the firm level (Panel A) and expected year-ahead employment growth and annual employment growth a year later (Panel B). The sample from the SBU covers 2014-2025. The sample from the UK DMP covers 2017-2025.*

>>>> Current data

>>>> Our Survey Process

>>>> Results

The Survey Starts with a Question on AI Use by the Exec themselves

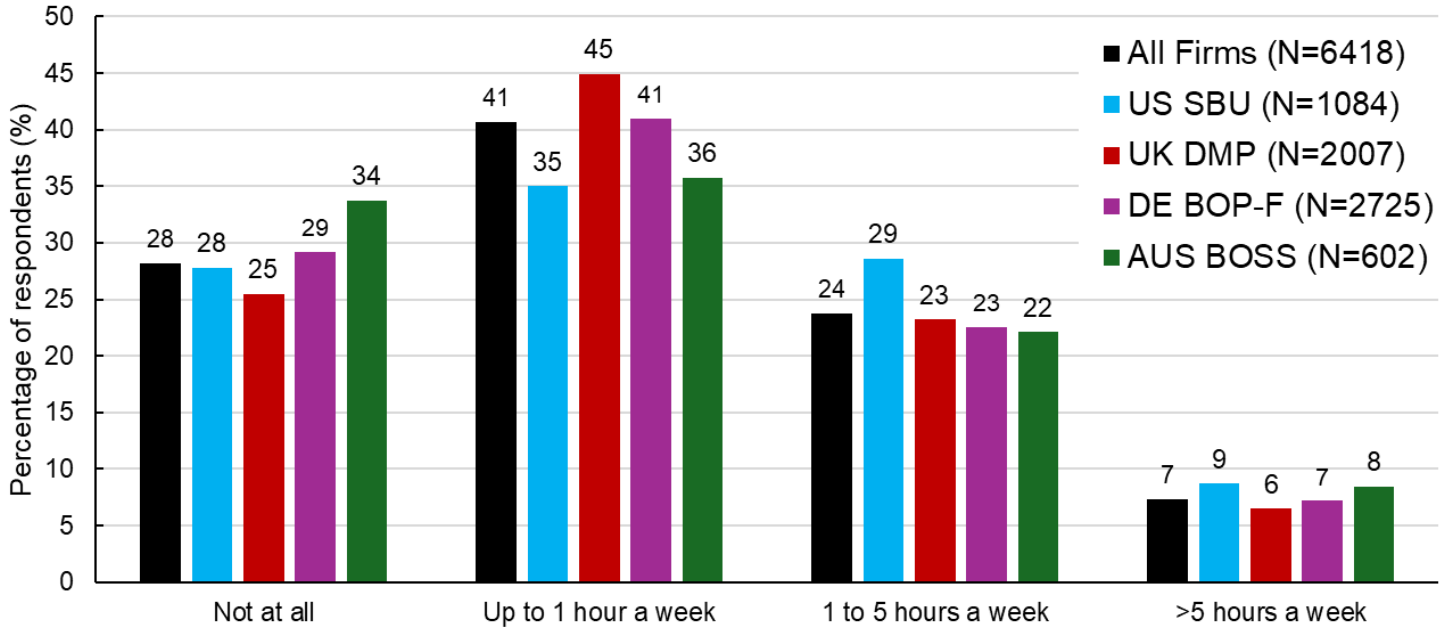
Decision Maker Panel

On average, how frequently do you **personally use** artificial intelligence technologies in a typical working week?

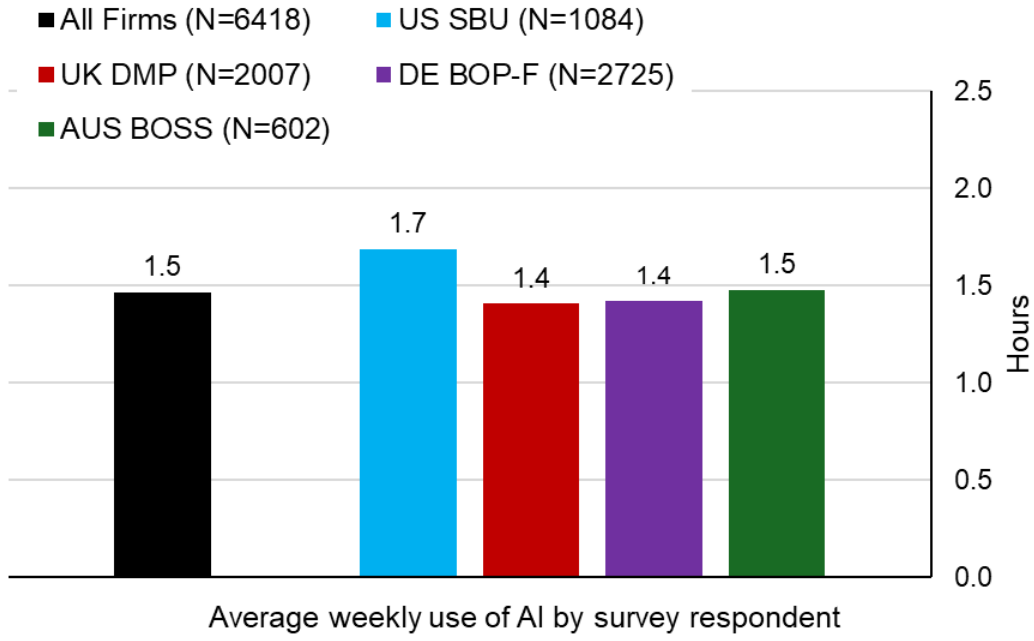
- Not at all
- Up to 1 hour a week
- 1 to 5 hours a week
- More than 5 hours a week

Most use it a few hours a week, one quarter never uses it

Panel A Distribution of responses

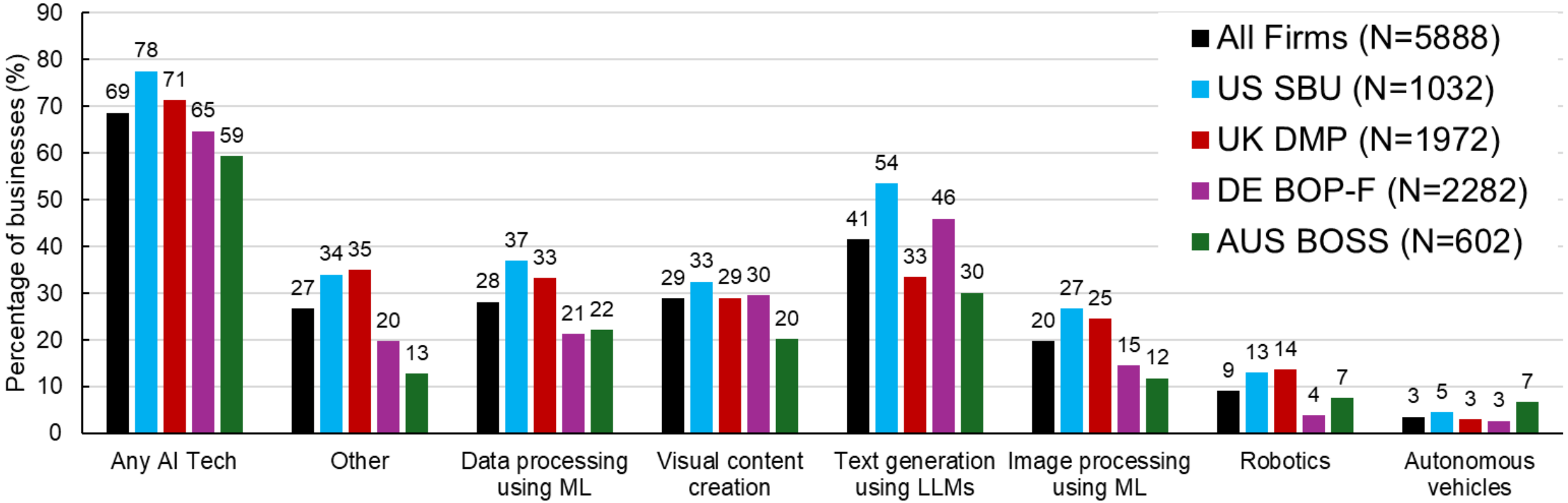


Panel B Average AI use per week



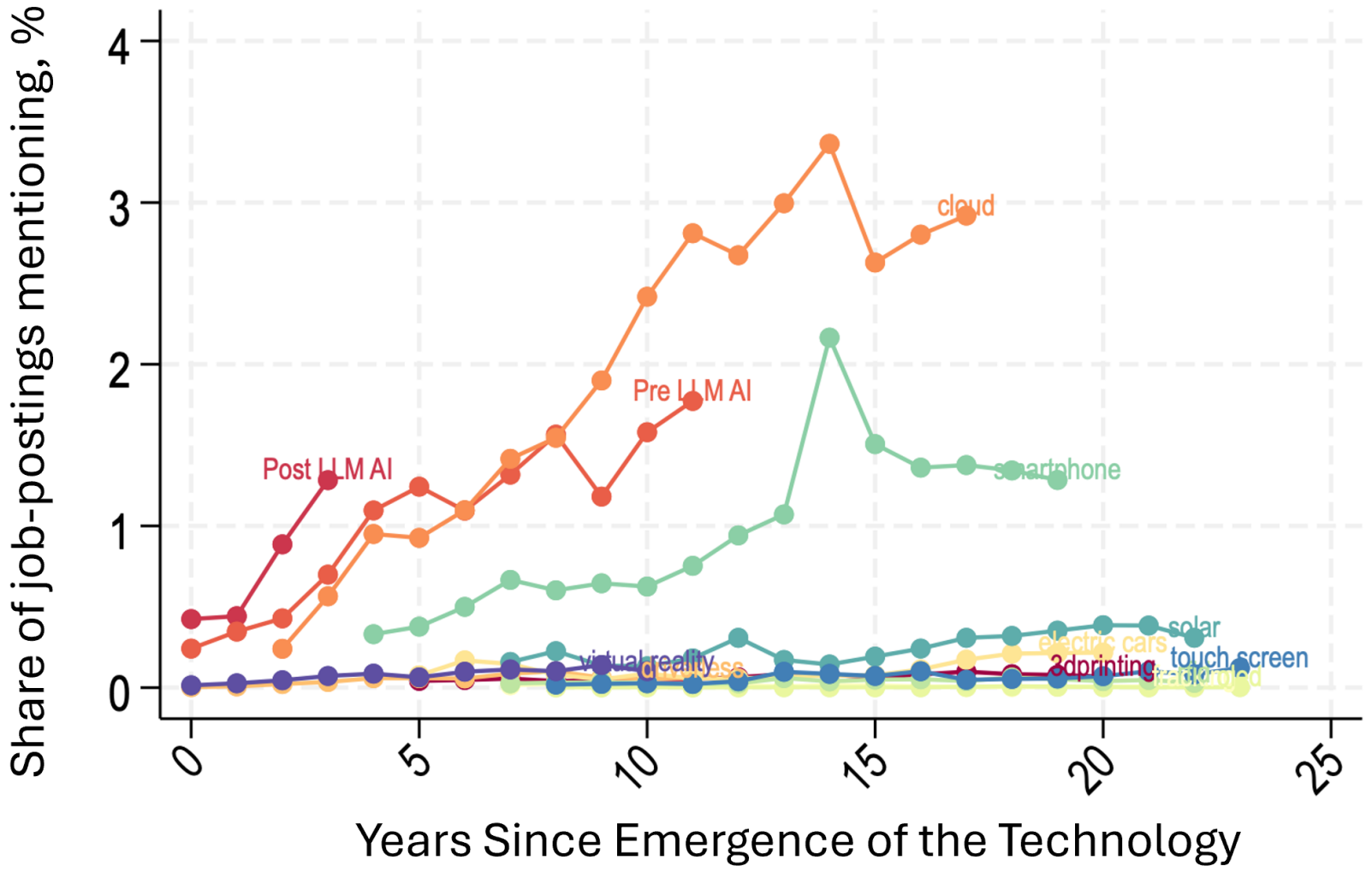
***Notes**: This figure is based on responses to the question: "On average, how frequently do you personally use artificial intelligence technologies in a typical working week?" The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data from the German Bundesbank Online Panel – Firms (BOP-F) were collected in January 2026. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. The results for all firms is the average of the four surveys, weighted by the respective number of responses. To calculate the average use per week (Panel B), values are assigned to each of the options in Panel A: 0 to "Not at all"; 0.5 to "up to 1 hour a week"; 3 to "1 to 5 hours a week"; 7.5 to ">5 hours a week".*

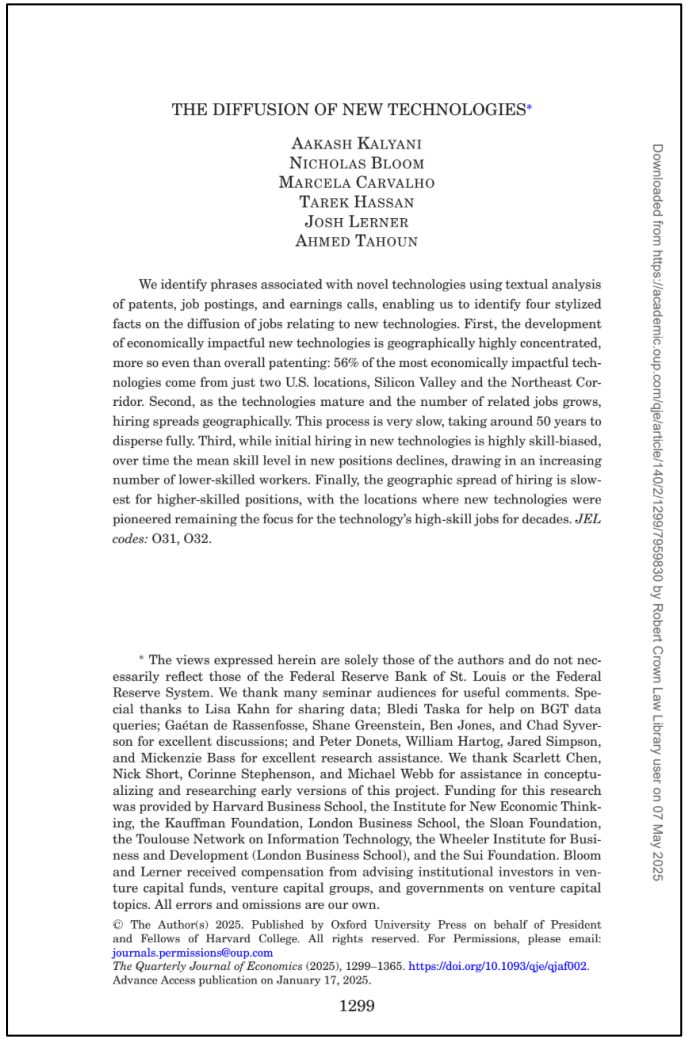
Most of their firms use AI, one quarter do not



***Notes**: This figure is based on responses to the question: "Which of the following artificial intelligence technologies, if any, does your business currently use?" Firms could select more than one option. The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the German Bundesbank Online Panel-Firms (BOP-F) was collected in January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. The results for all firms is the average of the four surveys, weighted by the respective number of responses.*

The adoption rate for AI appears fast compared to other tech





THE DIFFUSION OF NEW TECHNOLOGIES*

AAKASH KALYANI
NICHOLAS BLOOM
MARCELA CARVALHO
TAREK HASSAN
JOSH LERNER
AHMED TAHOUN

We identify phrases associated with novel technologies using textual analysis of patents, job postings, and earnings calls, enabling us to identify four stylized facts on the diffusion of jobs relating to new technologies. First, the development of economically impactful new technologies is geographically highly concentrated, more so even than overall patenting: 56% of the most economically impactful technologies come from just two U.S. locations, Silicon Valley and the Northeast Corridor. Second, as the technologies mature and the number of related jobs grows, hiring spreads geographically. This process is very slow, taking around 50 years to disperse fully. Third, while initial hiring in new technologies is highly skill-biased, over time the mean skill level in new positions declines, drawing in an increasing number of lower-skilled workers. Finally, the geographic spread of hiring is slowest for higher-skilled positions, with the locations where new technologies were pioneered remaining the focus for the technology's high-skill jobs for decades. *JEL codes:* O31, O32.

* The views expressed herein are solely those of the authors and do not necessarily reflect those of the Federal Reserve Bank of St. Louis or the Federal Reserve System. We thank many seminar audiences for useful comments. Special thanks to Lisa Kahn for sharing data; Bledi Taska for help on BGT data queries; Gaétan de Rassenfosse, Shane Greenstein, Ben Jones, and Chad Syverson for excellent discussions; and Peter Donets, William Hartog, Jared Simpson, and Mickenzie Bass for excellent research assistance. We thank Scarlett Chen, Nick Short, Corinne Stephenson, and Michael Webb for assistance in conceptualizing and researching early versions of this project. Funding for this research was provided by Harvard Business School, the Institute for New Economic Thinking, the Kauffman Foundation, London Business School, the Sloan Foundation, the Toulouse Network on Information Technology, the Wheeler Institute for Business and Development (London Business School), and the Sui Foundation. Bloom and Lerner received compensation from advising institutional investors in venture capital funds, venture capital groups, and governments on venture capital topics. All errors and omissions are our own.

The Quarterly Journal of Economics (2025), 1299–1365. https://doi.org/10.1093/qje/qjaf002.
Advance Access publication on January 17, 2025.

Source: Job postings data based on "The diffusion of new technologies" by Aakash Kalyani, Nick Bloom, Marcela Carvalho, Tarek Hasan, Josh Lerner and Ahmed Tahoun Quarterly Journal of Economics, 2025

Also asked about past and expected future impact of AI

SBU Survey of Business Uncertainty

How has the adoption of A.I. technologies affected the volume of SALES PER EMPLOYEE of your business over the **past three years**?

And how do you expect this to affect your volume of SALES PER EMPLOYEE over the **next three years**?

	Past 3 years	Next 3 years
A large negative influence, subtracting 5% or more	○	○
A minor negative influence, subtracting less than 5%	○	○
No material impact	○	○
A minor positive influence, adding less than 5%	○	○
A large positive influence, adding 5% or more	○	○

SBU Survey of Business Uncertainty

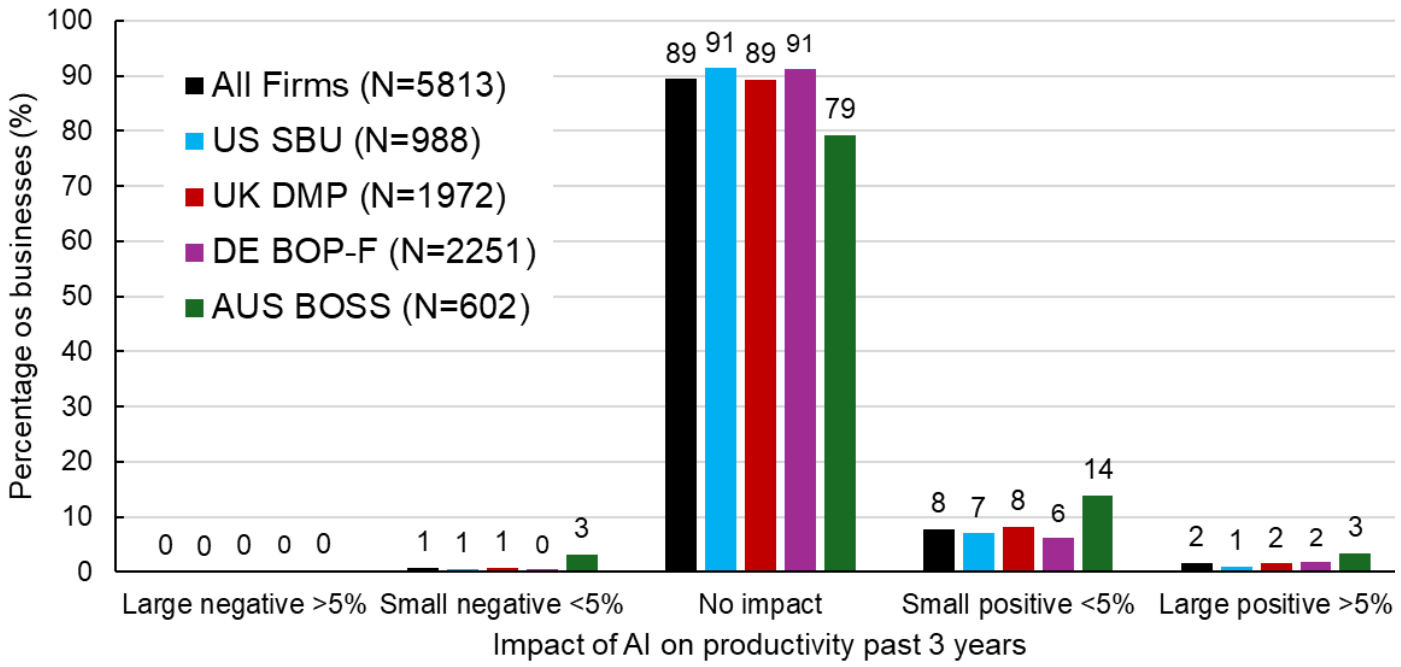
How has the adoption of A.I. technologies affected the NUMBER OF EMPLOYEES of your business over the **past three years**?

And how do you expect this to affect your NUMBER OF EMPLOYEES over the **next three years**?

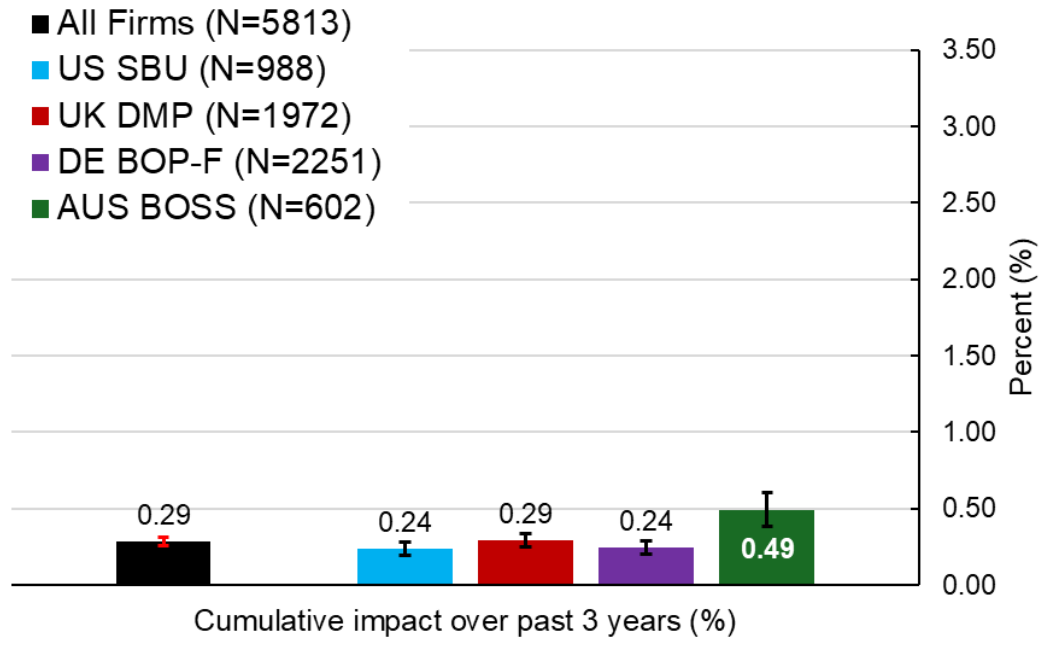
	Past 3 years	Next 3 years
A large negative influence, subtracting 5% or more	○	○
A minor negative influence, subtracting less than 5%	○	○
No material impact	○	○
A minor positive influence, adding less than 5%	○	○
A large positive influence, adding 5% or more	○	○

Execs reported little impact of AI on productivity over past 3 years

Panel A Distribution of responses



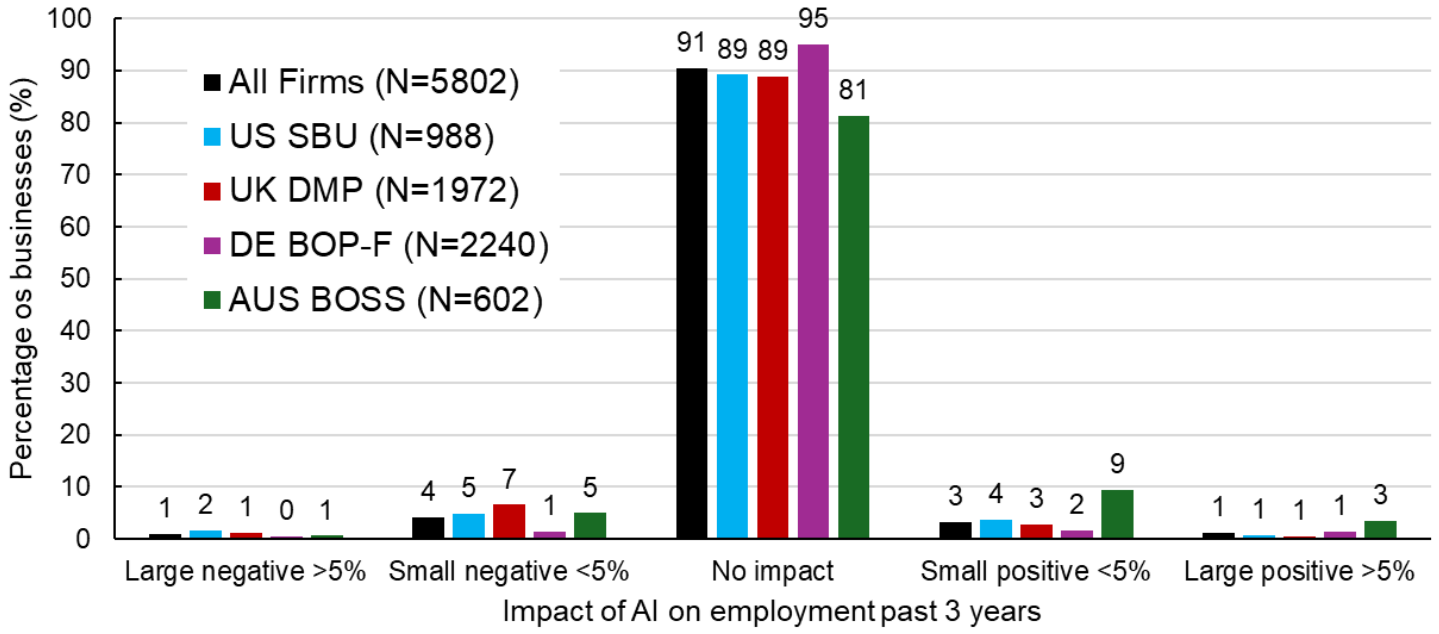
Panel B Average total impact



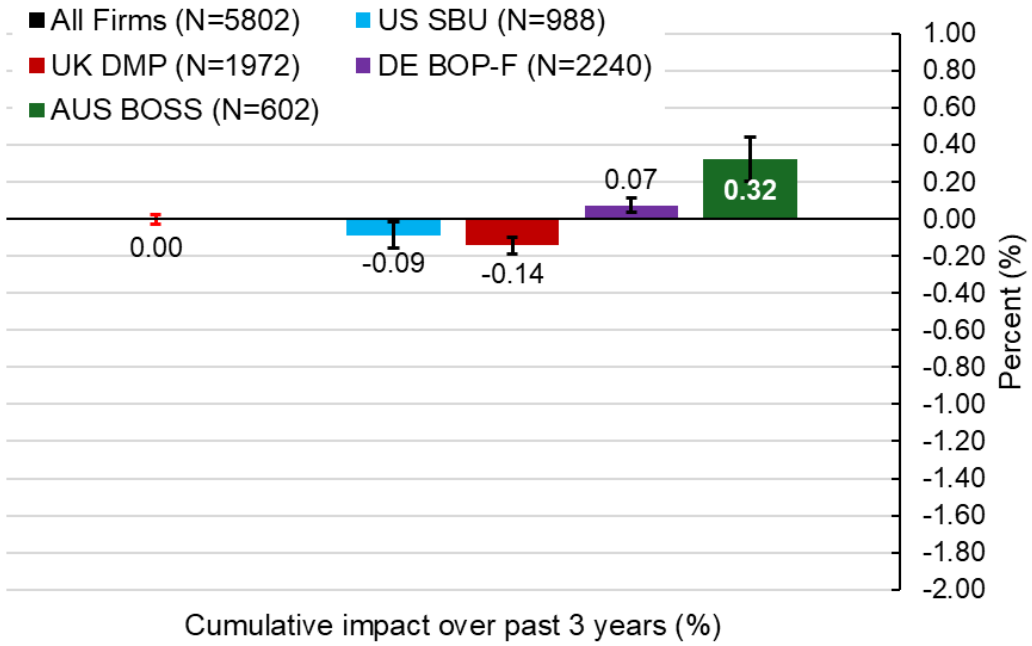
***Notes**: This figure is based on responses to the question: "How has the adoption of artificial intelligence technologies affected the volume of sales per employee in your business over the past three years?" The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the German Bundesbank Online Panel-Firms (BOP-F) was collected in January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. To calculate the average impacts (Panel B), values are assigned to each of the options in Panel A: large negative/large positive impacts are treated as $\pm 7.5\%$; small negative/small positive impacts are treated as $\pm 2.5\%$. The impact for all firms is the average of the impacts for the four surveys, weighted by the respective number of responses. 90% confidence intervals are shown for these impacts.*

Execs reported no impact of AI on employment over past 3 years

Panel A Distribution of responses



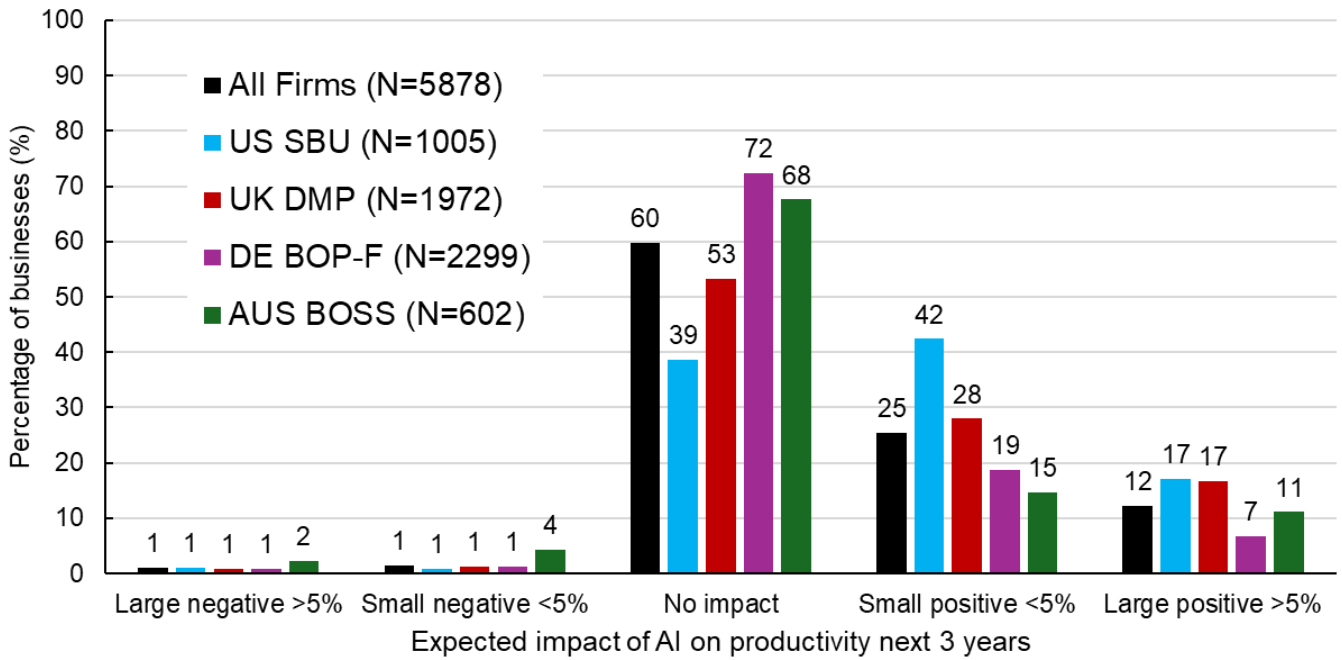
Panel B Average total impact



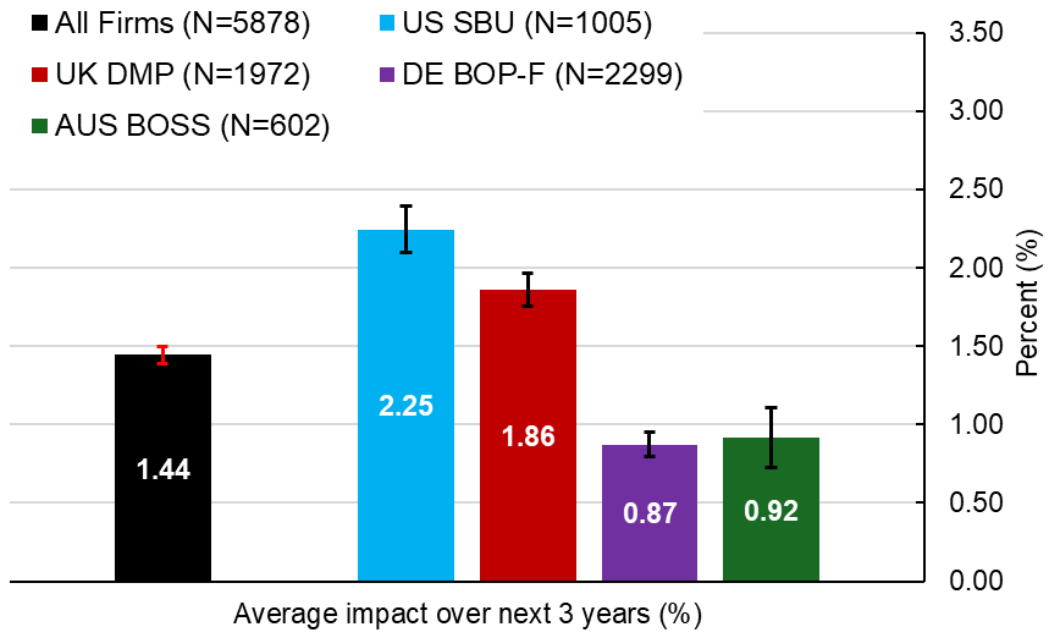
***Notes**: This figure is based on responses to the question: "How has the adoption of artificial intelligence technologies affected the number of employees in your business over the past three years?" The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the German Bundesbank Online Panel-Firms (BOP-F) was collected in January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. To calculate the average impacts (Panel B), values are assigned to each of the options in Panel A: large negative/large positive impacts are treated as $\pm 7.5\%$; small negative/small positive impacts are treated as $\pm 2.5\%$. The impact for all firms is the average of the impacts for the four surveys, weighted by the respective number of responses. 90% confidence intervals are shown for these impacts.*

Execs forecasted huge impacts on productivity in next 3 years

Panel A Distribution of responses



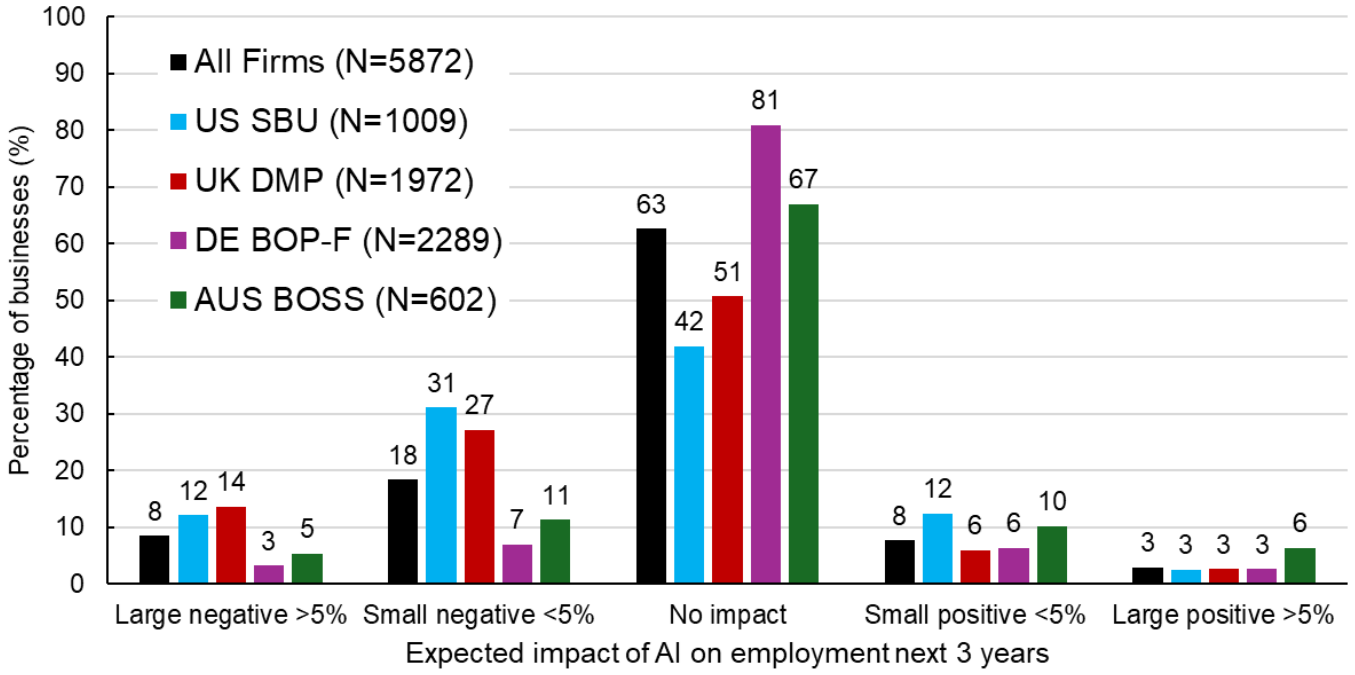
Panel B Average total impact



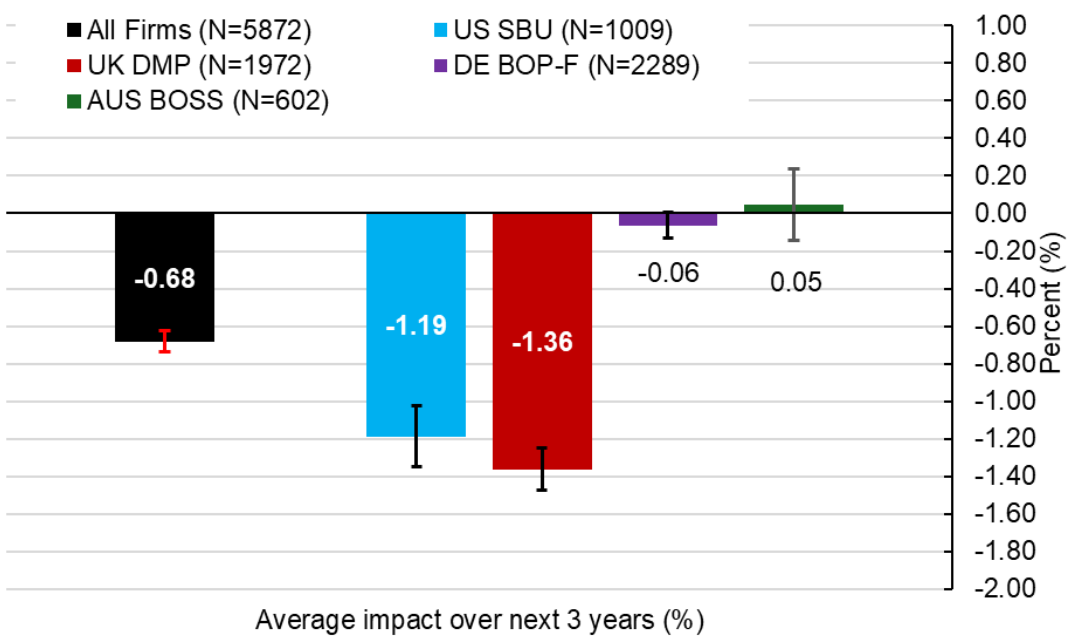
***Notes**: This figure is based on responses to the question: "How has the adoption of artificial intelligence technologies affected volume of sales per employee in your business over the past three years? And how do you expect this to affect your volume of sales per employee over the next 3 years?" The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the German Bundesbank Online Panel-Firms (BOP-F) was collected in January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. To calculate the average impacts (Panel B), values are assigned to each of the options in Panel A: large negative/large positive impacts are treated as $\pm 7.5\%$; small negative/small positive impacts are treated as $\pm 2.5\%$. The impact for all firms is the average of the impacts for the four surveys, weighted by the respective number of responses. 90% confidence intervals are shown for these impacts.*

Execs forecast big negatives on employment in their firms in the next 3 years

Panel A Distribution of responses



Panel B Average total impact



***Notes**: This figure is based on responses to the question: "How has the adoption of artificial intelligence technologies affected the number of employees in your business over the past three years? And how do you expect this to affect your number of employees over the next 3 years?" The data from the US Survey of Business Uncertainty was collected in November 2025. The data from the UK Decision Maker Panel was collected over November 2025 – January 2026. The data from the German Bundesbank Online Panel-Firms (BOP-F) was collected in January 2026. The data from the Australian Business Outlook Scenarios Survey was collected in December 2025. The data results from the SBU, DMP, and BOP-F are employment-weighted; the results from the BOSS are unweighted. To calculate the average impacts (Panel B), values are assigned to each of the options in Panel A: large negative/large positive impacts are treated as $\pm 7.5\%$; small negative/small positive impacts are treated as $\pm 2.5\%$. The impact for all firms is the average of the impacts for the four surveys, weighted by the respective number of responses. 90% confidence intervals are shown for these impacts.*

Asked employees same questions on AI use and impact on their firm

How has the adoption of Artificial Intelligence technologies affected your employer's SALES PER WORKER (PRODUCTIVITY):
- over the past three years?
- over the next three years?

	Past 3 years	Next 3 years
A large positive influence, adding 5% or more	○	○
A minor positive influence, adding less than 5%	○	○
No material impact	○	○
A minor negative influence, subtracting less than 5%	○	○
A large negative influence, subtracting 5% or more	○	○

Continue

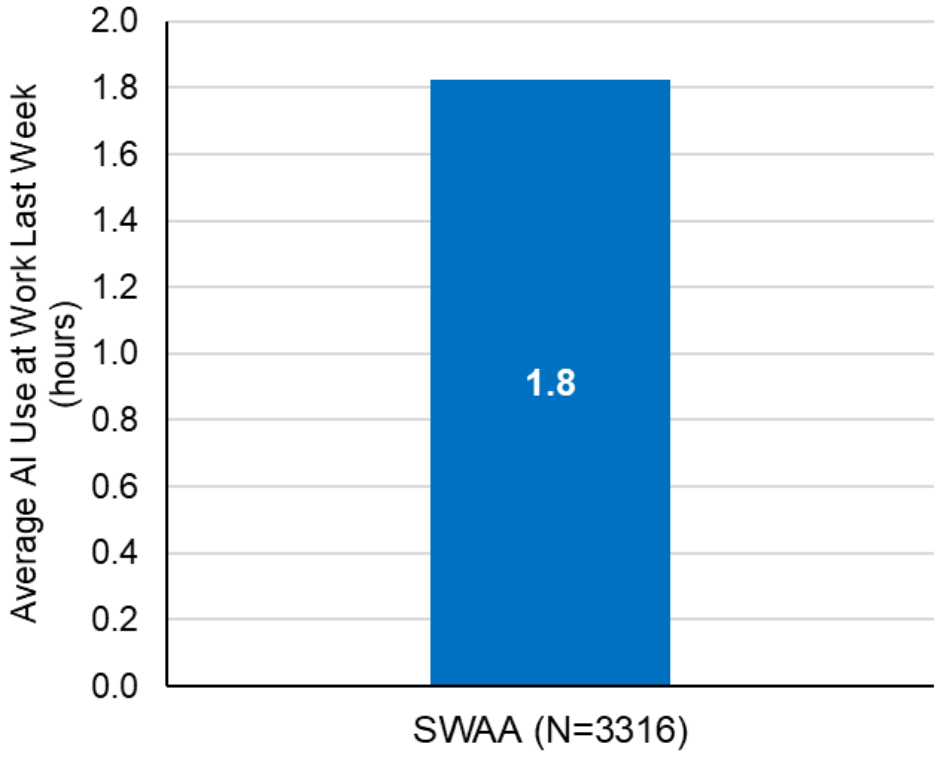
How has the adoption of Artificial Intelligence technologies affected the NUMBER OF EMPLOYEES who work for your employer:
- over the past three years?
- over the next three years?

	Past 3 years	Next 3 years
A large positive influence, adding 5% or more	○	○
A minor positive influence, adding less than 5%	○	○
No material impact	○	○
A minor negative influence, subtracting less than 5%	○	○
A large negative influence, subtracting 5% or more	○	○

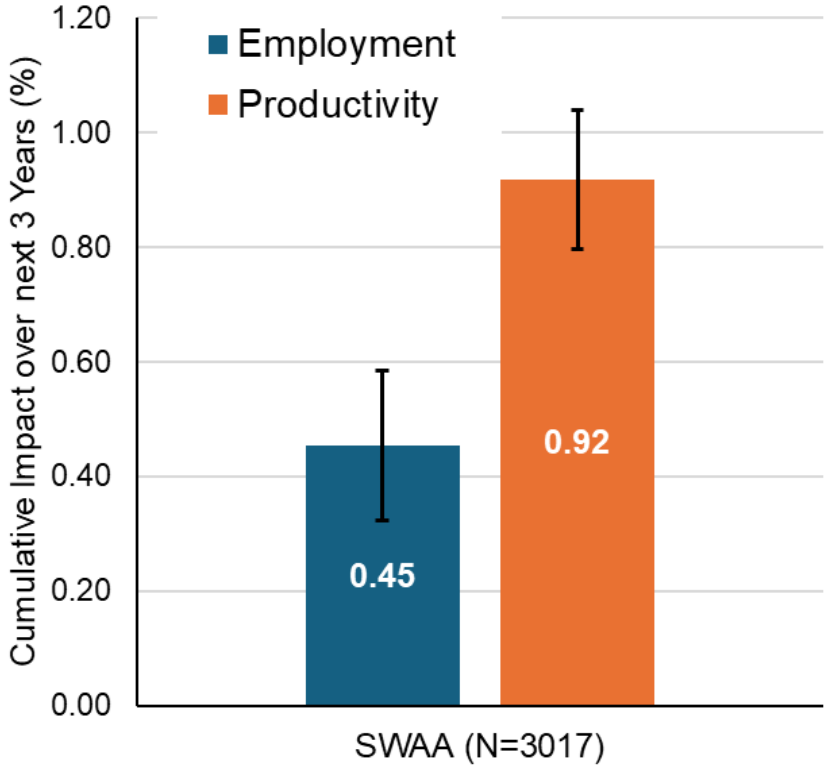
Continue

Employees similar usage (1.8 hours a week), but more optimistic on employment (positive impact), much less optimistic on productivity

AI Use



Impact Next 3 Years



Responses to the questions: *You indicated that you sometimes use Generative AI for your job. Did you use Generative AI for your job LAST WEEK? Please think back to the days LAST WEEK on which you used Generative AI for your job. On average, how much time did you spend actively using Generative AI for your job How has the adoption of Artificial Intelligence technologies affected the NUMBER OF EMPLOYEES who work for your employer: over the past three years? over the next three years? How has the adoption of Artificial Intelligence technologies affected your employer's SALES PER WORKER (PRODUCTIVITY): over the past three years? over the next three years?*

Notes: *Sample includes respondents to the December 2025 SWAA wave who worked for pay during the prior week and pass our attention-check questions. We impute zero AI use for respondents who did not use it last week, or do not use it for their job. In forecasts we restrict attention to wage and salary employees, (excluding self-employed workers and contractors). We reweight the raw responses to match the 2024 US population in cells defined by the cross product of age, sex, education and earnings.*

Summary – firms forecast AI will ≈ double US productivity growth

Massive impact, with adoption speeds far greater than other recent technologies

Also suggests impacts on labor markets in existing firms

Led me to significantly change my views (to be more growth positive)

Running these surveys every 6-months, so update next in June 2026