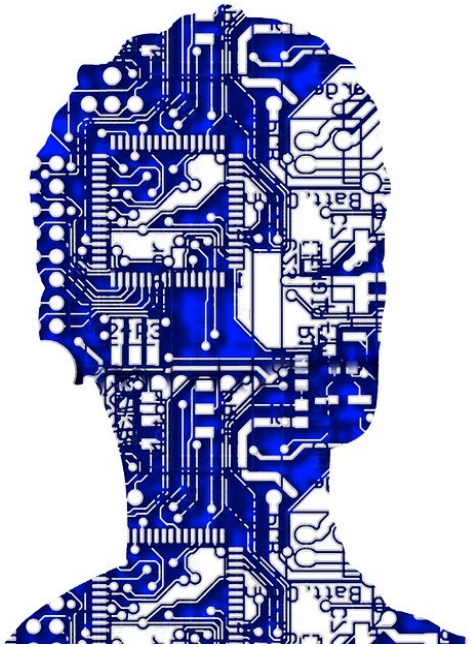
Measuring AI Use by U.S. Businesses



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Federal Economic Statistics Advisory Committee (FESAC)
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Outline

1. Recent Census Bureau measurement of AI use by businesses:
    - Surveys
        a) Annual Business Survey (ABS)
        b) Business Trends and Outlook Survey (BTOS)
    - Administrative data
        a) Microdata underlying Business Formation Statistics (BFS)
2. Summary of key findings
3. Future measurement efforts
    a) Annual Business Survey (ABS)
    b) Business Trends and Outlook Survey (BTOS)
    c) Business Formation Statistics (BFS)
    d) Annual Integrated Establishment Survey (AIES)
4. Questions for FESAC

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Annual Business Survey (ABS)

- A large survey of businesses with several rotating modules
  - Joint w. National Center for Science and Engineering Statistics (NCSES)
- R&D, Innovation, Technology, Intellectual Property, Ownership Characteristics, Financing…
- Frequency: Annual (started in 2018)
- Survey unit: Employer businesses (300 K firms; 850 K in economic census years)
- ABS technology modules:
  - 2018/2021: *Digital Technology Module* -- 10 business tech (some AI-related)
  - 2019/2023: *Automation Technology Module* -- 5 technologies including AI
  - 2020: One question on AI use in innovation activities

ABS 2018	ABS 2019	ABS 2020	ABS 2021	ABS 2024
Digital	Automation	AI use in innovation	Digital	Automation

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2018/2021 ABS

- First measurement of AI-related tech was in the 2018 ABS for the reference year 2017
- Technology Modules in 2018 and 2021 ABS assessed firm use of:
  - Digitization (digital share of information in key business activities)
  - Cloud Services (purchases of cloud services for key IT functions)
  - Business Technologies (use *in producing goods or services*):

    10 technologies, including some AI-related technologies:

    Machine Learning, Machine Vision, Voice recognition, Natural Language Processing, Automated Guided Vehicles
- Academic experts: Erik Brynjolfsson (Stanford U.), Kristina McElheran (U of Toronto)
- Papers (based on 2018 ABS)
  - Zolas et al. (2020) "Advanced Technologies Adoption and Use by U.S. Firms: Evidence from the Annual Business Survey" NBER Working Paper 28290
  - McElheran et al. (2024) "AI Adoption in America: Who, What, and Where" *Journal of Economics and Management Strategy*, 33: 375–415, January 2024.

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2019/2023 ABS

- Measurement pertains to a three-year period before the survey year
  - Inquired directly about AI use “in producing goods or services”
  - Aimed to capture “significant” use of AI in production
- Technology Module:
  - *Robotics, AI, Cloud, Specialized Software, Specialized Equipment*
  - Use, motivation for/barriers to use, effects of technology on firm employment/skills/worker types
  - Information on providers/producers of these technologies (not just adopters)
  - Adoption timing, effect of covid on adoption (2023)
- Academic experts: Daron Acemoglu (MIT), Pascual Restrepo (Boston U.)
- Papers (based on 2019 ABS)
  - Acemoglu at al. (2022) “Automation and the Workforce: A Firm-Level View from the 2019 Annual Business Survey”, *NBER Chapters, in: Technology, Productivity, and Economic Growth*
  - Acemoglu et al. (2023) “Advanced Technology Adoption: Selection or Causal Effects?”, *AEA Papers and Proceedings*, May 2023.

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Business Trends and Outlook Survey (BTOS)

- High-frequency, timely, and flexible survey that aims to capture the effects of changing economic conditions on businesses and their near-term expectations (initiated in 2022)
- Frequency: Every 2 weeks; Survey Unit: Employer businesses (200 K firms every collection period)
- Questions on **AI** starting in September 2023 to measure AI diffusion
  - Two core questions: Current use of AI, expected future use of AI (in the next 6 months)
  - An AI supplement was sent out for 6 collection periods (Dec. 2023-Feb. 2024):
    - Types of AI technologies/applications used
    - Worker task replacement, AI-labor/AI-capital substitution, and employment effects
    - Organizational changes to accommodate AI; barriers to adoption
- Public data available starting October 26, 2023 published bi-weekly
- Papers:
  - Bonney et al. (2024) "Tracking Firm Use of AI in Real Time: A Snapshot from the Business Trends and Outlook Survey," *NBER Working Papers* 32319
  - Bonney et al. (2024) "The Impact of AI on the Workforce: Tasks versus Jobs" *Economics Letters*, 2024, Volume 244.

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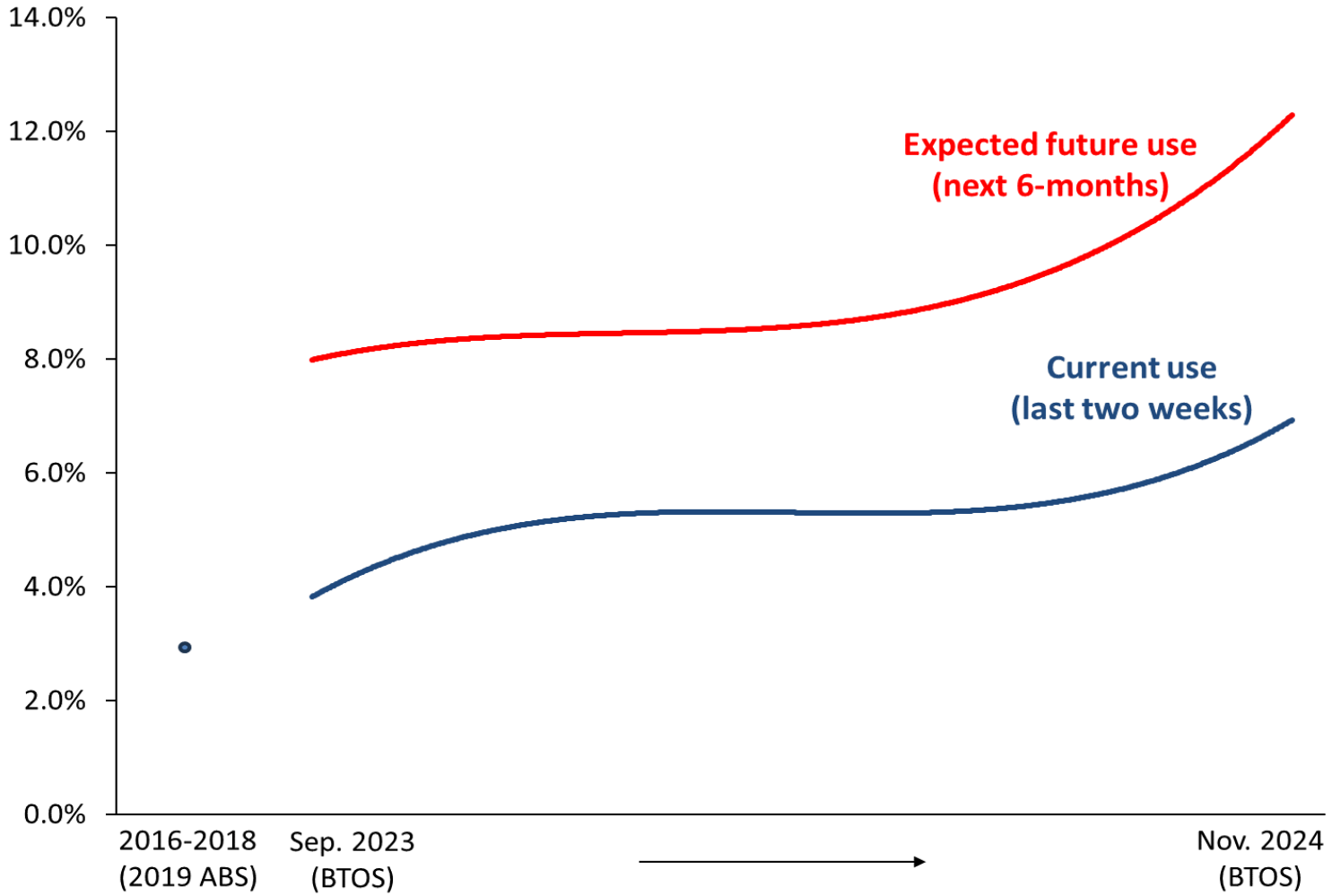
Business Formation Statistics (BFS)

- High-frequency public-use data product that provides information on new business applications and the resulting employer startups
- Based on: Micro data for all applications for Employer Identification Numbers (EINs)
- Application form contains some information on the characteristics of planned business
- Research used text information in the application to identify businesses applications that plan to develop or supply AI, or use AI in producing goods or services
- Analysis:
  - Provides time series for emerging AI-related business applications and the resulting employer businesses (startups)
  - Studies characteristics of AI-related business applications and performance of AI-related startups
- Data is high frequency (monthly) and timely, and allows continuing measurement
- Paper: Dinlersoz, Dogan, and Zolas (2024) "Starting Up AI" Working Paper 24-09, Center for Economic Studies, U.S. Census Bureau.

AI Use Rate Estimates for Businesses
(ABS & BTOS)



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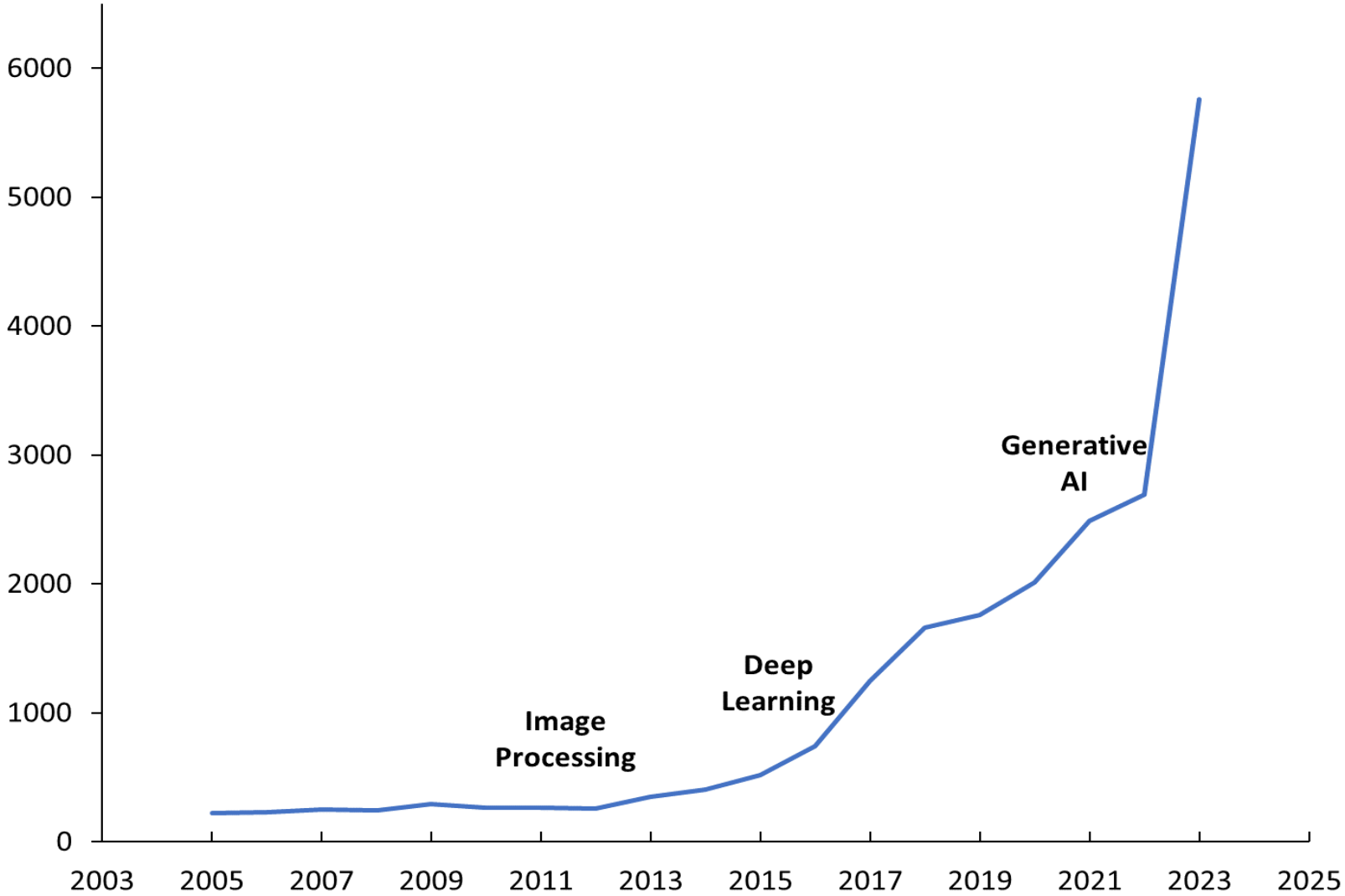
Note: Curves indicate polynomial time trends fitted to bi-weekly measurements

AI-related Business Applications
(BFS)



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Summary of Key Findings

- AI use is concentrated among firms, industries, and locations:
  - Larger firms use AI-related tech with a higher rate and intensity
  - Smaller firms' use of AI is rising, potentially driven by Gen AI applications
  - Information, professional services, finance and insurance sectors lead AI use
  - AI-use is concentrated in western states, large metro areas, tech hubs
- AI-use generally associated with better current and expected future performance
  - Higher employment, revenue, average pay
- About a quarter of AI-using businesses utilize AI to replace worker tasks (as of Spring 2024)
  - A large fraction (87%) of these firms use AI to replace a small number of tasks
- Most AI-using firms do not experience a net change in employment due to AI use
  - Only 5% experience a change; an increase more common than a decrease
  - The fraction of firms experiencing a change was expected to increase to 12% by Fall 2024

Future Measurement Efforts

- **ABS:** Technology modules that measure AI proposed for ABS 2025 and 2027
- **BTOS:** AI core questions in BTOS will continue in 2025; a new AI supplement is being considered, aimed at more broadly measuring AI use by businesses including where Generative AI assists employees
- **AIES:** AI questions proposed for the Annual Integrated Economic Survey (AIES) could attempt to measure AI use and investment
    - All of the above subject to OMB approval
- **BFS:** Ongoing measurement of AI-related business formation (and plans to extend to other advanced technologies, such as robotics, cloud computing, etc.)

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Questions for FESAC

- What specific public data products on AI use by firms and AI's diffusion would be useful?
  - What topics/measures should such data products emphasize/prioritize?

- What other datasets could be of use to Census Bureau in measuring AI use by firms?
  - Commercial or administrative data?

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