

Recent Patterns in Aggregate Productivity

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Rob Shimer, Chicago

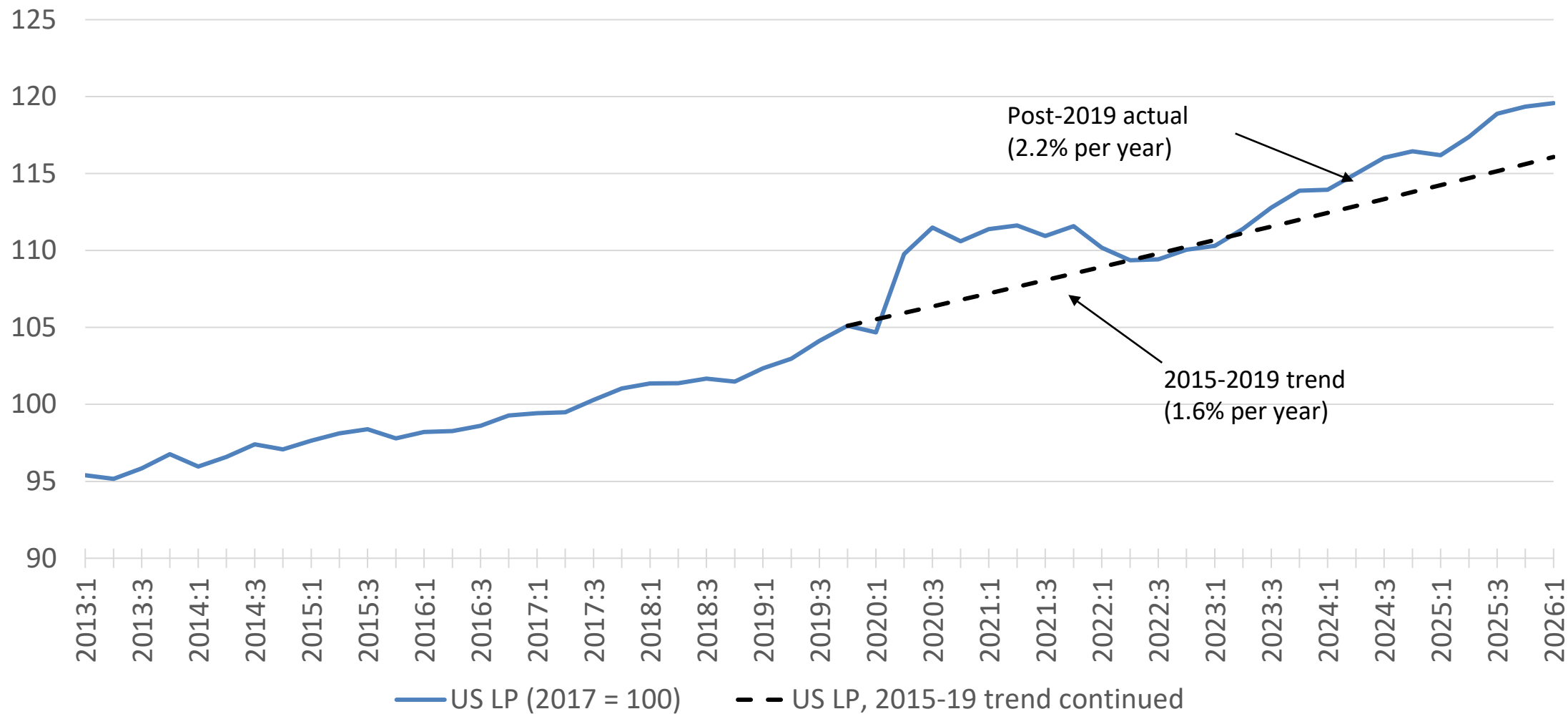
Chad Syverson, Chicago Booth

Chicago Fed Academic Advisory Council Meeting

May 15, 2026

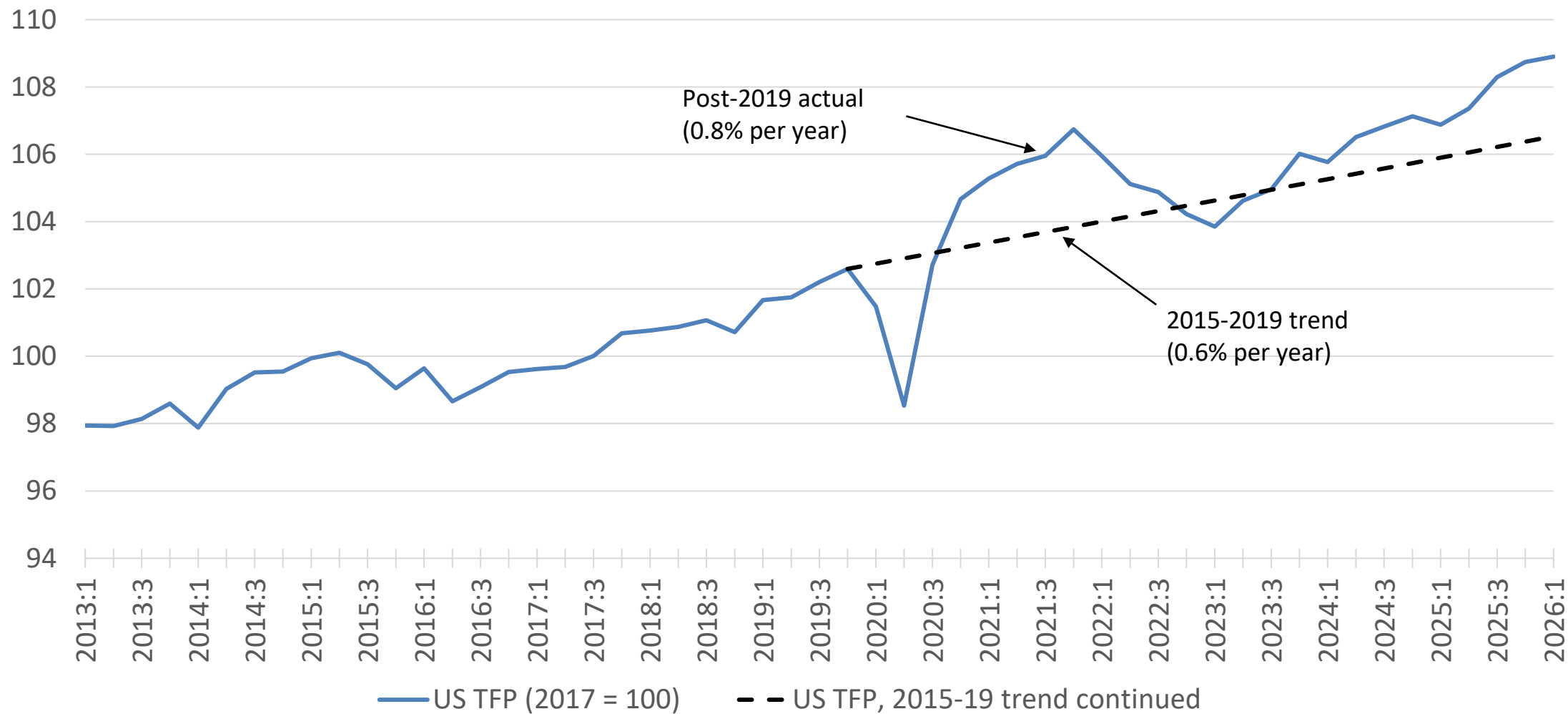
Coming Out of Covid

U.S. Labor Productivity, Actual and Counterfactual



Coming Out of Covid

U.S. TFP, Actual and Counterfactual

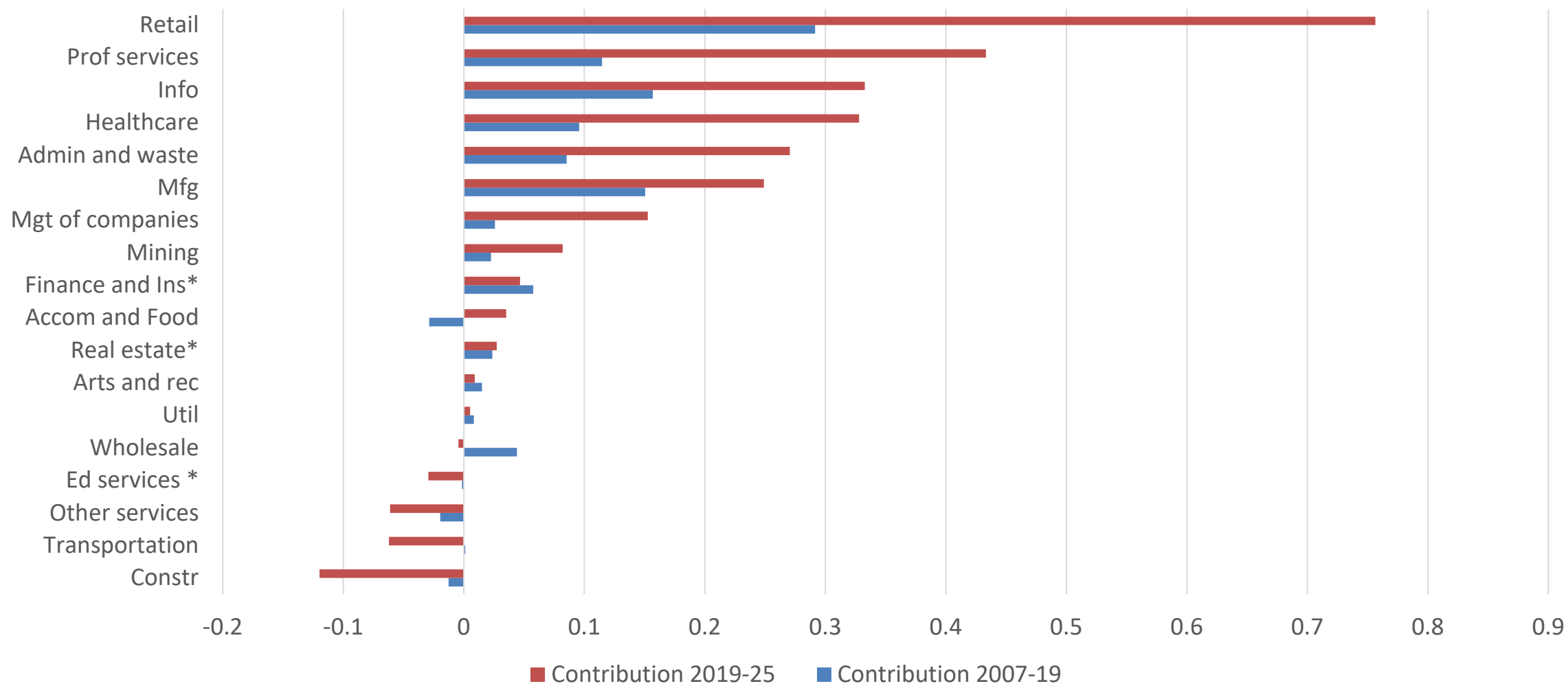


Has the Post-Covid Resurgence in Dynamism Abated?

	2015-2019	2022-2023	2025
Average hires + separations rate	7.4	7.8	6.6
Quits-to-layoff ratio among job separations	1.8	2.5	1.8
Business formations, U.S. (millions)	3.2	5.2	5.6
“High propensity” business formations, U.S. (millions)	1.3	1.7	1.7

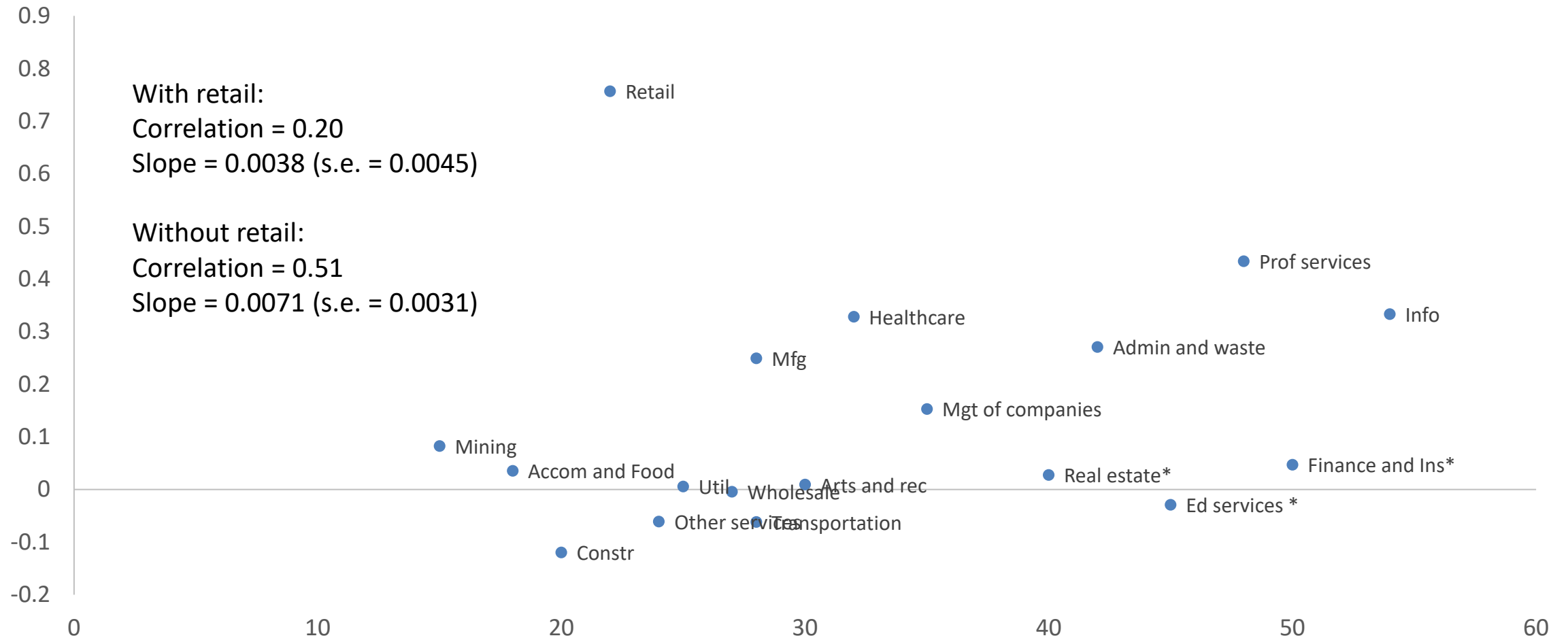
Can We See AI in Industry Data?

Industry Labor Productivity (Real VA/hr) Growth Contribution



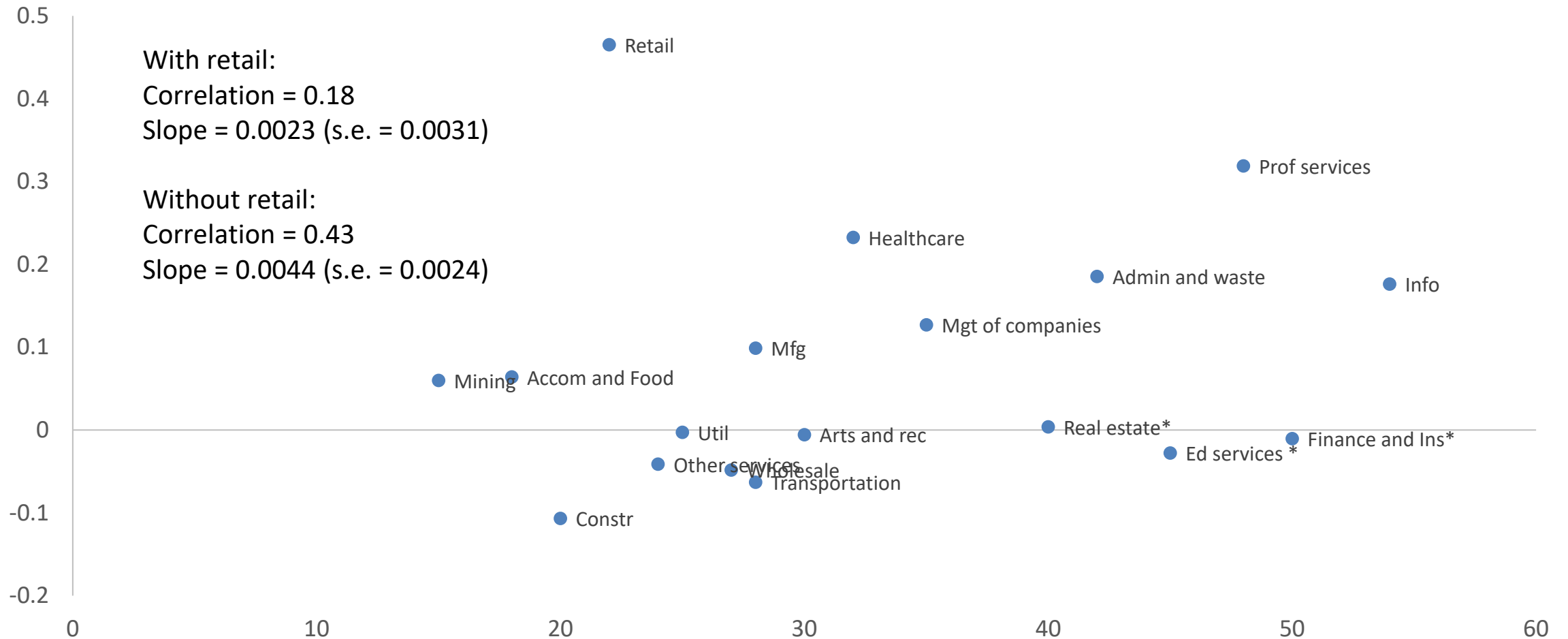
Can We See AI in Industry Data?

Labor Productivity Growth Contribution 2019-25
vs. Census BTOS Reported AI Intensity



Can We See AI in Industry Data?

Change in Labor Productivity Growth Contribution (2019-25 vs. 2007-19)
vs. Census BTOS Reported AI Intensity



The J-Curve: Intangibles and Productivity Measurement

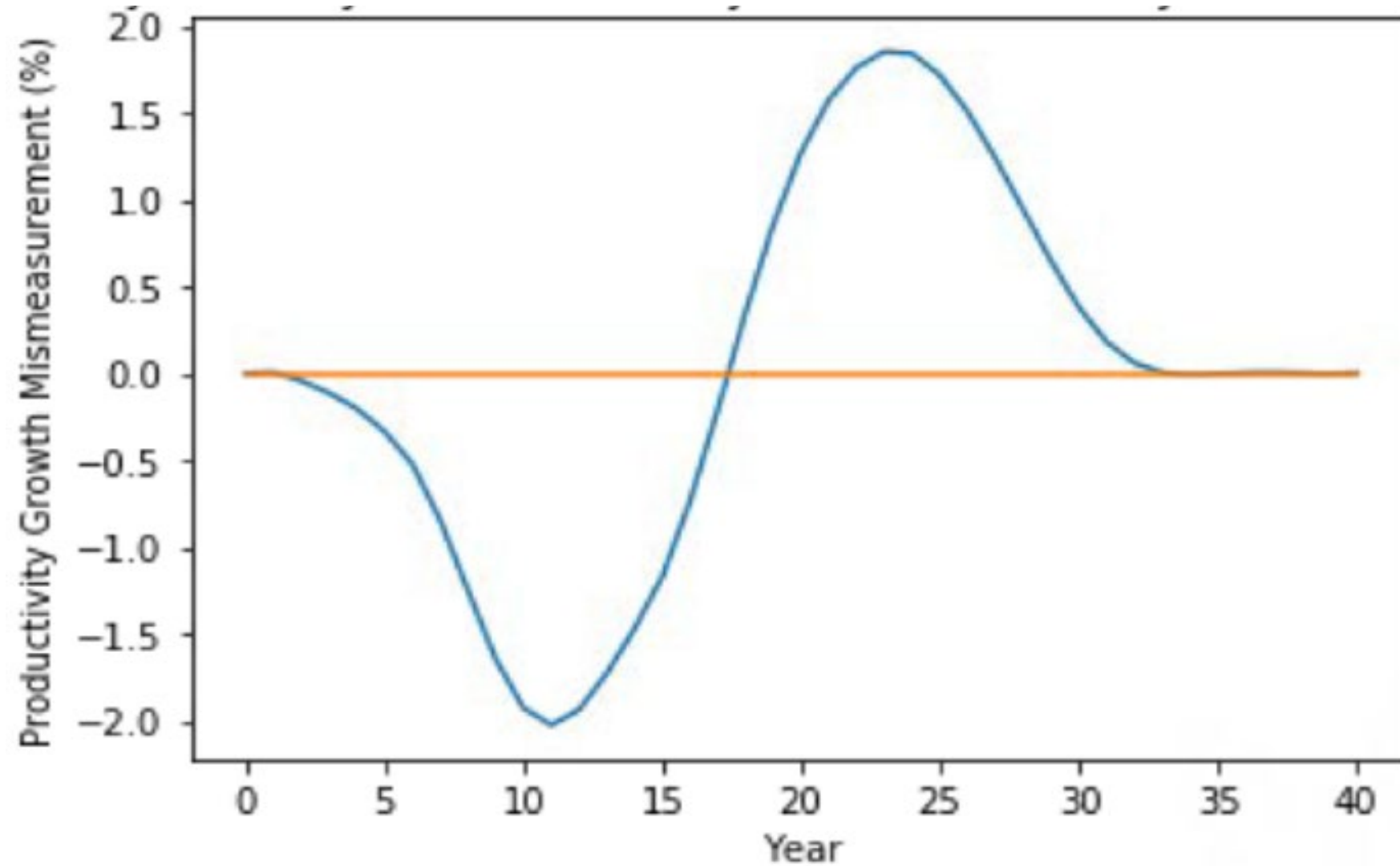
J-curve arises because harnessing general purpose technologies (like electric power, computing, etc.) requires a lot of intangible investments

Intangibles' effects on productivity measurement:

$$Productivity = \frac{Output}{Input}$$

- Intangible capital is an unmeasured input, causing productivity to be overstated
- However, intangible capital is also an output, causing productivity understatement
- Net effect depends on relative timing of input vs. output mismeasurement
 - Economics of situation implies understatement before overstatement

The J-Curve: Intangibles and Productivity Measurement



AI and Productivity: Early Research

Brynjolfsson, Li, and Raymond

- Call center experiment in one company
- AI increases worker productivity
- Helps less skilled more
- Dose-response relationship
- Customers like AI-augmented help more
- Increased worker retention

AI and Productivity: Early Research

Humlum and Vestergaard

- Survey of 25,000 workers throughout Danish economy, matched to administrative data, followed from Nov '23 for two years
- Plenty of AI LLM adoption
- Some productivity gains (about 3% on average)
- But no measurable effects on wages
 - Even among high-adopting occupation-industry-demographic groups
- No measurable effect on employment
- Very small increase in mobility across companies

AI and Productivity: Early Research

Yotzov et al.

- Survey 6000 executives at US, UK, German, and Australian companies
- 70% of firms actively use AI
 - Correlated positively with productivity and negatively with firm age
- Executives' own average AI use is 1.5 hours/wk
- Report little AI impact of AI over past 3 years
- But predict bigger effects over next 3 years
 - +1.4% productivity, +0.8% output, -0.7% employment
- Employees AI will instead raise employment 0.5% over period

AI and Productivity: Early Research

Bonney et al.

- BTOS AI supplement: 117K firms, nationally representative
 - Not the same as Yotzov et al.'s US sample
- Average adoption numbers lower than other studies
- But emp-wt adoption in Info, Professional Services, and Finance is 60-70%
- Scope of use (number of business functions) remains limited
 - 60% use AI for 3 or less (of 15) functions
- Two-thirds of AI adopting firms use for task augmentation, 2% have reduced employment
- Positively correlated with firms' qualitative self-assessment of performance

AI and Depreciation

NDP is closer to welfare than GDP (Weitzman 1976)

- It reflects both current and the present value of future consumption

Defintionally, $NDP \equiv GDP(1 - \bar{\delta})$

If aggregate depreciation rate $\bar{\delta}$ is roughly constant, NDP growth equals GDP growth

But if aggregate depreciation rate changes, then NDP/GDP changes

$$\Delta \left(\frac{NDP}{GDP} \right) = \bar{\delta}_0 - \bar{\delta}_1$$

AI and Depreciation

If each type of capital K_i has a depreciation rate δ_i , and investment I_i is such that all capital stocks grow at the same rate g (i.e., economy has balanced growth), then:

$$\bar{\delta} = \sum_i \frac{I_i}{Y} \frac{\delta_i}{g + \delta_i}$$

Suppose two capital types: ordinary (depr. rate δ_o) and data centers (depr. rate δ_{dc})

Define total and data center investments' GDP shares as $s \equiv \frac{I}{Y}$ and $x \equiv \frac{I_{dc}}{Y}$. Then:

$$\bar{\delta}(x) = s \frac{\delta_o}{g + \delta_o} + x \left(\frac{\delta_{dc}}{g + \delta_{dc}} - \frac{\delta_o}{g + \delta_o} \right)$$

If $\delta_{dc} > \delta_o$, more DC intensity x raises average depreciation rate and NDP/GDP falls

AI and Depreciation

Compute how much higher GDP must be to keep NDP the same if depreciation rises from $\bar{\delta}_0$ (no data center capital) to $\bar{\delta}_1$ (with data centers):

$$\frac{Y_1^{new}}{Y_1^{old}} = \frac{1 - \bar{\delta}_0}{1 - \bar{\delta}_1} = \frac{1 - s \frac{\delta_o}{g + \delta_o}}{1 - s \frac{\delta_o}{g + \delta_o} - x \left(\frac{\delta_{dc}}{g + \delta_{dc}} - \frac{\delta_o}{g + \delta_o} \right)}$$

From US national accounts over 2000-19:

$\delta_o = 0.052$ (consumption of fixed capital over fixed capital stock)

$g = 0.046$ (nominal growth rate of current-cost fixed assets)

$s = 0.210$ (gross private plus government investment divided by GDP)

AI and Depreciation

$$\frac{Y_1^{new}}{Y_1^{old}} = \frac{1 - s \frac{\delta_o}{g + \delta_o}}{1 - s \frac{\delta_o}{g + \delta_o} - x \left(\frac{\delta_{dc}}{g + \delta_{dc}} - \frac{\delta_o}{g + \delta_o} \right)}$$

Data center capital parameters:

$x = 0.047$ (\$1.5T AI investment/\$32T GDP)

– Amazon, Google, Microsoft, and Meta alone plan \$700B of AI investment in 2026

$\delta_{dc} = 0.20$ (somewhere between buildings and software)

Result:

$$\frac{Y_1^{new}}{Y_1^{old}} = 1.015$$

I.e., 1.5% of future growth would be running faster to stay in the same (welfare) place

Conclusion

Productivity increasingly seems to have moved to outperform pre-Covid period

Initial acceleration may have been dynamic markets and better job sorting

But AI may be a new GPT—broad potential effects

- Maybe some early signs in the industry data, if you squint
- Usage case studies find productivity effects
- OTOH many broad surveys are finding adoption but no large effects yet

It is very early! Many, many things still to learn