Artificial intelligence and monetary policy

Cyclical transmission, structural transition, & financial stability

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The views expressed in this paper are those of the authors and do not necessarily represent those of the Federal Reserve Bank of New York, the Federal Reserve System, anyone associated with these institutions.

(Gen)AI and central banking

- Transformative technology with potential to reshape many (most?) aspects of economic activity.
- Will likely alter the behavior of variables that monetary policy cares and is designed to stabilize:
  - inflation dynamics and its sensitivity to real economic activity
  - economic fundamentals
  - financial system and stability
- Relevant question is no longer *whether* the diffusion of AI will matter for central banks, but *how*.

This paper

Stylized framework to think about three conceptually distinct but interrelated channels through which AI may affect the conduit of MP:

1. [*short-run*] **Cyclical transmission** of disturbances into inflation, given equilibrium benchmarks
2. [*long-run*] **Structural transition** (equilibrium benchmarks) around which policy is calibrated
3. Impact on **financial system and financial stability** *(Not today)*

Place the analysis in a policy perspective.

Roadmap

1. Cyclical transmission

2. Structural transition

3. Some perspectives

A stylized NK framework

Two-equation forward-looking system pins down inflation & output gap jointly:

$\pi_t = \lambda \widehat{mc}_t + \beta \mathbb{E}_t\{\pi_{t+1}\}$

(supply side)

New Keynesian Phillips curve

- Describes price-setting behavior

$\widehat{y}_t = \mathbb{E}_t\{\widehat{y}_{t+1}\} - \frac{1}{\sigma}\widehat{r}_t$

(demand side)

Investment-Saving curve

- Intertemporal aggregate demand dynamics

$\widehat{mc}_t \equiv mc_t - mc_t^\star$

$\widehat{y}_t \equiv y_t - y_t^\star$

$\widehat{r}_t \equiv r_t - r_t^\star$

$\star$ = natural (flexible-price) benchmark

$\Rightarrow$ ***taken as given* in the short-run**

$\widehat{\text{hat}}$ = cyclical (log-)deviation from benchmark

Transmission of cyclical disturbances to inflation

Primitive formulation of NKPC — (Gagliardone, Gertler, Lenzu, Tielens, AER 2025):

$$\begin{aligned}\pi_t &= \lambda\, \widehat{mc}_t + \beta\, \mathbb{E}_t\{\pi_{t+1}\} \\ &= \lambda \sum_{\tau=0}^{\infty} \beta^{\tau}\, \mathbb{E}_t\{\widehat{mc}_{t+\tau}\}\end{aligned}$$

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(1) Cost channel(s): AI $\rightarrow \widehat{mc}_t$

AI may impact the cyclicality of costs

— Can push $\widehat{mc}_t$ in opposite directions *simultaneously* and make it *more volatile*

(2) Pass-through channel(s): AI $\rightarrow \lambda_t$

AI may impact speed at which firms pass though movements in costs into prices

— Inflation *response to shocks* could be faster or slower

Cost channel
AI can amplify or dampen the cyclicality of costs

- Demand and supply forces jointly determine $\widehat{mc}_t$ dynamics.

$$\widehat{mc}_t = \underbrace{\underbrace{\chi \widehat{y}_t}_{\text{Scale effects}} + \underbrace{\widehat{w}_t}_{\text{Real input cost wedge}} + \underbrace{\widehat{\tau}_t}_{\text{Factor markets wedges}}}_{\text{Cost pressure}} - \underbrace{\widehat{a}_t}_{\substack{\text{Efficiency} \\ \text{wedge}}}}_{\text{Productivity}}$$

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1. When input-market frictions and productivity vary endogenously over the cycle cost dynamics *cannot be inferred from output (unemployment) gaps alone*

1. *"AI is disinflationary"* only insofar as it raises effective productivity (relative to potential) by more than it increases cost pressure.

Cost channel
Sensitivity of costs to demand

$$\widehat{mc}_t = \underbrace{\chi \widehat{y}_t}_{\textbf{Scale effects}} + \underbrace{\widehat{w}_t}_{\text{Real input costs}} + \underbrace{\widehat{\tau}_t}_{\text{Factor markets wedges}} - \underbrace{\widehat{a}_t}_{\text{Efficiency wedge}}$$

$\underbrace{\qquad\qquad\qquad\qquad\qquad\qquad}_{\text{Cost pressure}}$ $\underbrace{\qquad\qquad}_{\text{Productivity}}$

- **Scale effects ($\chi \widehat{y}_t$)** — how strongly costs rise (fall) when demand expands (contracts)
  - — Better inventory management / capacity utilization / enhanced forecasting $\Rightarrow \chi \searrow$
  - — Output gap (or unemployment gap) poorer / less reliable indicator of cost pressure

Cost channel
The cyclicality of input costs

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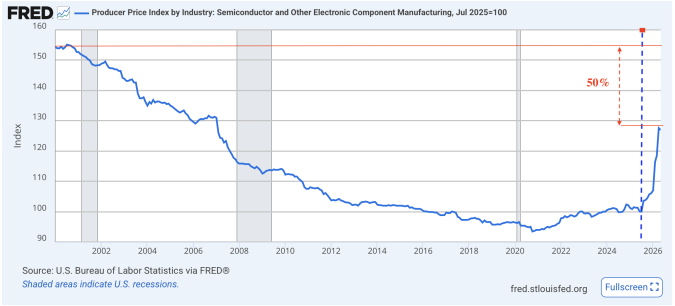
- **The cyclicality of inputs costs ($\widehat{w}_t$)**
  - — Significant pressure on prices of *scarce inputs* (chips, compute, water, energy, high-skill labor)
  - — Supply chain concentration & correlated exposures ⇒ Higher volatility, bottlenecks, & cost cascades
  - — AI input cost pressures may be slow to appear in standard inflation measures

Cost channel

The price of semiconductor and other electronic components



- Summer 2025: Nvidia's Blackwell (B200/GB200) GPU production ramping to scale
- Half of 25-years of cost-saving wiped out in the last 9 months
- In the US, areas with high concentrations of data centers saw electricity prices +267% in 5 years
- Water demand is soaring

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- **Factor-market efficiency ($\widehat{\tau}_t$)** with wedge $\tau_t = w_t - mp_t$ (Chari et al. 2007)
  - AI can reduce wedges removing inefficiencies in factor markets (credit, labor market)
  - But correlated loosening might become correlated tightening when conditions turn.

Cost channel
Productivity and the disinflationary narrative

Common narrative: *"AI is (or will soon be) a disinflationary force because it boosts productivity"*

Productivity gains will almost certainly realize in the *long-run*

— but *short-medium run* implications for cost-price dynamics are not straightforward

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- At cyclical horizons, AI is disinflationary only insofar as it raises **productivity *relative* to potential** by more than it increases real unit input costs.

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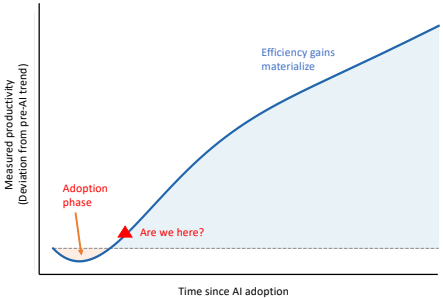
- Cyclical movements in production efficiency can either dampen cost pressures (temporary productivity gains) or amplify them (transitory efficiency losses).

$$\hat{a}_t = a_t - a_t^\star \gtreqless 0$$

Cost channel
Productivity and the disinflationary narrative

- **The productivity J-curve**

During early diffusion: reorganization costs, integration frictions, legacy coexistence temporarily lower productivity even as the frontier expands (Brynjolfsson, Rock & Syverson 2021)



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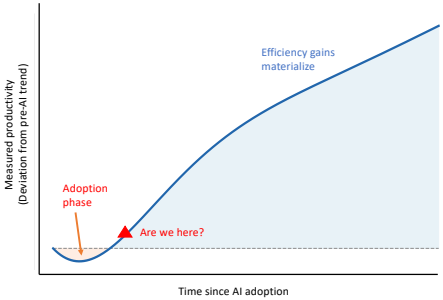
ICT revolution (1980-2000):

— Productivity effect arrived 15y past PC commercialization

AI impact could be quicker?

— Costs falling faster for AI than did for ICT equipment
— Adoption easier b/c network effects are less vital



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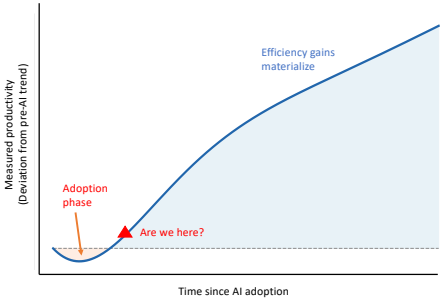

- **Resource (mis)allocation and resource diversion**

Unequal access to factors of production — capital, skilled labor, and key inputs

— $3 trillion in external financing over next 3 years directed to data centers and GPUs for US hyperscalers
— Are other borrowers — firms, sectors, and countries — being crowded out?"

Cost channel
Productivity and the disinflationary narrative

- **Which productivity measure?**

  — ***Macro*:** Labor productivity picks up *capital deepening*

$$\Delta \ln Y_t/L_t = \Delta \ln TFP_t + \alpha \, \Delta \ln (K_t/L_t)$$

  — ***Micro*:** Actual gains in production efficiency (TFP) due to AI are *hard to measure*;

  Commonly used revenue-based (TFPR) proxies *confound changes in TFP and prices*

$$\Delta \ln TFPR_{ft} = \Delta \ln TFP_{ft} + \acute{} \ln \mathbf{P_{ft}}$$

(Lenzu, Rivers, Tielens, Hu, RESTUD 2026)

  Ongoing work: Lenzu, Mezzanotti, and Tielens (WP, 2026)

The pass-though channel
AI can alter the slope of the PC

$$\pi_t = \boxed{\lambda}\,\widehat{mc}_t + \beta \mathbb{E}_t\{\pi_{t+1}\}$$

$$\lambda = \begin{bmatrix} \text{Nominal} \\ \text{Rigidities} \end{bmatrix} \otimes \begin{bmatrix} \text{Real} \\ \text{Rigidities} \end{bmatrix}$$

Net effect on λ is ex ante ambiguous — but the uncertainty itself complicates inflation forecasting

- Algorithmic pricing $\rightarrow \uparrow \lambda$ (faster repricing and more state-dependent) Calvano et al (2020)
- Market concentration $\rightarrow \downarrow \lambda$ (strategic complementarities slow adjustment) Dou et al (2025a,b) Mihet et al (2025)
- Input-output linkages $\rightarrow \uparrow \lambda$ (cost cascades pass through faster) Rubbo (2023)

Roadmap

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AI and structural transition

- In the *long-run*, AI matters through effects on benchmarks around which MP is calibrated
  - potential output $y_t^\star$
  - natural rate of interest $r_t^\star$
  - inter-temporal allocation (σ) governs sensitivity of aggregate demand to policy instrument

$$r_t^\star \propto \sigma \, \mathbb{E}_t\{\Delta y_{t+1}^\star\}$$

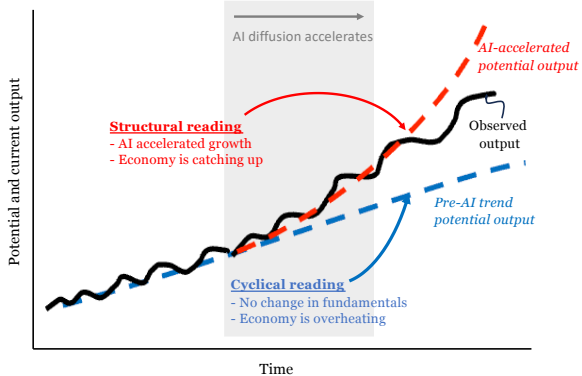
- MP *stabilizes* the economy around these evolving benchmarks, not attempting to *influence* them

$$i_t = r_t^\star + \phi_\pi \left(\pi_t - \pi_t^\star\right) + \phi_x \hat{y}_t$$

- Theory provides guidance on how benchmarks enter policy decisions and trade-offs (Woodford 2011; Clarida et al. 1999; Karadi et al 2025)

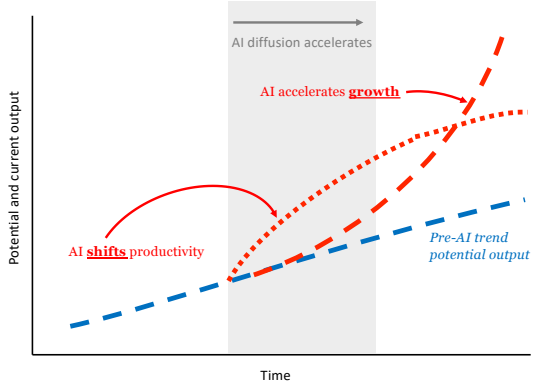
- But $y^\star$ and $r^\star$ are unobserved and subject to substantial real-time uncertainty, which a rapid development of AI is likely to exacerbate

AI and structural transition
Fast AI adoption confounds cyclical and structural readings



Lenzu S. – *AI's Macroeconomic Challenges and Promises* (Liberty Street Economics 2026)

AI and structural transition
Level shift or change in trend growth?



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r^* moves with expected growth of potential, not its level.

$$r_t^\star \propto \sigma \mathbb{E}_t\{\Delta y_{t+1}^\star\}$$

- **Level shift in y:** $r^\star$ rises during the transition but reverts once the new level is reached
- **Change in trend y:** $r^\star$ stays elevated if growth expected to stay permanently higher
- Range of available estimates is wide: Aghion et al. (2019) , Acemoglu (2024), Trammell & Korinek (2024), Jones (2024), Jones and Tonetti (2026)

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AI's *centrifugal* bind

Three forces pulling simultaneously:

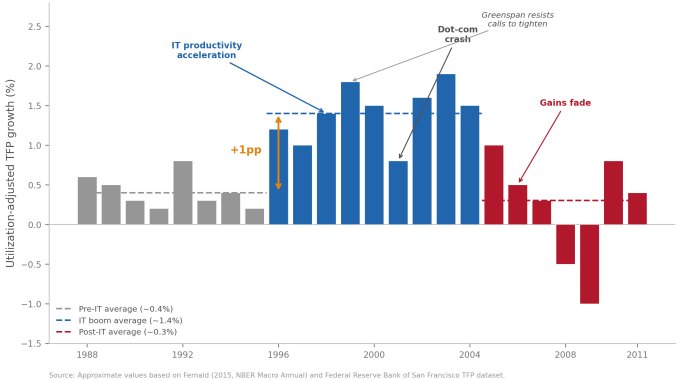
1. Input costs rising *now* before productivity gains materialize
2. Elevated asset valuations and consumption / CapEx driven by **expectations** of future returns
   - But expectations-driven demand can be fragile and volatile
   - The *Citrini report* episode (February 2026)
3. A complex, leveraged, multi-layered financing chain can generate systemic vulnerabilities
   - Off-balance sheet project finance and securitization
   - Private credit / FI-NBFI interconnections

The policy bind:

- Tackling inflation could puncture asset valuations, triggering financial stress when the supply-side payoff has yet to arrive
- But allowing cost and demand pressures to compound is risky.

A cautionary tale from the dot-com era

US productivity growth 1988-2011



Source: Approximate values based on Fernald (2015, NBER Macro Annual) and Federal Reserve Bank of San Francisco TFP dataset.

- "Greenspan got it right": ICT accelerated productivity growth
- But expectations ran ahead of fundamentals and boom turned into bust
- The productivity boost of the IT revolution was (for most countries) a level shift, not a change in trend

Taking stock

- AI does not call for a redefinition of monetary policy objectives, but it changes the environment in which those objectives are pursued.
  - Weaker informational content of traditional indicators (output /unemployment gap) and raises value of cost-side diagnostics
  - New sources of economic / financial fragility and volatility
- Faster information flows and more responsive expectations may make policy both more powerful and more fragile
  - Rethinking “long and variable lags” — some might shorten other might lengthen
  - Blurred distinction between cyclical fluctuations and shifts in long-term benchmarks.