

On Inflation: A Look From Above, Backwards and Forwards

Iván Werning, MIT

First Calvo Lecture | LACEA Lecture Series
May 22, 2026

Guillermo Calvo



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■ Unique economist, ahead of the curve...



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▶ **Macro Theory...**

Calvo Pricing + expectations +
Time Inconsistency
(independent of Kydland-Prescott)



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sovereign debt + capital flows



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tequila + 1000 crises...



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■ Theory

→ Understand World + Policy

→ Theory



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- Theory

- Understand World + Policy

- Theory

- Attention to LATAM and other developing countries



Talk Today

■ Inflation, fully figured out?

▶ **YES...** for big & persistent inflations, hyperinflations, fiscal dominance
i.e. avoiding huge mistakes

1980s



1990s



2000s



2010s



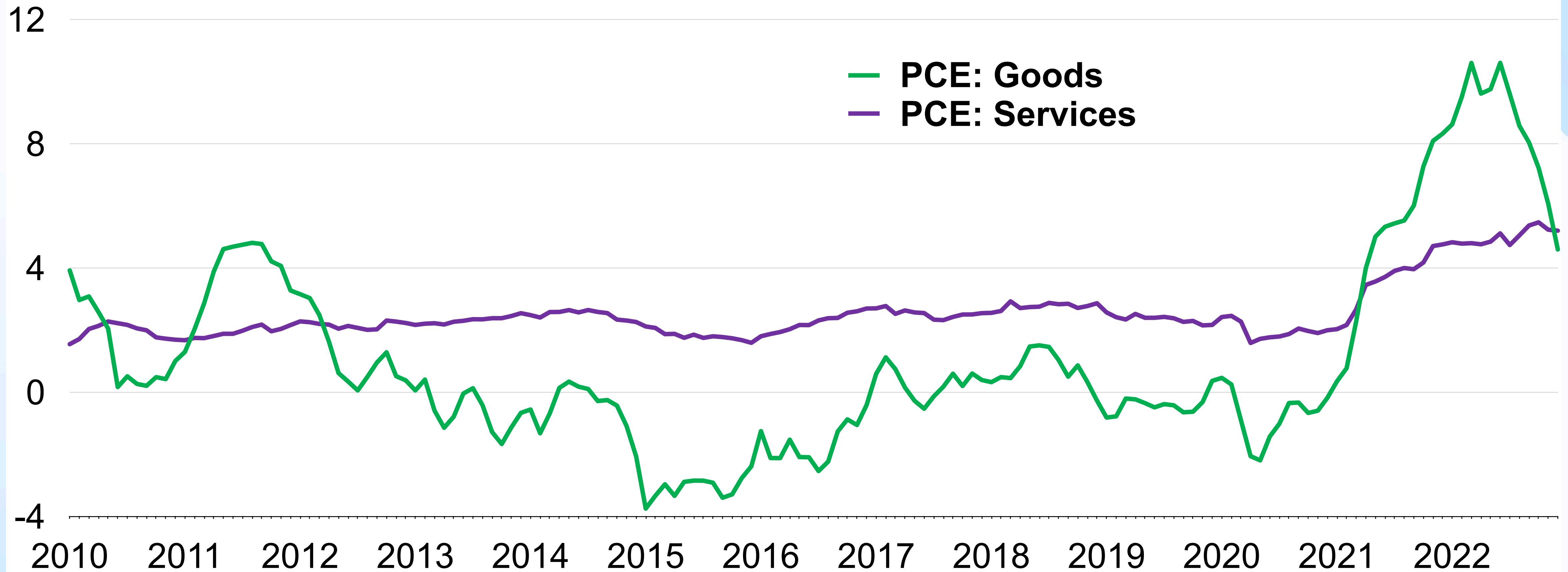
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US Inflation: Goods vs Services

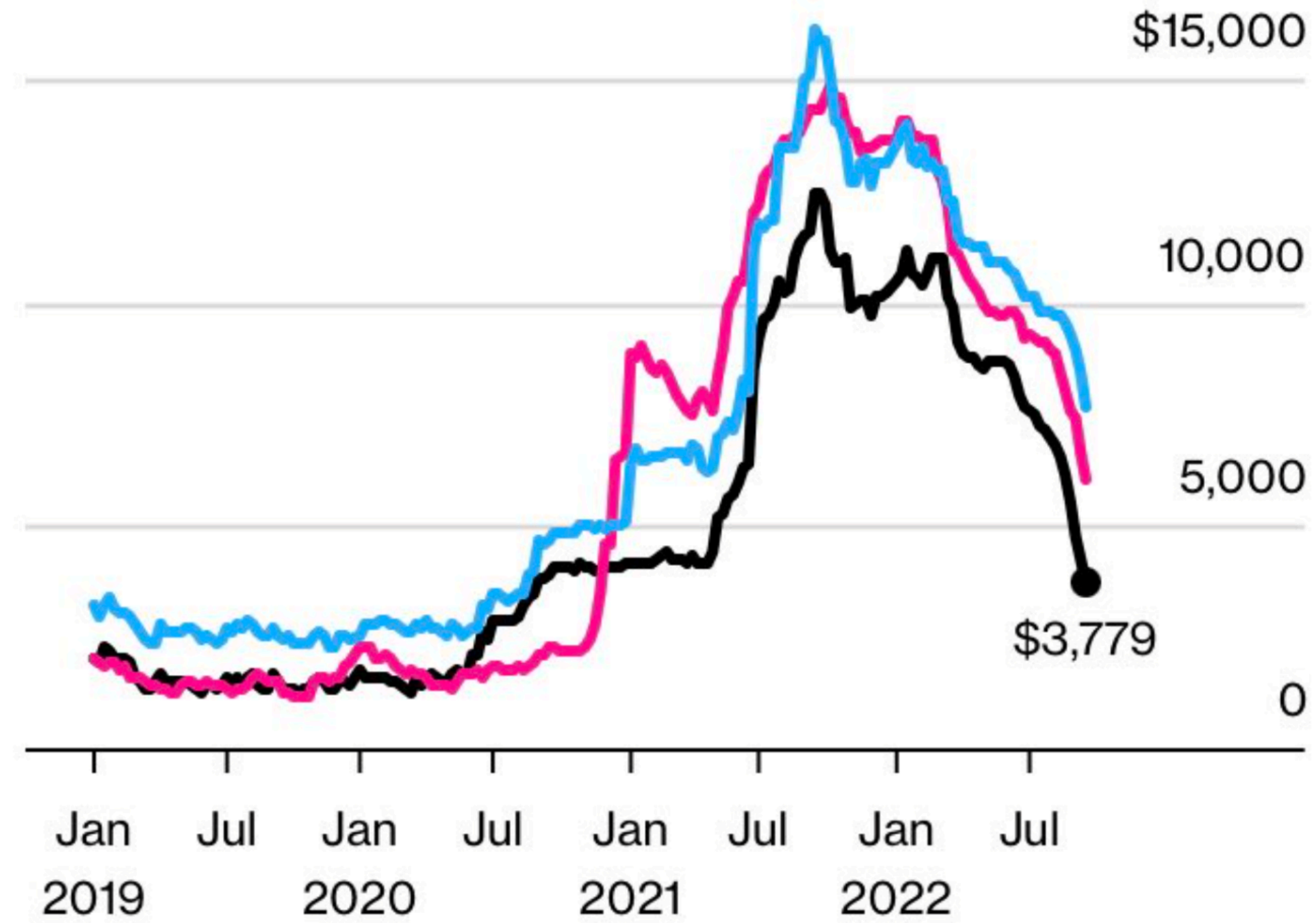
Year-over-year percentage change



Supply Shortages

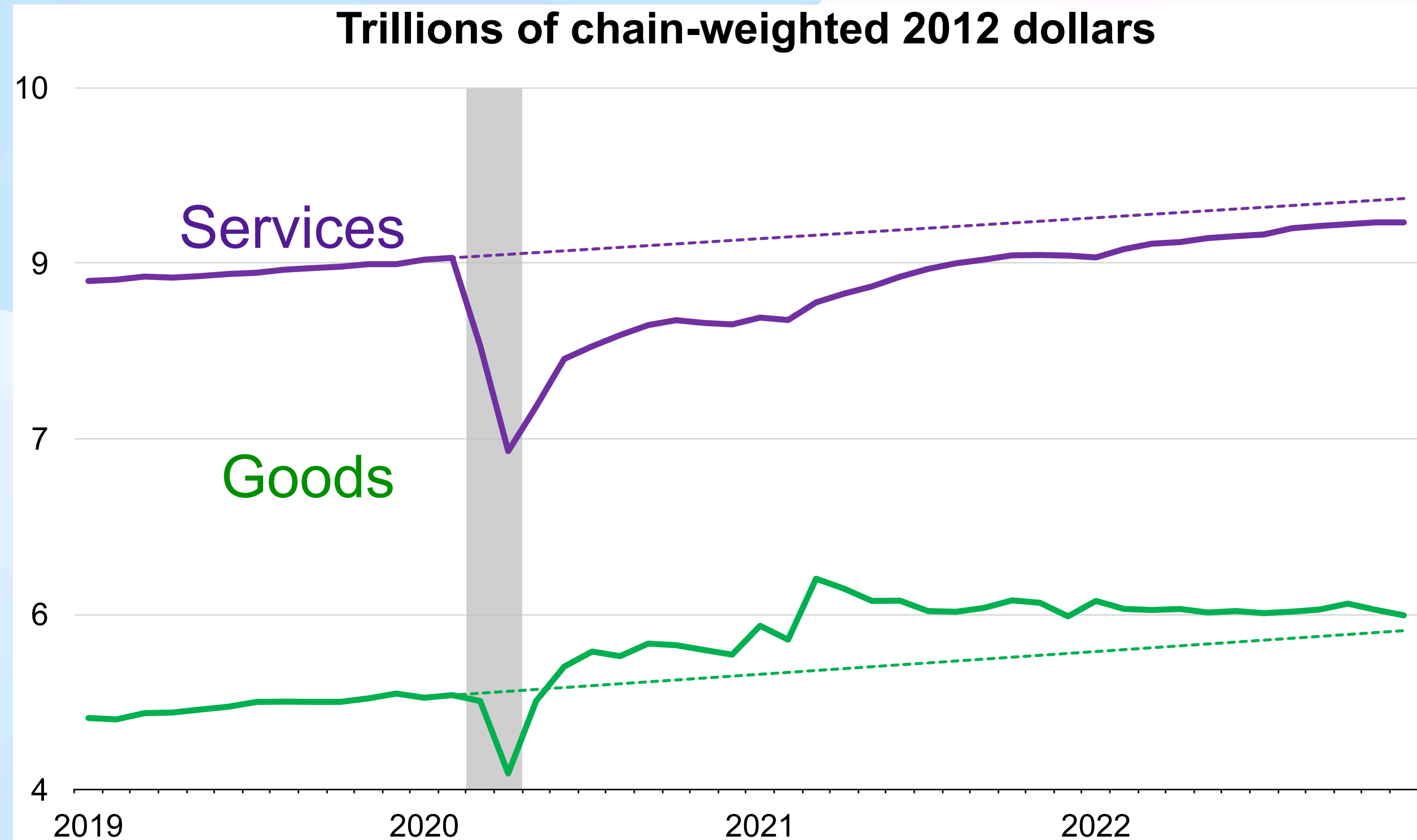
Cost to send a 40-foot container from Shanghai to Los Angeles has halved in last three months

— Shanghai to Los Angeles — Shanghai to Rotterdam
— Shanghai to New York



Big Shocks and Restructuring

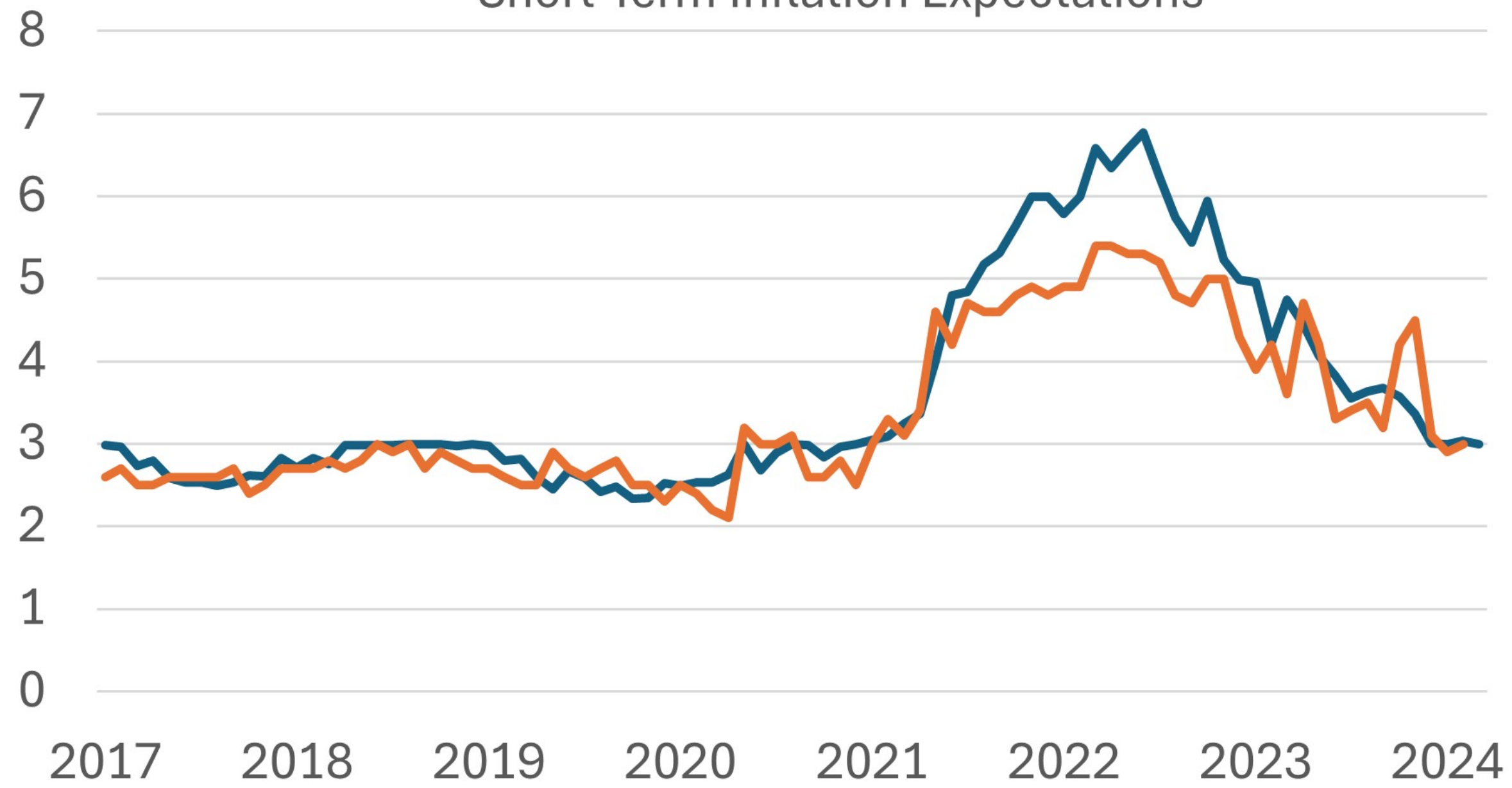
Goods vs Services



Inflation Expectations

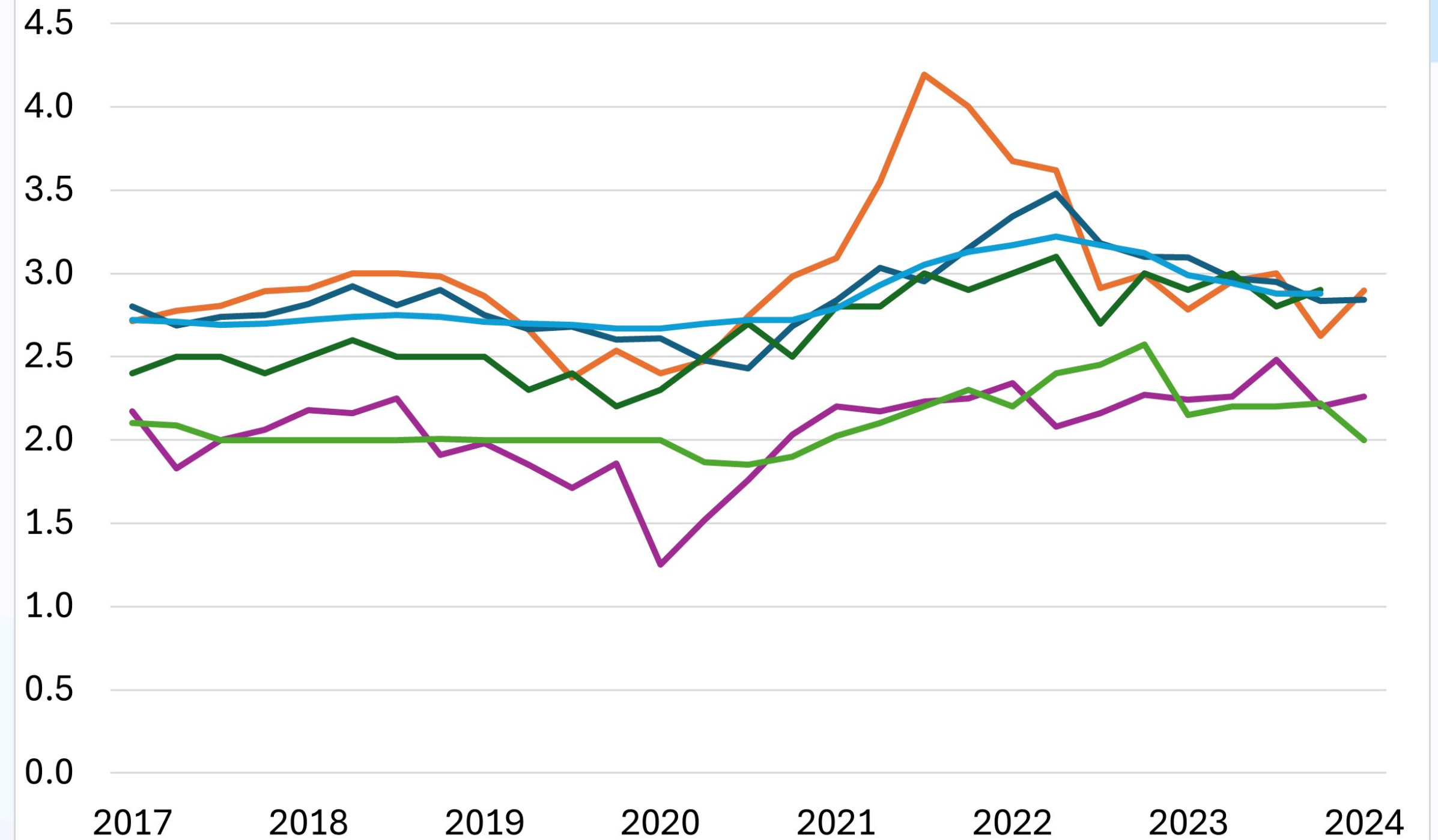
- NY Fed Survey of Consumer Exp, infl over next Y
- U Mich Consumer infl Exp, over next Y

Short-Term Inflation Expectations



- NY Fed Survey of Cons Exp, infl over next 3 yrs
- Atlanta Fed Bussness Infl Exp, over next 5-10yrs
- U Mich Infl Exp, over next 10 years
- BOG Common Infl Exp, over next 5-10Y
- Infl Comp: 5yr/5yr Forward
- SPF, 10Y PCE infl

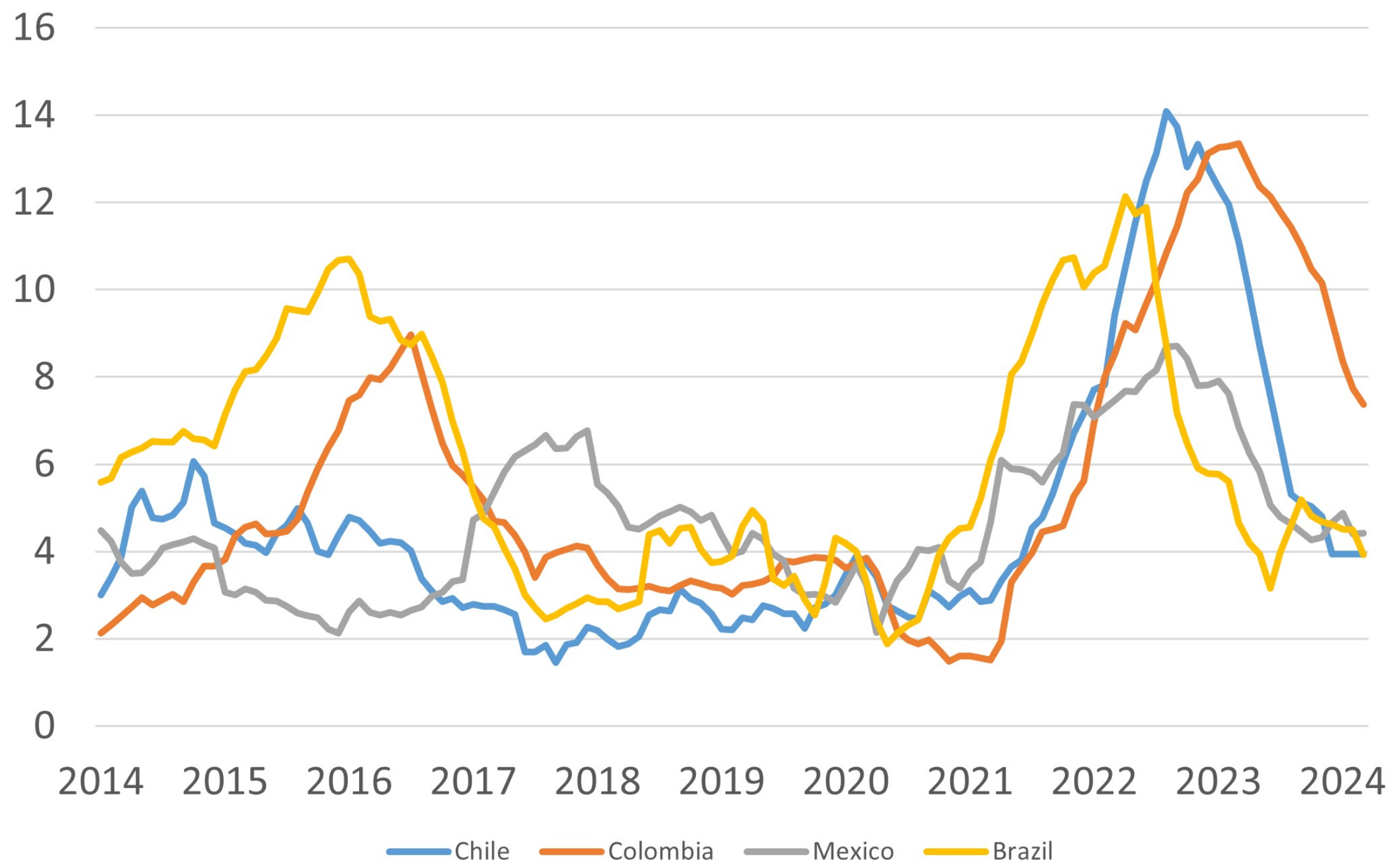
Long-Term Inflation Expectations



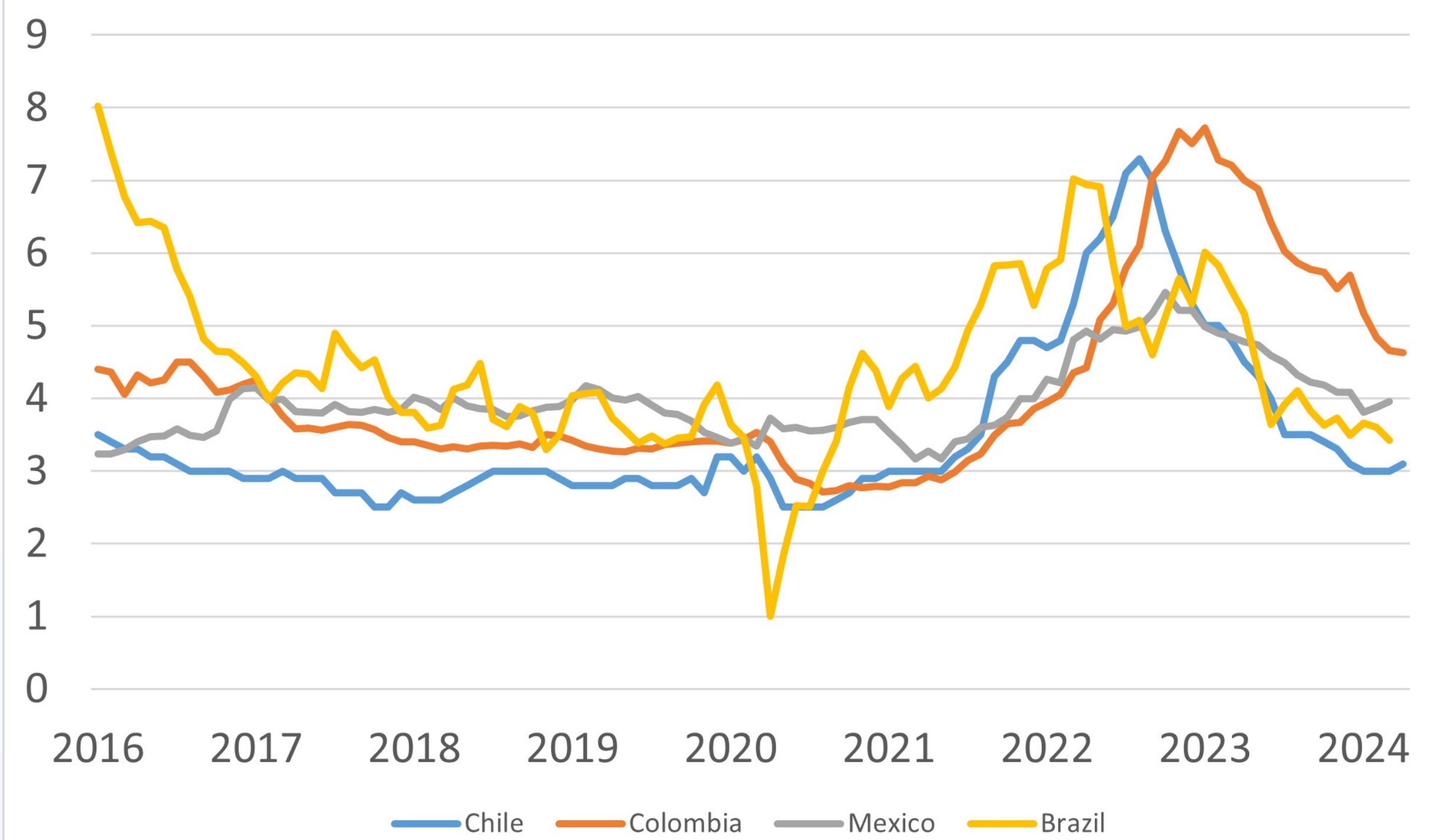
Latin America

- Similar to US
- Illustrate: Brazil, Chile, Colombia, Mexico

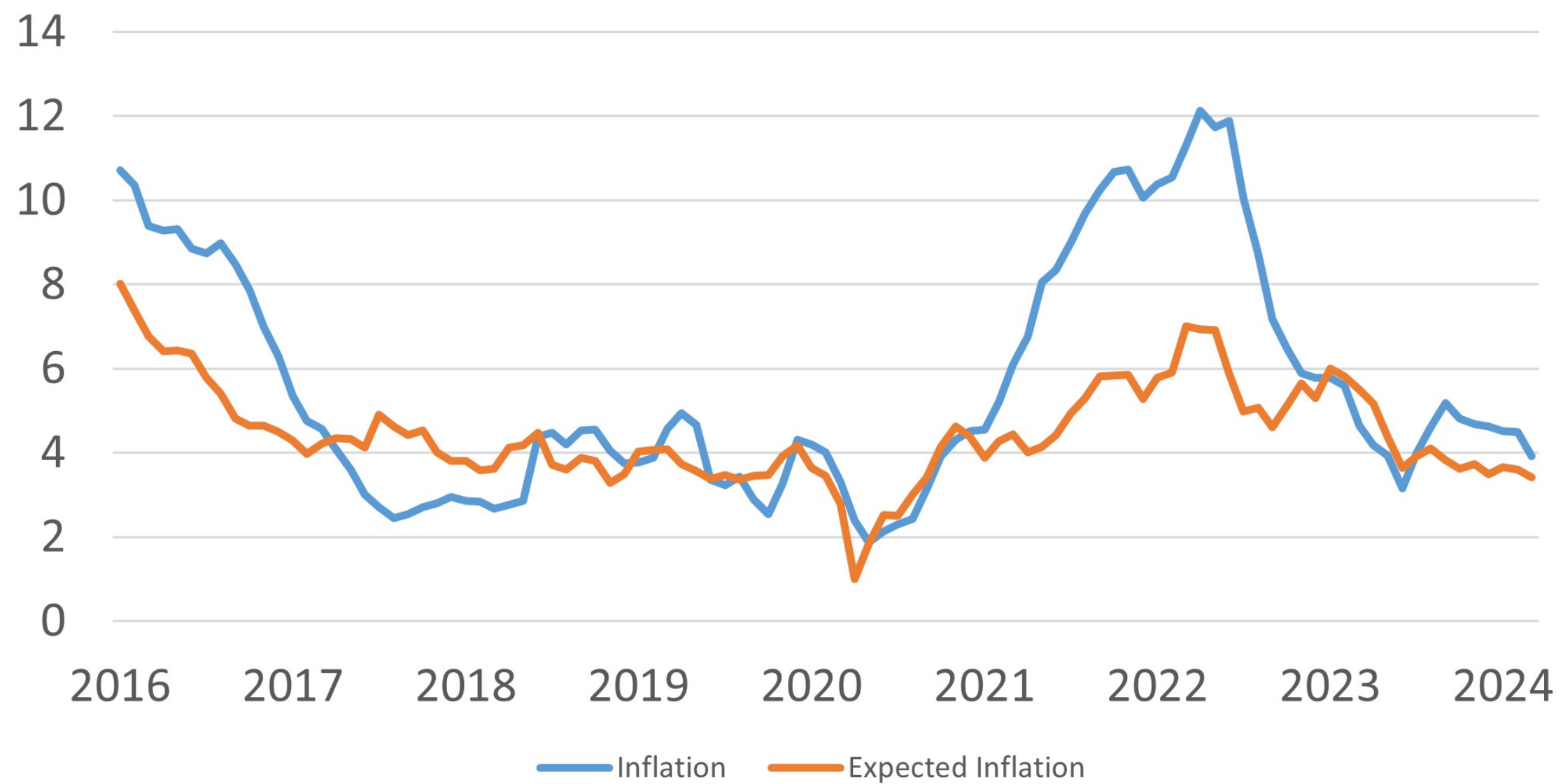
12-month Inflation in Latin America



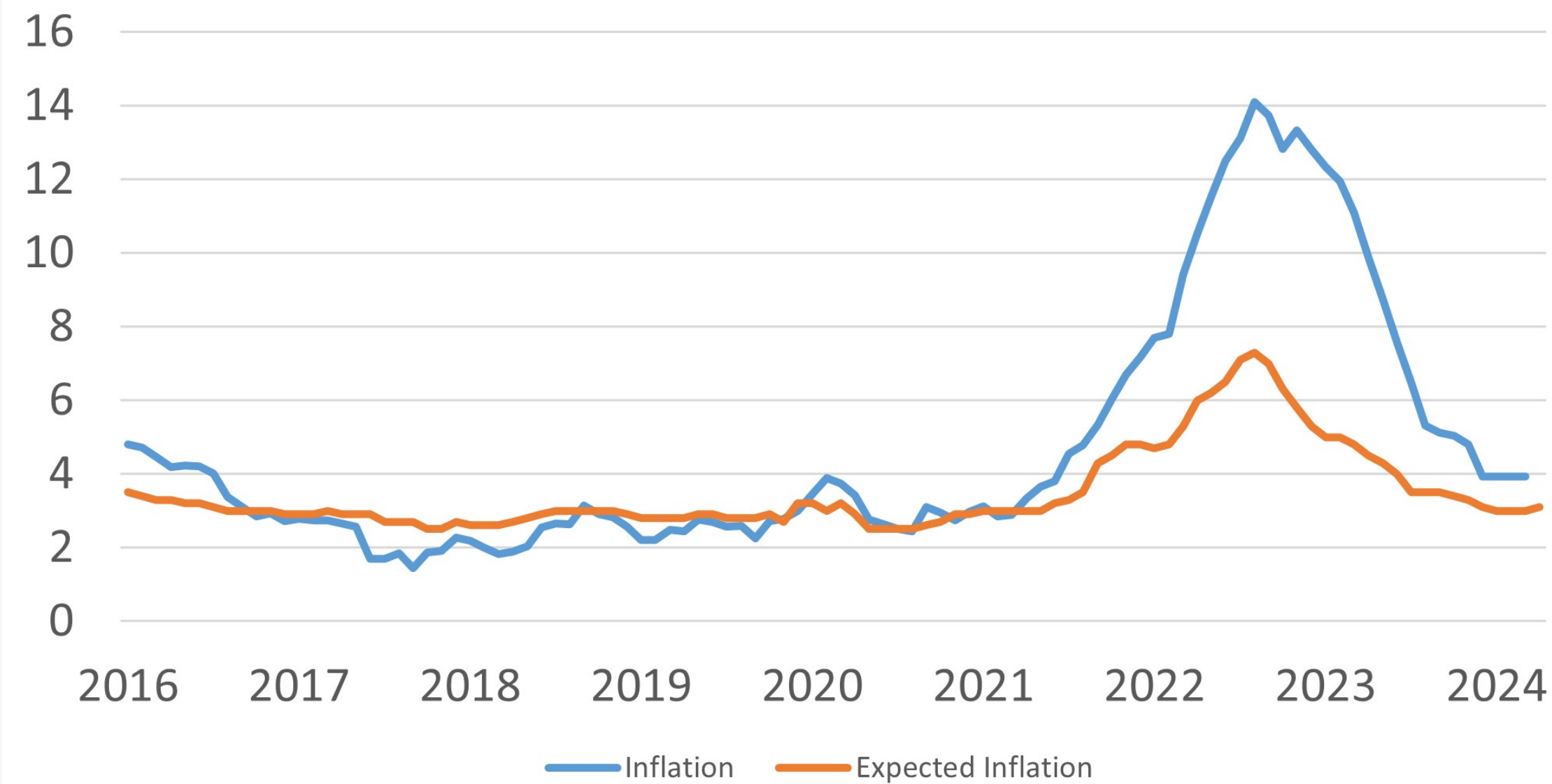
12-months-ahead Inflation Expectations



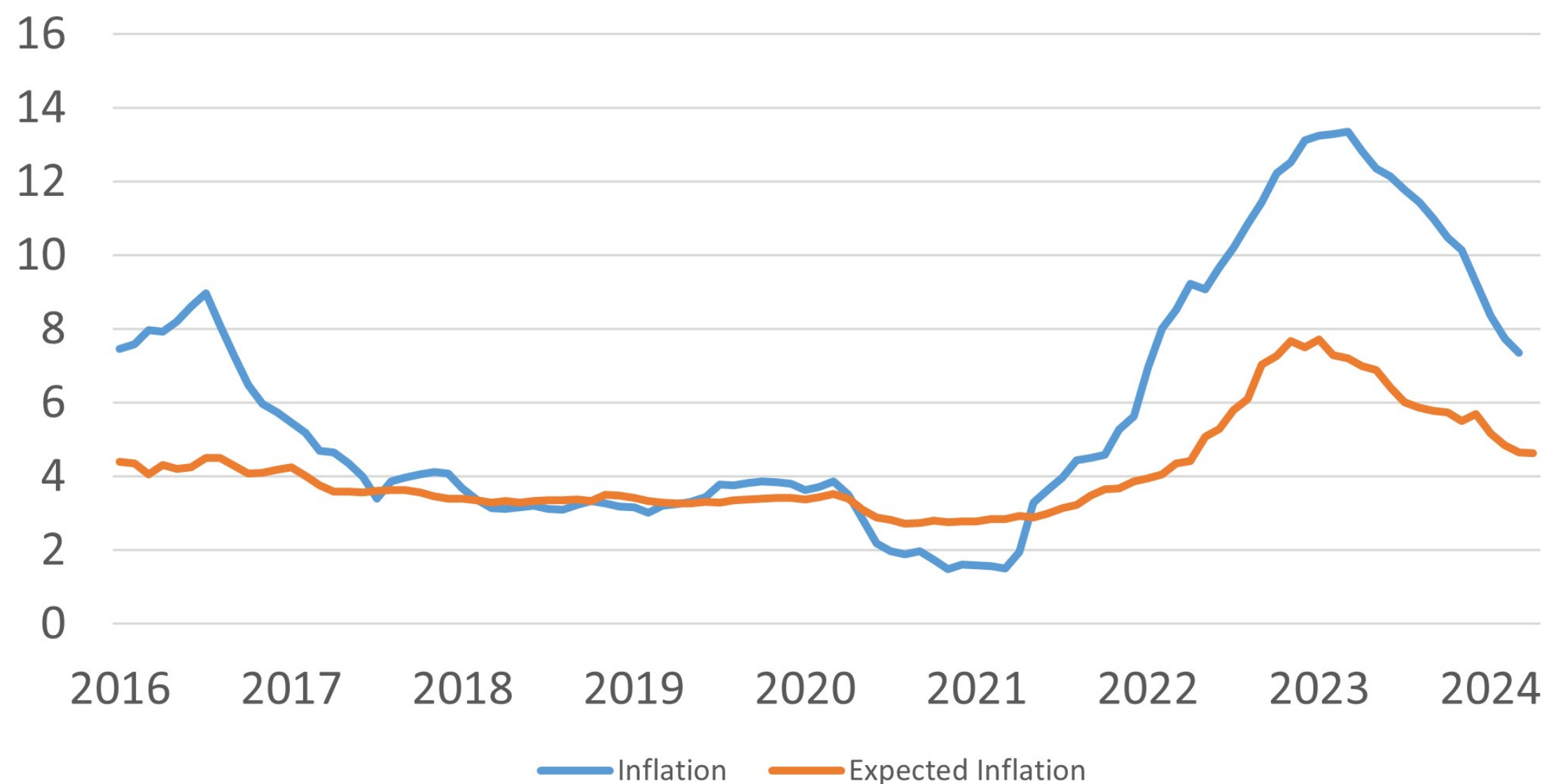
Inflation (y/y) and Expected Inflation (12m ahead), Brazil



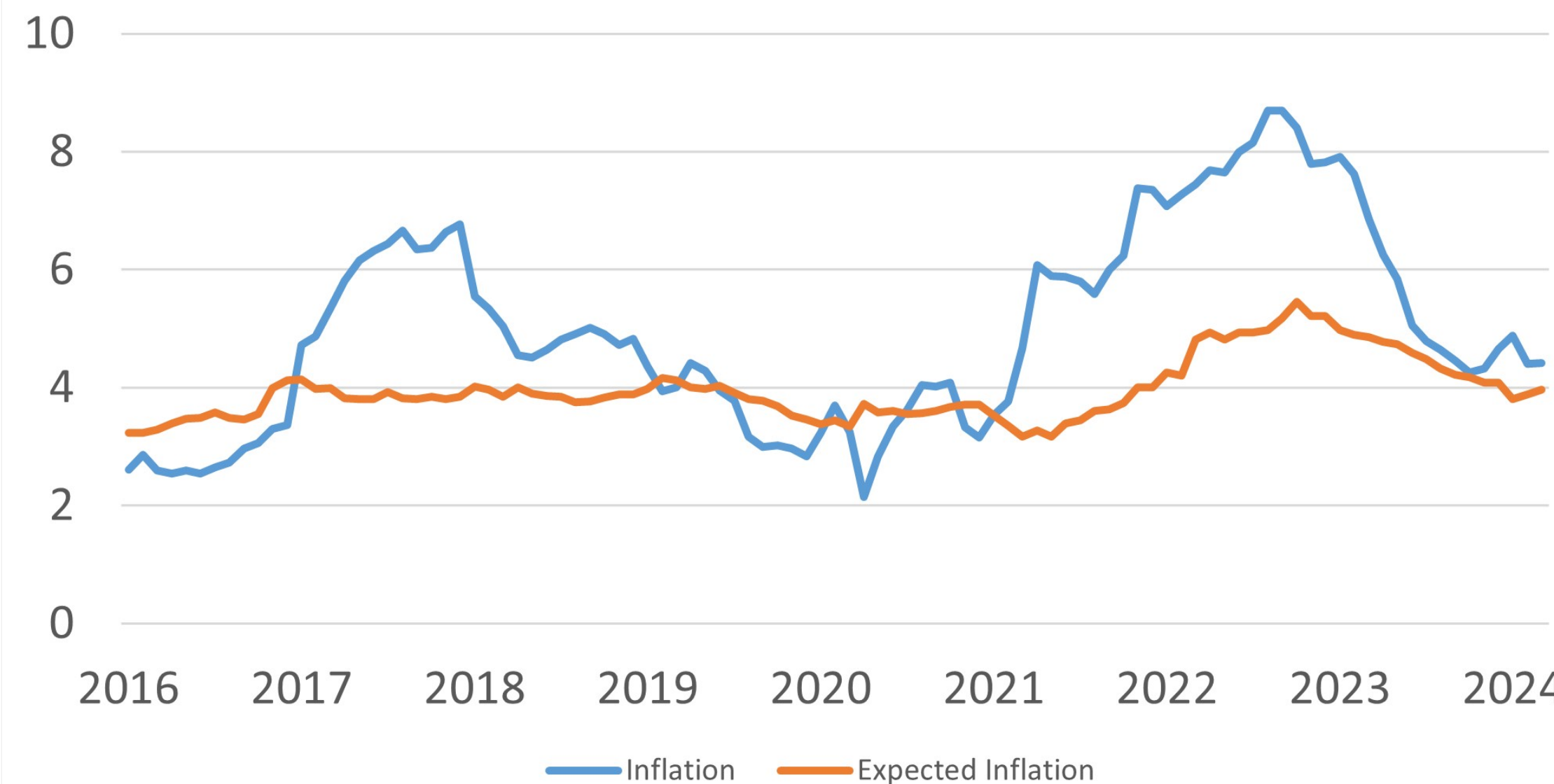
Inflation (y/y) and Expected Inflation (12m ahead), Chile



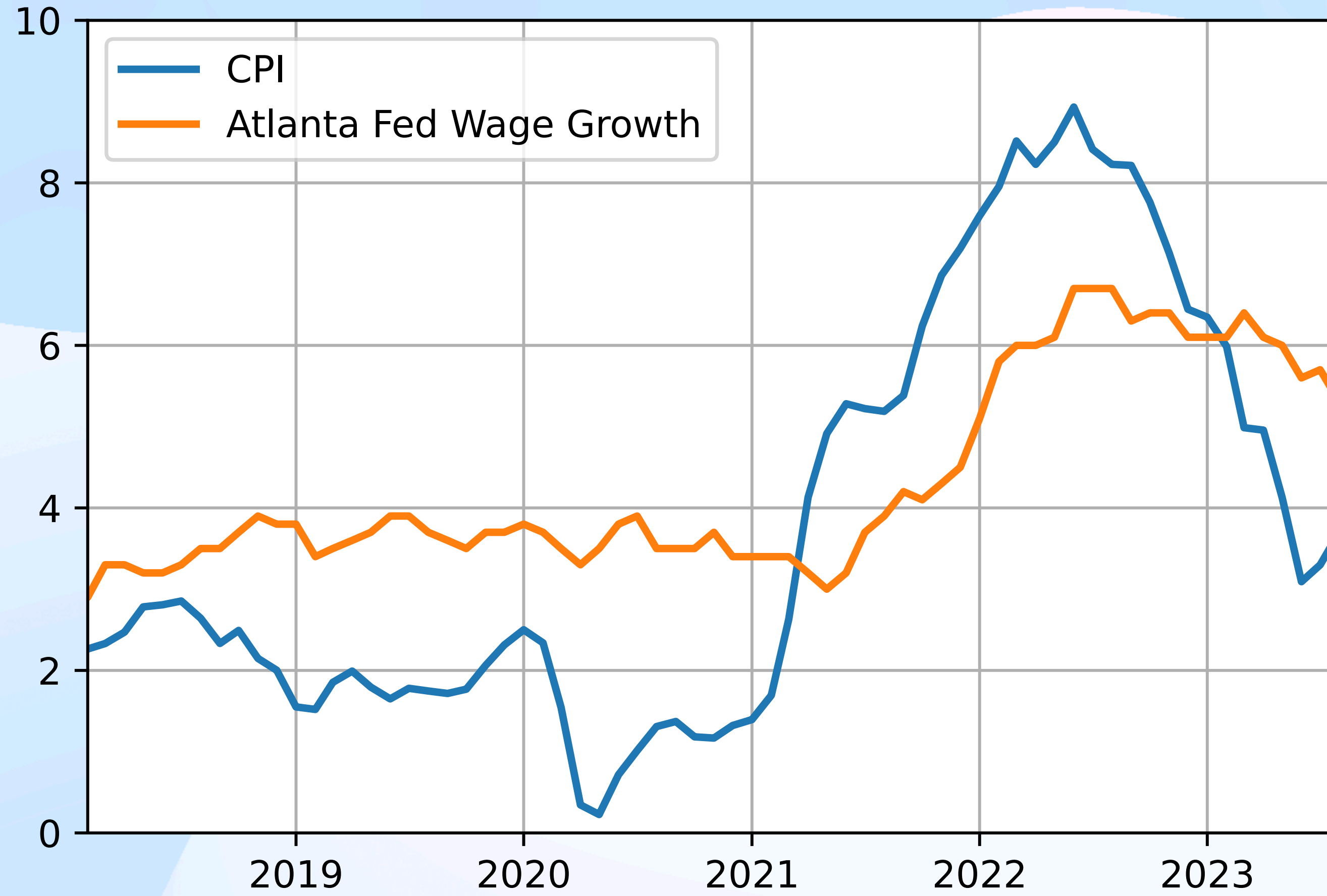
Inflation (y/y) and Expected Inflation (12m ahead), Colombia



Inflation (y/y) and Expected Inflation (12m ahead), Mexico



US Inflation: Prices and Wages



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■ Discussions...

- ▶ Oversimplified theories + Myths
- ▶ Slogans
- ▶ Why? Academic vs Teaching vs Politics?

“Inflation is always and everywhere a monetary phenomenon...”

Milton Friedman

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Milton Friedman

$$M/P = L(y, \pi, \dots)$$

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“... for persistent inflation episodes”

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$$\pi = \pi^e + \kappa(y - y^*)$$

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“Everything is interconnected, potentially everything endogenous! Need to go deeper...”

Tom Sargent (UTDT talk)

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Important to understand motives and mechanisms

Samuelson-Solow 1960

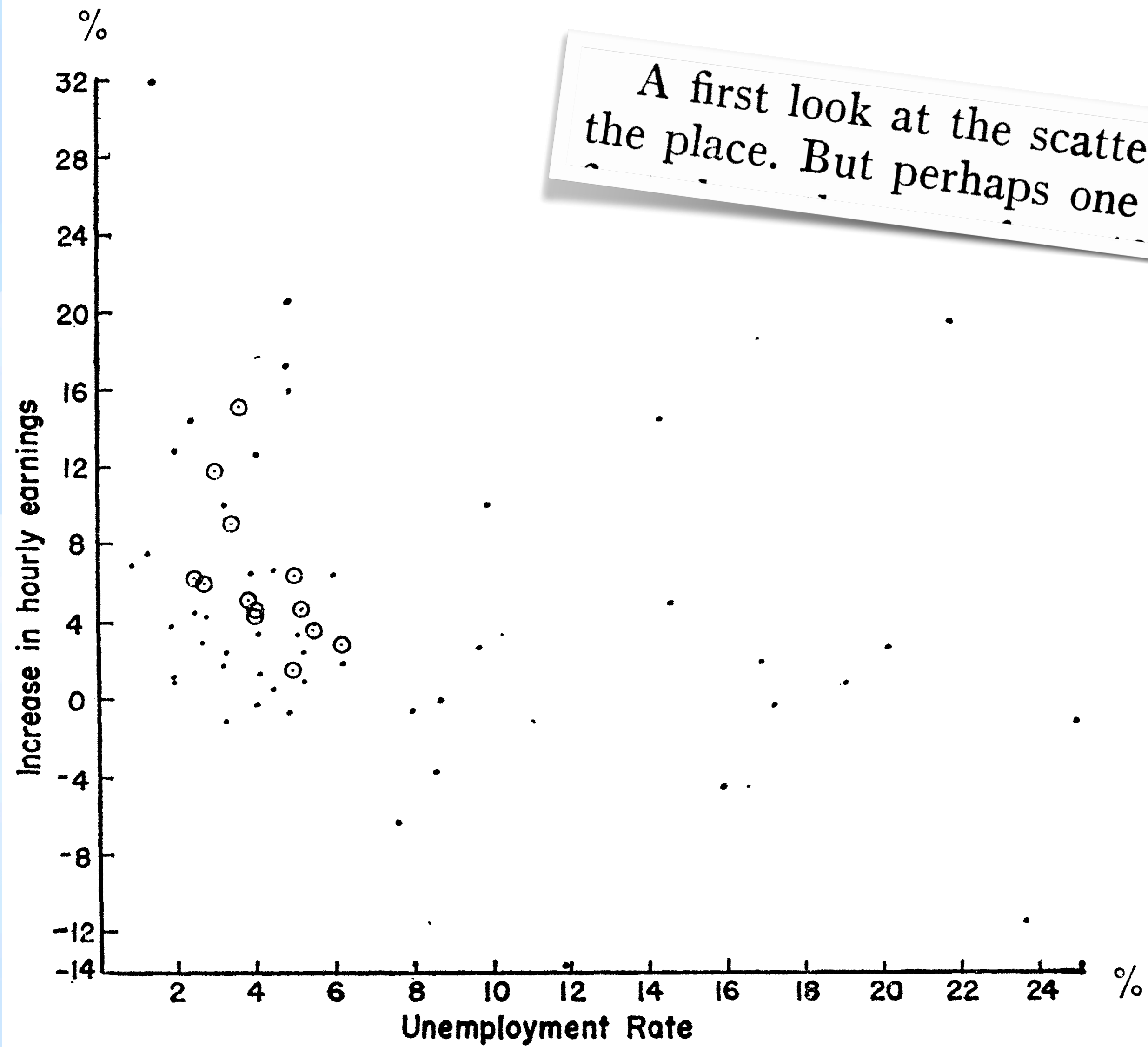
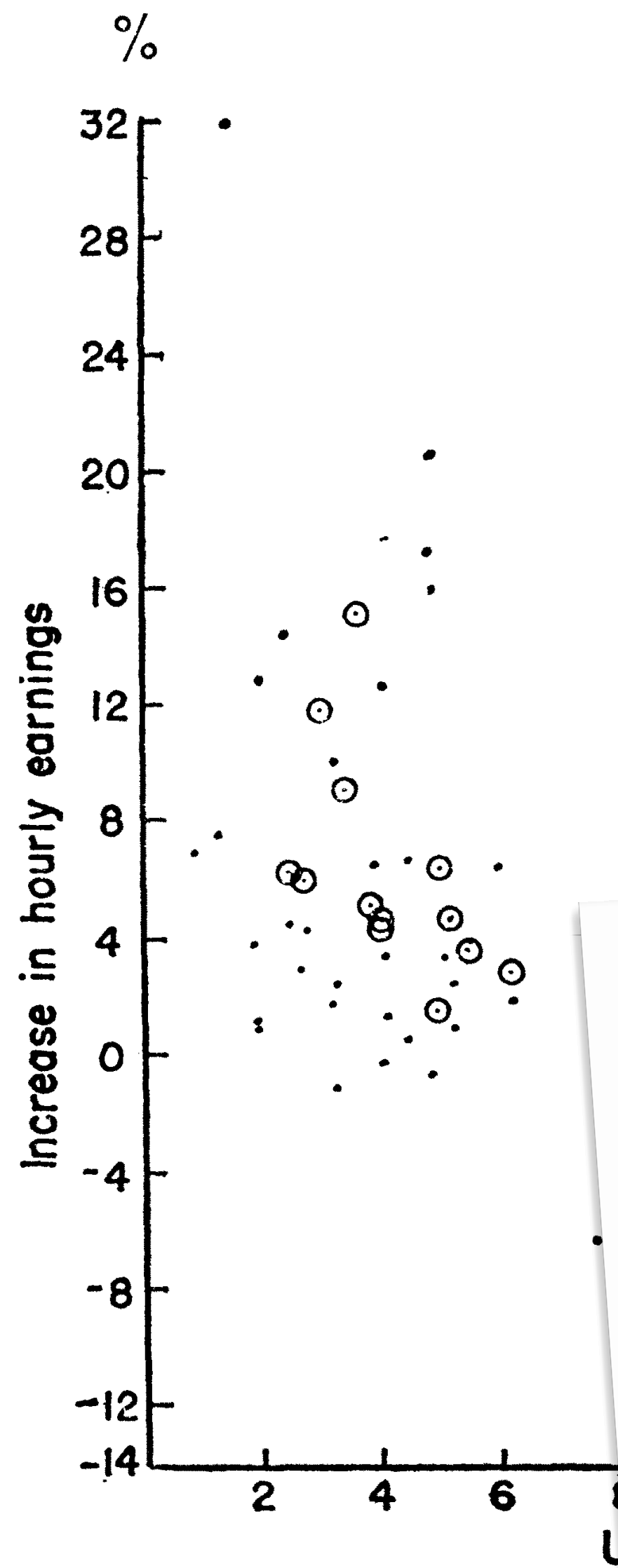


FIGURE 1

PHILLIPS SCATTER DIAGRAM FOR U.S.
(The circled points are for recent years.)

Samuelson-Solow 1960



A first look at the scatter is discouraging; there are points all over the place. But perhaps one can notice some systematic effects. In the

Aside from the usual warning that these are simply our best guesses we must give another caution. All of our discussion has been phrased in short-run terms, dealing with what might happen in the next few years. **It would be wrong, though, to think that our Figure 2 menu that relates obtainable price and unemployment behavior will maintain its same shape in the longer run.** What we do in a policy way during the next few years might cause it to shift in a definite way.

FIGURE 1
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- ▶ Slogans
- ▶ Why? Academic vs Teaching vs Politics?

■ **Theme of my talk...**

- ▶ lot we do not understand → need to explore
- ▶ old approaches + new ideas and methods

Theory: Stylized Standard Model

$$\pi = \kappa(y^d - y^s) + \pi^e + c$$

demand relative to supply

cost-push shifter

sensitivity

expectations

The diagram shows the equation $\pi = \kappa(y^d - y^s) + \pi^e + c$ with four annotations and arrows pointing to specific parts of the equation: 'demand relative to supply' points to y^d , 'cost-push shifter' points to c , 'sensitivity' points to κ , and 'expectations' points to π^e .

Theory: Stylized Standard Model

■ stylized Phillips Curve...

$$\pi = \kappa(y^d - y^s) + \pi^e + c$$

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The diagram shows the equation $\pi = \kappa(y^d - y^s) + \pi^e + c$ with four annotations. An arrow points from the text 'demand relative to supply' to the term $(y^d - y^s)$. An arrow points from 'cost-push shifter' to the constant term c . An arrow points from 'sensitivity' to the coefficient κ . An arrow points from 'expectations' to the term π^e .

Theory: Stylized Standard Model

- stylized Phillips Curve...

$$\pi = \kappa(y^d - y^s) + \pi^e + c$$

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- Does demand vs supply matter? **No, only $y^d - y^s$**
- Where does cost-push shifter c come from? **(coming up)**

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- Does demand vs supply matter? **No, only $y^d - y^s$**
- Where does cost-push shifter c come from? **(coming up)**
- Do expectations have one-for-one effect? **(coming up)**
- Interplay with wages? **(coming up)**

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$$\pi = f(\dots)$$

Theory: Stylized Standard Model

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demand relative to supply

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expectations

Need to Explore
Richer:
Micro, Network,
Heterogeneity,
Expectations

- Does demand vs supply matter? **No, only $y^d - y^s$**
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$$\pi = f(\dots)$$

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Down the Phillips Curve with Gun and Camera

Robert M. Solow (1978)

Any time seems to be the right time for reflections on the Phillips curve. So long

It did not occur to me then that the Phillips curve (or perhaps Phillips surface would be better, to signal that more than the unemployment rate governs the rate of wage increase) needed any subtle theoretical justification. It seemed reasonable in a commonsense way that the change in the money wage, like the

Inflation Papers

- Dynamic Oligopoly and Price Stickiness Wang-Werning
- Monetary Policy in Times of Structural Reallocation
Guerrieri-Lorenzoni-Straub-Werning
- Expectations and the Rate of Inflation
- Wage-Price Spirals
- Inflation is Conflict
- Doing Macroeconomics with Excess Demand
- Fiscal Dominance...
 - Recalculating Sargent and Wallace's Unpleasant
 - Dollarization I and II
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Now

- Fiscal Dominance...

- Recalculating Sargent and Wallace's Unpleasant

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Macro ↔ GE

■ Walrasian General Equilibrium...

- ▶ well developed theory
- ▶ flexible framework
- ▶ applied: Trade, Macro, Public Finance, IO...

■ Today: Modern Macro...

- ▶ micro + nominal rigidities...
- ▶ GE: “many markets” ...
- ▶ ... but not truly “general”!

■ Earlier attempts at true GE: 60-70s (disequilibrium theory)...

... but New Keynesian framework → long series of example

$$U = u(c) - v(n)$$

$$u'(c_t) = \beta R \mathbb{E}_t u'(c_{t+1})$$

$$p_t^* = \mu_t + \sum_{s \geq 0} \beta^s MC_{t+s}$$

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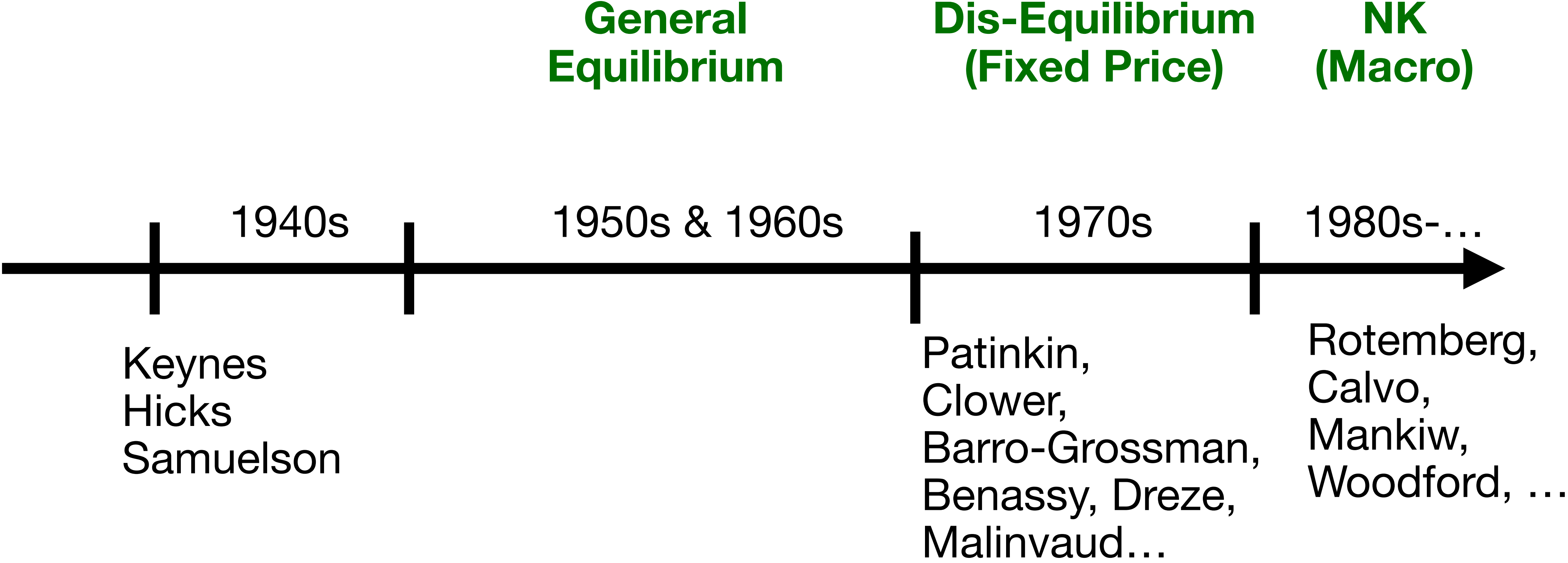
$$Z(\bar{p}) = 0$$

equilibrium
(vectors)

$$U = u(c) - v(n)$$

$$u'(c_t) = \beta R \mathbb{E}_t u'(c_{t+1})$$

$$p_t^* = \mu_t + \sum_{s \geq 0} \beta^s MC_{t+s}$$



“Doing Macroeconomics with Excess Demands”

- Idea: reconnect GE and macro!

- Framework...

- ▶ general GE model, N goods, H agents, general technology, preferences

- ▶ Calvo Pricing in all goods (thus, wages too)

- Method...

- ▶ developed for “Tâtonnement...” paper...

- ▶ ... but followup → pure macro angle

Static GE Model

■ GE = **General** Equilibrium

■ General Primitives...

▶ n goods (goods and factors, many labor etc.)

▶ h household types, general preferences

▶ f firms, general technologies (networks, etc.)

$$x = (x_1, \dots, x_N) \geq 0$$

$$y = (y_1, \dots, y_N) \geq 0$$

$$z = (z_1, \dots, z_N) = x - y$$

$$\Pi^f \equiv \max_{z \in Y^f} -p \cdot z$$

$$\Pi^f \equiv \max -p \cdot z$$



$$z \in Y^f$$

$$z^{**f}(p)$$

$$\Pi^f \equiv \max - p \cdot z$$



$$z \in Y^f$$

$$z^{**f}(p)$$

$$U^h(z^h)$$

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$$z^{**f}(p)$$

$$\max_{z^h} U^h(z^h)$$

$$p \cdot z^h \leq p \cdot a^h + \sum_f \omega^{h,f} \Pi^f$$

$$\Pi^f \equiv \max - p \cdot z$$



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$$Z^{**h}(p)$$



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$$z \in Y^f$$

$$Z^{**f}(p)$$

$$(Z^{**}(p) \equiv \sum_j Z^{**j}(p))$$

$$Z^{**h}(p)$$



$$\max_{z^h} U^h(z^h)$$

$$p \cdot z^h \leq p \cdot a^h + \sum_f \omega^{h,f} \Pi^f$$

$$Z^{**}(p) = 0$$

Adding Market Power

$$z_{un}(\omega) + z_{vn}(\omega) = 0$$

Adding Market Power

■ Each market n ... continuum varieties ω ...

▶ **price-taking undifferentiated (u)** vs. **price-setting differentiated (v = varieties)**

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▶ **differentiated side n** \rightarrow agent type j \rightarrow sets prices $p_{nv}(\omega)$...

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□ monopolistic supply → $z_{vn}(\omega) = -y_{vn}(\omega)$

□ monopsonistic demand → $z_{vn}(\omega) = x_{vn}(\omega)$

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□ simplify: each agent j assigned at most one market n

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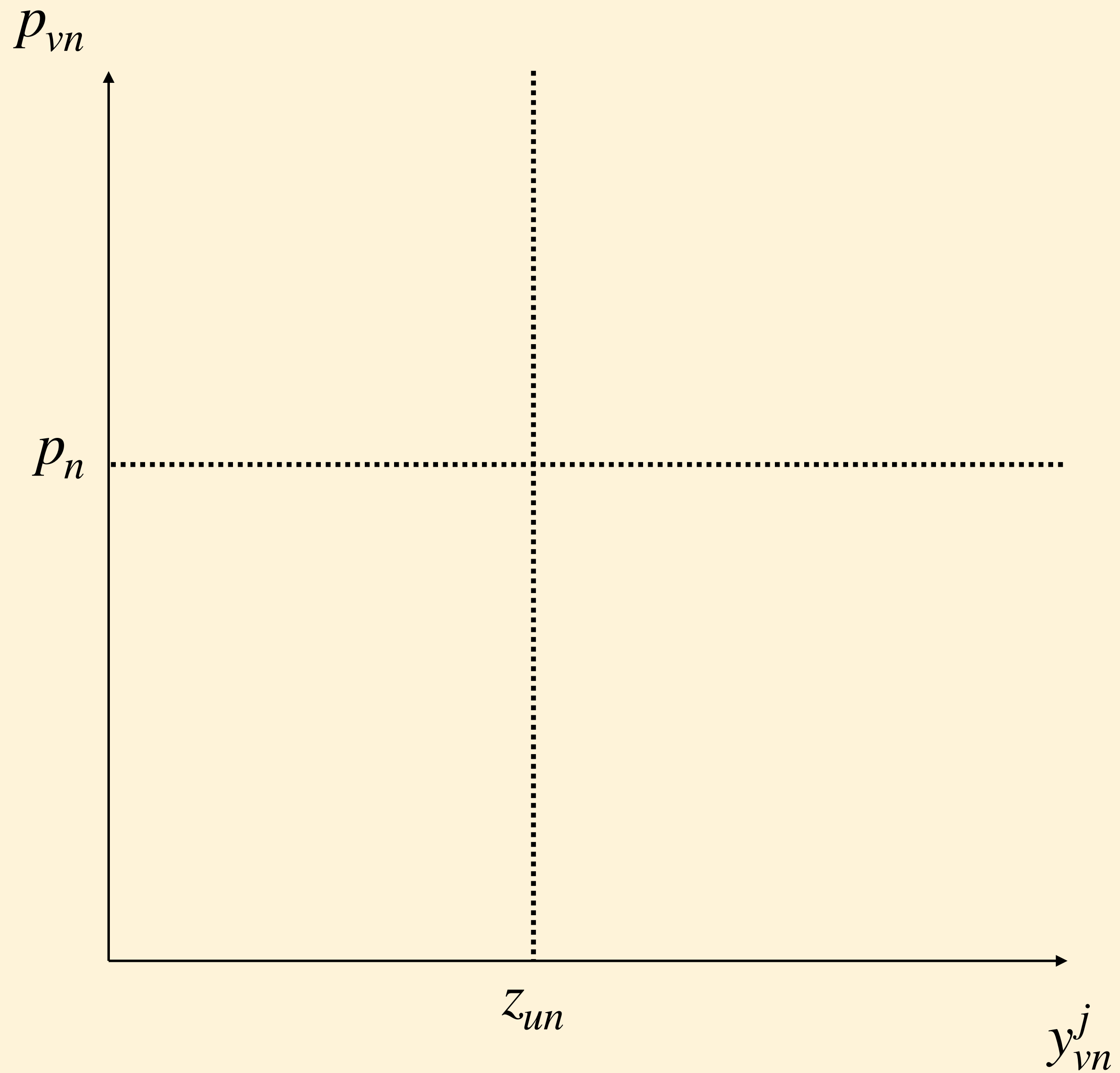
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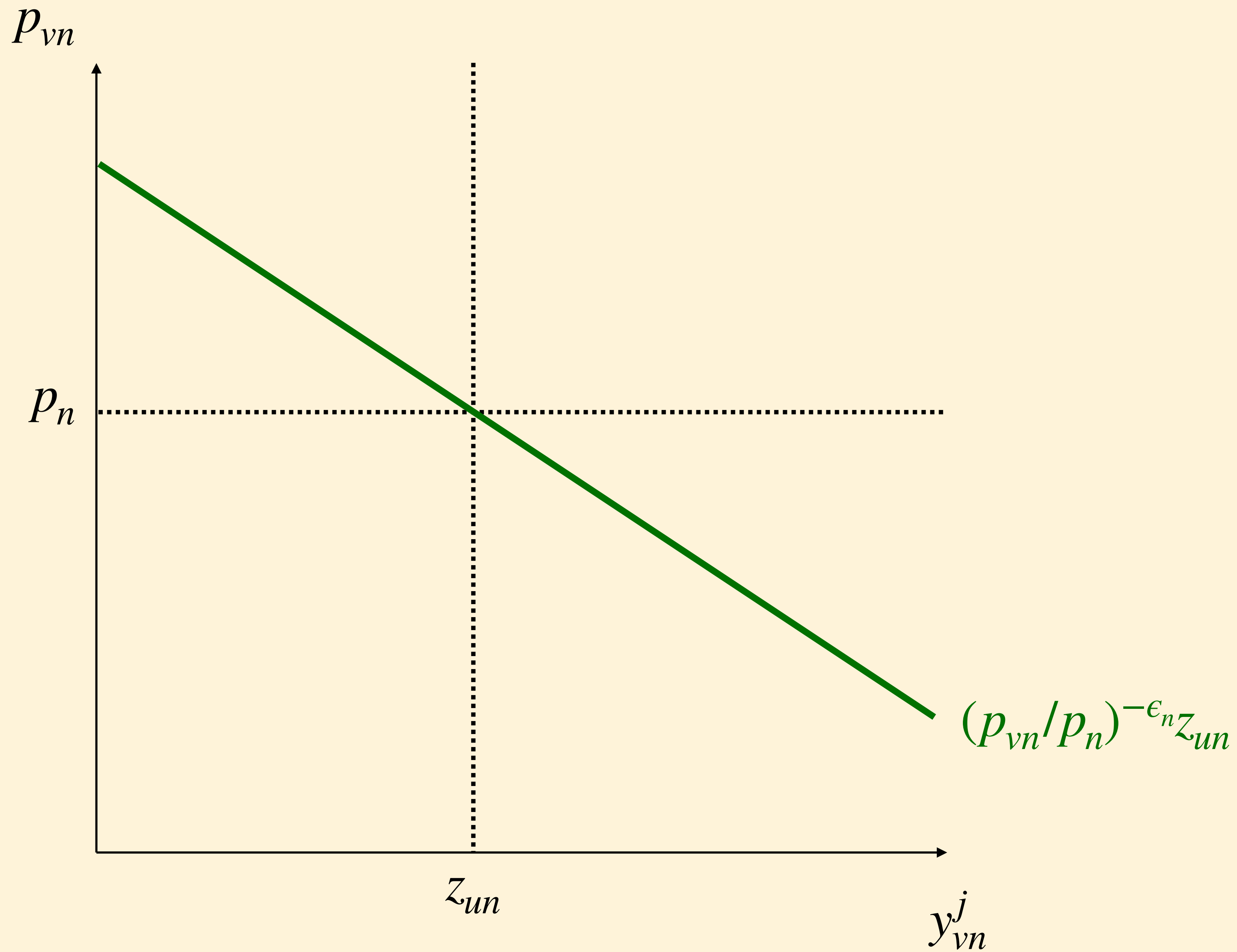
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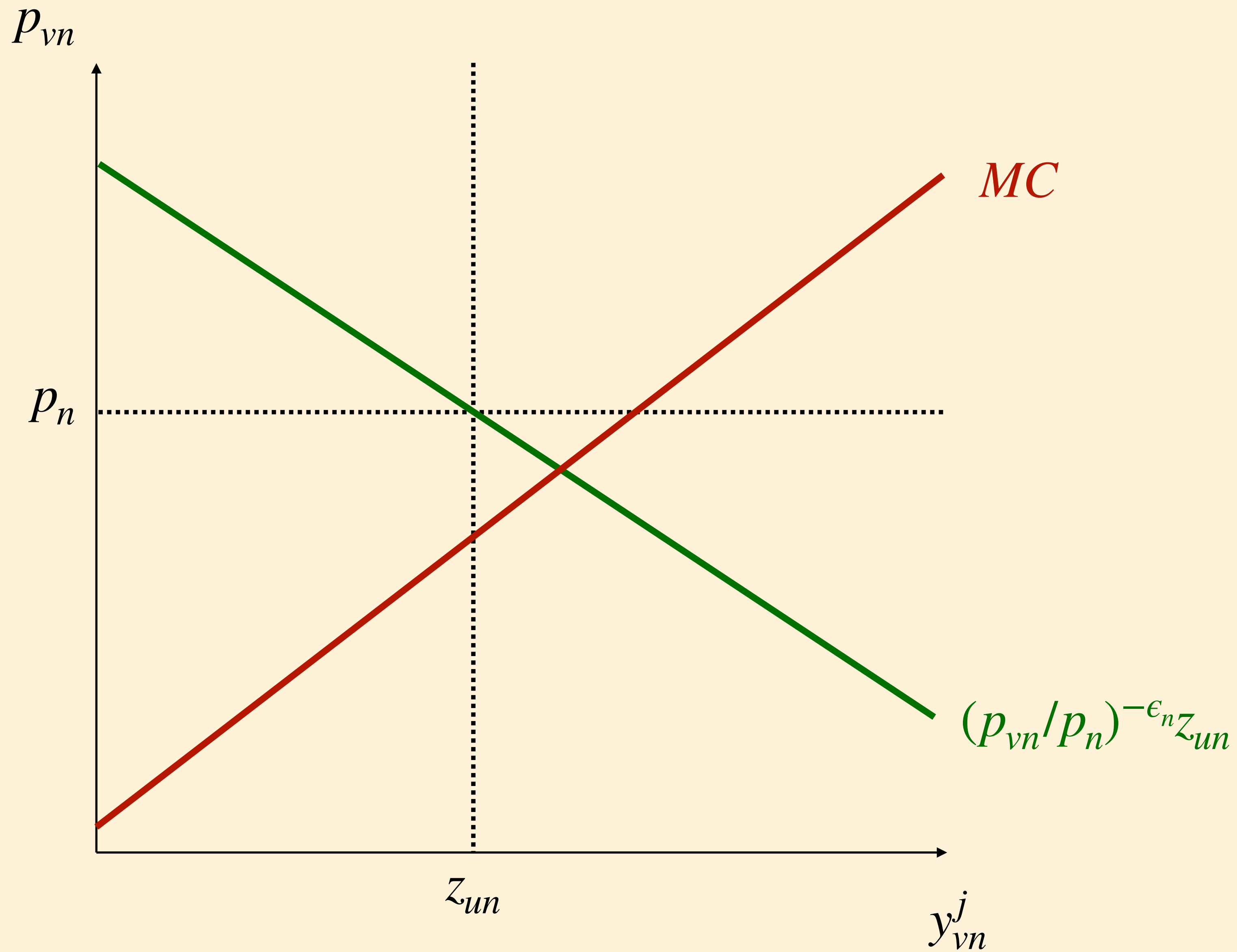
□ monopsonistic demand → $z_{vn}(\omega) = x_{vn}(\omega)$

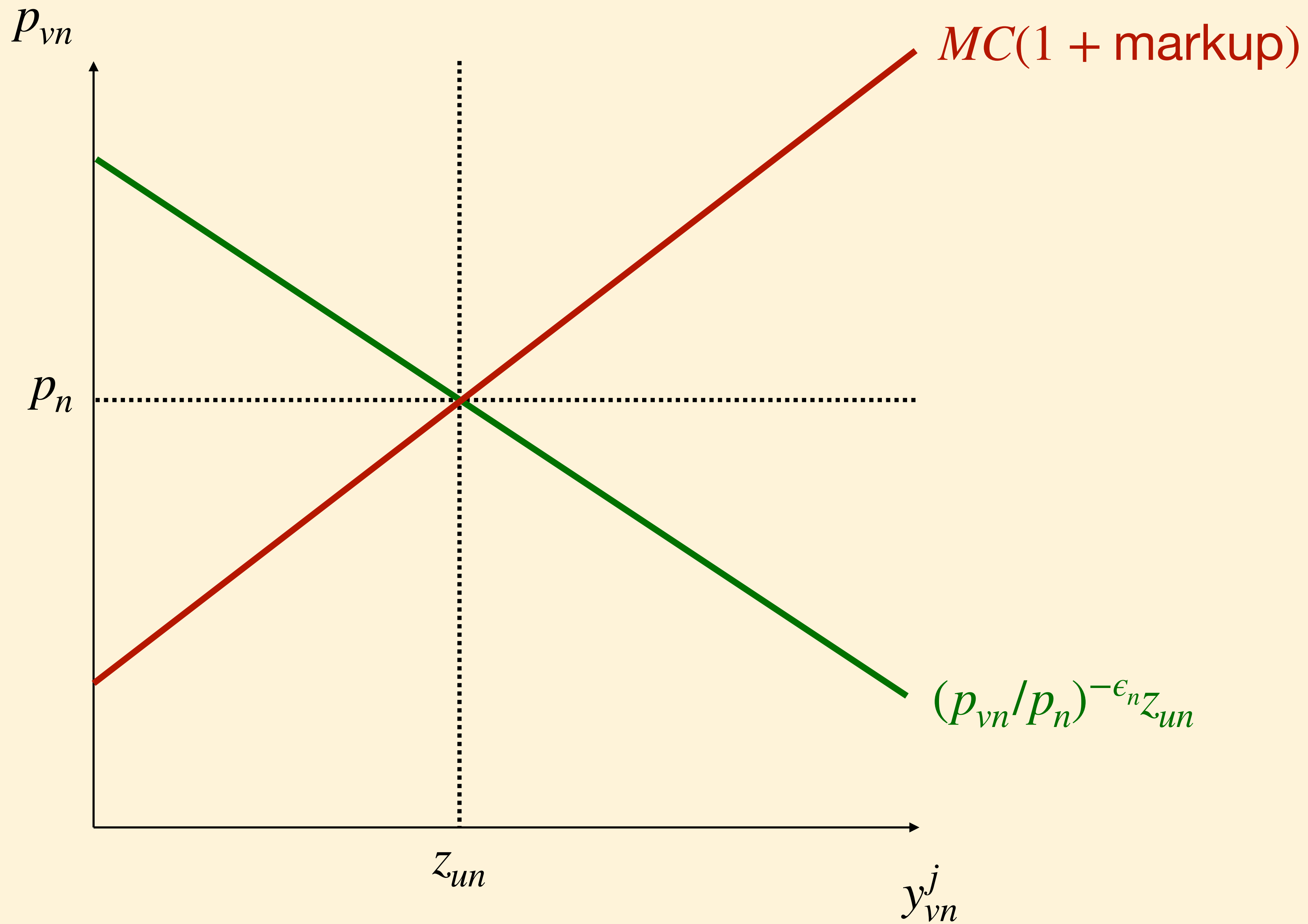
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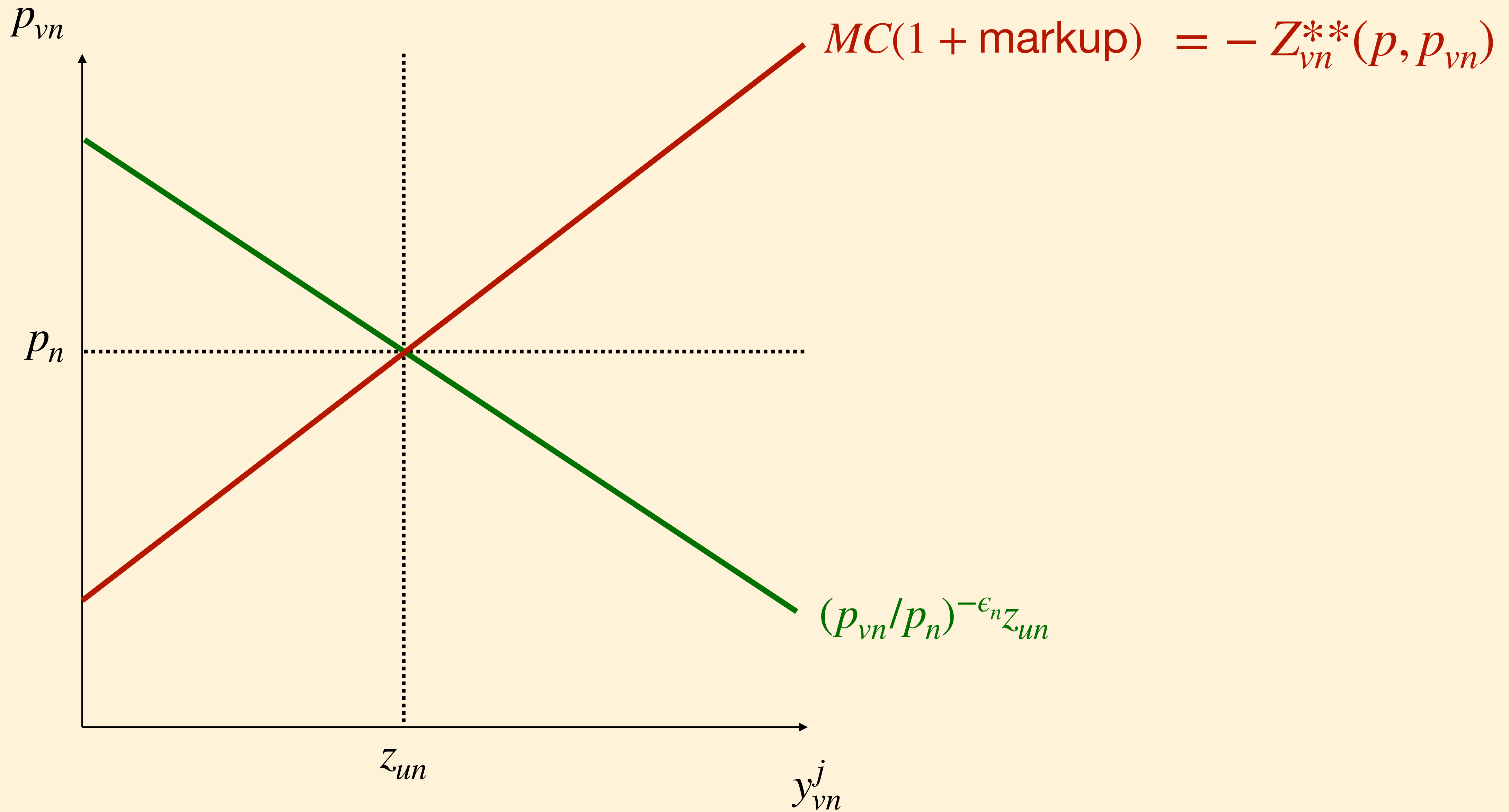
▶ **undifferentiated side n** : CES subutility over varieties elasticity ϵ_n

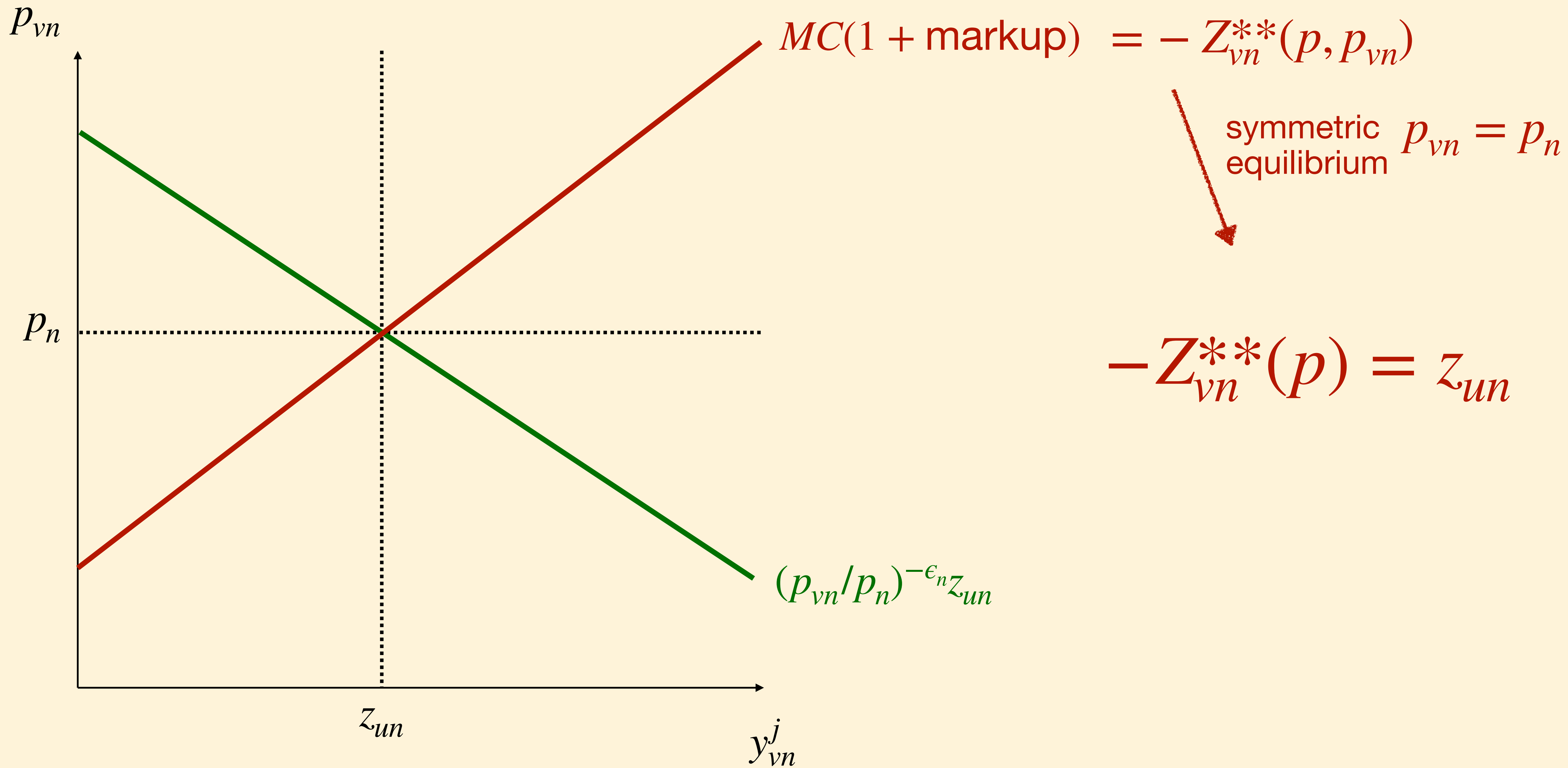


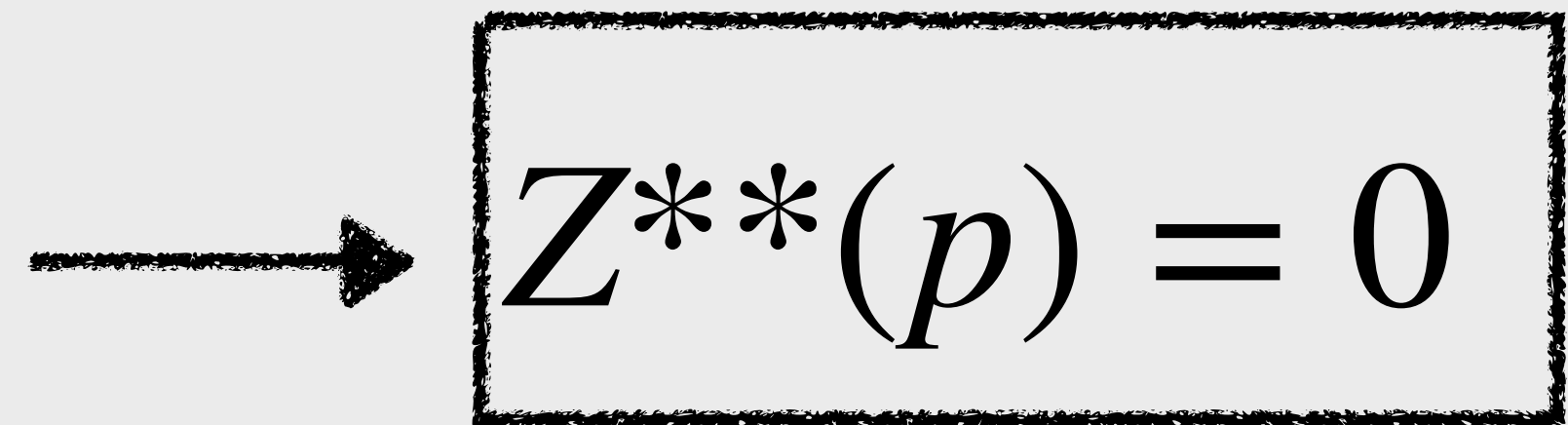










An arrow points from the left towards a rectangular box containing the equation $Z^{**}(p) = 0$.
$$Z^{**}(p) = 0$$

...exactly as if Walrasian!
(new result)

Price Frictions...

Price Frictions...

■ Now: Price Frictions

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■ Non-Walrasian (temporary) equilibrium...

▶ price pressure market n \leftrightarrow excess demand $\tilde{z}_n = z_{un} + Z_{vn}^{**}(p)$

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■ Now: Price Frictions

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▶ solve equilibrium z_{un} or \tilde{z}_n quantities at given prices p ...

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▶ equilibrium excess demand \neq Walrasian excess demand...

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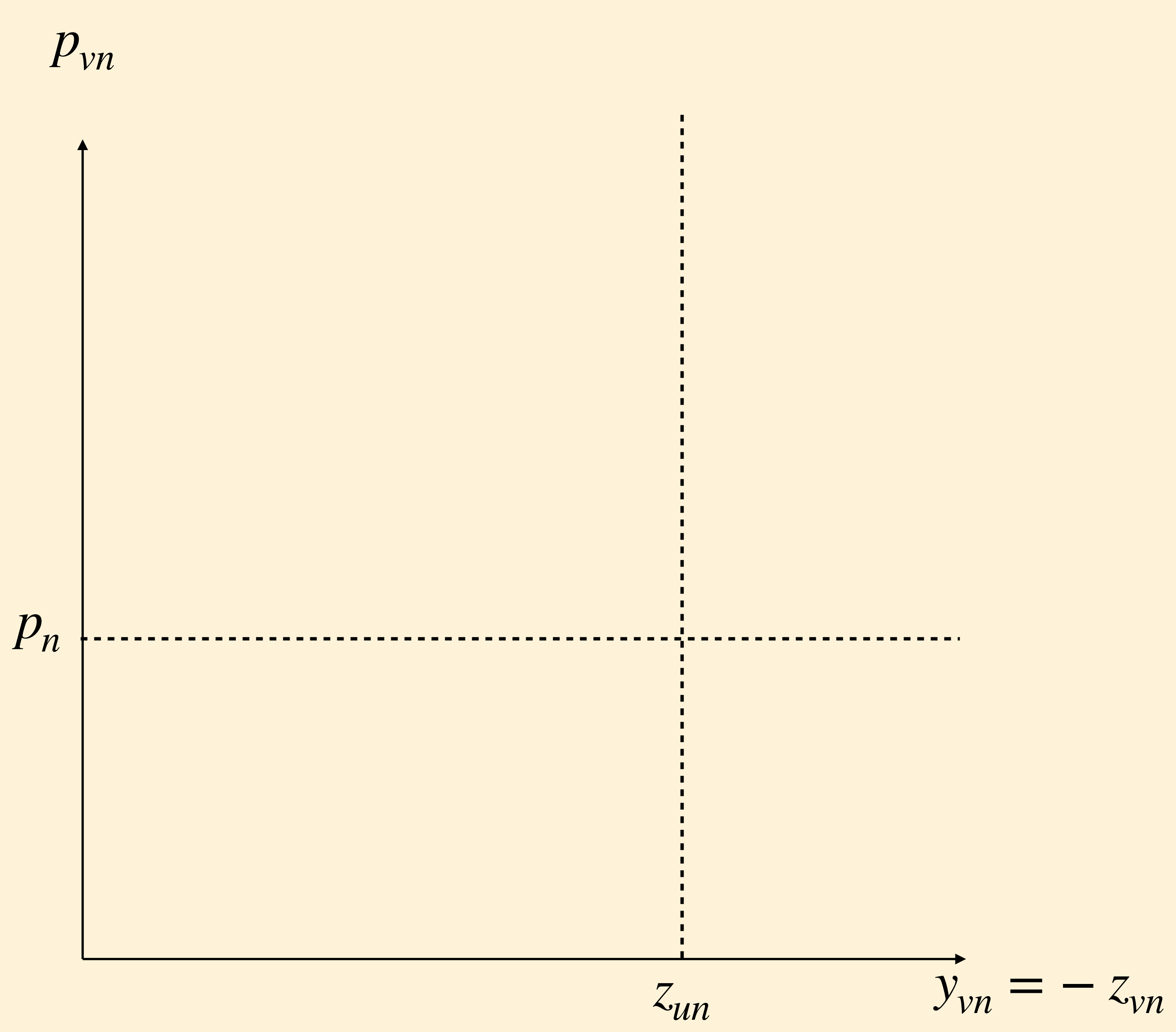
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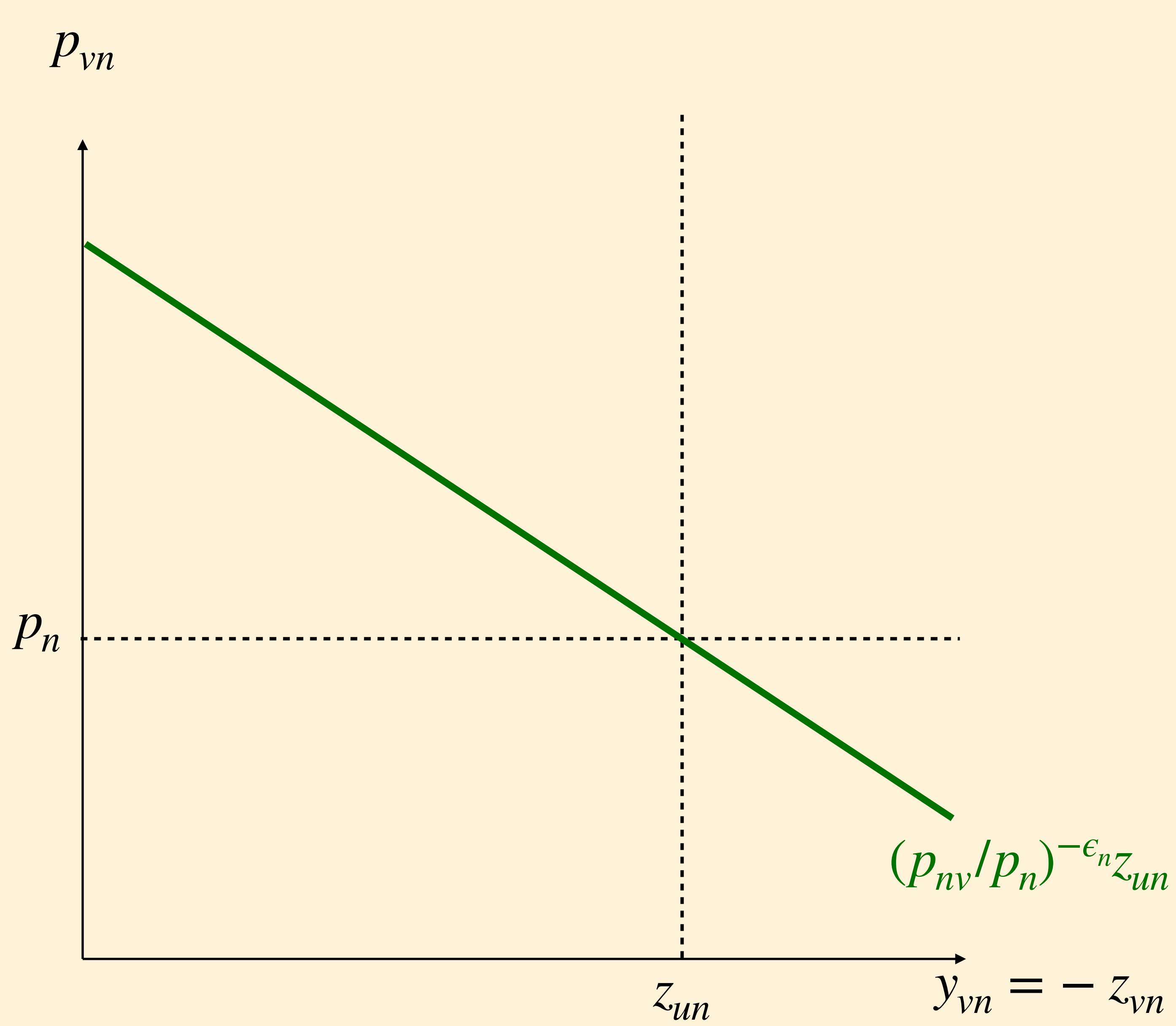
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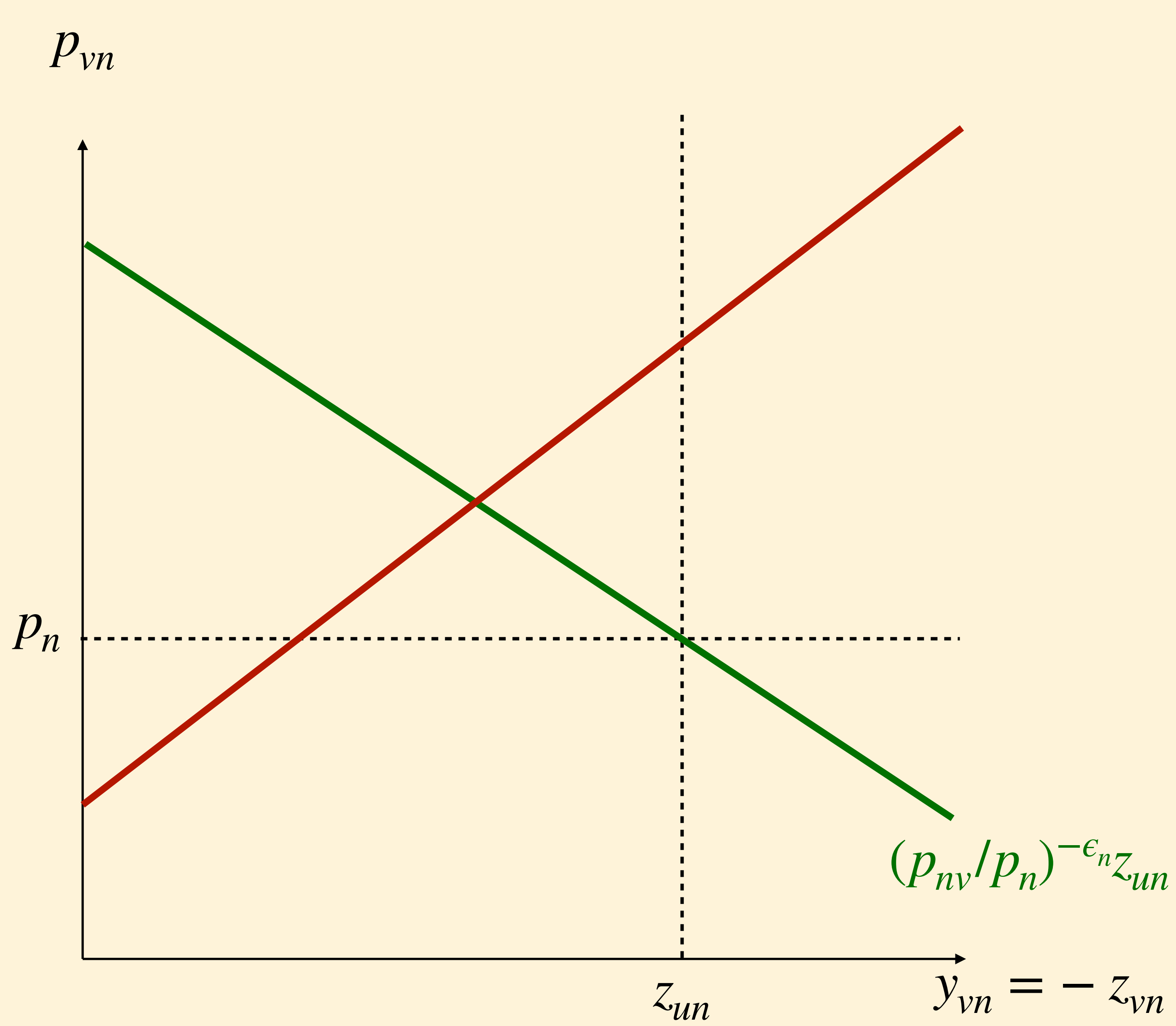
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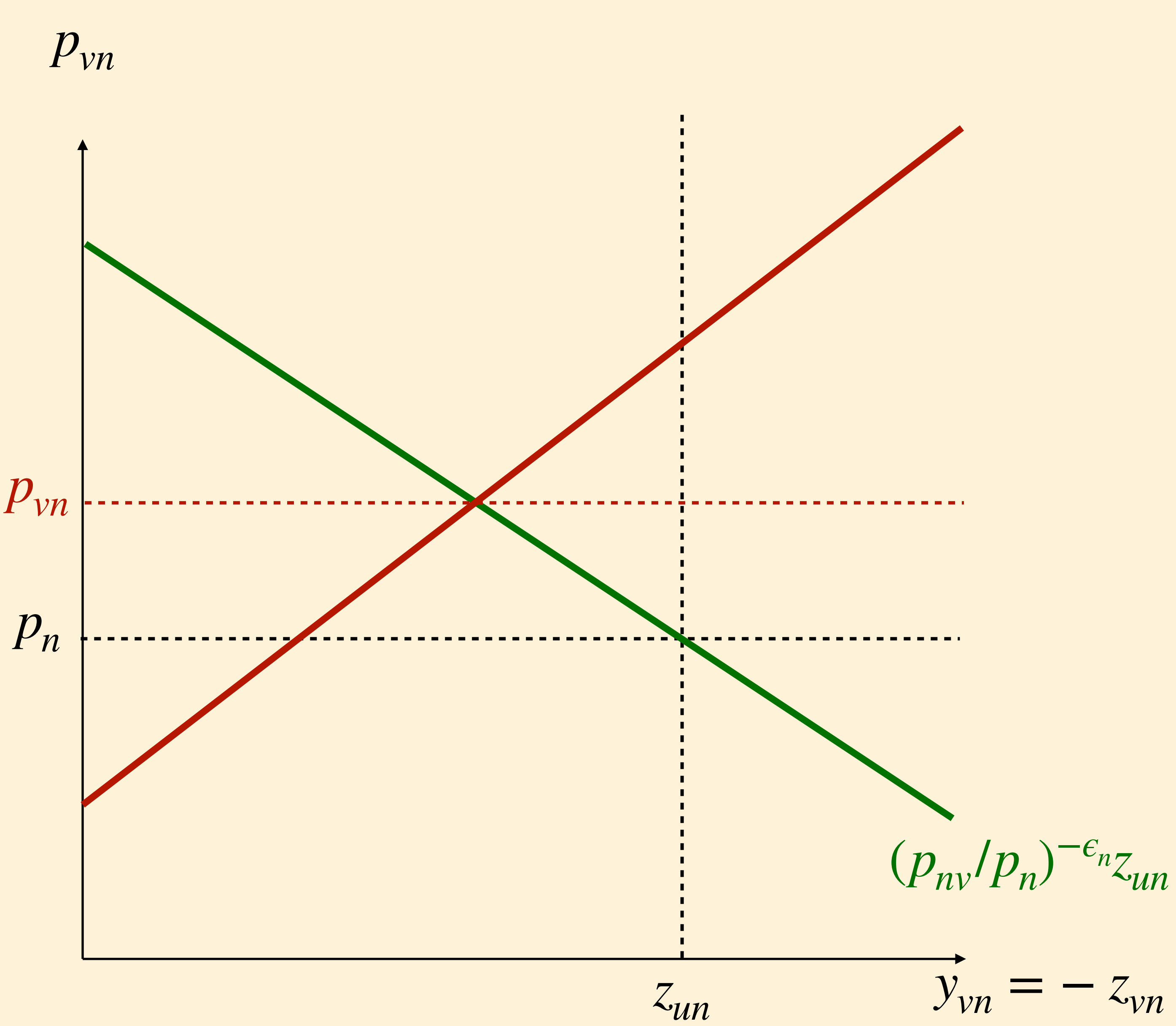
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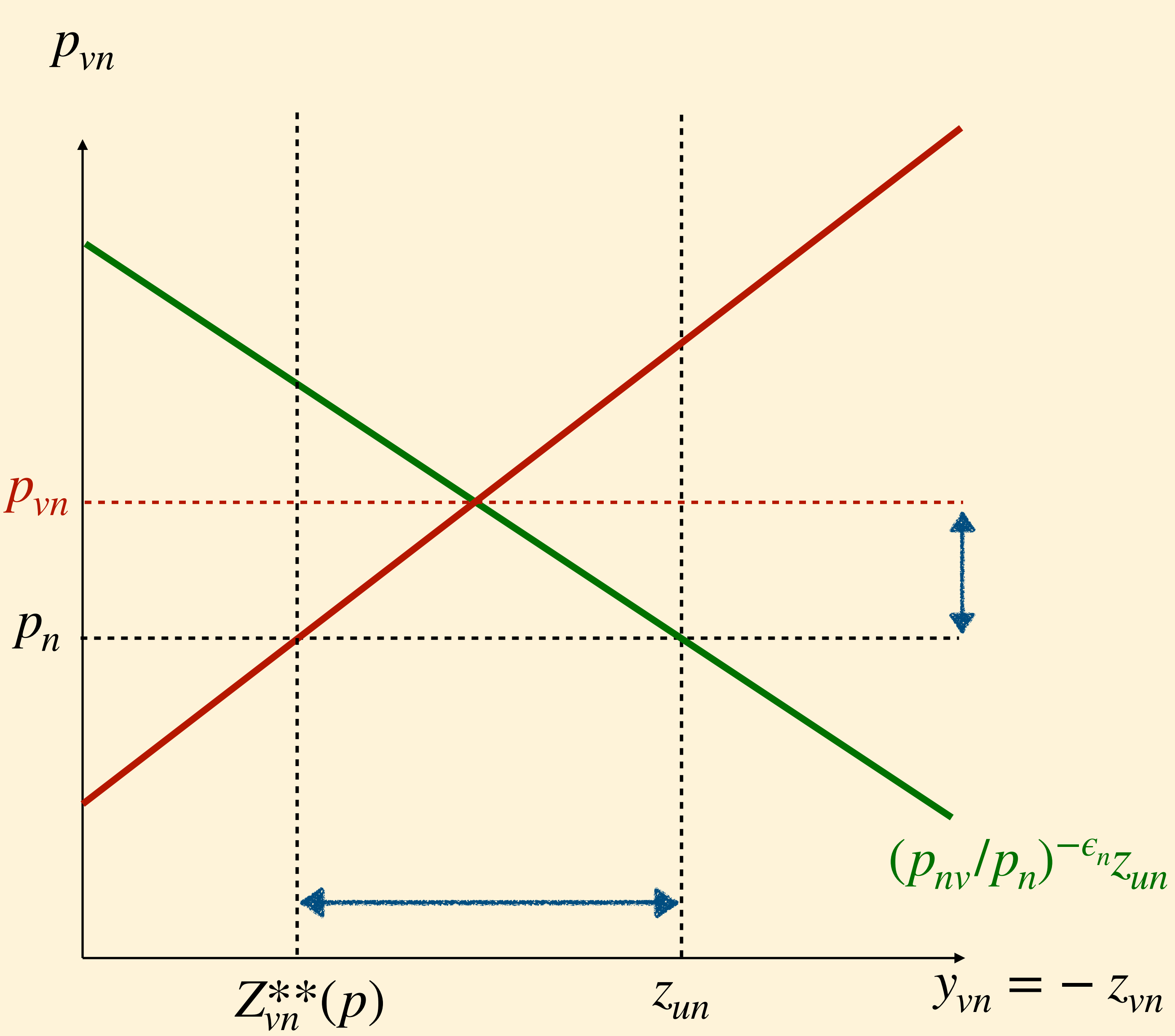
$$Z(p) = (I - A)^{-1} Z^{**}(p) \quad (A = \text{Spillover Matrix})$$











$$\pi_{n,t} = \kappa_n Z_n(p_t) + \beta \mathbb{E}_t \pi_{n,t+1}$$

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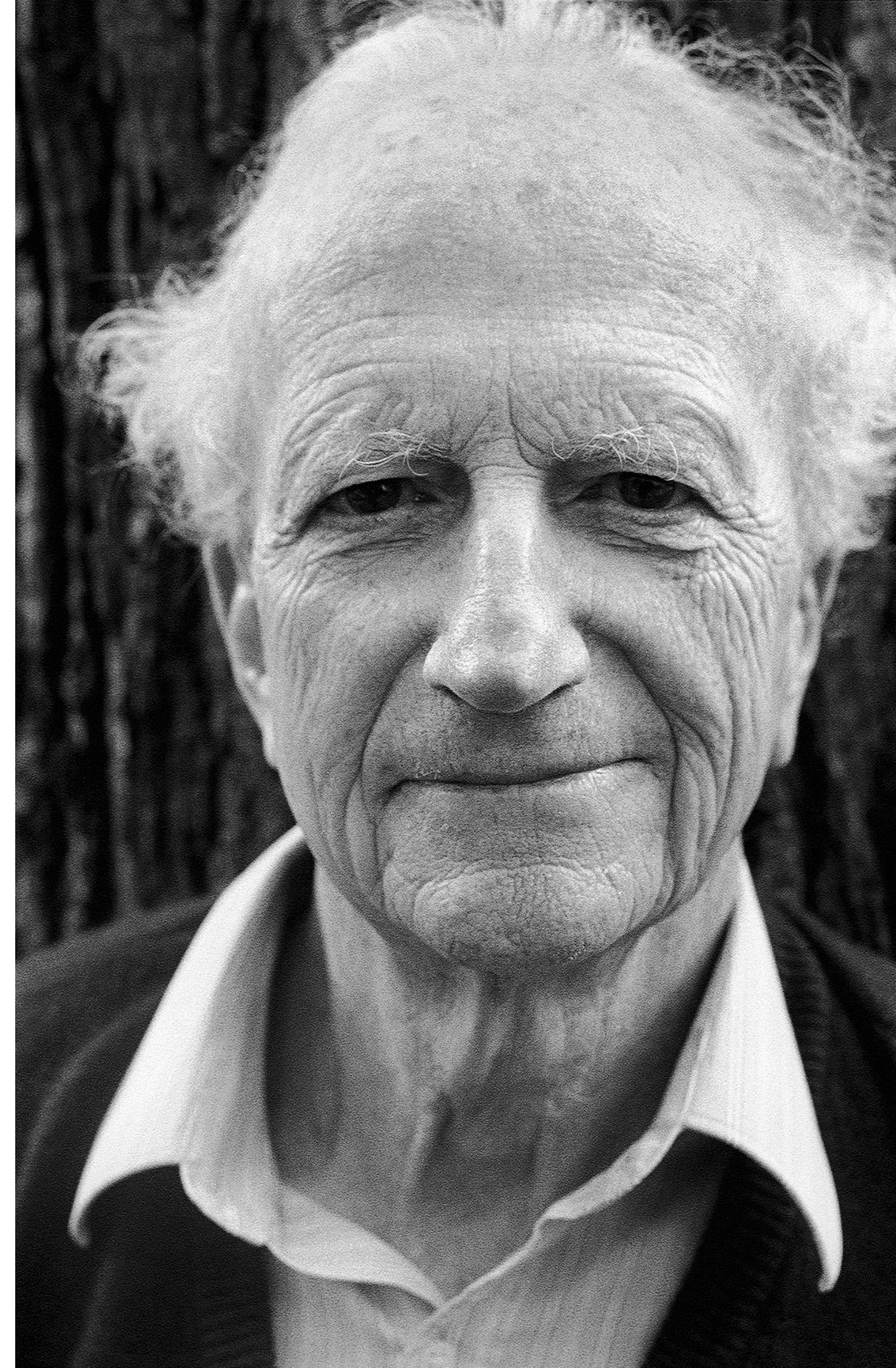
■ ...random comments heard on internet...

“...Phillips curves don't exist...dead...”

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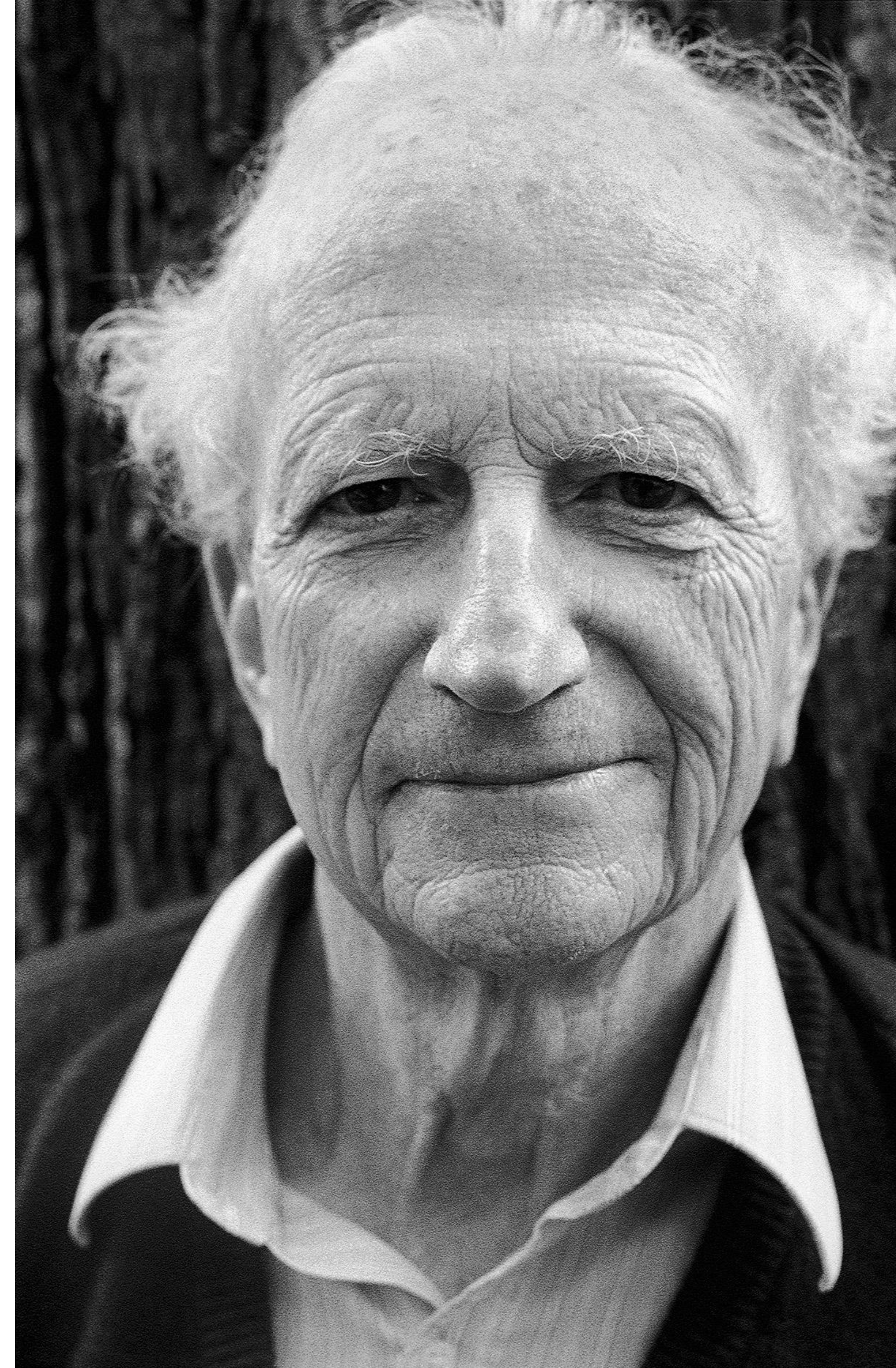
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■ Microeconomics 101...

“Price rises if excess demand”



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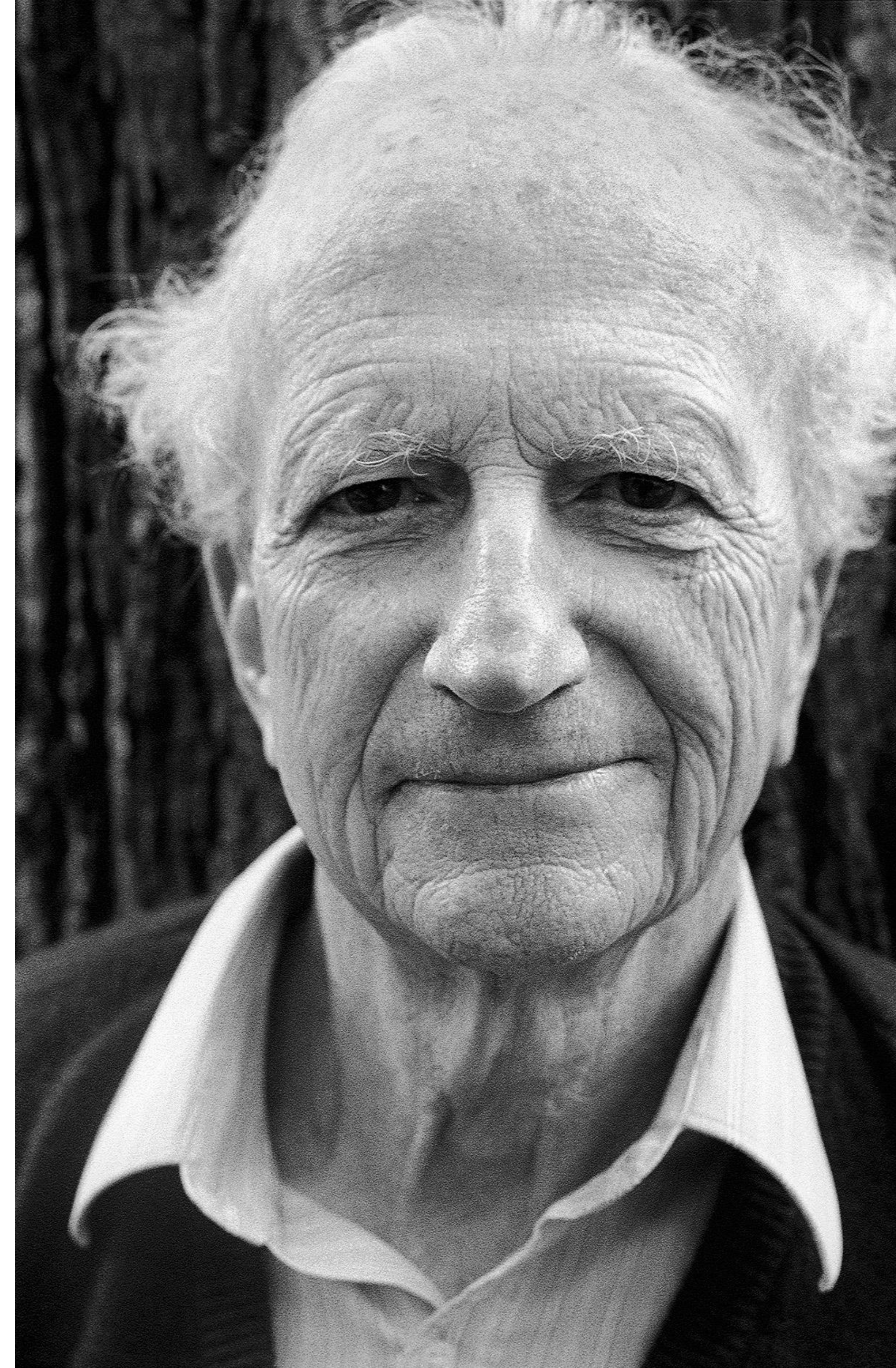
excess demand \neq output gap

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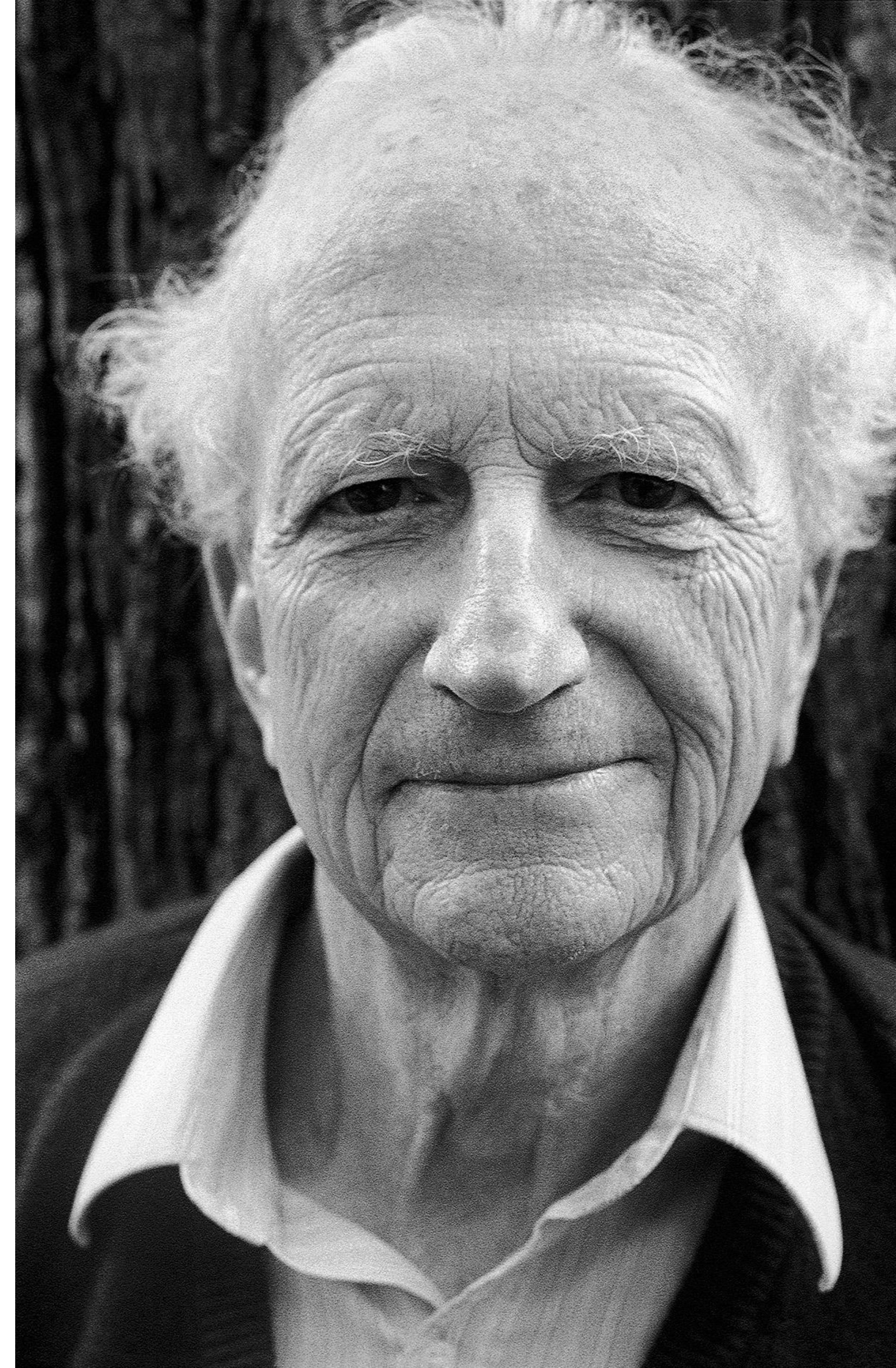
more general + more intuitive !

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Inflation Papers

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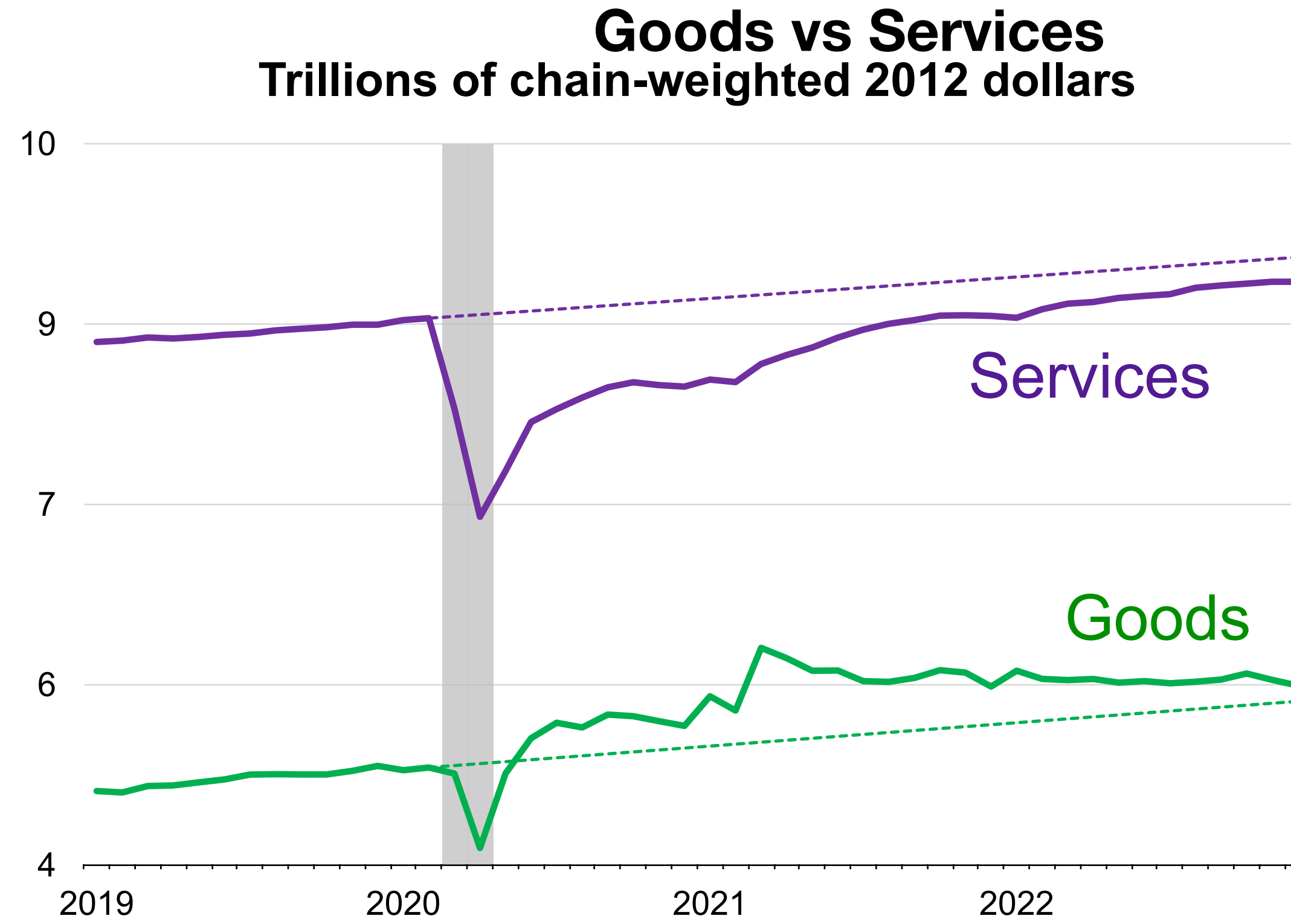
- Cagan to Ramsey: Optimal Financial Repression



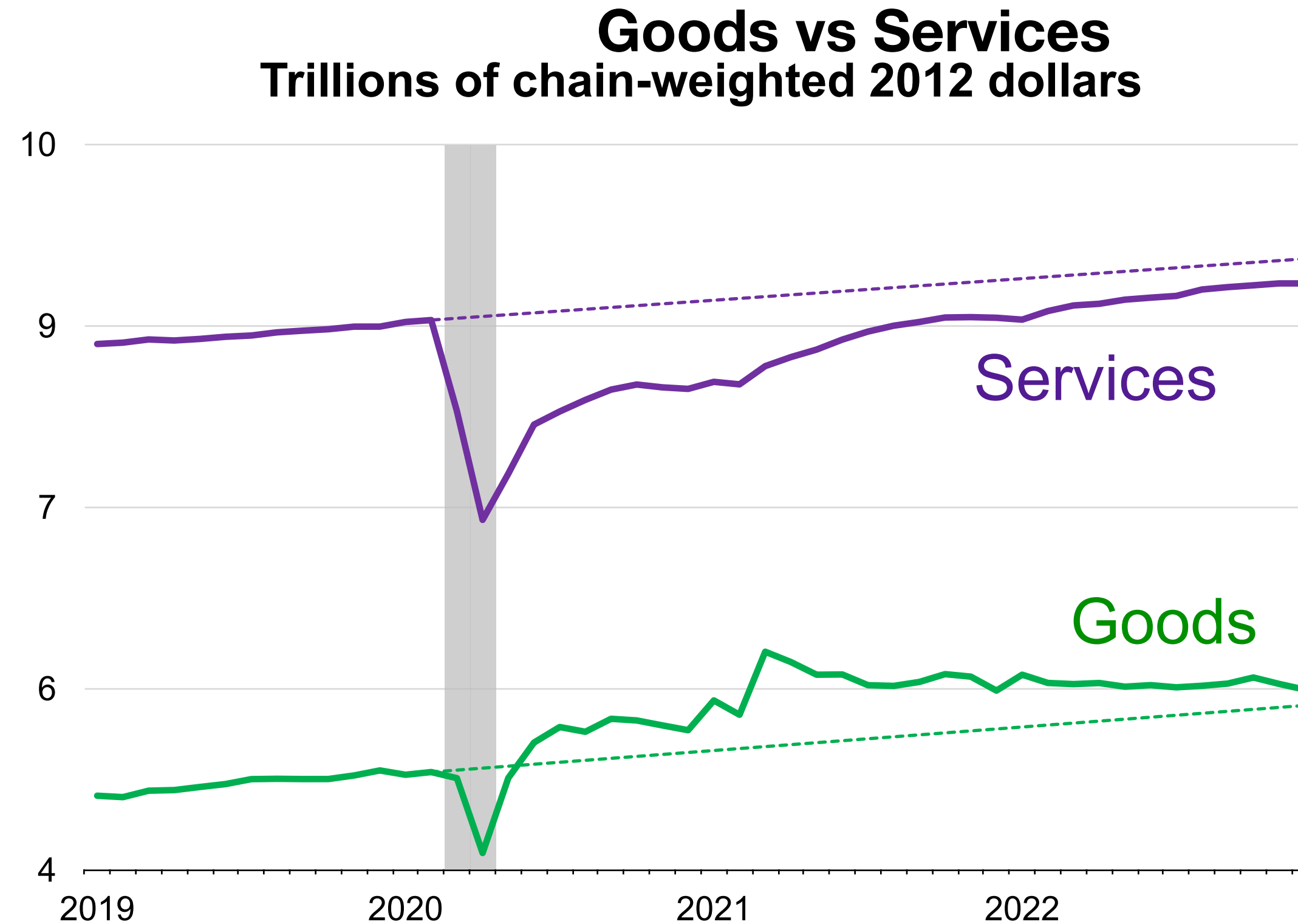
Now

Sectoral & Structural Shocks

Sectoral & Structural Shocks



Sectoral & Structural Shocks



■ 2020: Guerrieri Lorenzoni Straub Werning I...

- Keynesian Supply Shocks: asymmetric supply shocks → endogenous aggregate Demand shock
- Transfers → individual insurance, firm balance sheet, support demand in other sectors

(Further work: Woodford, Baqaee-Farhi)

Bob Solow...

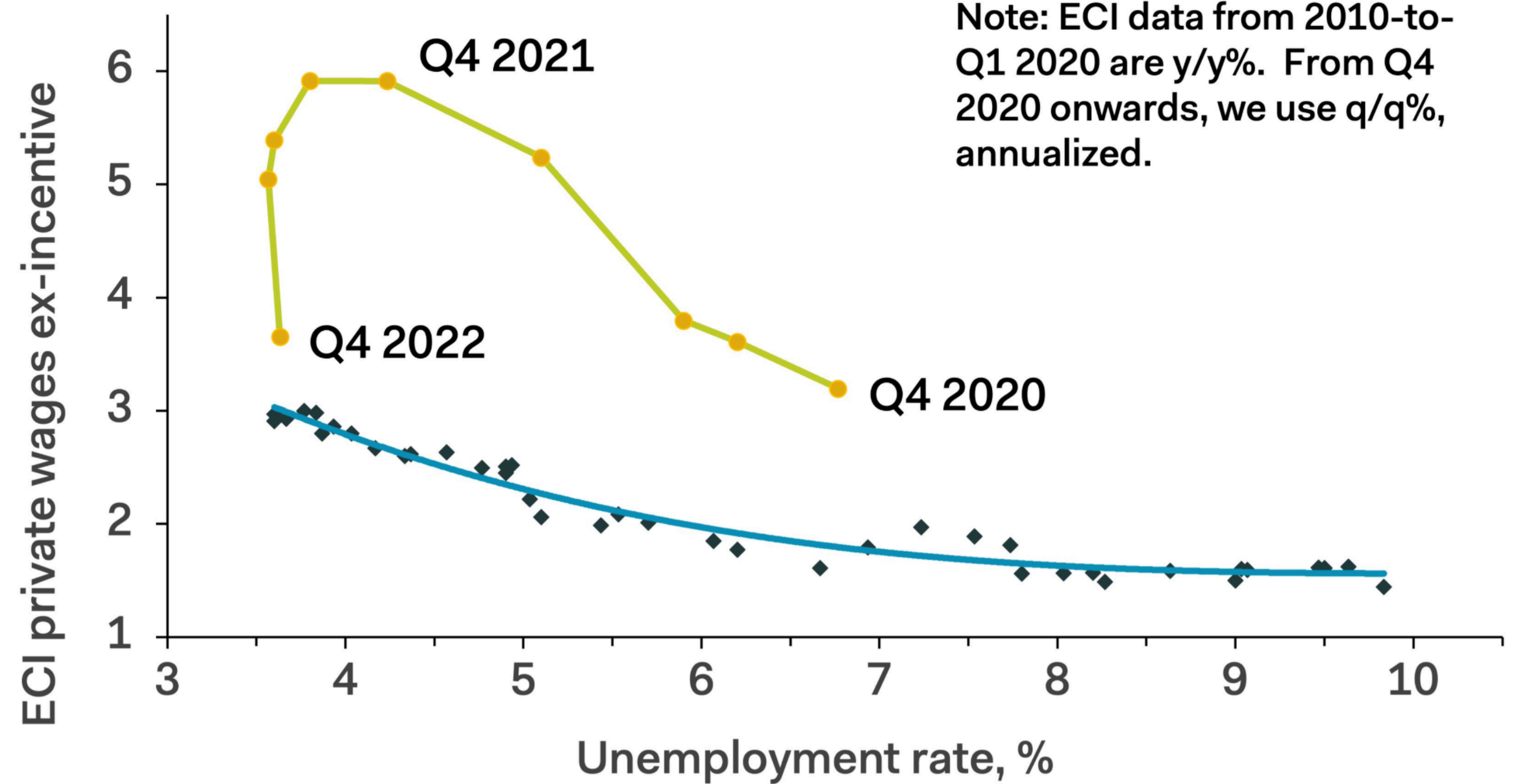
Mankiw: What are the big unanswered questions that the next generation of macroeconomists should be focused on in this line of work?

Solow: I've already shot my wad on that. I think that there **are changes in the structure of the economy, like the shift from goods to services**, like the growing importance of import competition, and, presumably, some decrease in the domestic degree of monopoly, and I can't believe that changes of that kind and magnitude do not affect price behavior. That would include the part of price behavior **that we try to capture in one version or another of the Phillips curve**. Those things, and they are only the obvious ones, ought to be studied.

Endogenous Cost Push Shock

$$\pi = \kappa(y^d - y^s) + \pi^e + c$$

U.S. Wages Phillips Curves, diamonds are data from 2010-to-Q1 2020; circles from Q4 2020 onwards



Source: Ian Shepherdson

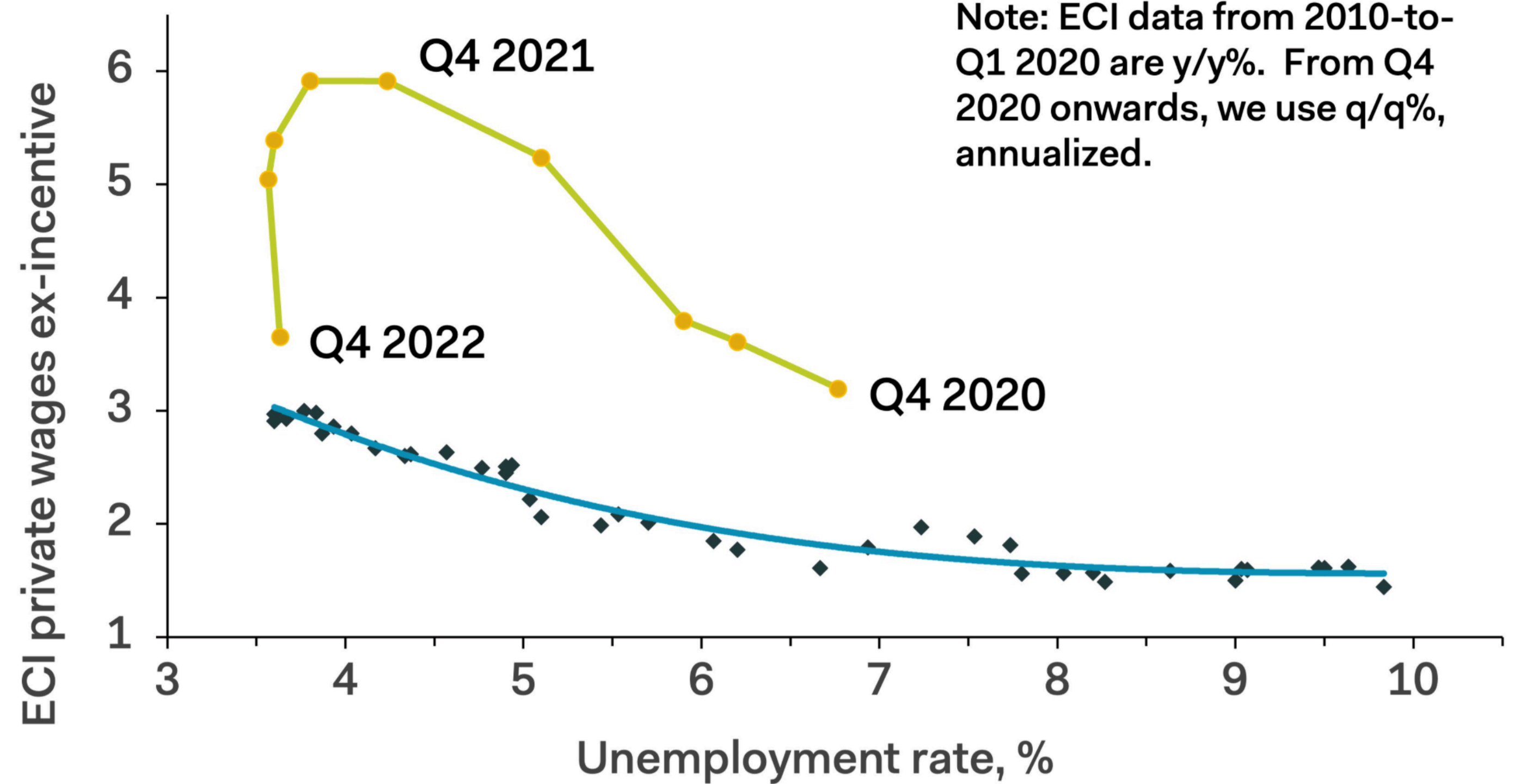
Endogenous Cost Push Shock

■ 2021: Guerrieri Lorenzoni Straub Werning II

$$\pi = \kappa(y^d - y^s) + \pi^e + c$$

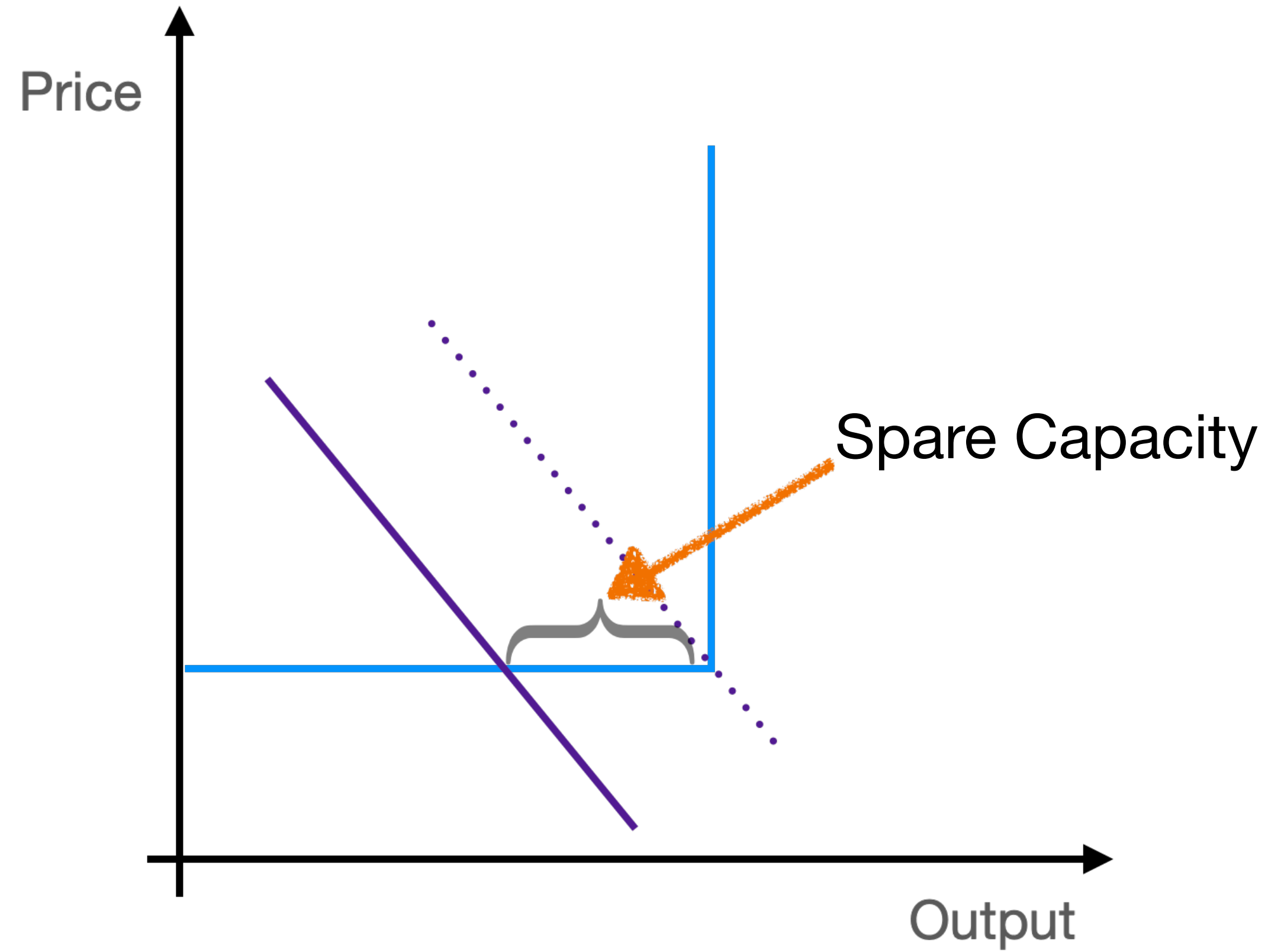
- Asymmetric shocks
→ endogenous cost push shock c
- Optimal policy: allows rise in inflation; tradeoff shifted
- Extra kick: contractionary monetary policy can hurt reallocation

U.S. Wages Phillips Curves, diamonds are data from 2010-to-Q1 2020; circles from Q4 2020 onwards

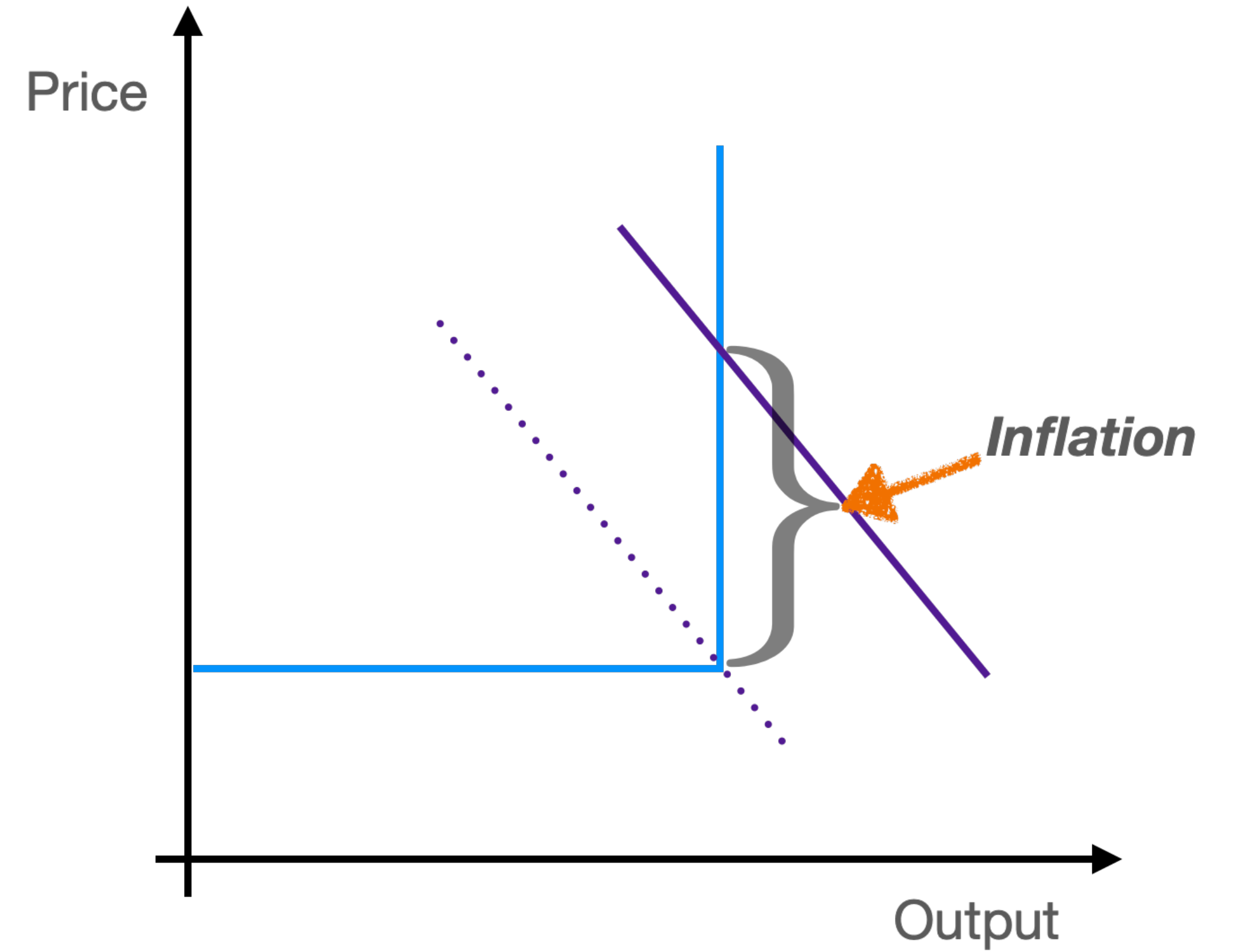


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Uneven Shock...

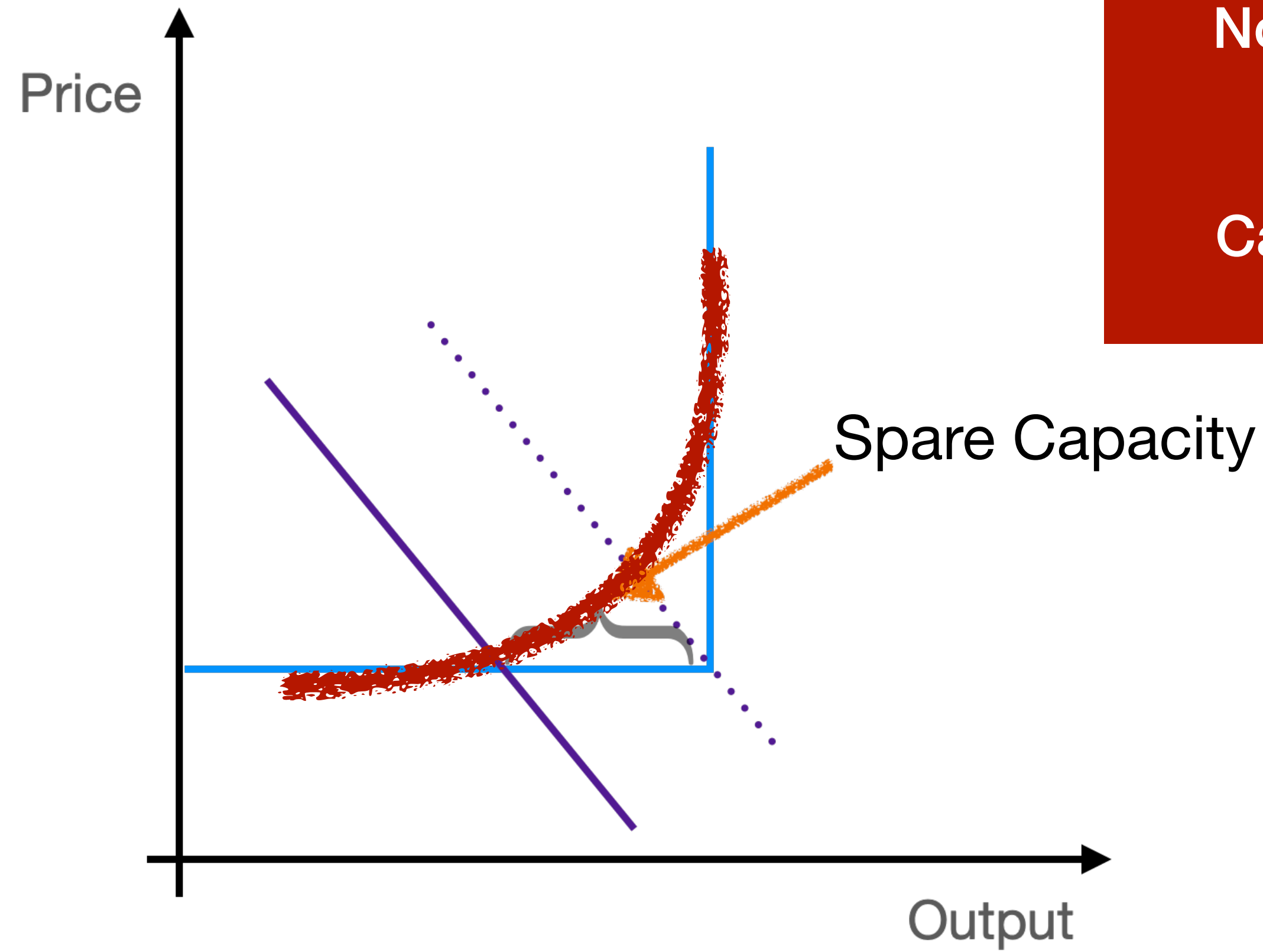


Sector A



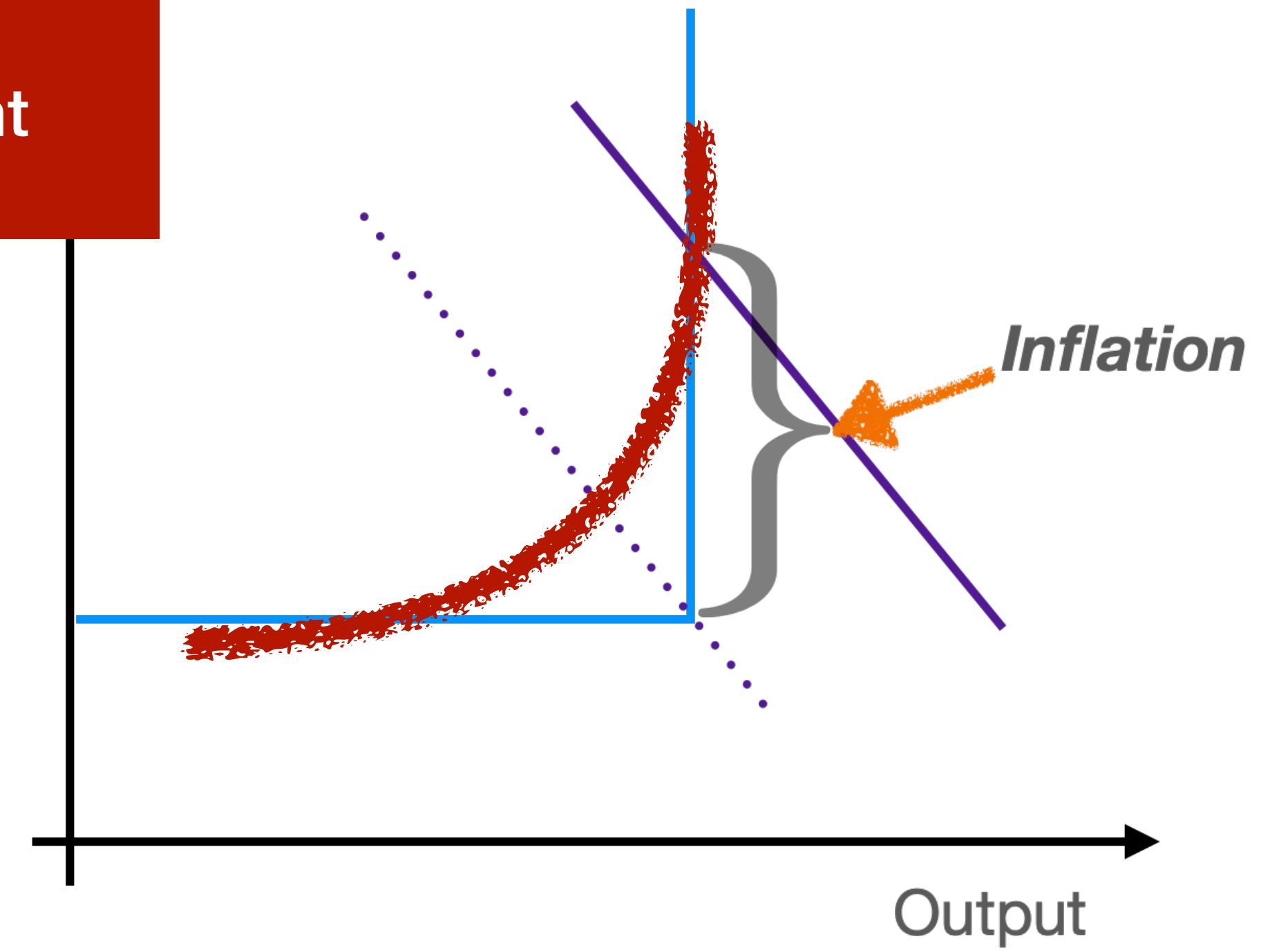
Sector B

Uneven Shock...

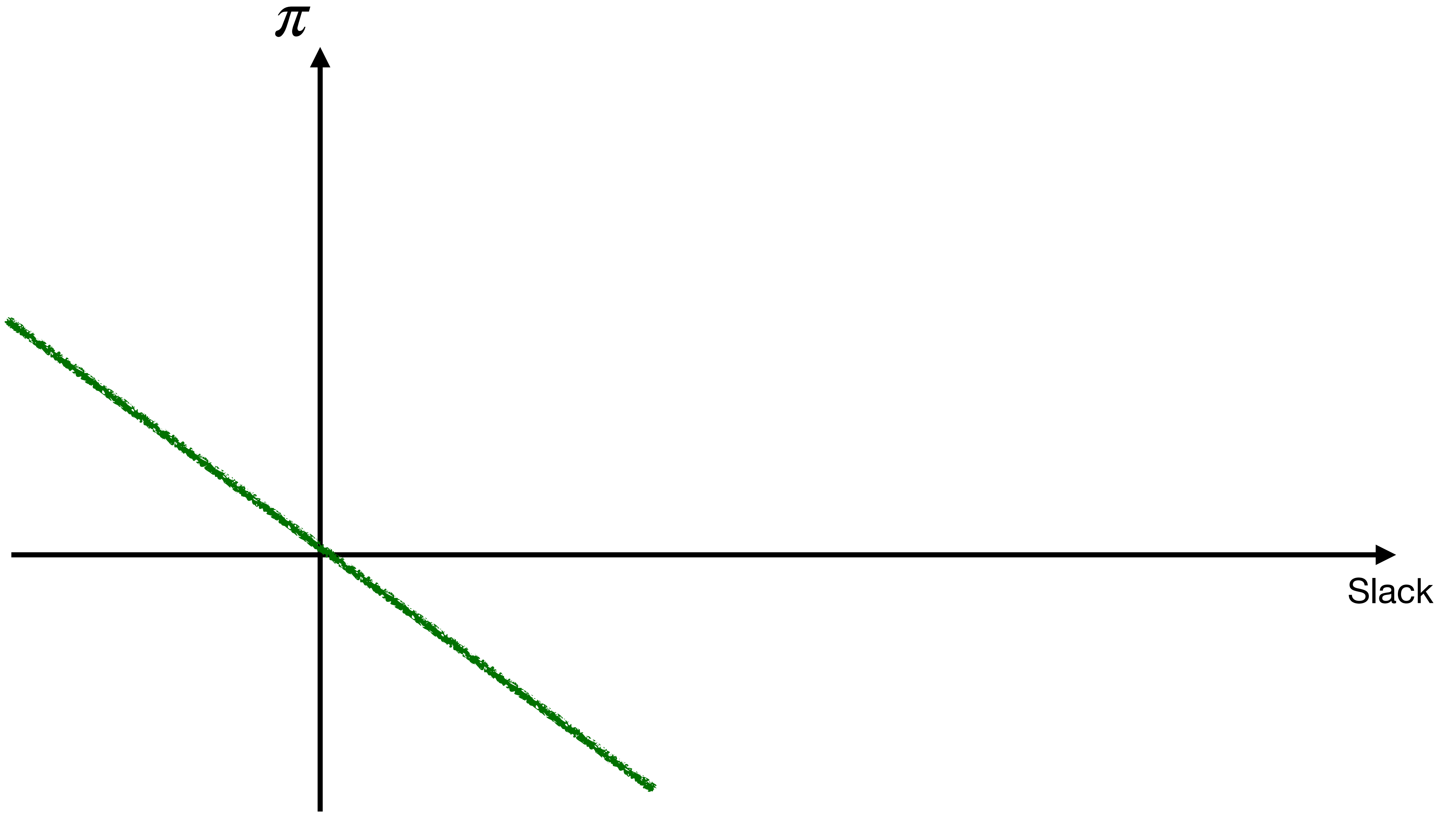


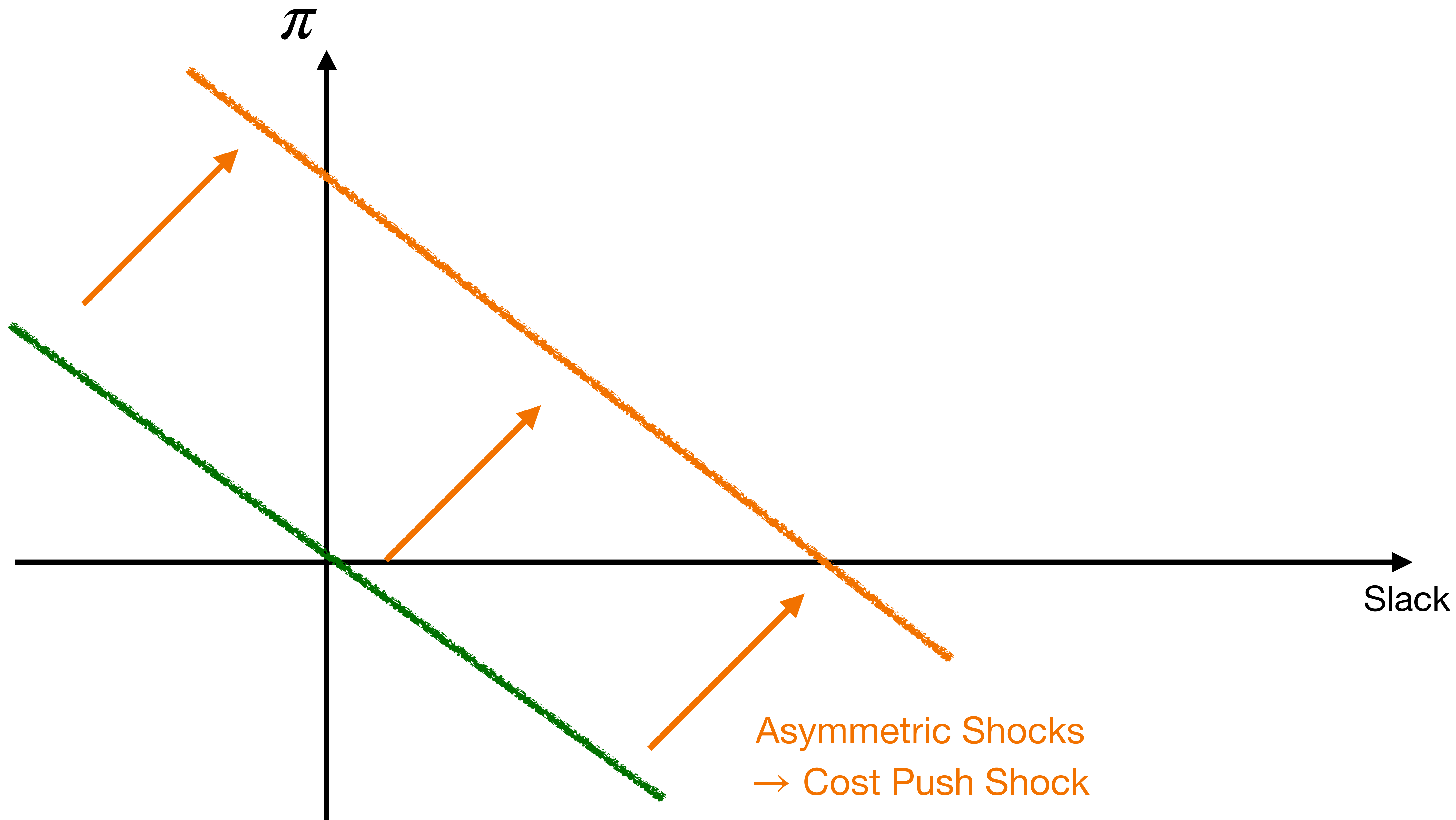
Sector A

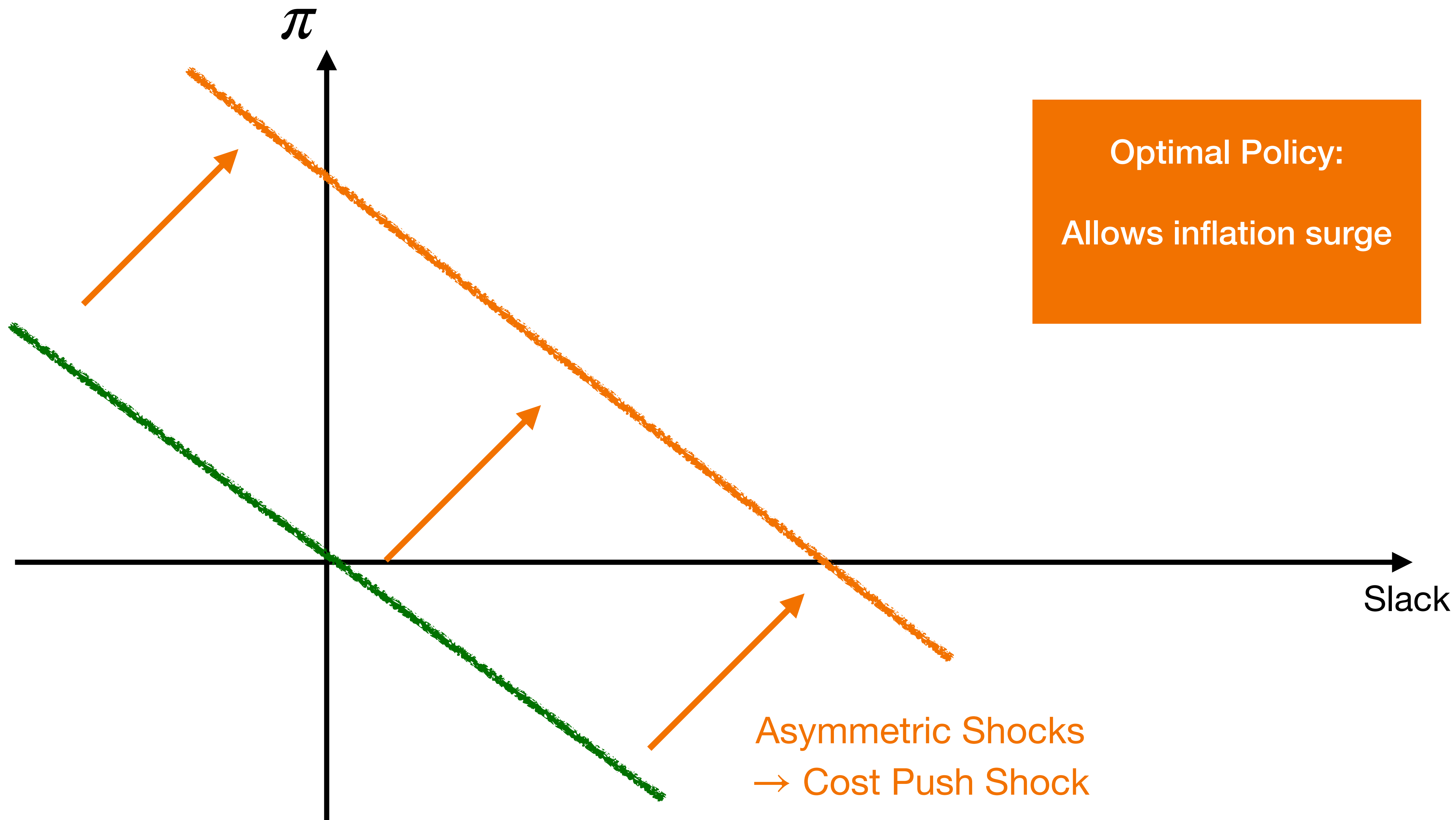
Non-Convex Supply
Labor Market
+
Capacity Constraint



Sector B

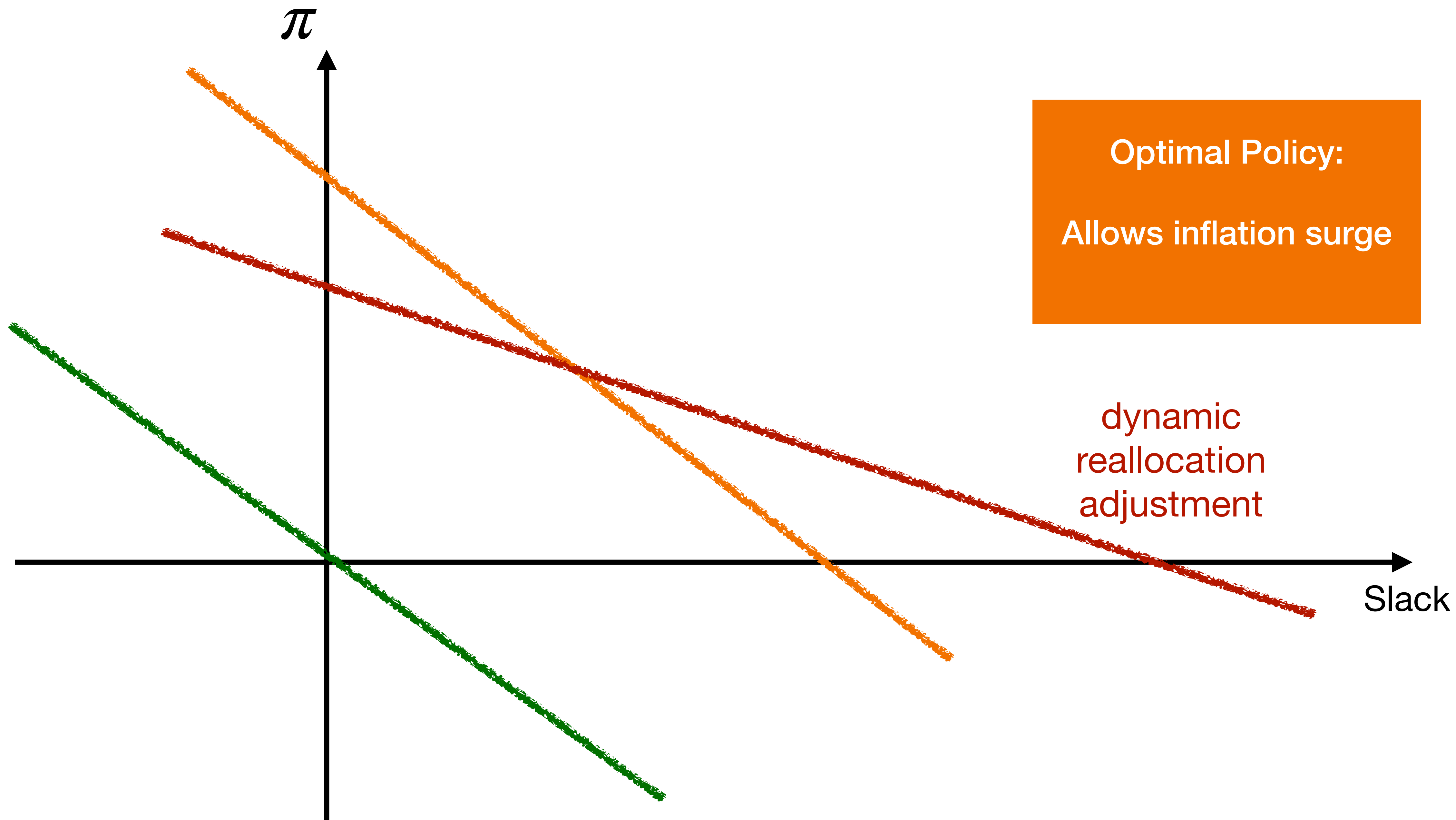


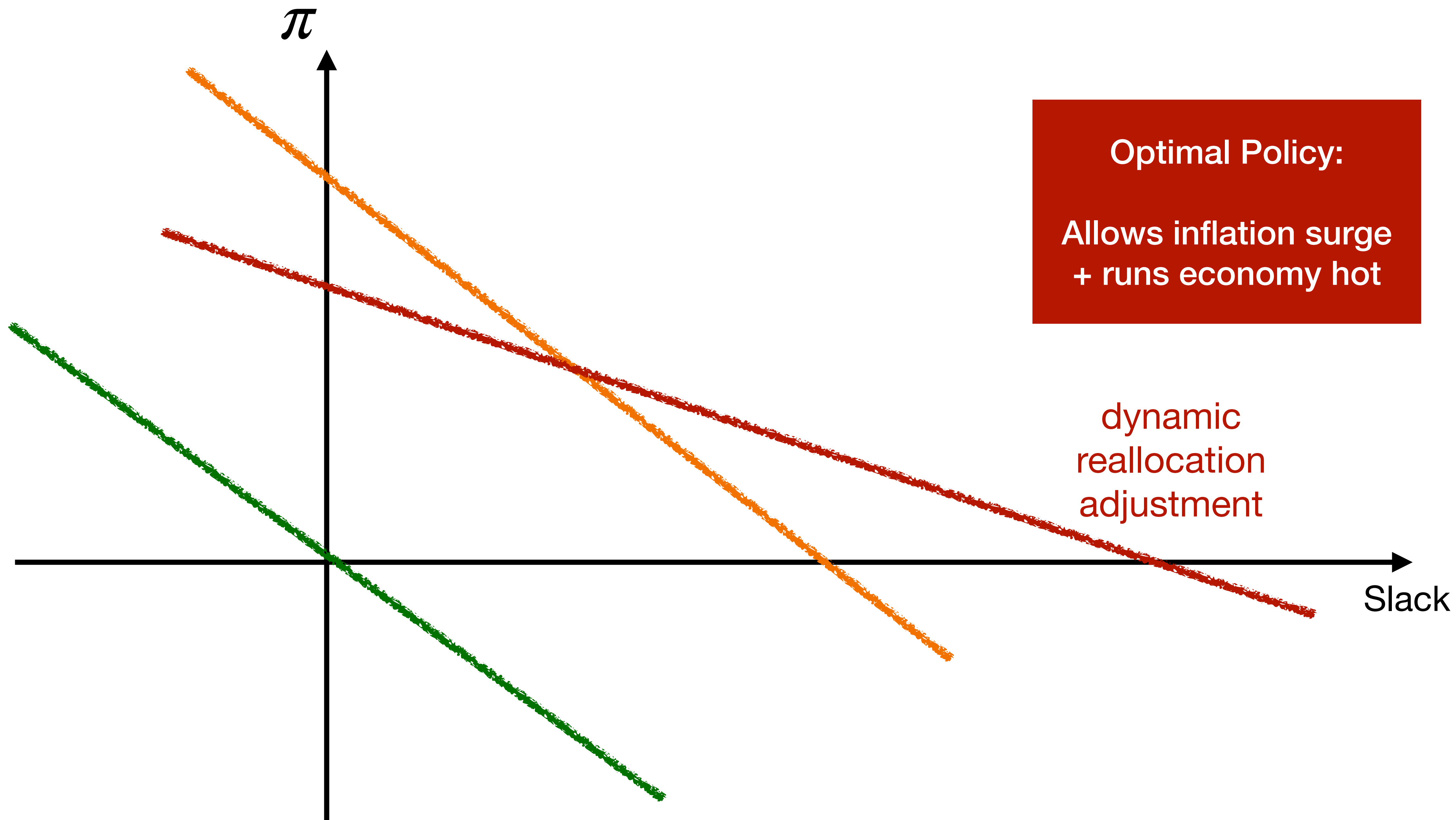




Optimal Policy:
Allows inflation surge

Asymmetric Shocks
→ Cost Push Shock





Optimal Policy:
Allows inflation surge
+ runs economy hot

dynamic
reallocation
adjustment

Slack

Tobin 1972 AEA Presidential Address

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Macro-economic policies, monetary and fiscal, are incapable of realizing society's unemployment and inflation goals simultaneously. This dismal fact has long stimu-

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← **Now**

$$\pi = \pi^e + \kappa(y - y^*)$$

$$\pi = \phi \pi^e + \kappa(y - y^*)$$

Received Wisdom or Myths

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■ **Theory:** $\phi \approx 1$ root of folk belief special models...?

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- Calvo (1983): *Poisson* nominal rigidities

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 - Time series (Phillips Curves):

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■ **Empirics:** Challenging + no consensus...

● Time series (Phillips Curves):

- ▶ no consensus: Gali-Gertler $\phi \approx 0.65$ vs. Rudd $\phi \approx 0$
- ▶ conceptual limitation if estimation imposes rational expectations, not answering question!

● Experimental evidence...

- Coibion-Gorodnichenko-Kamdar: $\phi \approx 0.2$
... caveat: changes expectations of inflation + expectations of output?
- much promising recent work + work in progress...

Friedman...

RATIONAL EXPECTATIONS

Taylor: That brings me to the question about what causes the short-run impact of money. Do you feel that it's mainly unfulfilled expectations or do you think that sticky prices and wages play a role?

Friedman: You've mentioned both the things that are no doubt the legitimate causes. After all, a wage agreement is not for a day, it's for a year, 2 years, 3 years. It's costly to change prices and so on, but I think the most important single thing is the tendency for expectations to be backward looking and to be adjusted slowly so that it takes time before any expectation is altered by the impact of an event.

Taylor: Does that mean you disagree with rational expectations?

Friedman: I have no basic disagreement with rational expectations. The question is, "how do you form your rational expectations." Let me start over. You are

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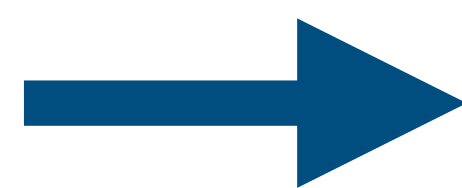
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cases." And so, the notion of "correct rational expectations" is a notion I find very hard to give much content to.

If the idea is that people try to predict what is going to happen tomorrow, then rational expectations, in that sense, certainly makes sense, but on what do they base their rational expectations? They base it on past experiences; there is always going to be a lag in expectations catching up.

**expectations
of inflation**



**price/wage
setters**



inflation



Expectation Formation

**expectations
of inflation**



**price/wage
setters**



inflation

**expectations
of output**

consumption

output

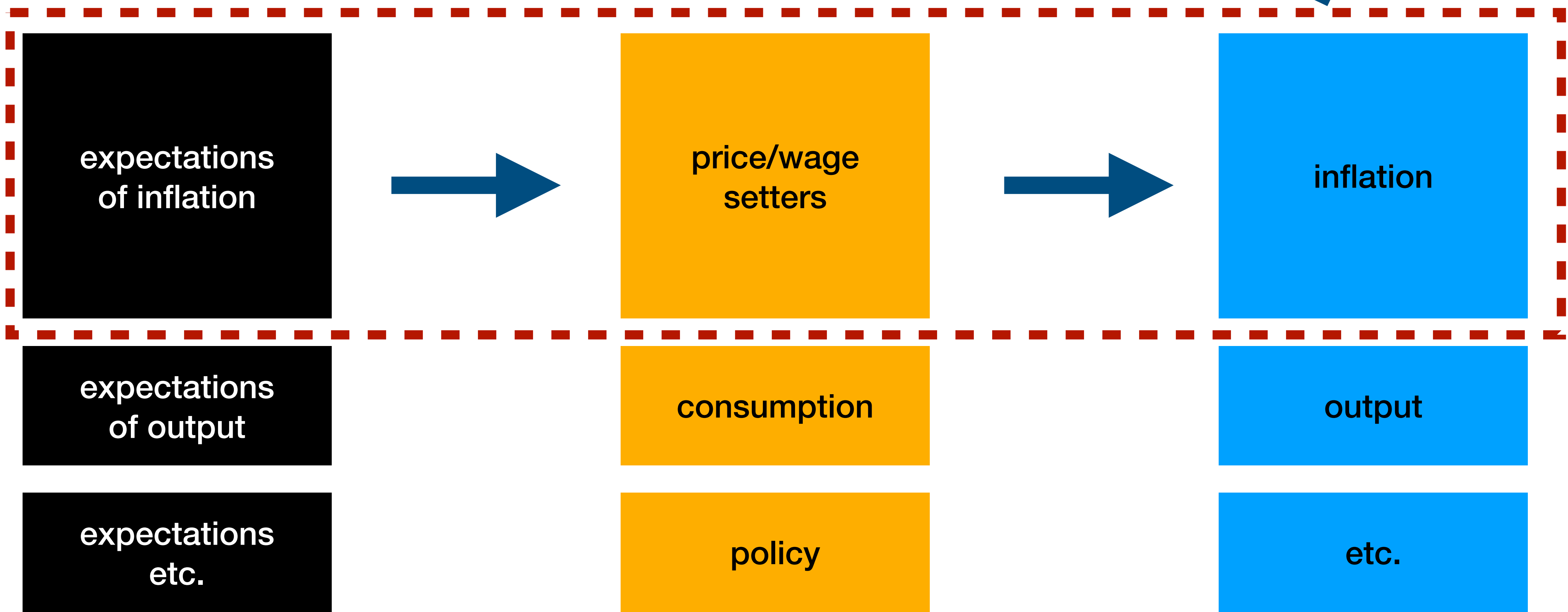
**expectations
etc.**

policy

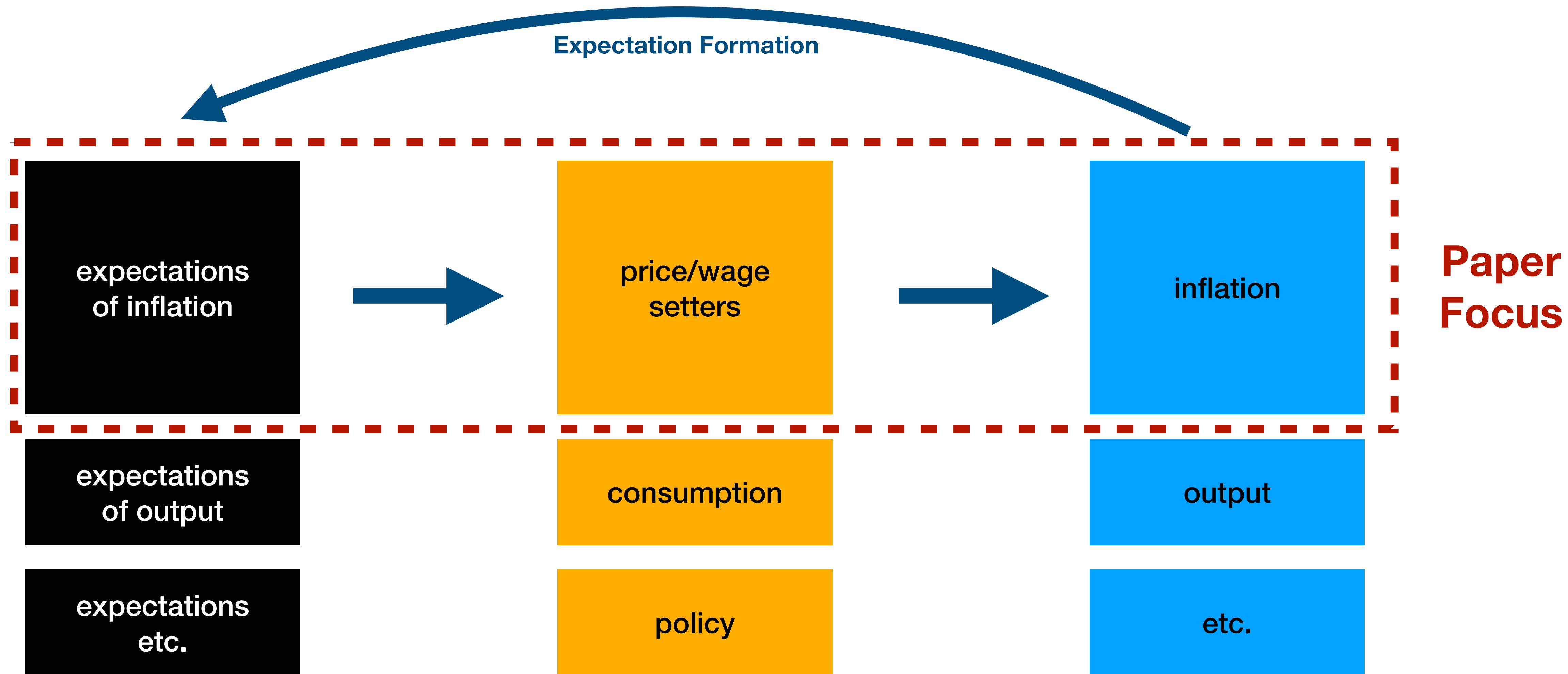
etc.



Expectation Formation



**Paper
Focus**



LESS IS MORE!

Results



LESS IS MORE!

Results



**Simple
Passthrough
Metric ϕ**

LESS IS MORE!

Results



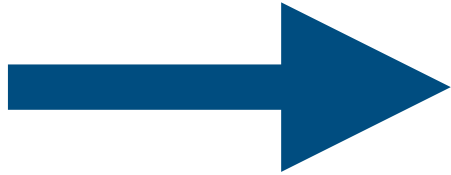
**Explore Wide
Range of Pricing
Model**

**Simple
Passthrough
Metric ϕ**

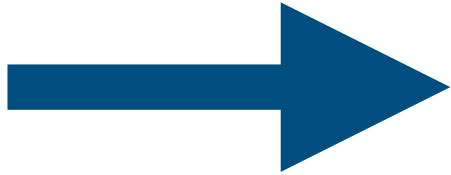
LESS IS MORE!

Results

expectations
of inflation



price/wage
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inflation

**Short vs Long Run
Expectations?**

**Explore Wide
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LESS IS MORE!

$$\pi = \phi\pi^e + \text{other stuff}$$

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- passthrough from inflation expectation to inflation
- holding *everything* else fixed, real marginal costs, demand, interest rates, etc.

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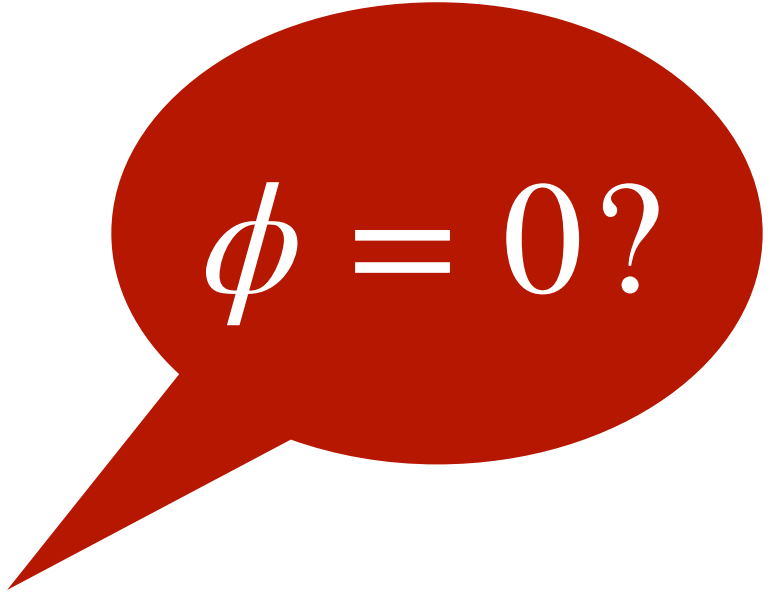
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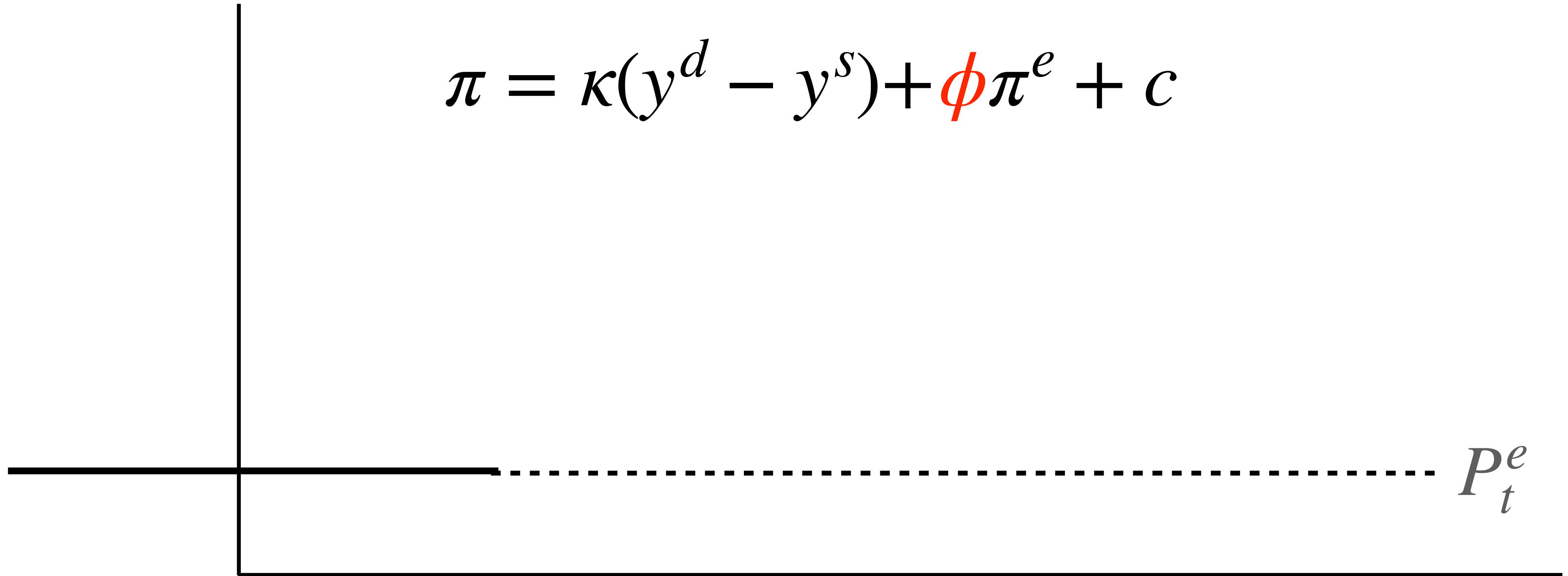
$\phi = 0?$

Rational Expectation \longrightarrow **inflation & real marginal costs tied up**

Need to separate them!

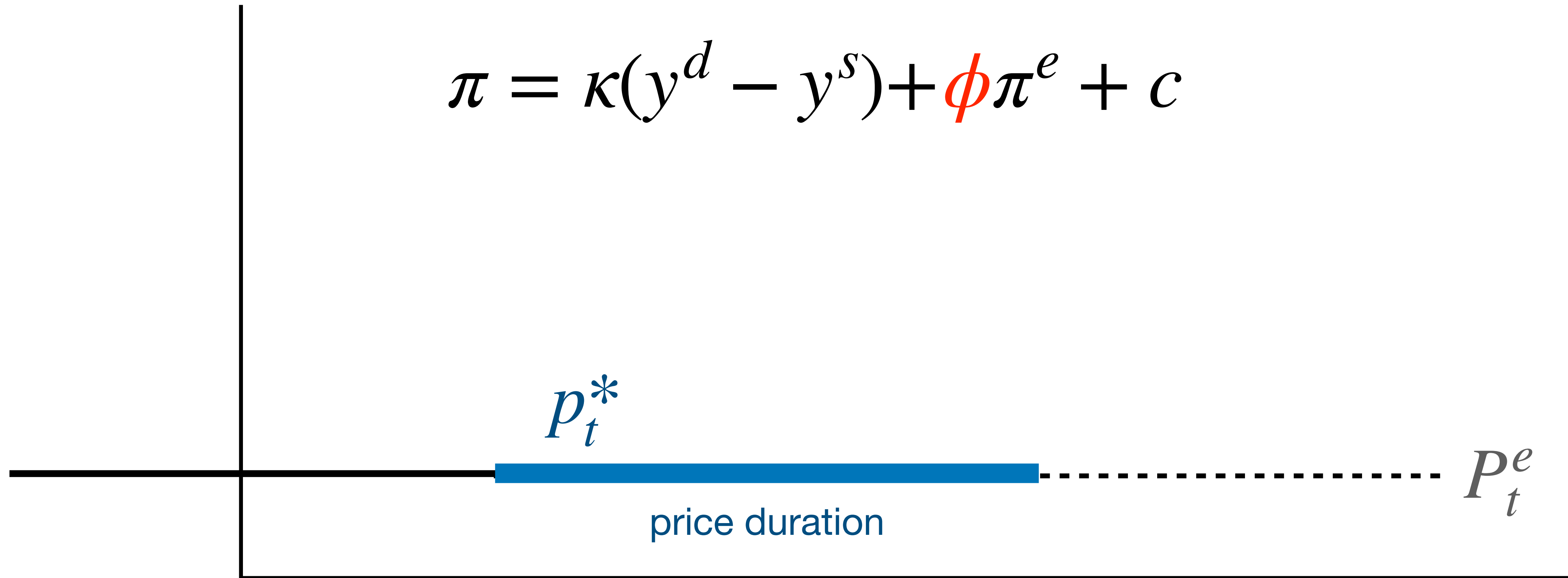
Intuition: Overshooting

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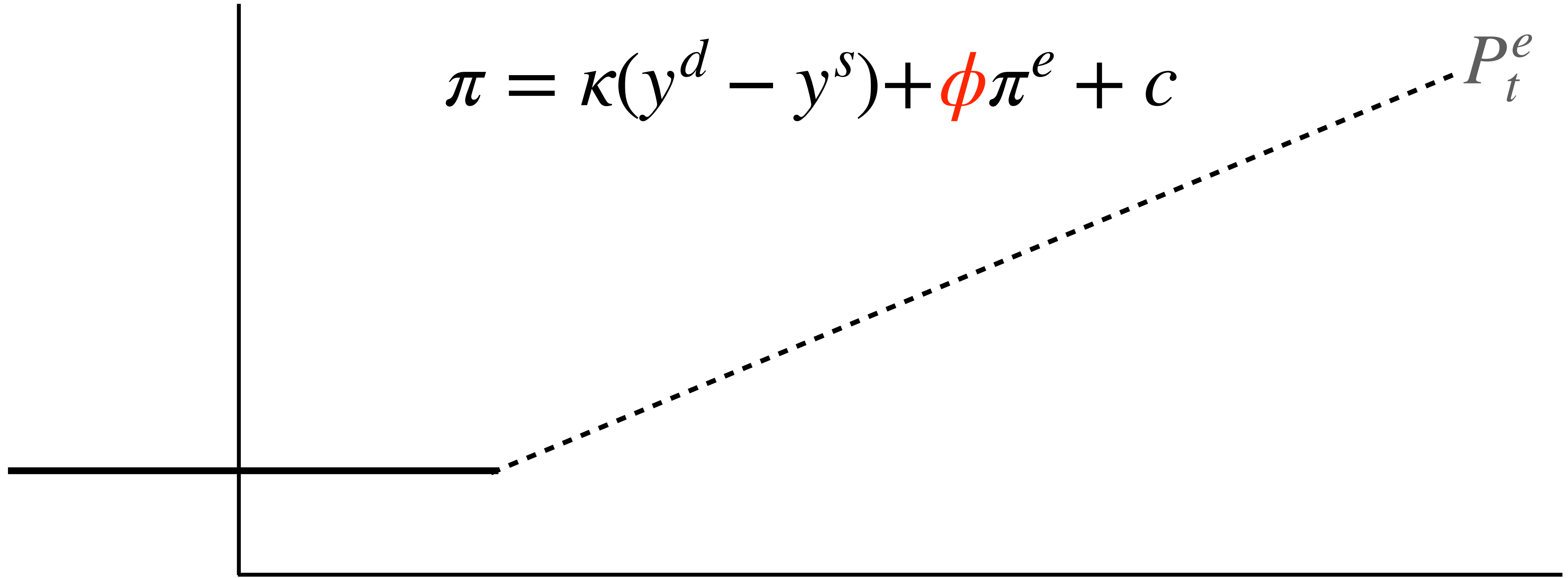
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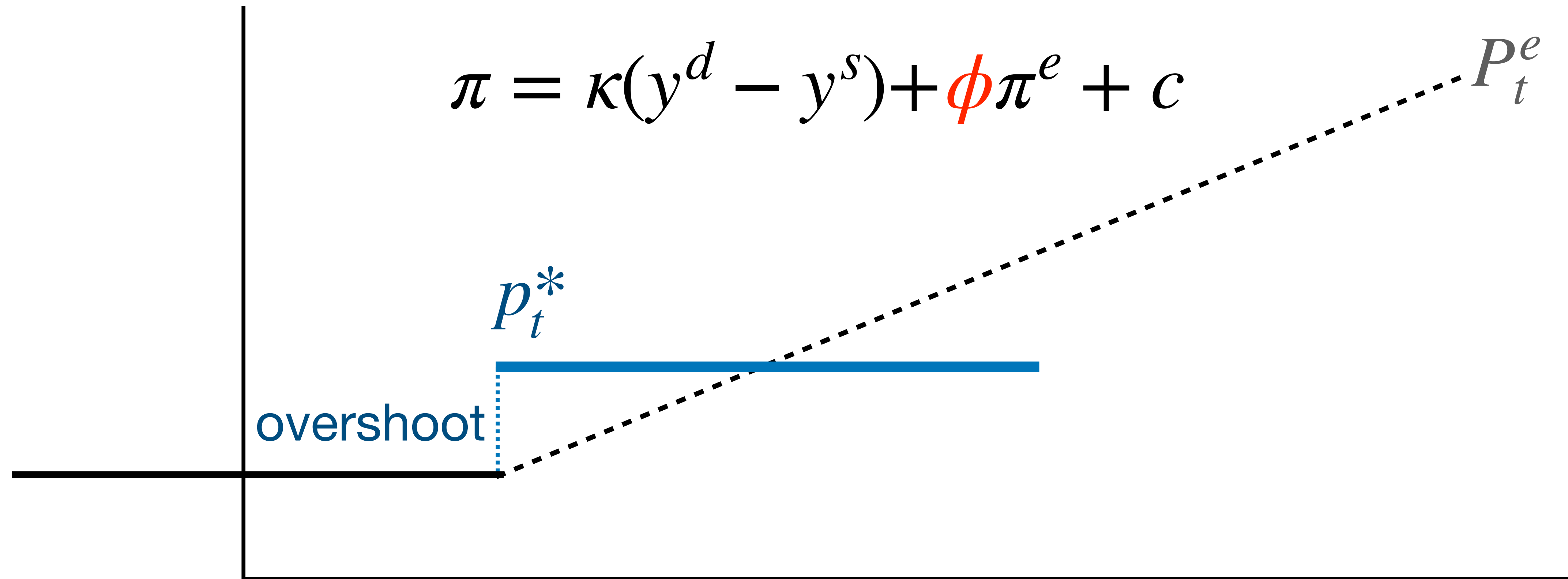


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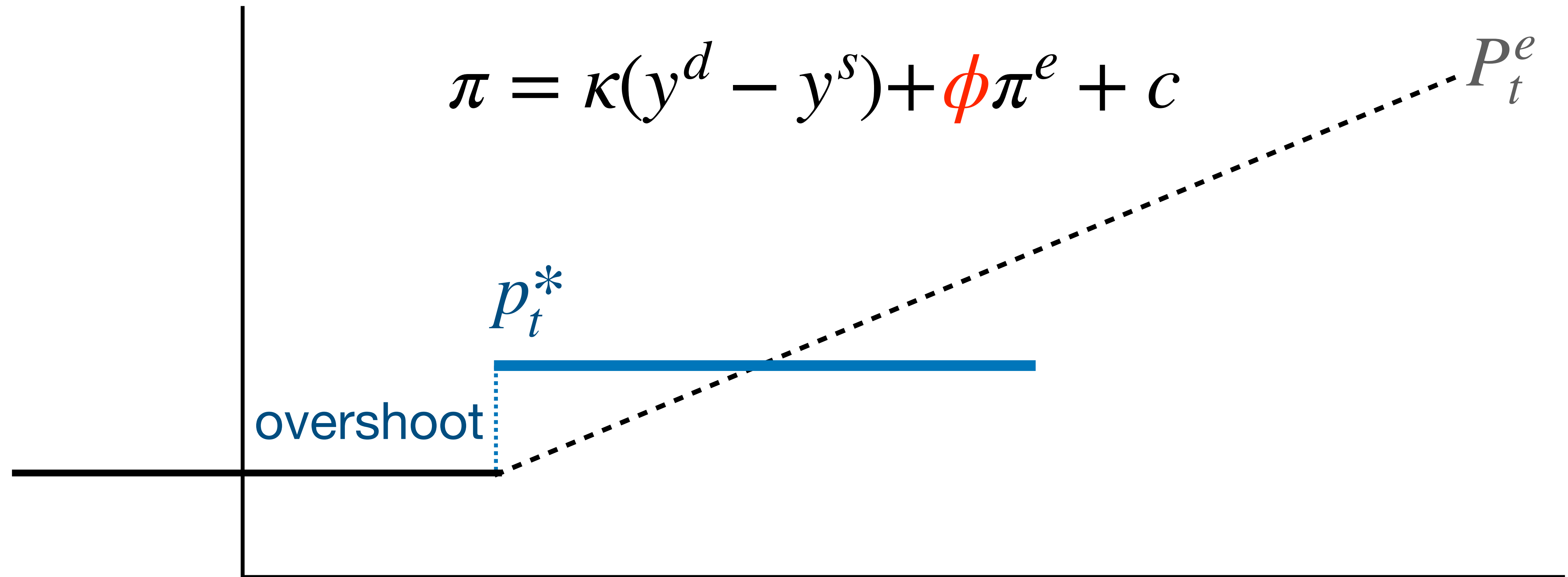
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Intuition: Overshooting



Intuition: Overshooting



$$\phi = 1/2$$

Time Dependent Model

- General time dependent model (e.g. allows complementarities across firms)
- General hazard rate of price changes (e.g. Calvo = constant hazard)...
 - average **completed duration** price spell (1/frequency)
 - average **ongoing duration** price spell (what firms care about)

Note: degree of stickiness does not matter!

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markups,
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Calvo $\phi = 1$

Taylor $\phi = 1/2$

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- Expectations and the Rate of Inflation (Werning, 2022)

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**Short not Long
Expectation Horizon!**

- Expectations and the Rate of Inflation (Werning, 2022)

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Short not Long
Expectation Horizon!

$$+ (1 - \phi) \pi_{-}$$



Intrinsic Inertia!

- Expectations and the Rate of Inflation (Werning, 2022)

$$\pi_t = \sum_{s=0}^{\infty} \phi_s \pi_{t+s}^e + \sum_{s=-1}^{-\infty} \phi_s \pi_{t+s} + a_t$$

(Expectations)

(Past Inflation)

(markups,
real costs etc.)

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(Past Inflation)
(markups,
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- **Short Run expectations** more important!

$$\phi_s \geq 0 \quad \text{decreasing} \quad \phi_{s \rightarrow \infty} \rightarrow 0$$

.... long-run expectations no direct effect

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- Expectations + Past = 1 → i.e. **vertical long run Phillips curve**

$$\sum_{s=0}^{\infty} \phi_s + \sum_{s=-\infty}^{-1} \phi_s = 1$$

Down the Phillips Curve with Gun and Camera

Robert M. Solow (1978)

Any time seems to be the right time for reflections on the Phillips curve. So long

It did not occur to me then that the Phillips curve (or perhaps Phillips surface would be better, to signal that more than the unemployment rate governs the rate of wage increase) needed any subtle theoretical justification. It seemed reasonable in a commonsense way that the change in the money wage, like the

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It did not occur to me then that the Phillips curve (or perhaps it would be better, to signal that more than one curve is possible) would be better, to signal that more than one curve is possible, if the rate of wage increase is reasonable in the long run. I am far from sold, then, on either leg of the accelerationist position. The long lag of price expectations behind reality is dubious at best. Nor am I ready to believe for practical purposes that the expected rate of inflation—if it is a permissible abstraction at all—enters the wage equation with a coefficient of unity as “economic rationality” requires. There is nothing in the Survey Research Center data to suggest that one ought to impute economic rationality to the respondents in this subtle matter.

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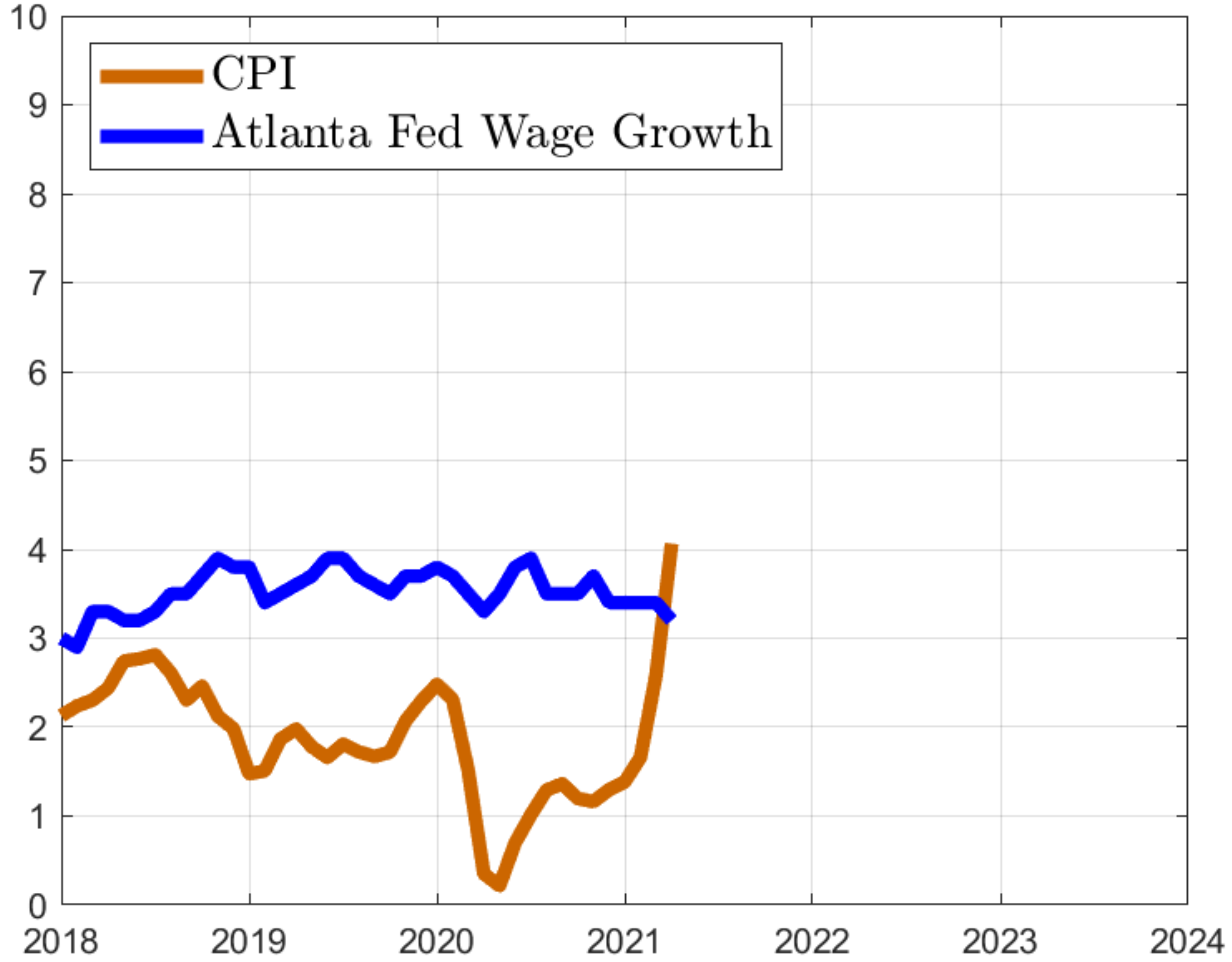
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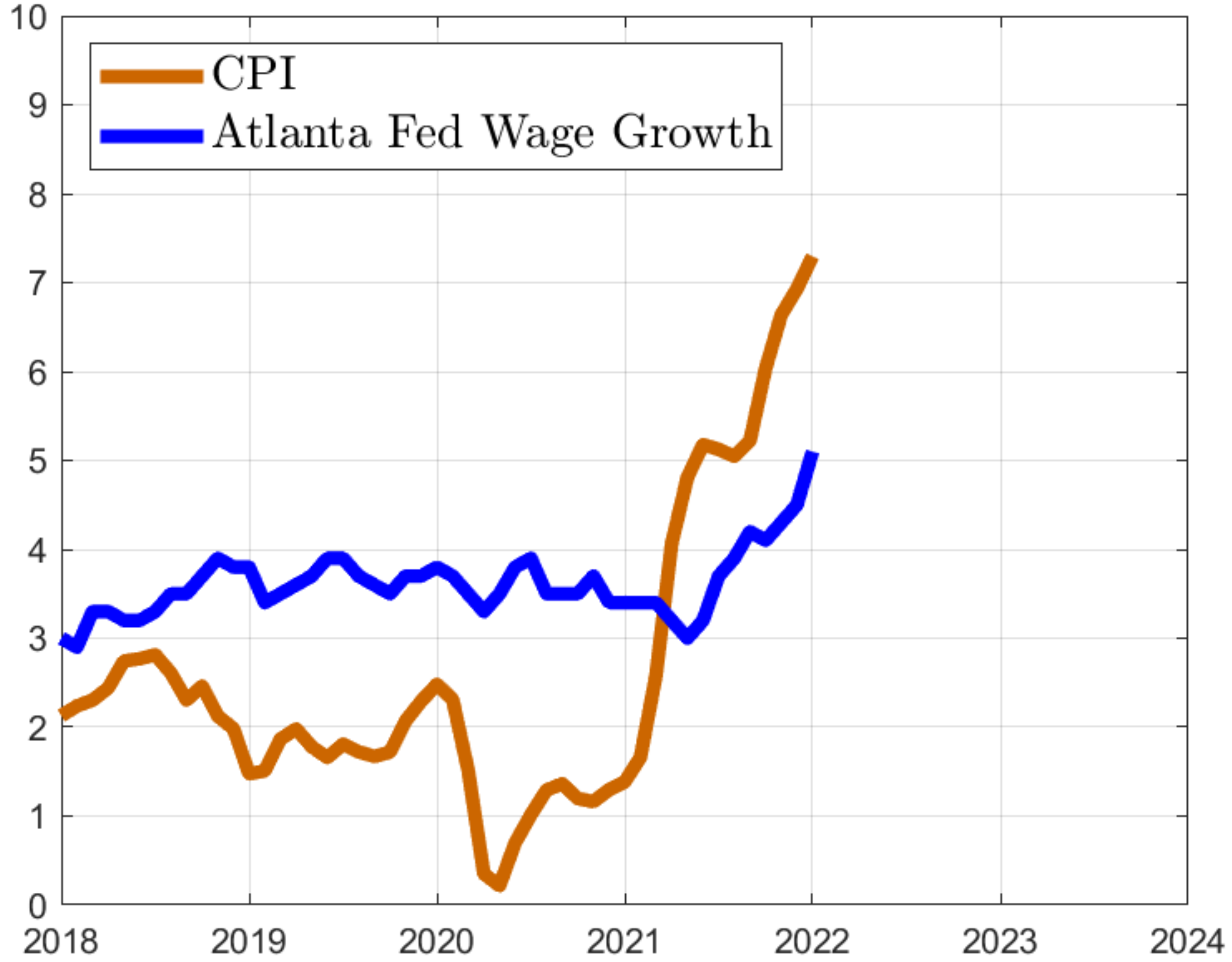
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← **Now**



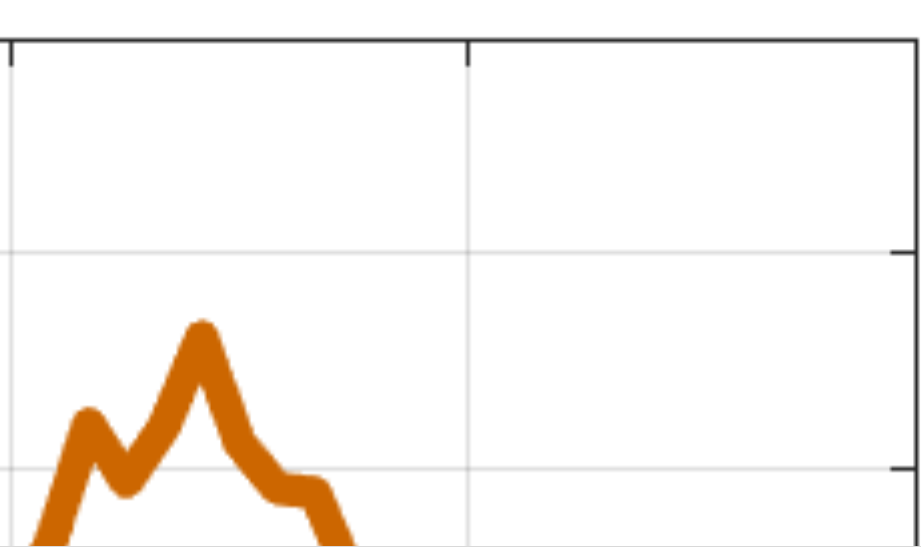
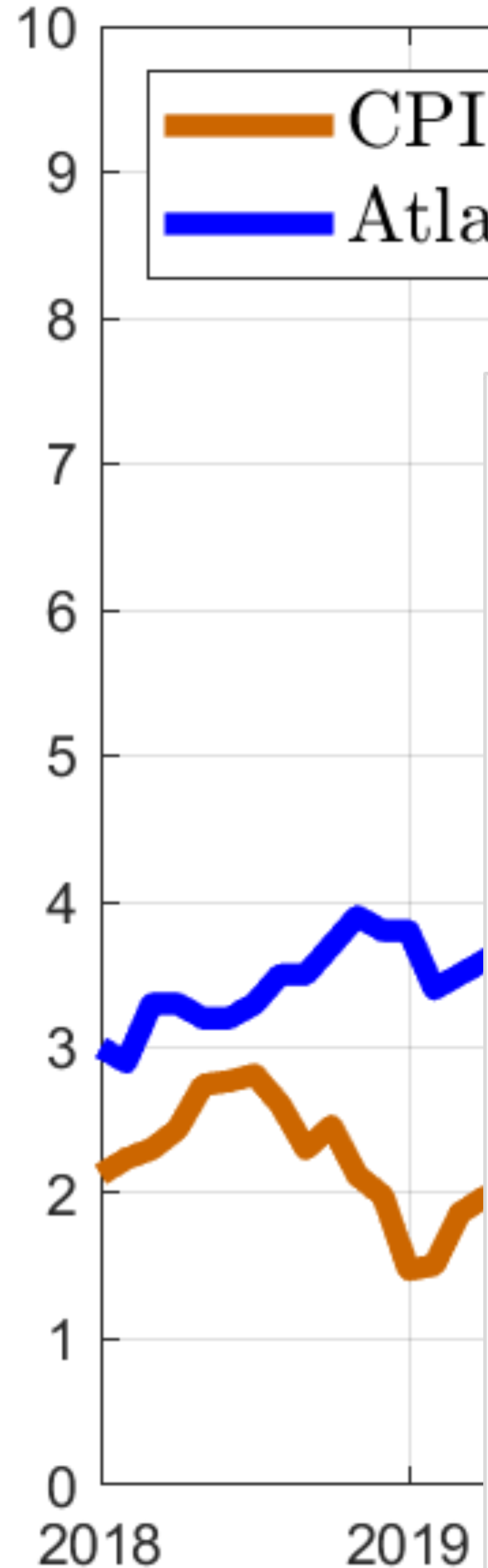




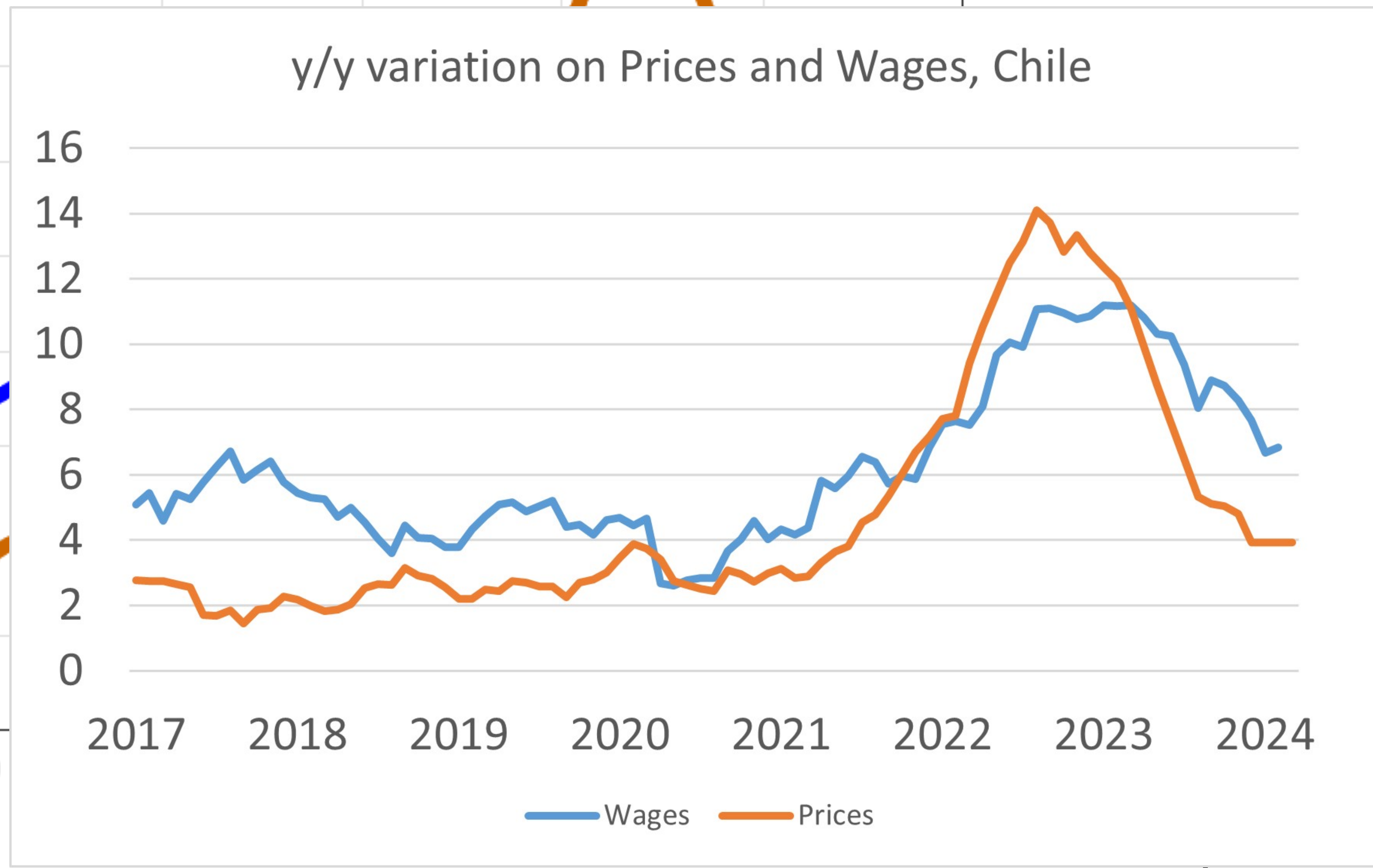


■ Wage-Price Spirals
(Lorenzoni-Werning, Brookings)

- simple model:
supply constraints + low substitutability
- 3 phases
 - ◆ inputs shoot up; slowly ease
 - ◆ inflation > wage growth
 - ◆ wage growth > inflation
- Demand and Supply similar!
- Simple takeaways, but missing in policy debate!



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- Key...
 - scarce input → inflation rise in input price
 - feedback between price and wage setters (i.e. spirals)

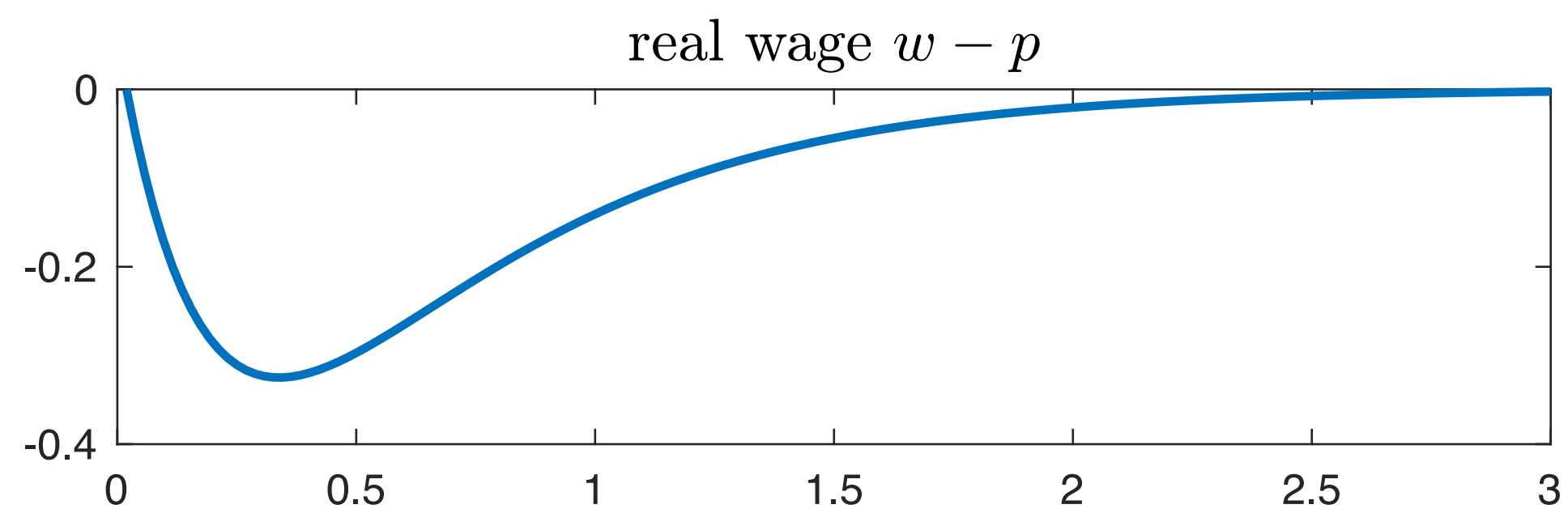
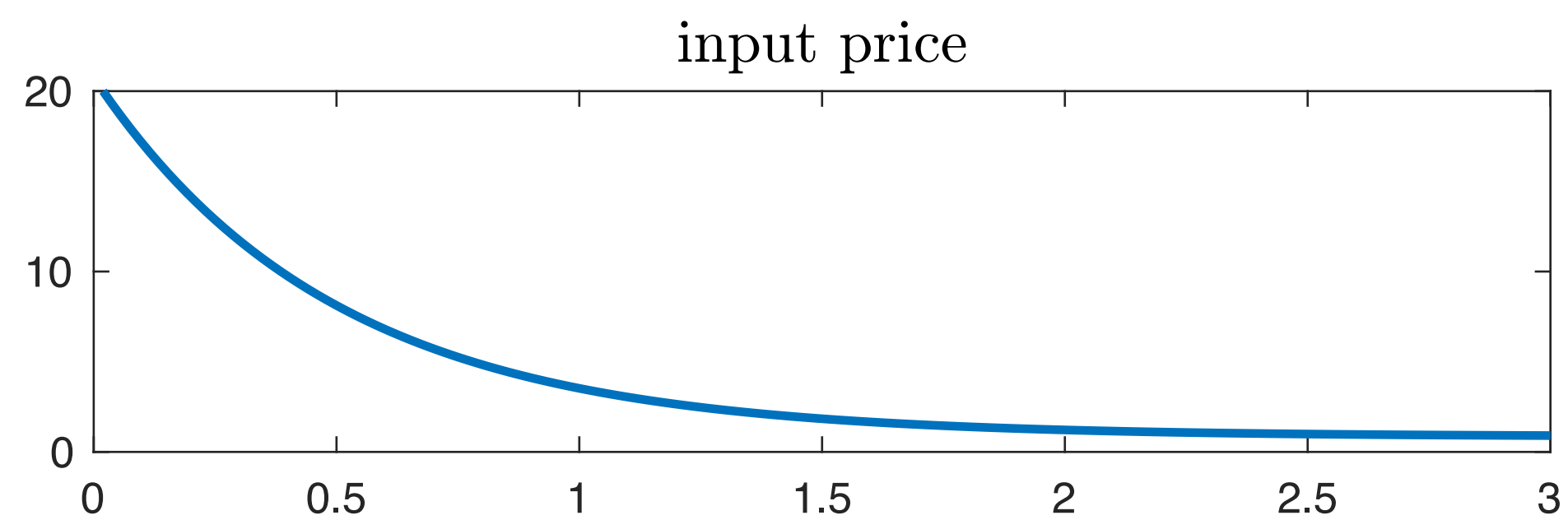
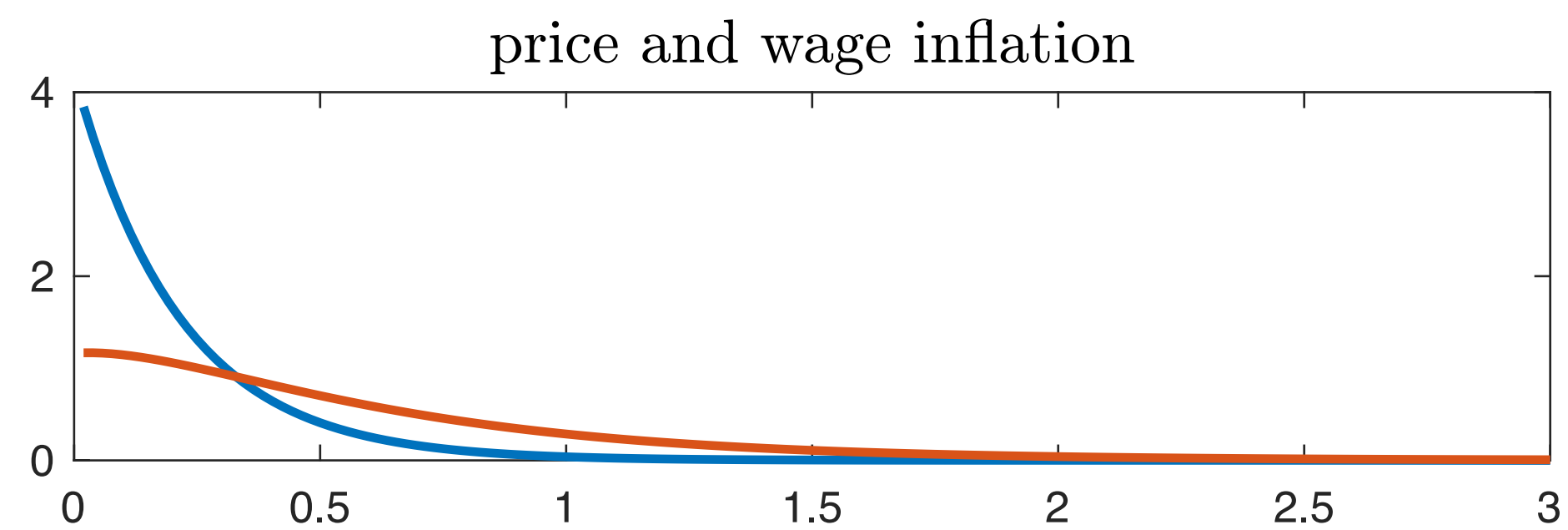
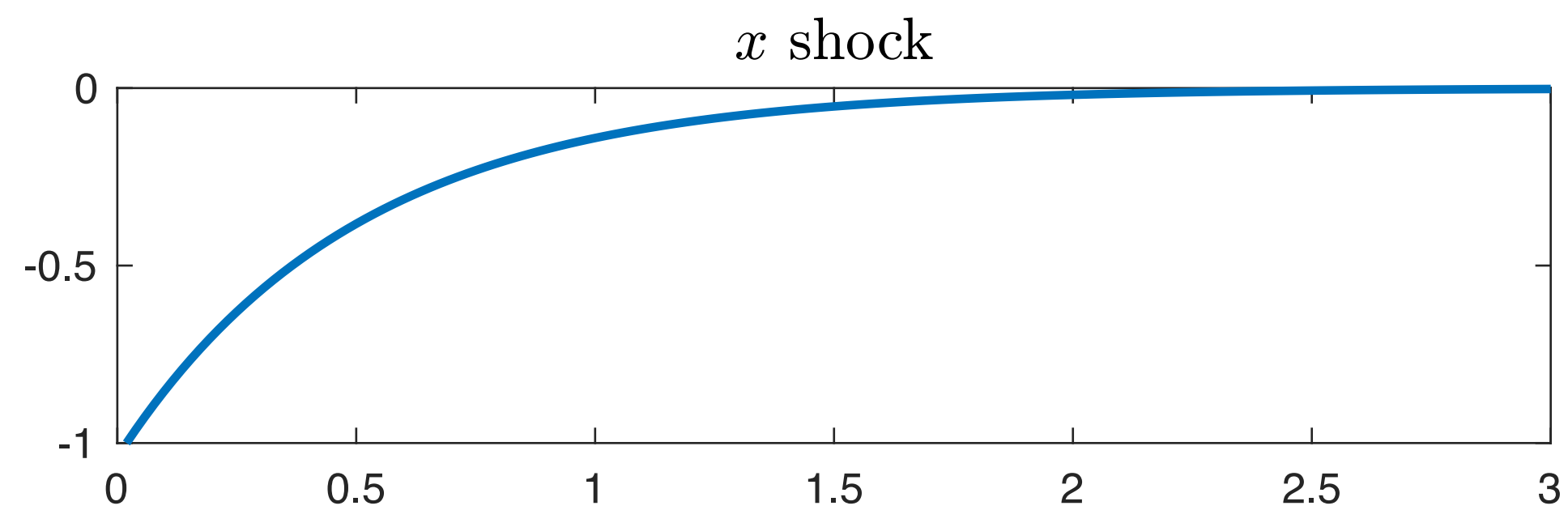
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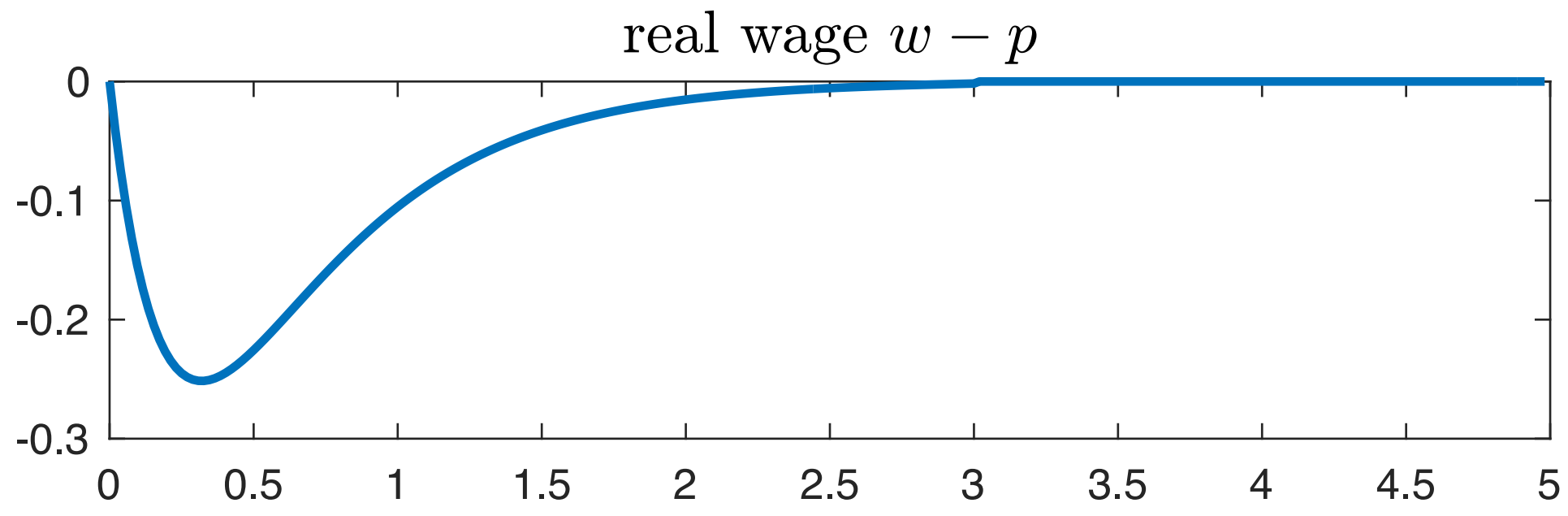
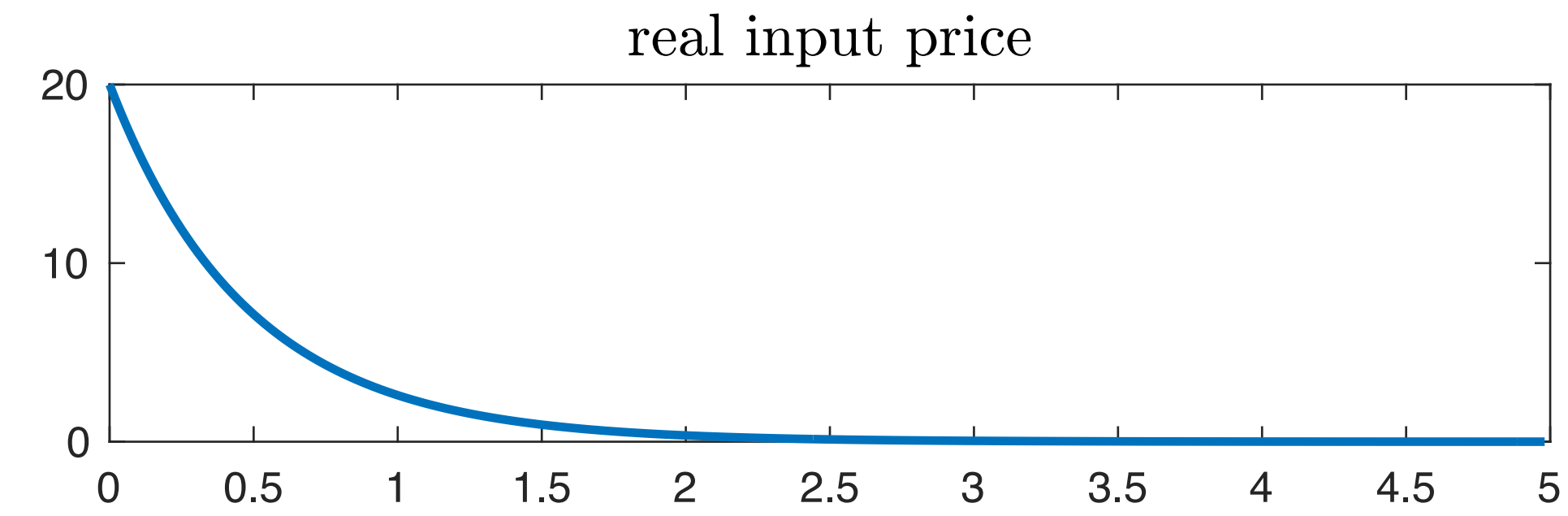
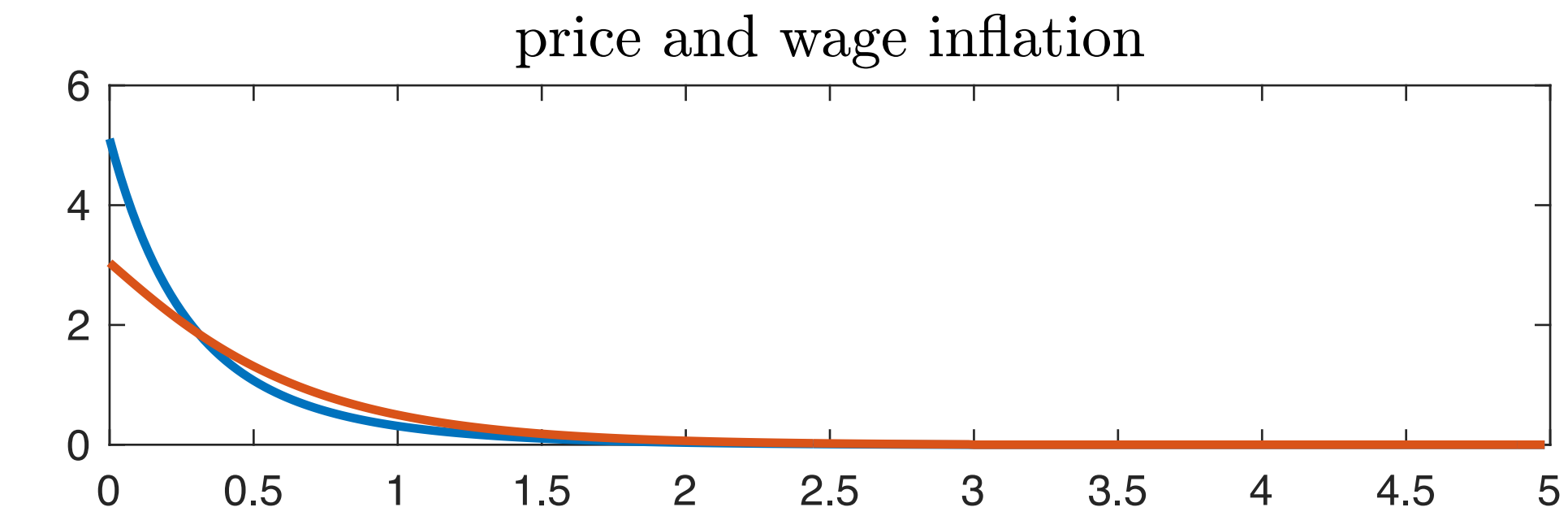
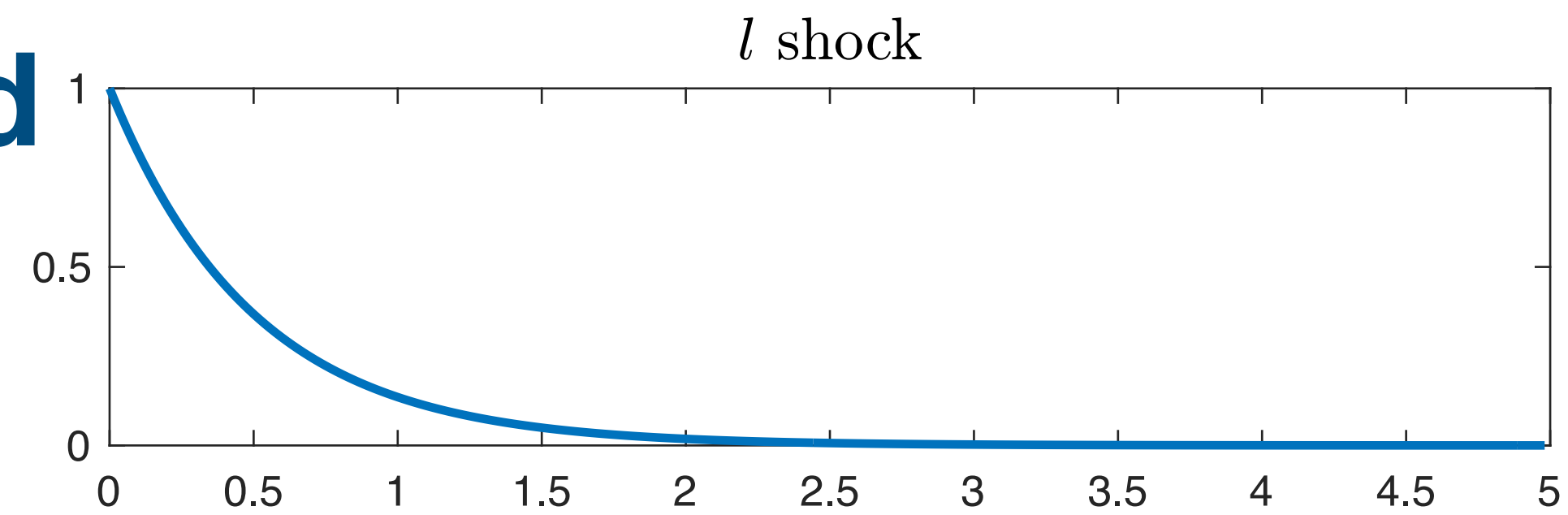
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- Study: demand and supply shocks, impulse response

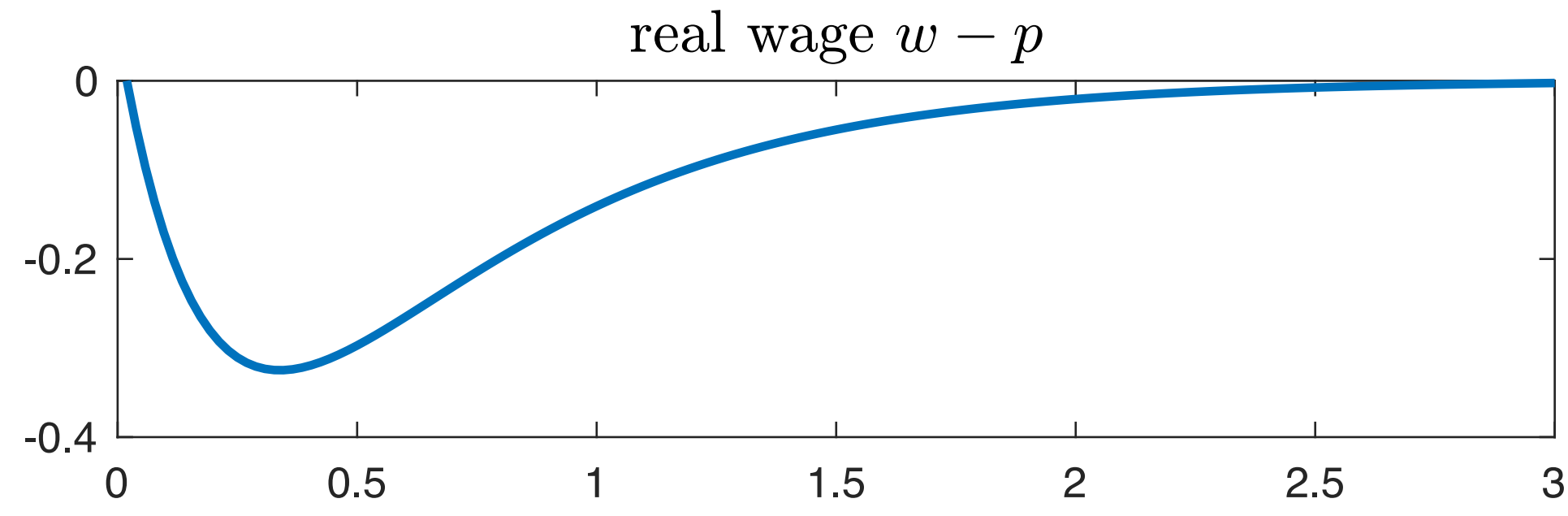
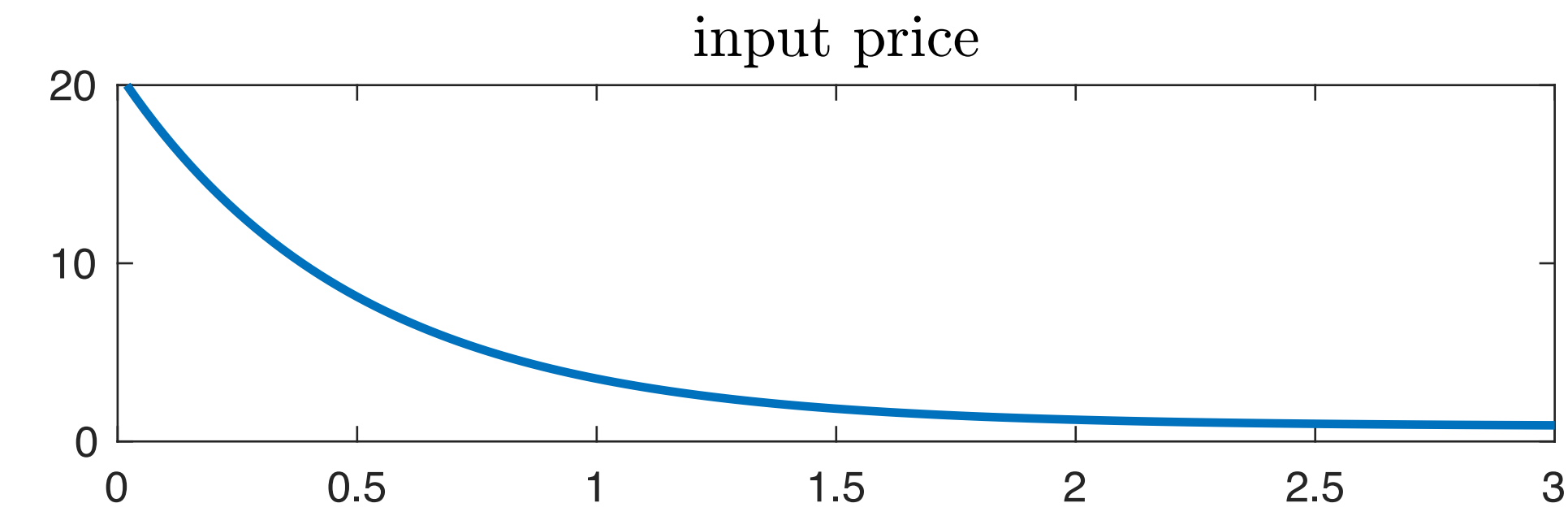
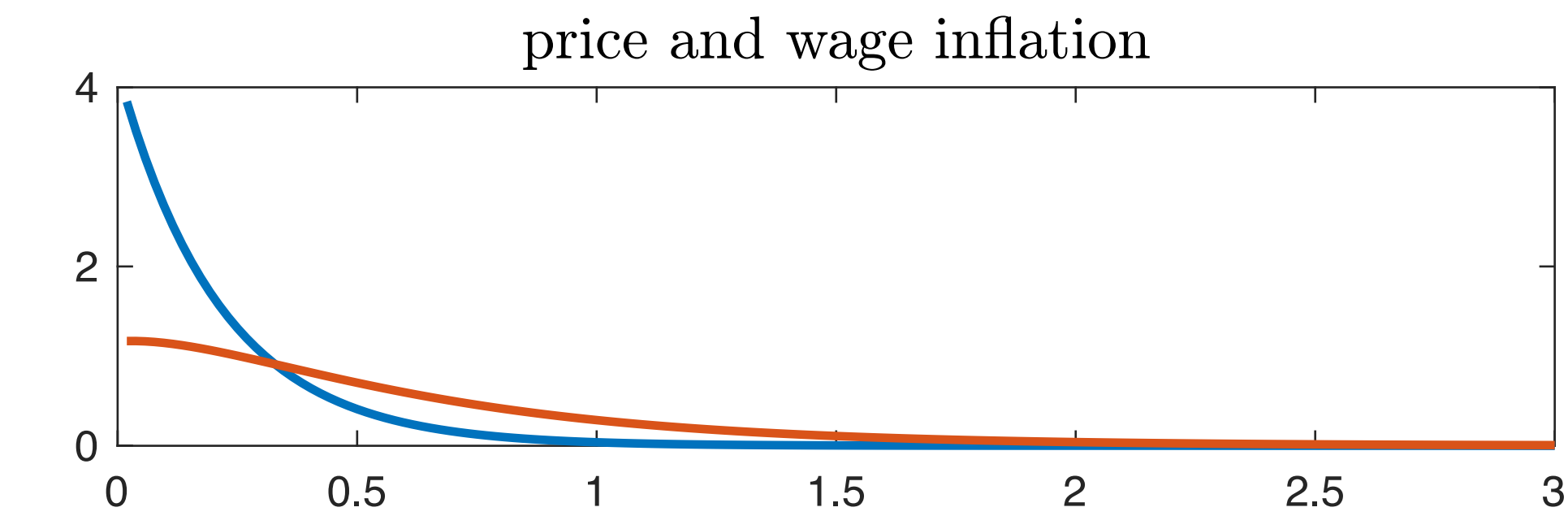
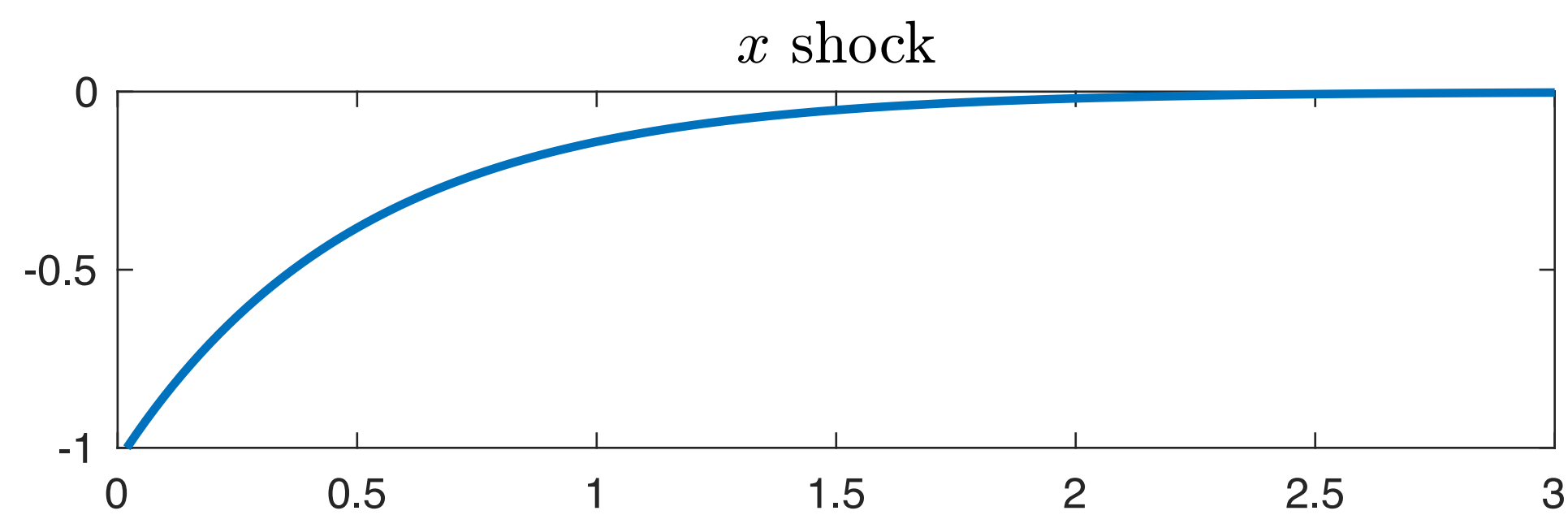
Supply Shock



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- Caveat: non-rational expectations + real rigidities (see paper) \rightarrow more persistent π

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- Other recent work: Ball et al. (2022), Amiti et al. (2023), Bernanke and Blanchard (2023), Comin et al. (2023), Gagliardone and Gertler (2023), Kabaca and Tuzcuoglu (2023) di Giovanni-Kalemli-Özcan-Silva-Yildirim (2023), Guerrieri-Marcussen-Reichlin-Tenreyo (2023)

Inflation Papers

- Dynamic Oligopoly and Price Stickiness Wang-Werning

- Monetary Policy in Times of Structural Reallocation
Guerrieri-Lorenzoni-Straub-Werning

- Expectations and the Rate of Inflation

- Wage-Price Spirals

- Inflation is Conflict

- Doing Macroeconomics with Excess Demand

- Fiscal Dominance...

- Recalculating Sargent and Wallace's Unpleasant

- Dollarization I and II

- Cagan to Ramsey: Optimal Financial Repression



Now

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Staggered Pricing Block



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aspirations



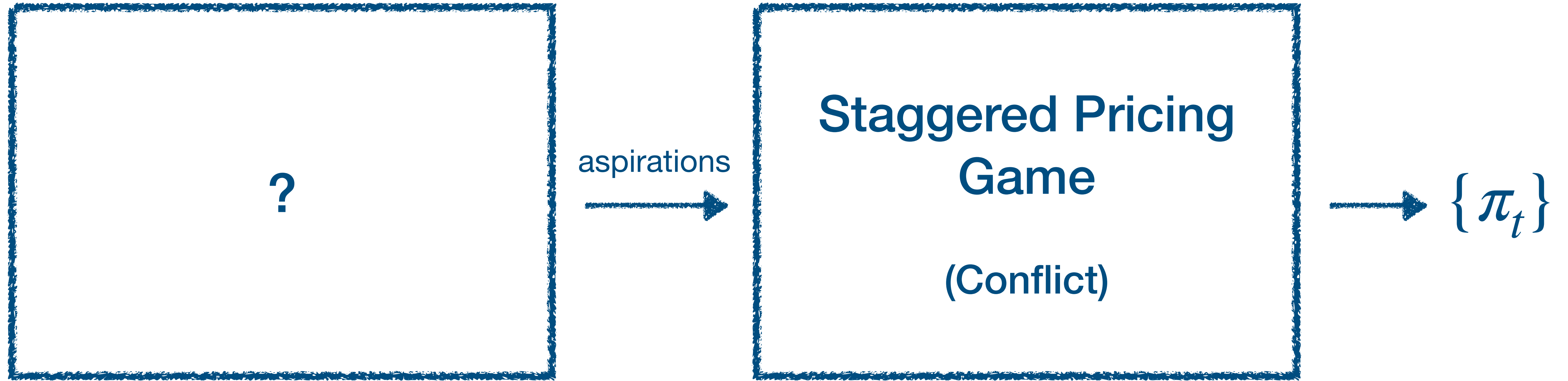
Staggered Pricing
Game

(Conflict)

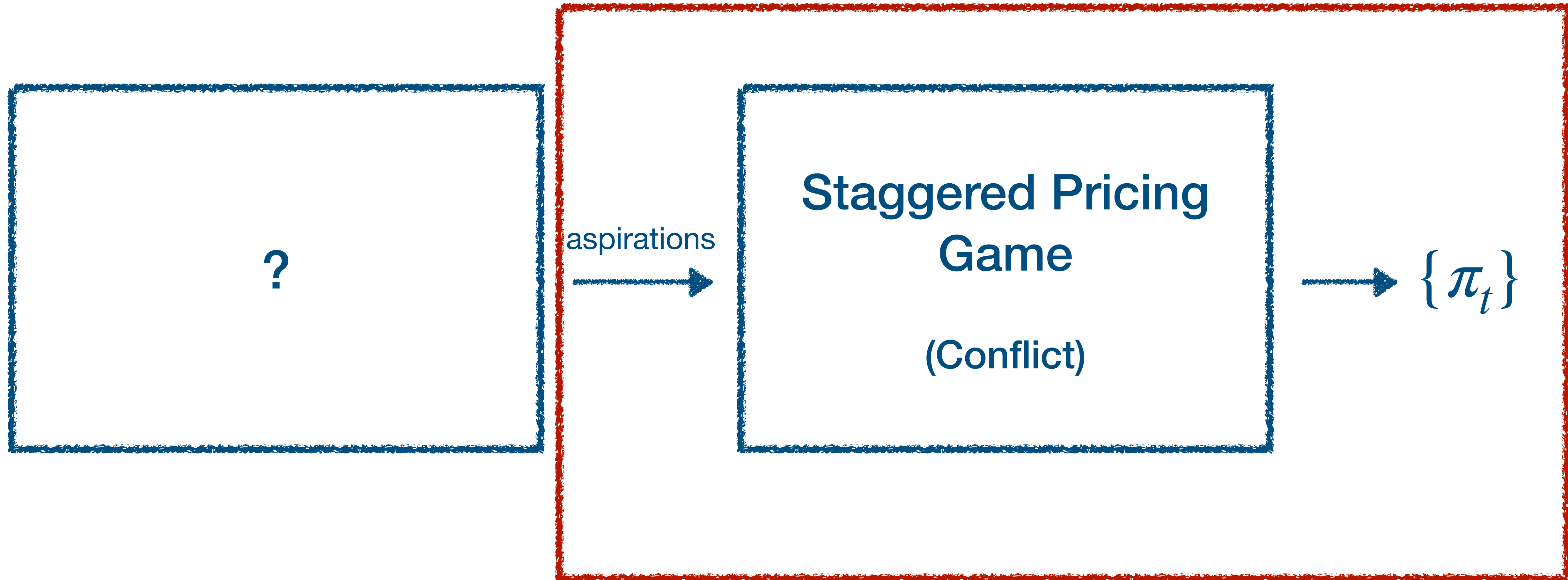


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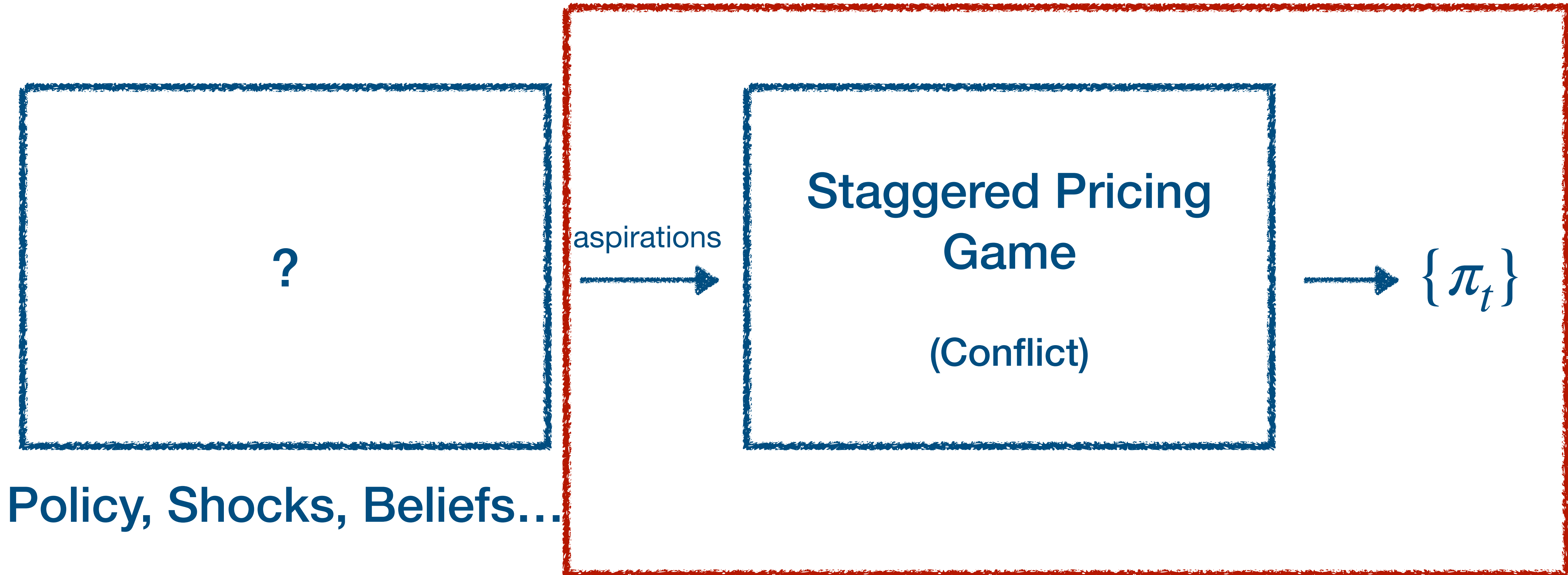
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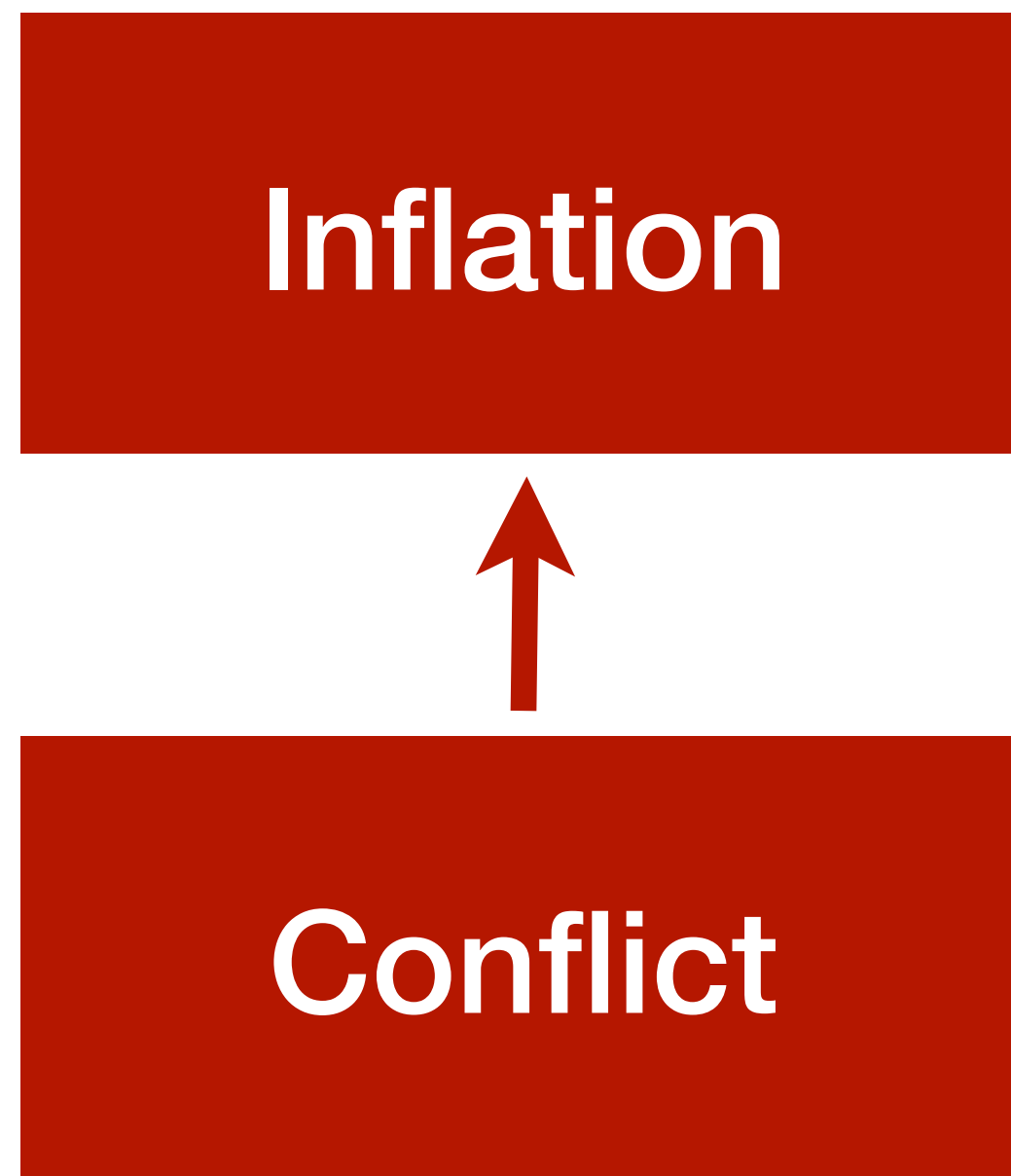
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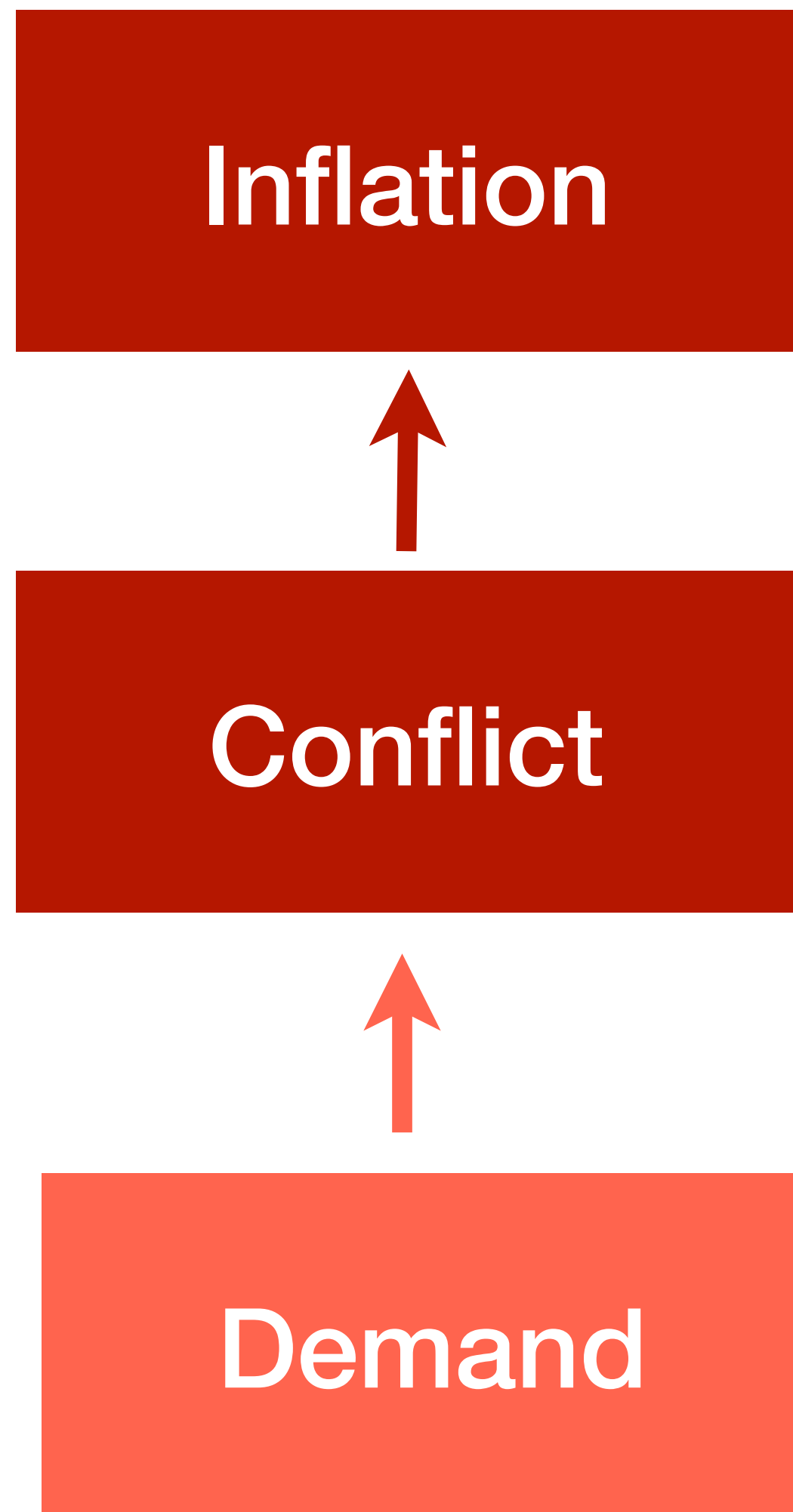
Causality (DAG)

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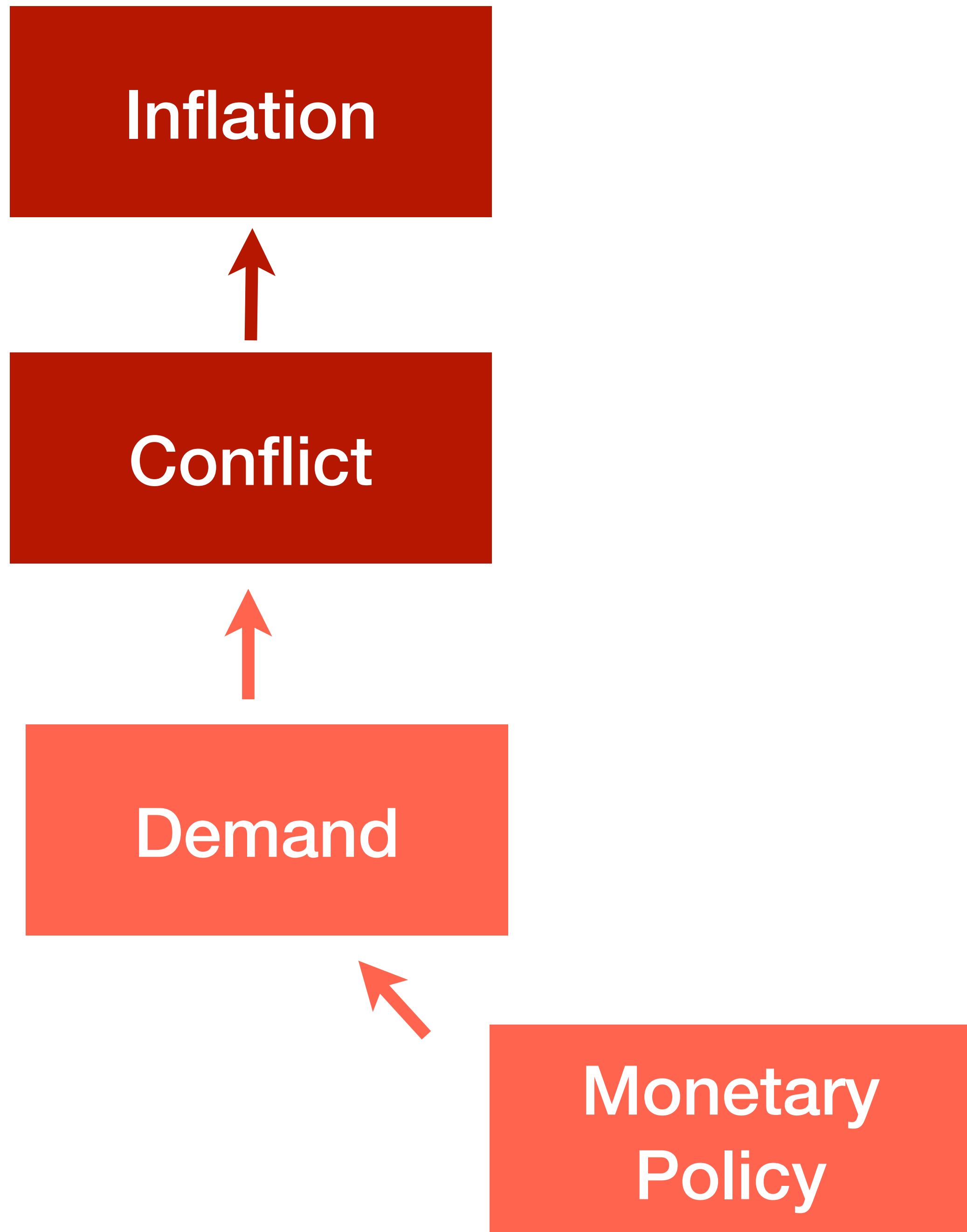
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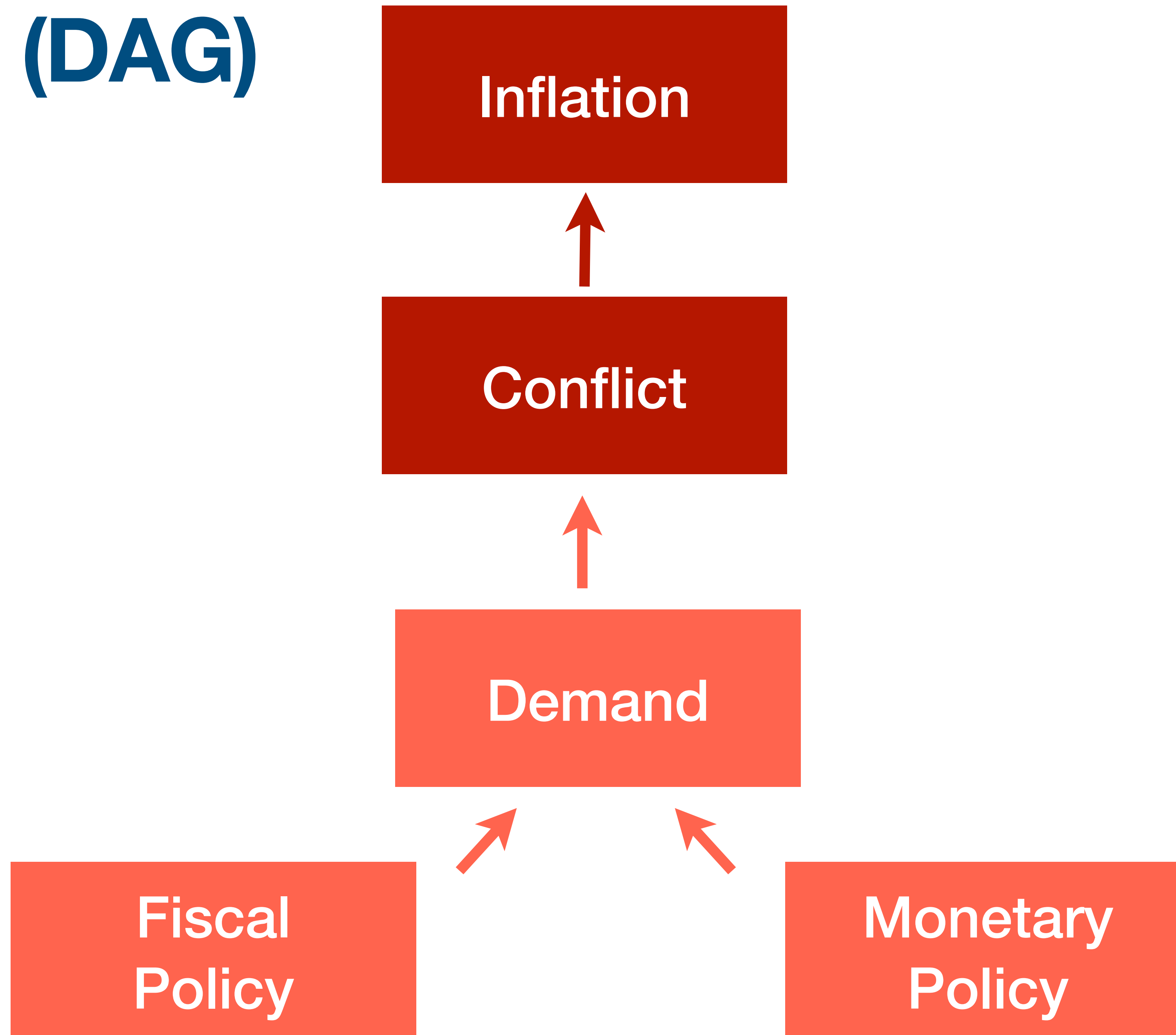
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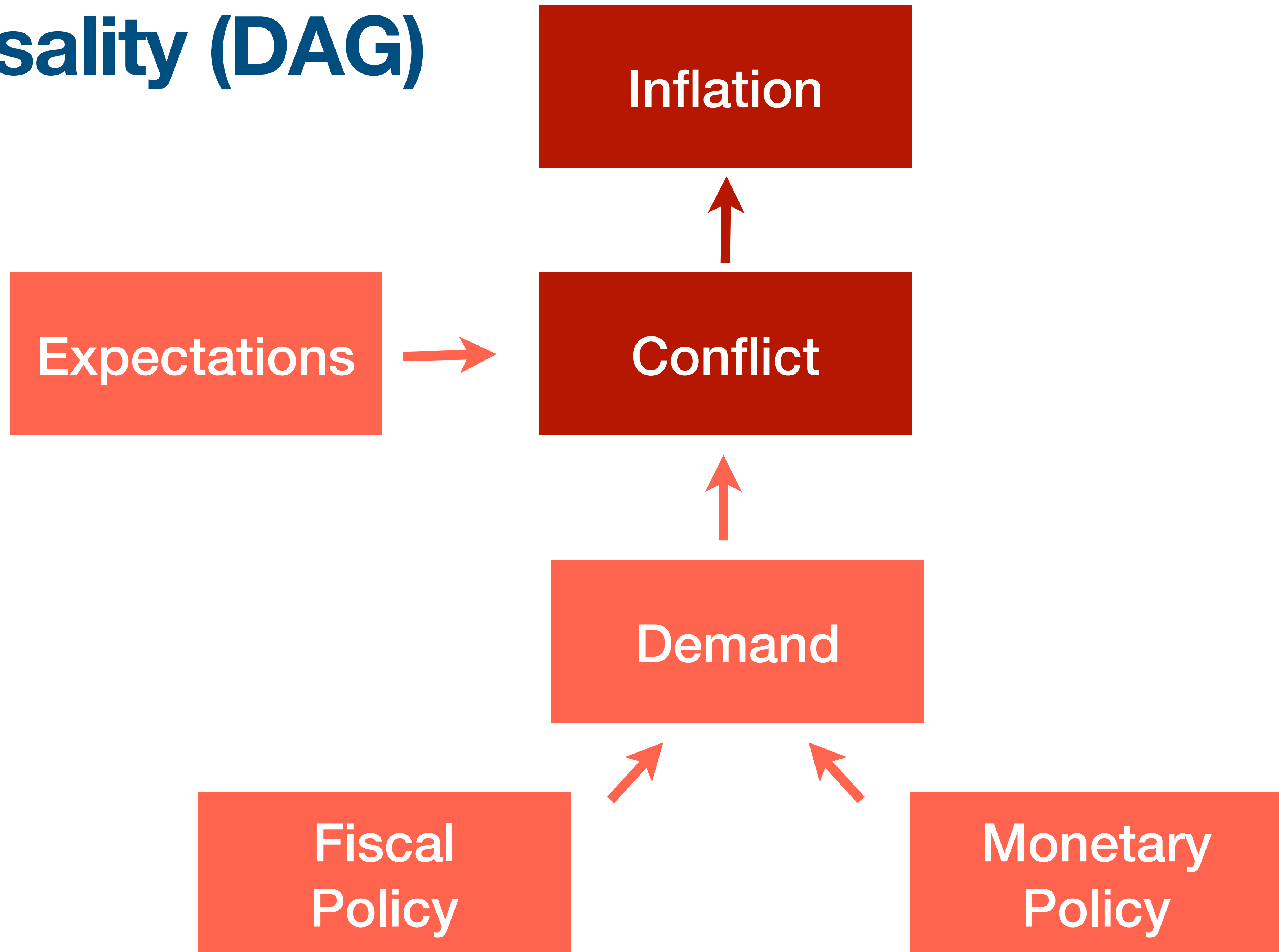
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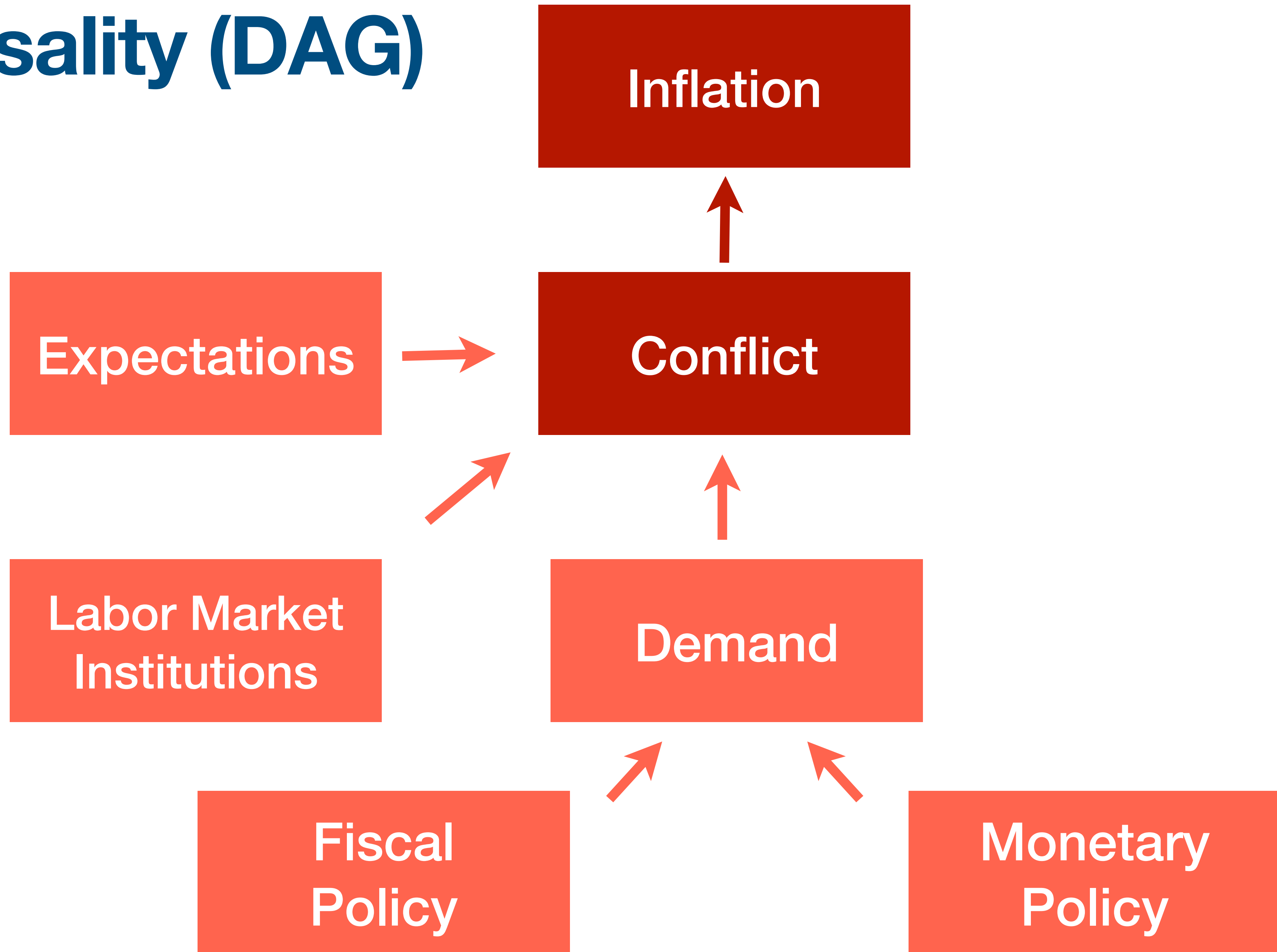
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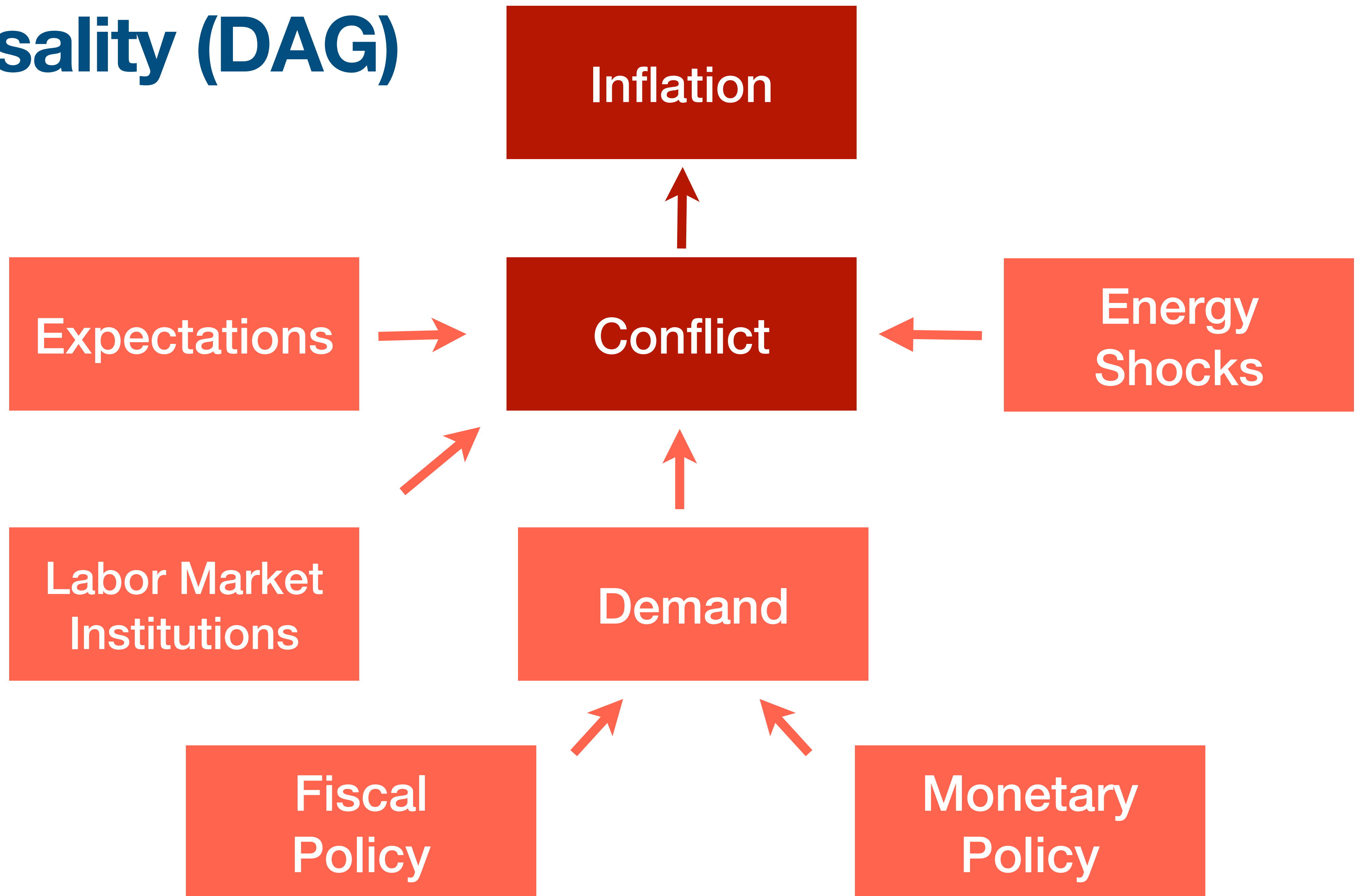
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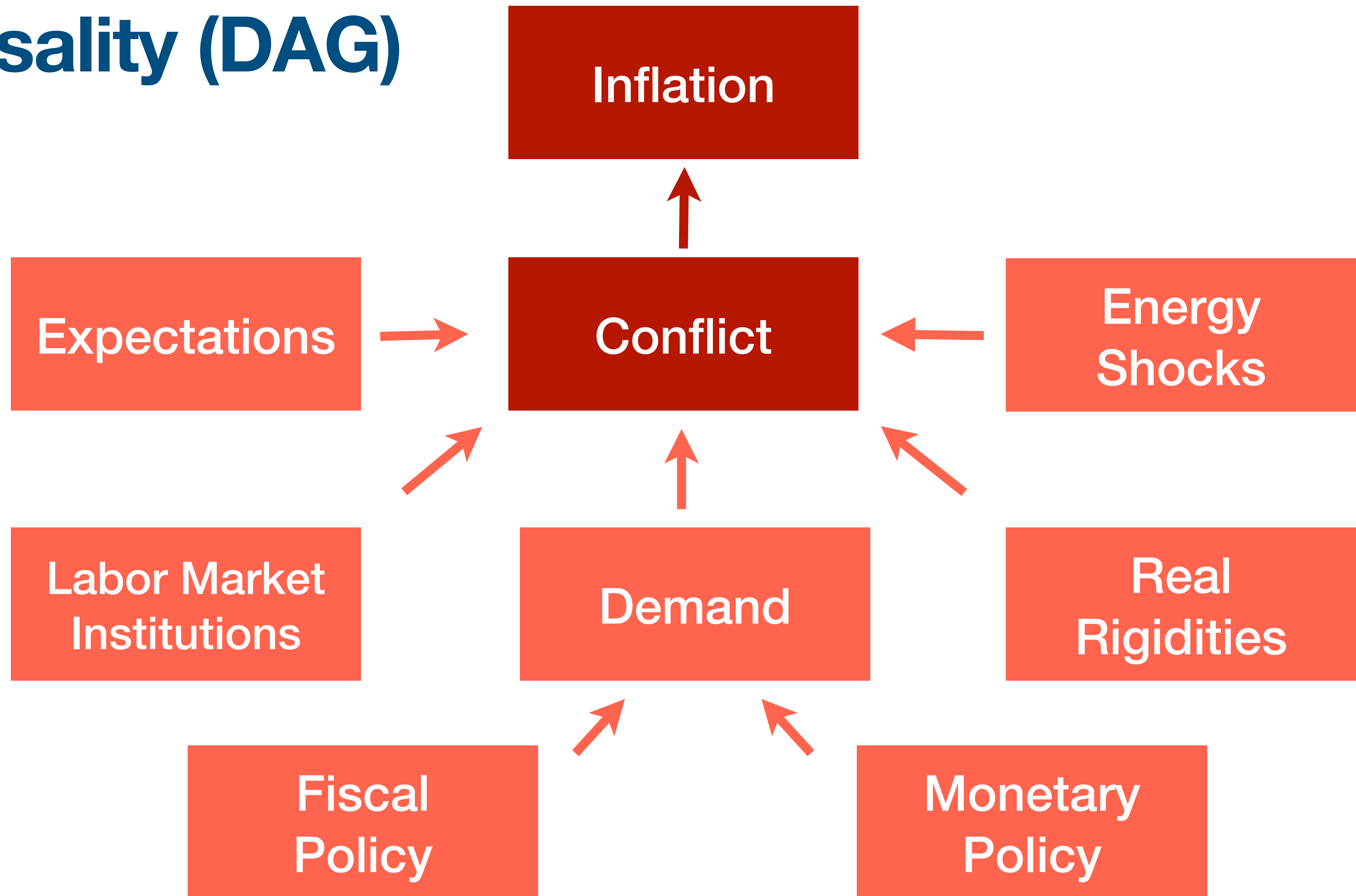
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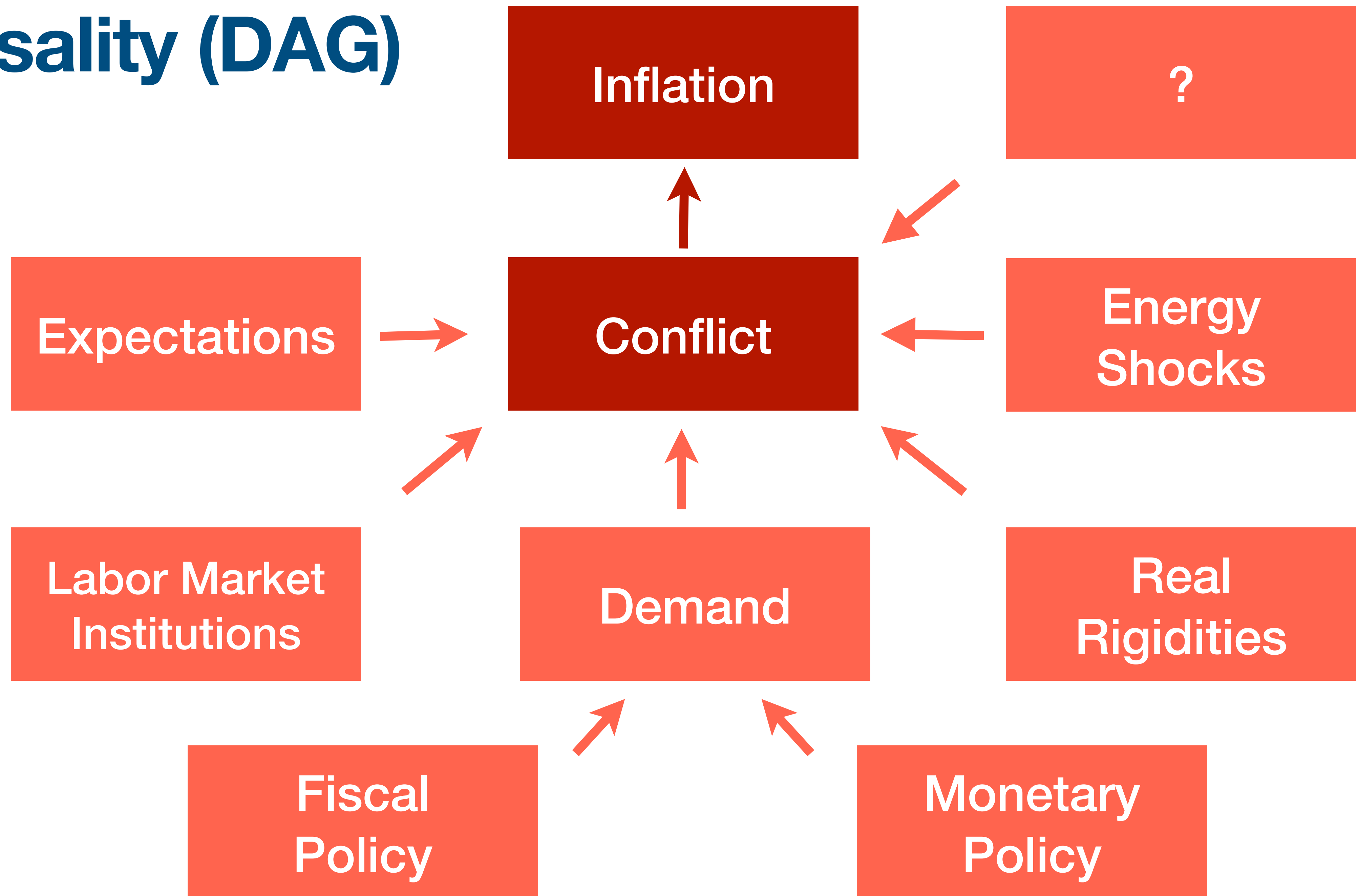
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- stylized, simple, conceptual, “intuition pump”, “shock to the system”
- far from standard traditional models (on purpose)
no money, no credit, no savings, no interest rates, no output, no employment
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■ #2 General Framework...

- akin to macro models...
- but stripped down and N sectors (fewer special assumptions)
- result: decomposition of conflict and adjustment inflation
- **Goal:** conflict → standard modern macro *bridge*

■ Stylized Model ← **Now!**

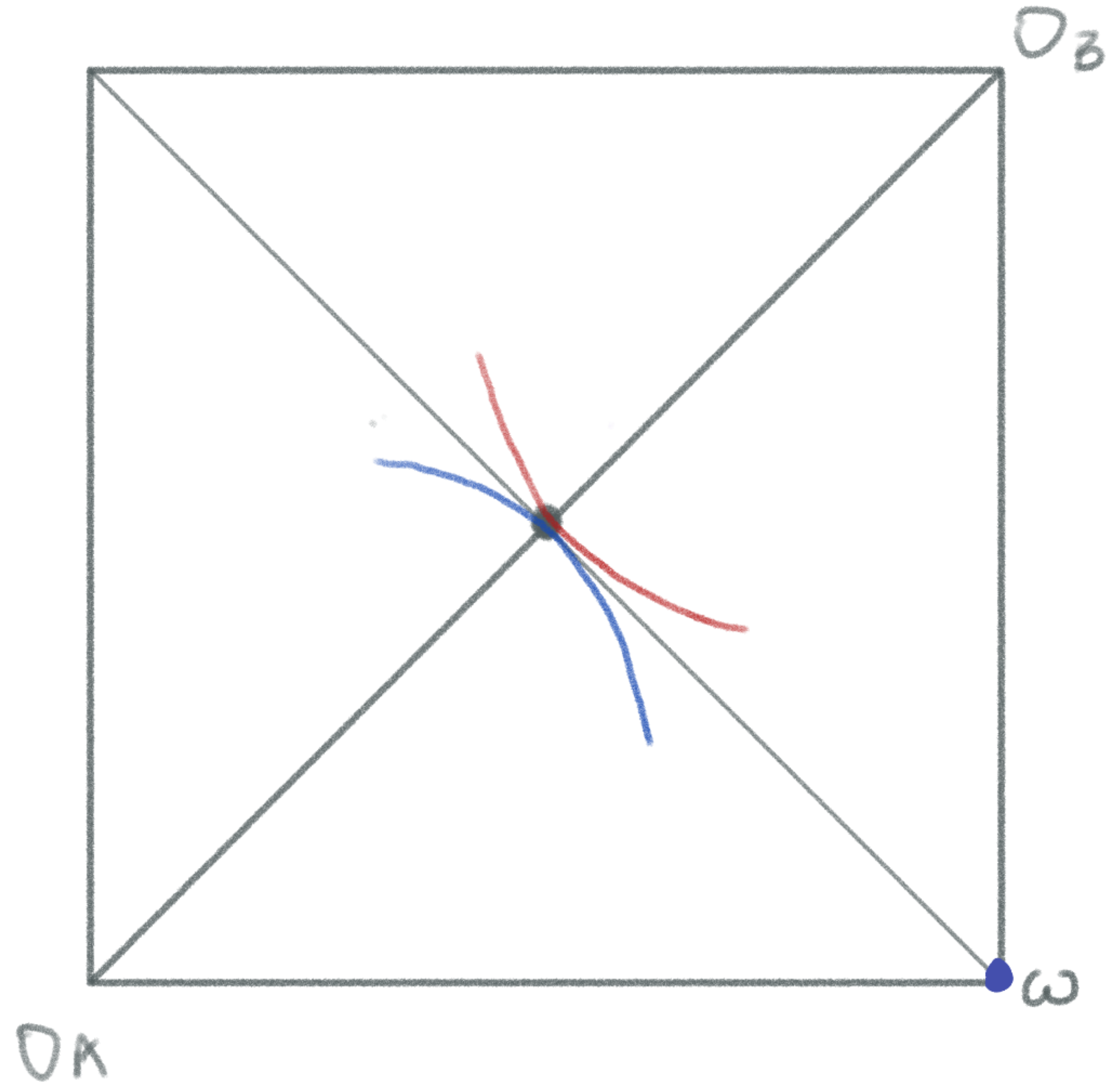
■ General Framework

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- Two agents: A and B
- Two goods: A and B
- No production: endowments
(1,0) for A
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- Utility: $U^A = U(c^A, c^B)$ $U^B = U(c^B, c^A)$
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- **Trade by barter**...
 - using prevailing relative prices taken as ratio of nominal ones
 - alternating who chooses quantities (buyer) and who does not (seller)

Equilibrium: Positive Conflict Inflation

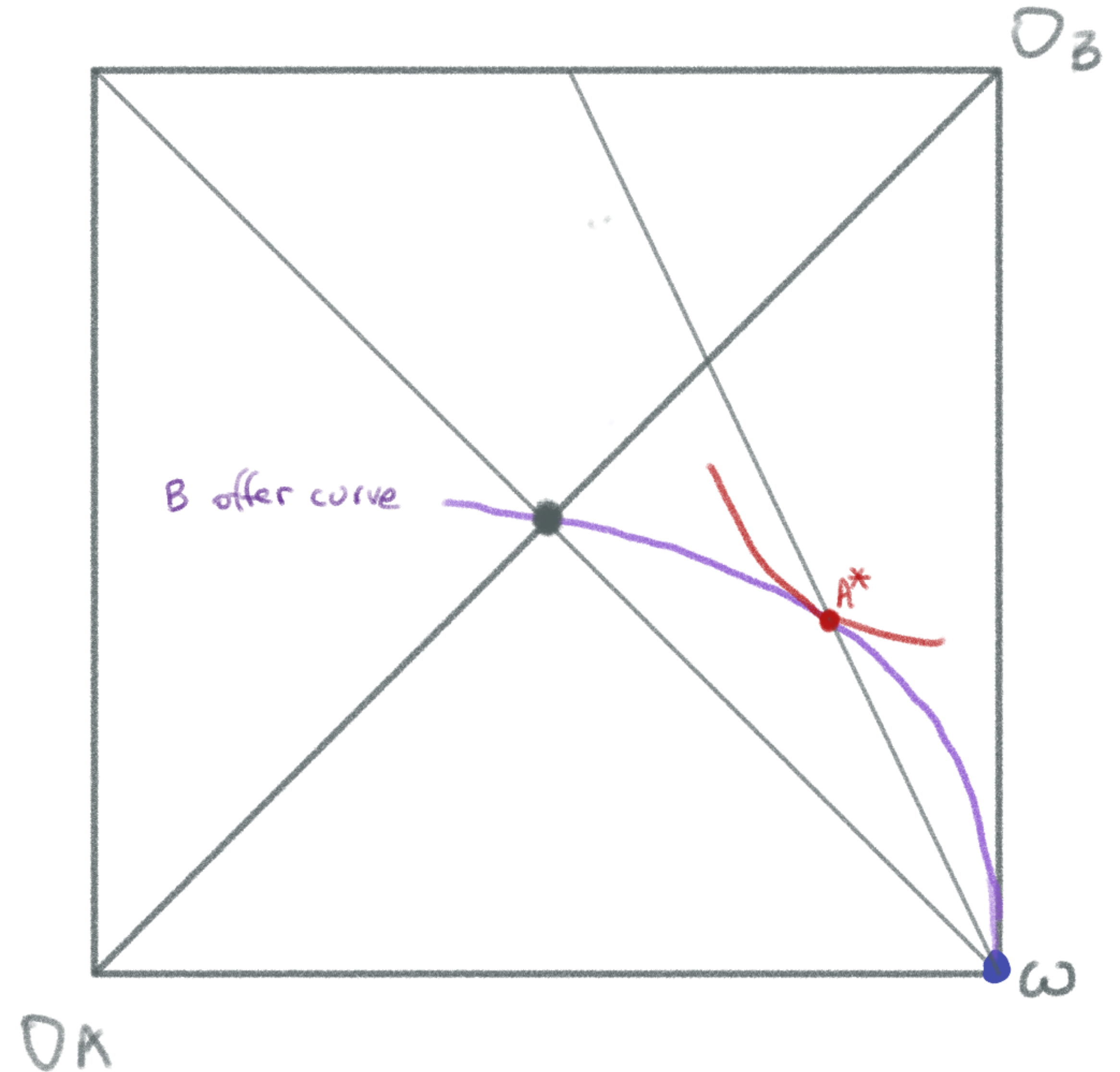
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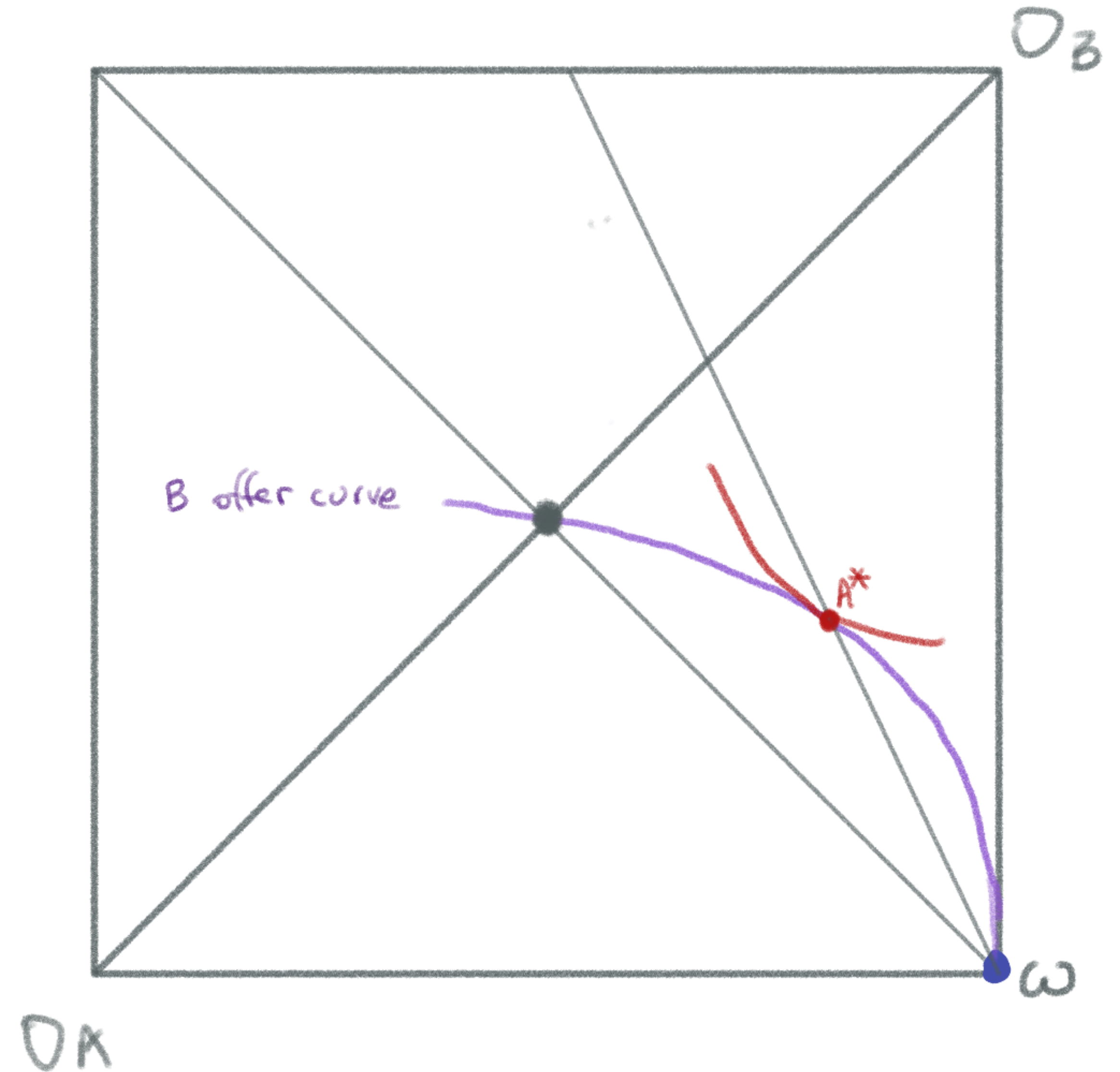


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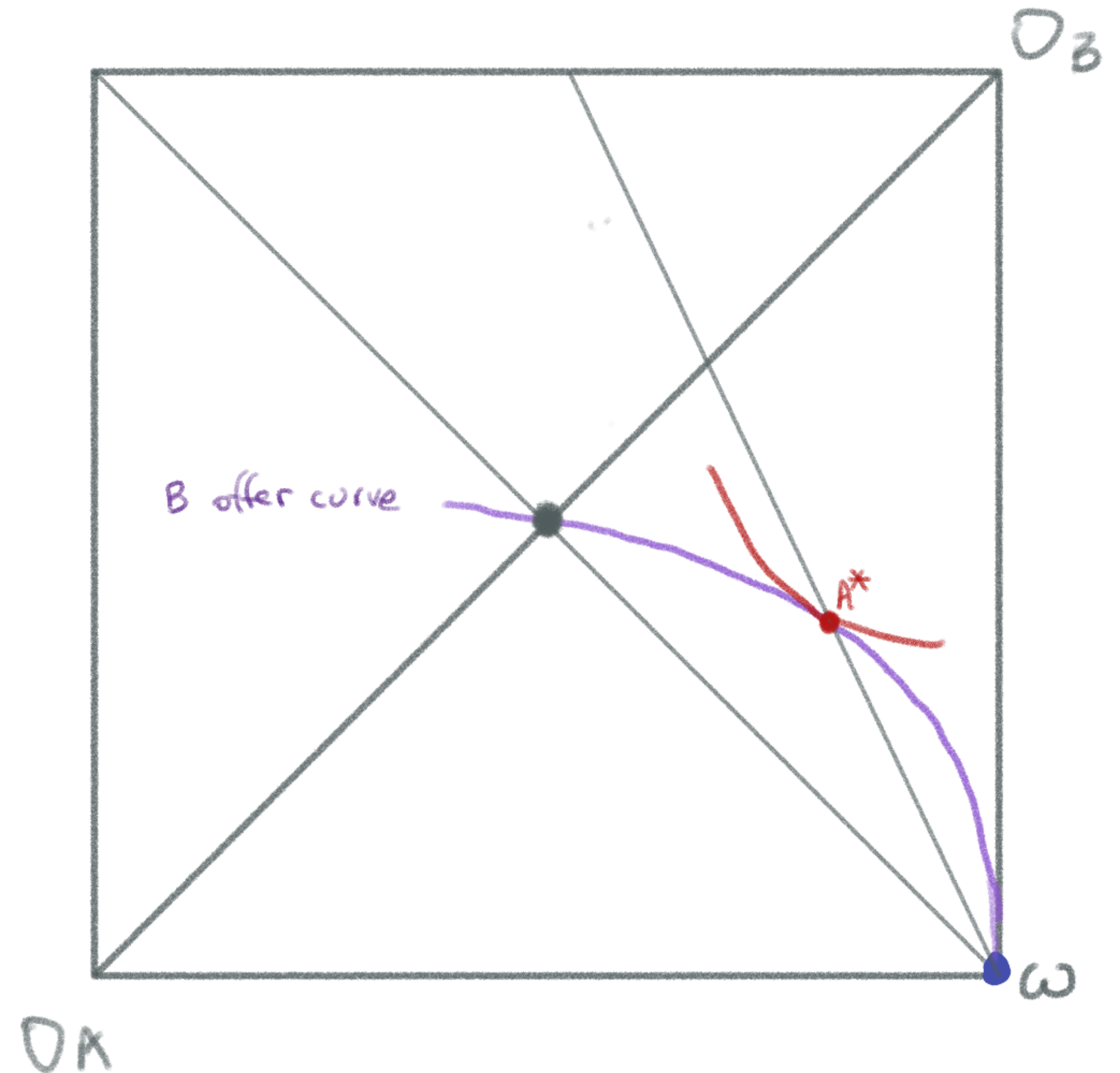
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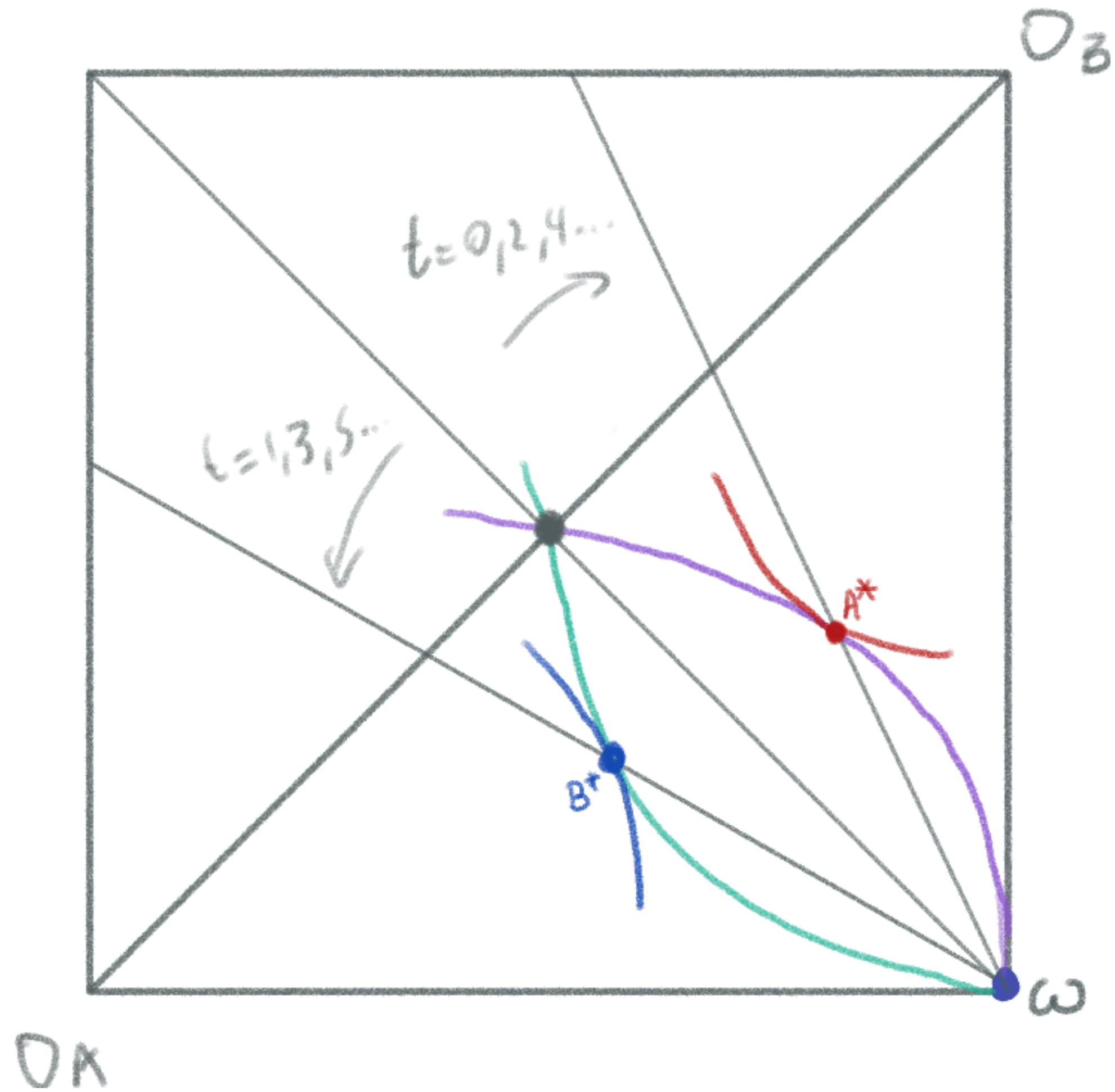
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No Role for Inflation Expectations here!

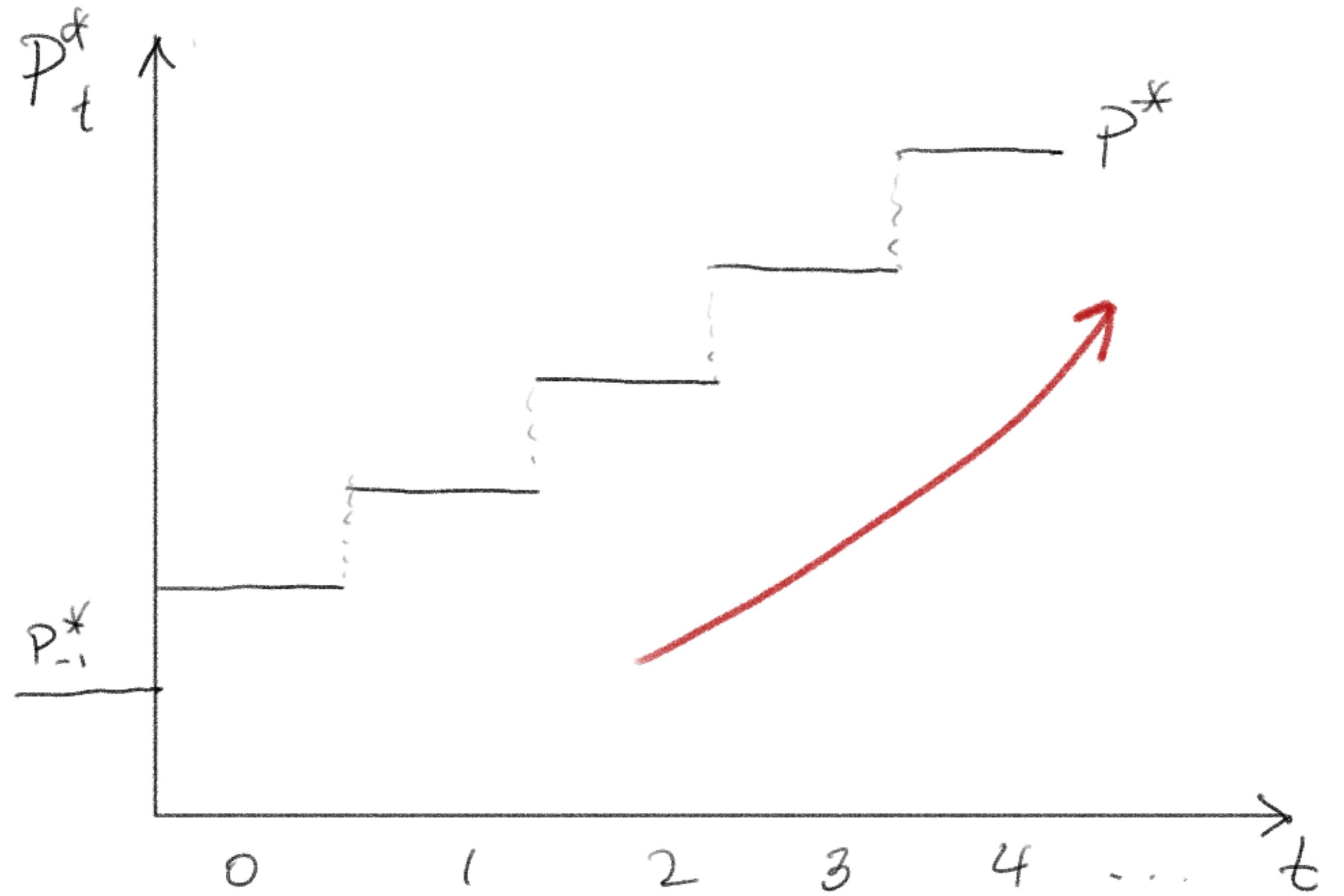
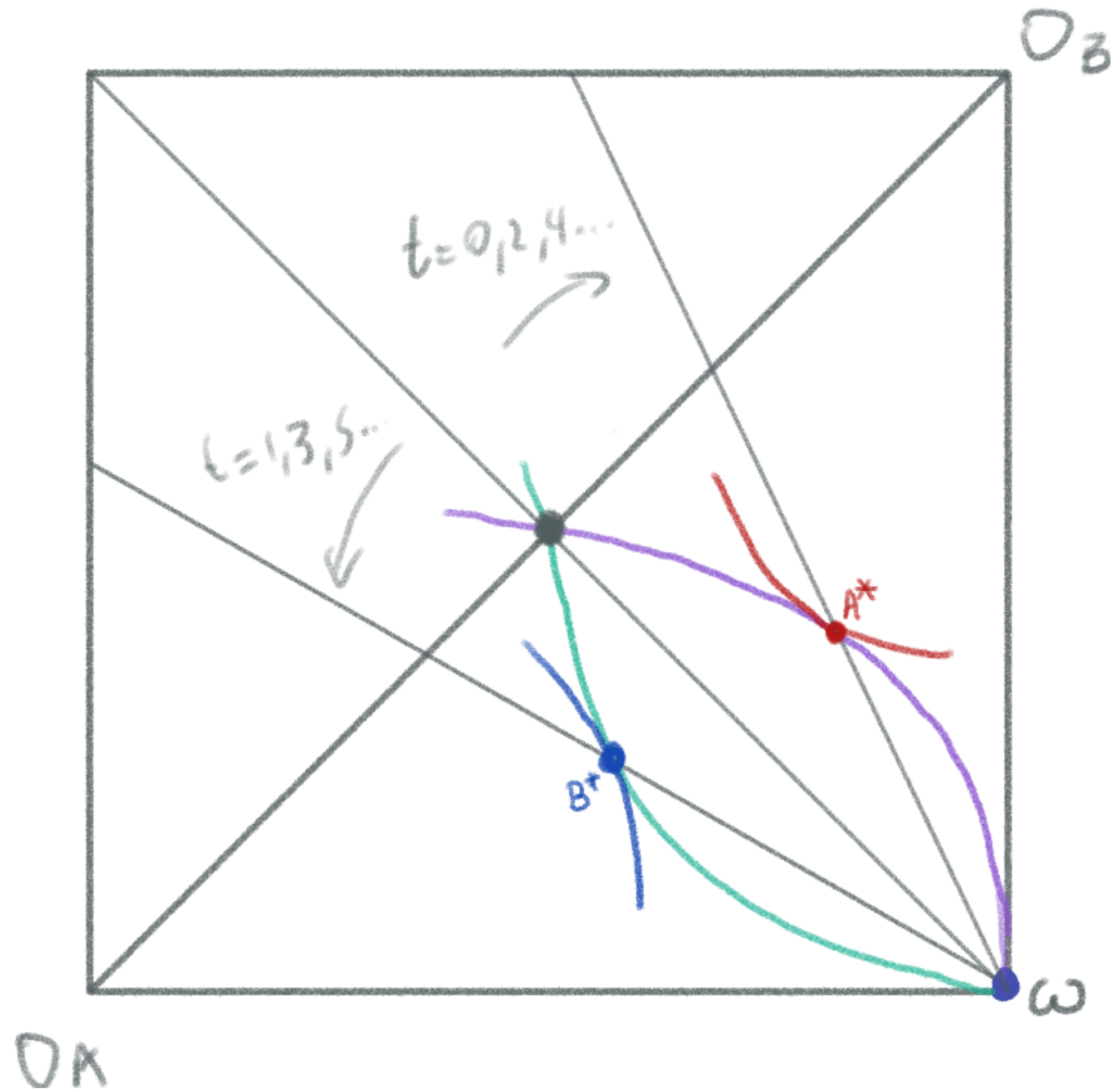
Does not depend on β discount



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- Stylized Model

- General Framework ← **Now!**

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Wage-Price Example

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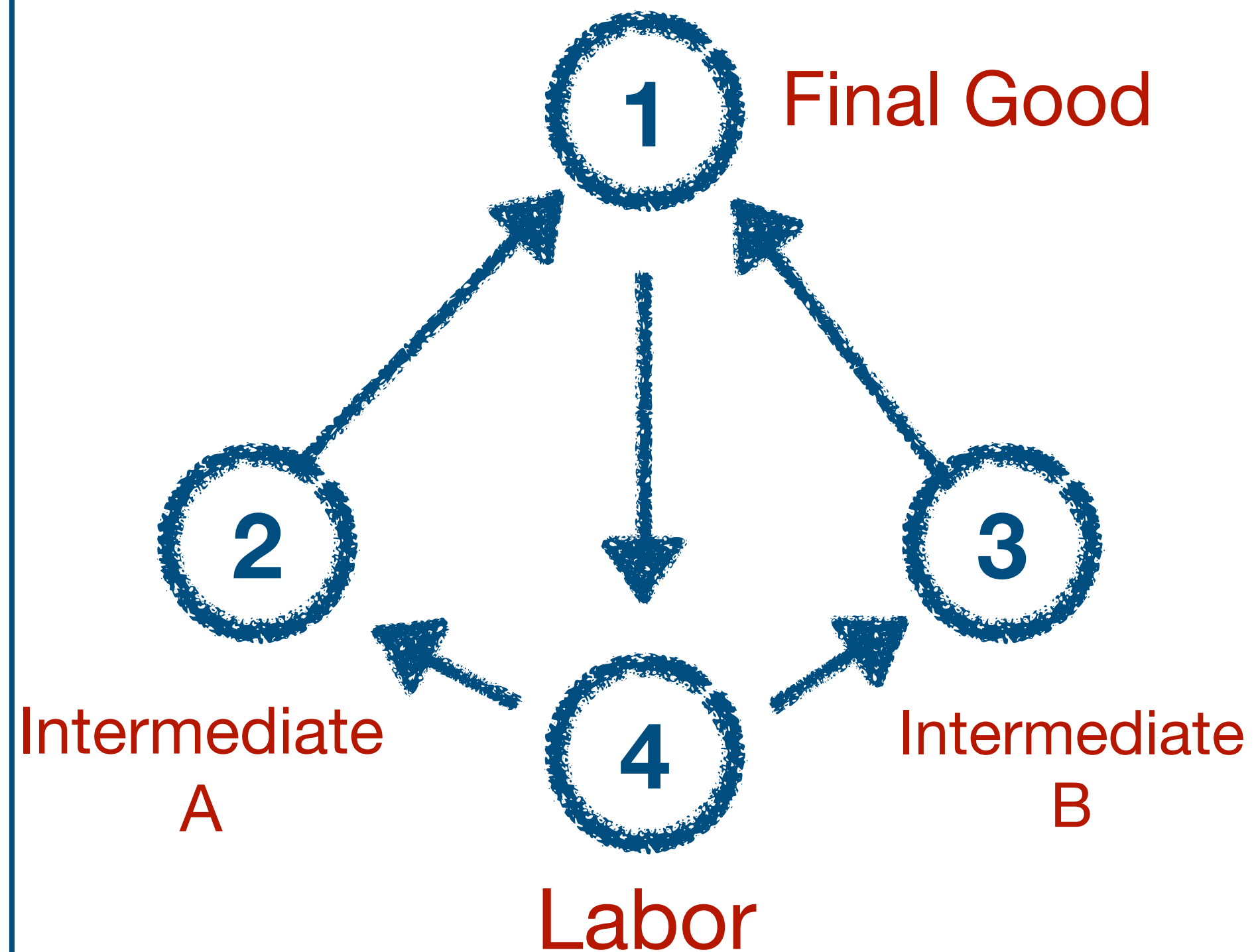
Wage-Price Example

$$W - P = a_W$$

$$P - W = a_P$$



Input-Output Example



Can we make everyone happy?

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- **Definition:** Is there a vector of prices P such that...?

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... if not, we say ***there is conflict***

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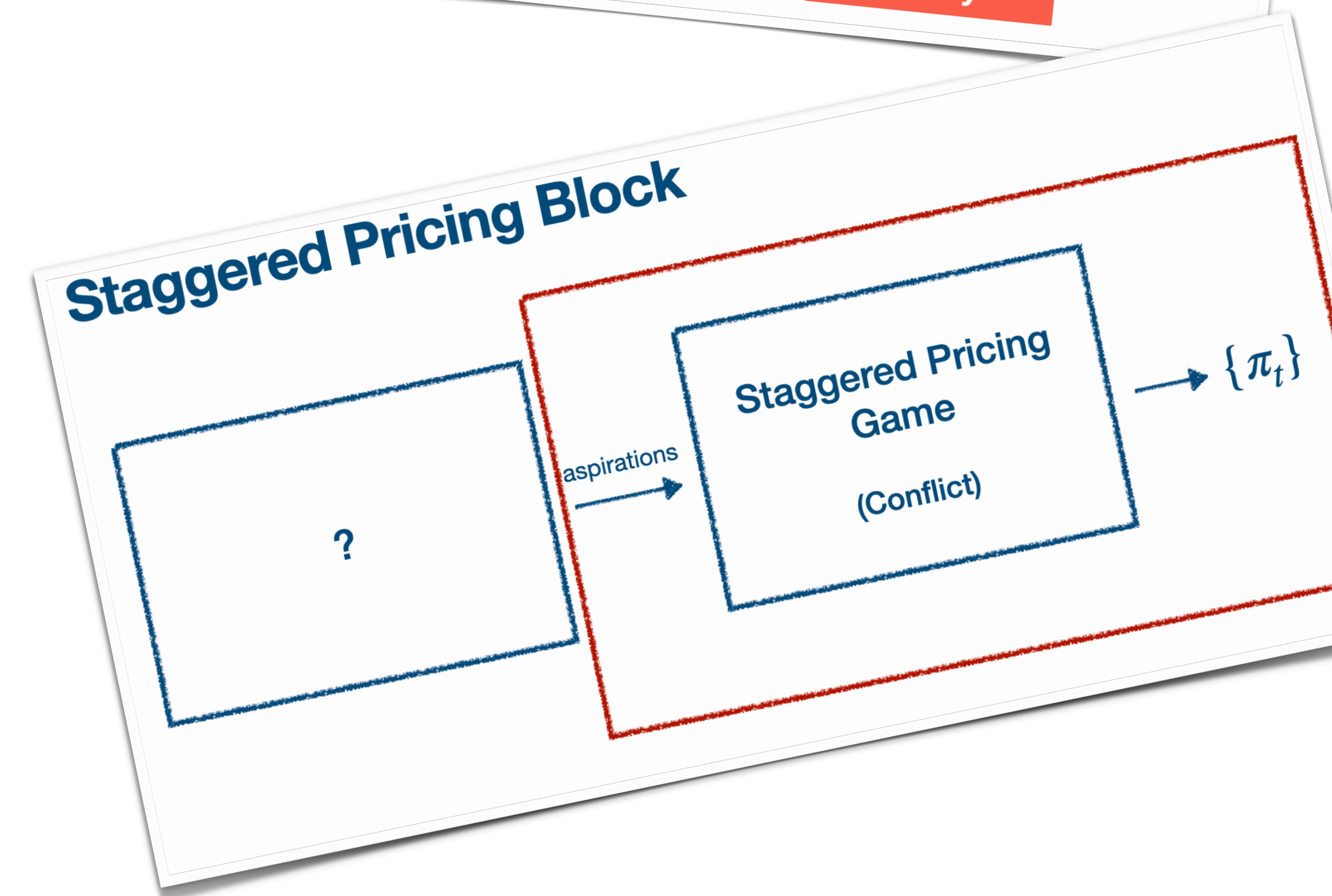
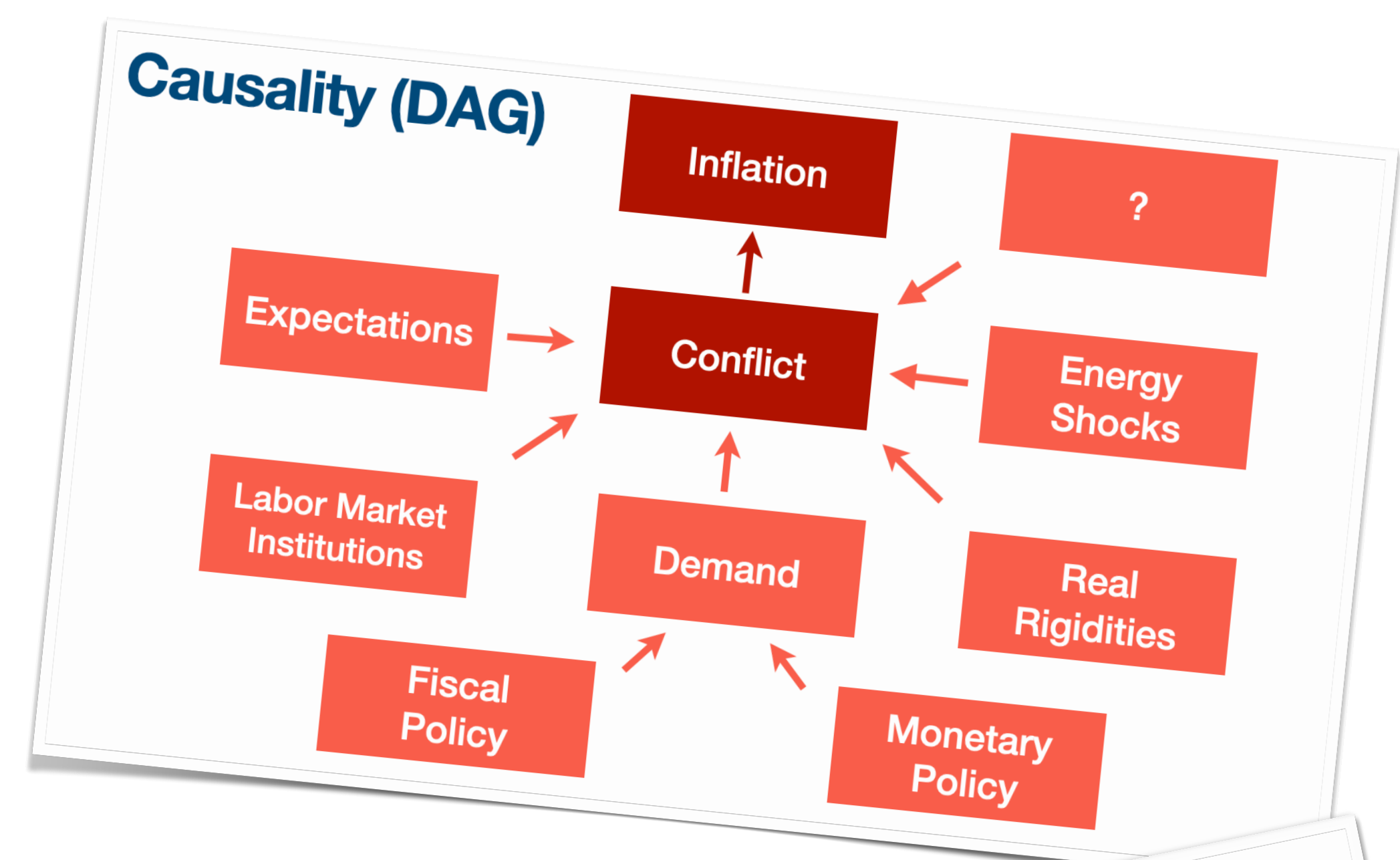
Wage-Price Example

$$a_W + a_P = 0$$

Modeling Aspirations...

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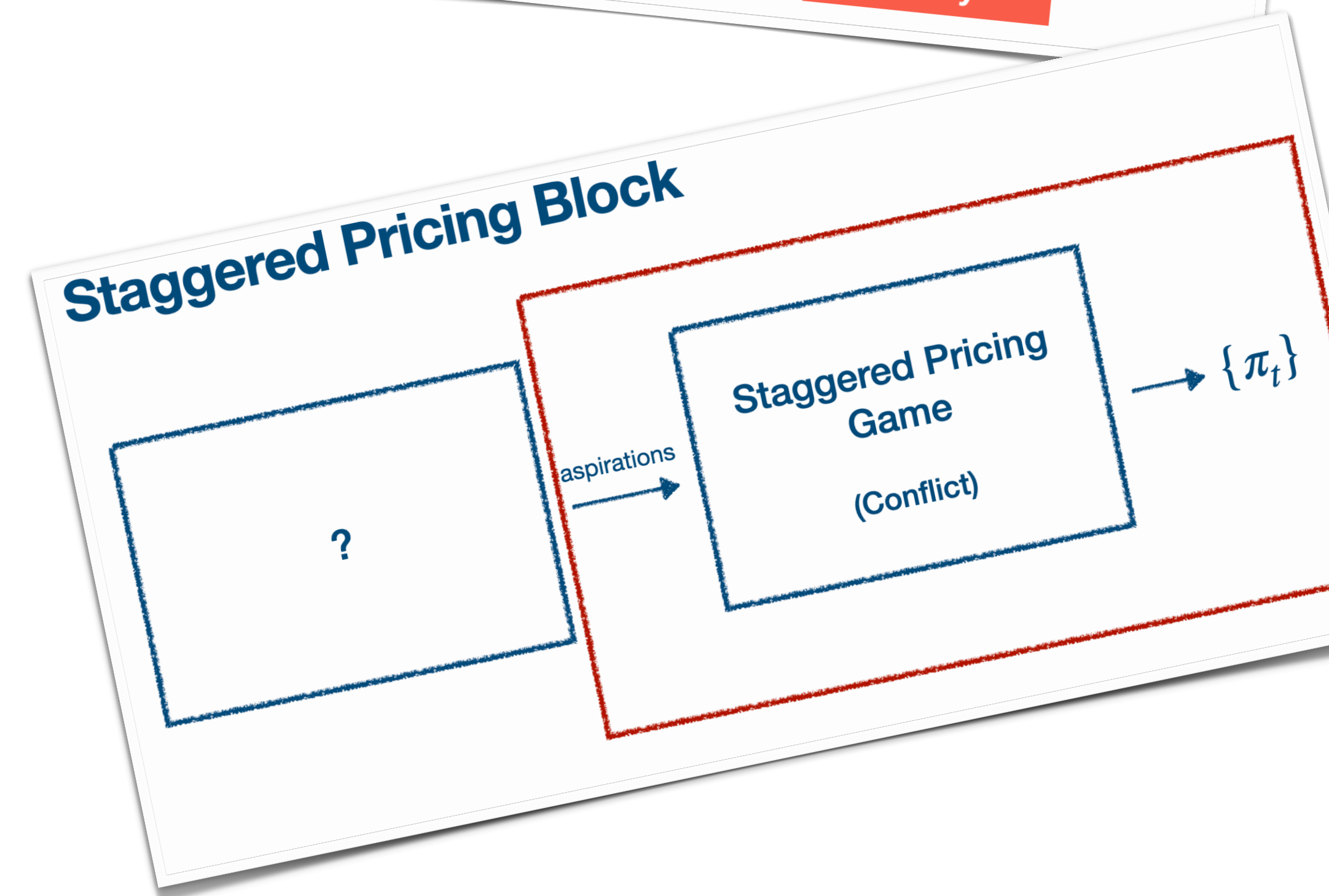
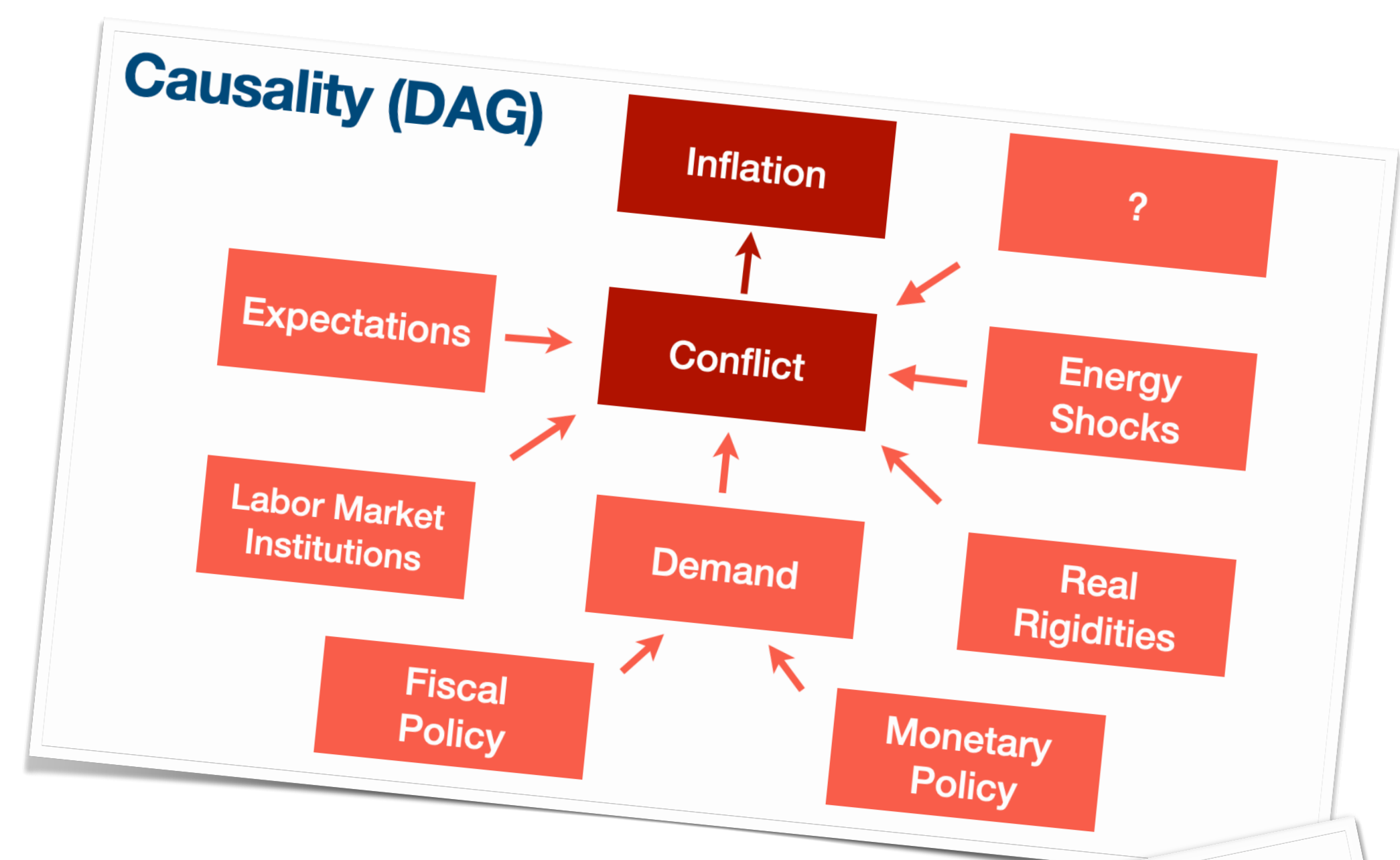
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$$a_w = \text{mrs} + \text{union markup} + \text{expected inflation}$$

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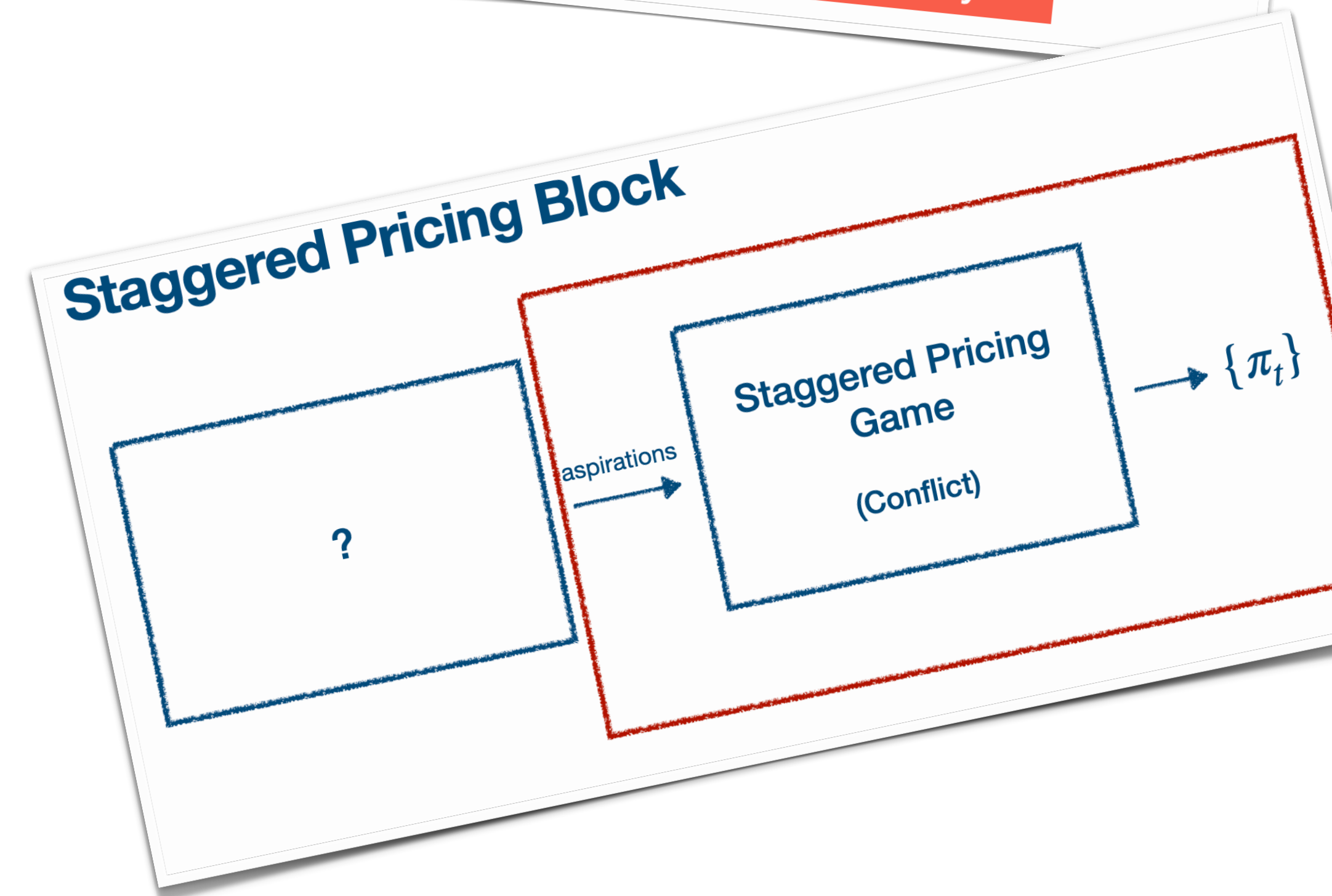
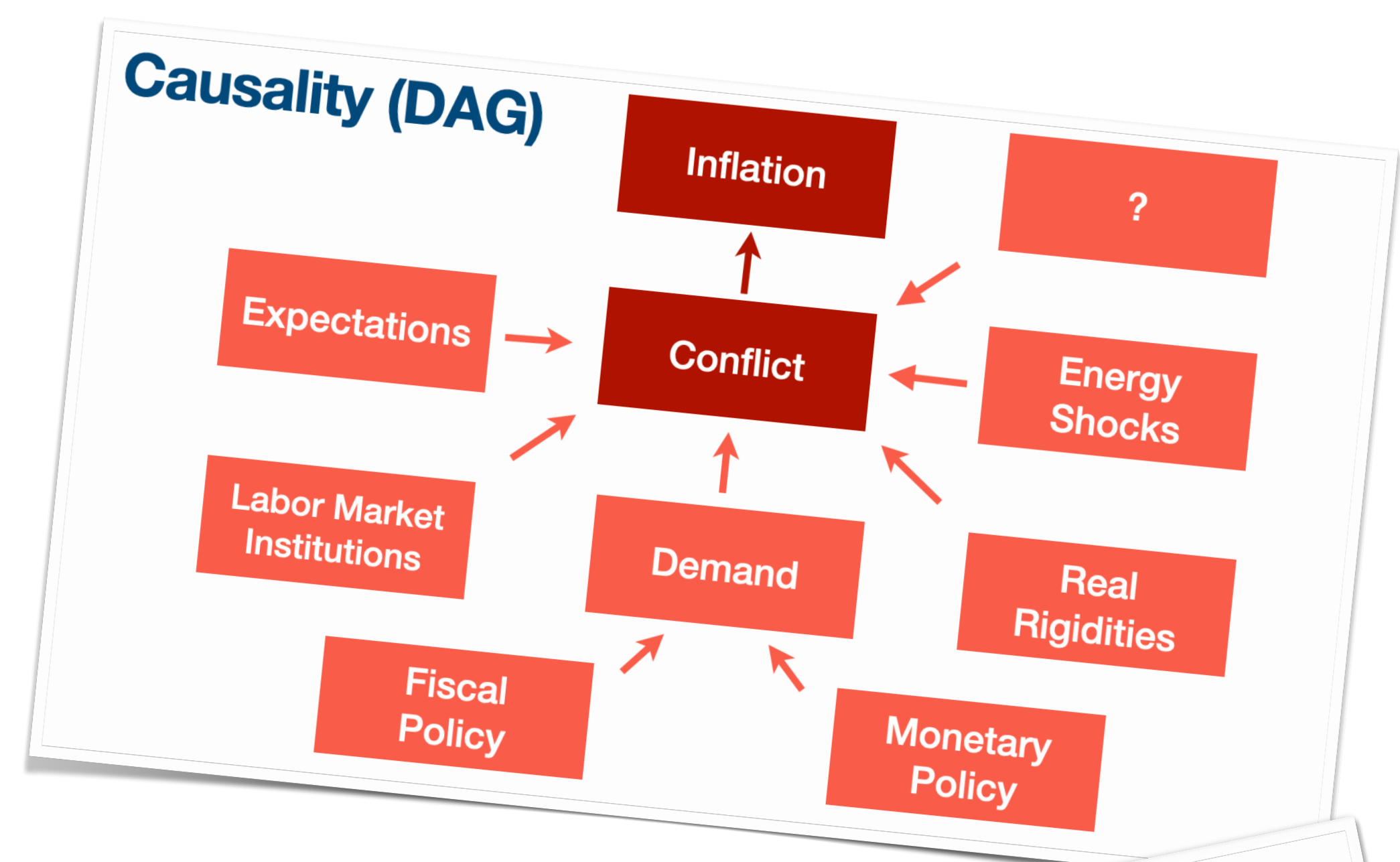
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$\hat{a} \rightarrow a$
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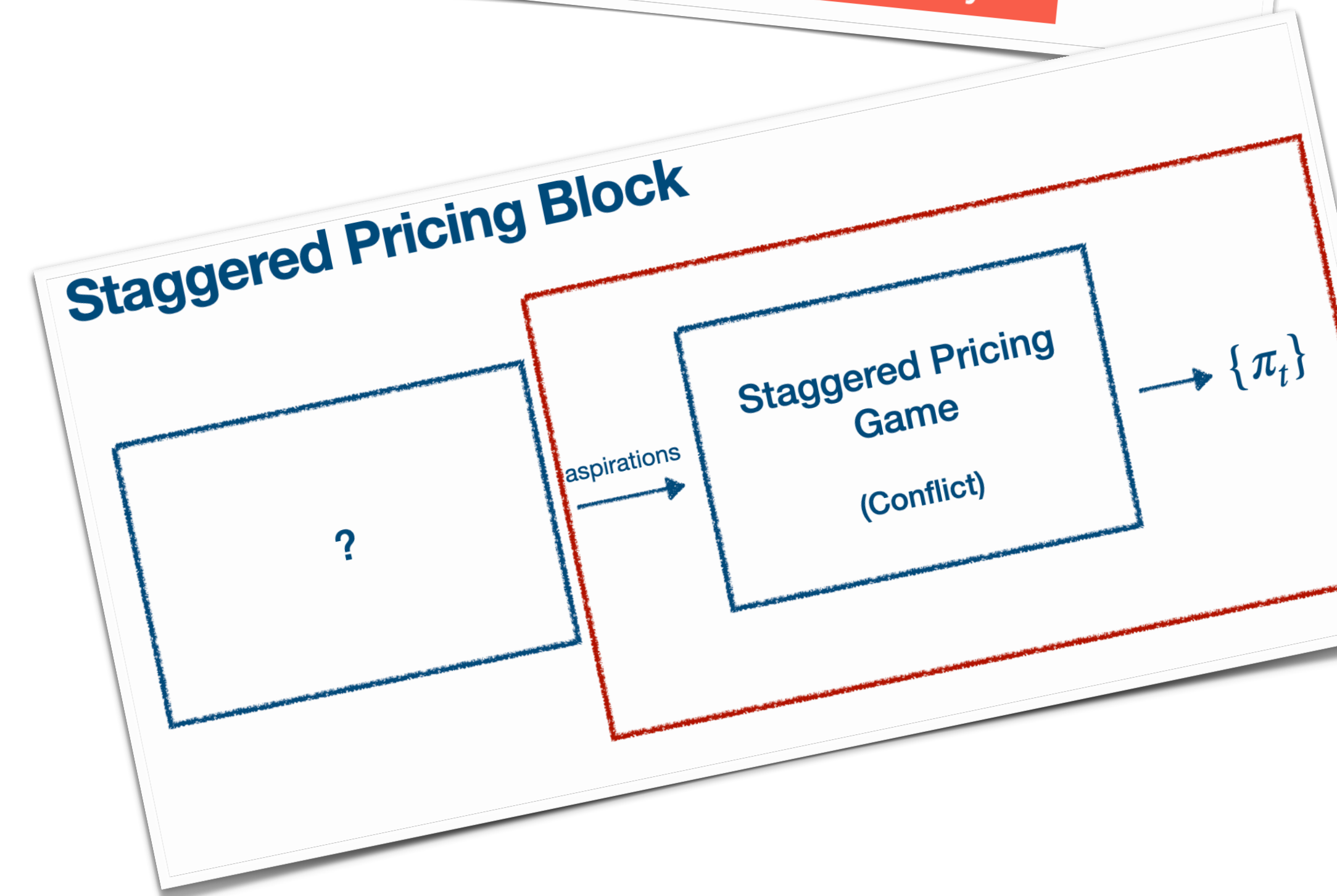
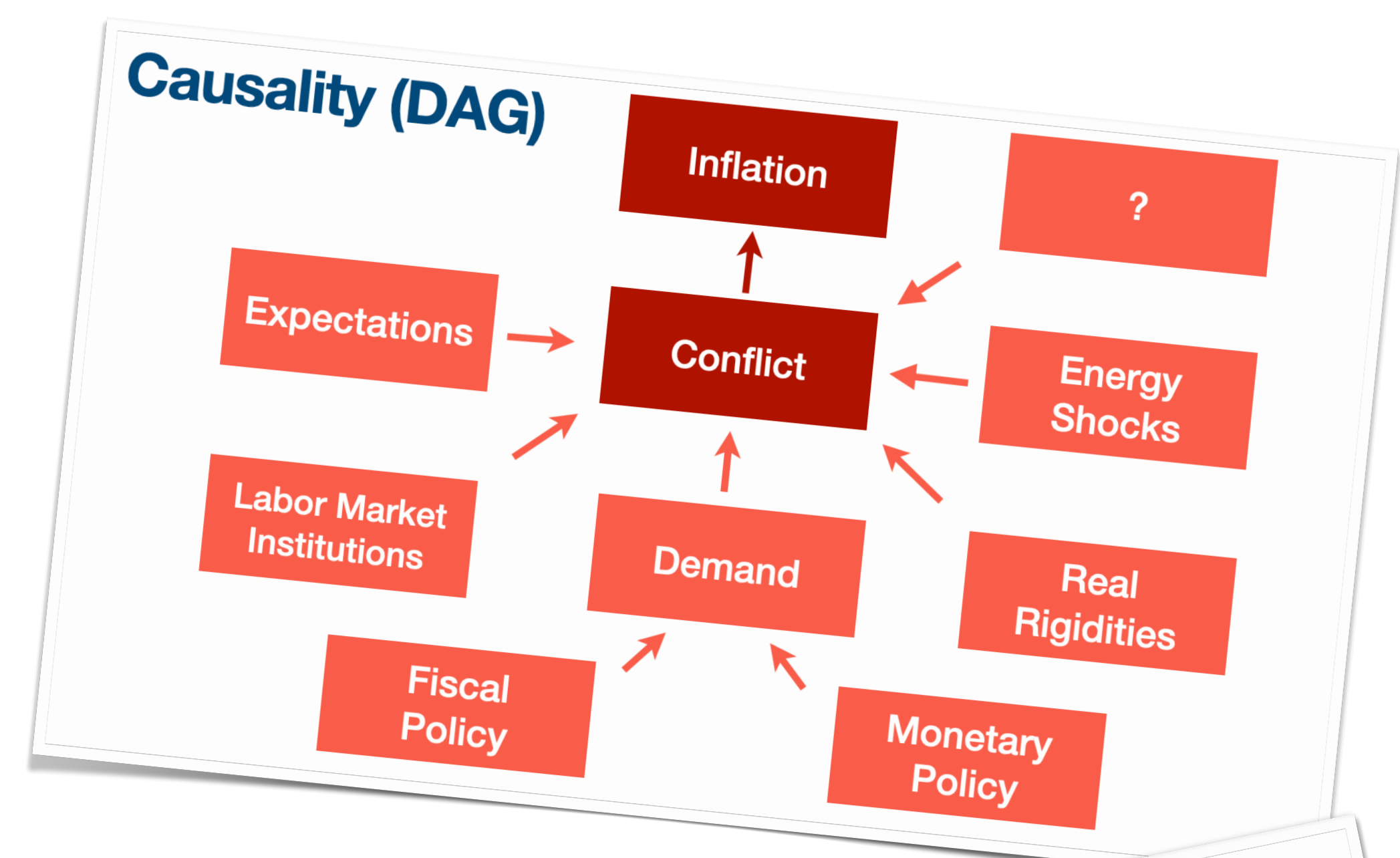
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- Other applications...

- real wage rigidities (Blanchard-Gali)
- income policies



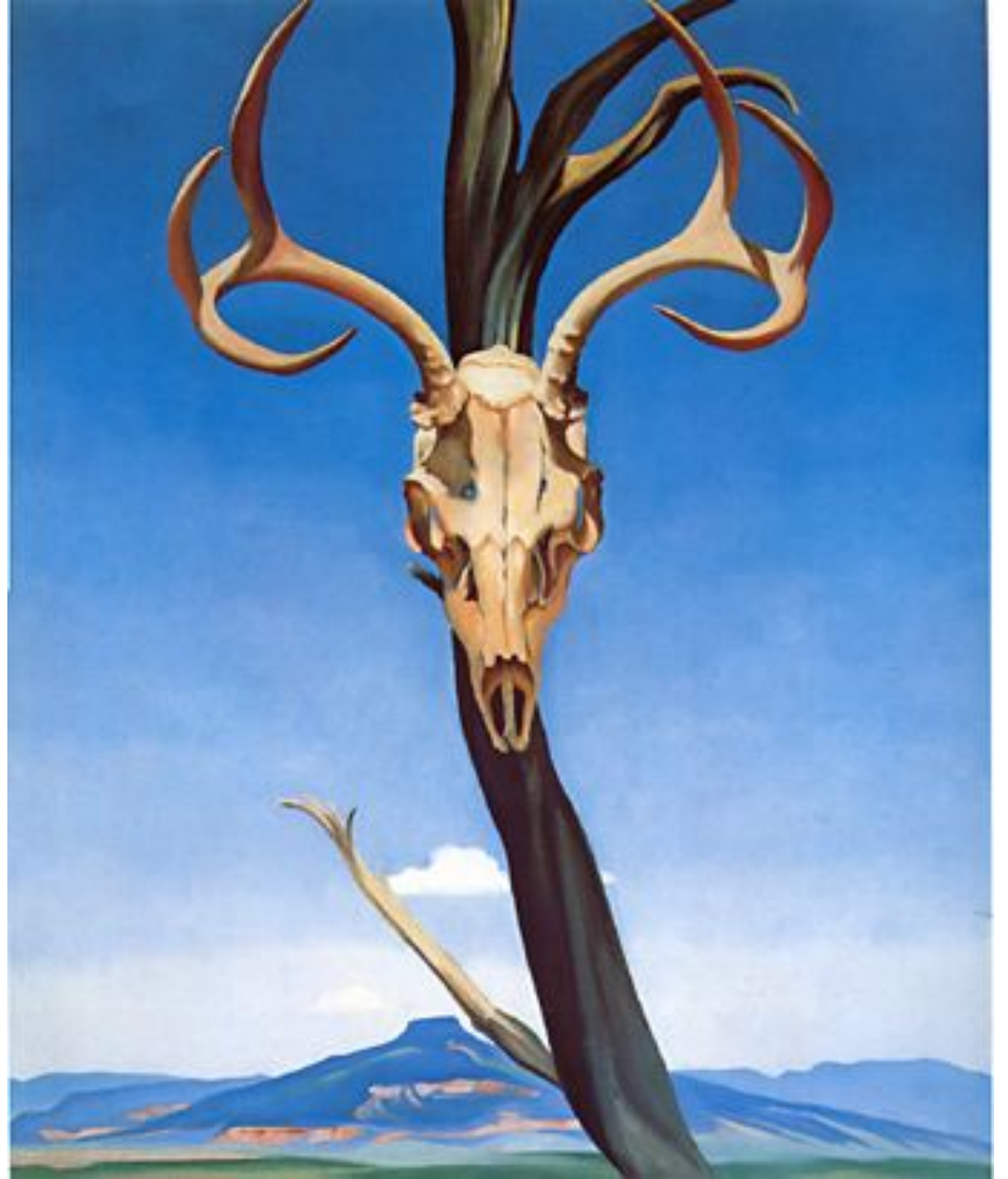
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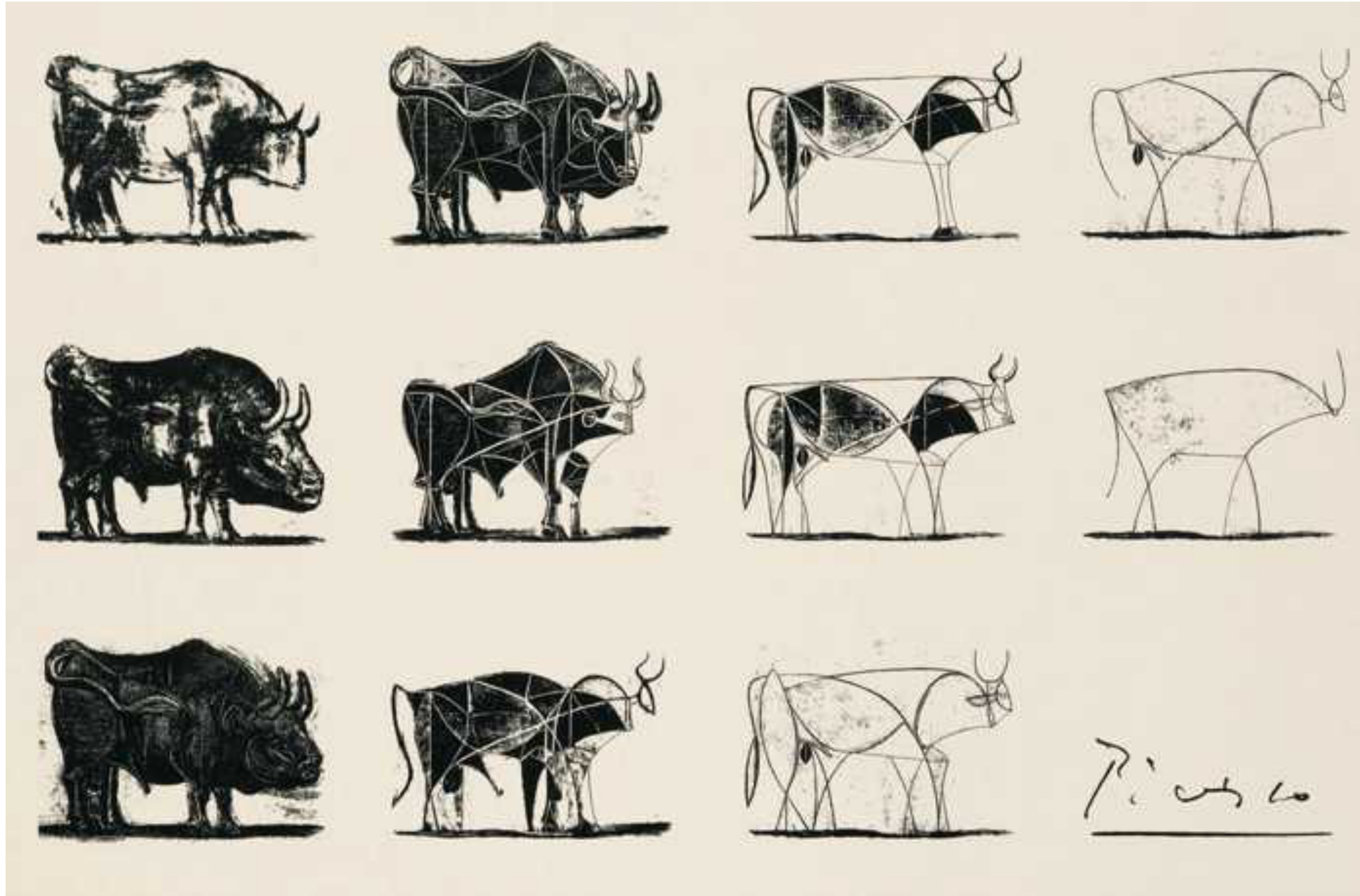
- Conceptual points with practical implications...

“Nothing is less real than realism. Details are confusing. It is only by selection, by elimination, by emphasis that we get at the real meaning of things.” -

Georgia O'Keeffe



Picasso



Borges: Funes



“Sospecho, sin embargo, que no era muy capaz de pensar.

Pensar es olvidar diferencias, es generalizar, abstraer. En el abarrotado mundo de Funes no había sino detalles, casi inmediatos.”

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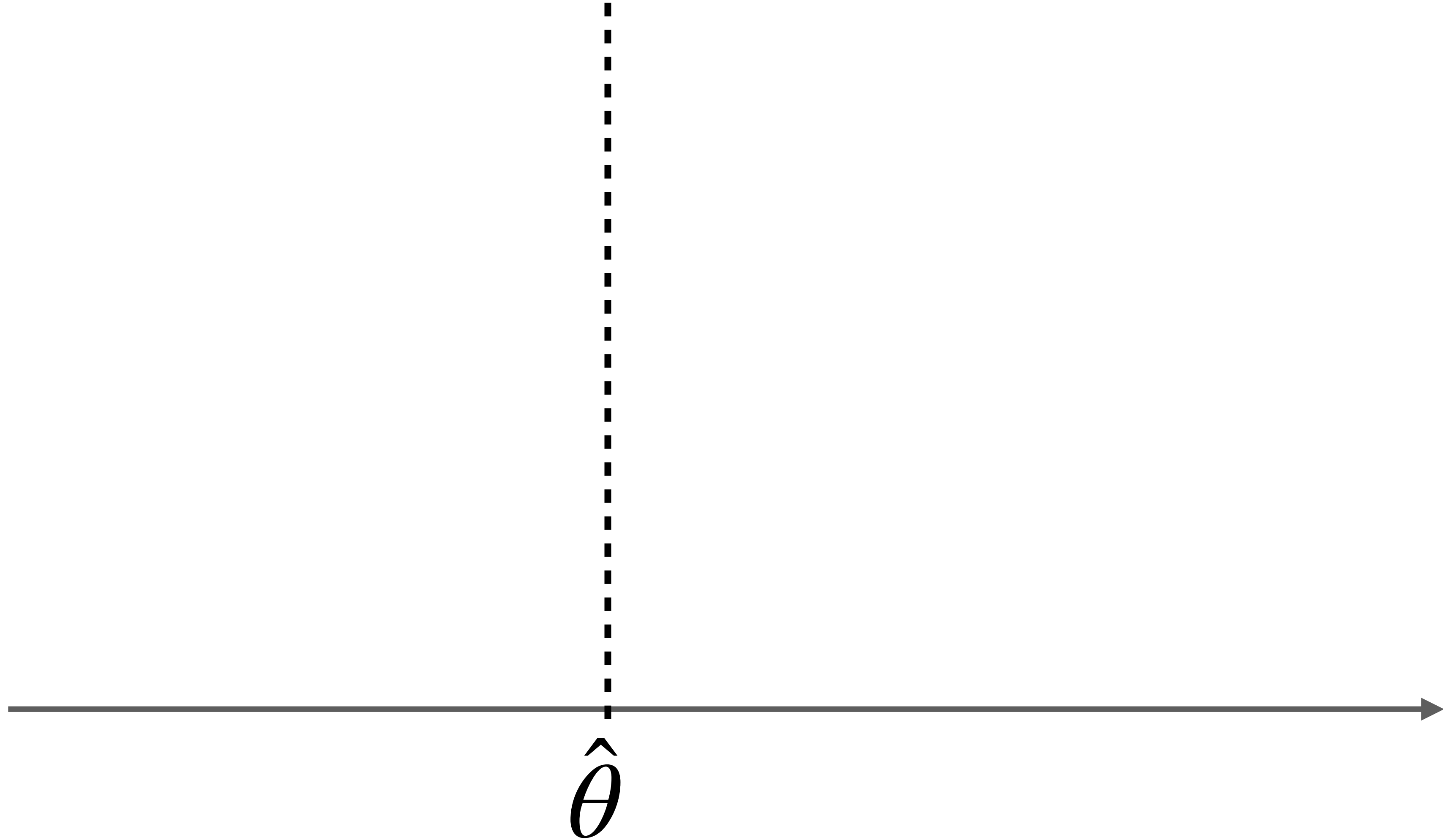
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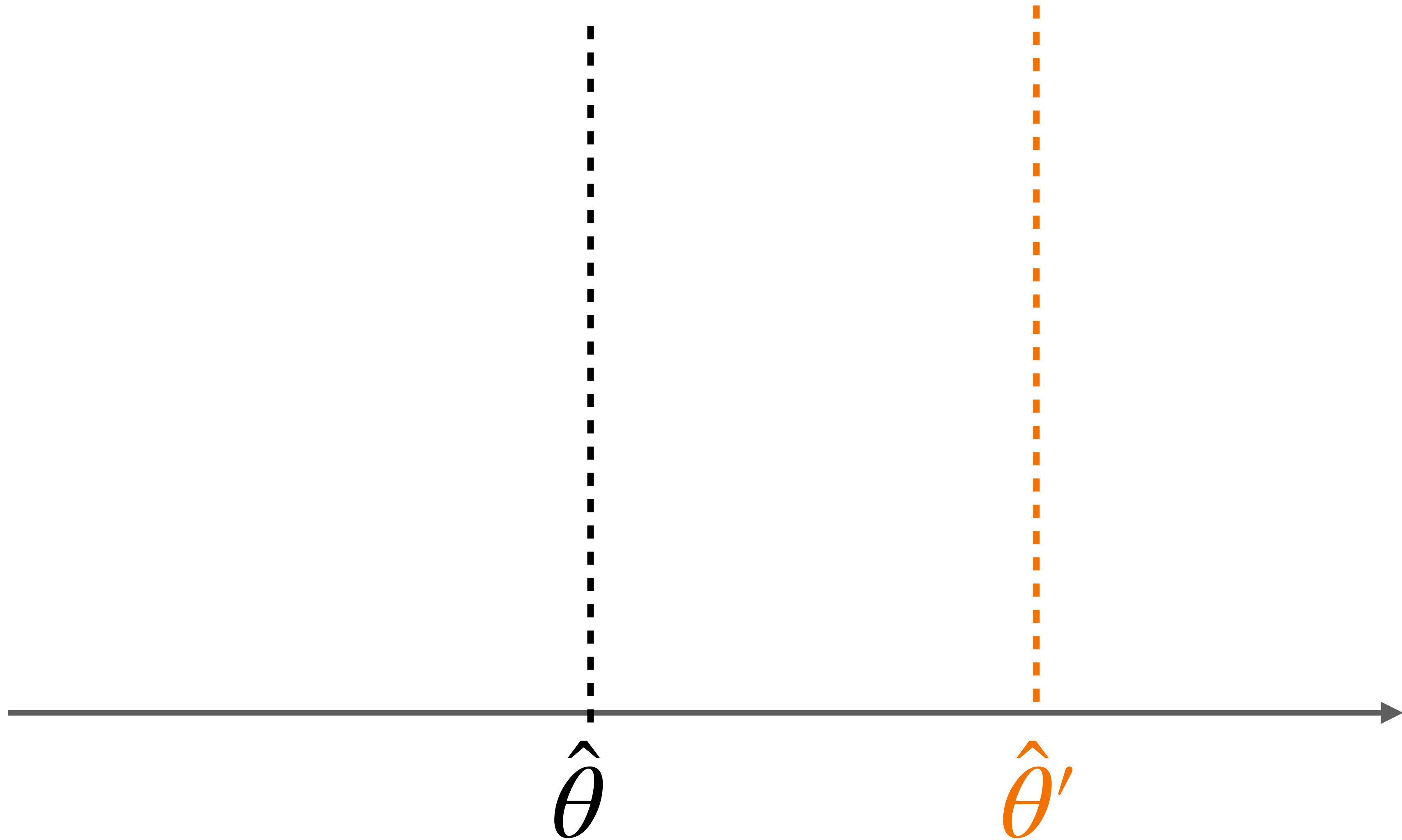
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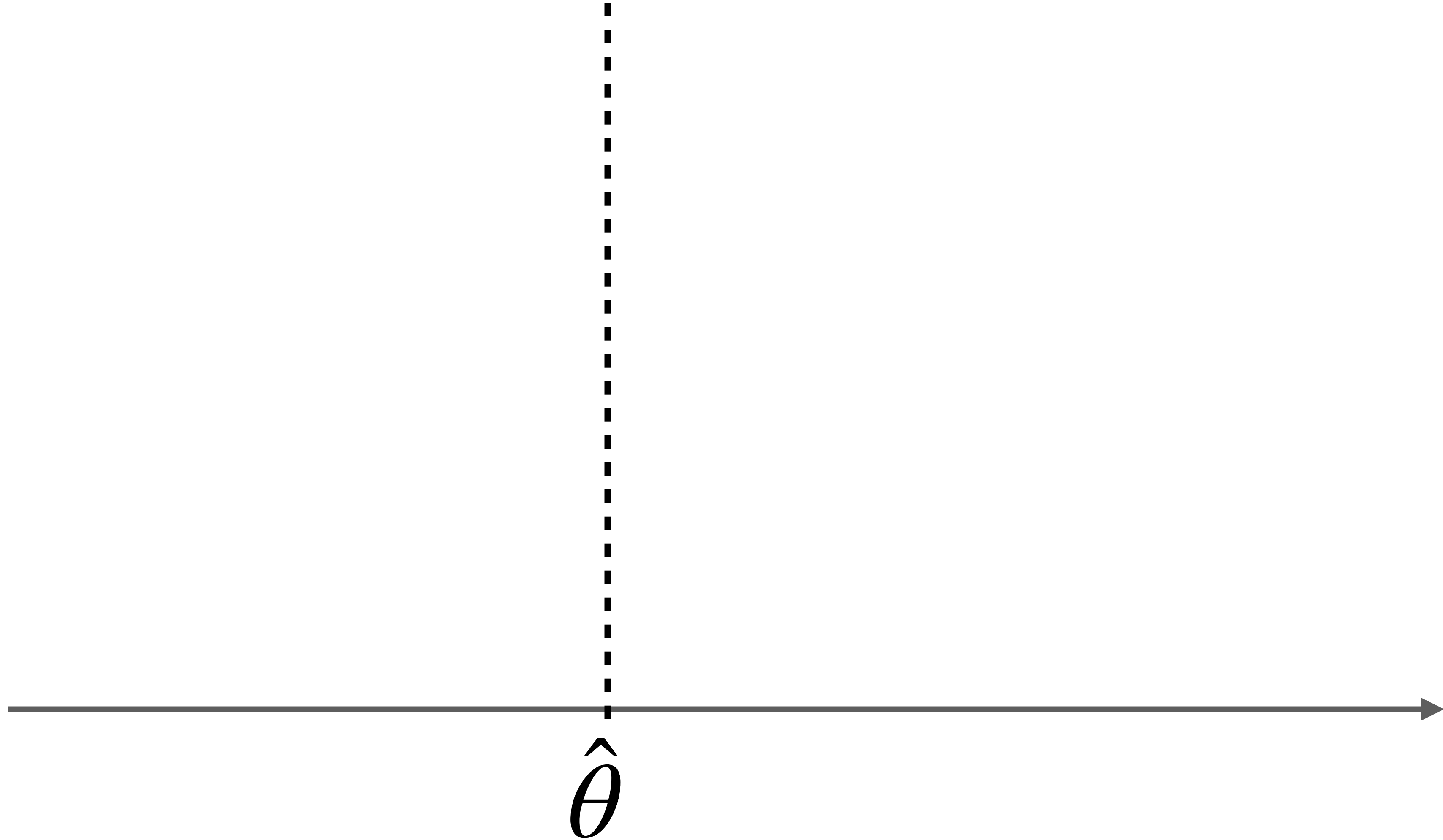
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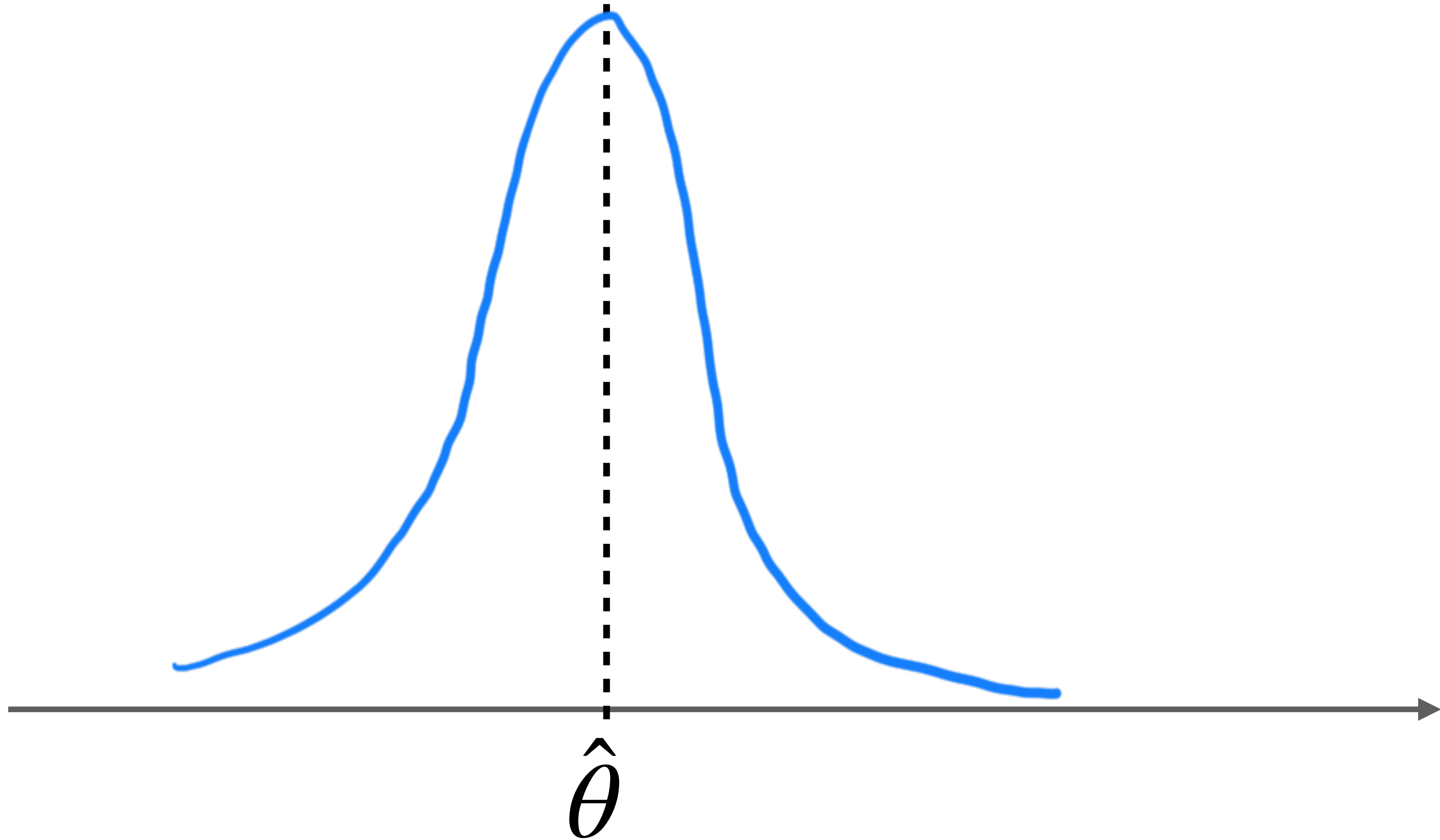
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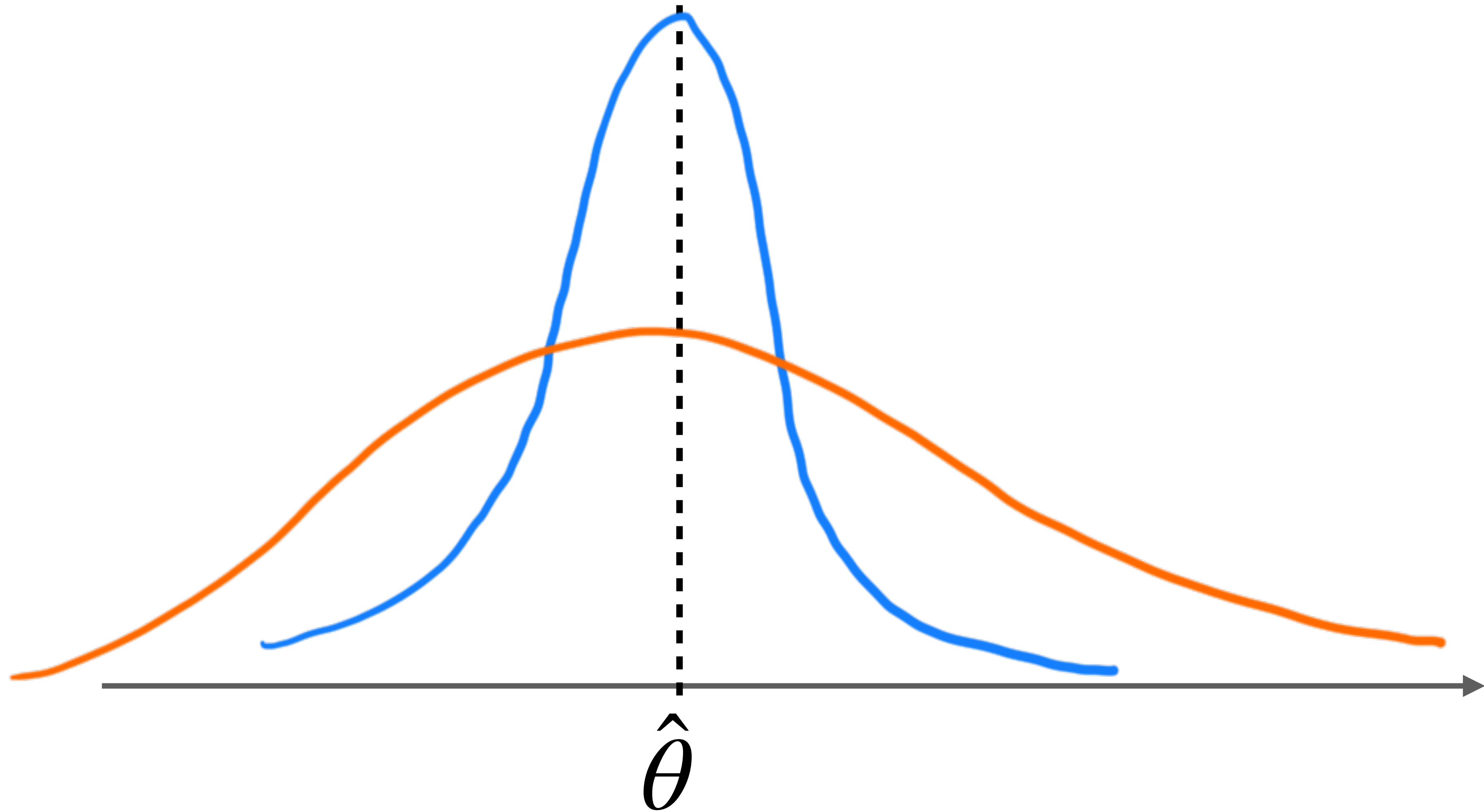
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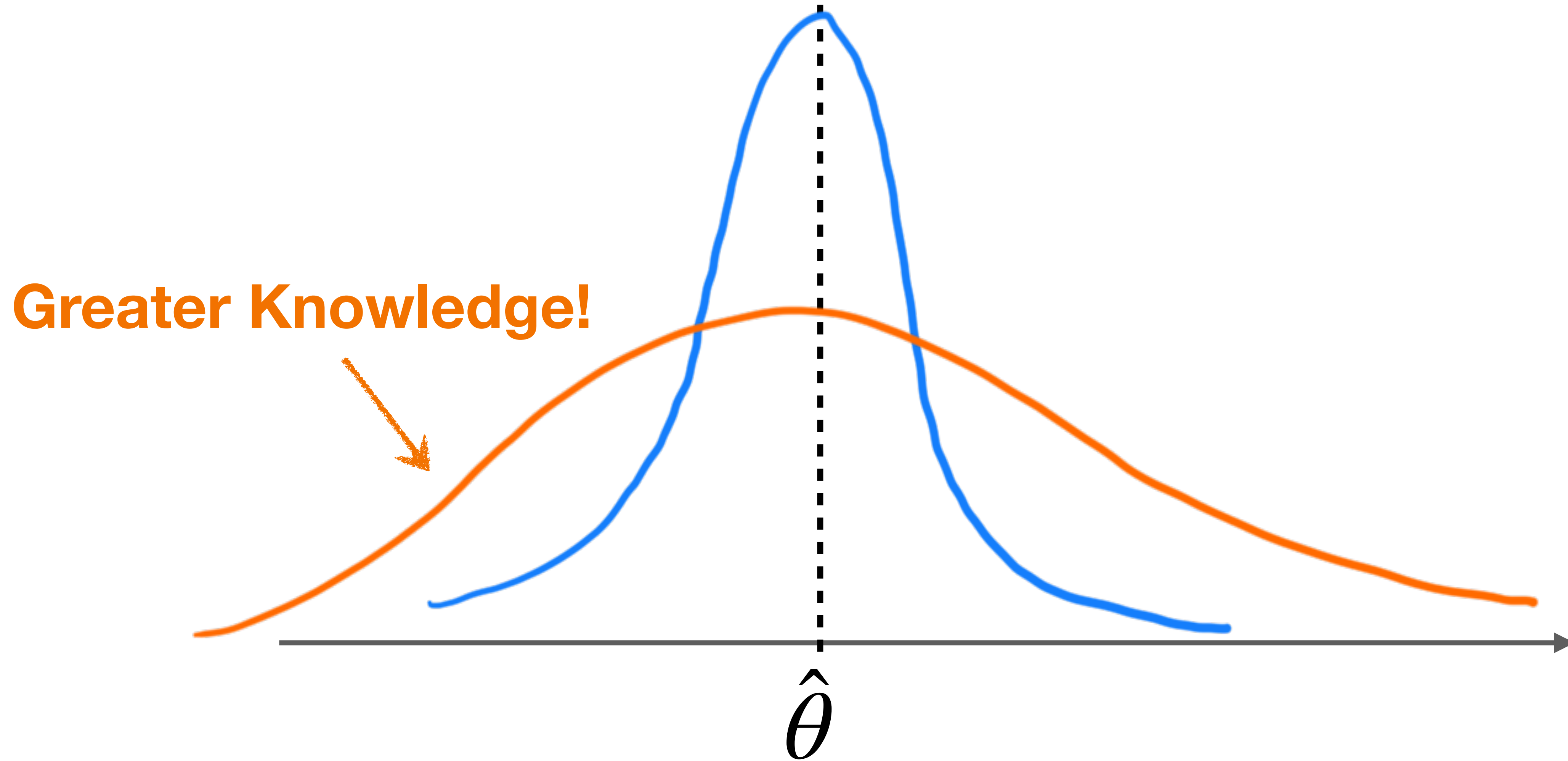
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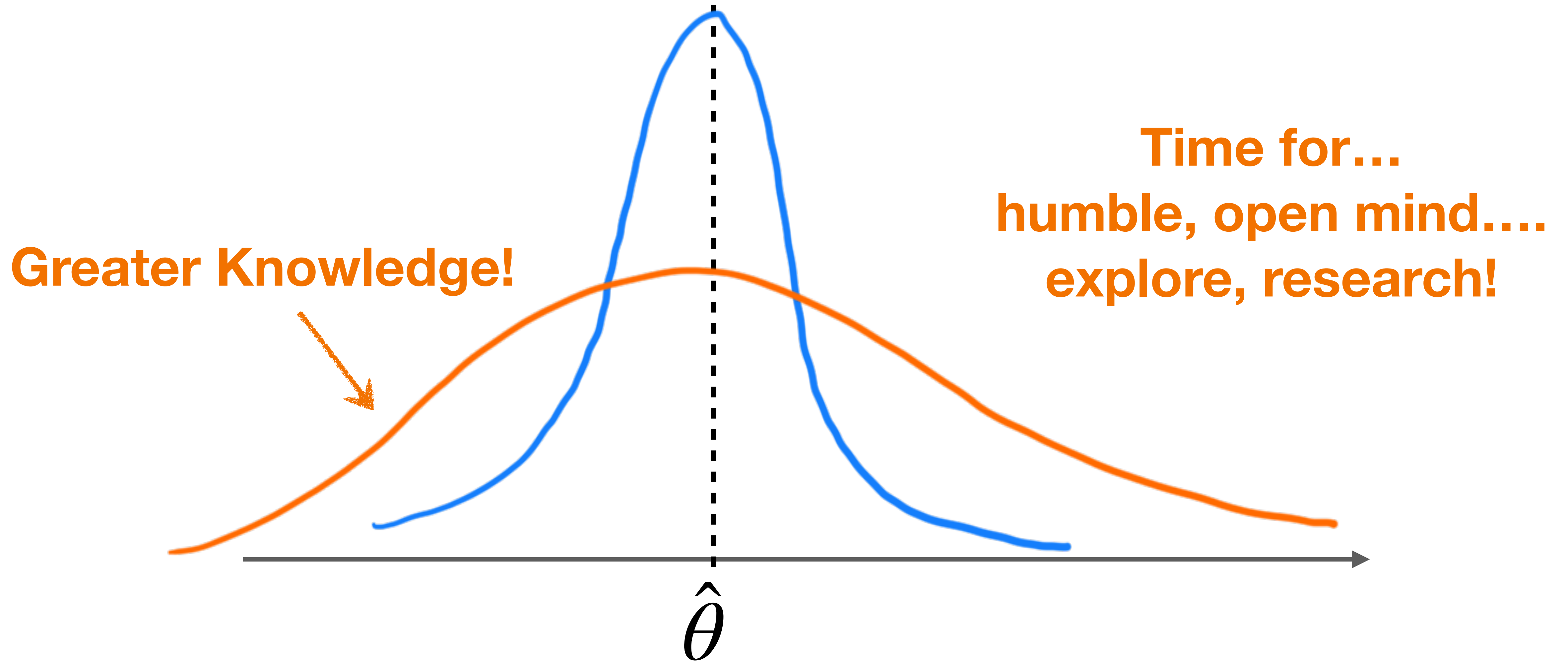
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Appendix: Some Links

- Irina Werning in The Guardian “How much?! The Absurdity of Inflation in Argentina”
- Guerrieri-Lorenzoni-Straub-Werning “Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?”
- Wang-Werning “Dynamic Oligopoly and Price Stickiness”
- Guerrieri-Lorenzoni-Straub-Werning “Monetary Policy in Times of Structural Change” (Jackson Hole, 2021) video
- Werning “Inflation Expectations and the Rate of Inflation” (2022) video
- Lorenzoni-Werning “Wage Price Spirals” (BPEA; 2023) podcast
- Lorenzoni-Werning “Inflation is Conflict” (2023) video

Extra if time permits...

Inflation Papers

- Dynamic Oligopoly and Price Stickiness Wang-Werning
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■ But Argentina...

- low credit: interest rate \rightarrow output broken? (commonly noticed)
- already in recession, without lowering rates! (not so commonly said!)
- **interest paid on various forms of money**
- **fiscal monetary interaction key: interest rates \rightarrow fiscal effects**
- **capital controls: exchange rate**

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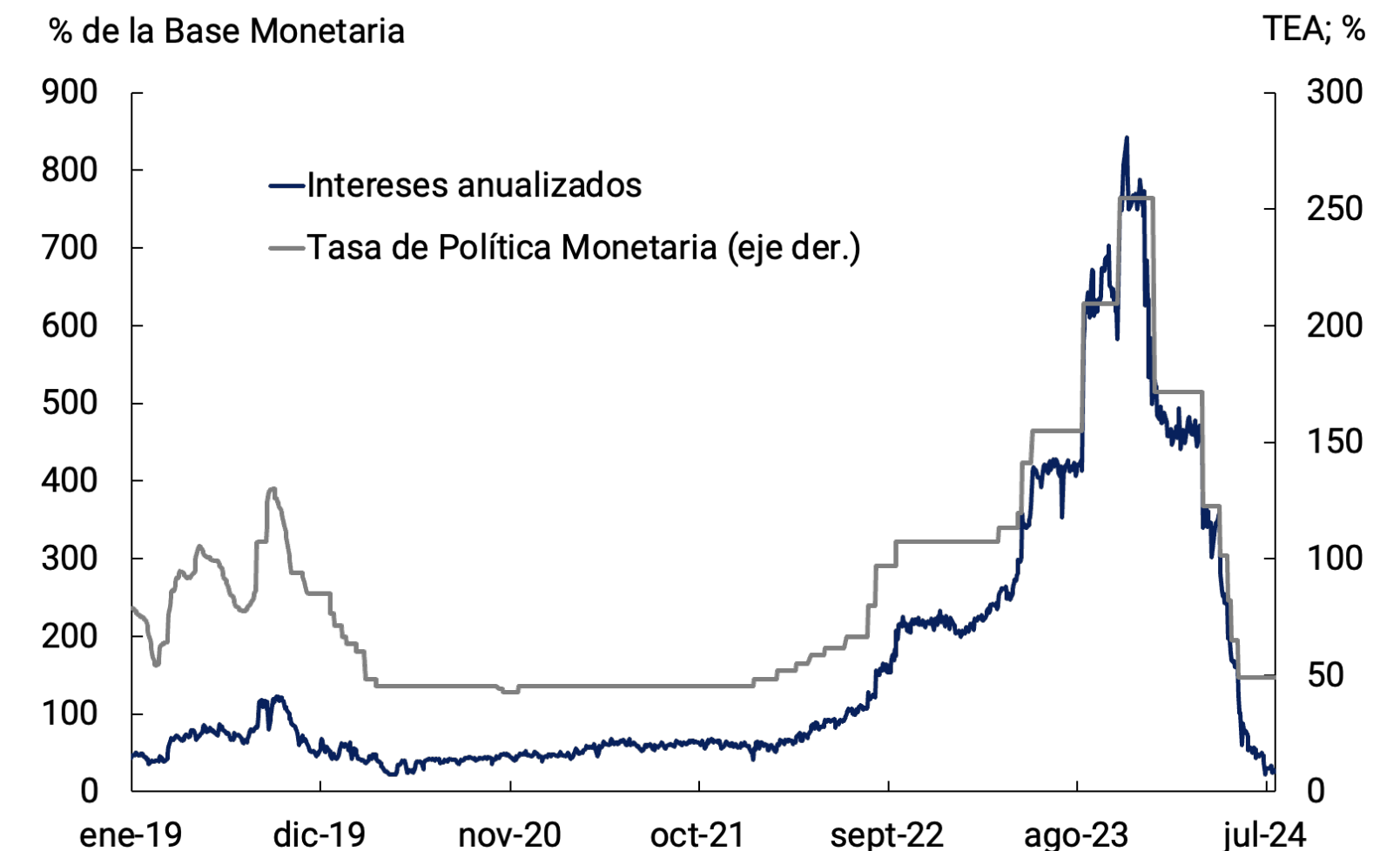
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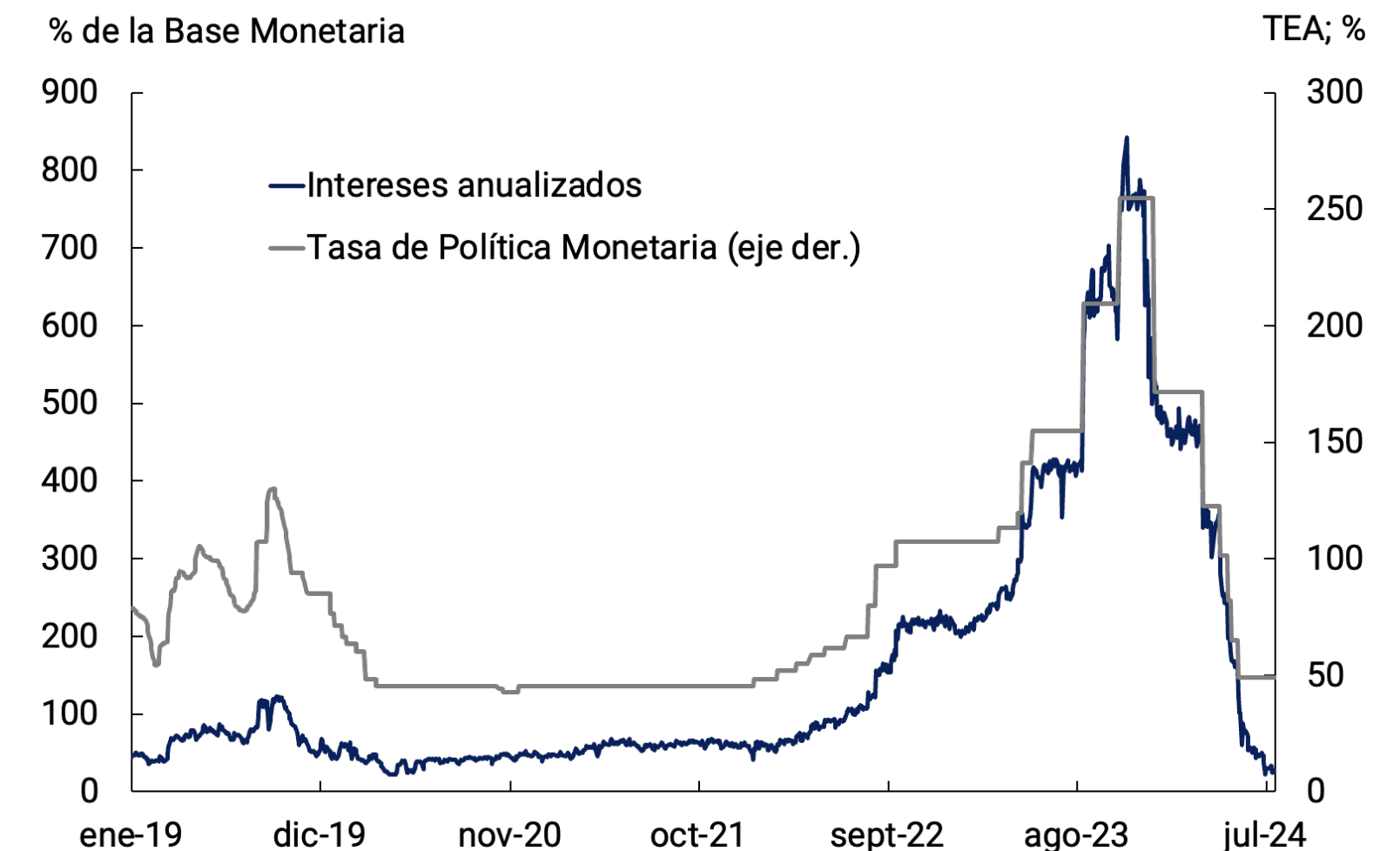
Q1: LOWER INTEREST RATES TO FIGHT INFLATION?

Q2: MAINTAIN CAPITAL CONTROLS?

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3RD BEST...
**CAGAN + INTEREST RATE +
CAPITAL CONTROLS**

Evidence: Giovannini & de Melo

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FROM FINANCIAL REPRESSION

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TABLE 3—THE FINANCIAL-REPRESSION TAX RATE
AND ITS COMPONENTS
(PERCENTAGES PER YEAR)

Country	Currency depreciation	Interest-rate differential	Tax rate
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Greece	14.29	1.65	15.94
India	7.38	3.43	10.81
Indonesia	11.6	11.67	23.27
Jamaica	0.47	6.85	7.32
Jordan	0.47	6.71	7.18
Korea	5.94	0.04	5.98
Malaysia	-0.64	2.40	1.76
Mexico	89.06	-43.25	45.81
Morocco	10.33	5.74	16.07
Pakistan	15.19	10.10	25.29
Panama	0.00	4.36	4.36
Papua New Guinea	4.66	0.90	5.56
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Mexico	1984–1987	5.77	39.65
Morocco	1977–1985	2.31	8.89
Pakistan	1982–1983	3.23	20.50
Panama	1977–1987	0.69	2.49
Papua	1981–1987	0.40	1.90
New Guinea			
Philippines	1975–1986	0.45	3.88
Portugal	1978–1986	2.22	6.93
Sri Lanka	1981–1983	3.40	19.24
Thailand	1976–1986	0.38	2.57
Tunisia	1978–1987	1.49	4.79
Turkey	1980–1987	2.20	10.89
Zaire	1974–1986 ^a	0.46	2.48
Zimbabwe	1981–1986	5.50	19.13

TABLE 3—THE FINANCIAL-REPRESSION TAX RATE AND ITS COMPONENTS (PERCENTAGES PER YEAR)

Country	Currency depreciation	Interest-rate differential	Tax rate
Brazil	196.77	-183.32	13.45
Colombia	18.97	3.46	22.43
Costa Rica	20.9	4.21	25.11
Greece	14.29	1.65	15.94
India	7.38	3.43	10.81
Indonesia	11.6	11.67	23.27
Jamaica	0.47	6.85	7.32
Jordan	0.47	6.71	7.18
Korea	5.94	0.04	5.98
Malaysia	-0.64	2.40	1.76
Mexico	89.06	-43.25	45.81
Morocco	10.33	5.74	16.07
Pakistan	15.19	10.10	25.29
Panama	0.00	4.36	4.36
Papua New Guinea	4.66	0.90	5.56
Philippines	10.42	1.53	11.95
Portugal	17.36	-2.00	15.36
Sri Lanka	12.53	2.00	14.53
Thailand	2.45	1.84	4.29
Tunisia	7.22	5.98	13.2
Turkey	54.64	0.85	55.49
Zaire	56.29	6.00	62.29
Zimbabwe	17.8	2.50	20.3

Seigniorage

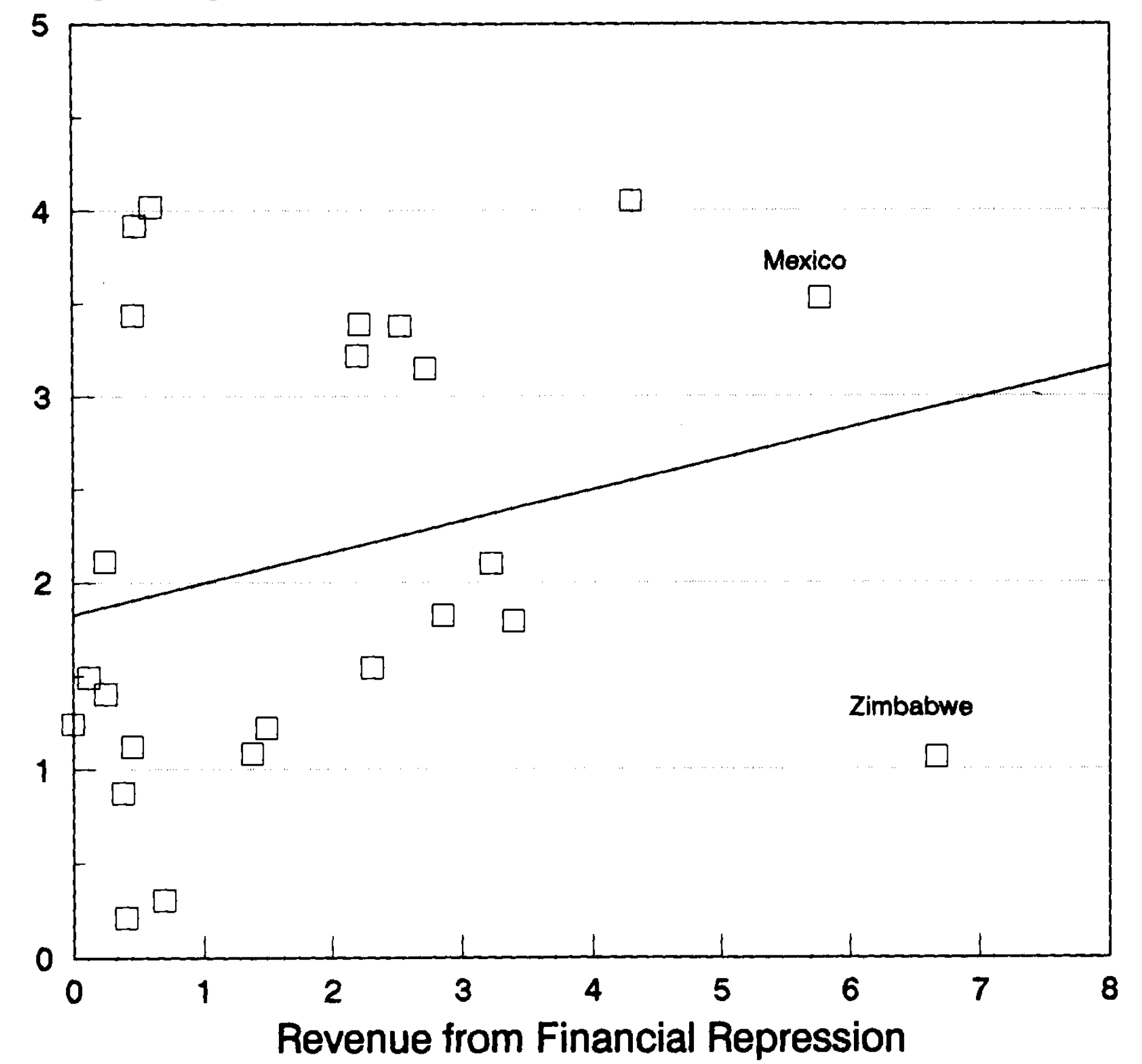


FIGURE 1. FINANCIAL-REPRESSION REVENUE AND SEIGNIORAGE (PERCENTAGES OF GDP)

Evidence: Giovannini & de Melo

HIGH REVENUE!

HIGH TAX RATE!

POSITIVELY RELATED TO SEIGNORAGE

TABLE 1—THE SIZE OF REVENUE FROM FINANCIAL REPRESSION

Country	Sample	Revenue from financial repression	
		Percentage of GDP	Percentage of tax revenue
Algeria	1974–1987	4.30	11.42
Brazil	1983–1987	0.48	1.57
Colombia	1980–1984	0.24	2.11
Costa Rica	1972–1984	2.33	12.76
Greece	1974–1985	2.53	7.76
India	1980–1985	2.86	22.38
Indonesia	1976–1986	0.00	0.00
Jamaica	1980, 1982	1.38	4.74
Jordan	1978–1987	0.60	2.40
Korea	1975–1987	0.25	1.36
Malaysia	1974–1981	0.12	0.31
Mexico	1984–1987	5.77	39.65
Morocco	1977–1985	2.31	8.89
Pakistan	1982–1983	3.23	20.50
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TABLE 3—THE FINANCIAL-REPRESSION TAX RATE AND ITS COMPONENTS (PERCENTAGES PER YEAR)

Country	Currency depreciation	Interest-rate differential	Tax rate
Algeria	1.59	8.49	10.08
Brazil	196.77	-183.32	13.45
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Seigniorage

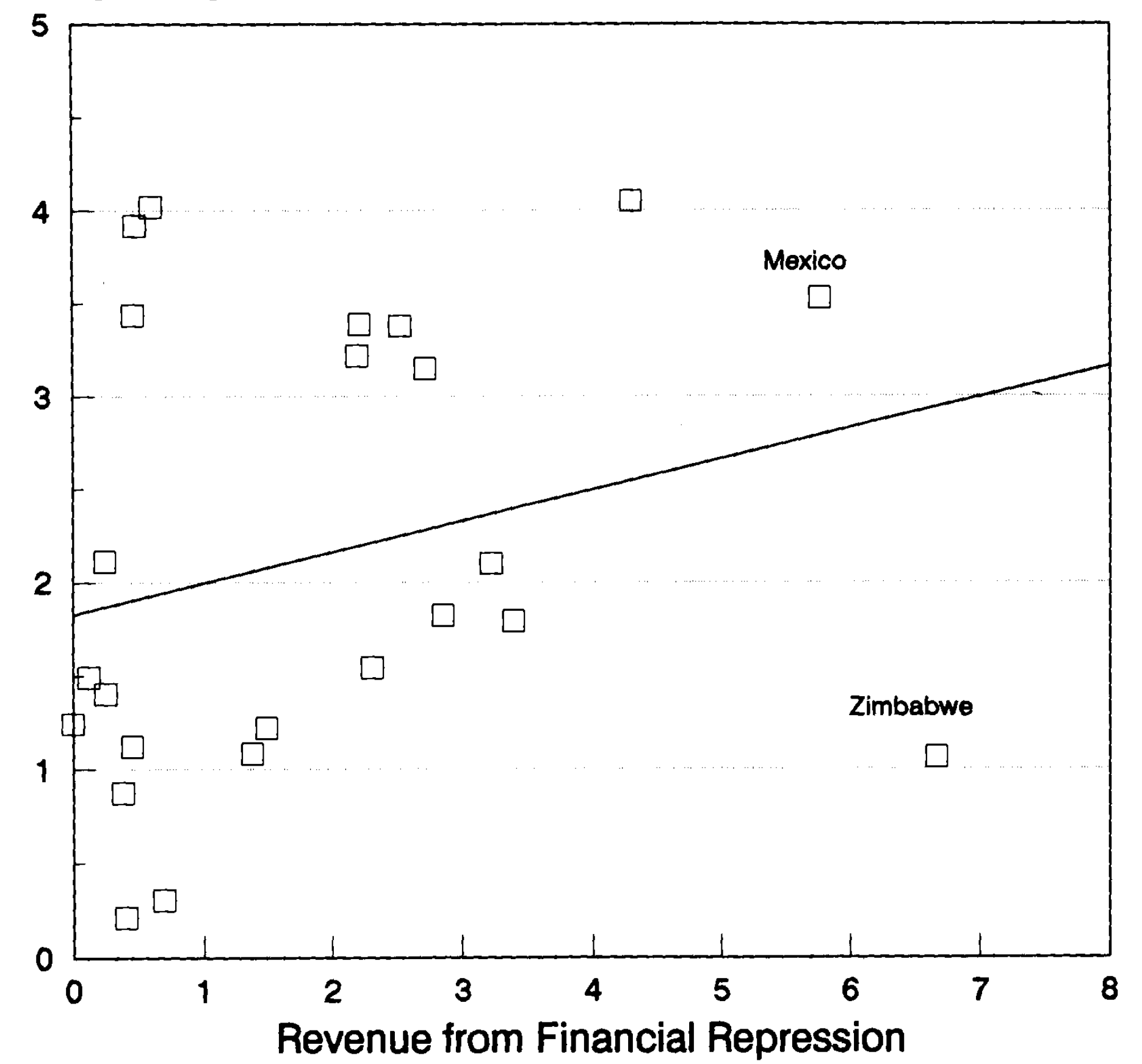


FIGURE 1. FINANCIAL-REPRESSION REVENUE AND SEIGNIORAGE (PERCENTAGES OF GDP)

Main Results

Main Results

1. Optimal interest rate...

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- Inflation \rightarrow tax on M0

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- Inflation \rightarrow tax on M0
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- Positive capital control (even if no direct revenue!)
 - depress domestic rate
 - increase demand for government liabilities

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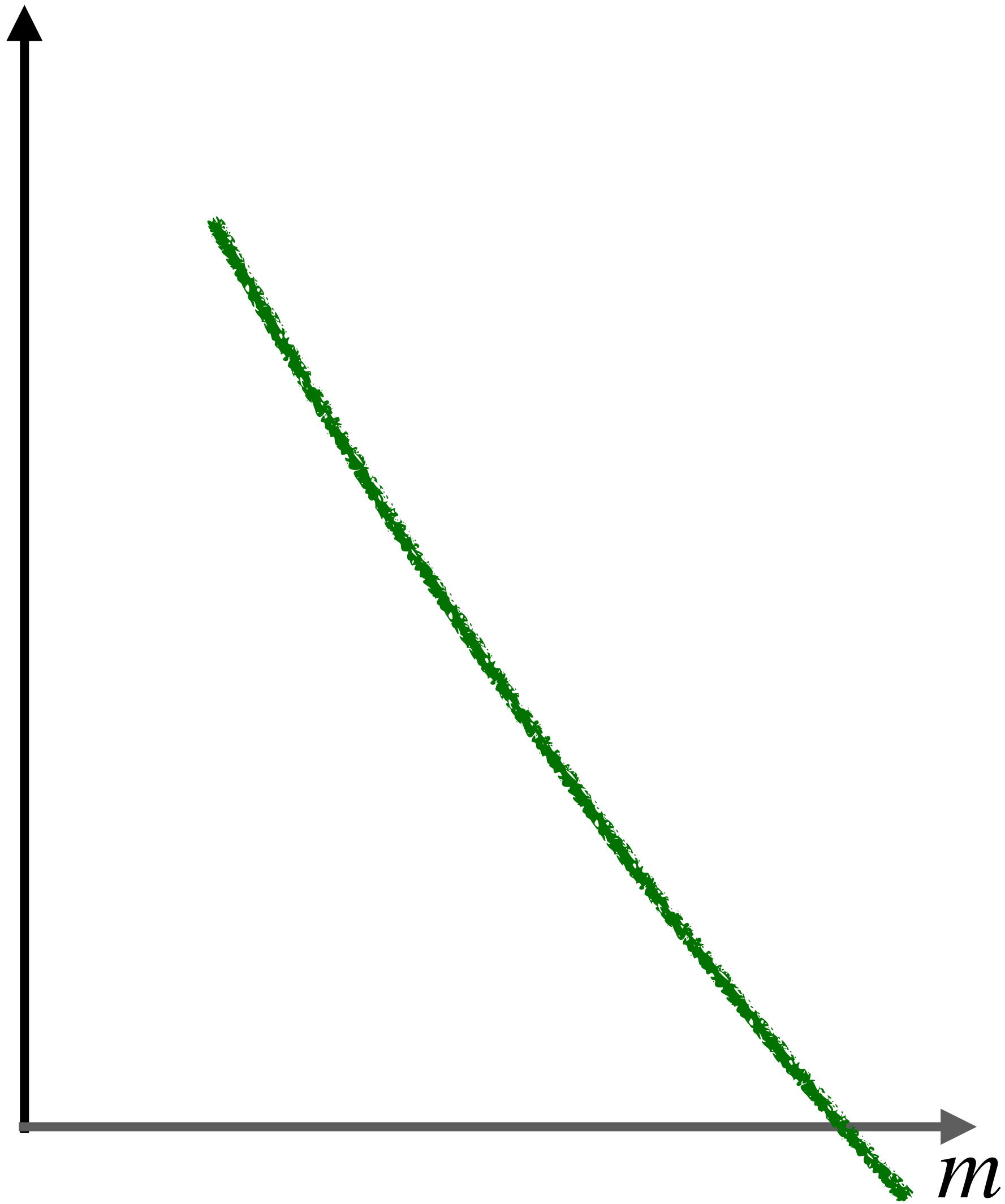
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INFLATION = REPRESSION...

**...BETTER OPTIMIZE
REPRESSION!**

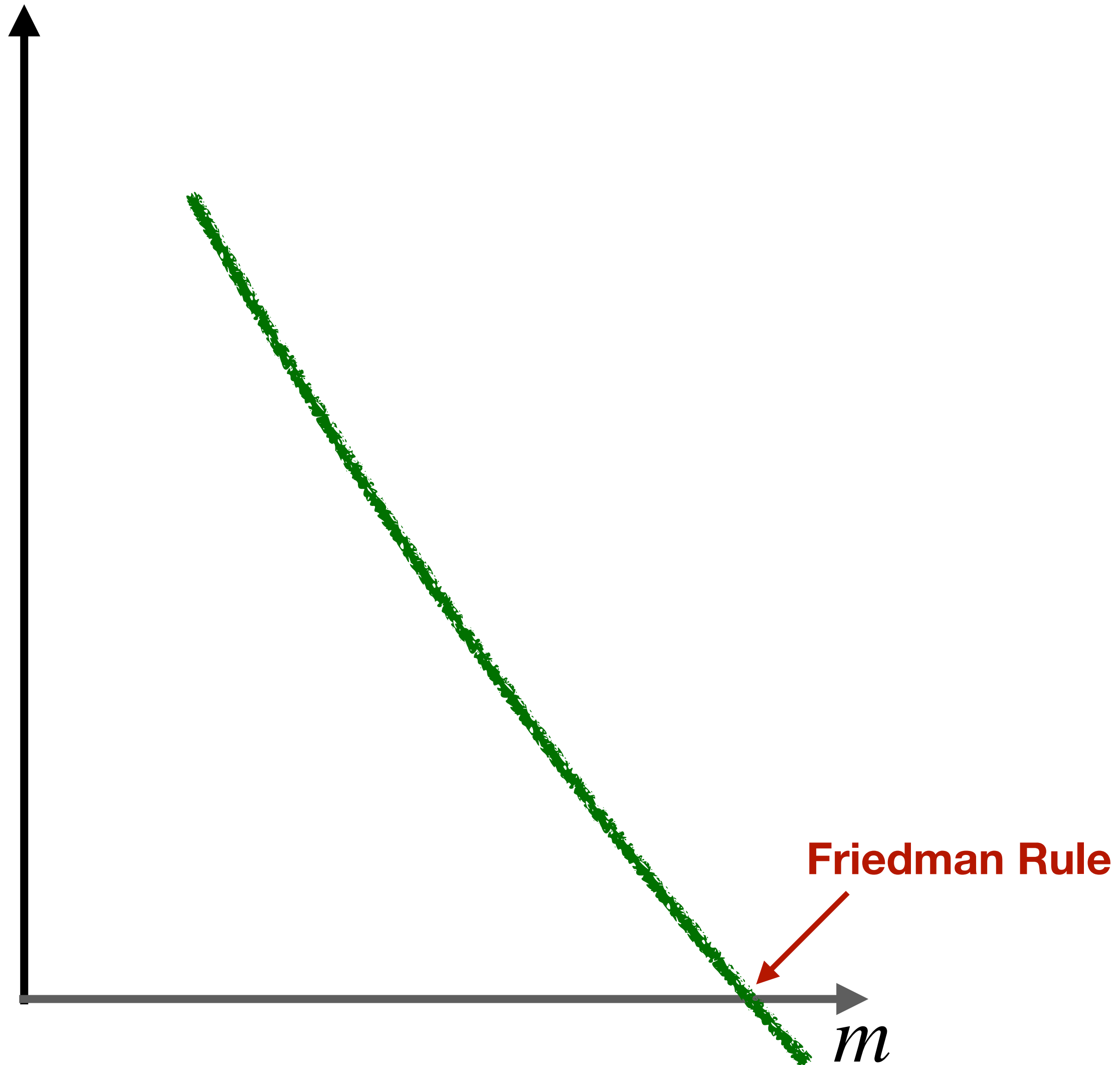
Main Results

$$\tau_m = \pi - i_m = \pi$$



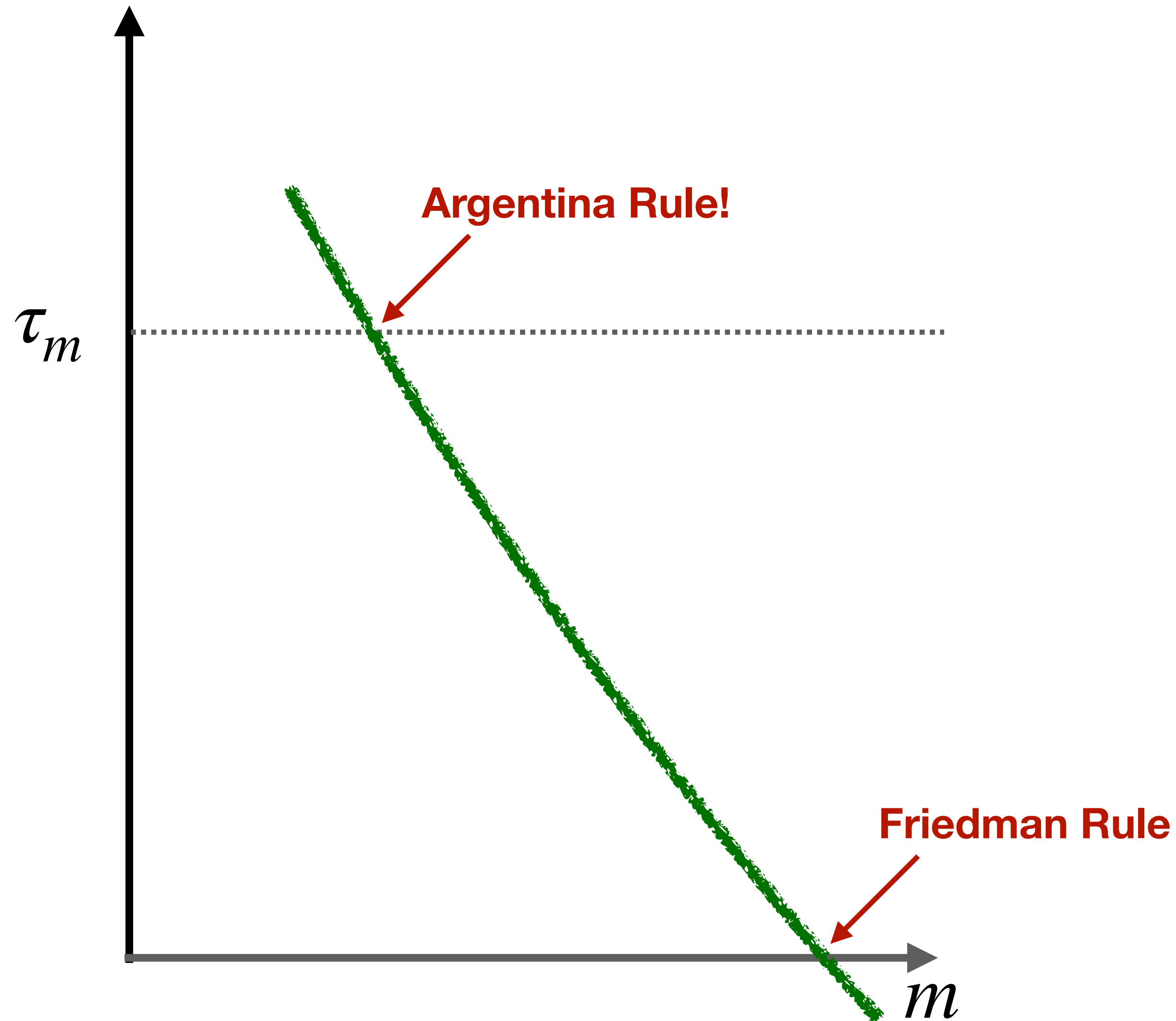
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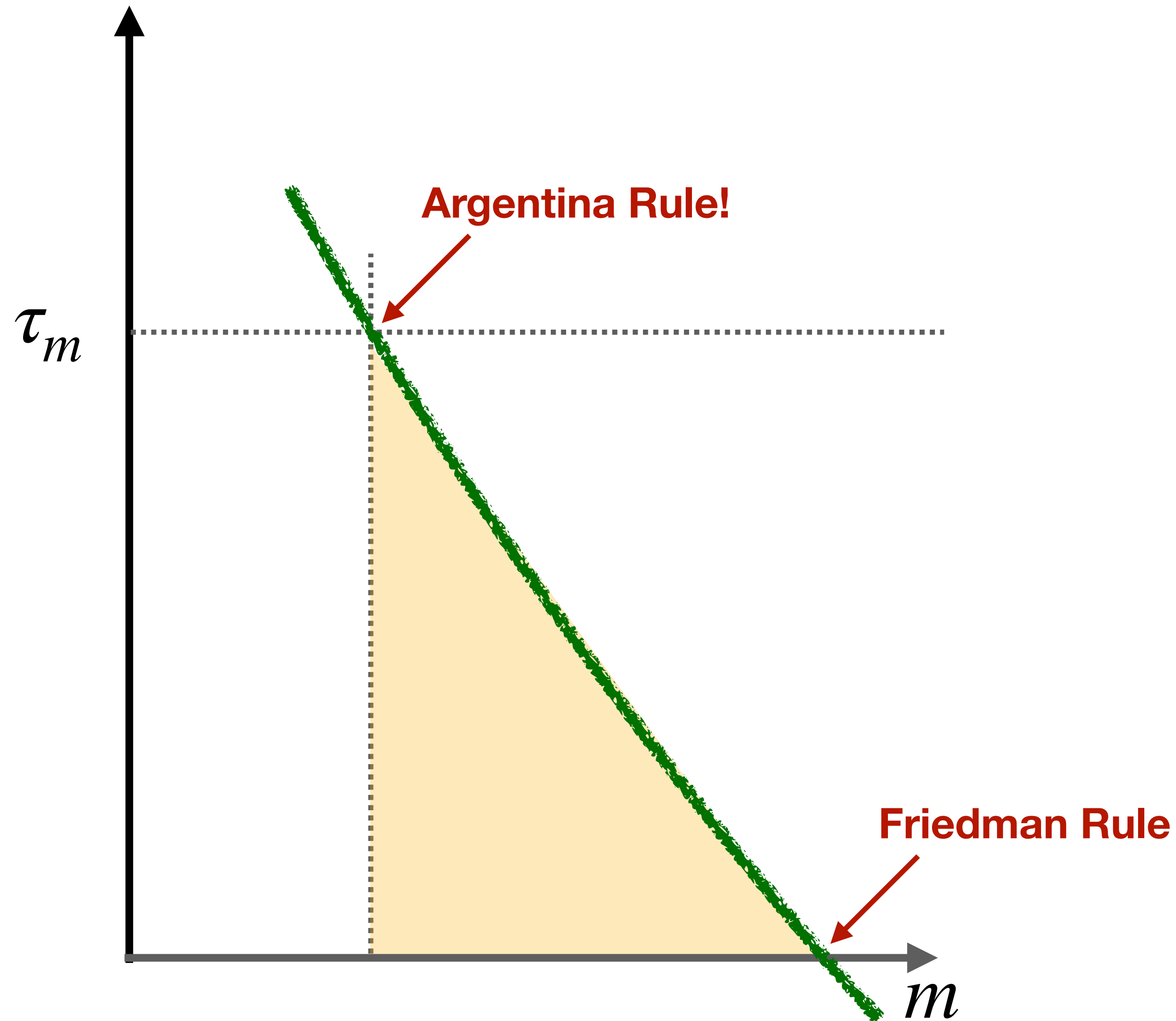
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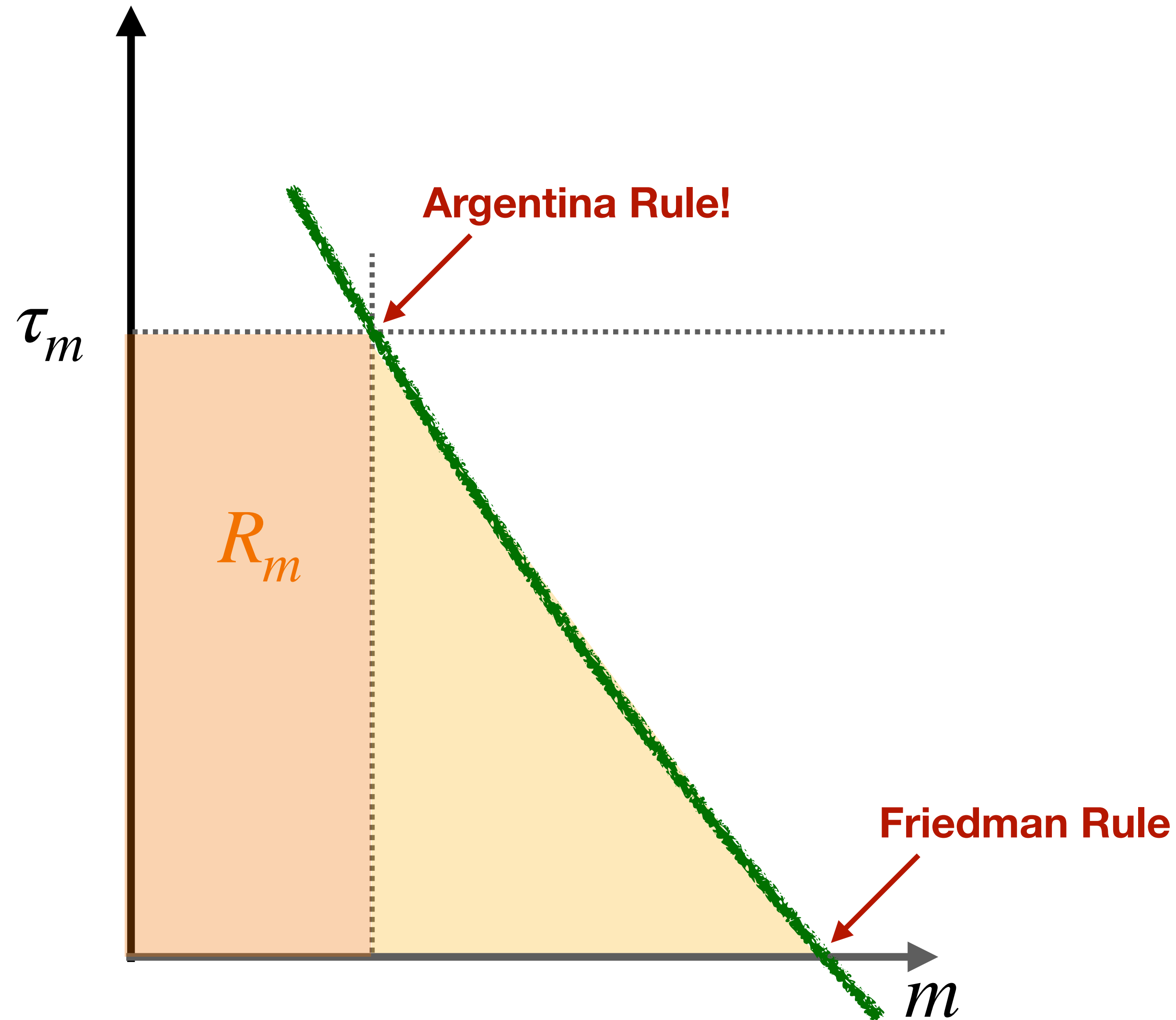
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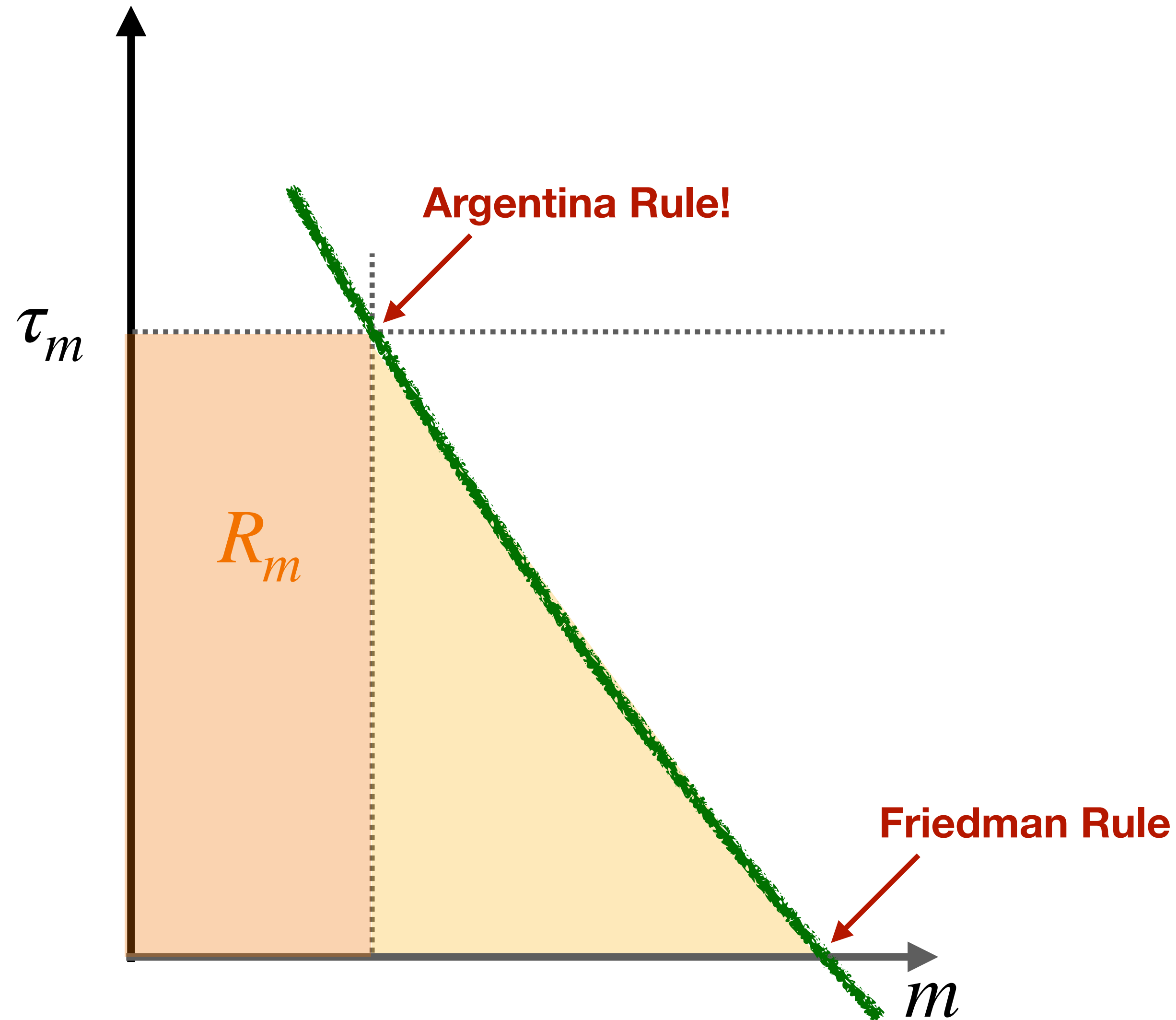
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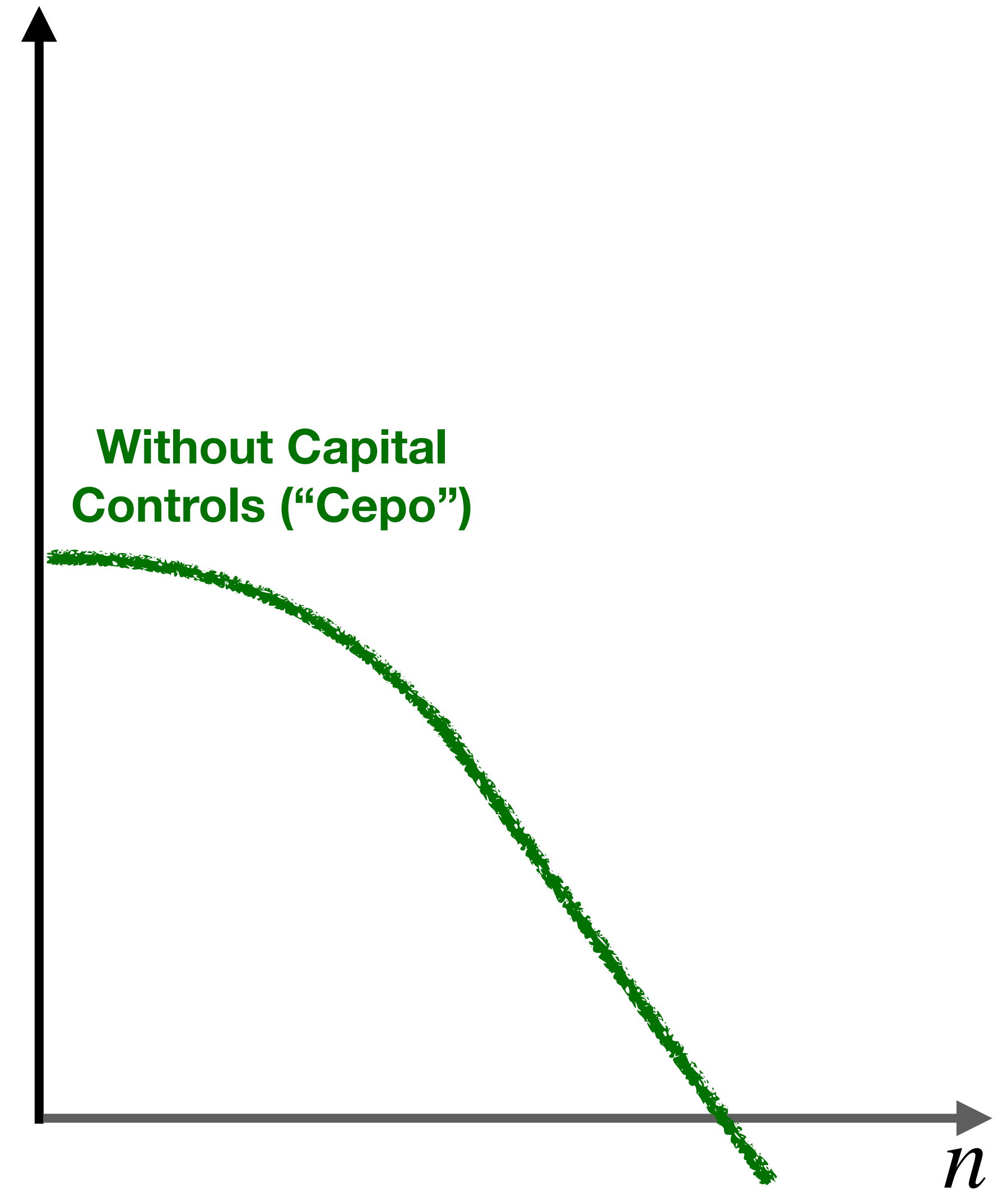


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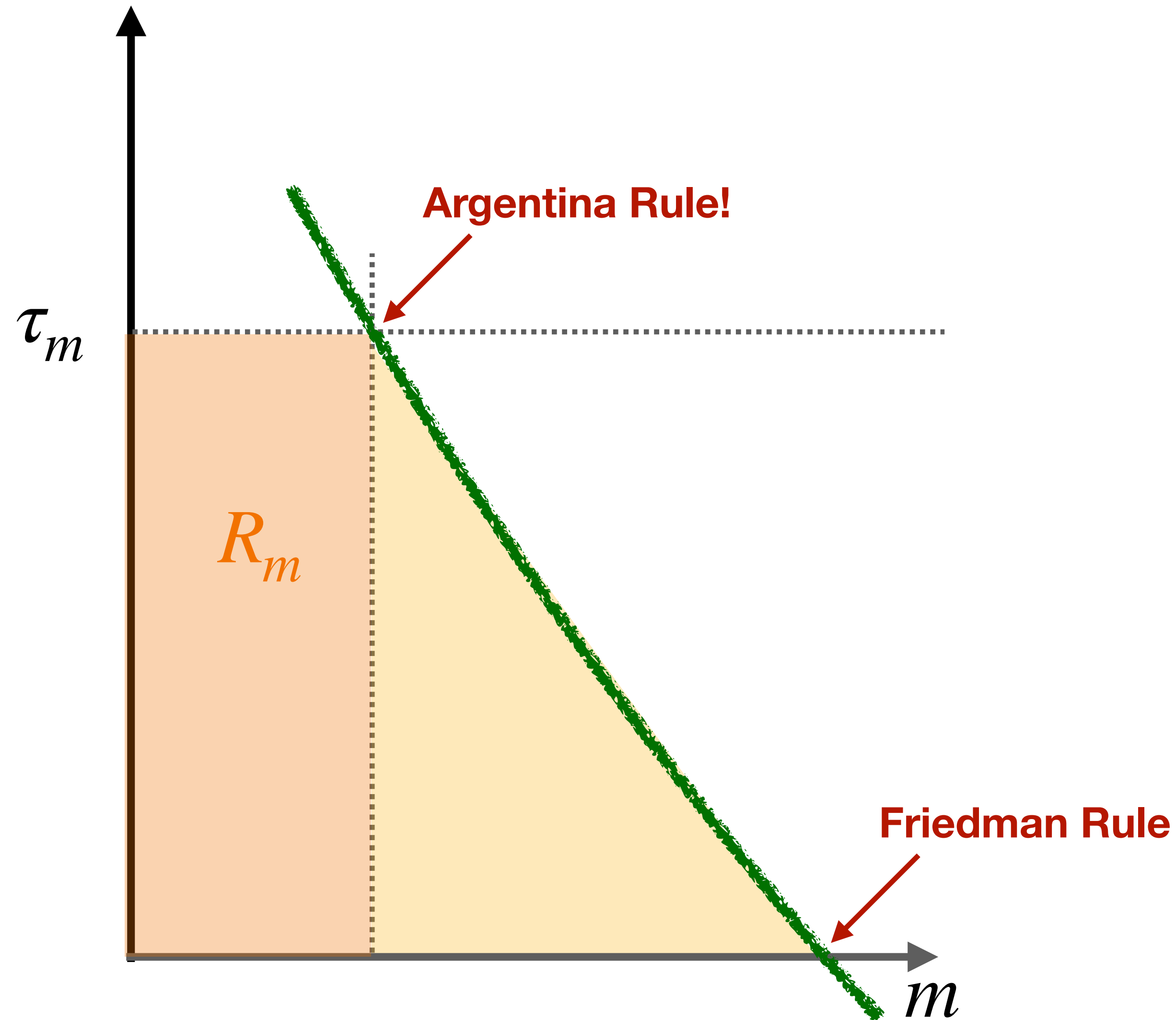


$$\tau_n = \pi - i_n$$

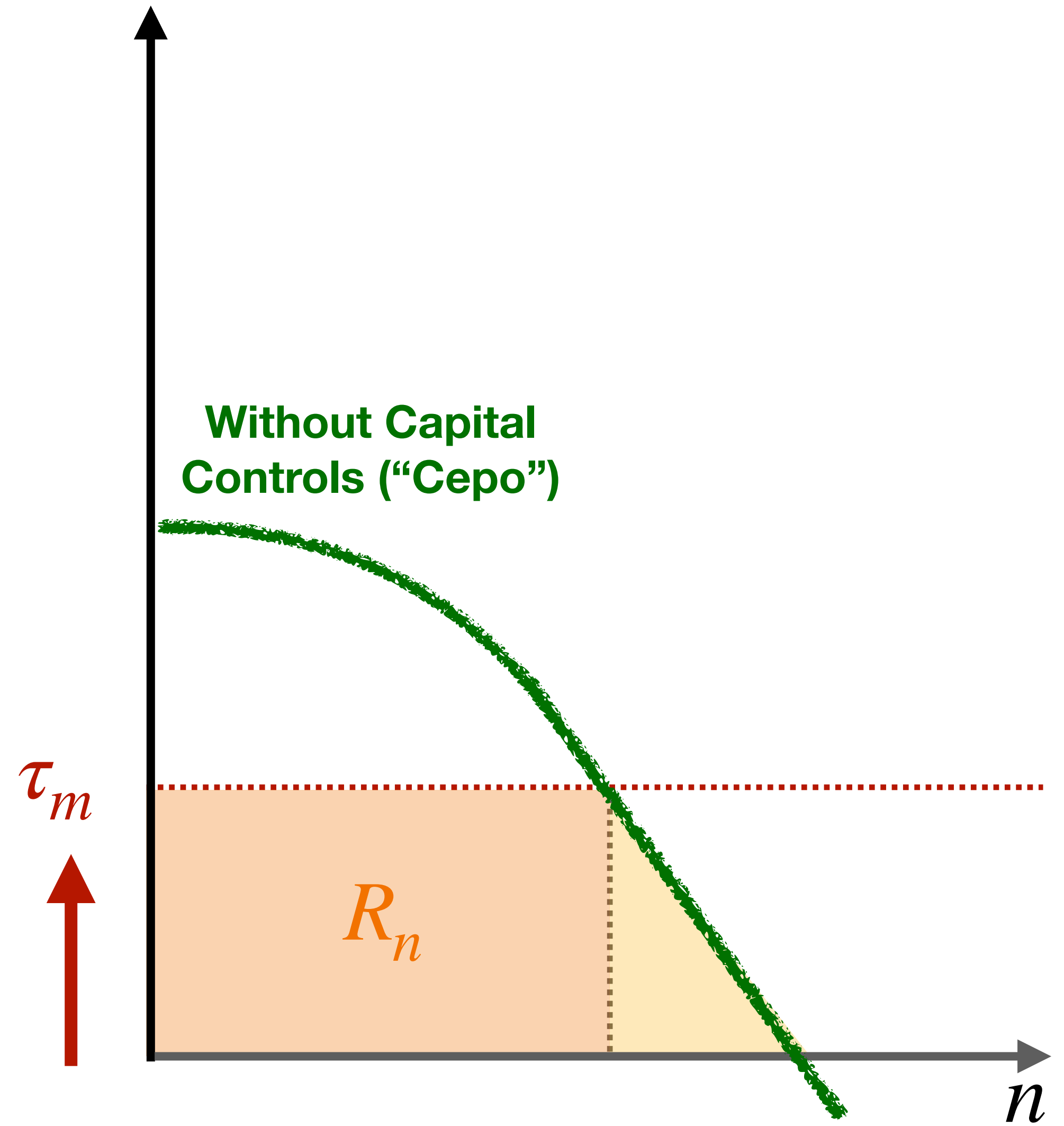


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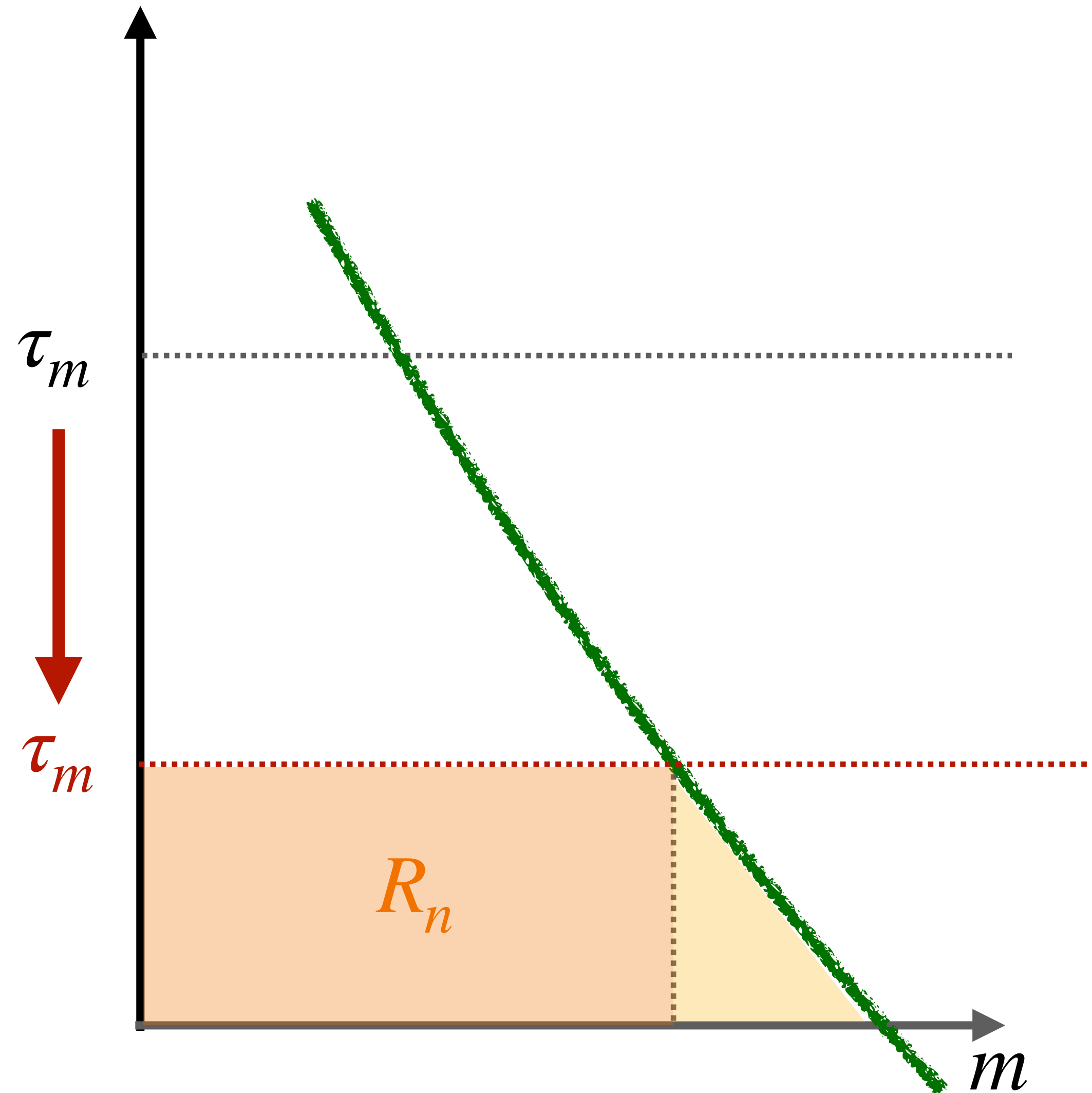


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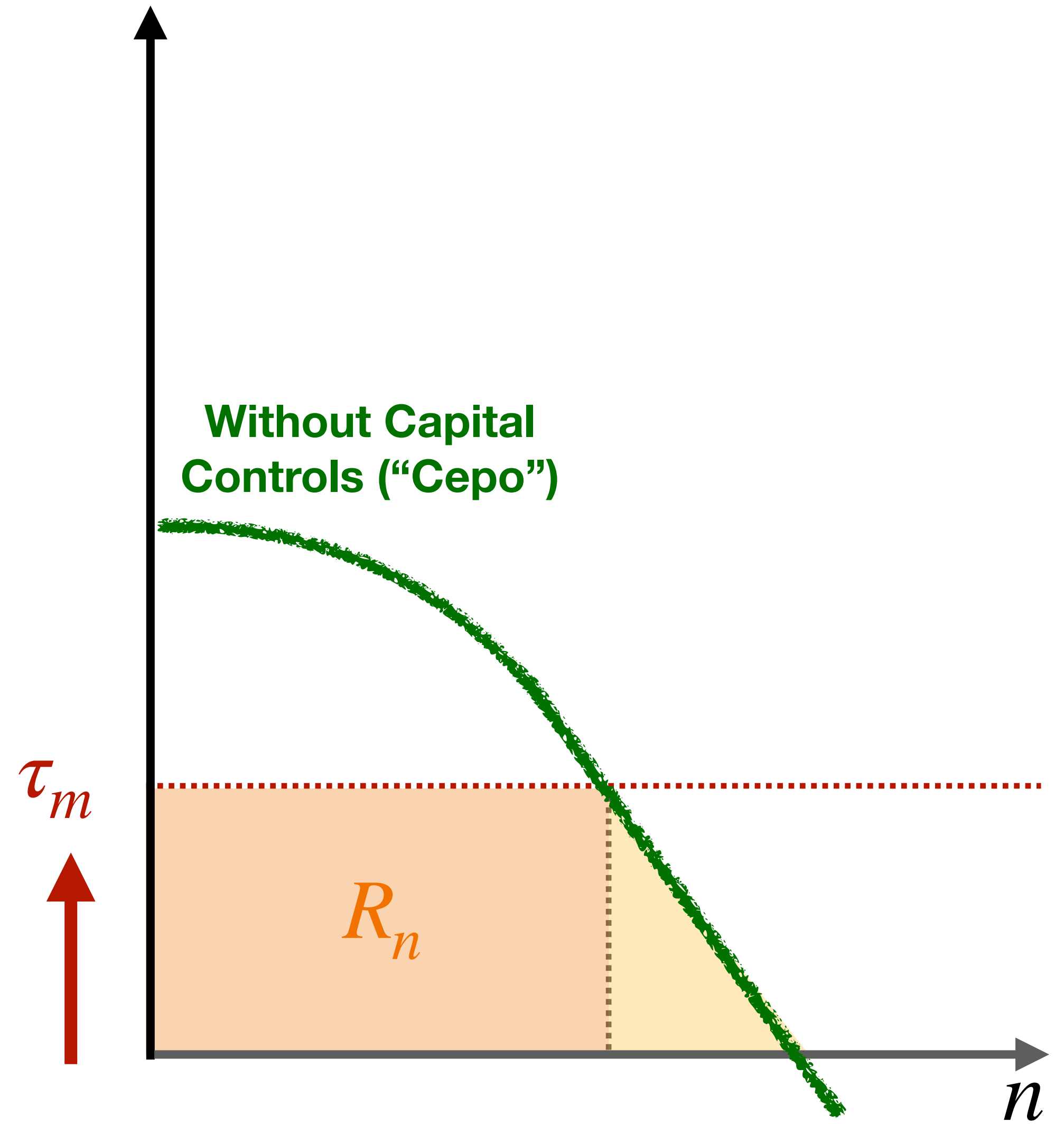


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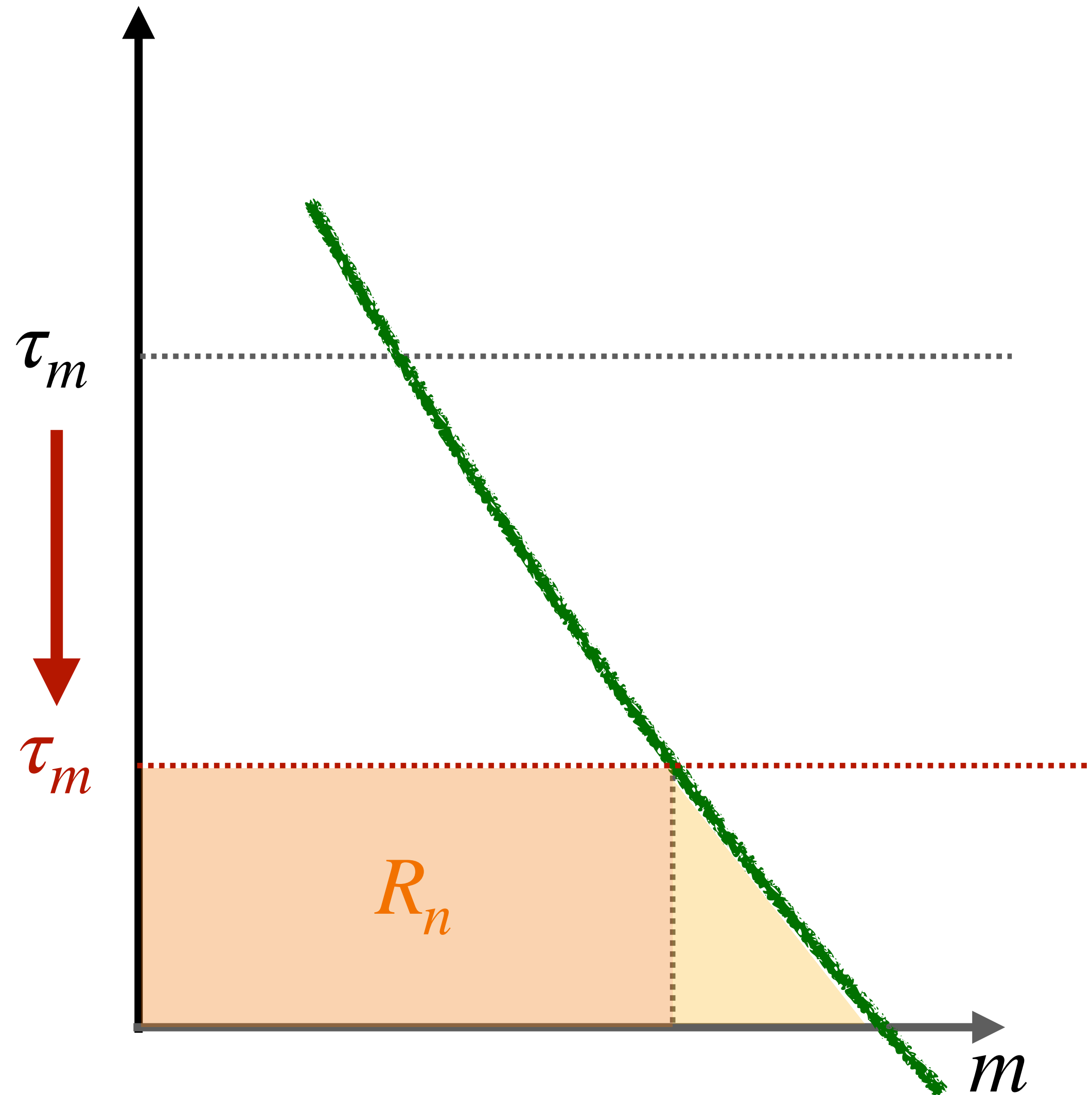
$$\tau_n = \pi - i_n$$



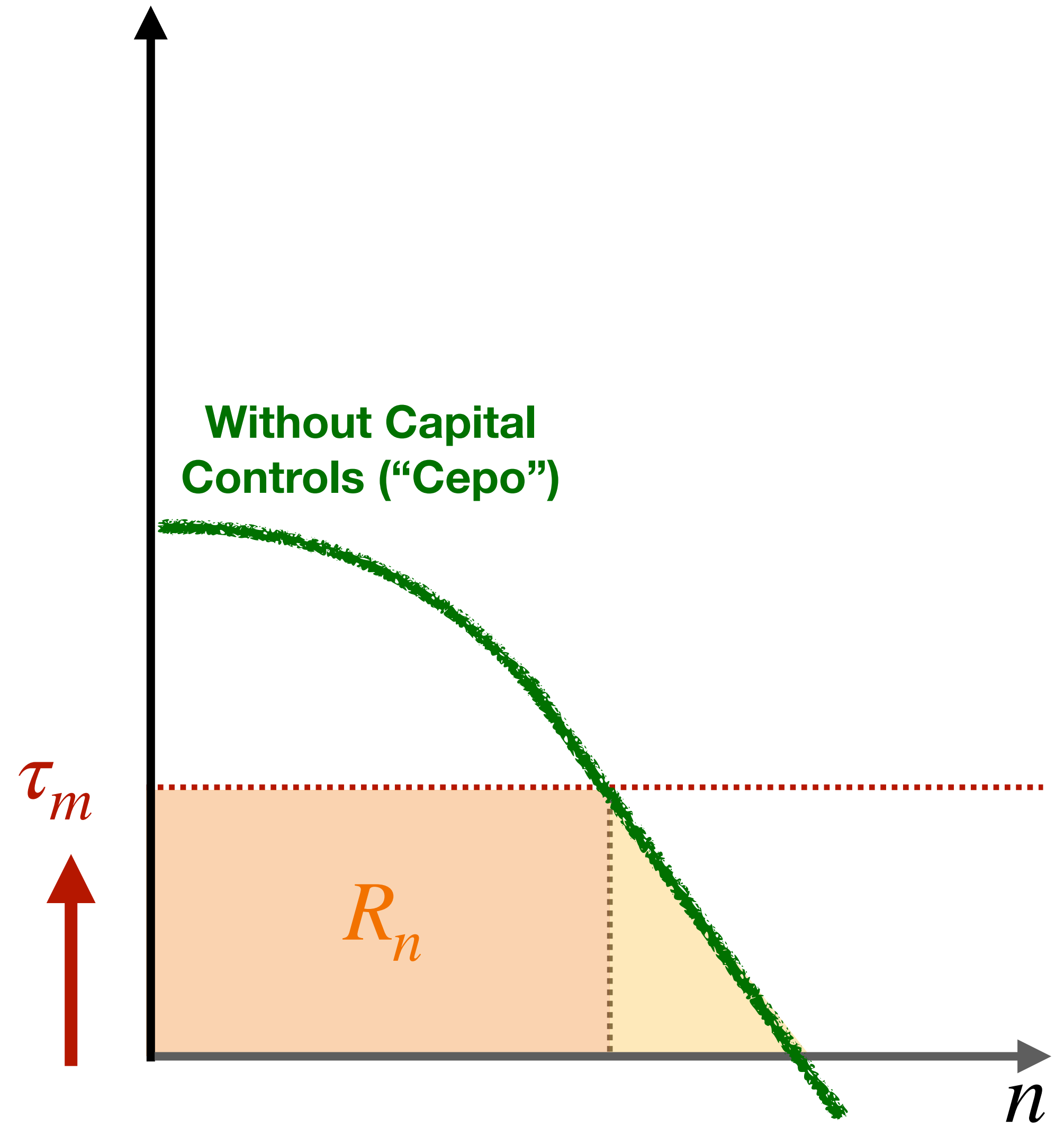
Main Results

$\downarrow i_n \Rightarrow \downarrow \pi$

$$\tau_m = \pi - i_m = \pi$$



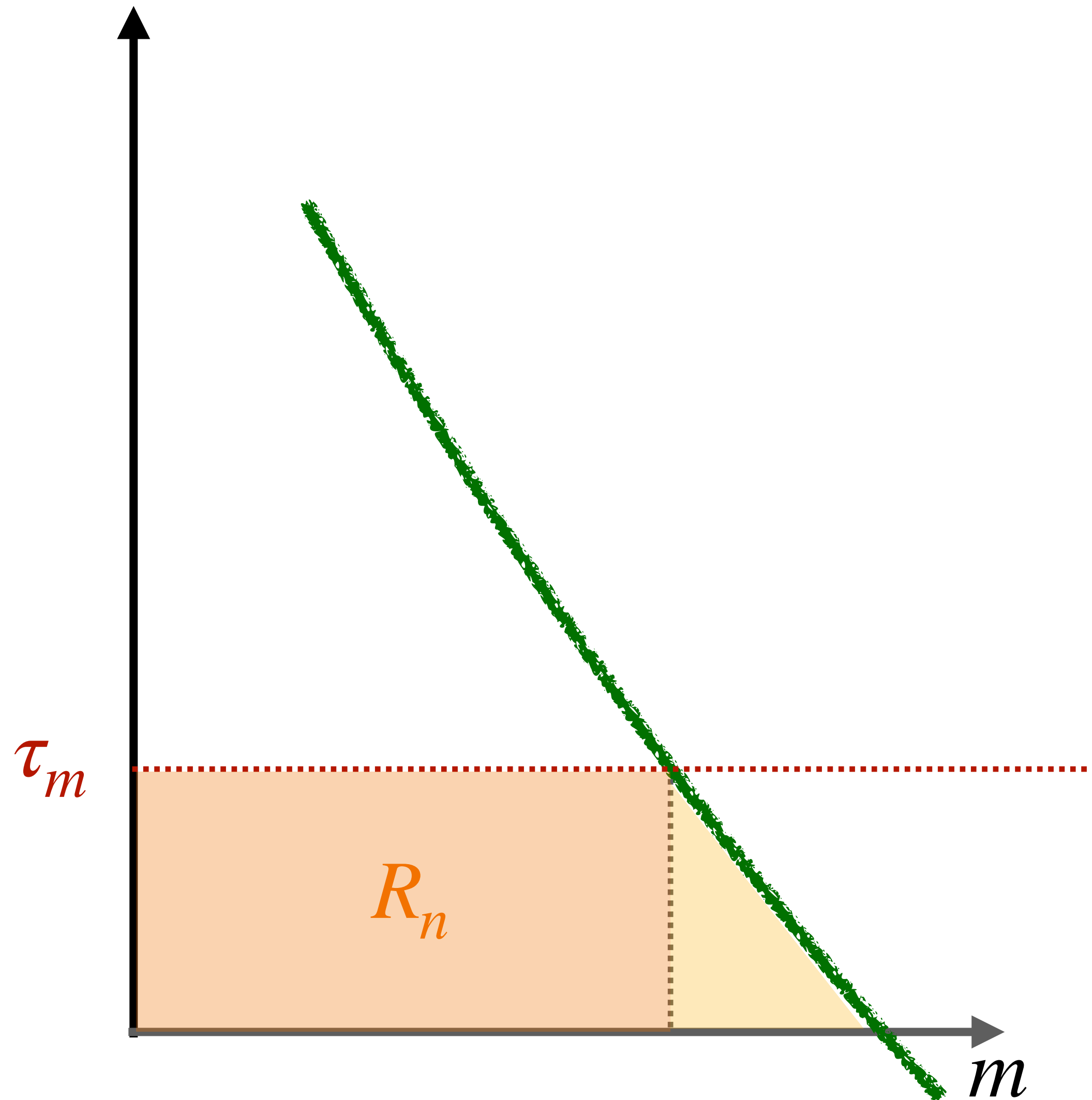
$$\tau_n = \pi - i_n$$



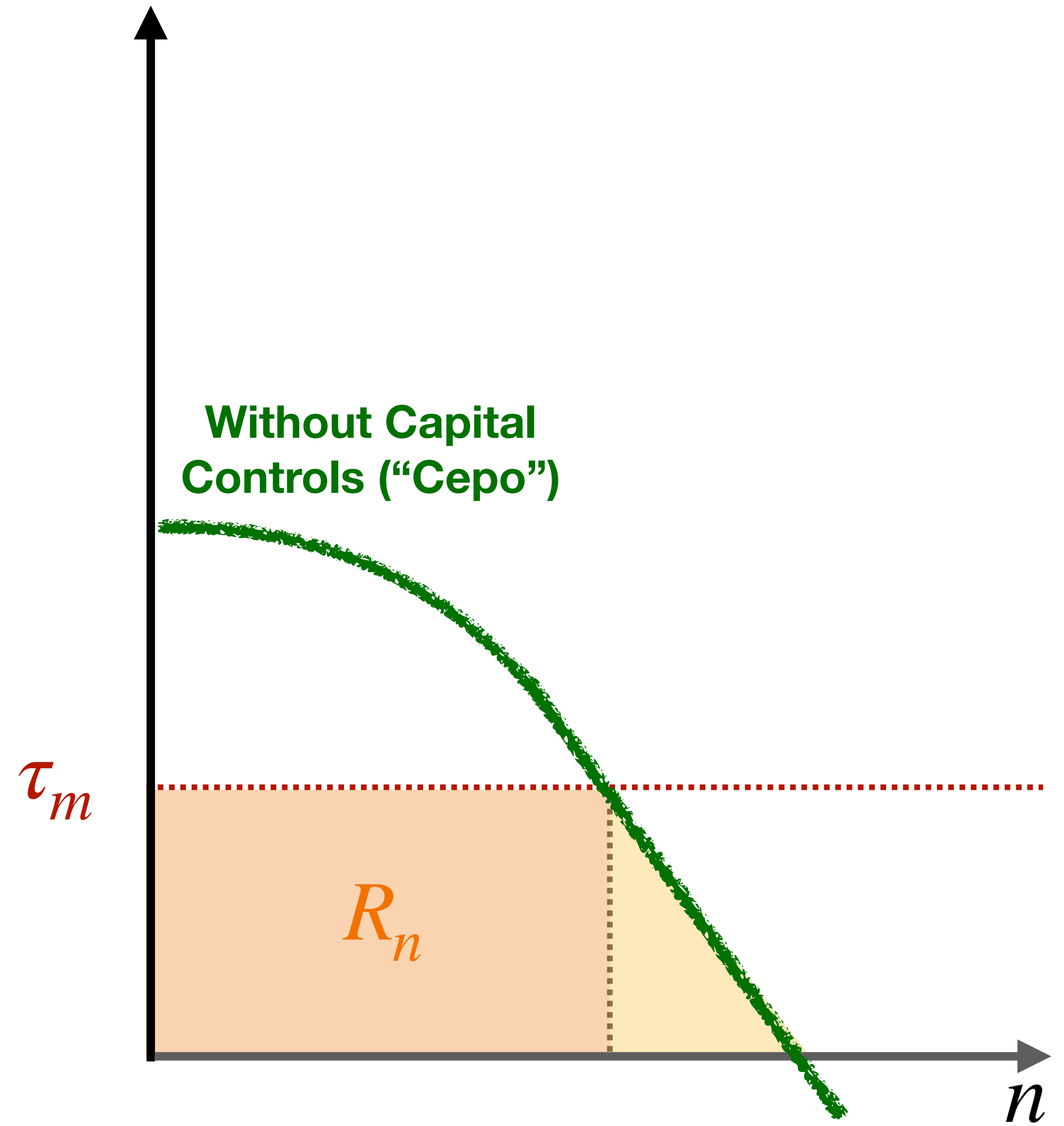
Main Results

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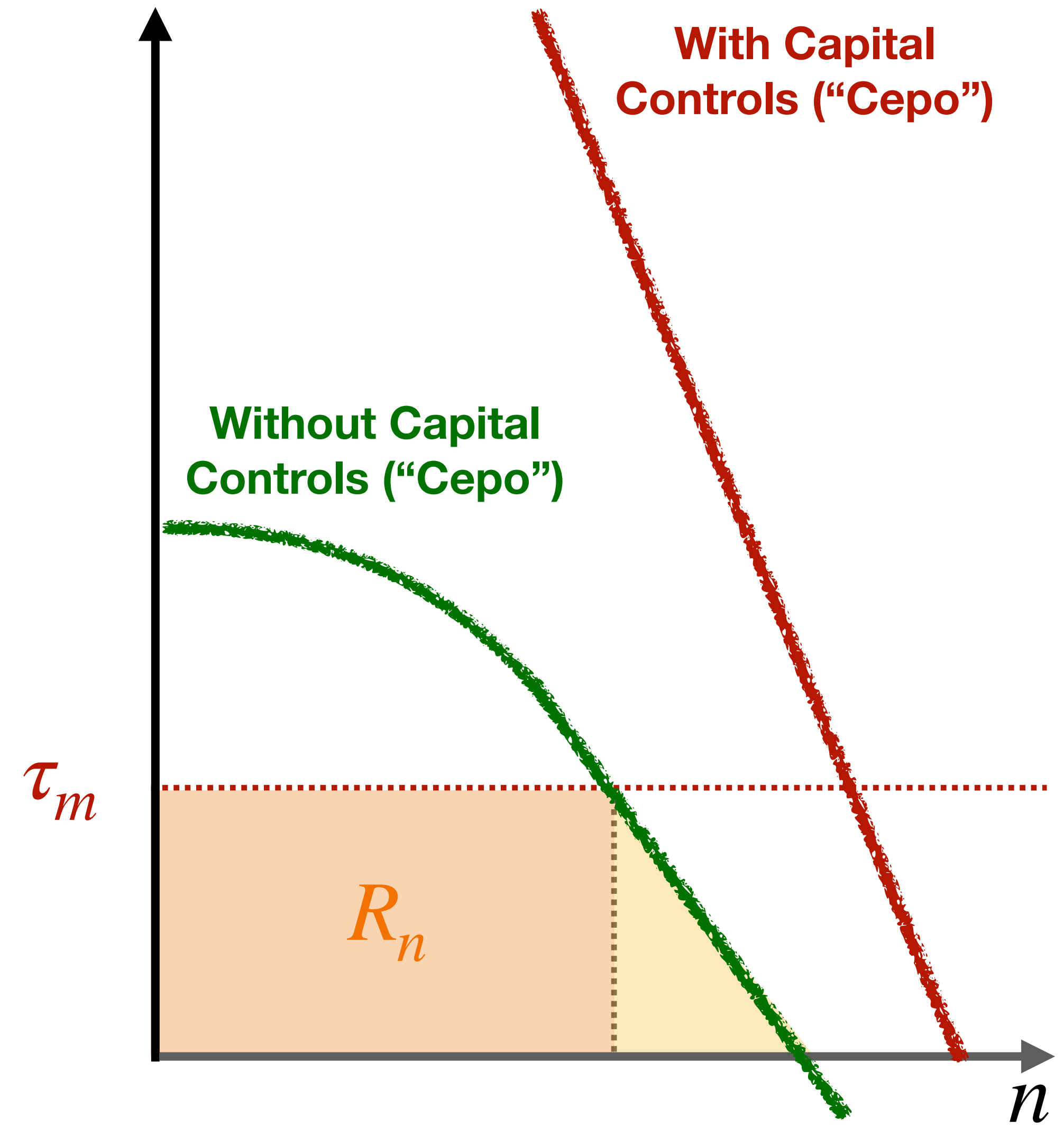
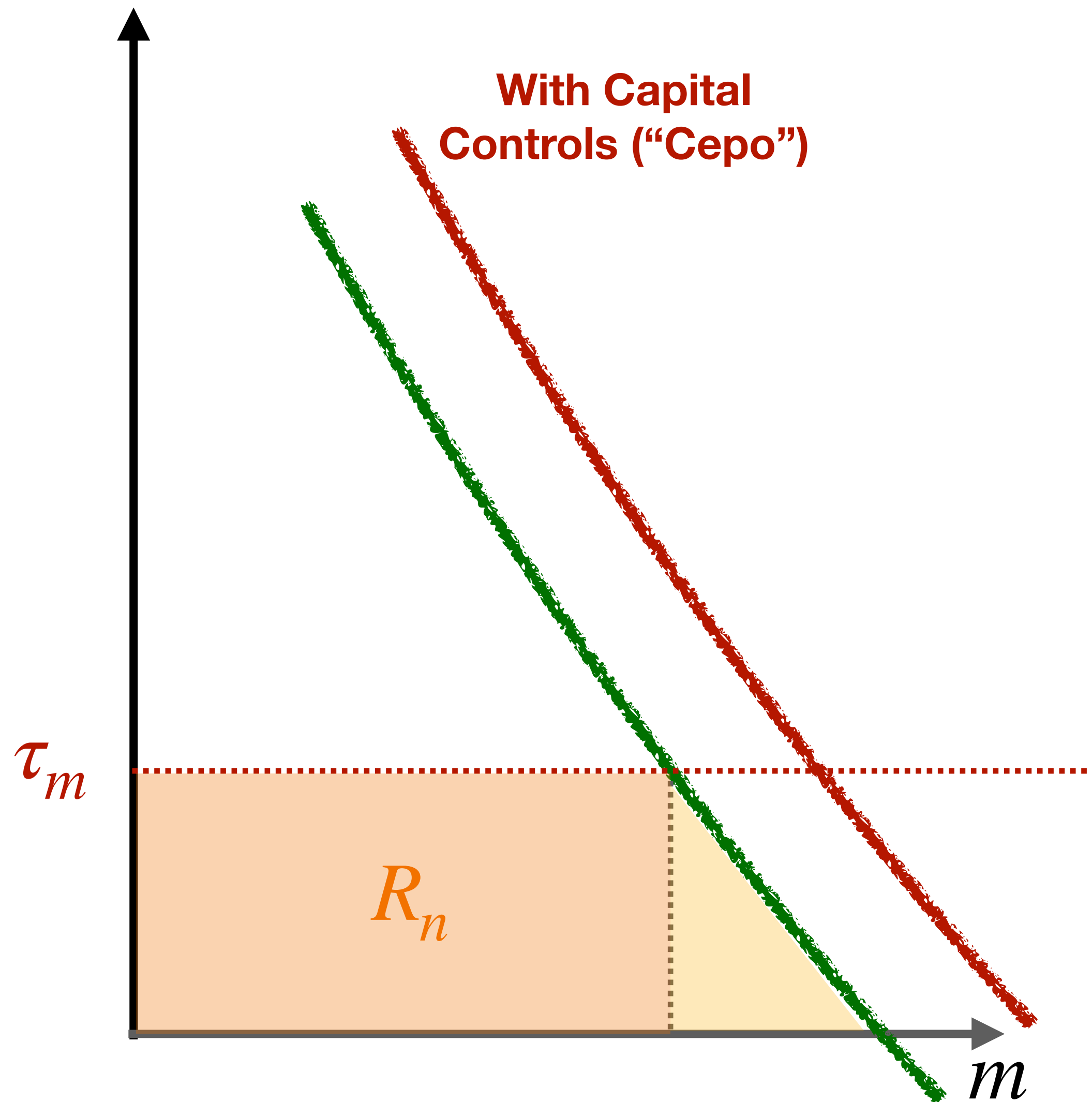


Main Results

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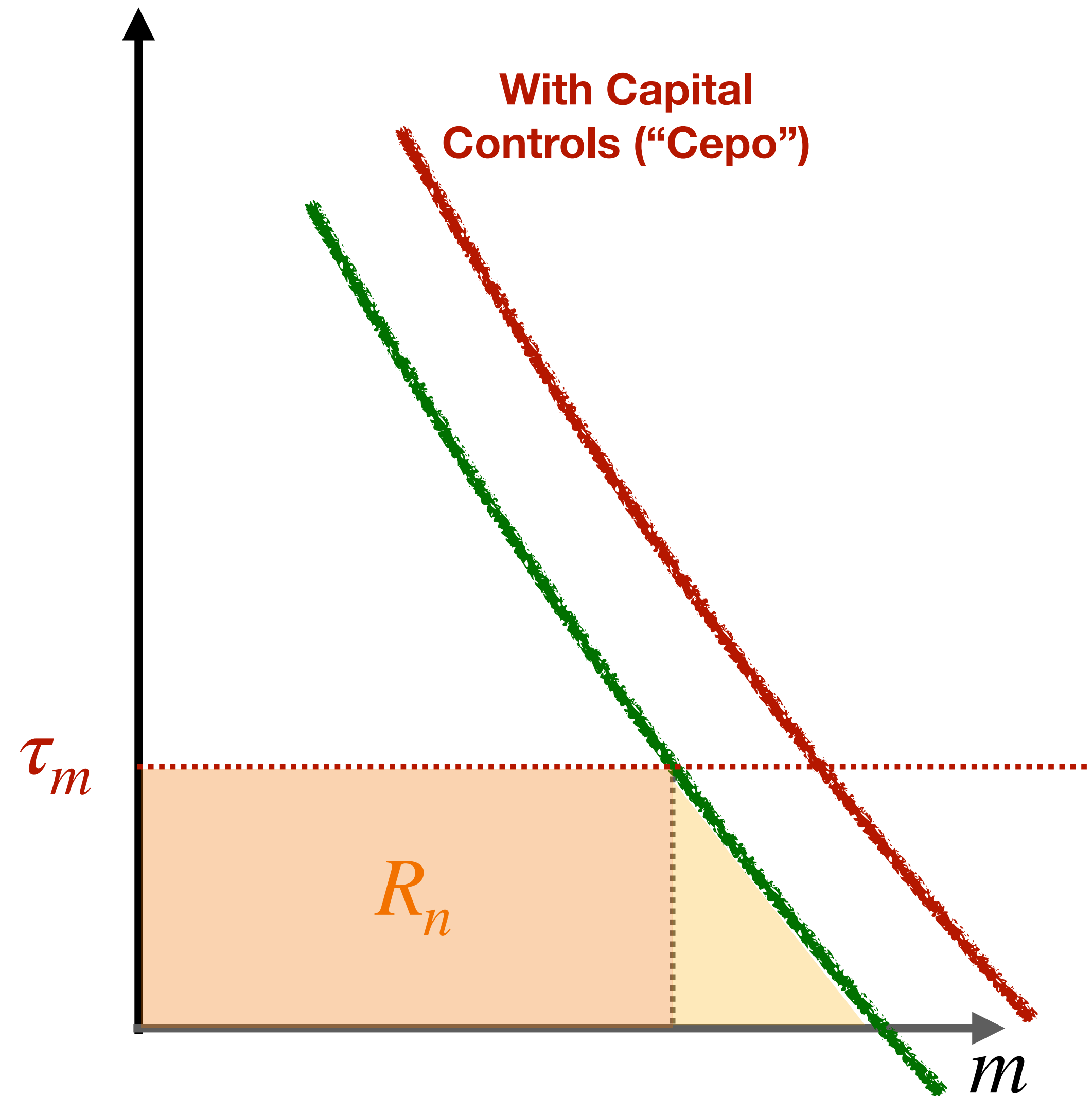
$$\tau_m = \pi - i_m = \pi$$

$$\tau_n = \pi - i_n$$



Main Results

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