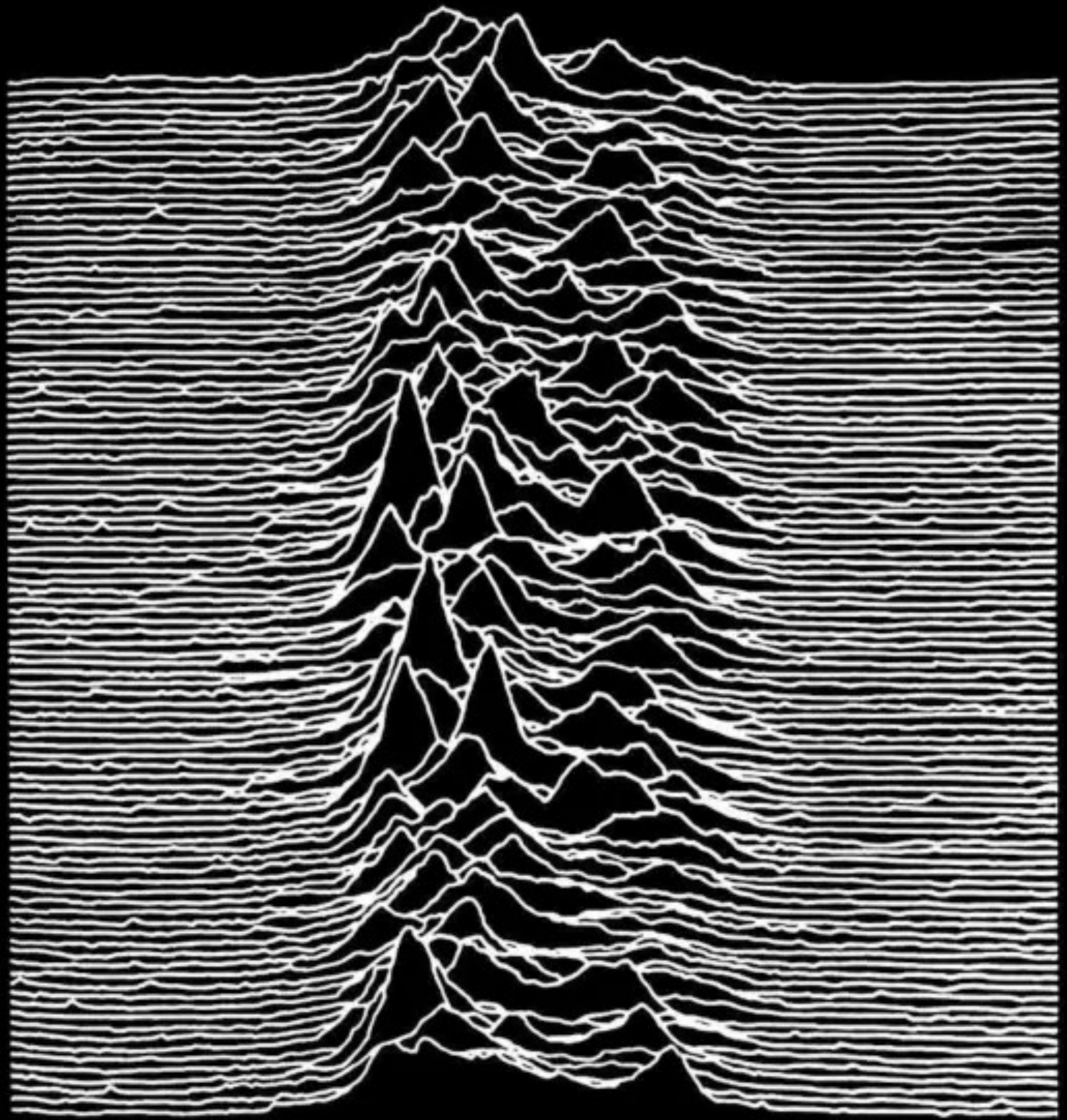
Macroeconomics with Excess Demands

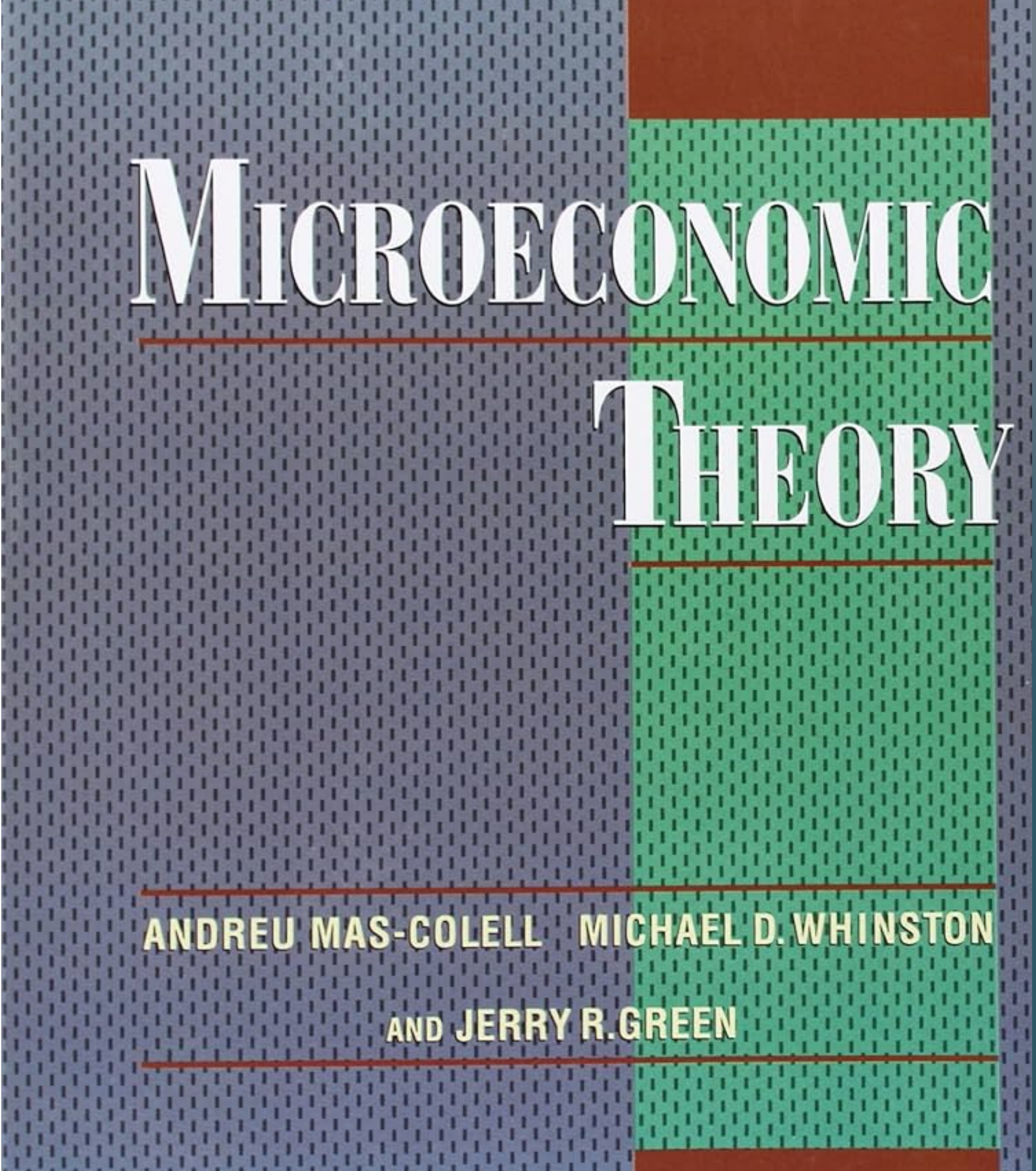


Guido Lorenzoni
Iván Werning

July 2026
NBER-SI

MICROECONOMIC THEORY

ANDREU MAS-COLELL MICHAEL D. WHINSTON
AND JERRY R. GREEN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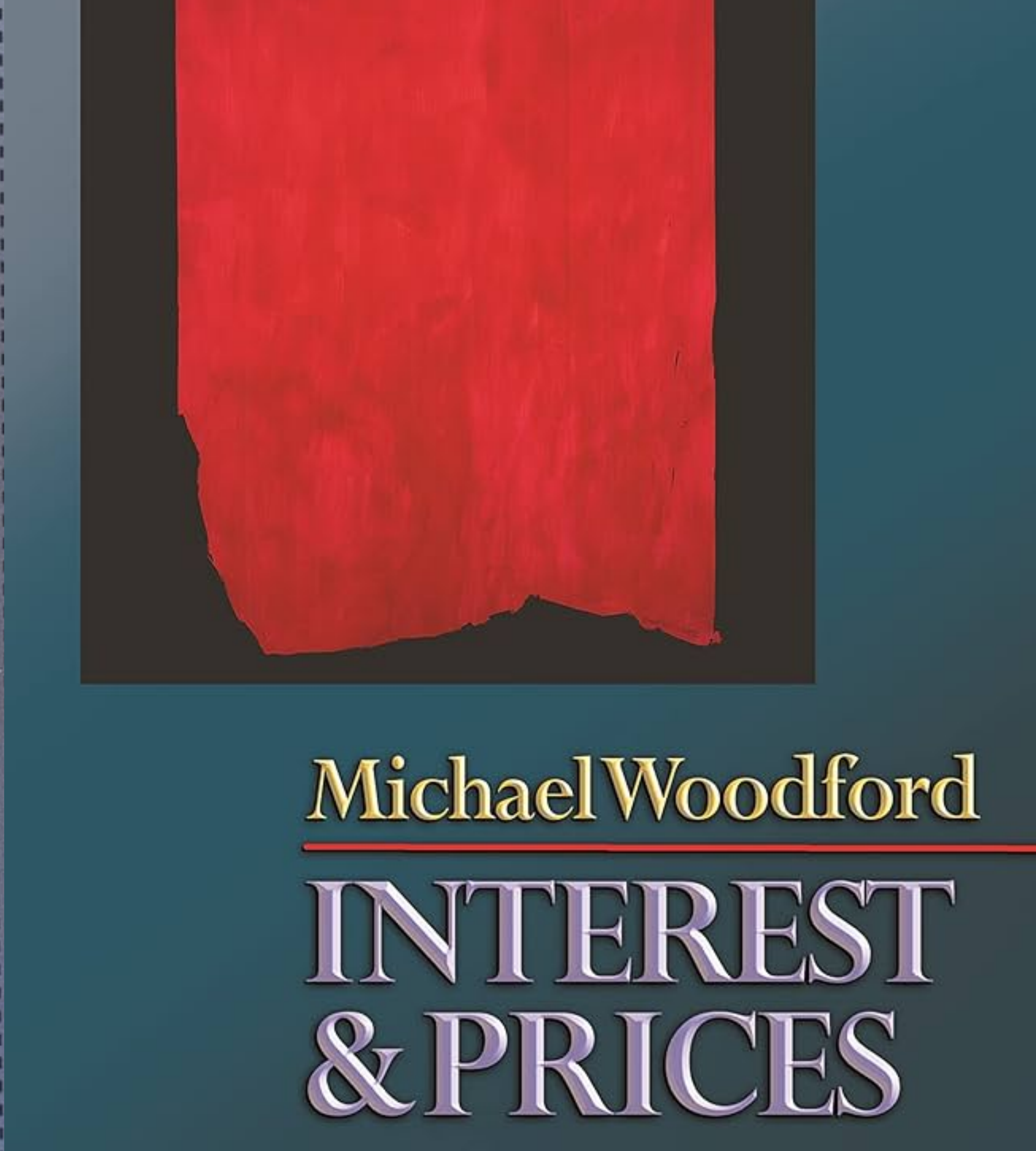
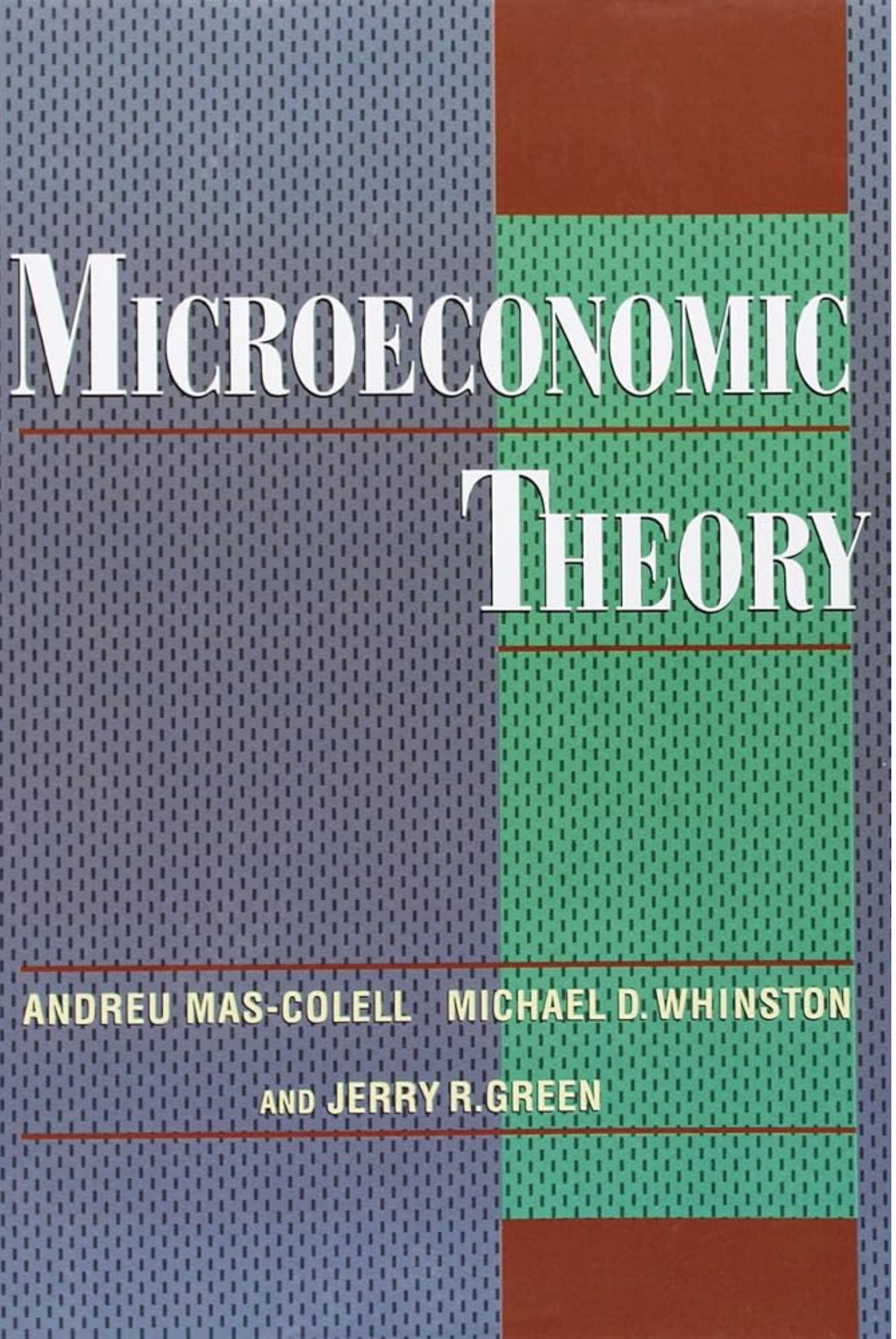
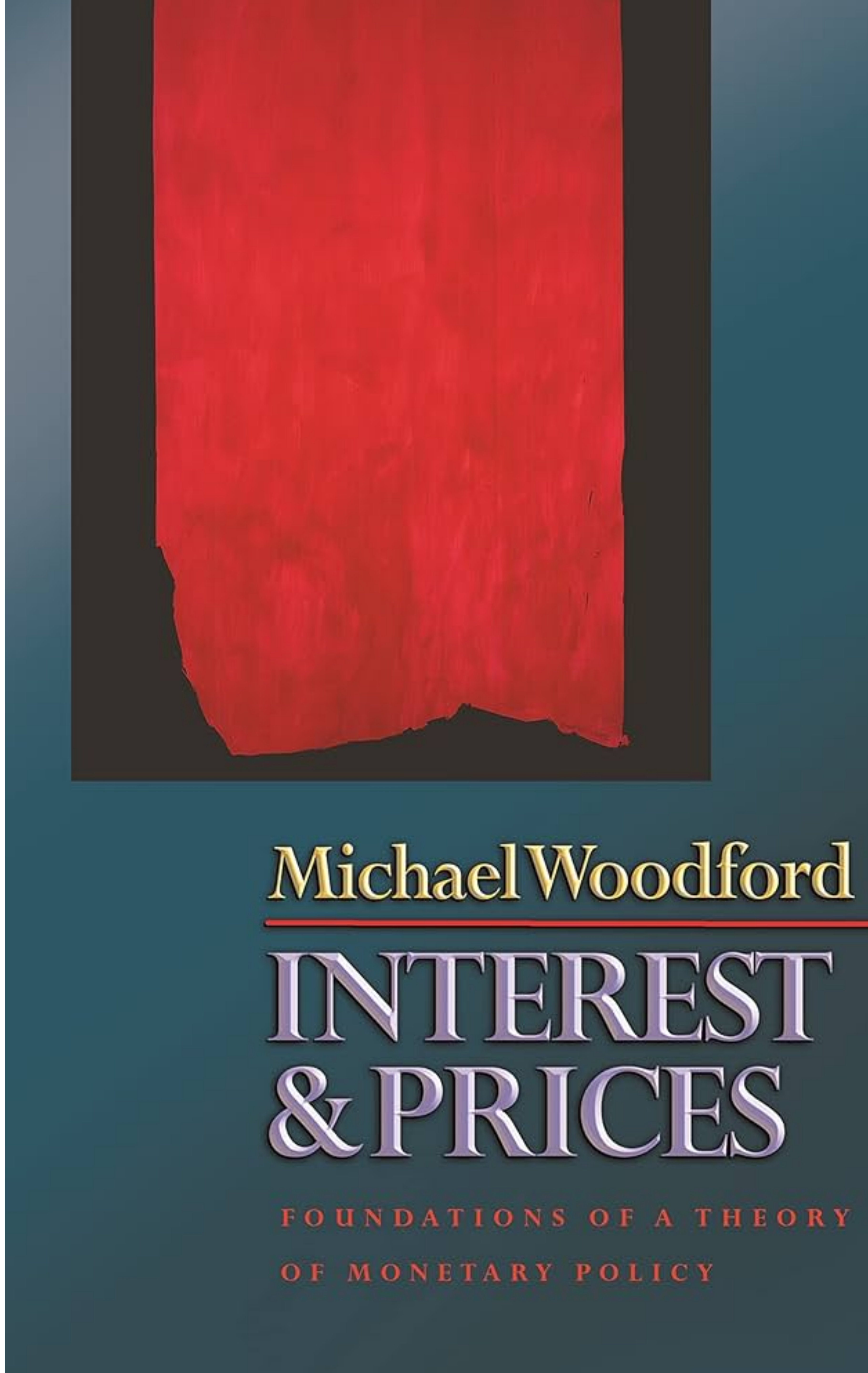

Michael Woodford
INTEREST
& PRICES



GE $\leftrightarrow$ Macro



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- **General Equilibrium Theory…**
  - well-developed theory
  - flexible framework
  - applied: Trade, Macro, Public Finance, IO…

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

equilibrium
(vectors)

GE ↔ Macro

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- **New Keynesian Macroeconomics…**
  - Success: micro + nominal rigidities…
  - … GE with many markets but…
  - → gap with GE theory
  - → gap with basic micro 101 intuition

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

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

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

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- **Disequilibrium Literature:** initial progress GE + price rigidities…
  … but challenges → price dynamics + intractable (2^N regimes)

?

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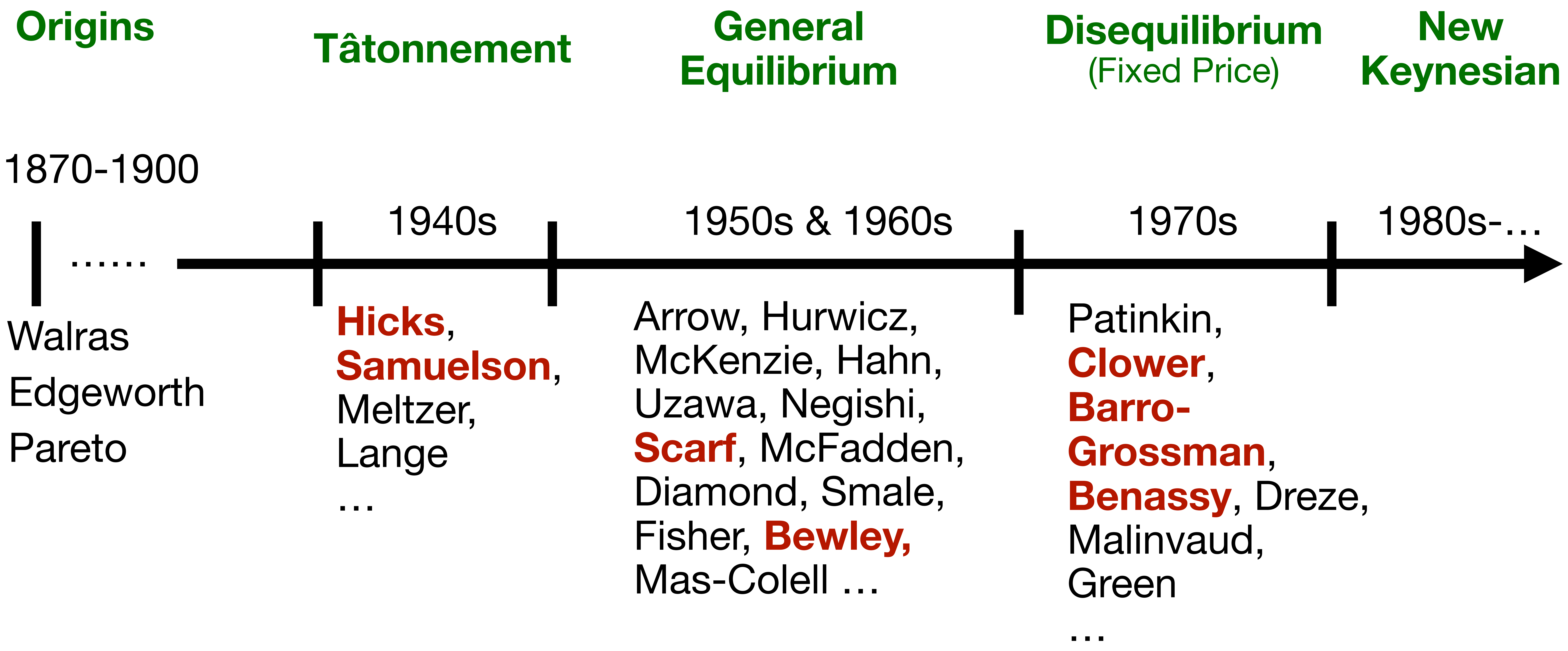
Keynes & ISLM	General Equilibrium (with Money)	Disequilibrium (Fixed Price)	New Keynesian
1930-40s	1950s & 1960s	1970s	1980s-present
Keynes Hicks	Patinkin Clower	Patinkin, Clower, Barro-Grossman, Benassy, Dreze, Malinvaud, Green …	


Origins
Tâtonnement
General Equilibrium
Disequilibrium
(Fixed Price)
New Keynesian
1870-1900
1940s
1950s & 1960s
1970s
1980s-…
……
Walras
Edgeworth
Pareto
Hicks, Samuelson, Meltzer, Lange …
Arrow, Hurwicz, McKenzie, Hahn, Uzawa, Negishi, Scarf, McFadden, Diamond, Smale, Fisher, Bewley, Mas-Colell …
Patinkin, Clower, Barro-Grossman, Benassy, Dreze, Malinvaud, Green …

This Paper

- This paper…
  - framework developed from previous "Tâtonnement…" paper…
  - … but focus on macro angle

- Our framework…
  - quantities and welfare at point in time
  - excess demand function: $Z(p)$
  - price setting $\rightarrow$ price+wage adjustments

Main Results

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more general → more **intuitive!**

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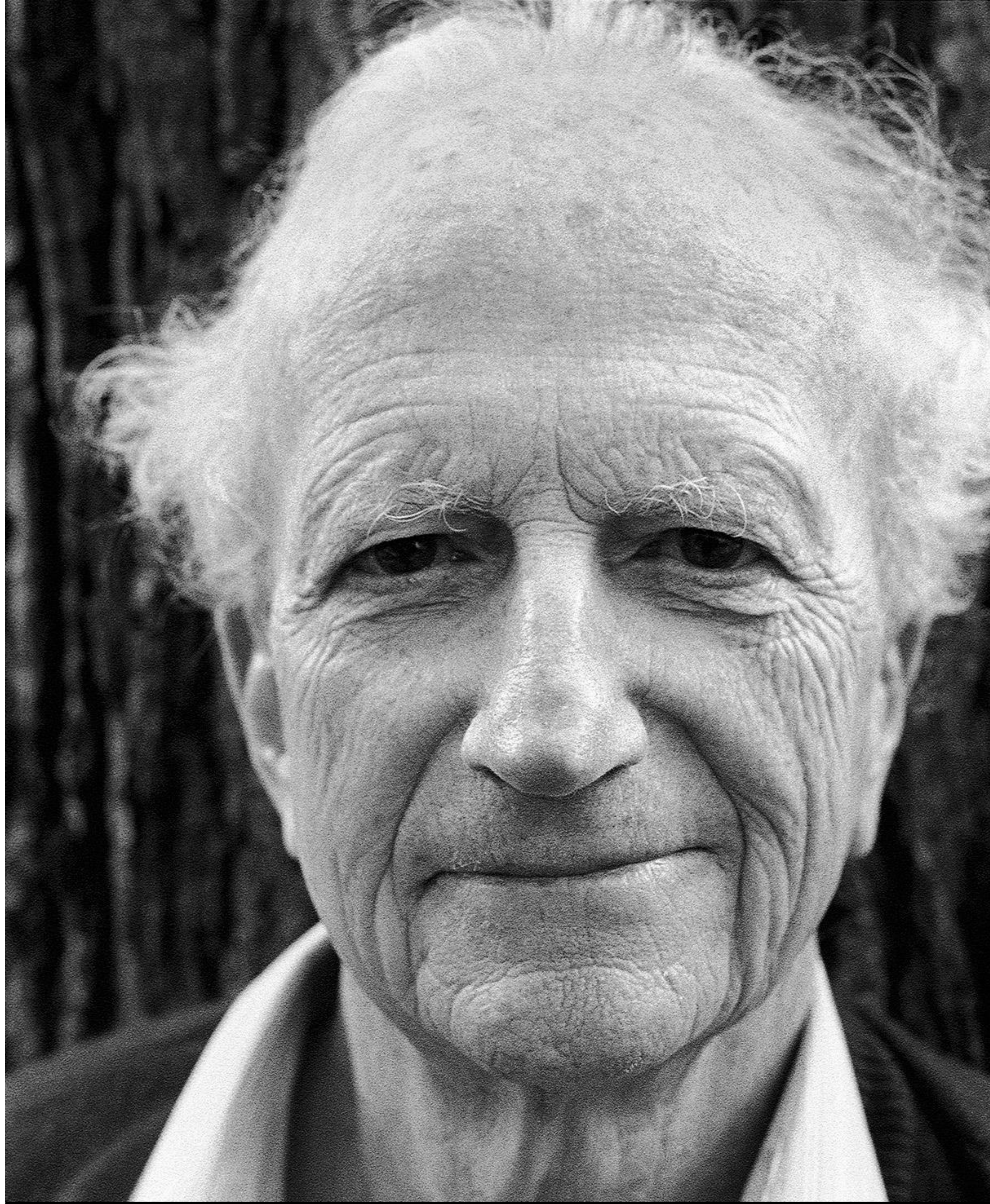

Micro 101…
"Prices Rise with Excess Demand"

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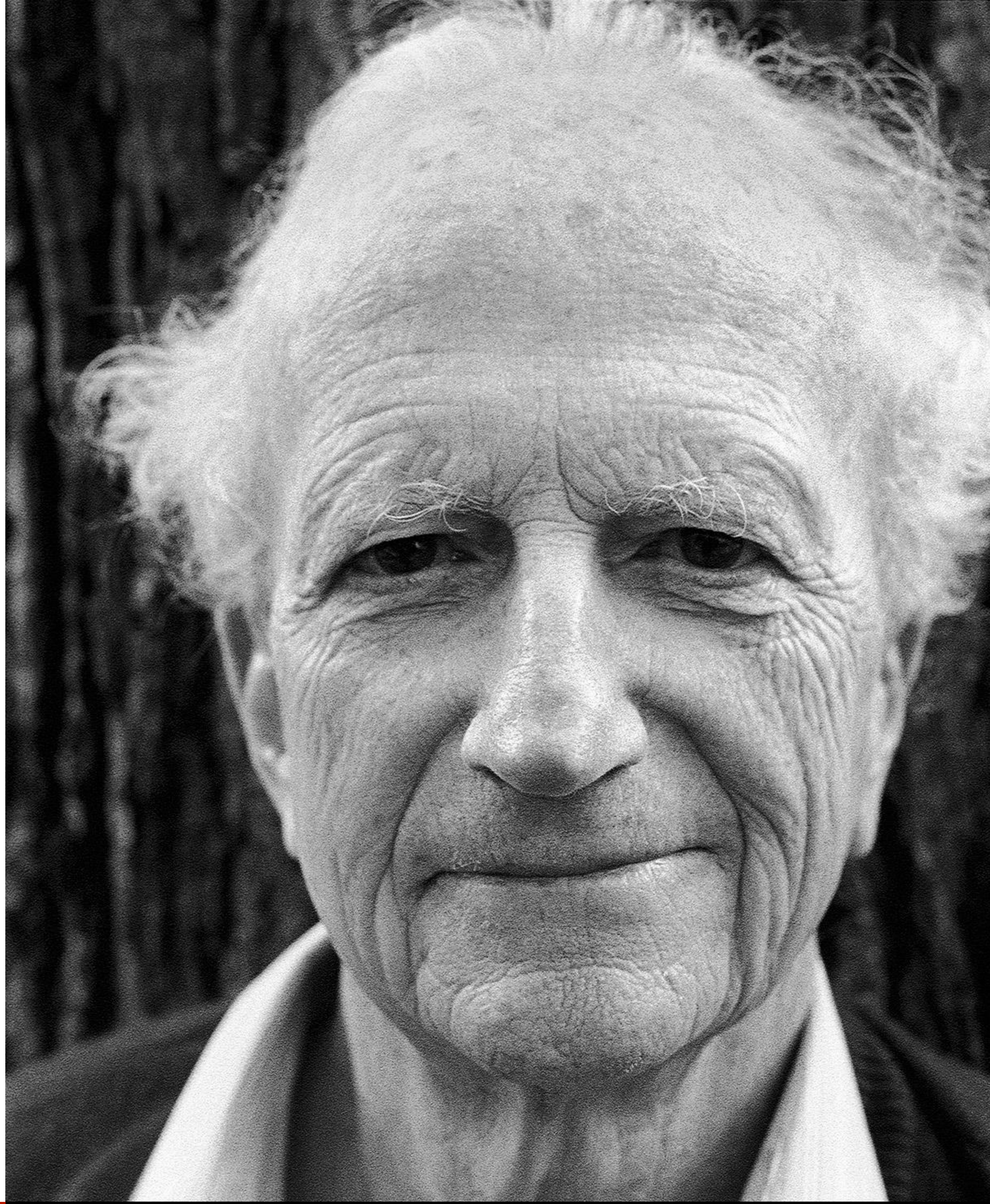
Heard on the internet…
"Phillips Curves don't exist
they are dead…"



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    disequilibrium GE + NK literatures

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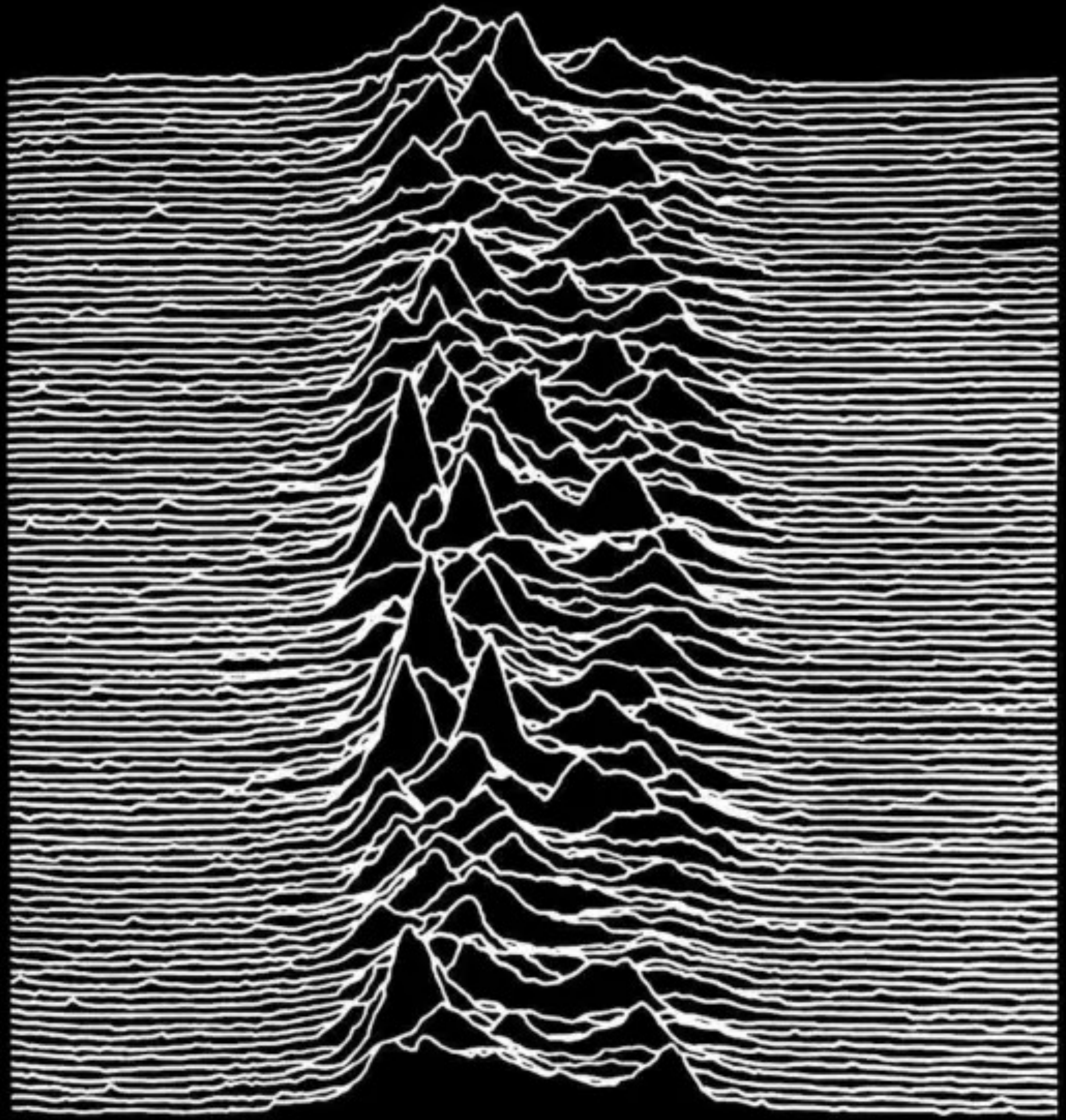
- Plan…
  - Build Excess Demand approach:
    steps by step → from static to dynamic
  - Applications

Static Walrasian Benchmark

$\boxed{0}$ 1 2 3 4



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.)

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

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

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

Math

$$\Pi^f(P) \equiv \max_{x^f, y^f} P \cdot (y^f - x^f)$$

$$(x^f, y^f) \in Y^f$$

$$\downarrow$$

$$D^f_W(P), S^f_W(P) \longrightarrow D_W(P) = \sum_j D^j_W(P) \longrightarrow D_W(P) = S_W(P)$$

$$D^h_W(P), S^h_W(P) \qquad S_W(P) = \sum_j S^j_W(P)$$

$$\uparrow$$

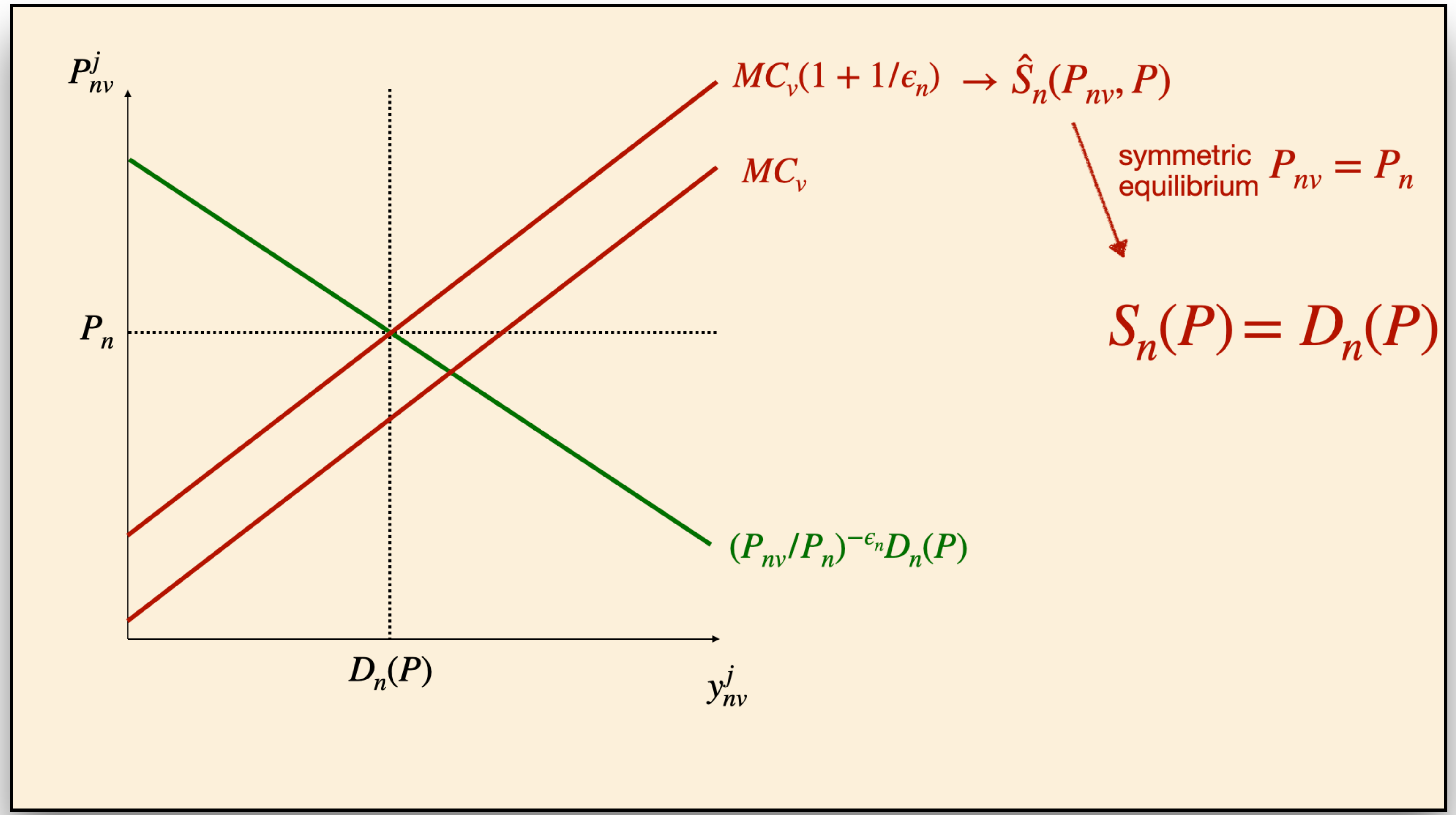
$$\max_{x^h, y^h} U^h(x^h, y^h)$$

$$P \cdot (x^h - y^h) \le P \cdot a^h + \sum_f \omega^{h,f} \Pi^f(P)$$

$$\dot{P}_n = \alpha_n(D_{Wn}(P) - S_{Wn}(P))$$

Samuelson's ad hoc proposal to capture Walras' idea…

Figure



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

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

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

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

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

$$z \in Y^f$$

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

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

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

N equations
N unknowns

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

$$\uparrow$$

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

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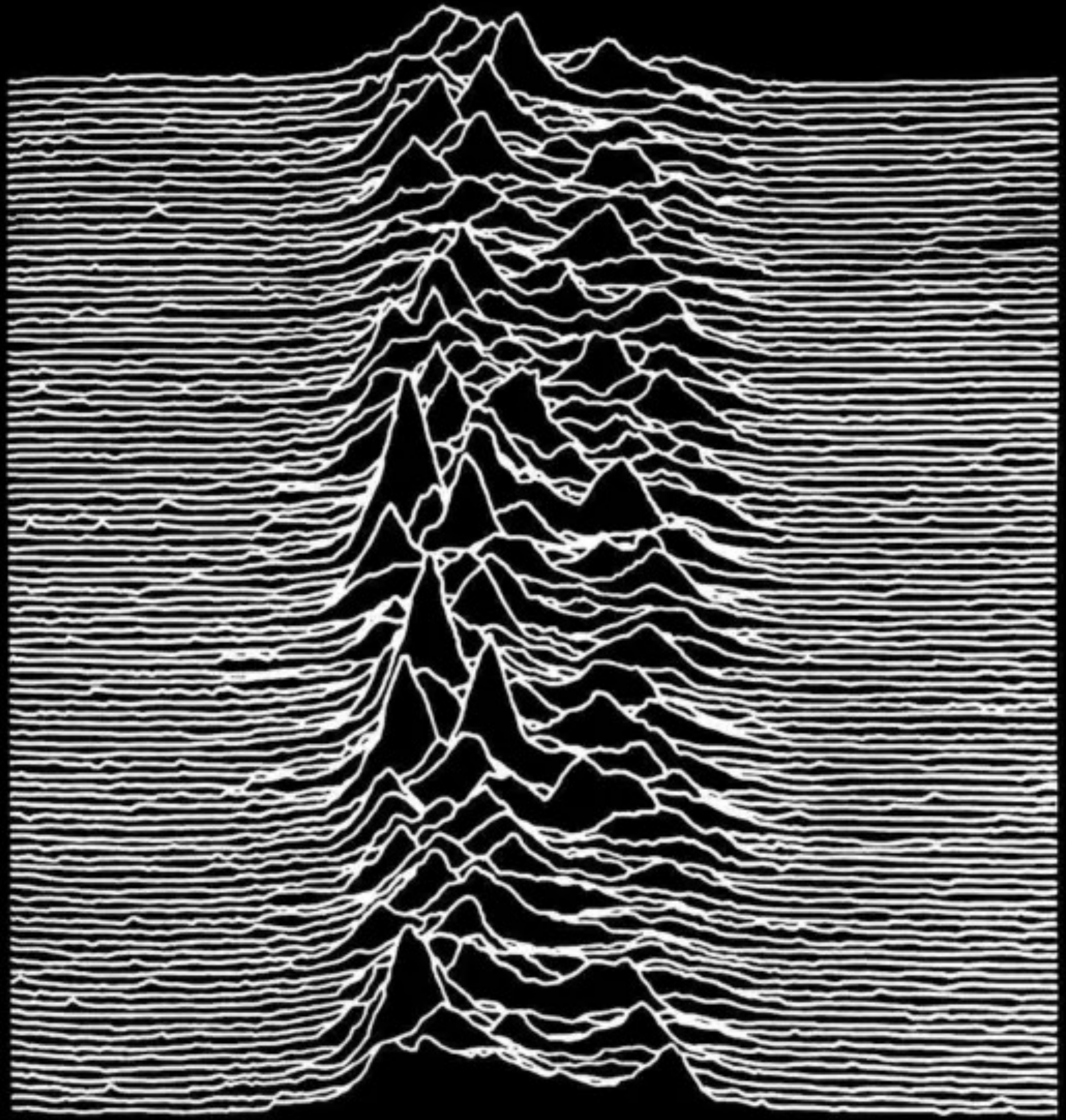
Static Market Power

0 $\boxed{1}$ 2 3 4



Adding Market Power

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

Adding Market Power

- Each market n $\rightarrow$ varieties $\omega \in [0,1]$
  - **price-taking undifferentiated (u)** vs. **price-setting differentiated (v = varieties)**

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    - today: each agent j assigned at most one market n
  - **undifferentiated side** n**:** CES aggregator over varieties with elasticity ϵ_n
    (other non-CES aggregators possible, Kimball, Matsuyama, etc.)

$$\Pi^f(p) \equiv \max_{z_u, z_{vn}, p_{vn}} -(p \cdot z_u^f + p_{vn} z_{vn})$$

$$(z_u^f, z_{vn}) \in Y^f$$

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Need prices and quantities

p and z_{un} …

… or do we really? ;)

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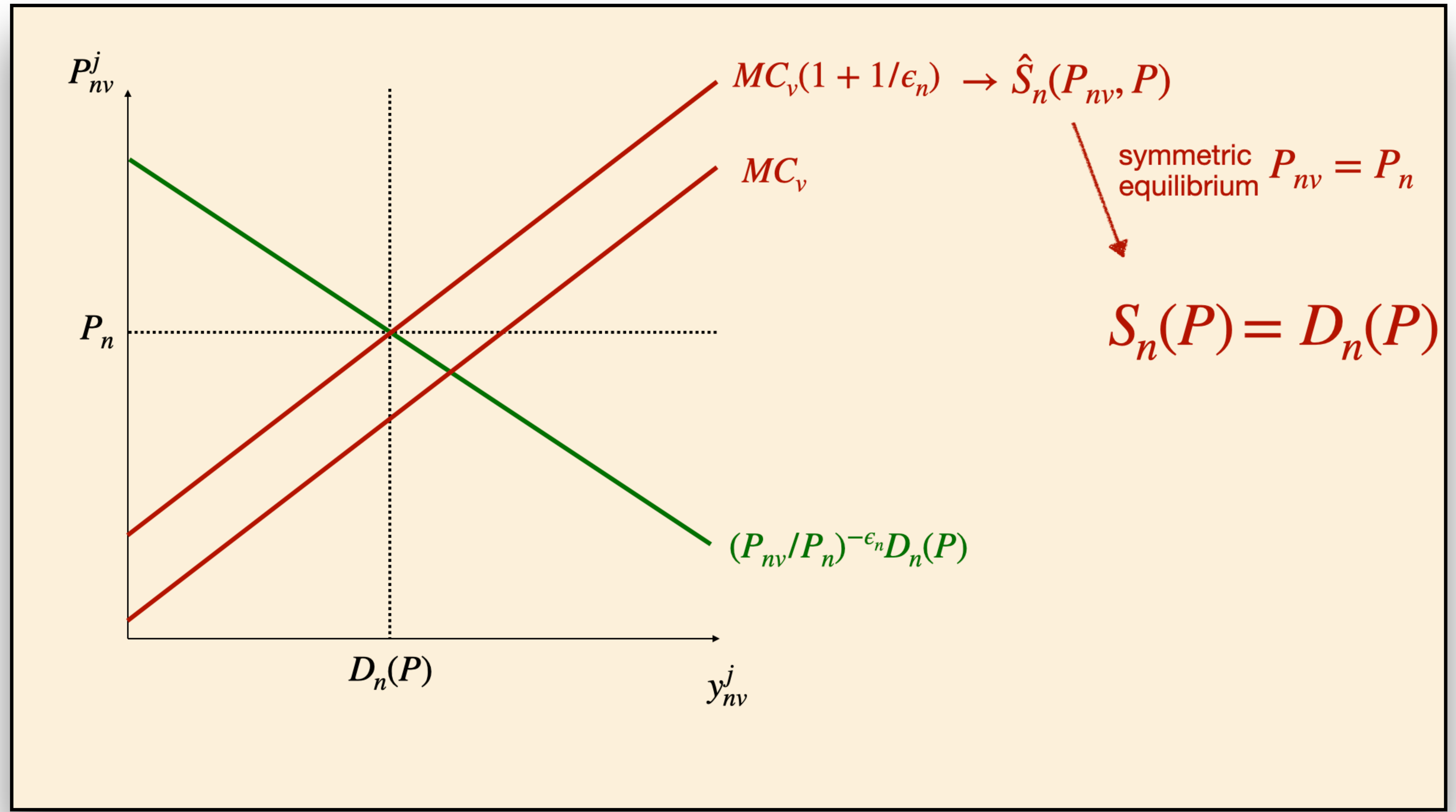
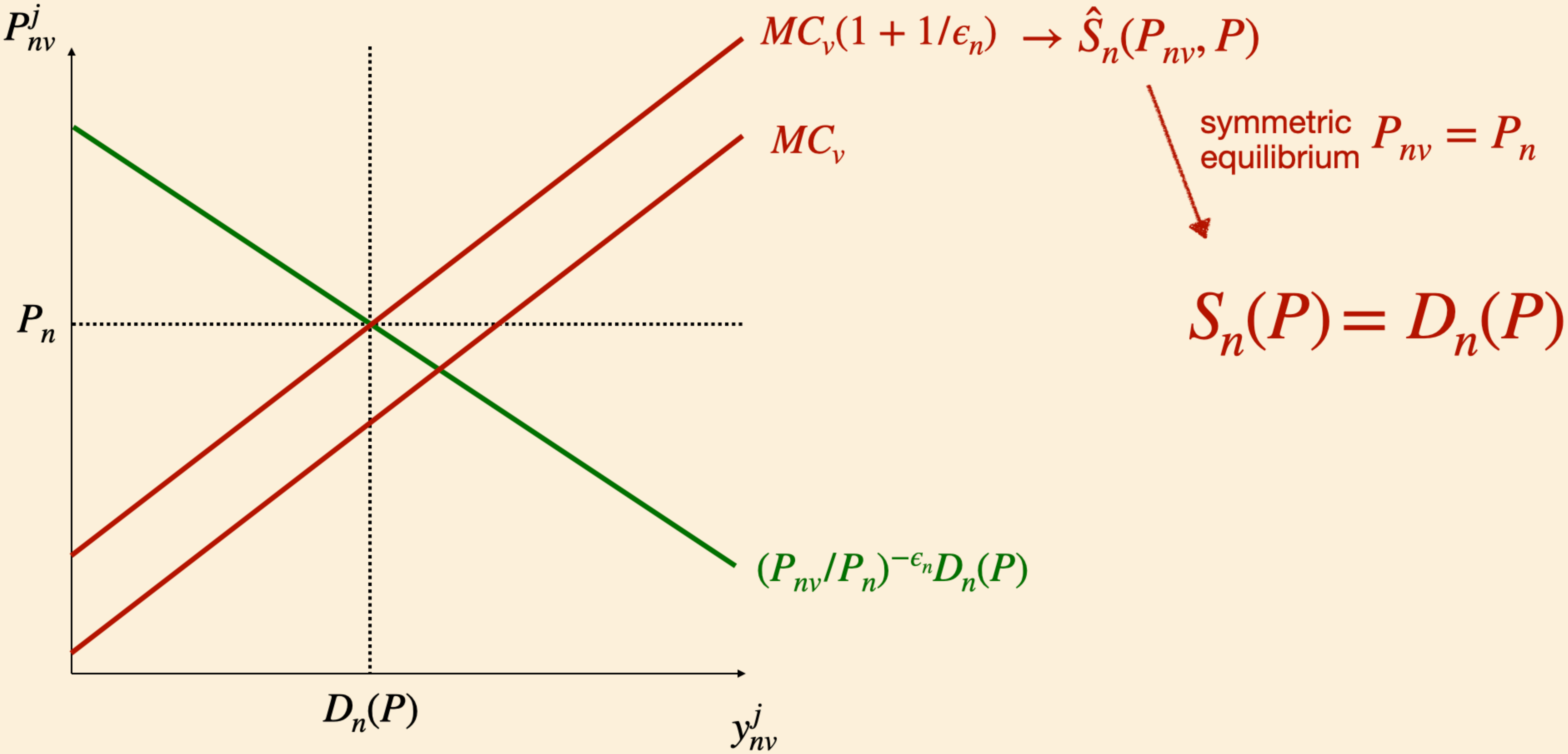
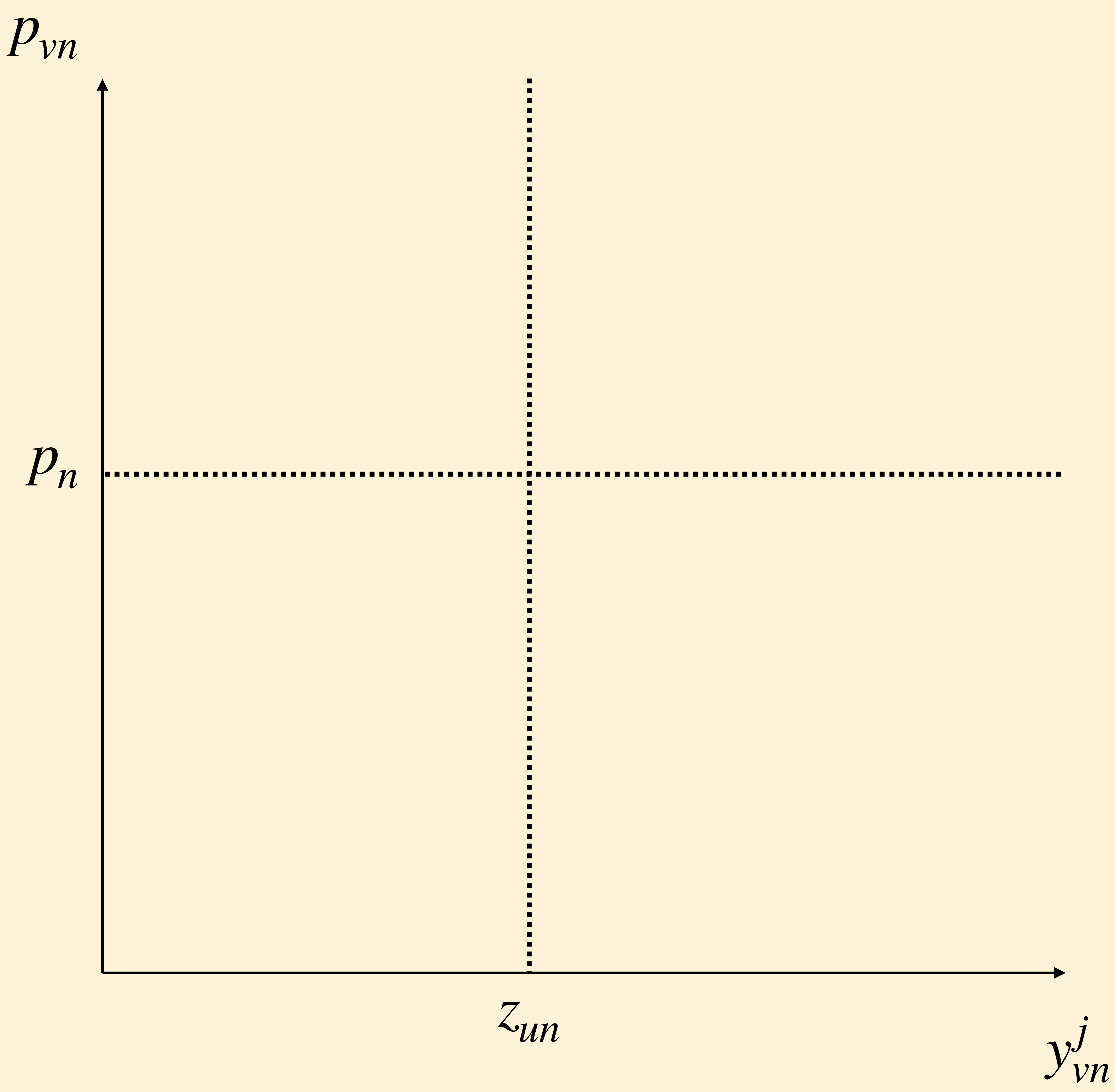
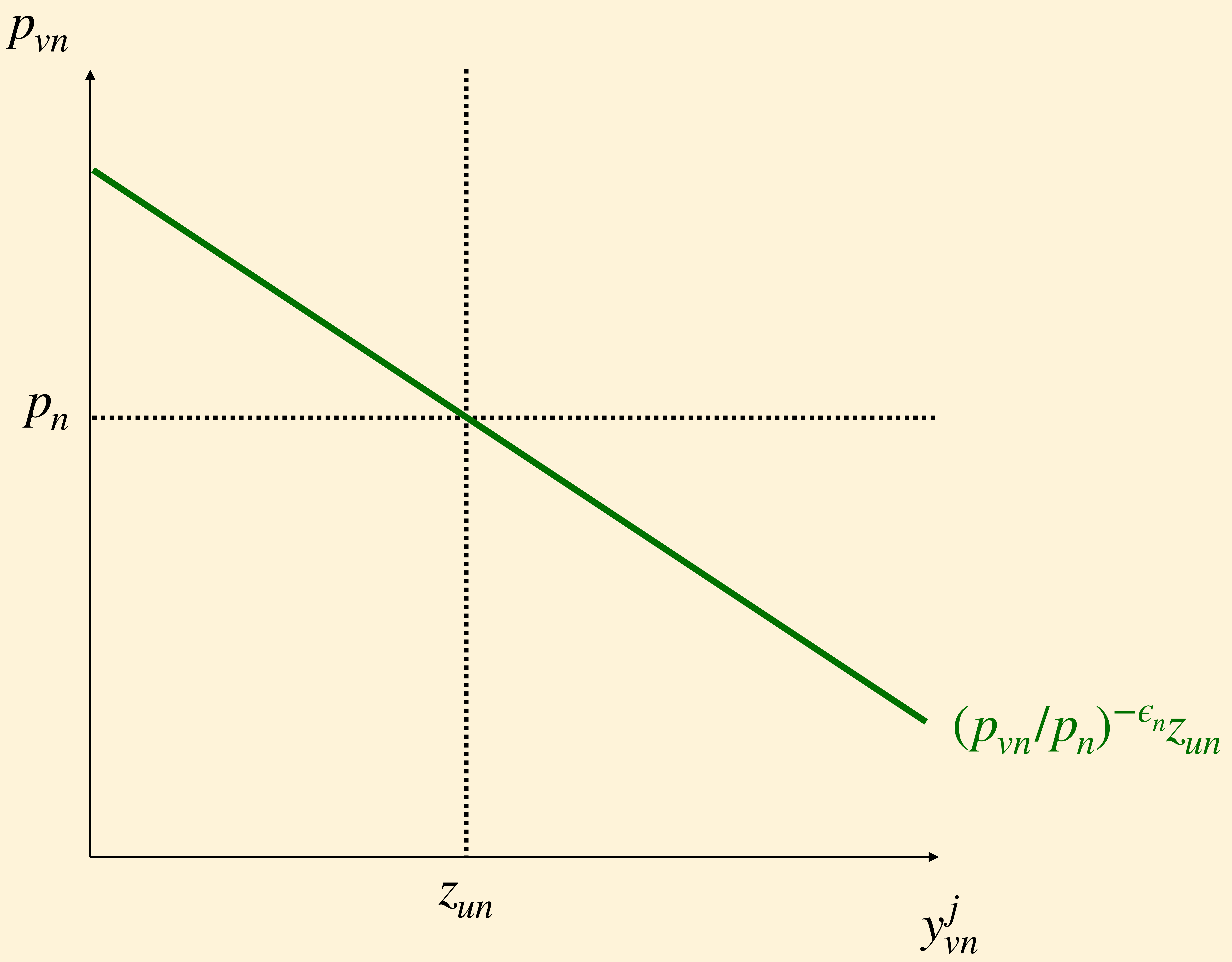




P_{nv}^j
P_n
$D_n(P)$
y_{nv}^j
$MC_v(1 + 1/\epsilon_n) \rightarrow \hat{S}_n(P_{nv}, P)$
MC_v
$(P_{nv}/P_n)^{-\epsilon_n} D_n(P)$
symmetric equilibrium $P_{nv} = P_n$
$S_n(P) = D_n(P)$


p_{vn}
p_n
z_{un}
y^j_{vn}


p_{vn}
p_n
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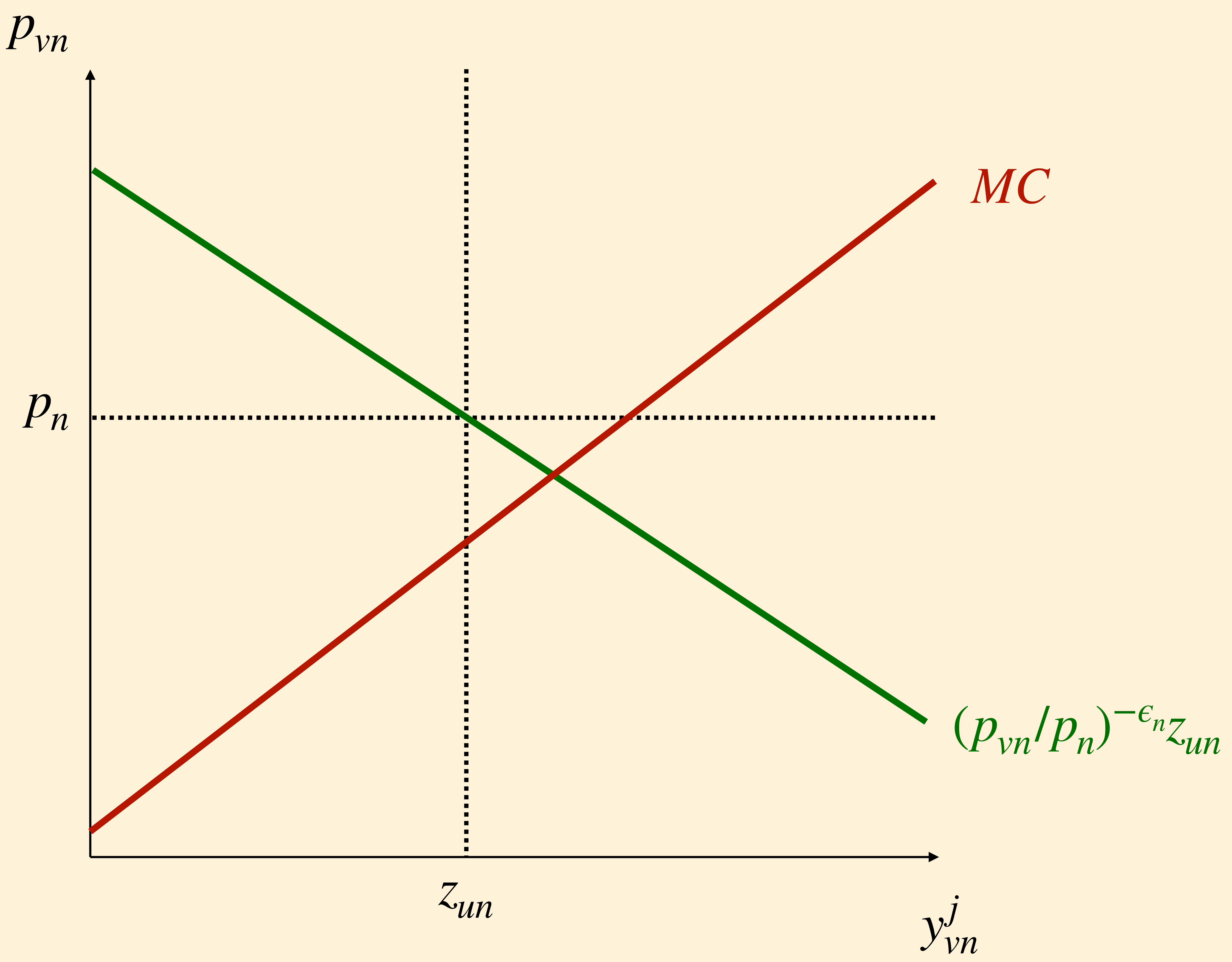
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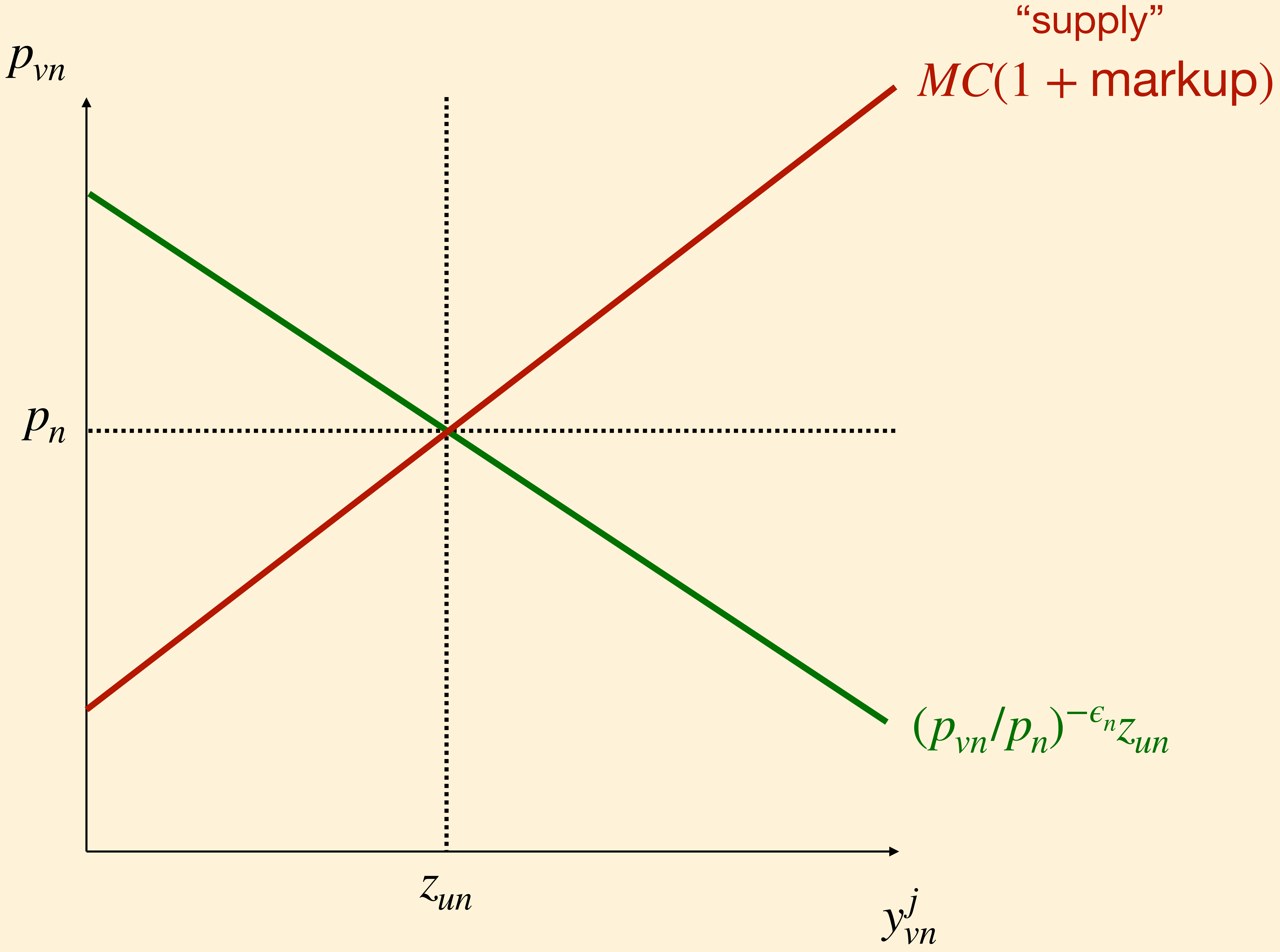
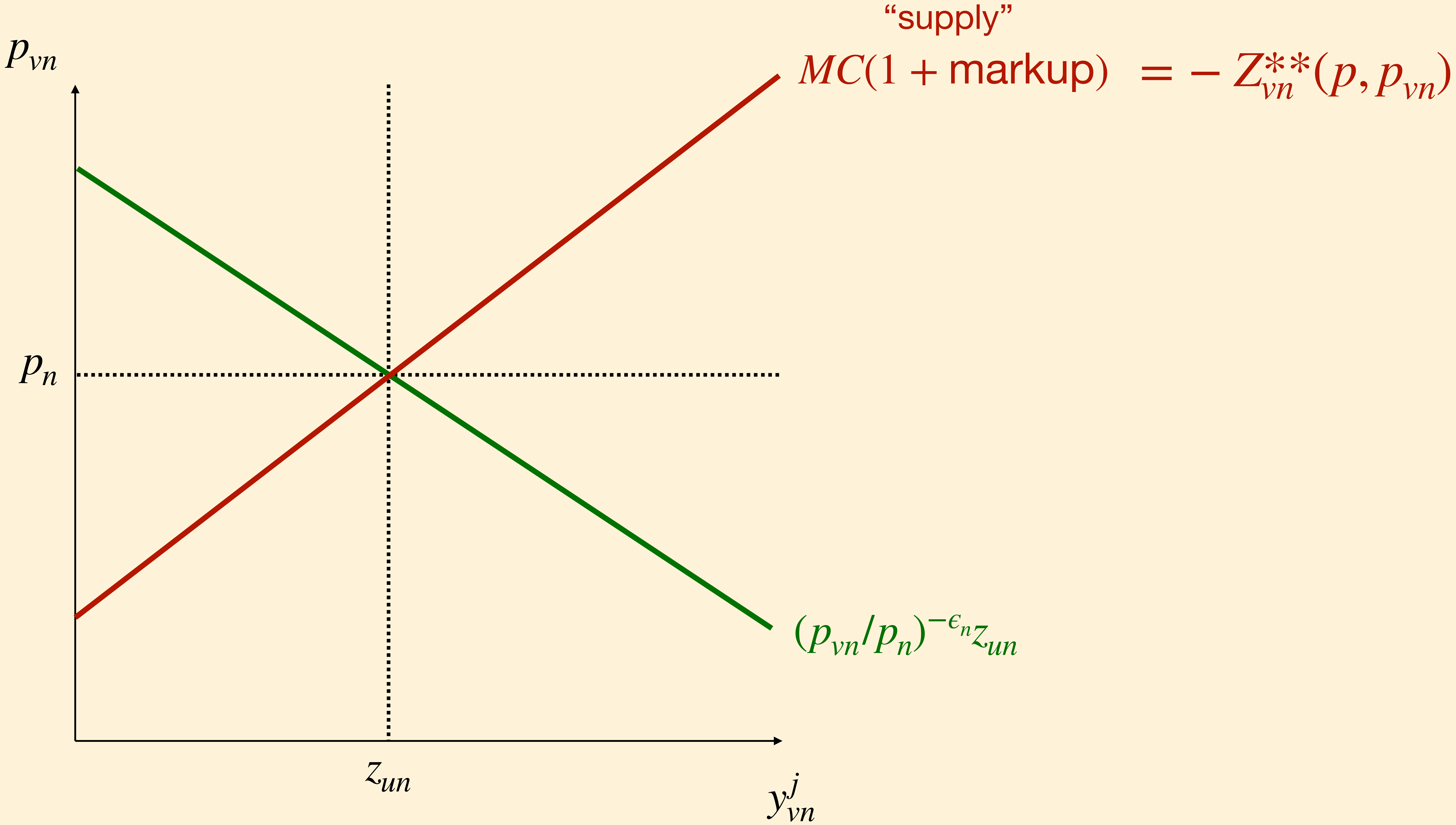
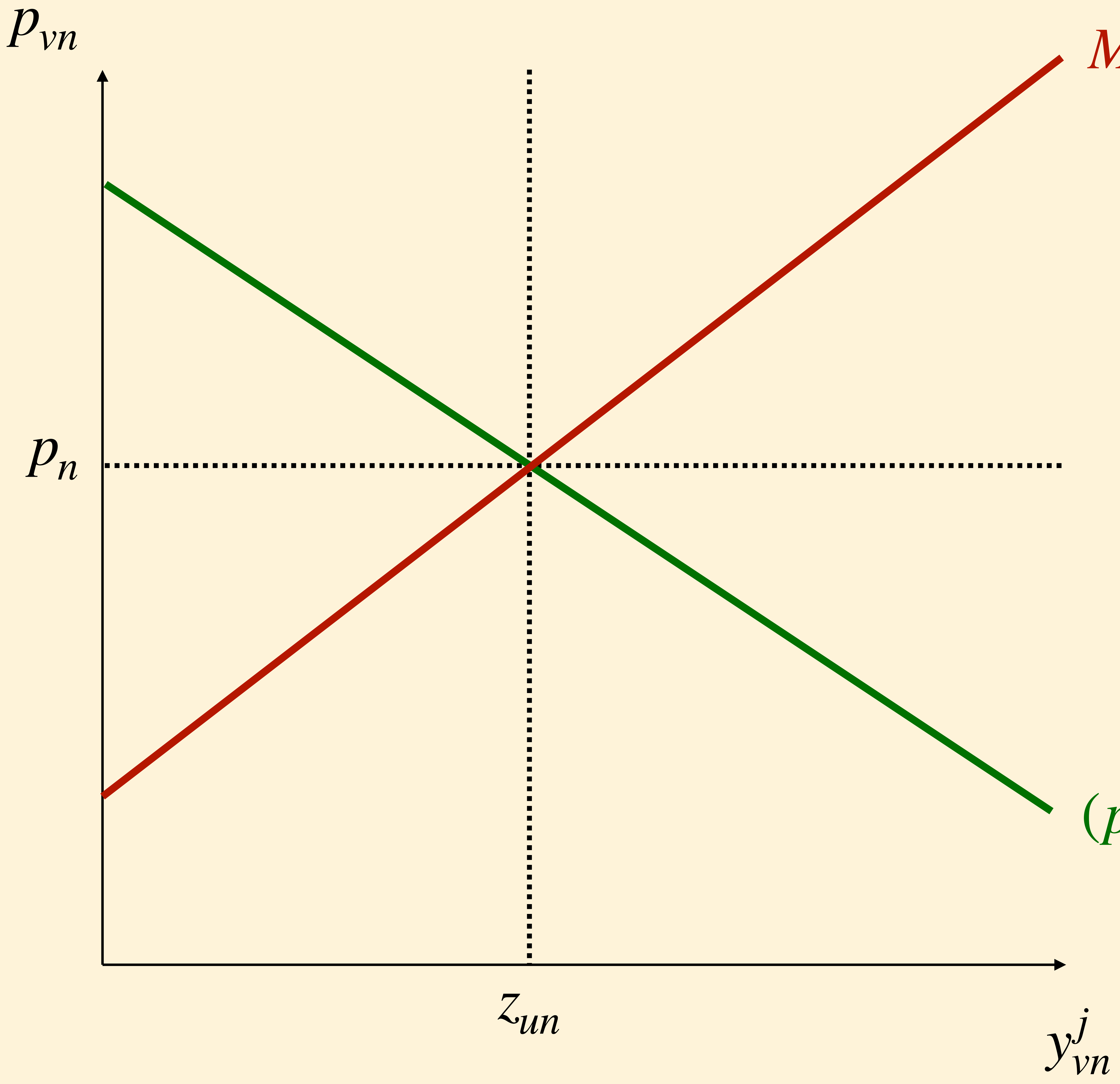


“supply”
$MC(1 + \text{markup})$
p_{vn}
p_n
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
z_{un}
y_{vn}^j



"supply"
$MC(1 + \text{markup}) \;\; = - Z_{vn}^{**}(p, p_{vn})$
p_{vn}
p_n
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
z_{un}
y_{vn}^j



"supply"

$MC(1+\text{markup}) \;=-Z^{**}_{vn}(p, p_{vn})$

$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$

symmetric equilibrium $p_{vn} = p_n$

$$-Z^{**}_{vn}(p) = z_{un}$$

$$\Pi^f(p) \equiv \max -(p \cdot z_u^f + p_{vn} z_{vn})$$

$$(z_u^f, z_{vn}) \in Y^f$$

$$z_{vn} = -(p_{vn}/p_n)^{-\epsilon_n} \; z_{un}$$

“as if” competitive…
(+ markup omitted here for simplicity)

$$\max U^h(z_u^h, z_{vn})$$

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$$Z^{**}(p) \equiv Z_{un}^{**}(p) + Z_{vn}^{**}(p)$$

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$$Z^{**}(p) \equiv Z_{un}^{**}(p) + Z_{vn}^{**}(p) \longrightarrow \boxed{Z^{**}(p) = 0}$$

…exactly as if Walrasian!
(new result)

$$\max U^h(z_u^h, z_{vn})$$
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Excess Demands 1.0

- Monotone Pricing = optimal price increasing in demand
  - automatic for firms
  - households?

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Proposition.

Monotone Pricing

$$\Rightarrow Z^{**h}(p) = Z_u^{**h}(p) + Z_v^{**h}(p)$$

$$\hat{U}^j(z_u^j, z_{vn}, I^j)$$

(optional outside good I^j)

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(optional outside good I^j)

$$p \cdot z_u^j + p_{vn} z_{vn} + I^j \leq p \cdot a^j + \sum_f \omega^{j,f} \Pi^f$$

$$z_{vn} = -\left(p_{vn}/p_n\right)^{-\epsilon_n} z_{un}$$

$$V^{*j}(p, z_{vn}, p_{vn}) = \max_{z_u^j, I^j} \quad \hat{U}^j(z_u^j, z_{vn}, I^j)$$

(optional outside good I^j)

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$$p \cdot z_u^j + p_{vn} z_{vn} + I^j \leq p \cdot a^j + \sum_f \omega^{j,f} \Pi^f$$

$$\rightarrow Z_u^{*j}(p, z_{vn}, p_{vn})$$

$$z_{vn} = -\,(p_{vn}/p_n)^{-\epsilon_n}\; z_{un}$$

$$V^{*j}(p, z_{vn}, p_{vn}) = \max_{z_u^j, I^j} \quad \hat{U}^j(z_u^j, z_{vn}, I^j)$$ (optional outside good I^j)

$$p \cdot z_u^j + p_{vn} z_{vn} + I^j \leq p \cdot a^j + \sum_f \omega^{j,f} \Pi^f$$

$\rightarrow Z_u^{*j}(p, z_{vn}, p_{vn}) \rightarrow Z_u^{*j}(p, z_{vn})$ when $p_{vn} = p_n$

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$$\rightarrow (p_{vn}^{**}(p, z_{un}), z_{vn}^{**}(p, z_{un}))$$

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increasing in z_{un}

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Price Setting → As If Walrasian Demand

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Aggregating…

$Z_u^*(p, z_v)$

$Z_v^{**}(p)$

$Z_u^{**}(p)$

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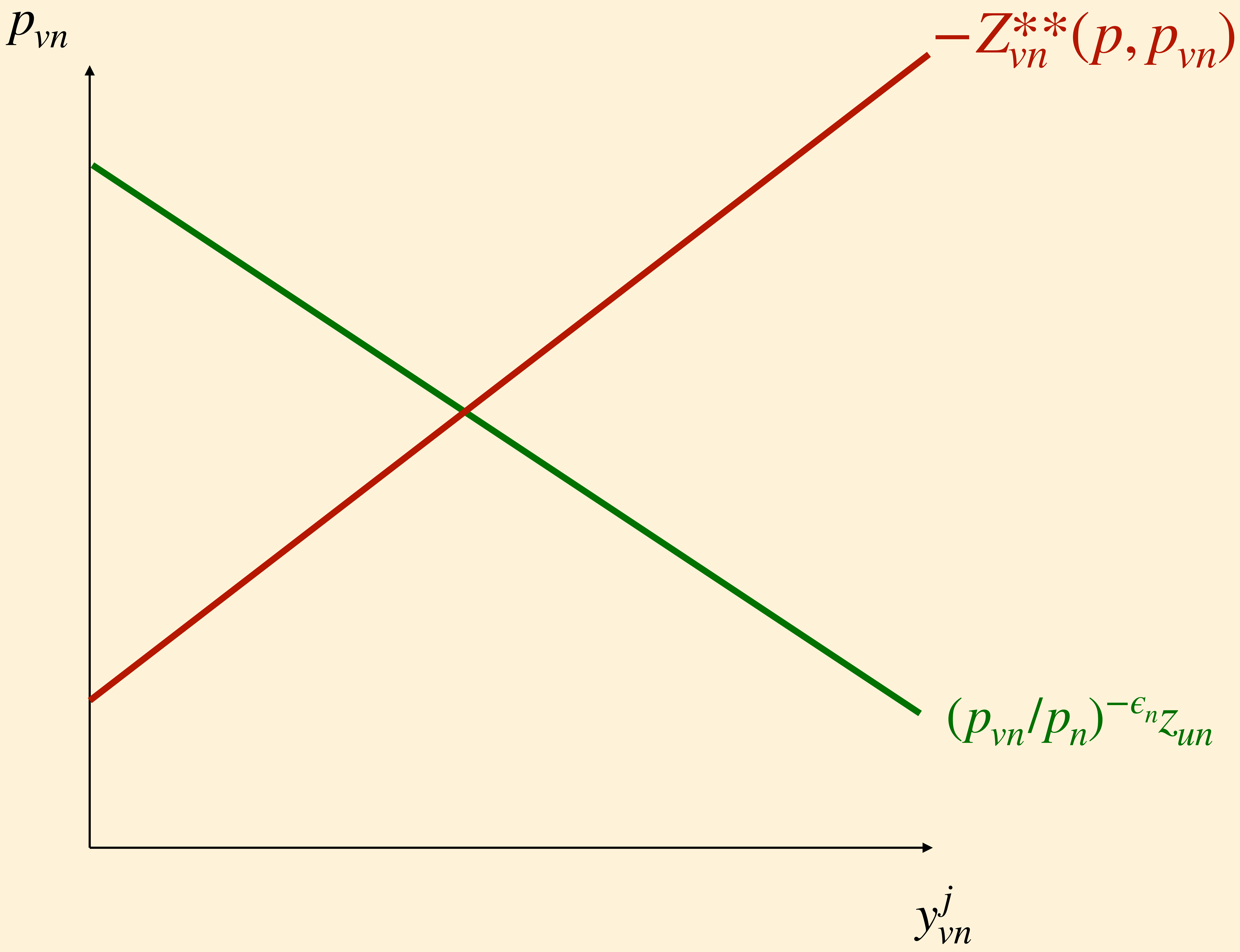
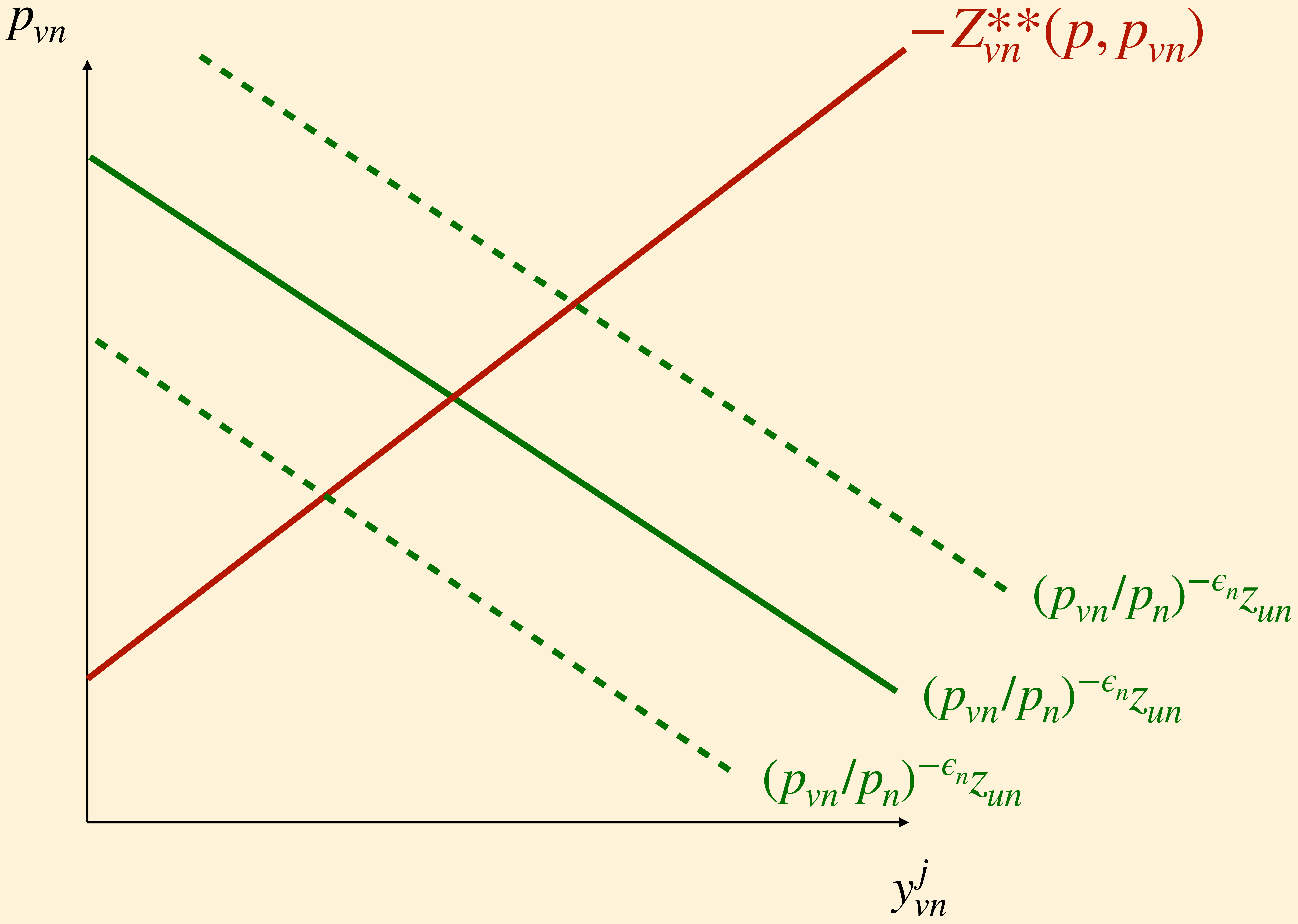
Price Setting → As If Walrasian Demand


p_{vn}
$-Z^{**}_{vn}(p, p_{vn})$
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
y^j_{vn}



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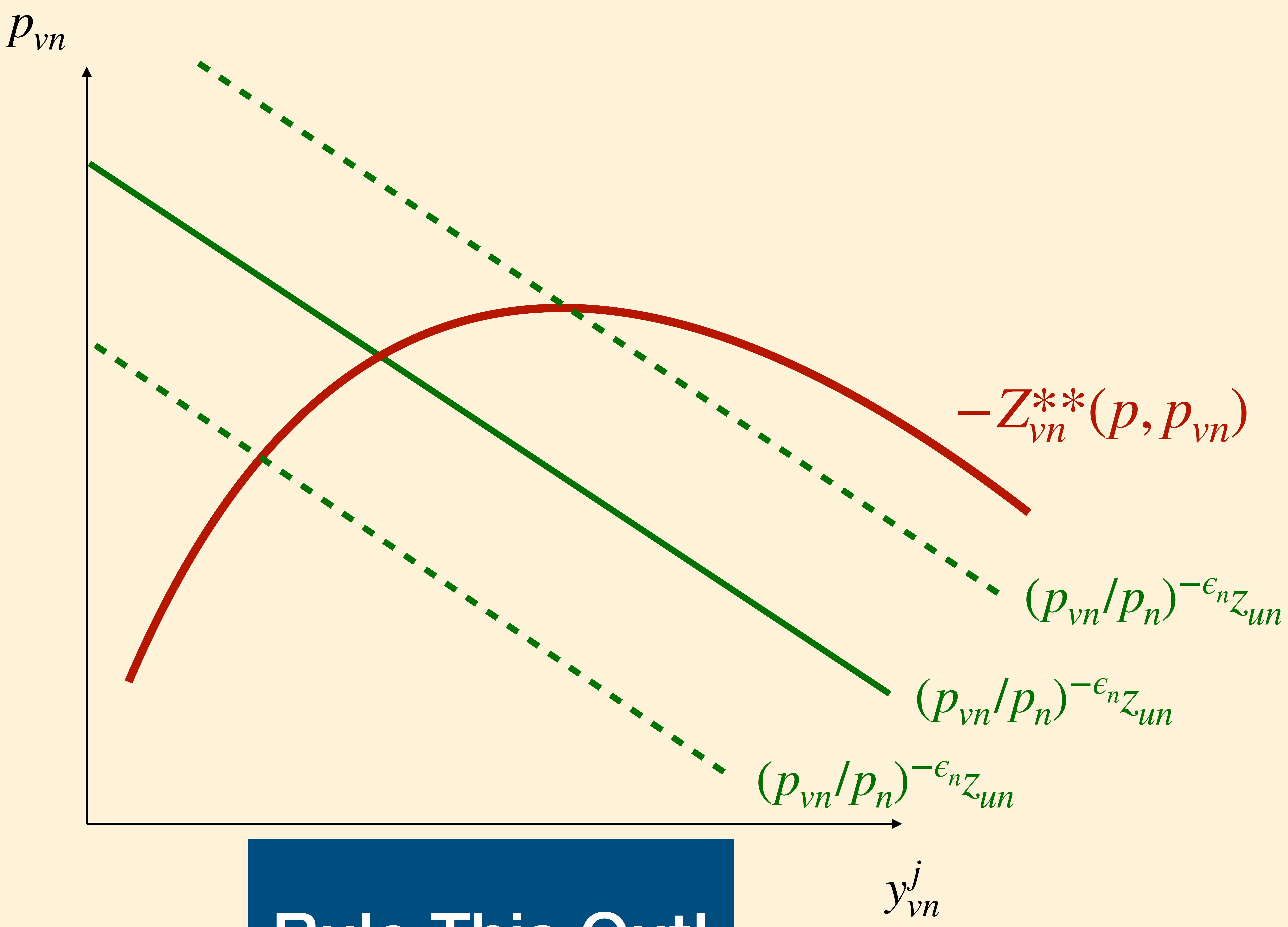
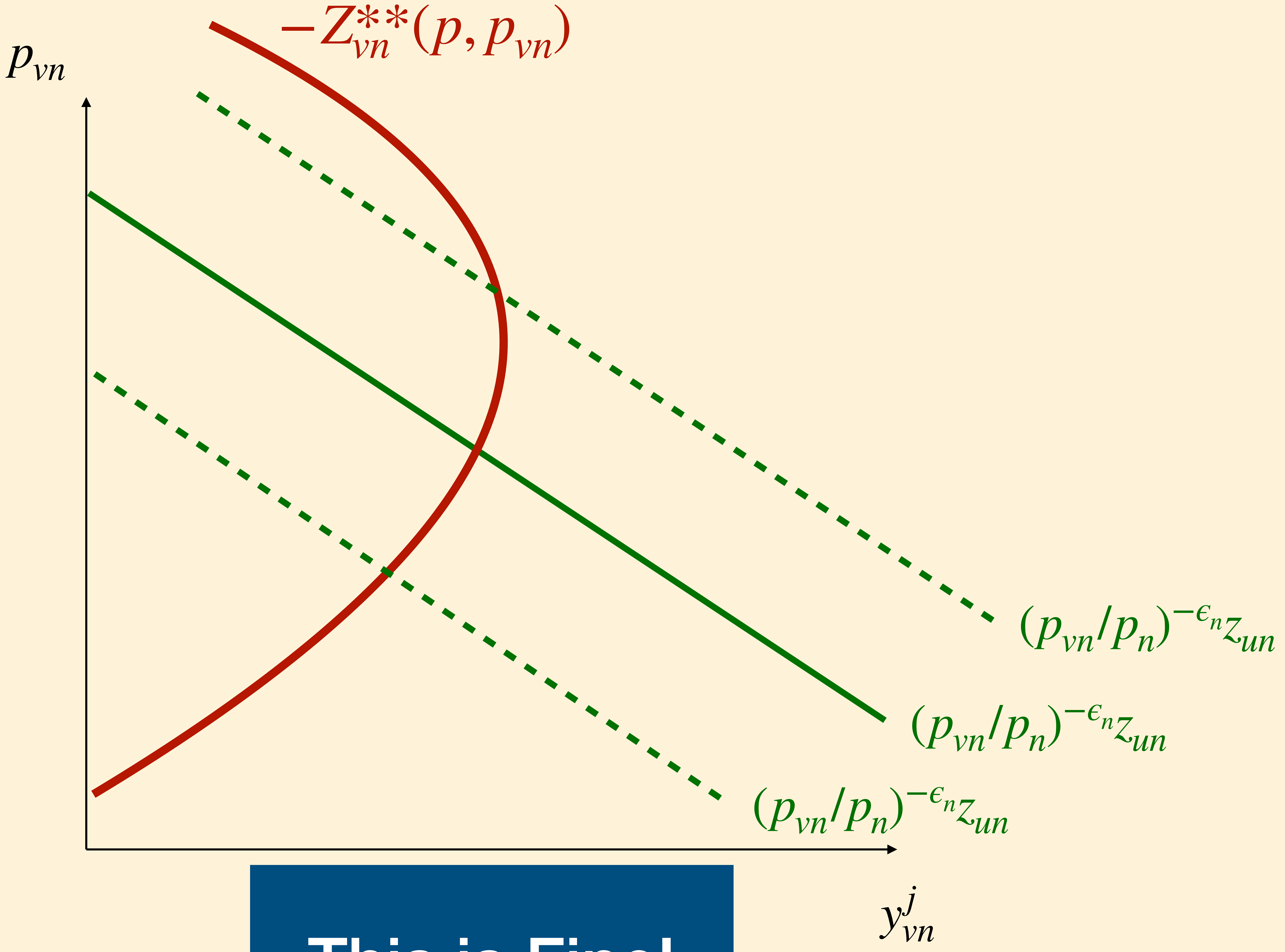
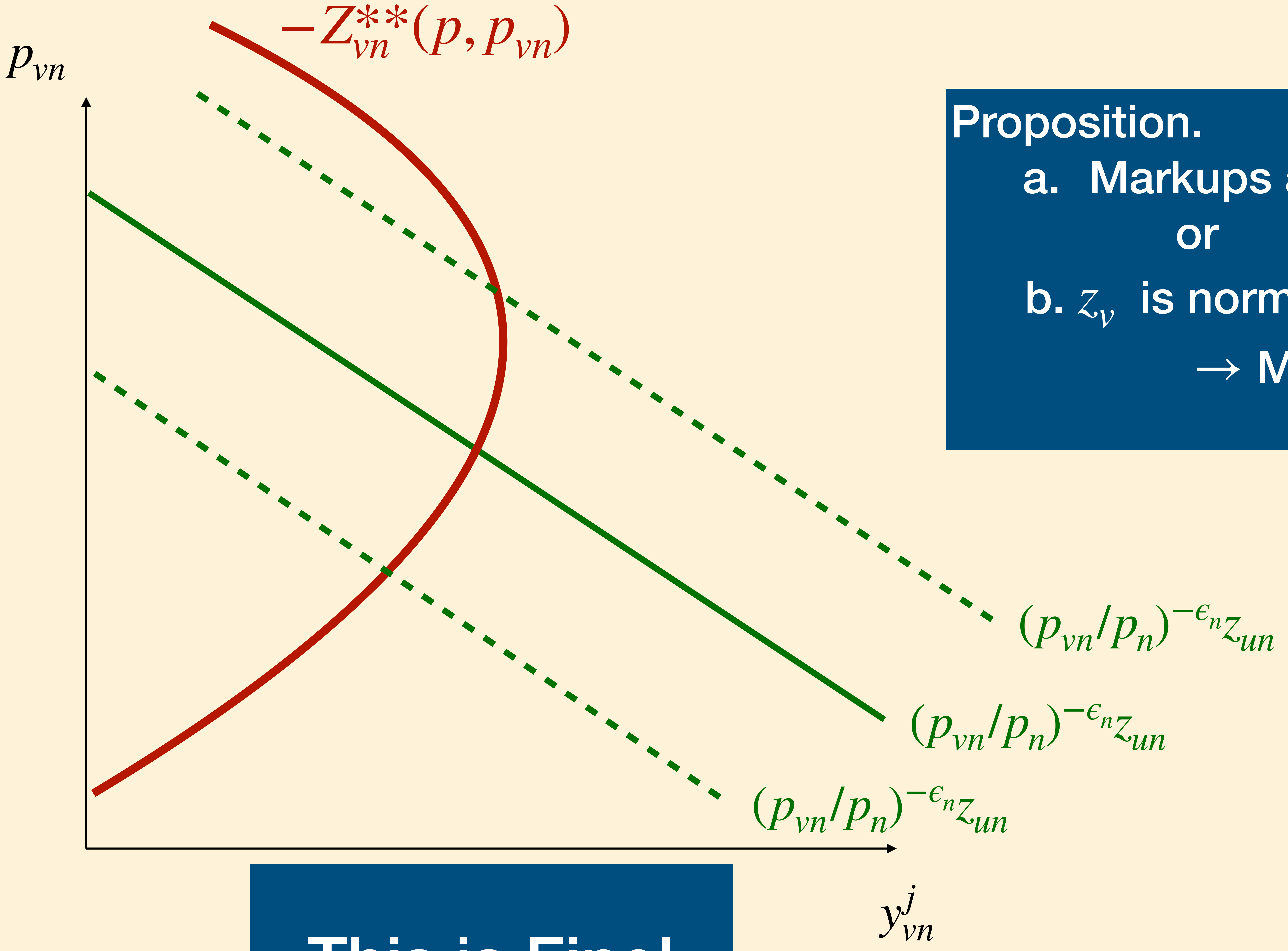


Rule This Out!


$-Z_{vn}^{**}(p, p_{vn})$
p_{vn}
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
$(p_{vn}/p_n)^{-\epsilon_n} z_{un}$
y_{vn}^{j}

This is Fine!



Proposition.

a. Markups are not too large

or

b. z_v is normal

$\rightarrow$ Monotone Pricing

This is Fine!

Excess Demands 1.0

- Monotone Pricing = optimal price increasing in demand
  - automatic for firms
  - households?

Proposition.

Monotone Pricing

$$\rightarrow$$

$$Z^{**h}(p) = Z_u^{**h}(p) + Z_v^{**h}(p)$$

Proposition.

a. Markups are not too large

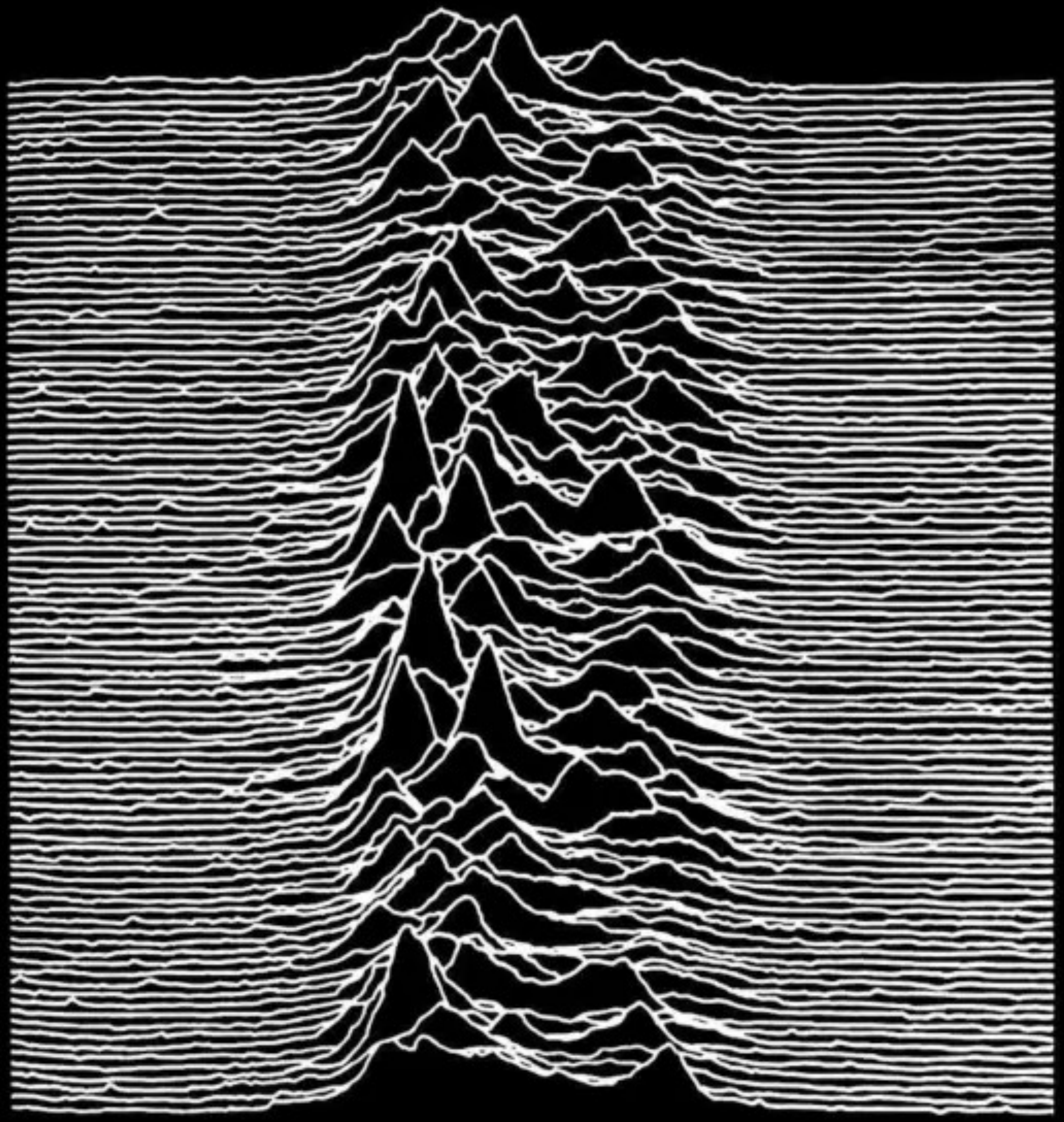
or

b. z_v is normal

$\Rightarrow$ Monotone Pricing

Weak Sufficient Condition!

Static Price Frictions



0 1 $\boxed{2}$ 3 4

Non-Walrasian Equilibria

Non-Walrasian Equilibria

- **Coming…** Price Frictions + Dynamics
- **First….** Price Frictions

Non-Walrasian Equilibria

- **Coming…** Price Frictions + Dynamics
- **First….** Price Frictions
- Non-Walrasian (temporary) equilibrium…
  - price pressure market n $\leftrightarrow$ excess demand $\tilde{z}_n = z_{un} + Z^{**}_{vn}(p)$

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$$Z(p) = (I - A)^{-1} Z^{**}(p)$$

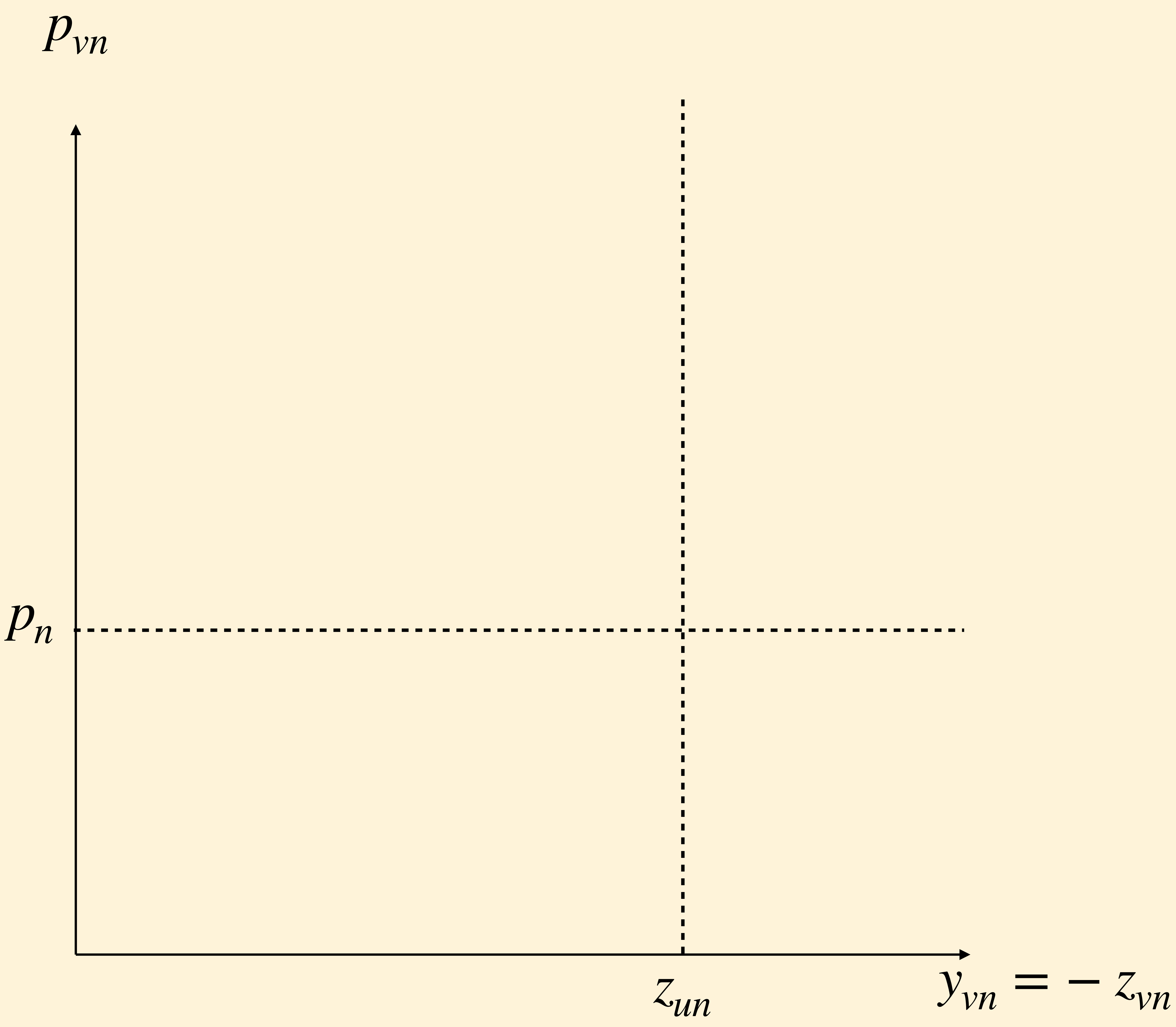
(A = Spillover Matrix)

Price Pressure and Excess Demand

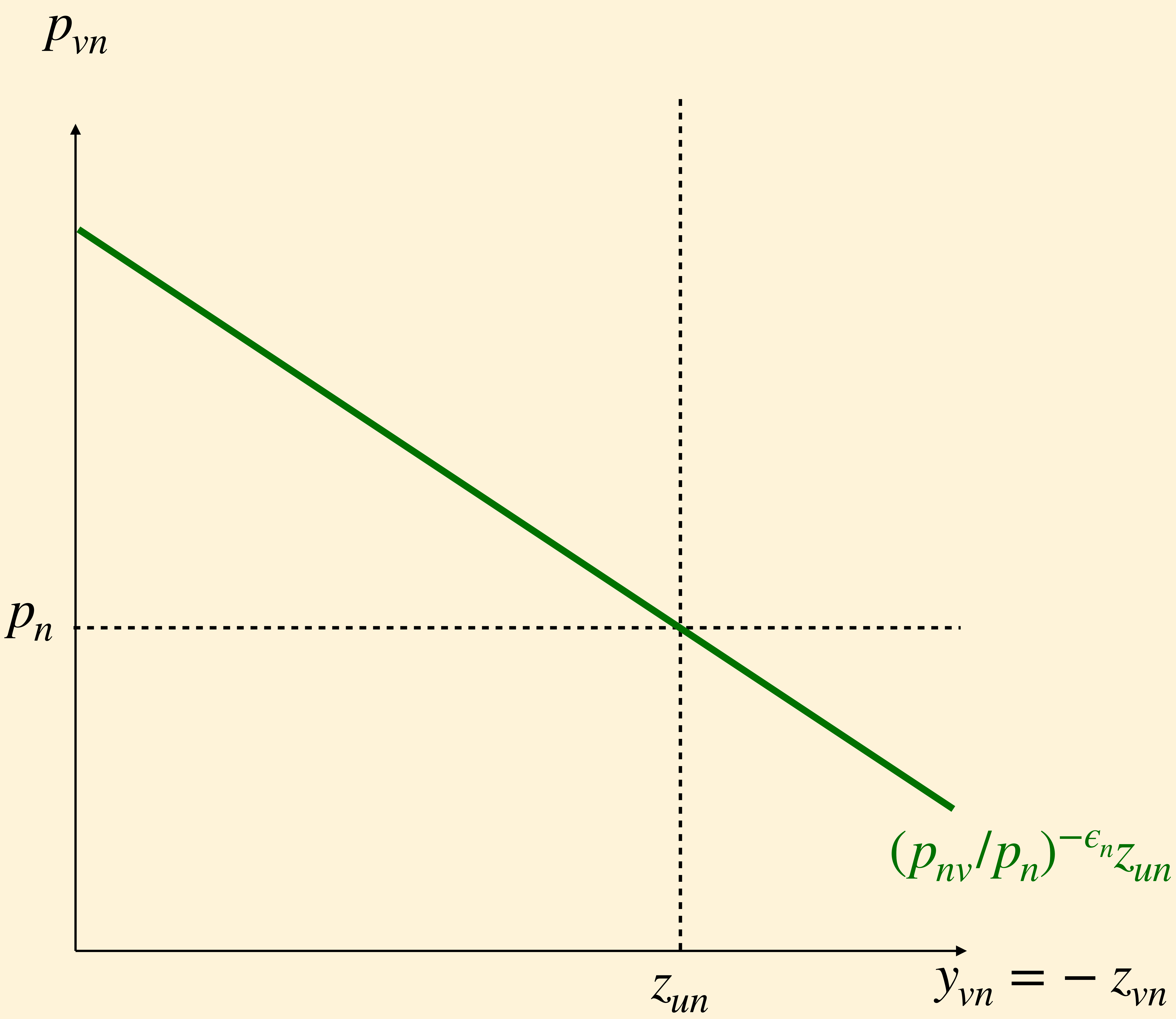
$$\boxed{Z_v^{**}(p)}$$

- Price deviator: $p_{vn} \neq p_n$
- Market clearing…

$$(p_{vn}/p_n)^{-\epsilon_n} z_{un} \; + \; Z_{vn}^{**}(p, p_{vn}) = 0$$



p_{vn}
p_n
z_{un}
$y_{vn} = -z_{vn}$



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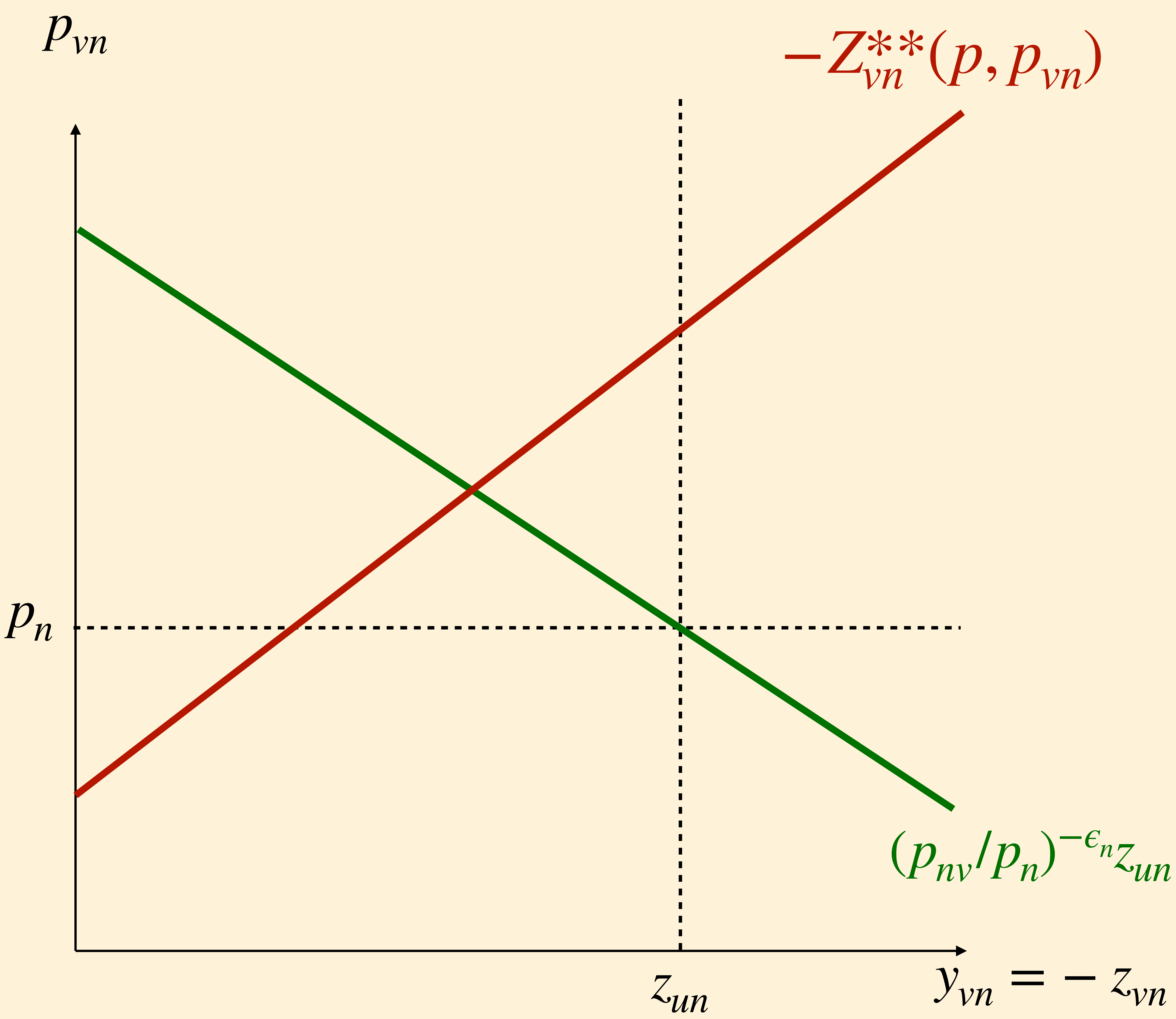
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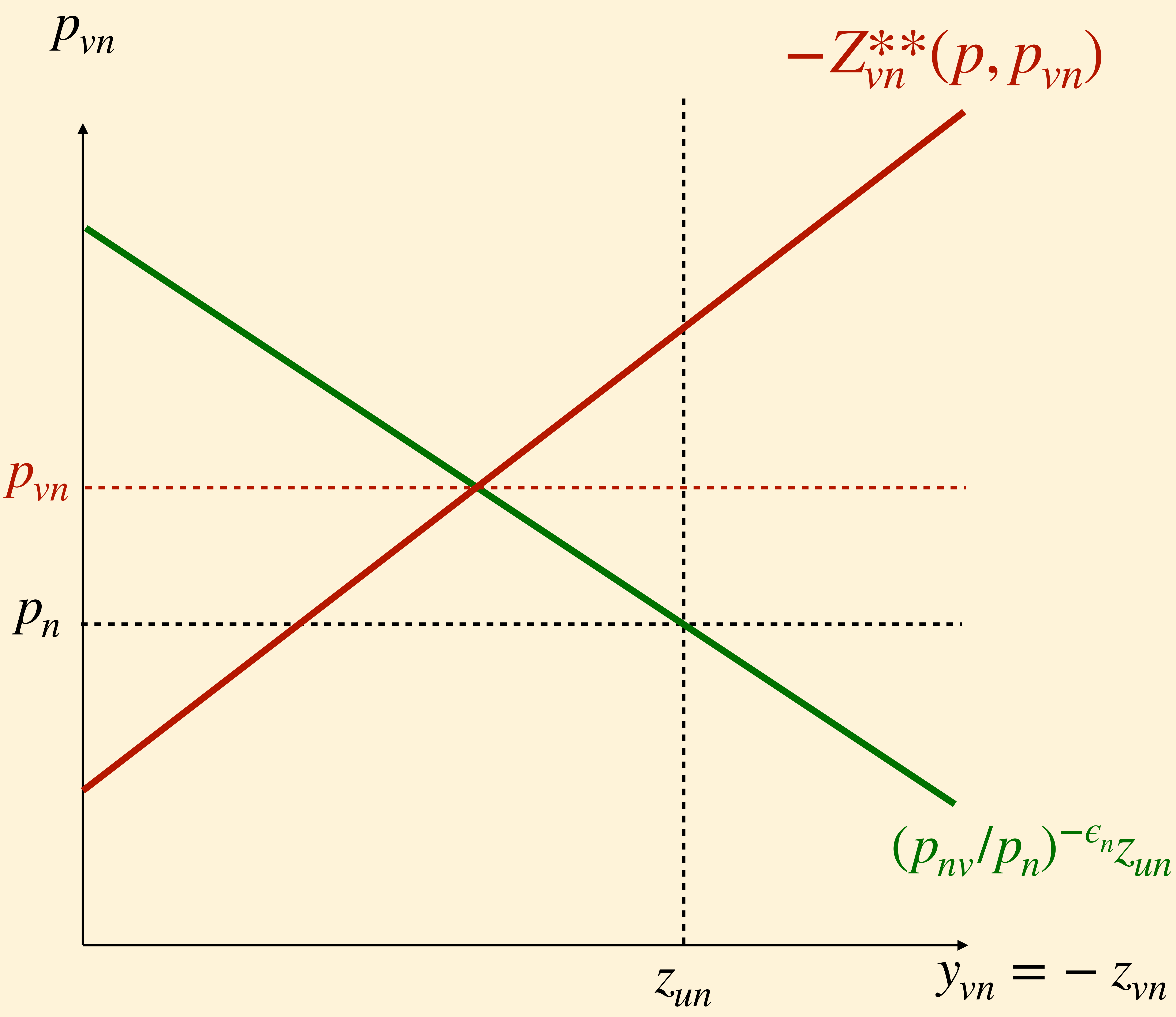
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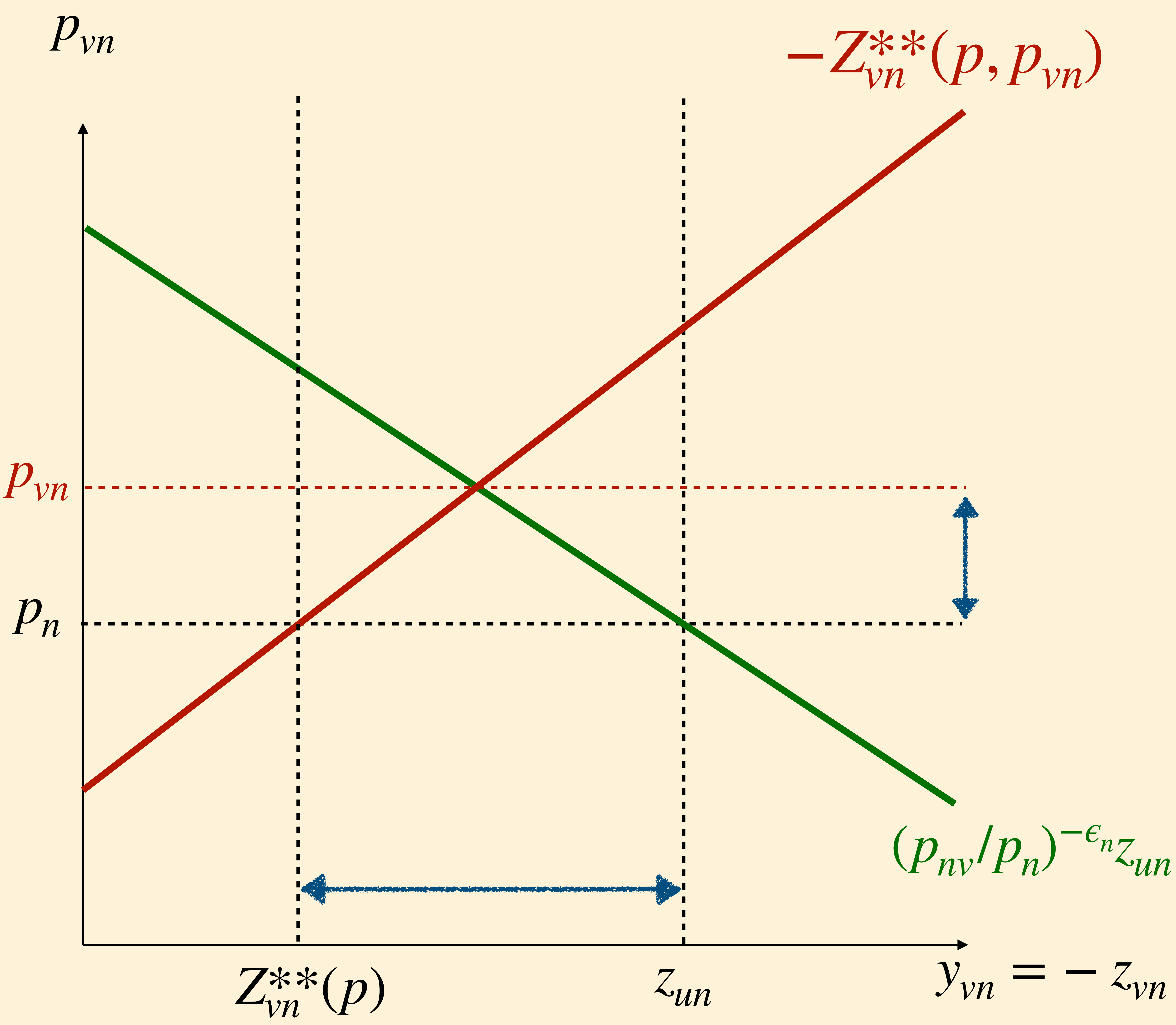

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Price Pressure and Excess Demand

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- Excess (Effective) Demand…

$$\tilde{z}_n \equiv z_{un} + Z^{**}_{vn}(p)$$

$$\longrightarrow \boxed{p_{vn} - p_n = \phi_n \tilde{z}_n}$$

(nonlinear in paper)

New Keynesian Literature:
excess demand ≠ "gaps")

Disequilibrium Literature:
did not have this

Equilibrium Quantities at Fixed Prices

$\boxed{\begin{array}{l} Z_u^*(p, z_v) \\ Z_v^{**}(p) \end{array}}$

Equilibrium Quantities at Fixed Prices

$$Z_u^*(p, z_v)$$

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- Fixed price: $p_{vn} = p_n$

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spillover
matrix

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spillover matrix

Effective Demand

Notional Demand

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spillover matrix

Effective Demand

Notional Demand

$$Z(p) = (I - A)^{-1} Z^{**}(p)$$

$$r(A) < 1$$

$$(I - A)^{-1} = I + A + A^2 + \cdots$$

Leontief Inverse

$$Z(p) = (I - A)^{-1} Z^{**}(p)$$

$$Z(p) = (I - A)^{-1} Z^{**}(p)$$

$$p_{nv} - p_n = \phi_n Z_n(p)$$

(nonlinear in paper)

Static Phillips Curve

Static Phillips Curve

- Price Pressure ↔ Equilibrium price adjustment? **Yes.**
  Later dynamic, now static setting…

  - fraction θ_n → reset prices optimally
  - fraction $1 - \theta_n$ → exogenous prices $p_{vn} = p_n$
  - index $\hat{p}_n = (1 - \theta_n)p_n + \theta_n p_{vn}^{**}$

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- Optimal price reset → $p_{vn}^{**} - p_n = \gamma_n Z_n(\hat{p})$

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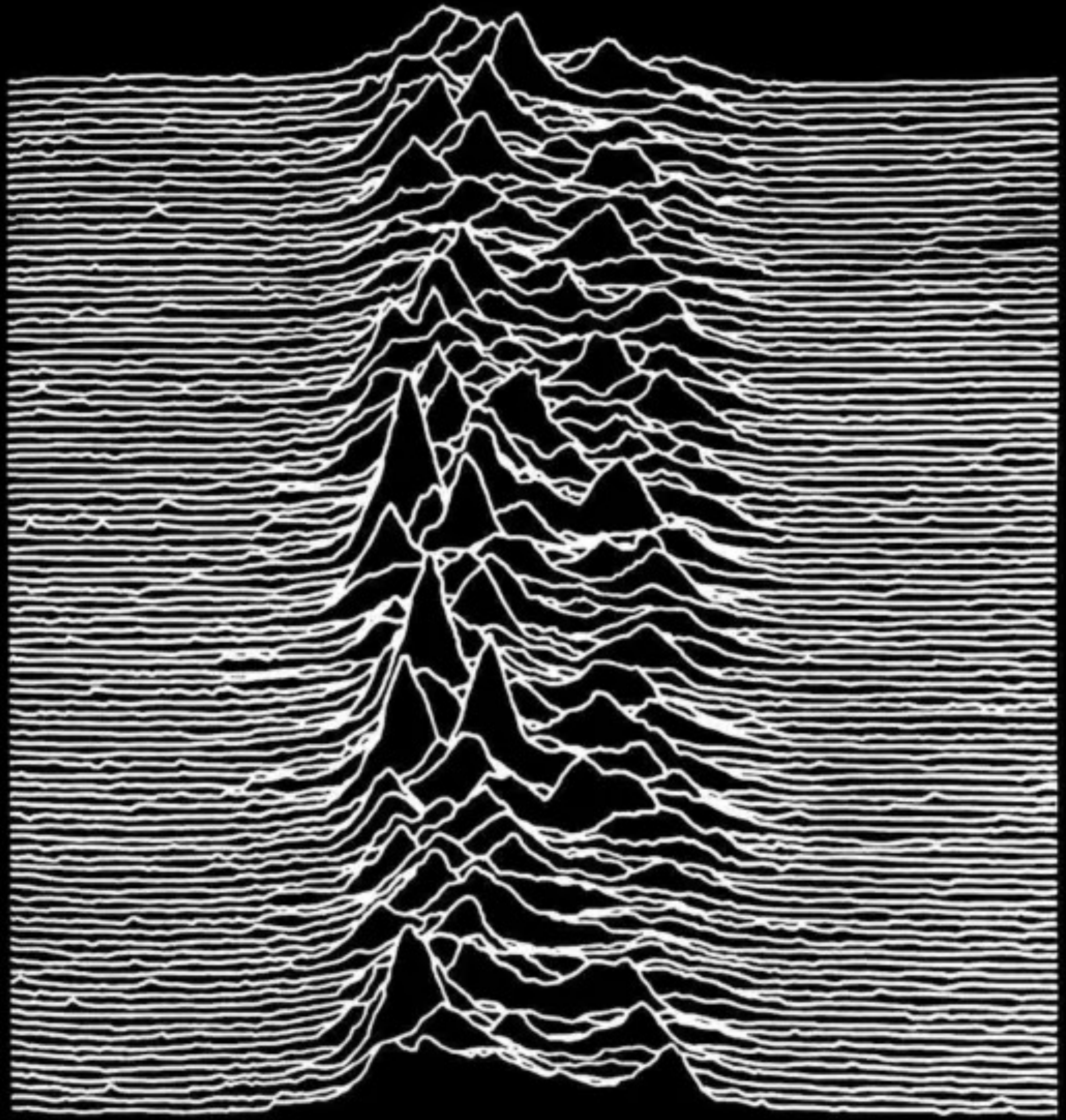
- Optimal price reset → $p_{vn}^{**} - p_n = \gamma_n Z_n(\hat{p})$
- Define: $\pi_n \equiv \hat{p}_n - p_n$

Proposition.

$$\pi_n = \theta_n \gamma_n Z_n(p)$$

Dynamic Price Adjustment

0 1 2 $\boxed{3}$ 4



Adding Dynamics

- Static GE → **Dynamic GE...**
  - repeated GE spot each t → previous GE model natural reference
  - intertemporal choices **+** add price frictions à la Calvo

Adding Dynamics

- Static GE → **Dynamic GE…**
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  - intertemporal choices + add price frictions à la Calvo
  - NK model but…

    setup → more general (GE tradition)

    approach → excess demand (GE tradition)

$$\Pi^f \equiv \max \qquad - (p \cdot z_u^f + p_{vn} z_{vn})$$

$$(z_{ut}^f, z_{vnt}) \in Y^f$$

$$z_{vnt} = -(p_{vnt}/p_{nt})^{-\epsilon_n}\ z_{unt}$$

$$\max \qquad U^h(z_u^h, z_{vn})$$

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$$\Pi^f \equiv \max -\mathbb{E} \sum_0^\infty Q_t (p_t \cdot z_{ut}^f + p_{vnt} z_{vnt})$$

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$$Q_t = \frac{1}{(1+i_0)(1+i_1)\cdots(1+i_{t-1})}$$

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s.t. Calvo pricing friction

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$$\mathbb{E}\sum_0^\infty Q_t(p_t \cdot z_{ut}^h + p_{vnt}z_{vnt}) \le p_0 \cdot a_0^h + \sum_f \omega^{h,f}\Pi^f$$

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s.t. Calvo pricing friction

$$\boxed{Q_t = \beta^t \quad \text{For now...}}$$

$$\Pi^f \equiv \max - \sum_0^\infty \beta^t [p_t \cdot z_{ut} + p_{vnt} y_{vnt}]$$

$$(z_{ut}, z_{vnt}) \in Y^f$$

$$\boxed{Q_t = \beta^t}$$

For now…

$$\max \sum_0^\infty \beta^t U^h(z_{ut}, z_{vnt})$$

$$\sum_0^\infty \beta^t [p_t \cdot z_{ut} + p_{nv} z_{nvt} - p_t \cdot a^h] \leq \sum_f \omega^{h,f} \Pi^f$$

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$$(z_{ut}, z_{vnt}) \in Y^f$$

$$\boxed{Q_t = \beta^t \quad \text{For now...}}$$

$\downarrow$

(Lagrangian)

$$L^j = \mu^j \sum_0^\infty \beta^t [\frac{1}{\mu^j} U^j(z_{ut}, z_{vnt}) - p_t \cdot z_{ut} - p_{vnt} z_{vnt}]$$

$\uparrow$

μ^j= Lagrange multiplier on agent j budget constraint

$$\max \textstyle\sum_0^\infty \beta^t U^h(z_{ut}, z_{vnt})$$

$$\textstyle\sum_0^\infty \beta^t [p_t \cdot z_{ut} + p_{nv} z_{nvt} - p_t \cdot a^h] \leq \sum_f \omega^{h,f} \Pi^f$$

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For now…

(Lagrangian)

$$L^j = \mu^j \sum_0^\infty \beta^t \boxed{[\frac{1}{\mu^j} U^j(z_{ut}, z_{vnt}) - p_t \cdot z_{ut} - p_{vnt} z_{vnt}]}$$

only this matters at a point in time…

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$$\sum_0^\infty \beta^t [p_t \cdot z_{ut} + p_{nv} z_{nvt} - p_t \cdot a^h] \leq \sum_f \omega^{h,f} \Pi^f$$

$$\frac{1}{\mu^j} U^j(z_{ut}, z_{vnt}) - p_t \cdot z_{ut} - p_{vnt} z_{vnt}$$

“as if” utility
as in
static analysis…

“as if”
quasilinear
outside good

$$\hat{U}^j = \frac{1}{\mu^j} U^j(z_u, z_{vn}) + I^j$$

"as if" utility
as in
static analysis…

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outside good

$$\hat{U}^j = \frac{1}{\mu^j} U^j(z_u, z_{vn}) + I^j$$

$$\rightarrow \begin{array}{l} Z(p) \\ Z_u^*(p, z_v) \\ Z_v^{**}(p) \end{array}$$

“as if” utility
as in
static analysis…

“as if”
quasilinear
outside good

$$\hat{U}^j = \frac{1}{\mu^j} U^j(z_u, z_{vn}) + I^j$$

except now…

$$\rightarrow \quad \begin{array}{l} Z(p) \\ Z_u^*(p, z_v) \\ Z_v^{**}(p) \end{array}$$

Frisch Demands

“As If” Representative Agent
with Quasilinear Utility

Removes income effects
<u>along</u> path

Skip Details of
Dynamic Pricing Problem

But similar to static
+ standard NK math magic

$$\leftarrow \quad \begin{array}{l} Z(p) \\ Z_u^*(p, z_v) \\ Z_v^{**}(p) \end{array}$$

Proposition.

$$\pi_{nt} = d_n Z_n(p_t) + \beta \mathbb{E}_t \pi_{nt+1}$$

$$(d_n = \theta_n(1 + \theta_n/\rho)\phi_n)$$

$\leftarrow$

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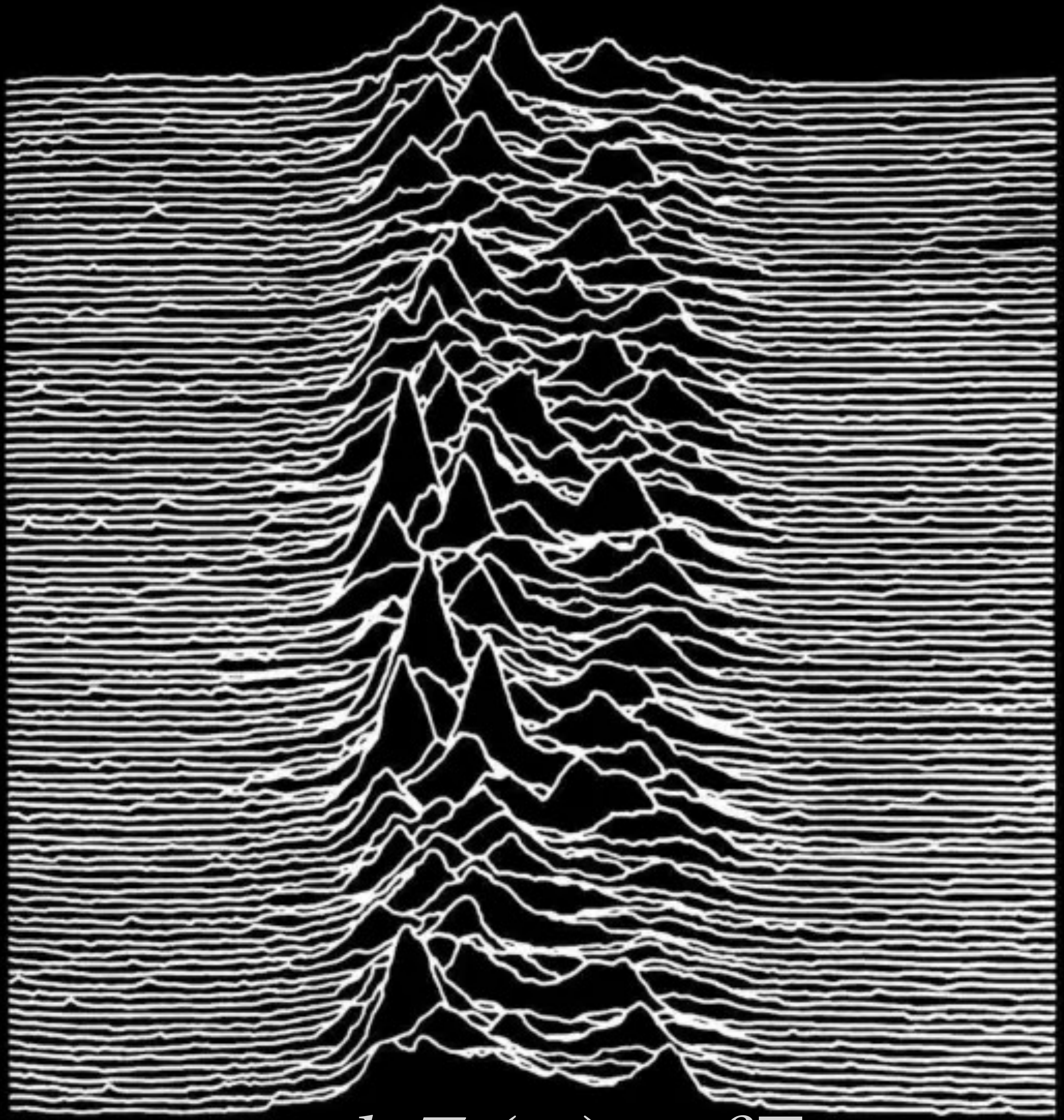
$\leftarrow$ $Z(p)$, $Z_u^*(p, z_v)$, $Z_v^{**}(p)$

$$\to \pi_{nt} = d_n \sum_0^\infty (1-\beta)\beta^s Z_n(p_{t+s})$$

$$\pi_{nt} = d_n z_{nt} + \beta \mathbb{E}_t \pi_{nt+1}$$

Applications

0 1 2 3 $\boxed{4}$



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Macro with Excess Demands…

- Excess Demand $\neq$ Gap
- Monetary Policy Rules
  - Taylor Rules + Determinacy
  - ZLB
- Shocks $\rightarrow$ Primitives + Policy
- Government Spending example (g_t)
- Extensions…
  - Non-Ricardian consumers
  - non-Calvo pricing
  - non-rational expectations, e.g. learning

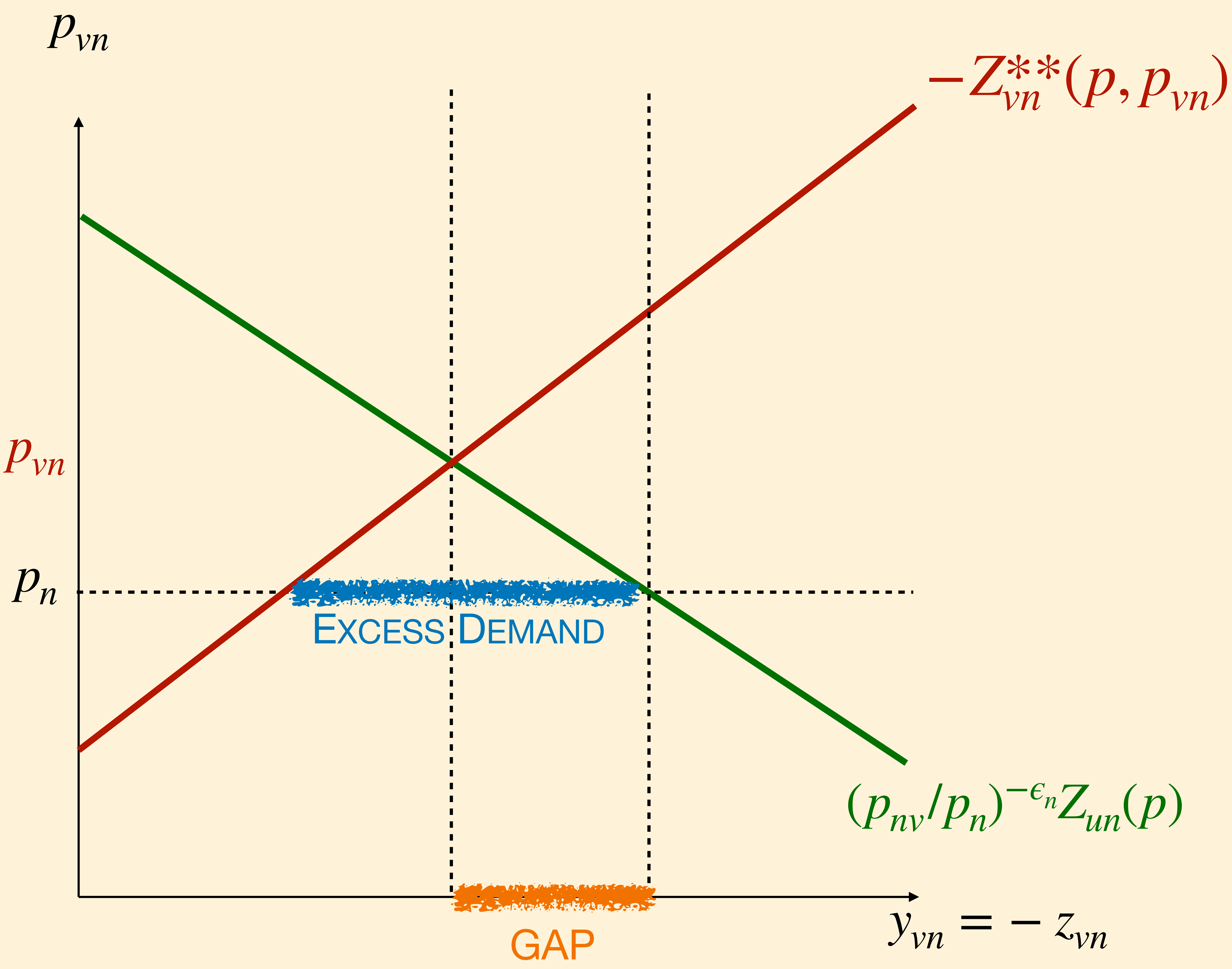
Excess Demand $\neq$ Output Gap

Excess Demand $\neq$ Output Gap

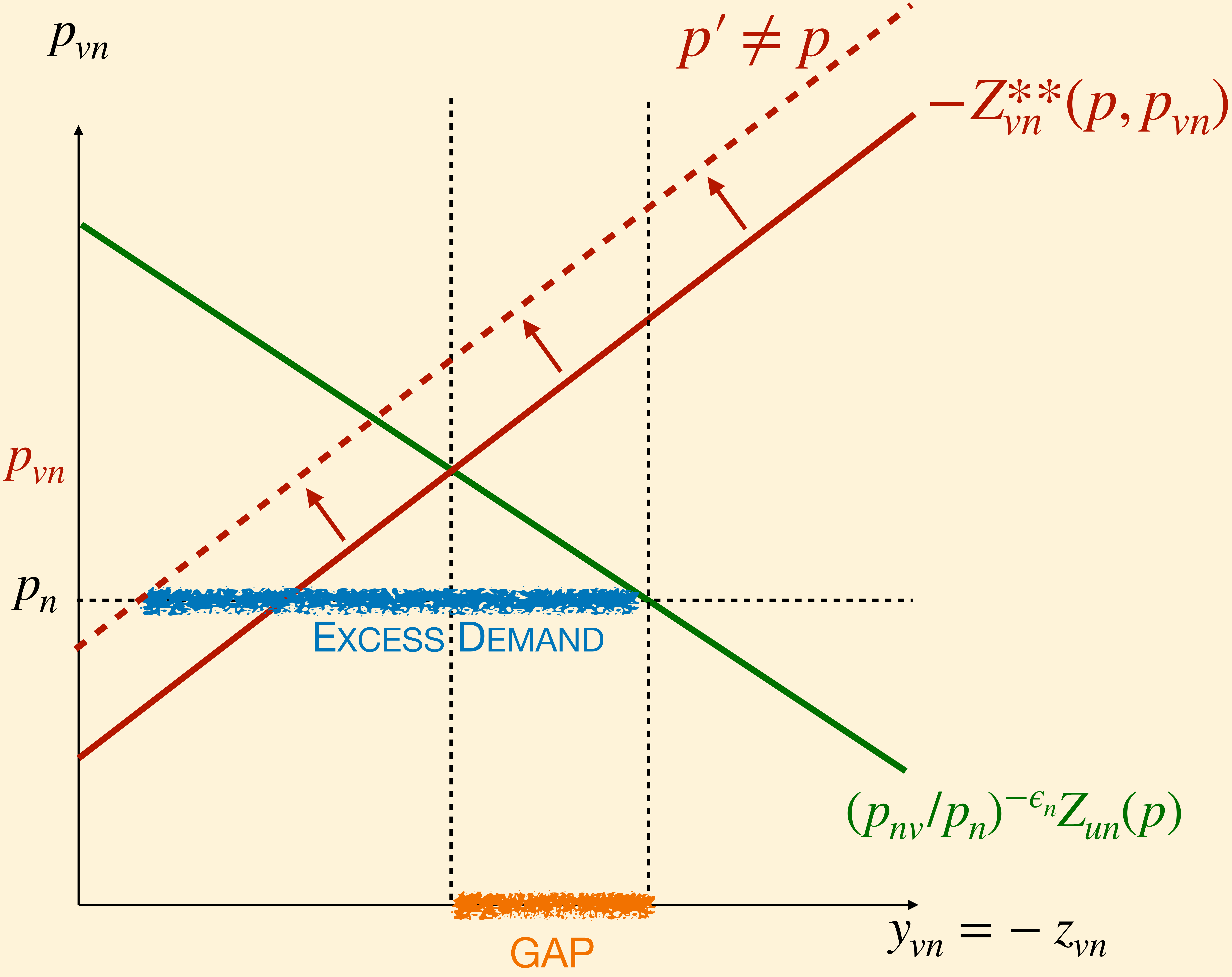
- Gap…
  - $N = 2$ textbook single final good + flex wages
    $\rightarrow$ output gap ~ excess demand
  - $N \geq 3$ **"output gap"** as aggregate measure (e.g. Rubbo, 2023)
    $\rightarrow$ assumptions homothetic + identical preferences+ CRS
    $\rightarrow$ plus: all other prices!
  - $N \geq 3$ what about an output gap in each market? (non-aggregate)

$$z_n^{\text{gap}} = z_{un} - \bar{z}_{un} \neq \tilde{z}_n$$

<u>not</u> equal to excess demand! (next figure…)



p_{vn}
$-Z^{**}_{vn}(p, p_{vn})$
p_{vn}
p_n
EXCESS DEMAND
$(p_{nv}/p_n)^{-\epsilon_n} Z_{un}(p)$
GAP
$y_{vn} = -z_{vn}$



p_{vn}
$p' \neq p$
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Taylor Rule $\longrightarrow$ $i_t = \phi\omega \cdot \pi_t + \bar{i}_t$

$$\phi > 0 \quad \omega \in \mathbb{R}^N$$

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Just as before!

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- No and no, in general, but…
- … some positive results…
  - "Tâtonnement" paper $\rightarrow$ conditions for stability
  - more general monetary policies allowing $\omega_n < 0$
    or
    constraints under which $\omega \geq 0$ works

Production Economies

- Production economy

$$N = N_c + N_\ell$$

  - N_c final + intermediate goods
  - N_ℓ labor types
- Production is CRS (w.l.o.g.)
- Pricing: monopolistic…
  - firms set price of goods p_c
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(Afrouzi Bhattarai is special case of 1)

Partitioned Production Economies

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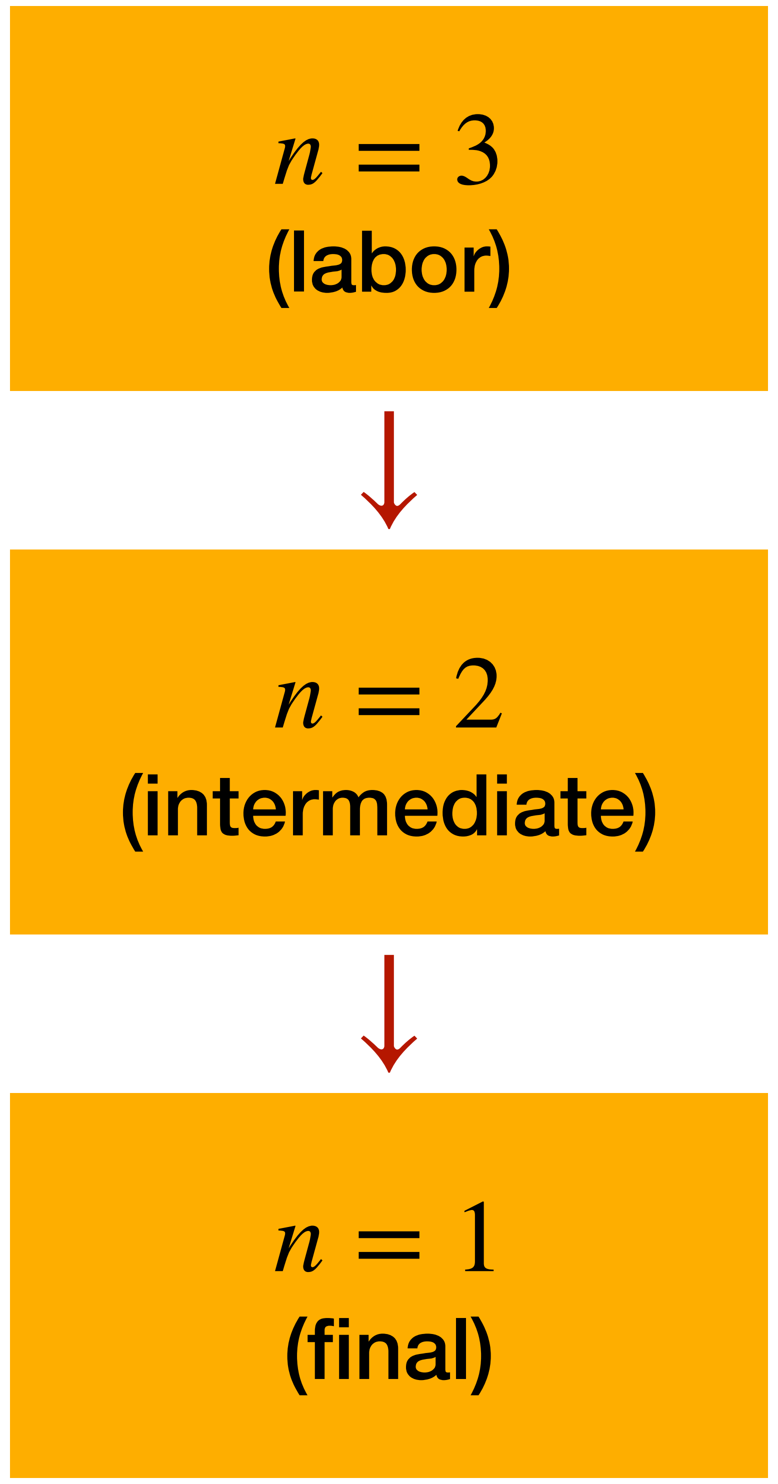
Proposition.

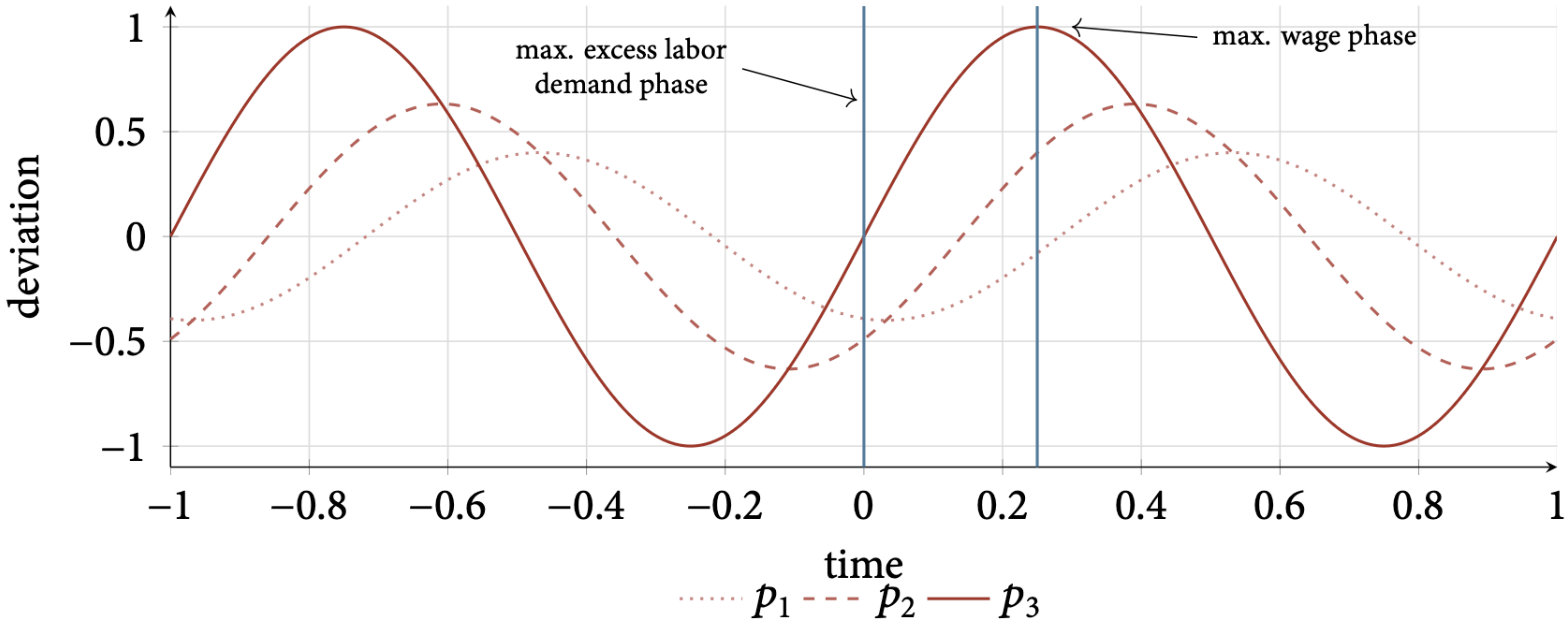
Within each partition….

1. No input-output $\rightarrow$ Stable
2. Dedicated exclusive labor *or* a Leontief input-output

   $\rightarrow$ stable or oscillatory instability (no explosive)

Production Chain Cycle: 3 goods





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Exists ω and ϕ

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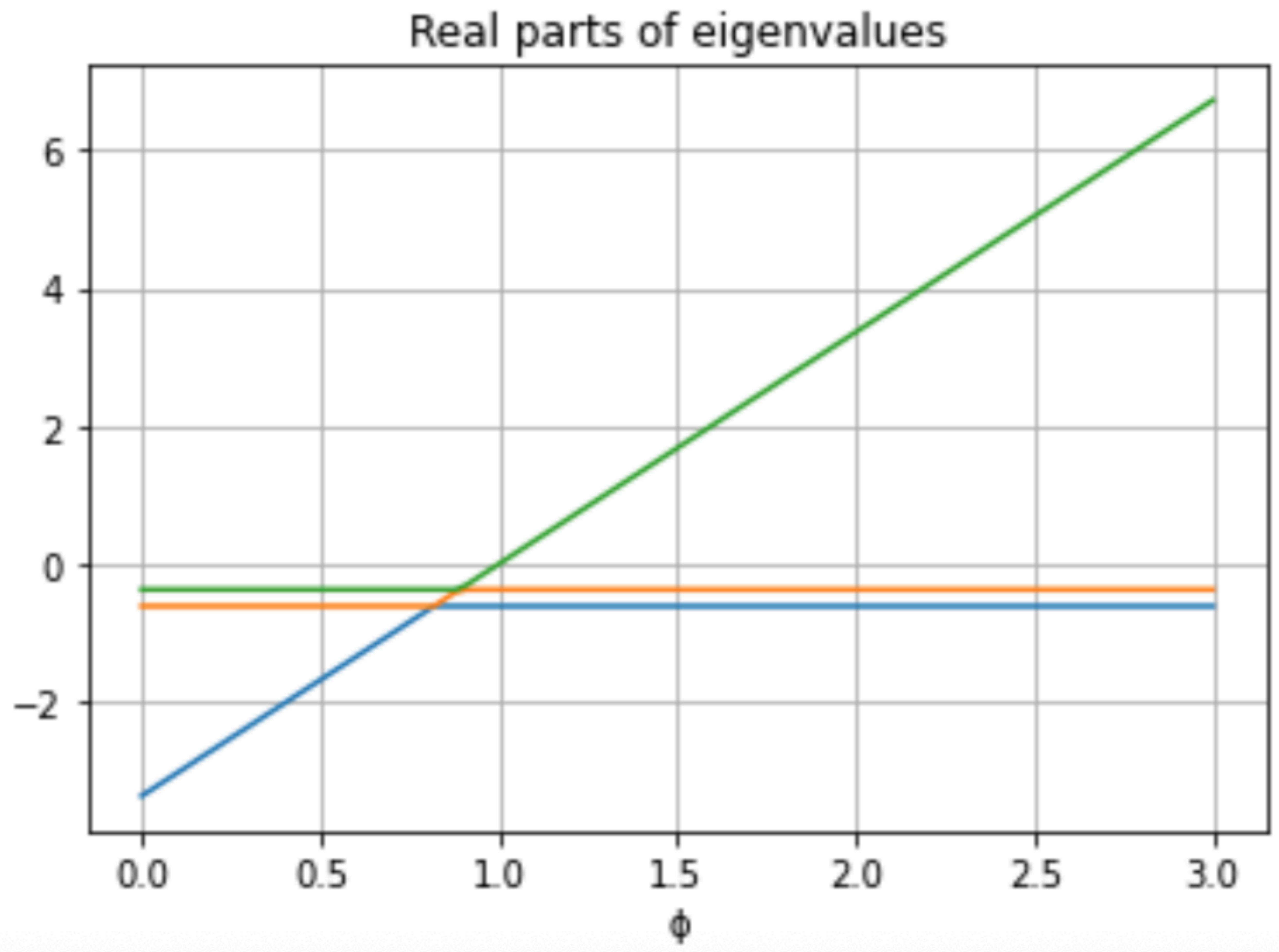
- Next: show Taylor principle for arbitrary or CPI ω fails to work

Example: Three good economy



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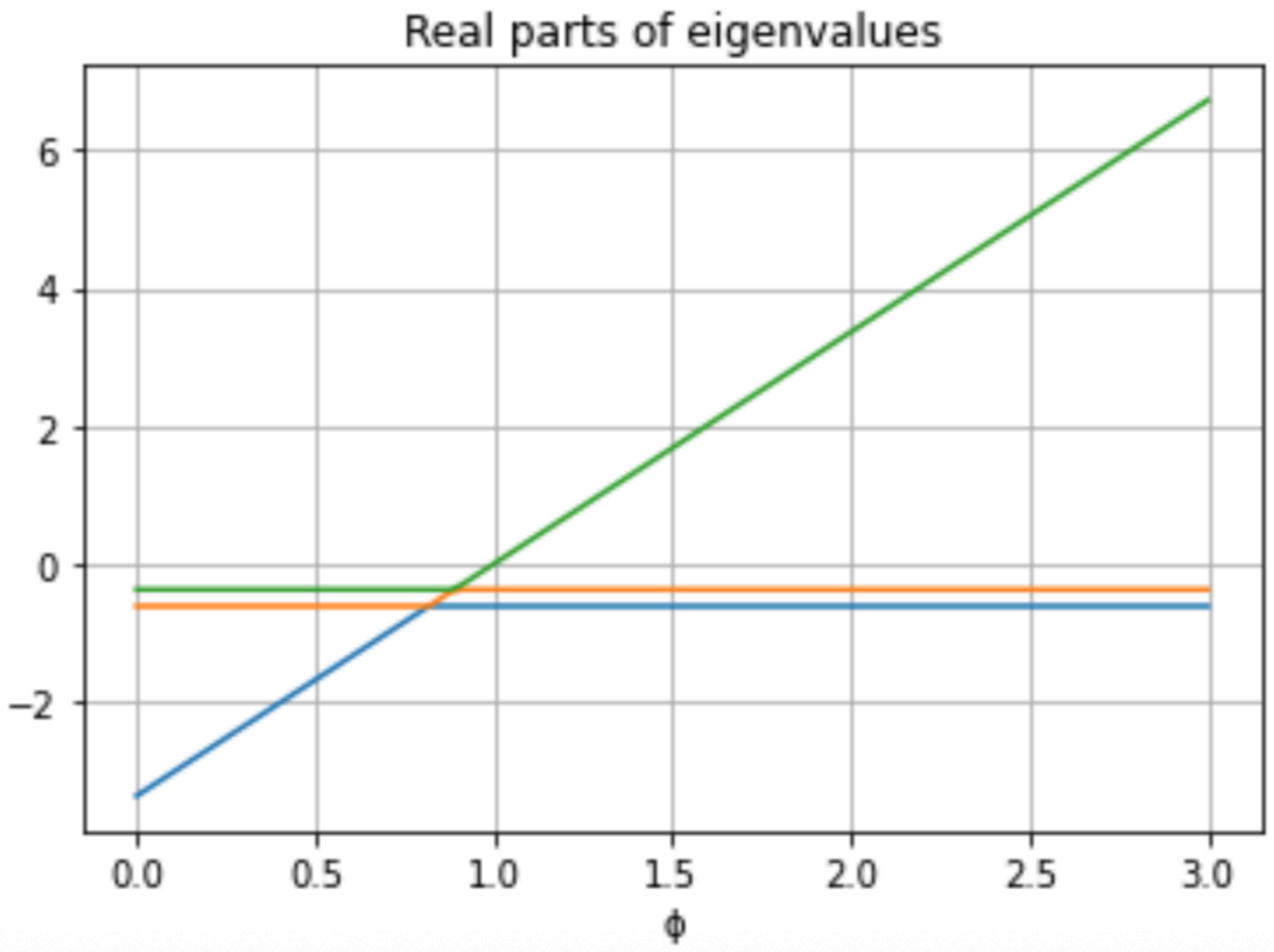

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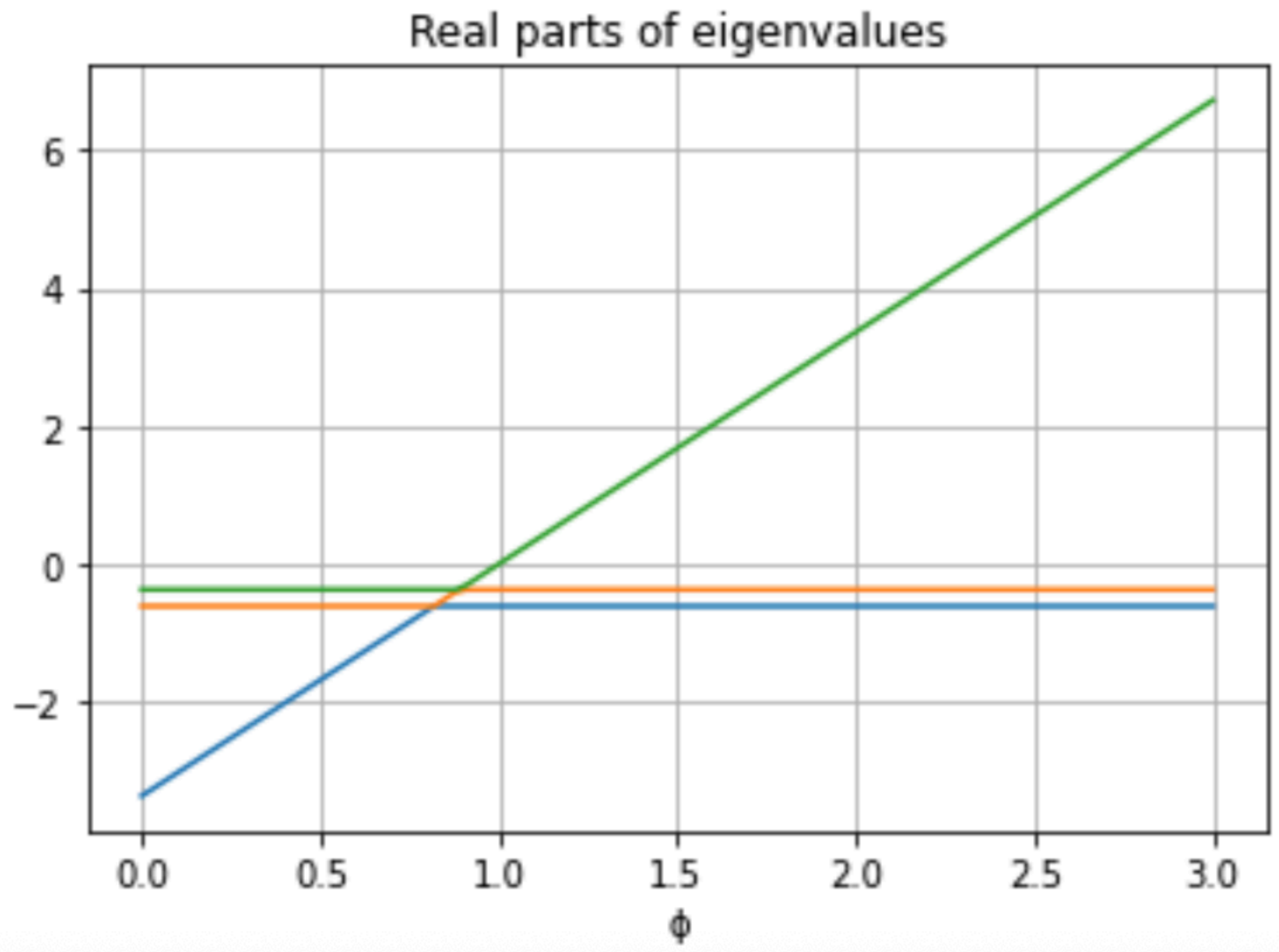

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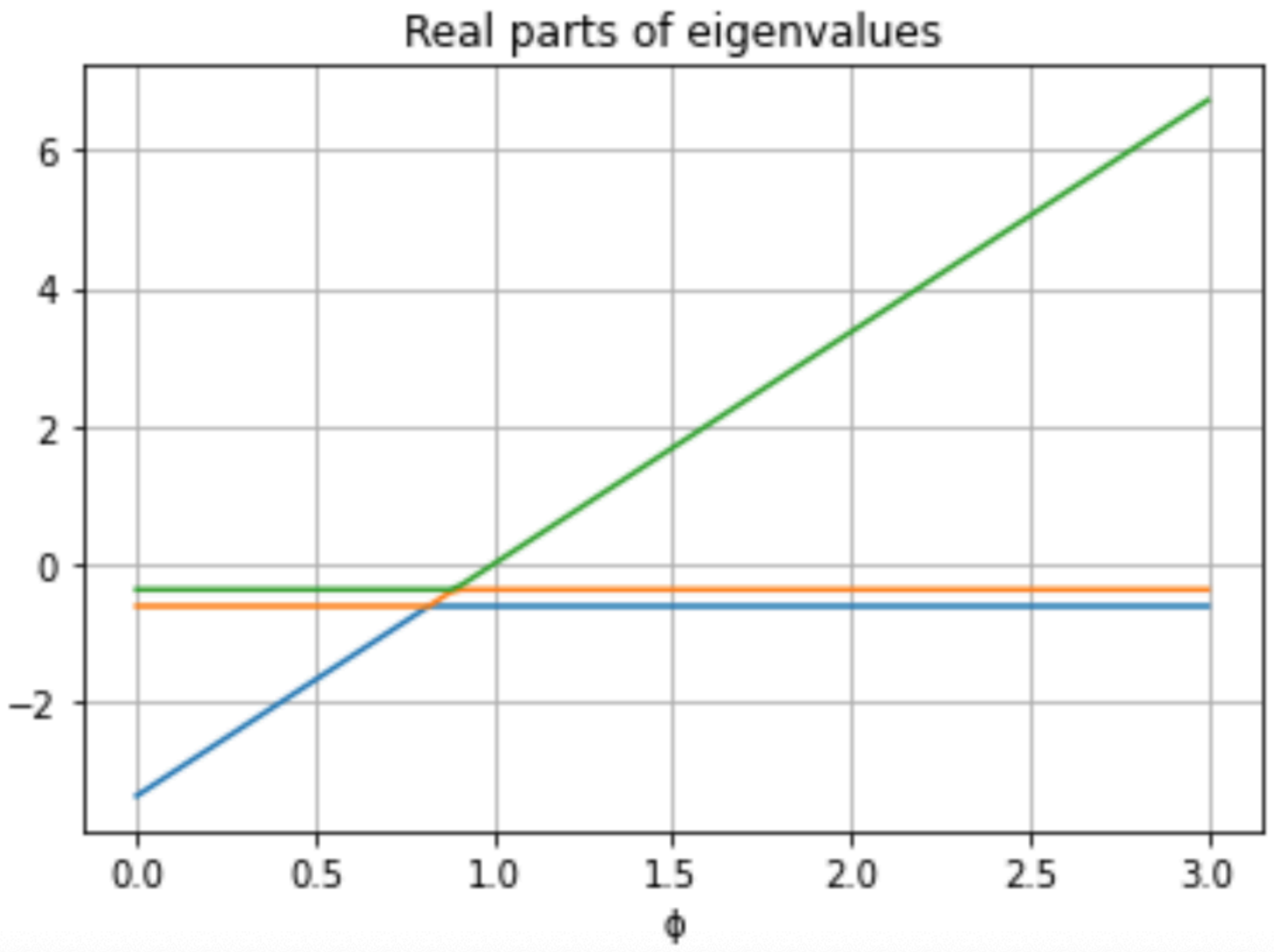

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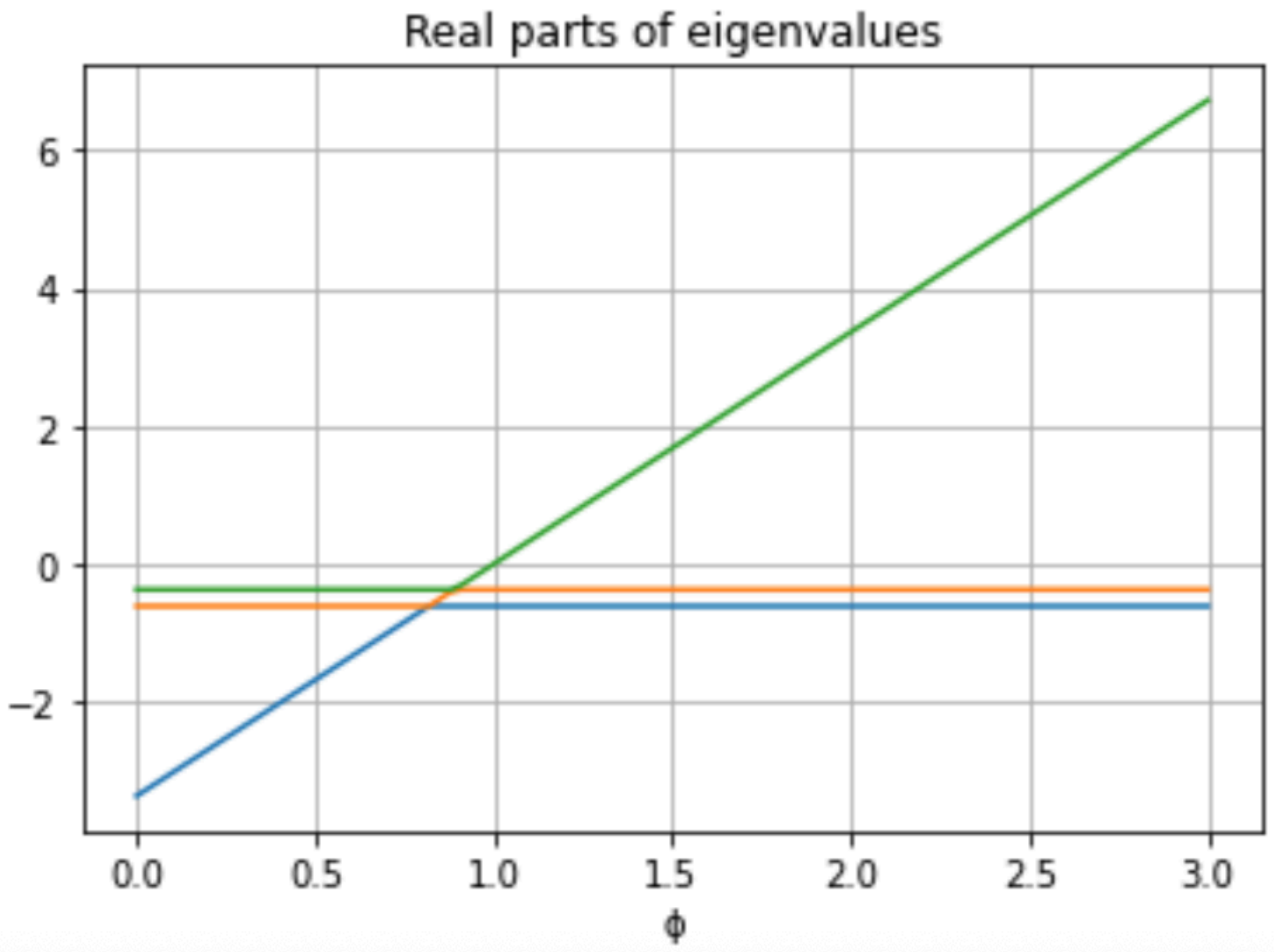

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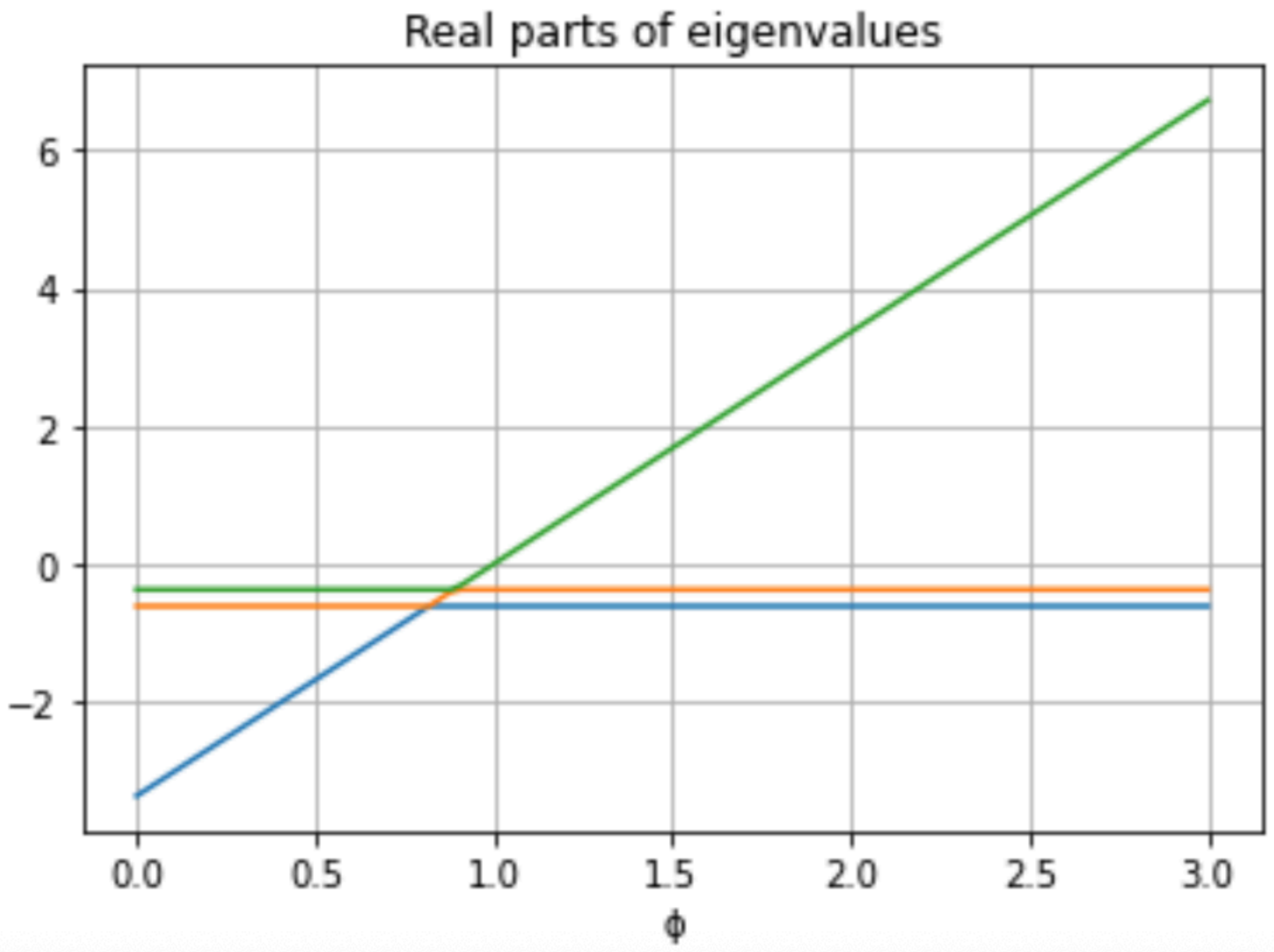
  - other rises and crosses 0 at $\phi = 1$!



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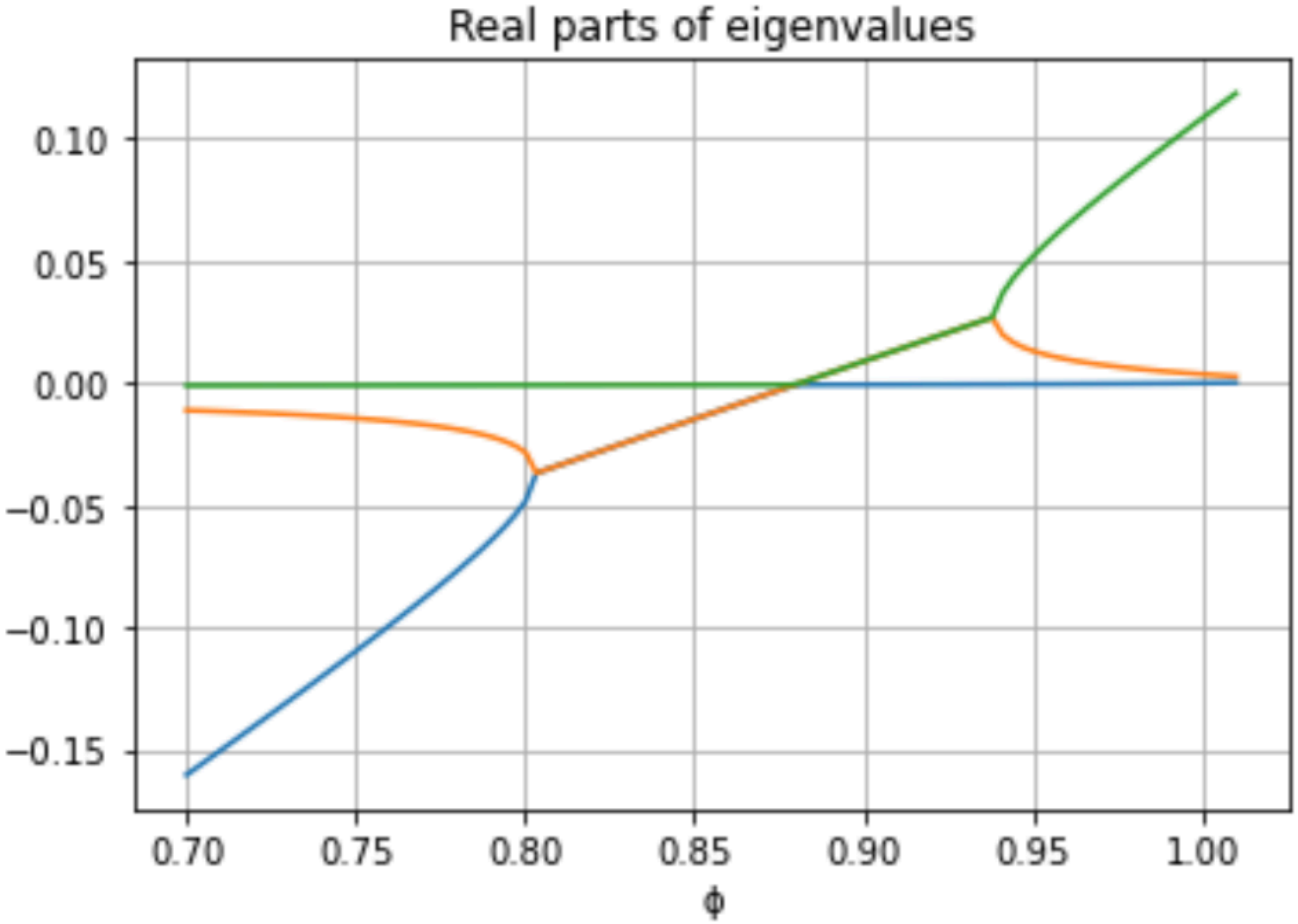

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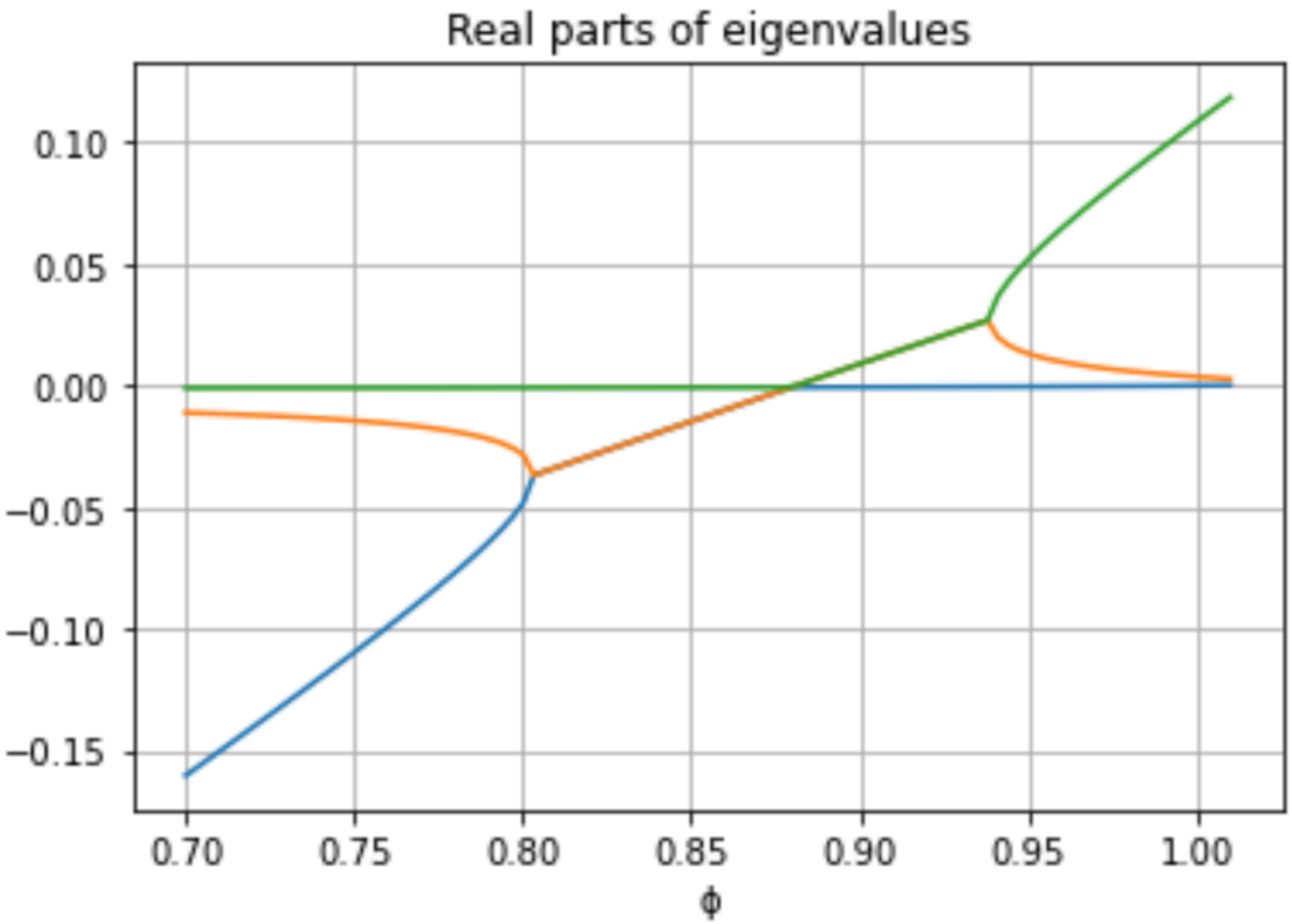

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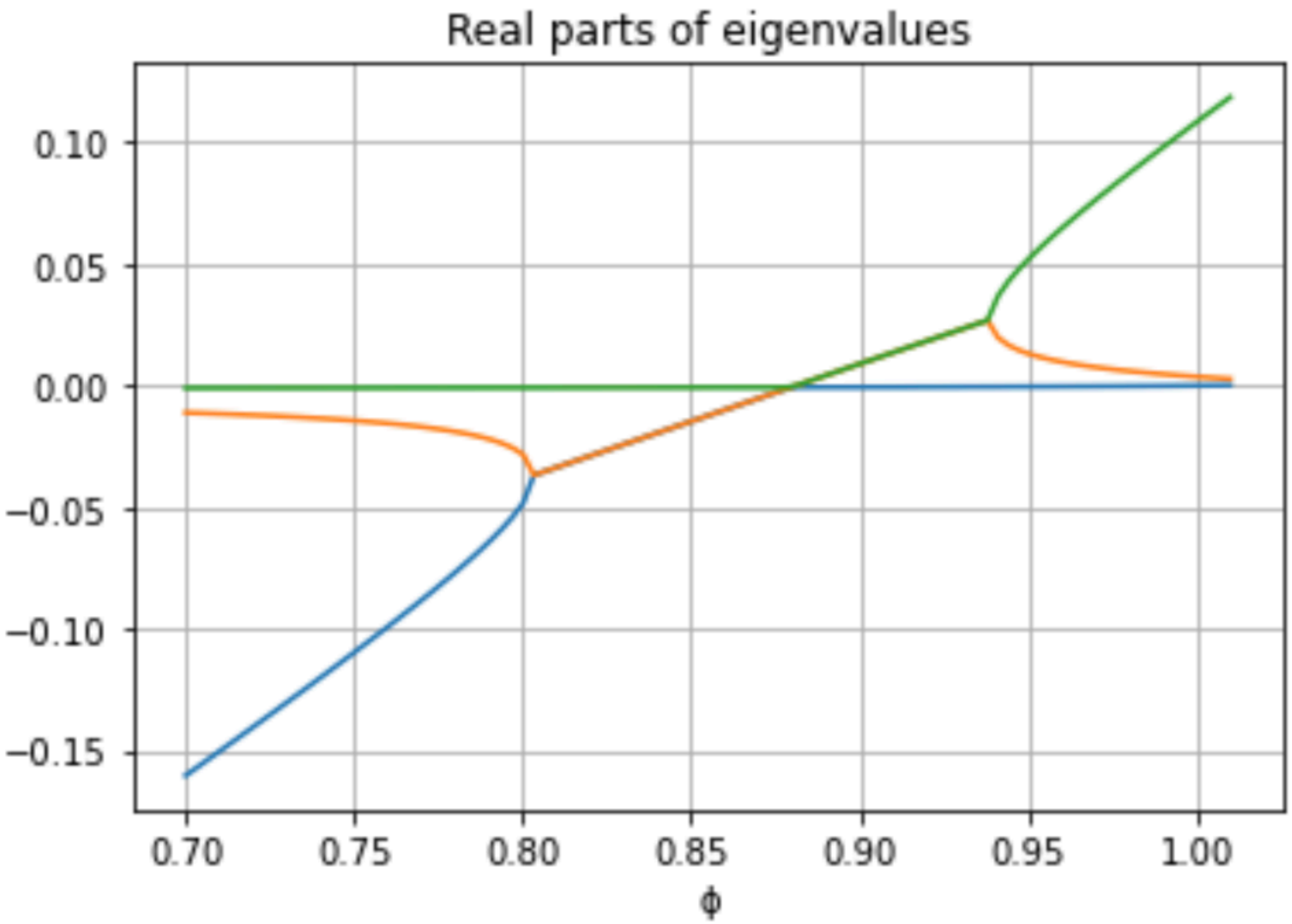

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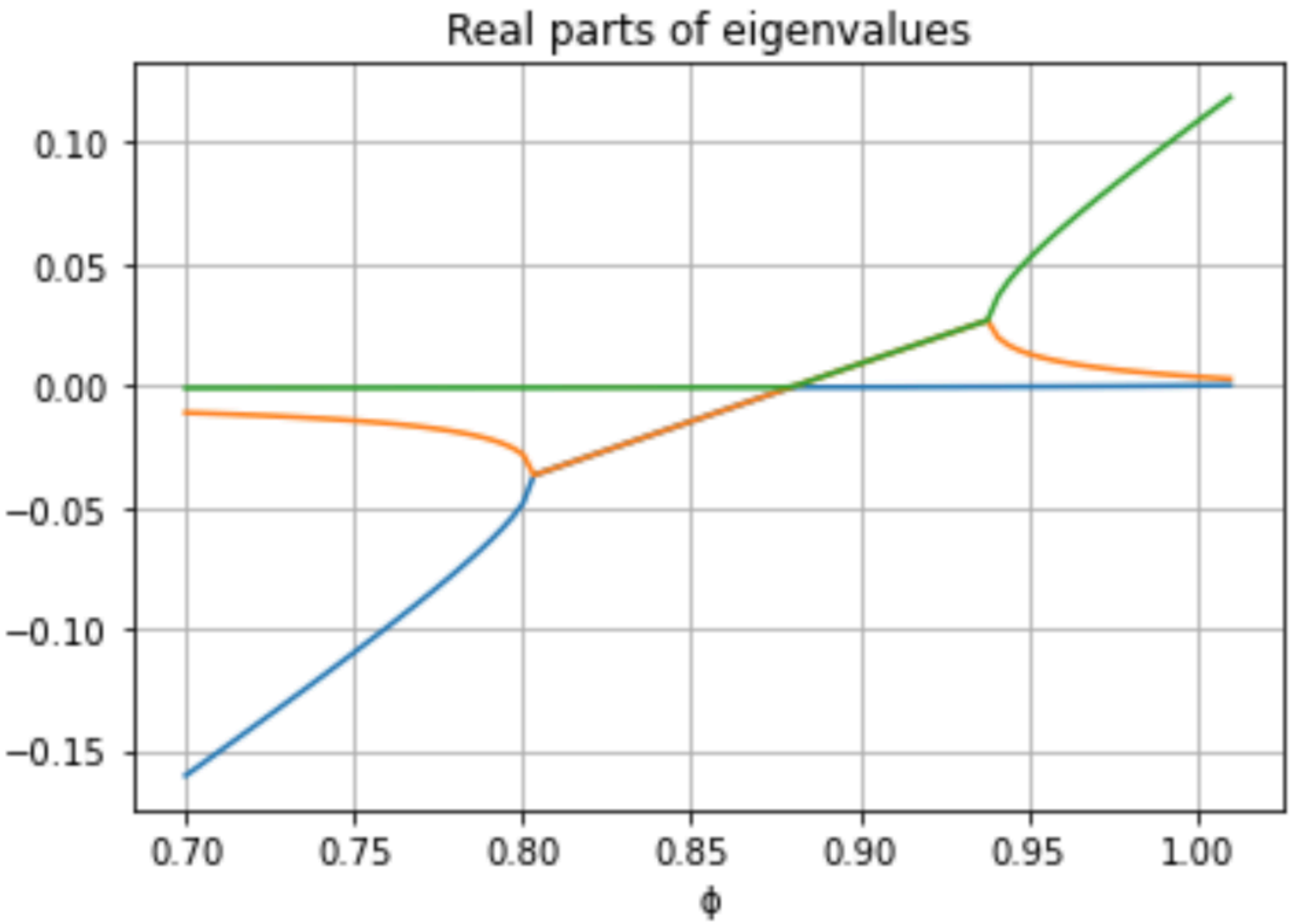

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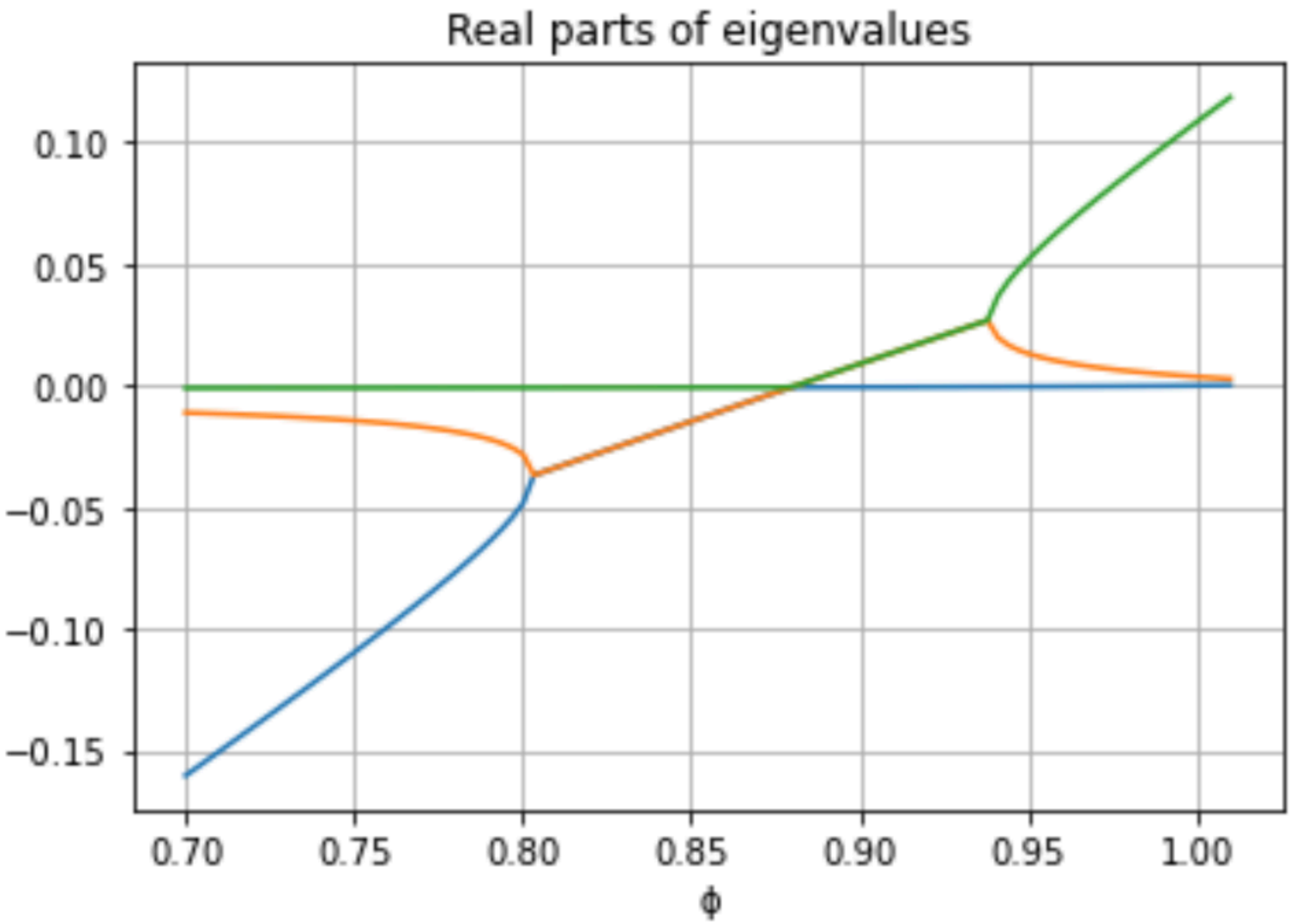

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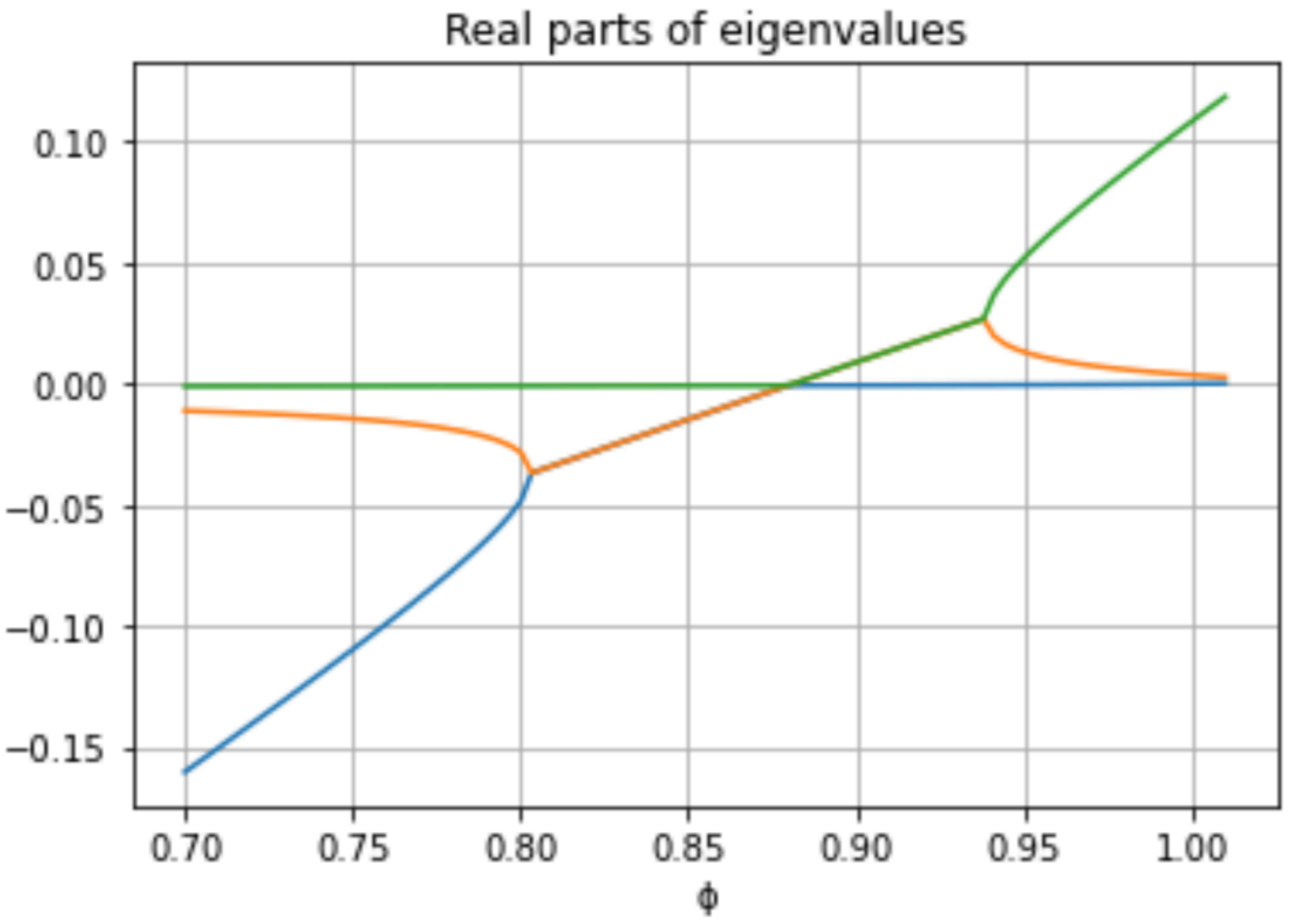

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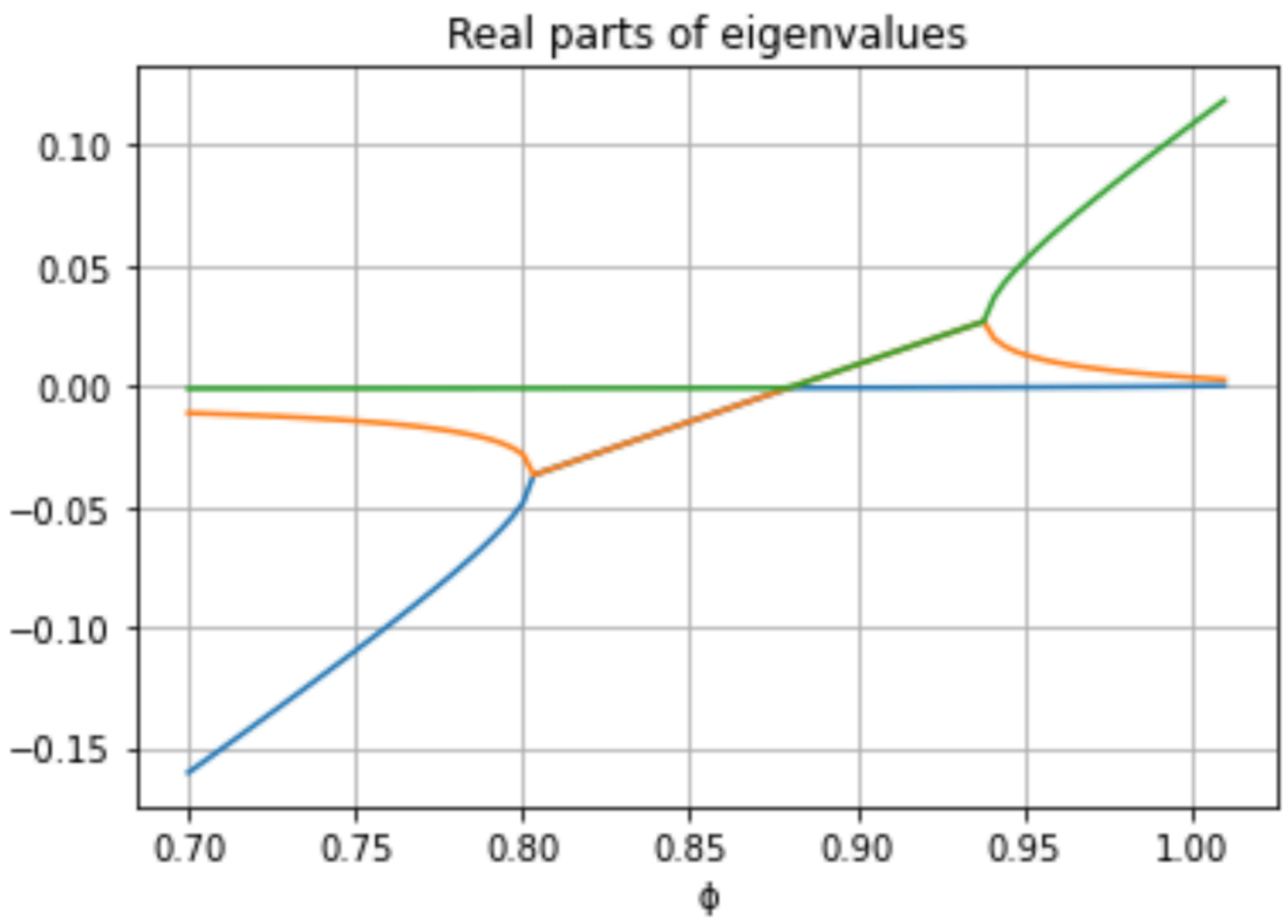

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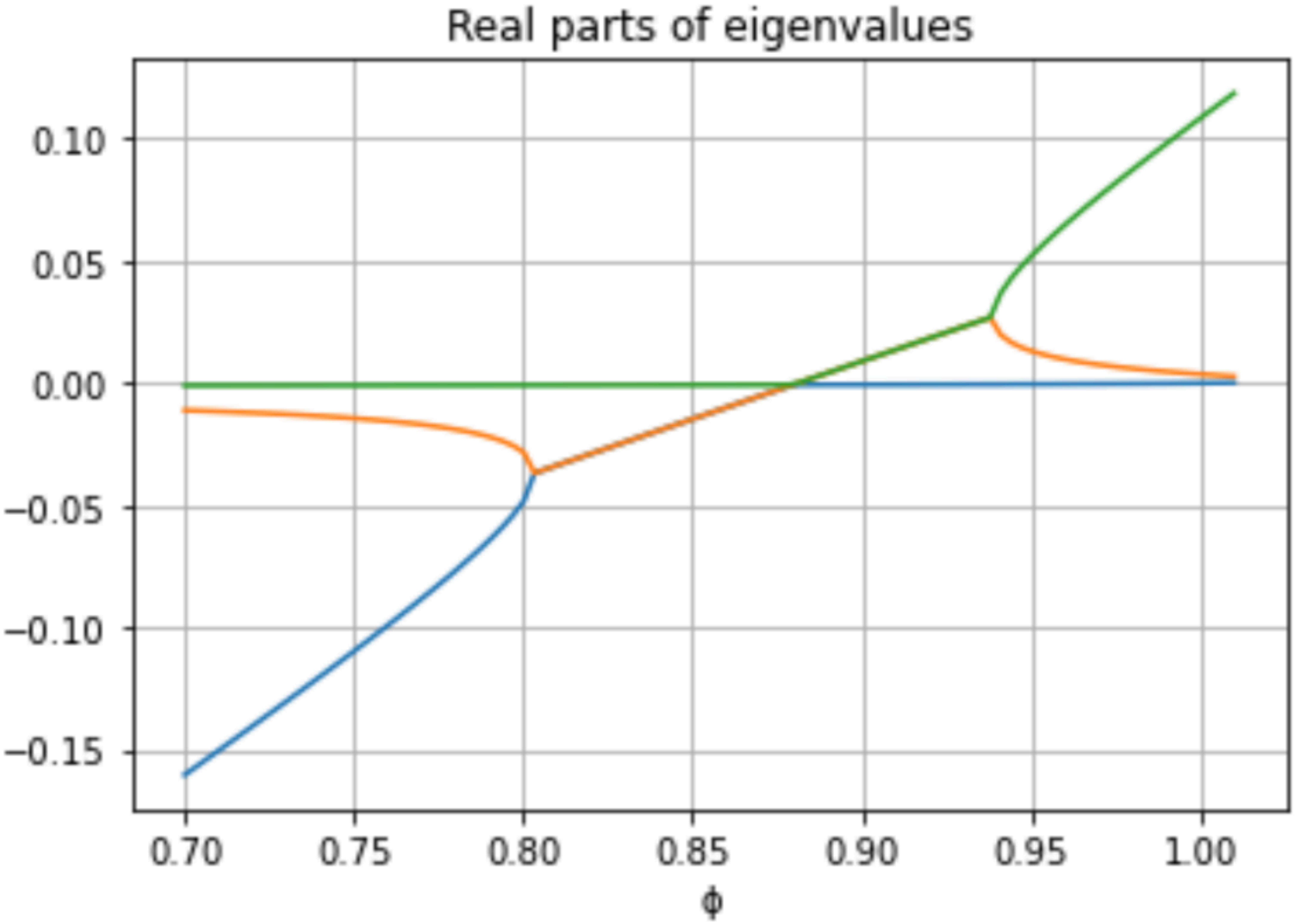
- No ϕ with two negative and one positive eigenvalues! 😢



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ZLB

- Monetary Policy $Q_t[p_t]$ time dependent
  - for $t \in [0,T]$ $\rightarrow$ $Q_t[]$ flat
  - for $t > T$ $\rightarrow$ $Q_t[]$ Taylor Rule (determinacy)

- Solve backwards…

$$\pi_t = Z_t(p_t) + \beta \mathbb{E} \pi_{t+1}$$

$$(\pi_t = CM_t p_t + \beta \mathbb{E} \pi_{t+1})$$

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Generalized Keynesian Cross

Shocks

$$\tilde{z}_t = Z^{**}(p_t, \theta_t) + A\tilde{z}_t$$

$$\rightarrow \quad Z(p_t; g_t) = (I - A)^{-1}(Z^{**}(p_t, \theta_t)$$

Super Generalized Keynesian Cross!

Shocks

- More generally…

$$\tilde{z}_t = Z^{**}(p_t, \theta_t) + A\tilde{z}_t$$

$$\rightarrow \quad Z(p_t; g_t) = (I - A)^{-1}(Z^{**}(p_t, \theta_t)$$

- Note: changes in A $\rightarrow$ no first order effects!

Super Generalized Keynesian Cross!

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Aggregation

- Aggregation: current state of the art (Rubbo, 2023)
  - assumptions: homothetic + identical preferences + CRS
  - inflation in each market ← single aggregate output gap + all other prices!

$$\pi_{n,t} = d_n g_n(y_t, p_t) + \beta \mathbb{E} \pi_{n,t+1}$$

- Our approach → general + immediate!

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  - assumptions: homothetic + identical preferences + CRS
  - inflation in each market ← single aggregate output gap + all other prices!

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- Our approach → general + immediate!

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Endogenous “aggregate output gap”!

Macro with Excess Demands…

- Excess Demand $\neq$ Gap
- Monetary Policy Rules
  - Taylor Rules + Determinacy
  - ZLB
- Shocks $\rightarrow$ Primitives + Policy
- Aggregation
- Extensions…
  - Non-Ricardian consumers
  - non-Calvo pricing
  - non-rational expectations, e.g. learning

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Excess Demand Approach Applies

Extensions

- Behavioral
  - Non-maximizing households
  - Non-rational expectations…
    - households
    - price setters
  - Excess Demand approach unchanged!

- (Note: Tâtonnement: considers myopic price setters)

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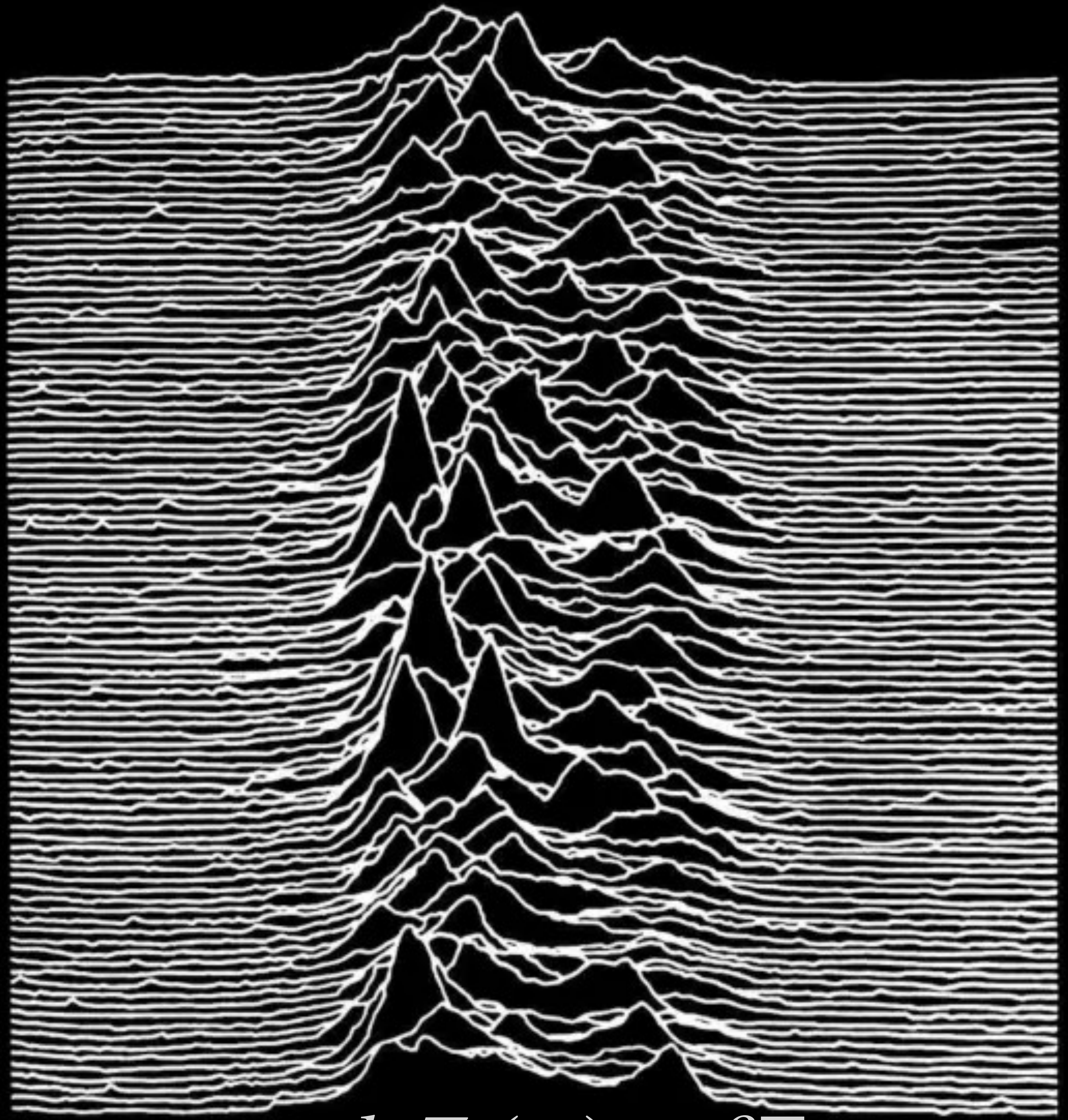
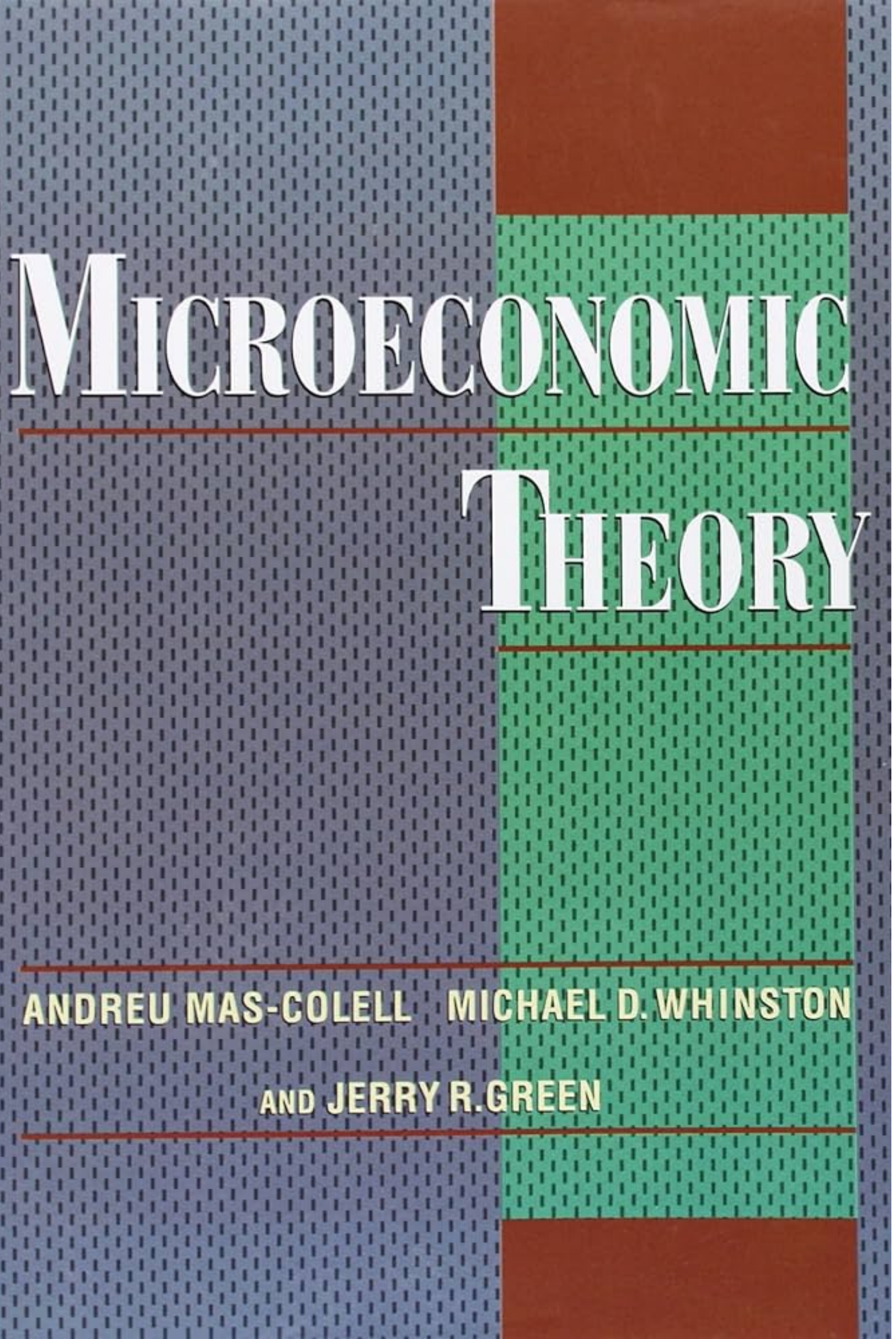
- Excess demands…?
  - as forcing variable $\{\tilde{z}_t\}$
  - linearized approximations

Conclusions

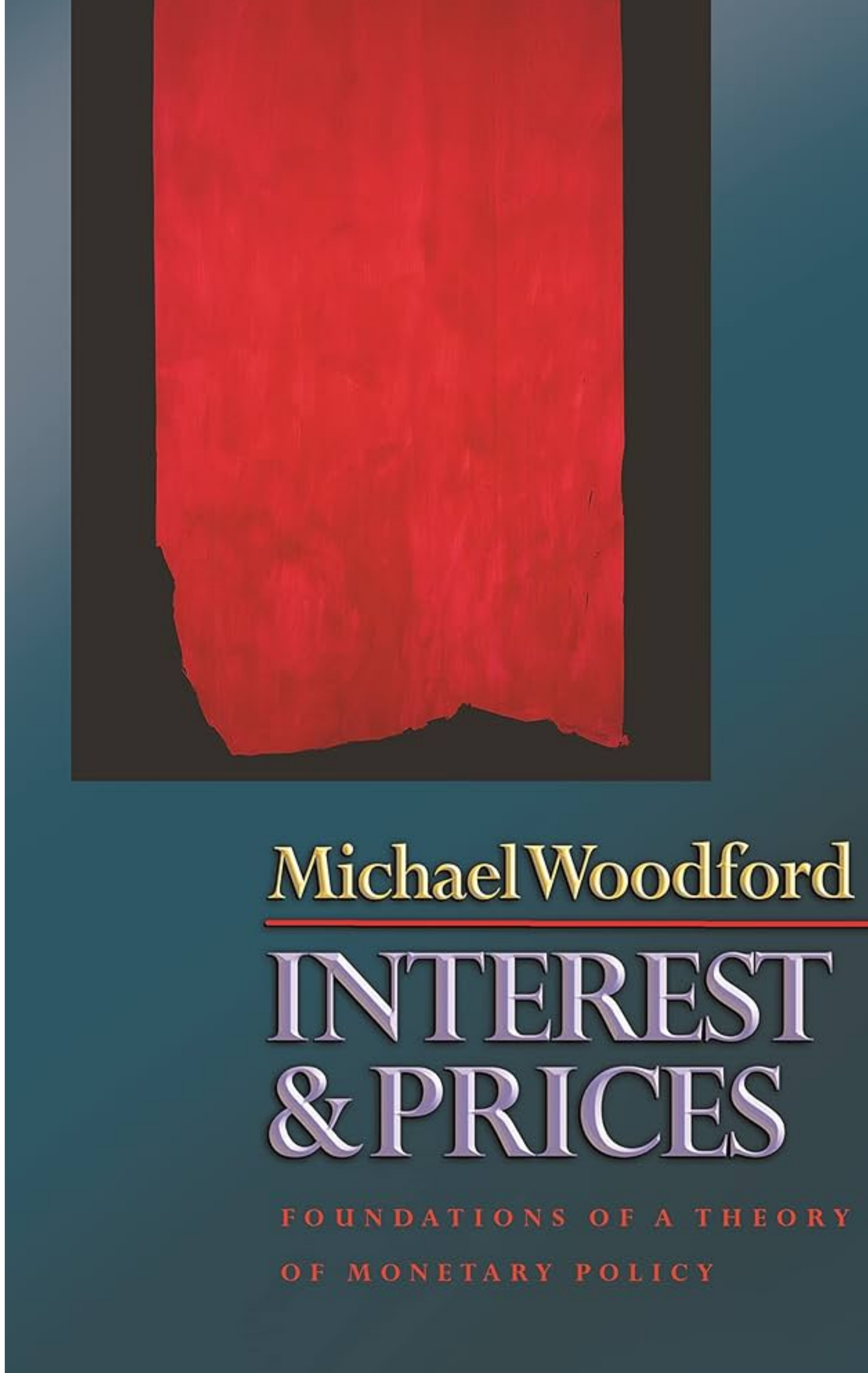


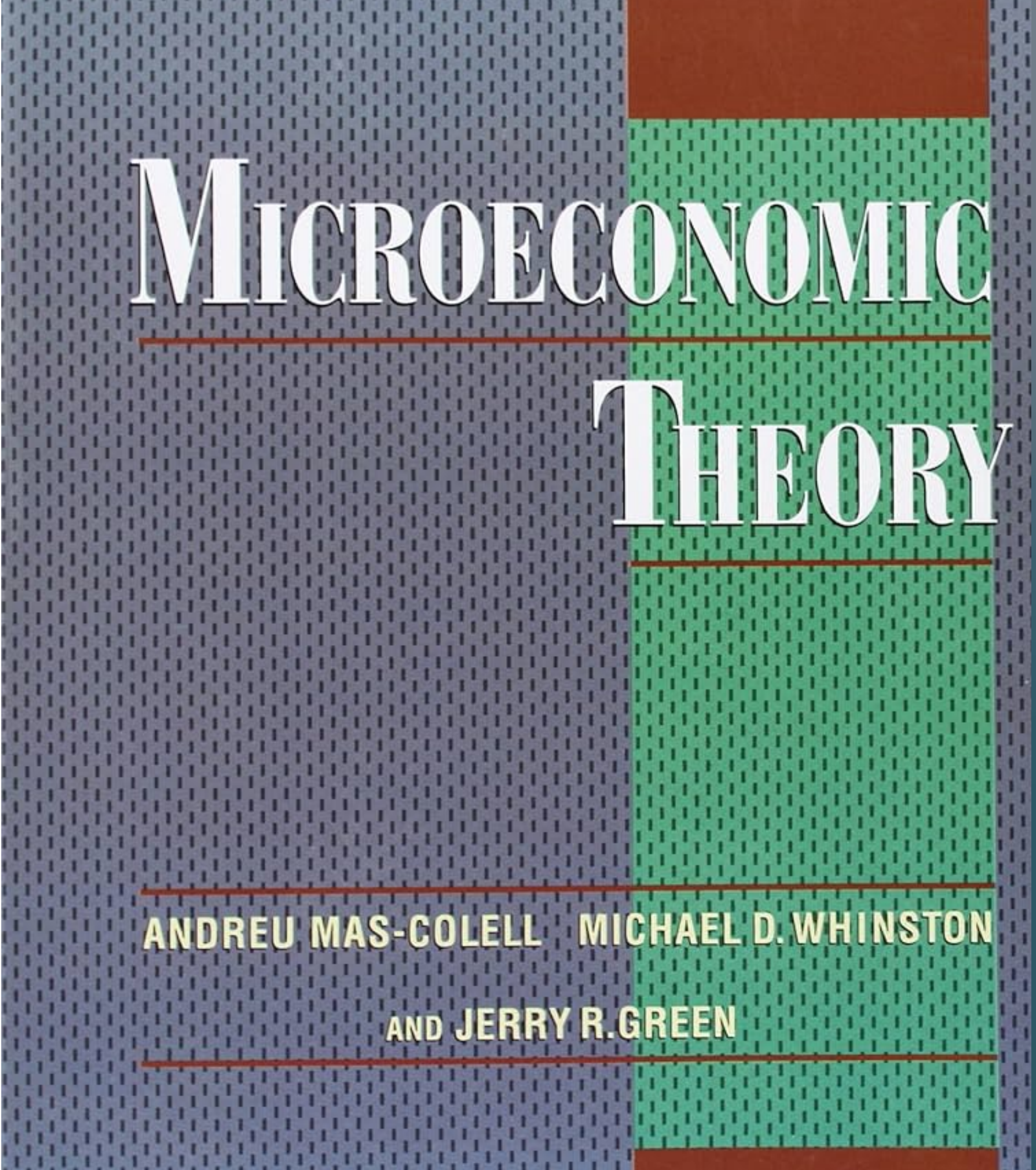
$$\pi_{nt} = d_n Z_n(p_t) + \beta \mathbb{E}_t \pi_{nt+1}$$

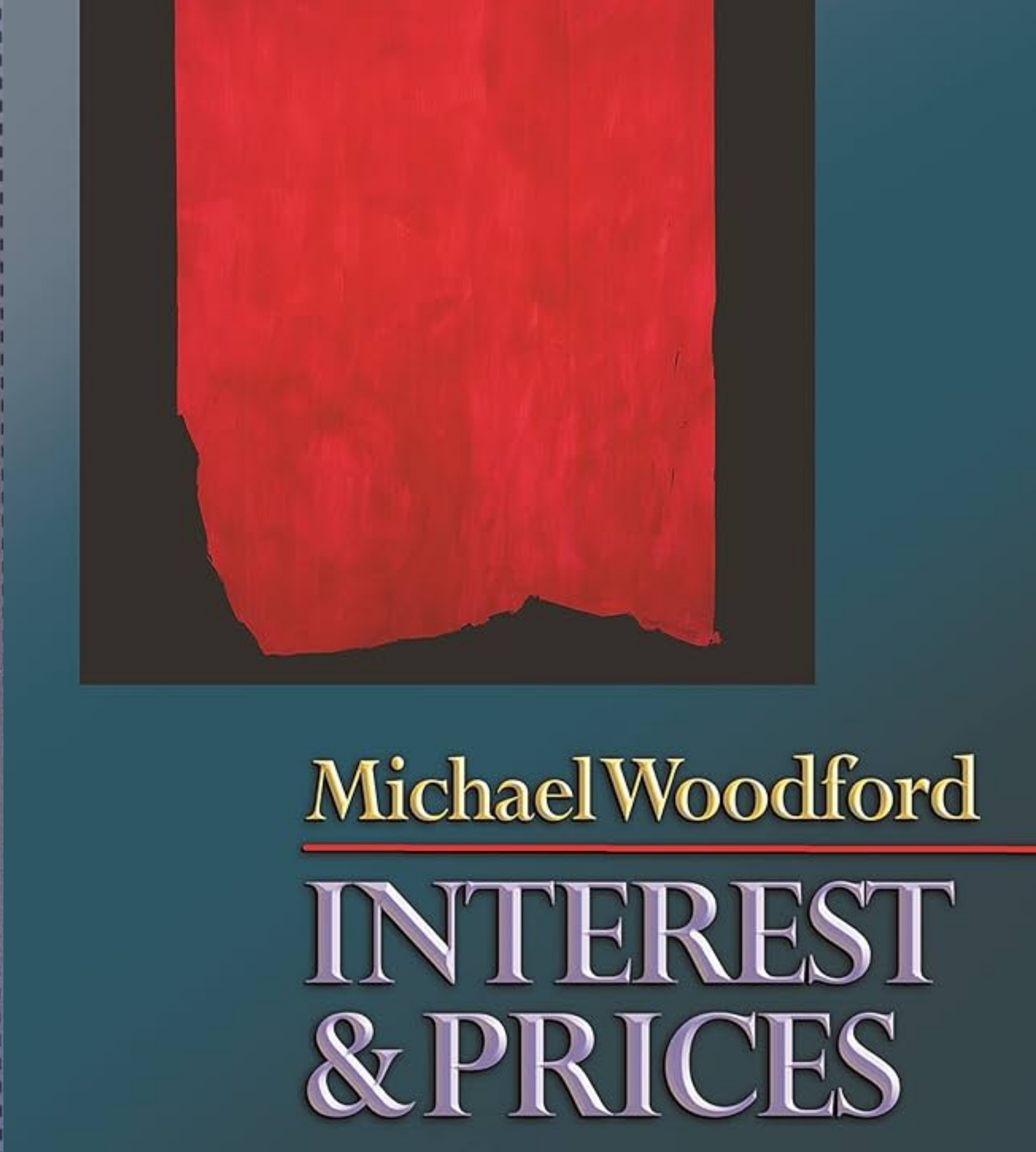
Keynes & ISLM	**General Equilibrium** (with Money)	**Disequilibrium** (Fixed Price)	**New Keynesian**
1930-40s	1950s & 1960s	1970s	1980s-present
Keynes Hicks	Patinkin Clower	Patinkin, Clower, Barro-Grossman, Benassy, Dreze, Malinvaud, Green …	



GE $\leftrightarrow$ Macro




MICROECONOMIC
THEORY
ANDREU MAS-COLELL MICHAEL D. WHINSTON
AND JERRY R. GREEN


Michael Woodford
INTEREST
& PRICES

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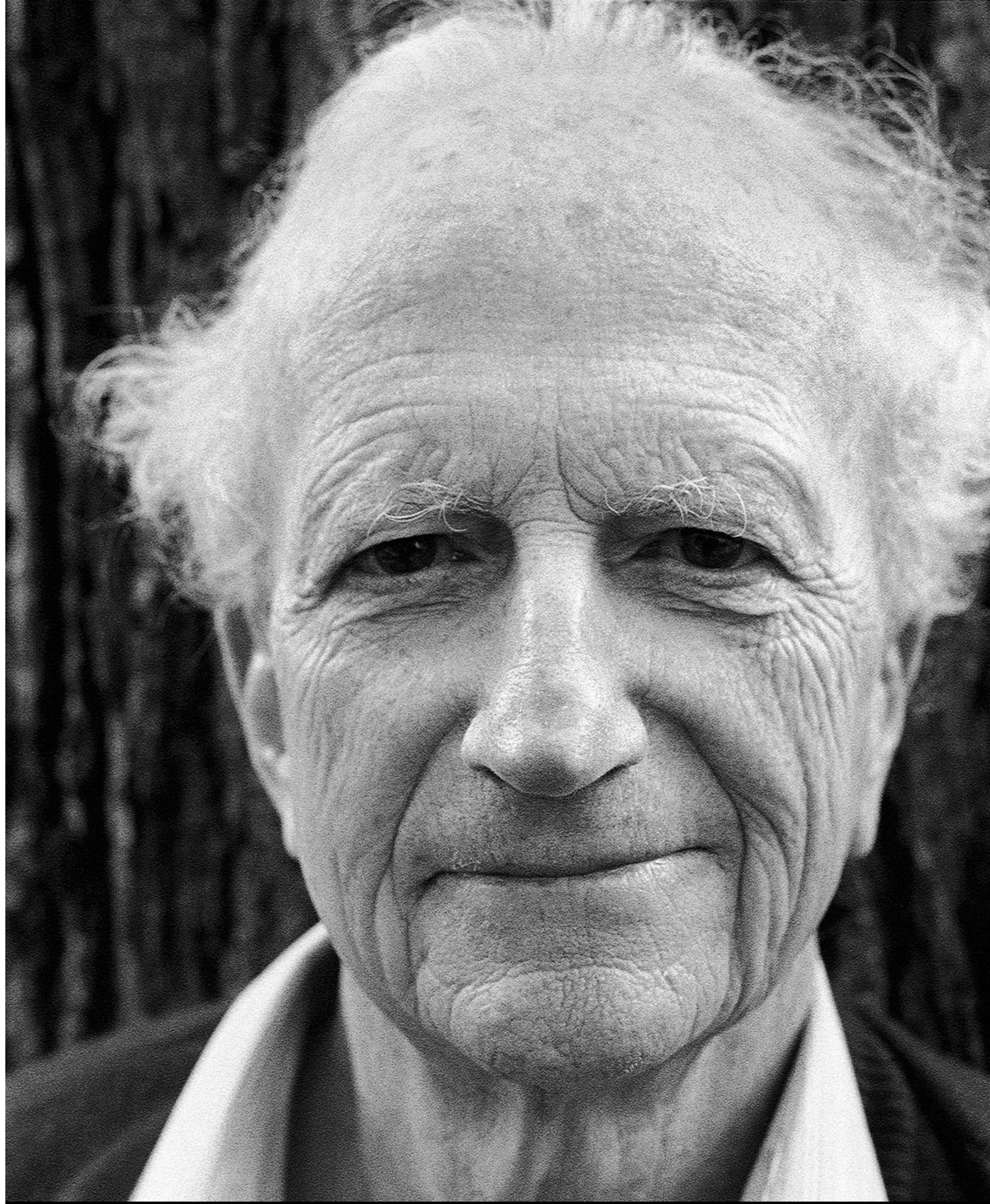

Micro 101…
"Prices Rise with Excess Demand"

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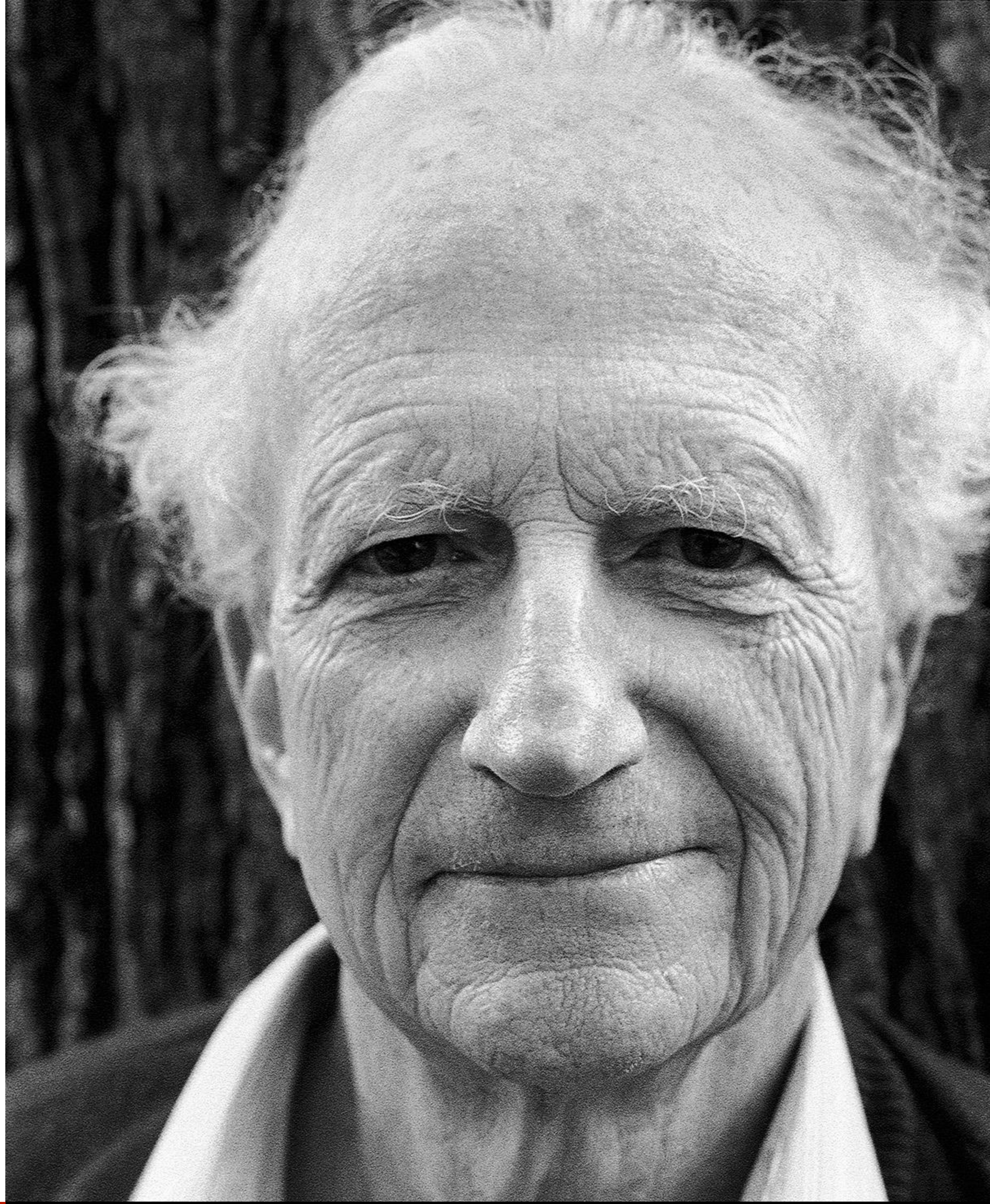
Heard on the internet…
“Phillips Curves don’t exist
they are dead…”



Micro 101…
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Fernando Email This Morning

- Value of alternative perspectives?

> **Richard Feynman:** "Suppose we have two such theories...
> …they both agree with experiment to the same extent...
>
> So two theories... may be mathematically identical...
>
> However, for psychological reasons, in order to guess new theories, **these two things are very far from equivalent**."

  - Feynman goes on to talk about **three** ways to write Newton's gravitational theories, and how one gets to general relativity, while the others do not suggest it.
  - He does not says—he was modest?-- but his own path integral is such an example!

Thank you!

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