Aggregate Demand, Idle Time, and Unemployment

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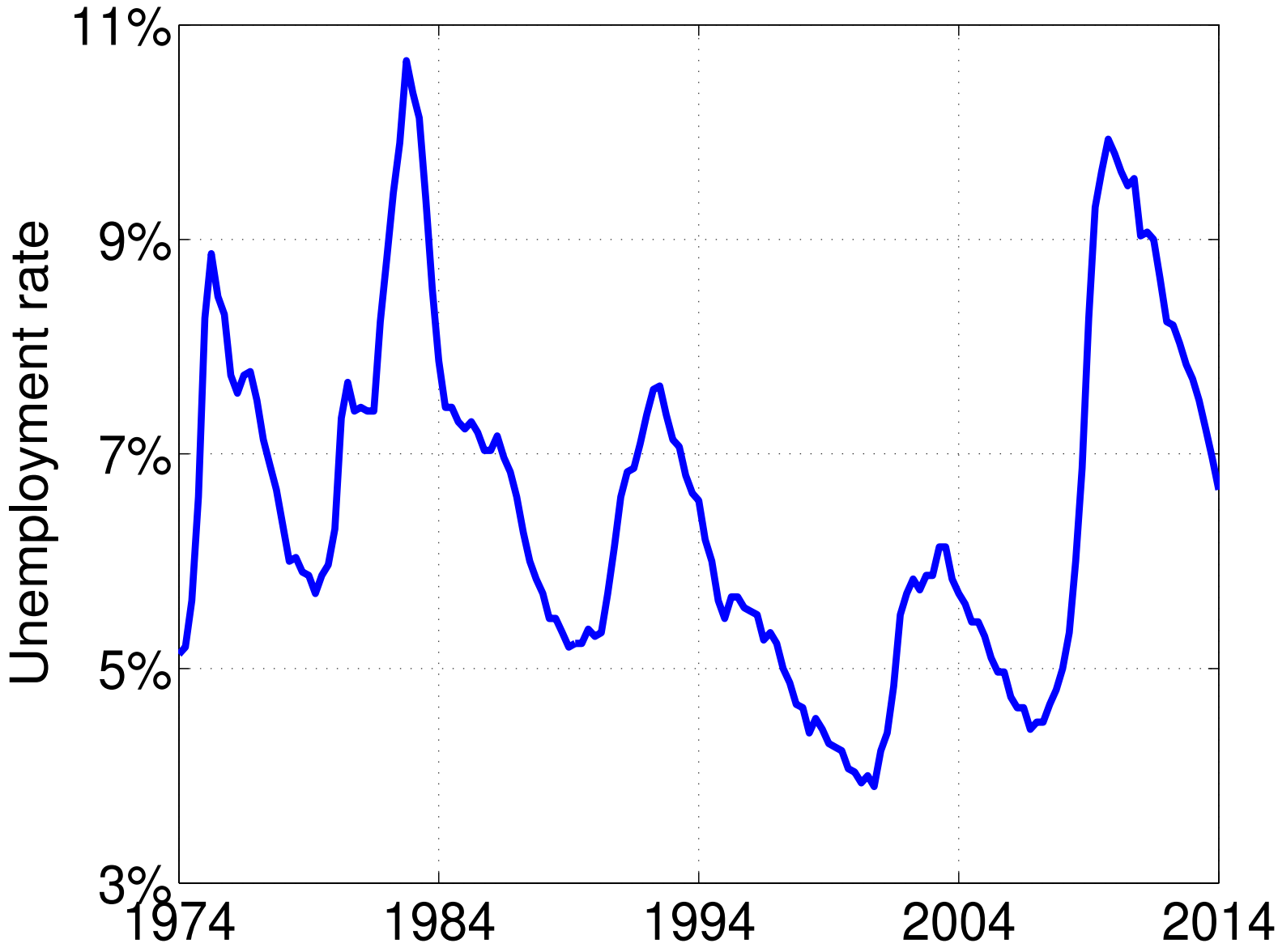
Motivation



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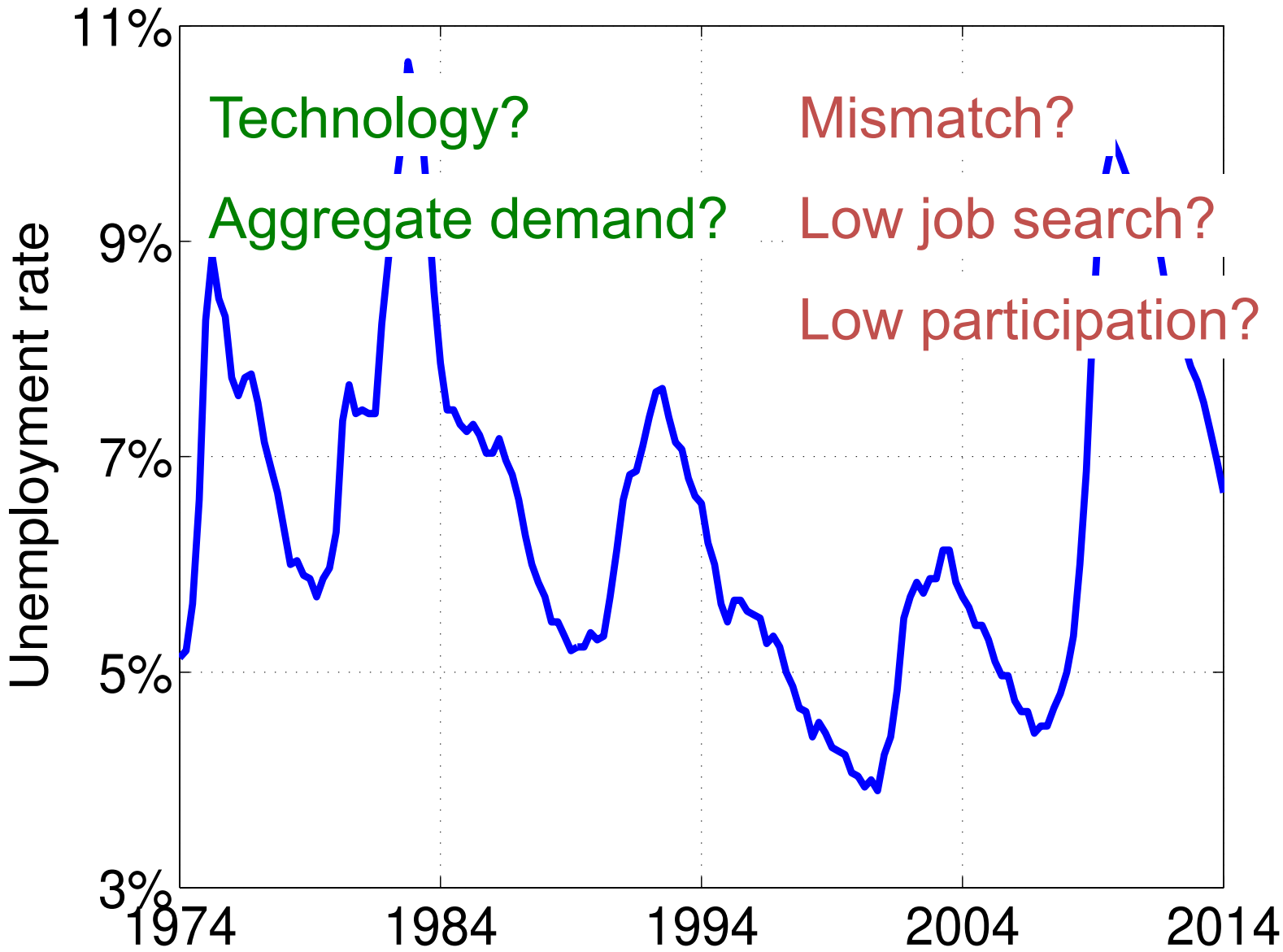
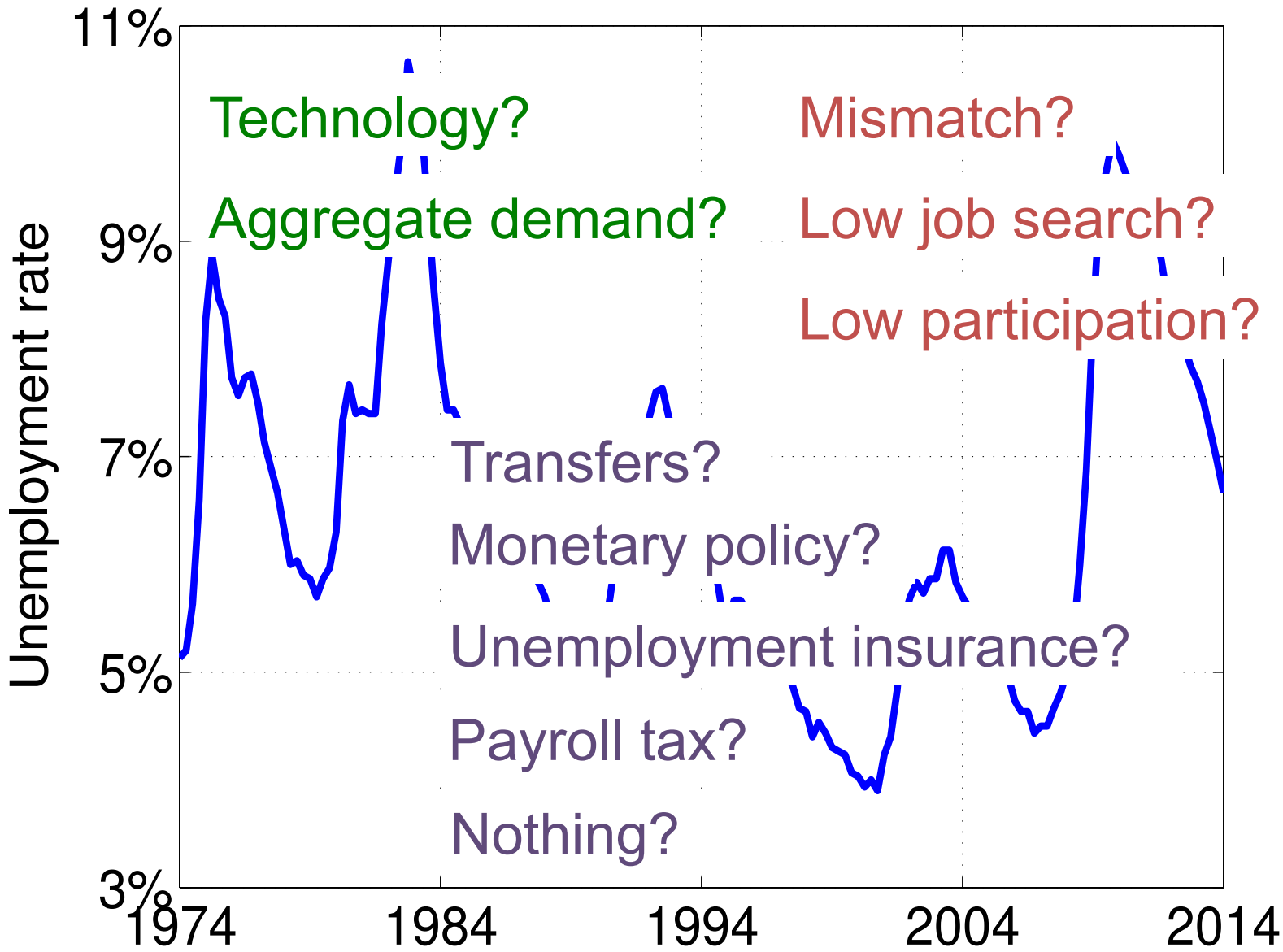

11%
9%
7%
5%
3%
Unemployment rate
1974
1984
1994
2004
2014
Technology?
Aggregate demand?
Mismatch?
Low job search?
Low participation?

Motivation


11%
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Unemployment rate
1974
1984
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2014
Technology?
Aggregate demand?
Mismatch?
Low job search?
Low participation?
Transfers?
Monetary policy?
Unemployment insurance?
Payroll tax?
Nothing?

The available models

1. matching model of the labor market
    - tractable
    - but no aggregate demand
2. ?
3. New Keynesian DSGE model
    - many shocks
    - but greater complexity

The general disequilibrium model?

- vast literature after Barro & Grossman [1971]
- recent revival after Great Recession
  - Mankiw & Weinzierl [2011]
  - Caballero & Farhi [2014]
- captures important intuitions
- but difficult to analyze

This model

equilibrium version of the Barro-Grossman model, with **matching frictions** on product + labor markets:

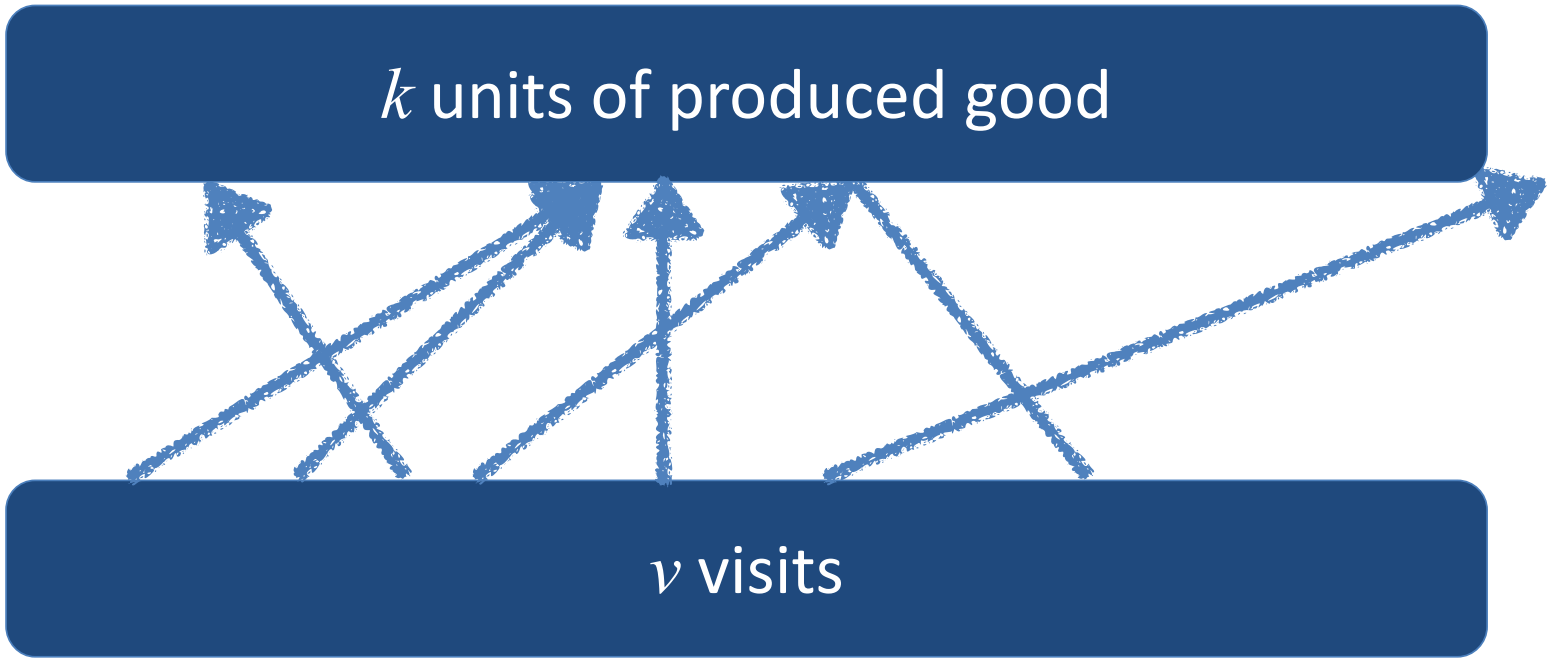
- graphical representation of GE and welfare
- frictional + classical + Keynesian unemployment

Basic model (no labor market)

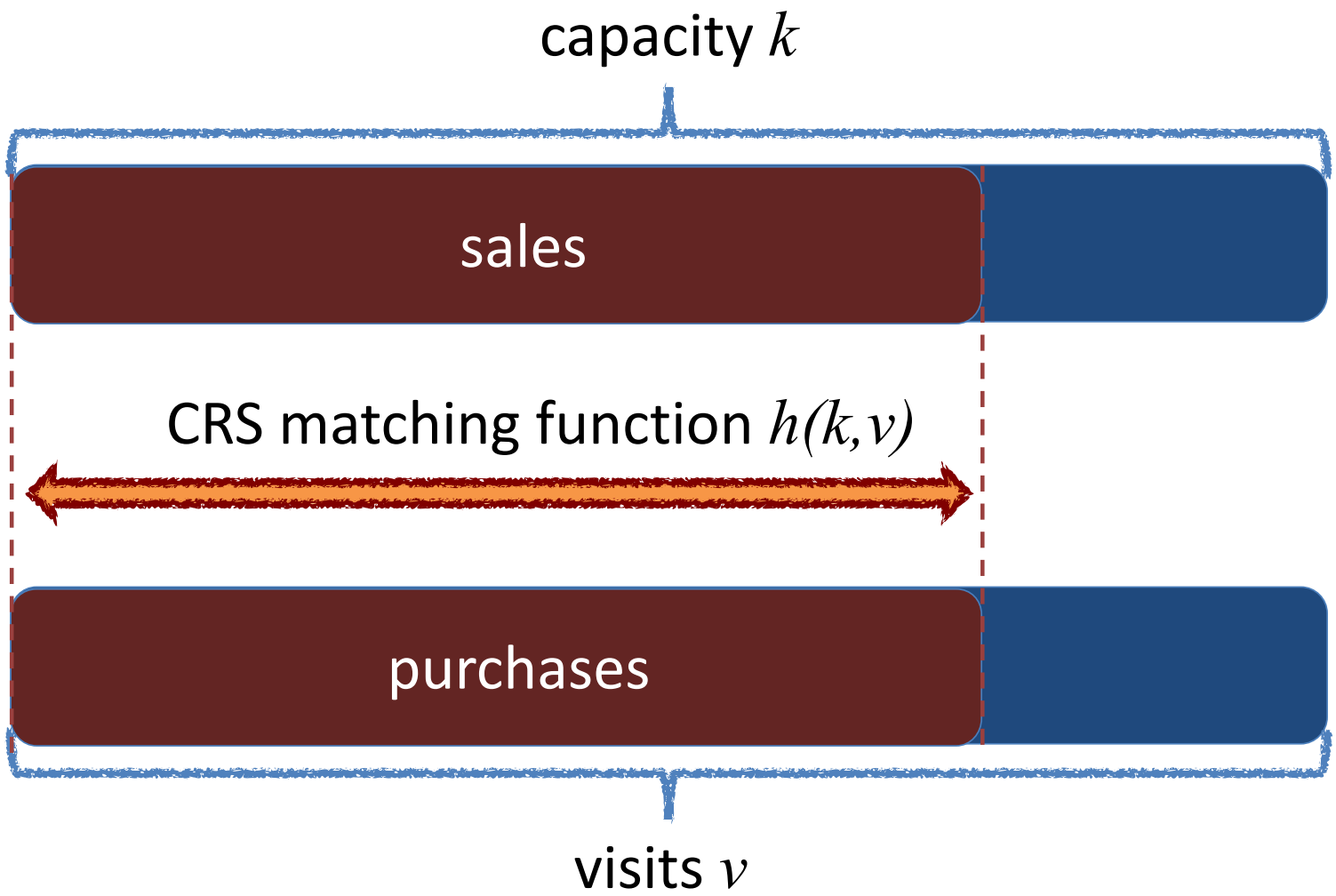
Setup

- static model
- measure 1 of identical households
- production takes place within households
- households cannot consume own production
- households trade production on frictional market

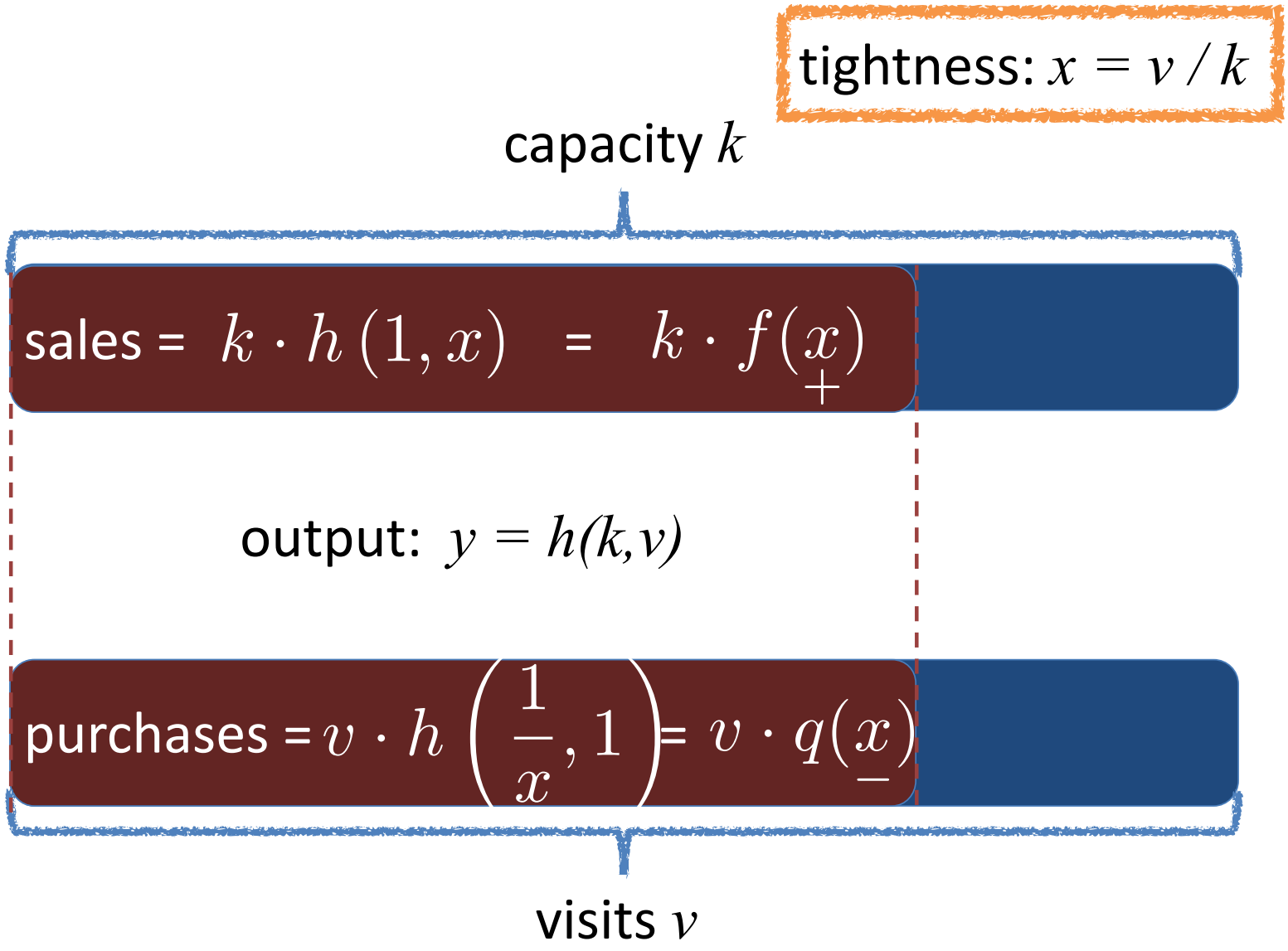
Matching function and tightness



Matching function and tightness



Matching function and tightness



Low product market tightness

High product market tightness

Matching cost: ρ goods per visit

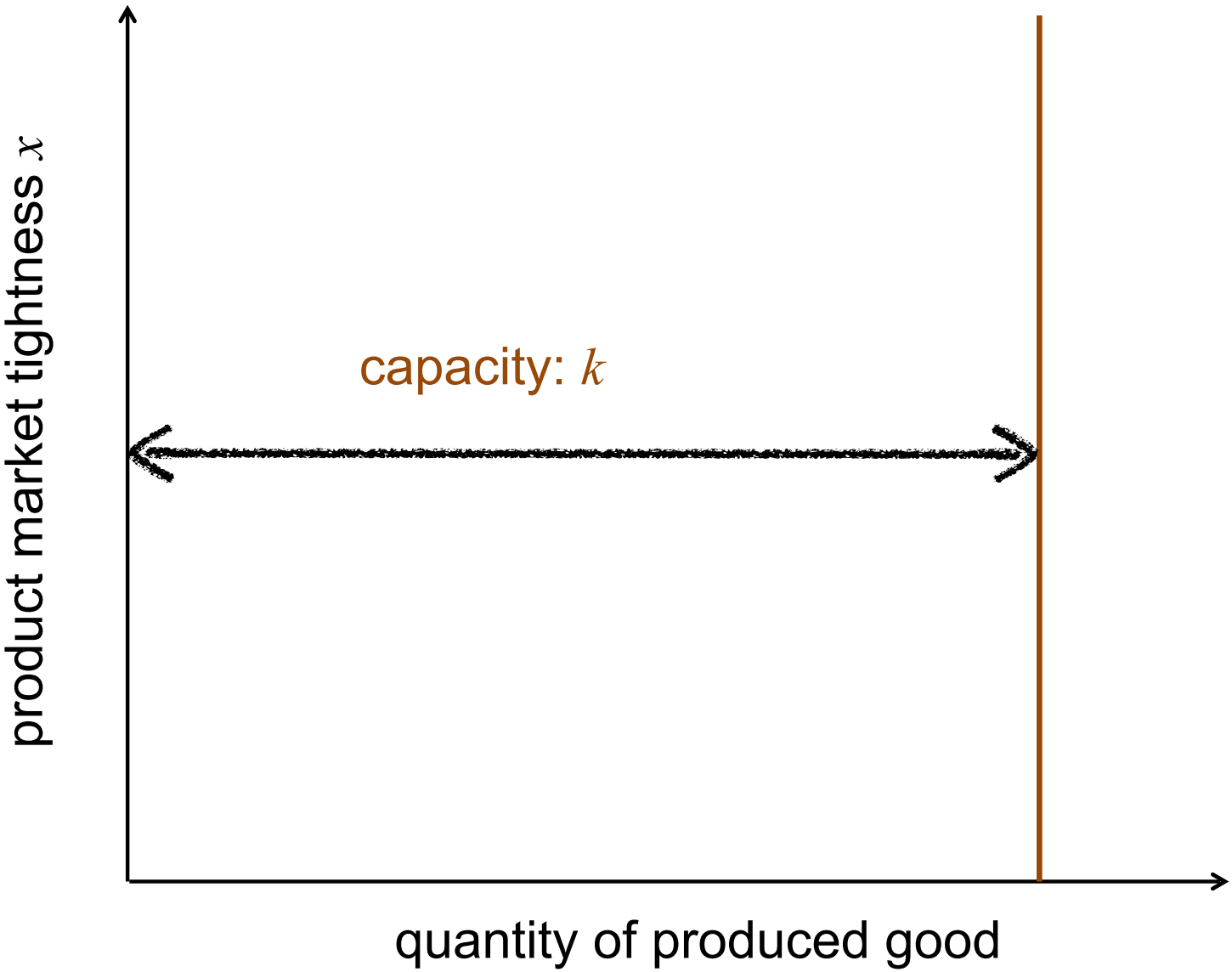
- output $= \left[1 + \tau(\underset{+}{x})\right] \cdot$ consumption
- proof:

$$\underbrace{y}_{\text{output}} = \underbrace{c}_{\text{consumption}} + \underbrace{\rho \cdot v}_{\text{trading}} = c + \rho \cdot \frac{y}{q(x)}$$

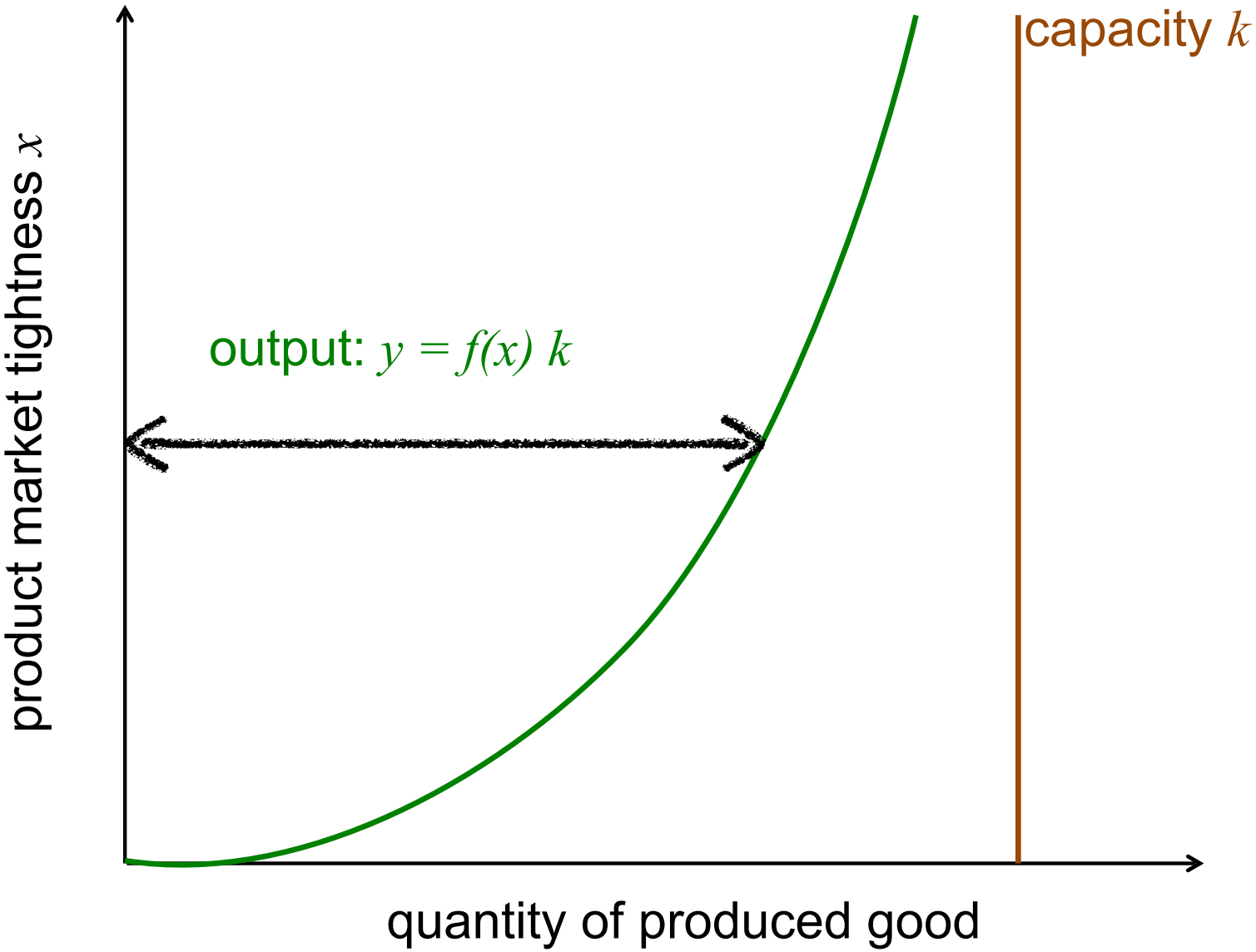
$$\Rightarrow y \cdot \left[1 - \frac{\rho}{q(x)}\right] = c$$

$$\Rightarrow y = \left[1 + \frac{\rho}{q(\underset{-}{x}) - \rho}\right] \cdot c \equiv \left[1 + \tau(\underset{+}{x})\right] \cdot c$$

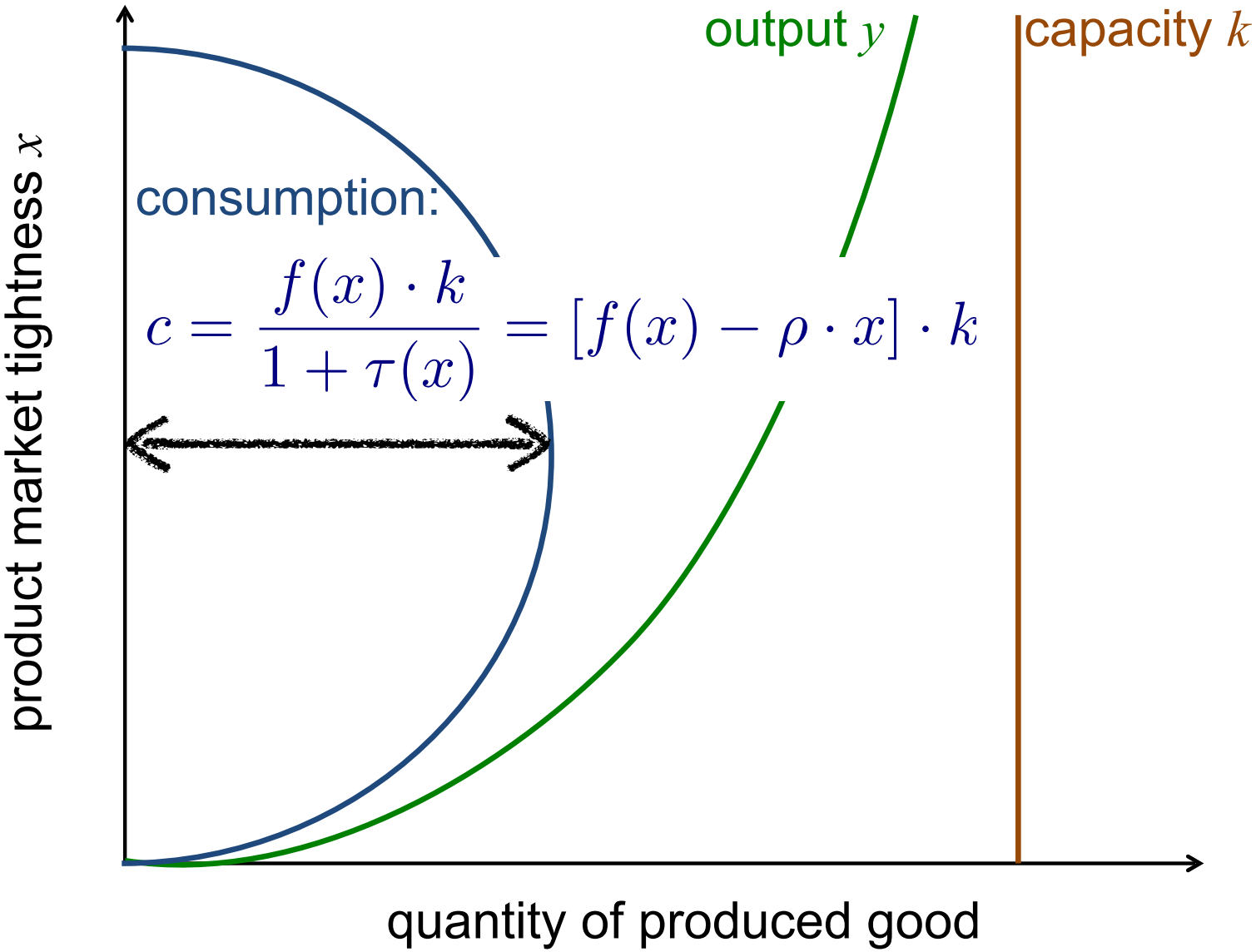
Tightness and aggregate supply



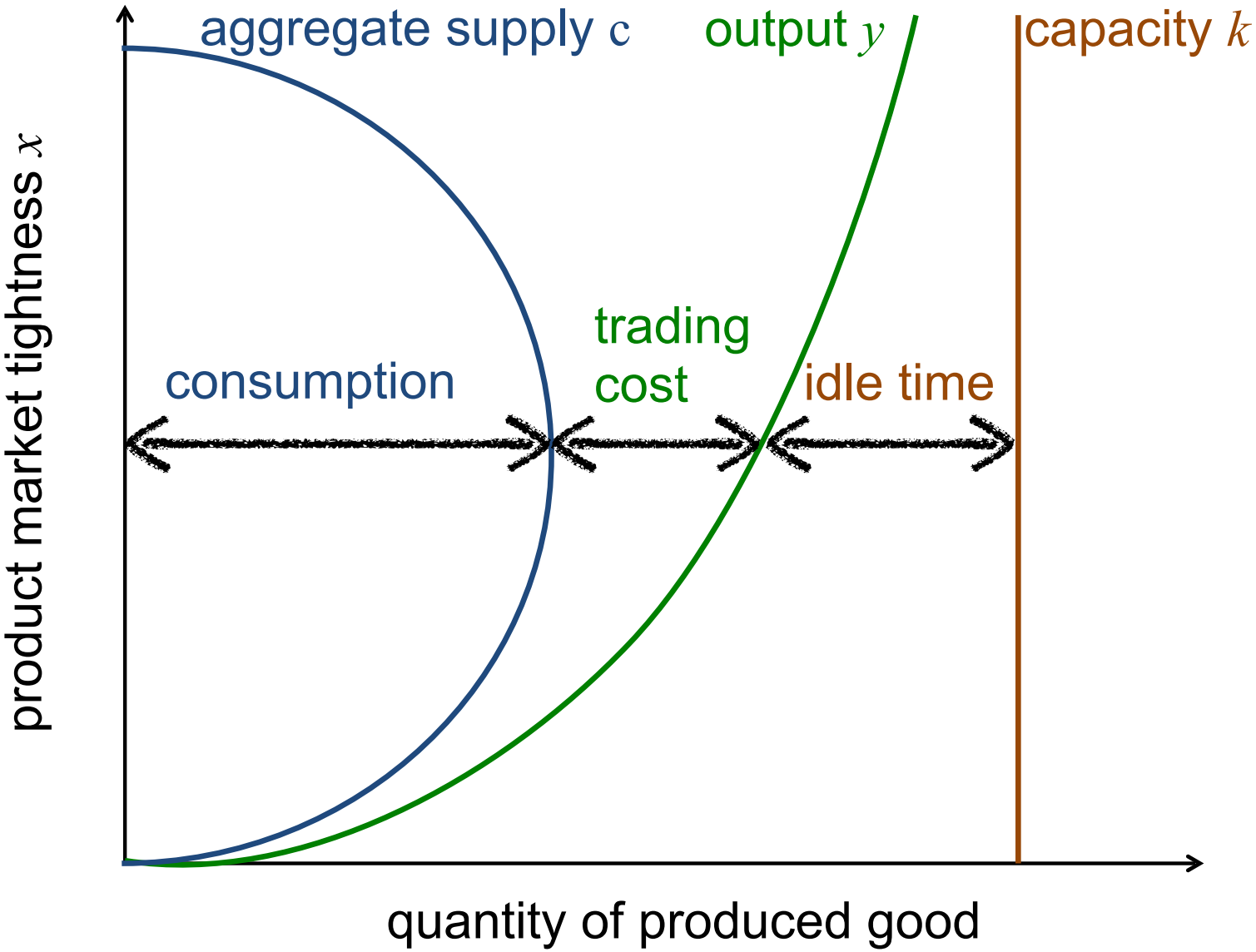
Tightness and aggregate supply



Tightness and aggregate supply



Tightness and aggregate supply



Nonproduced good

- valued by consumers
- in fixed supply
- traded on a perfectly competitive market
- examples: real money, land, gold, fixed capital
- as in Barro & Grossman [1971], Hart [1982], and Blanchard & Kiyotaki [1987]

Households

- take price p and tightness x as given
- choose c, m to maximize utility

$$\left(\underbrace{\frac{\chi}{1+\chi} \cdot c^{\frac{\varepsilon-1}{\varepsilon}}}_{\text{produced good}} + \underbrace{\frac{1}{1+\chi} \cdot m^{\frac{\varepsilon-1}{\varepsilon}}}_{\text{nonproduced good}} \right)^{\frac{\varepsilon}{\varepsilon-1}}$$

- subject to budget constraint

$$\underbrace{m}_{\text{numeraire}} + p \cdot \underbrace{(1+\tau(x)) \cdot c}_{\text{produced good}} = \underbrace{\mu}_{\text{endowment}} + \underbrace{f(x) \cdot p \cdot k}_{\text{labor income}}$$

Optimal consumption decision

- first-order condition

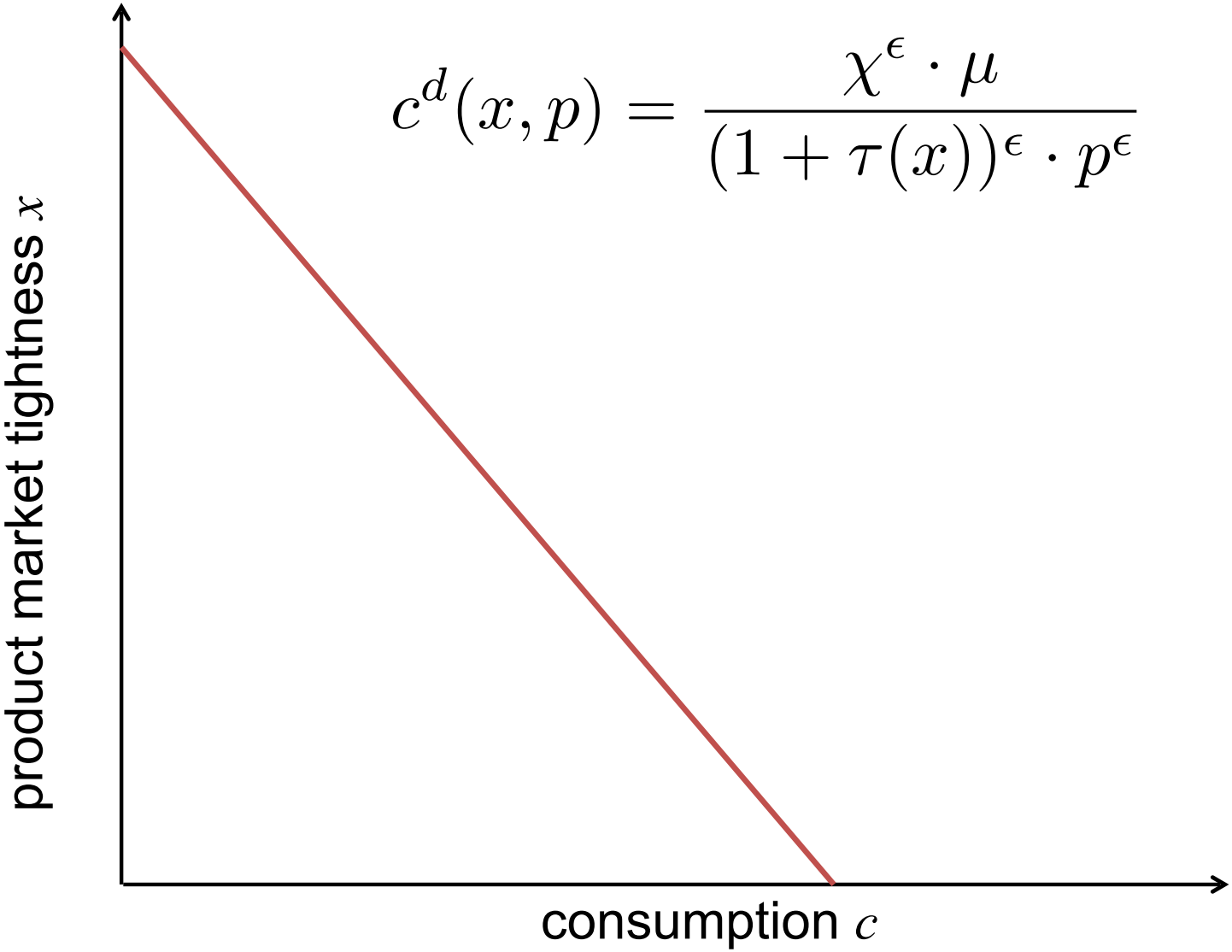
$$\underbrace{(1+\tau(x))\cdot p}_{\text{product price}}\cdot \underbrace{\frac{1}{1+\chi}\cdot m^{-\frac{1}{\varepsilon}}}_{\text{MU of nonproduced good}} = \underbrace{\frac{\chi}{1+\chi}\cdot c^{-\frac{1}{\varepsilon}}}_{\text{MU of produced good}}$$

- aggregate demand (as $m=\mu$):

$$c^d(x,p)=\frac{\chi^{\varepsilon}\cdot\mu}{(1+\tau(x))^{\varepsilon}\cdot p^{\varepsilon}}$$

Tightness and aggregate demand

$$c^d(x,p) = \frac{\chi^\epsilon \cdot \mu}{(1+\tau(x))^\epsilon \cdot p^\epsilon}$$



Definition of equilibrium

- equilibrium is (x, p) such that supply $=$ demand:

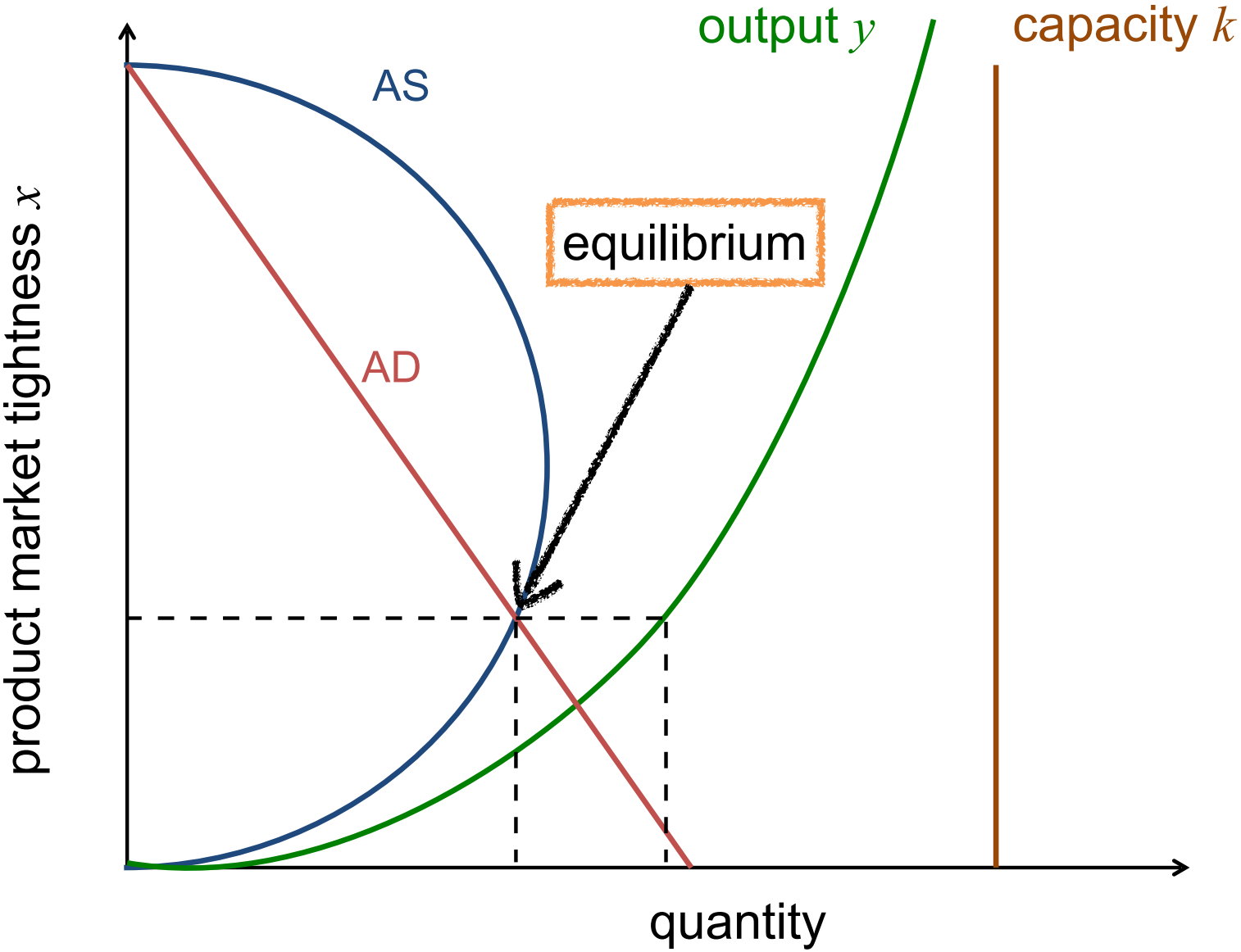
$$c^s(x) = c^d(x, p)$$

- 1 equation, 2 variables: indeterminacy
- need a price mechanism to select equilibrium
  - fixed price
  - efficient price

Comparative statics

with fixed price and efficient price

Increase in AD with fixed price



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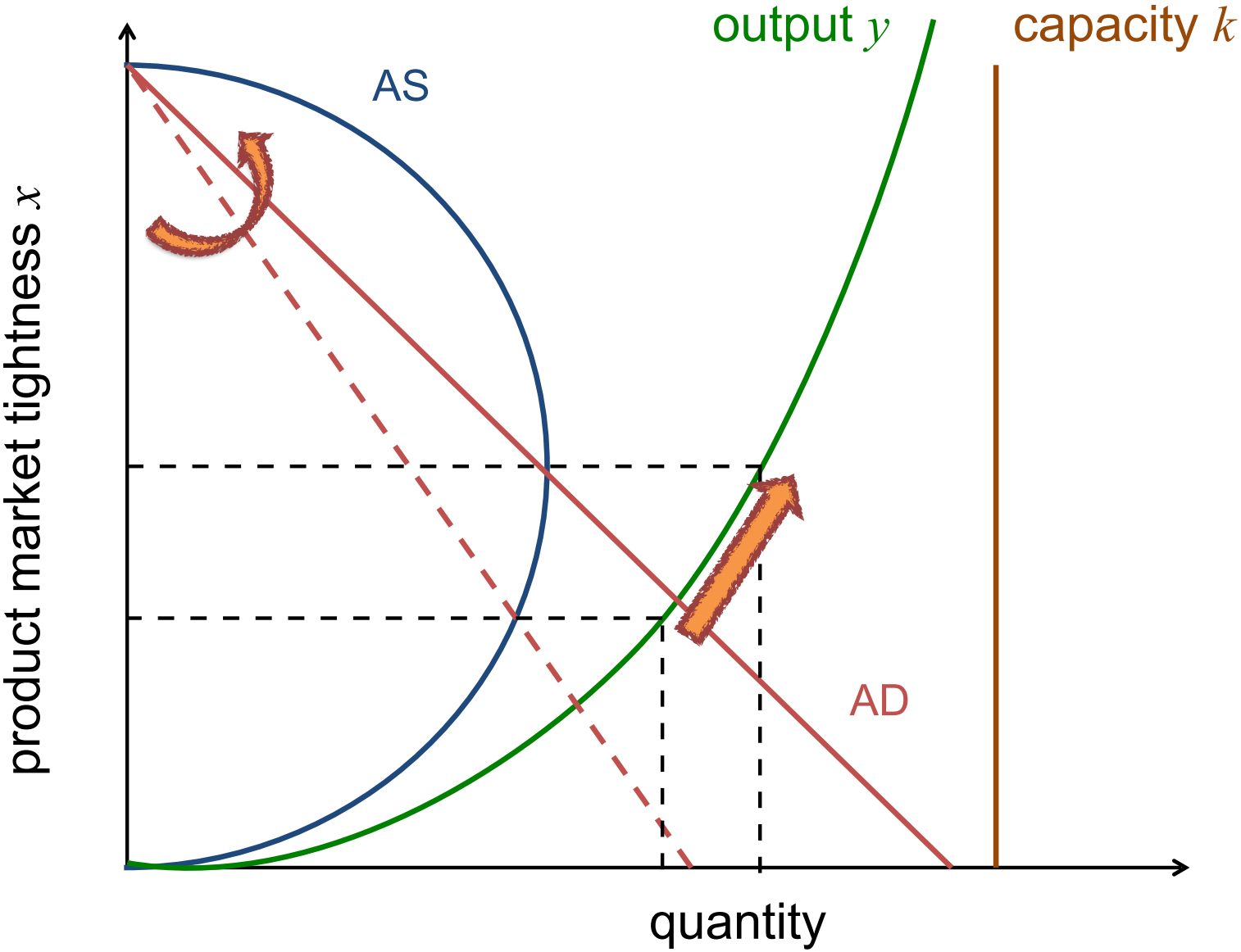
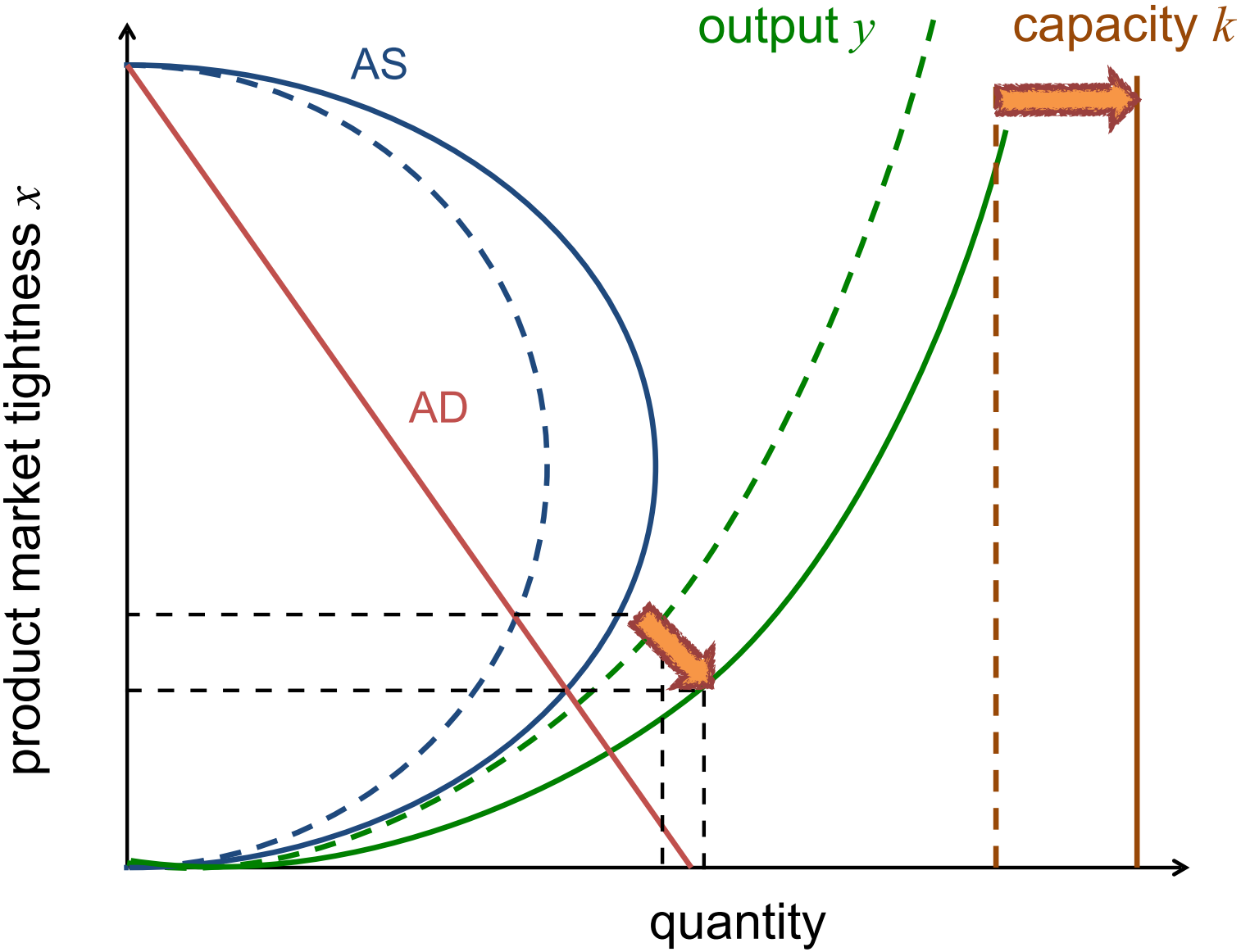


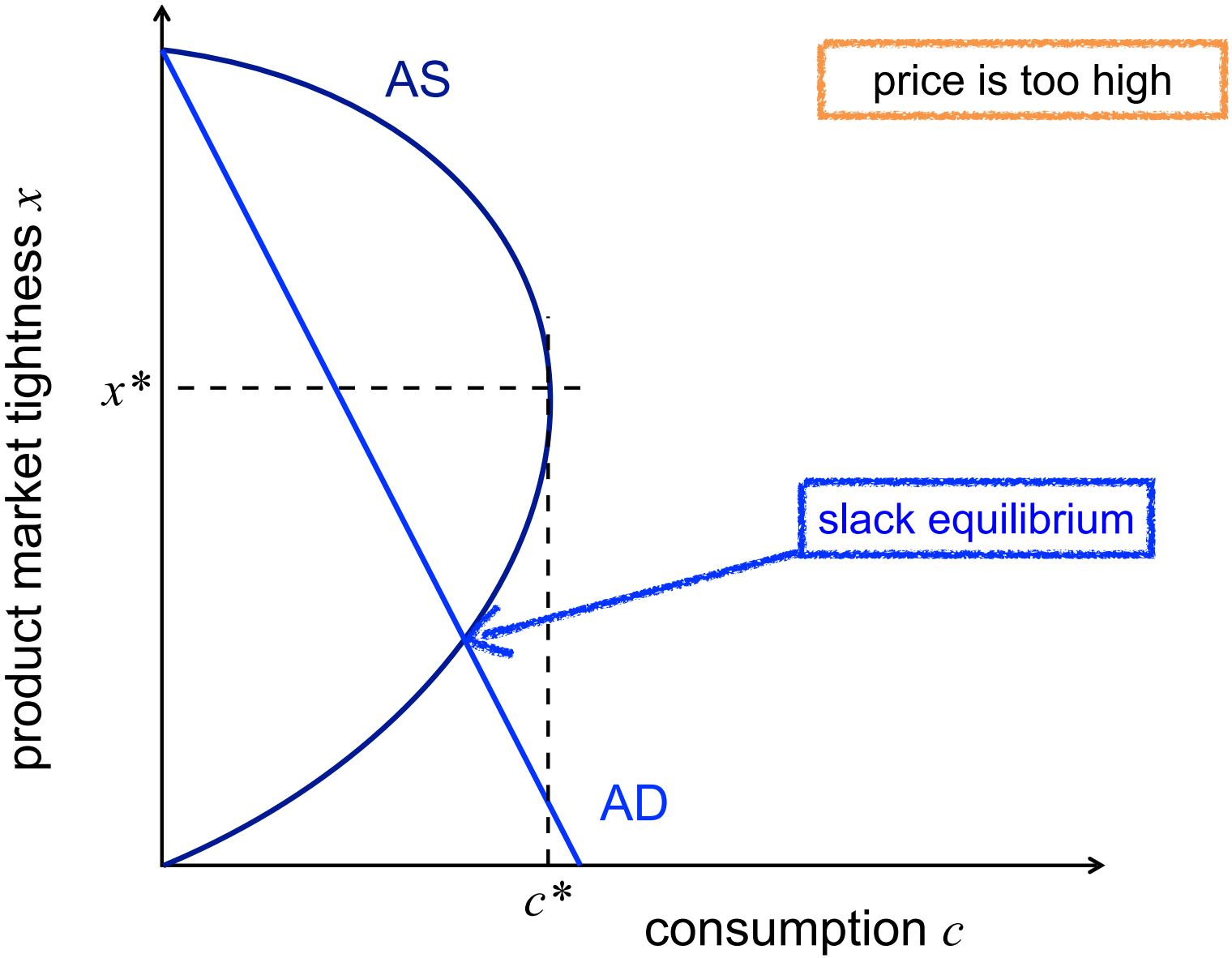
Increase in AS with fixed price



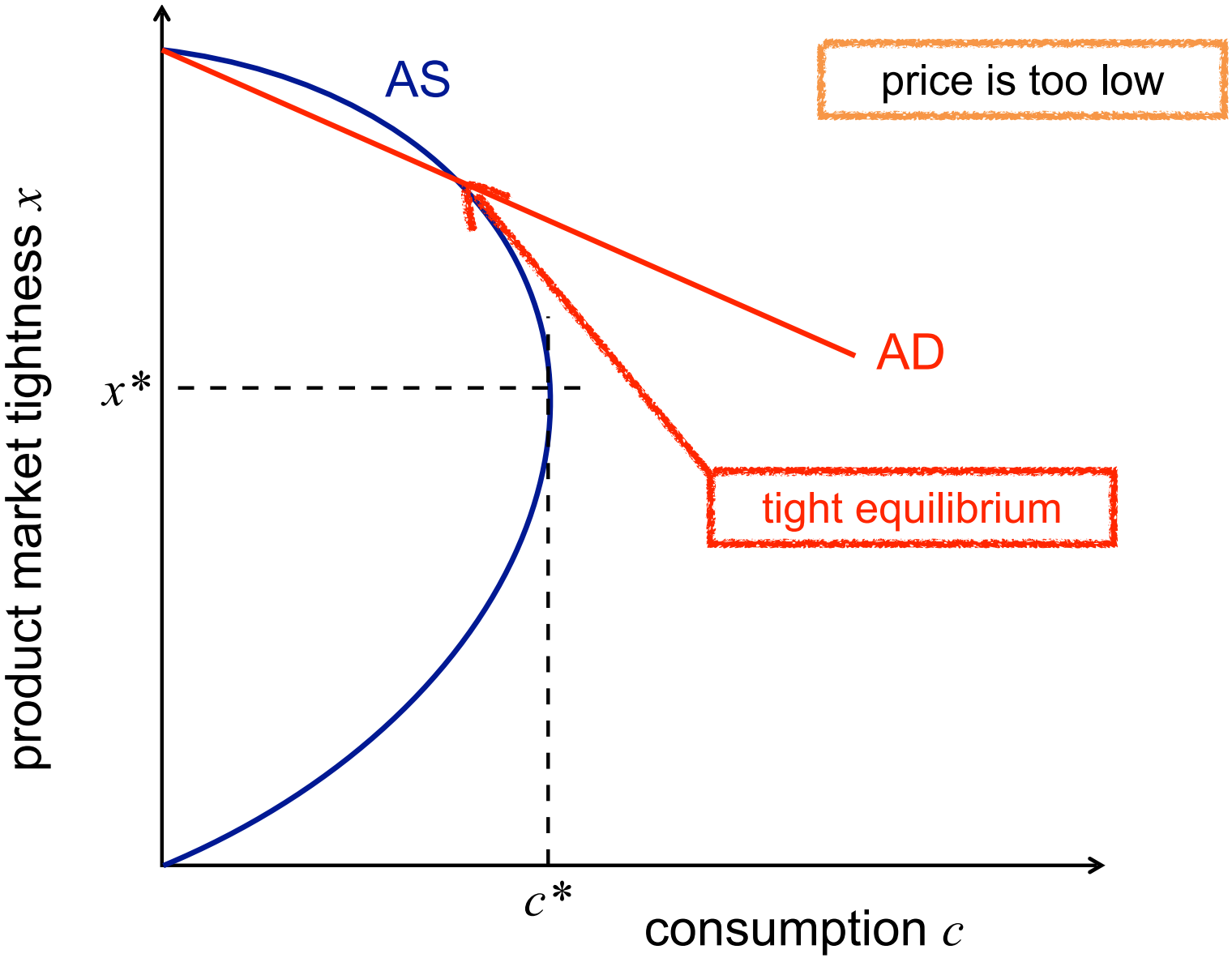
Comparative statics with fixed price

	effect on:	
	output	tightness
increase in:	y	x
aggregate demand	$+$	$+$
aggregate supply	$+$	$-$

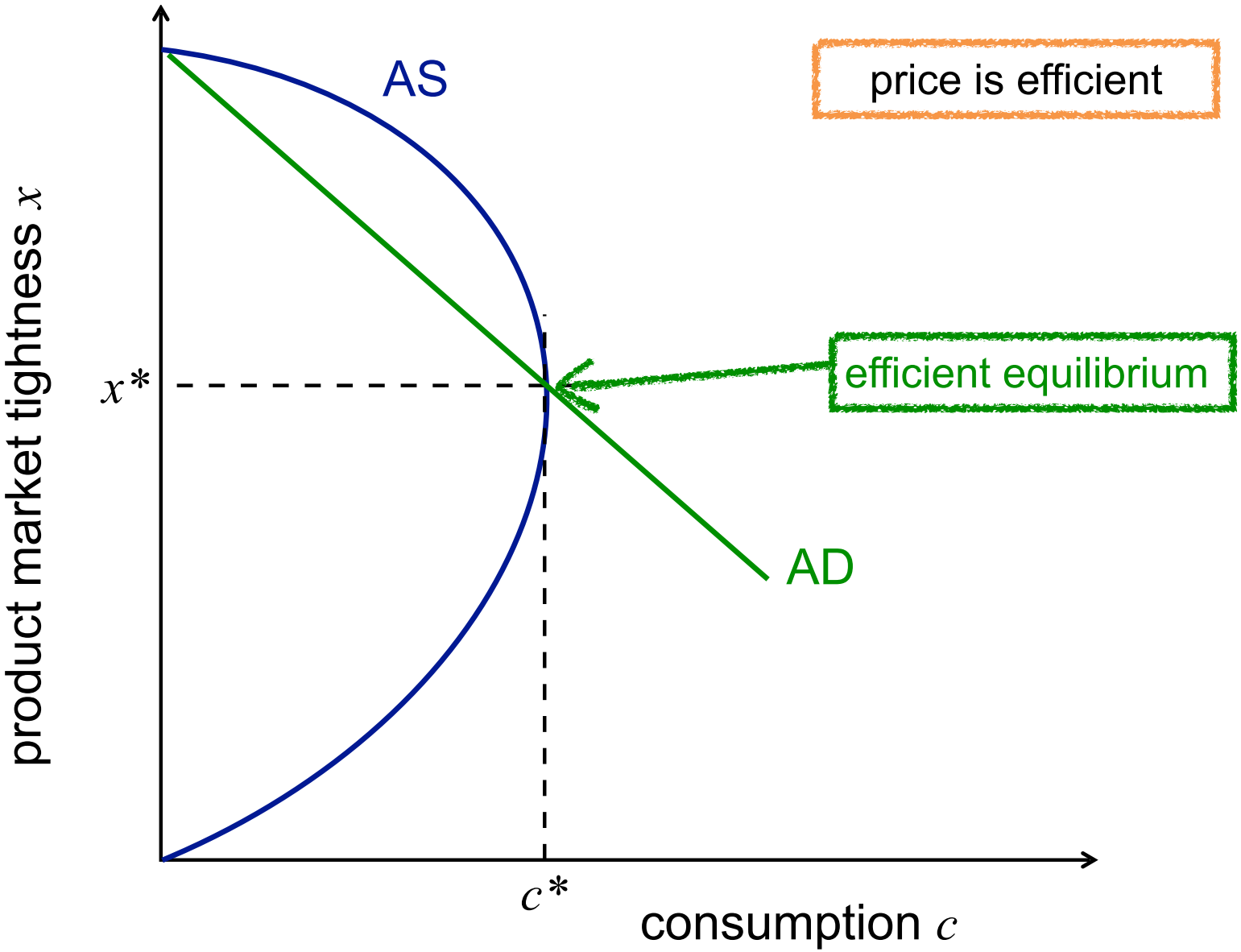
Definition of efficient price



Definition of efficient price



Definition of efficient price

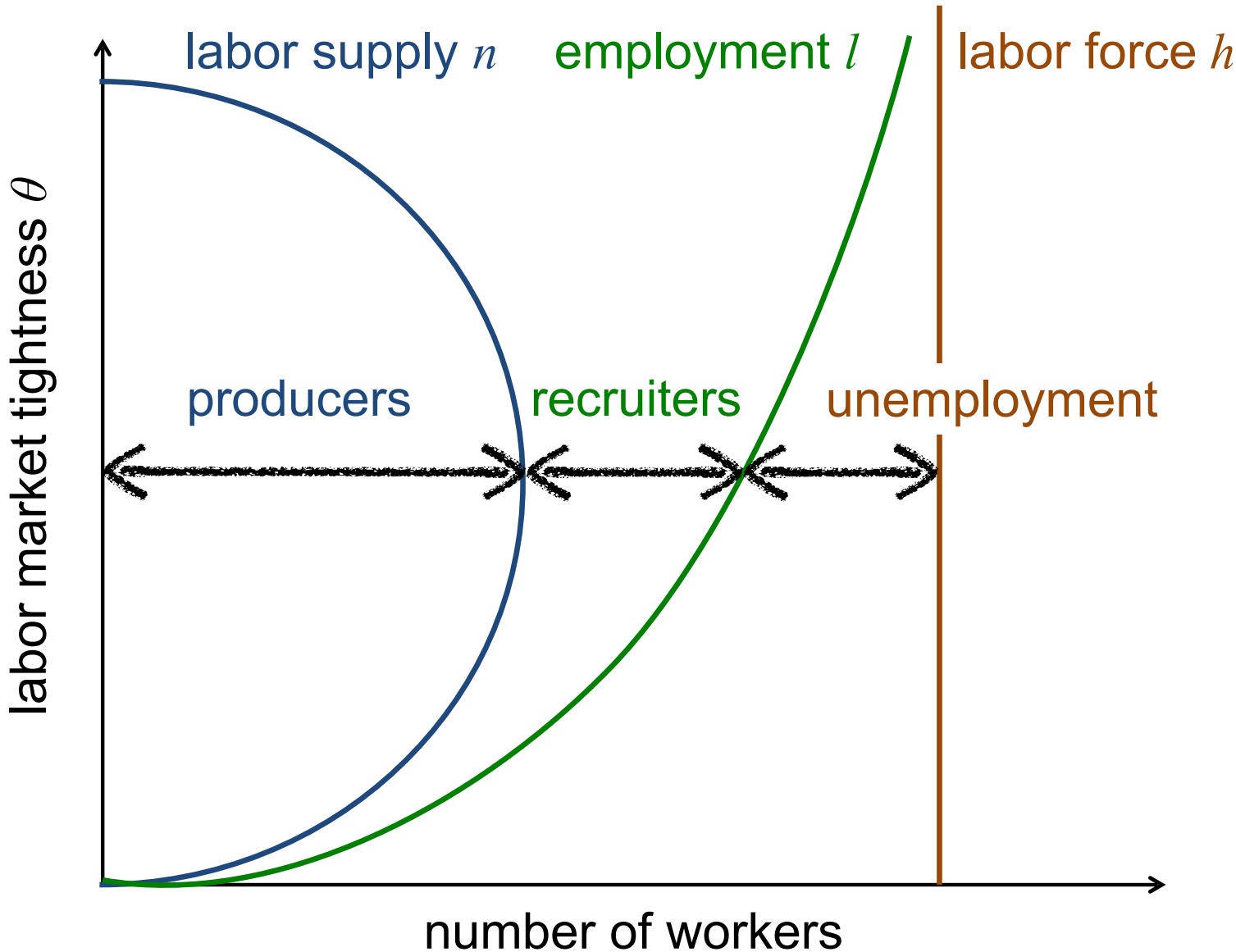


Comparative statics with efficient price

	effect on:	
	output	tightness
increase in:	y	x
aggregate demand	0	0
aggregate supply	$+$	0

Complete model

Labor market and unemployment



Firms

- employ producers and recruiters and sell production
- take real wage w and tightnesses x and θ as given
- choose number of producers n to maximize profits

$$\underbrace{f(x)}_{\text{selling probability}} \cdot \underbrace{a \cdot n^{\alpha}}_{\text{production}} - \underbrace{[1+\hat{\tau}(\theta)] \cdot w \cdot n}_{\text{wage of producers + recruiters}}$$

Optimal employment decision

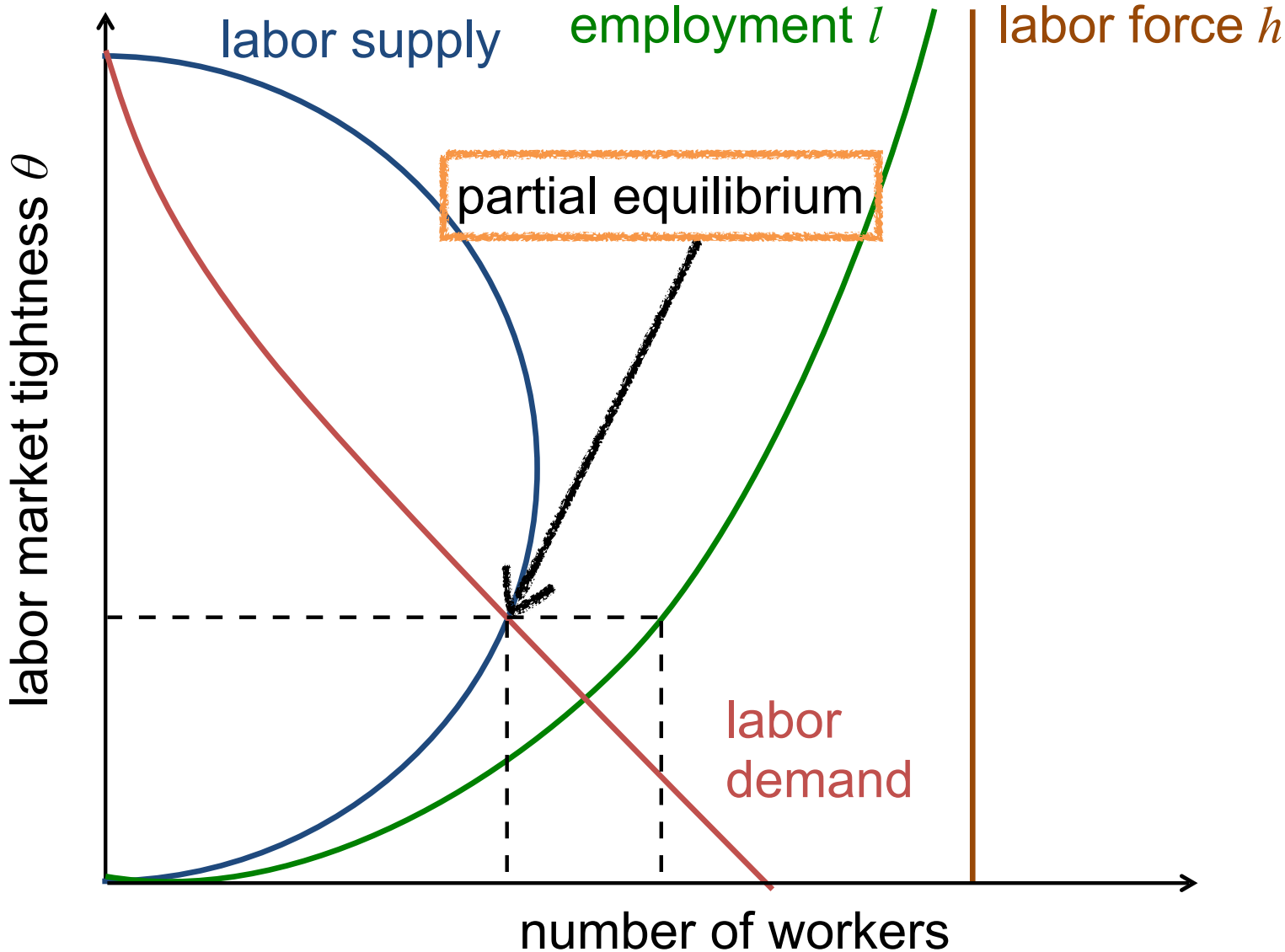
- first-order condition:

$$\underbrace{f(x)}_{\text{selling probability}} \cdot \underbrace{\alpha \cdot a \cdot n^{\alpha-1}}_{\text{MPL}} = \underbrace{[1+\hat{\tau}(\theta)]}_{\text{matching wedge}} \cdot \underbrace{w}_{\text{real wage}}$$

- labor demand: demand for producers

$$n^d(\theta, x, w) = \left[\frac{f(x) \cdot a \cdot \alpha}{(1+\hat{\tau}(\theta)) \cdot w}\right]^{\frac{1}{1-\alpha}}$$

Partial equilibrium on labor market



General equilibrium (x, θ, p, w)

- supply $=$ demand on product and labor markets

$$\begin{cases} c^s(x,\theta) &= c^d(x,p) \\ n^s(\theta) &= n^d(\theta,x,w) \end{cases}$$

- 2 equations, 4 variables: indeterminacy
- need price and wage mechanisms

Keynesian, classical, and frictional unemployment

- equilibrium employment:

$$l = \left(\frac{f(x) \cdot a \cdot \alpha}{w} \right)^{\frac{1}{1-\alpha}} \cdot \left(\frac{1}{1+\hat{\tau}(\theta)} \right)^{\frac{\alpha}{1-\alpha}}$$

- frictional unemployment from $\hat{\tau}(\theta) > 0$
- classical unemployment from $w > a \cdot \alpha$
- **Keynesian unemployment from** $f(x) < 1$

Comparative statics with fixed prices

	effect on:			
	output	product tightness	labor tightness	employment
increase in:	y	x	θ	l
aggregate demand	+	+	+	+
technology	+	−	+	+
labor supply	+	−	−	+
mismatch	−	+	+	−

Comparative statics with fixed prices

	effect on:			
	output	product tightness	labor tightness	employment
increase in:	y	x	θ	l
aggregate demand	+	+	+	+
technology	+	−	+	+
labor supply	+	−	−	+
mismatch	−	+	+	−

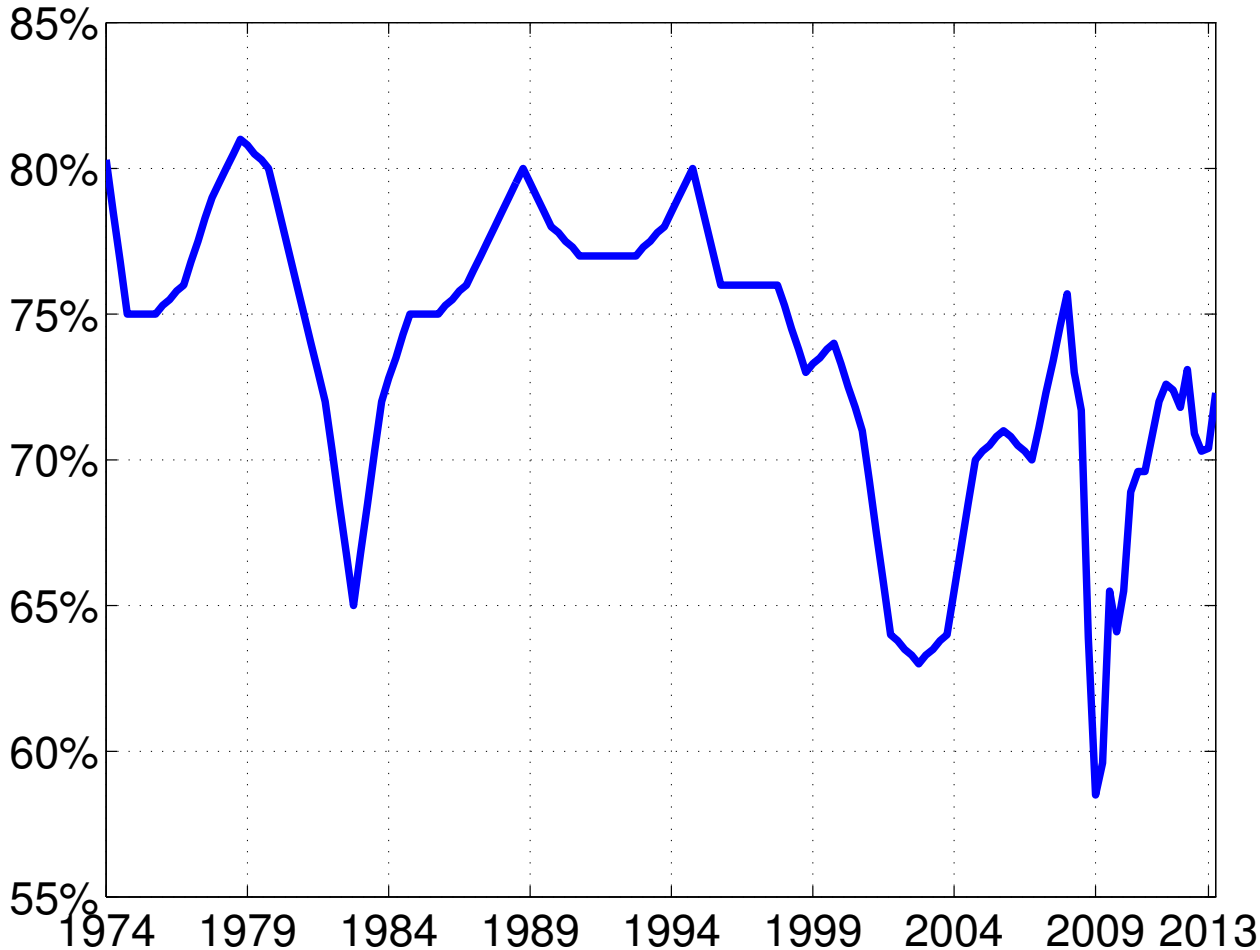
Comparative statics with efficient prices

	effect on:			
	output	product tightness	labor tightness	employment
increase in:	y	x	θ	l
aggregate demand	0	0	0	0
technology	+	0	0	0
labor supply	+	0	0	+
mismatch	−	0	0	−

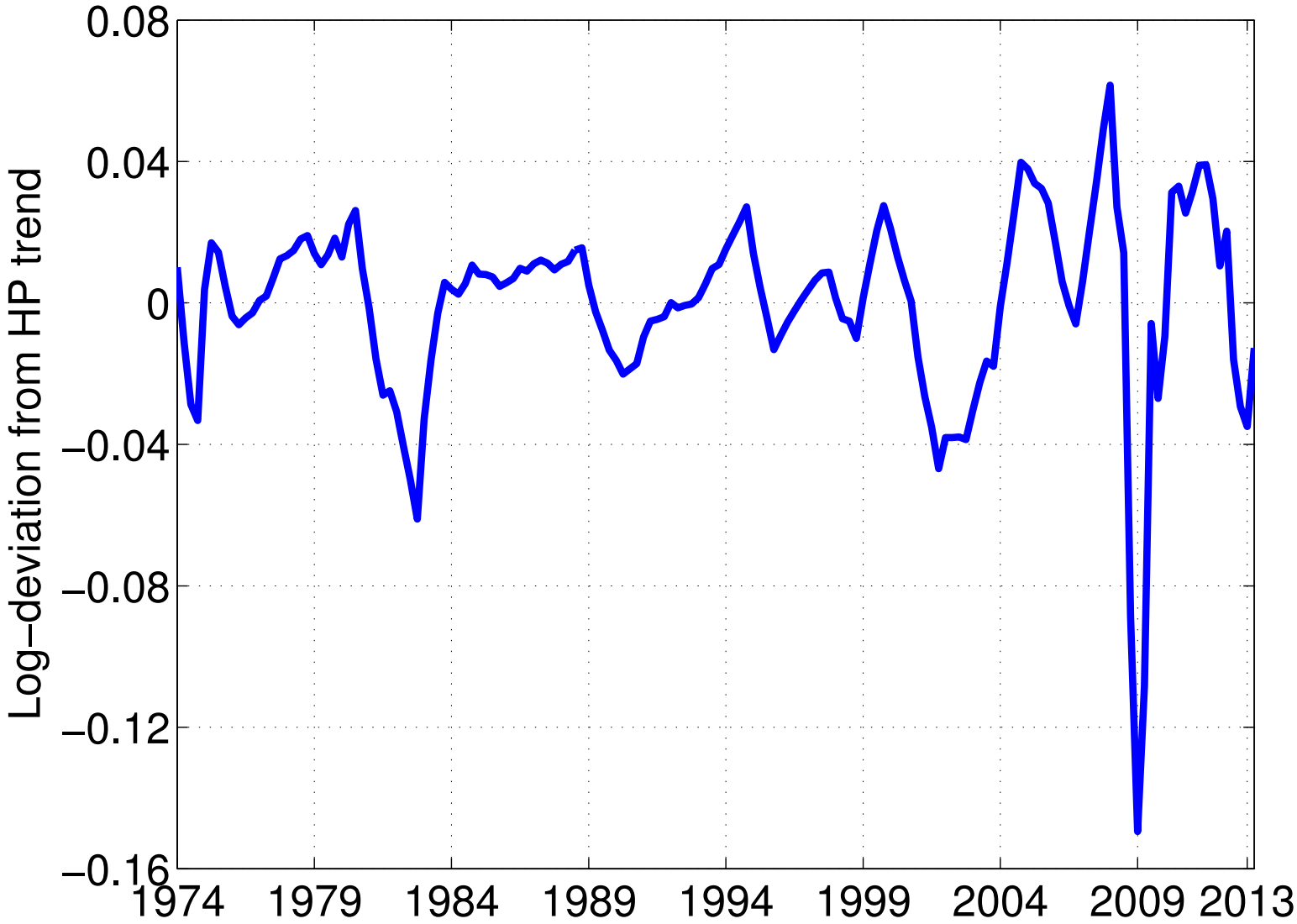
Rigid or flexible prices?

Construct proxy for product market tightness from

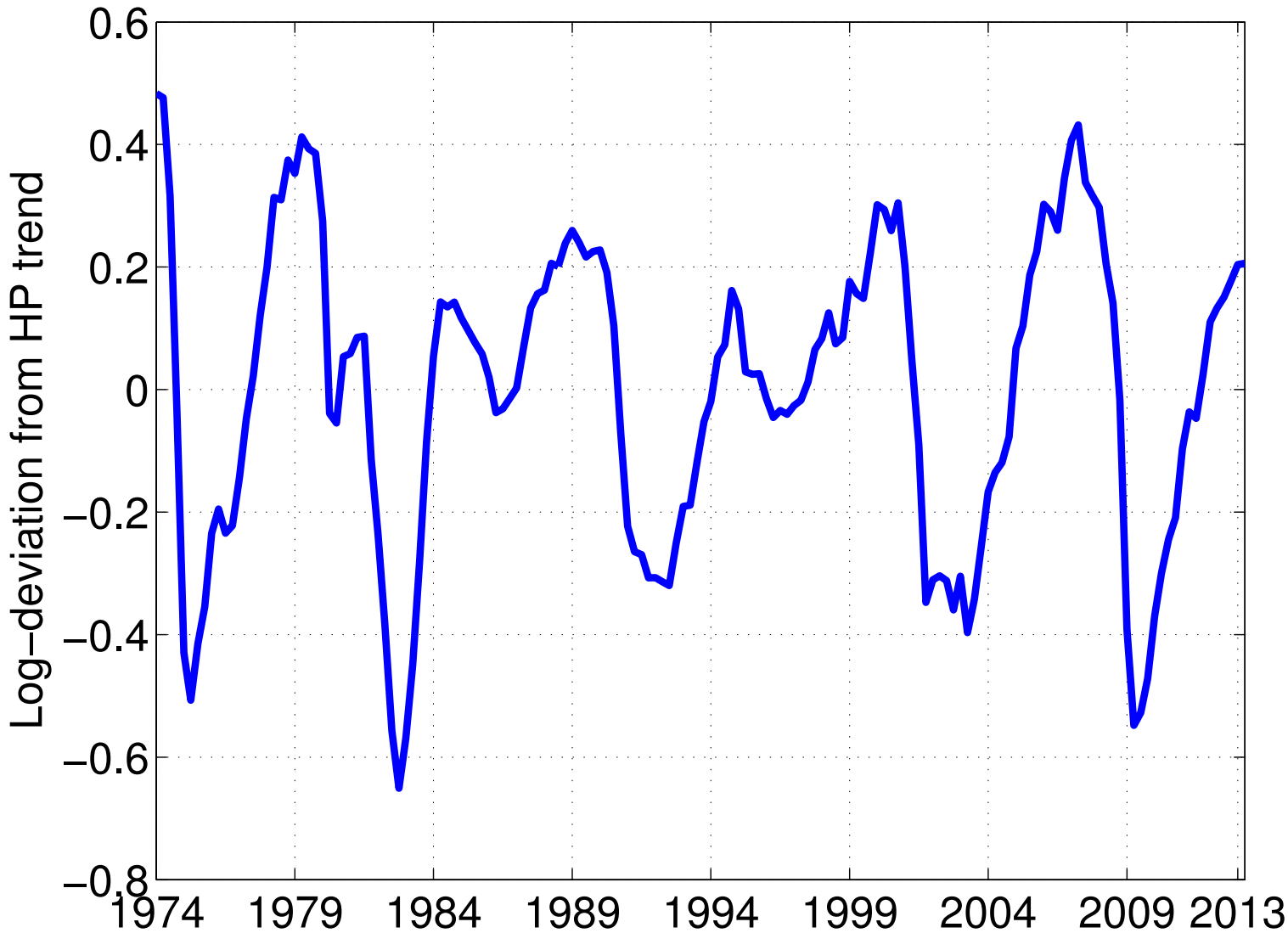
capacity utilization measure in Survey of Plant Capacity:



Fluctuations in product market tightness: rigid price



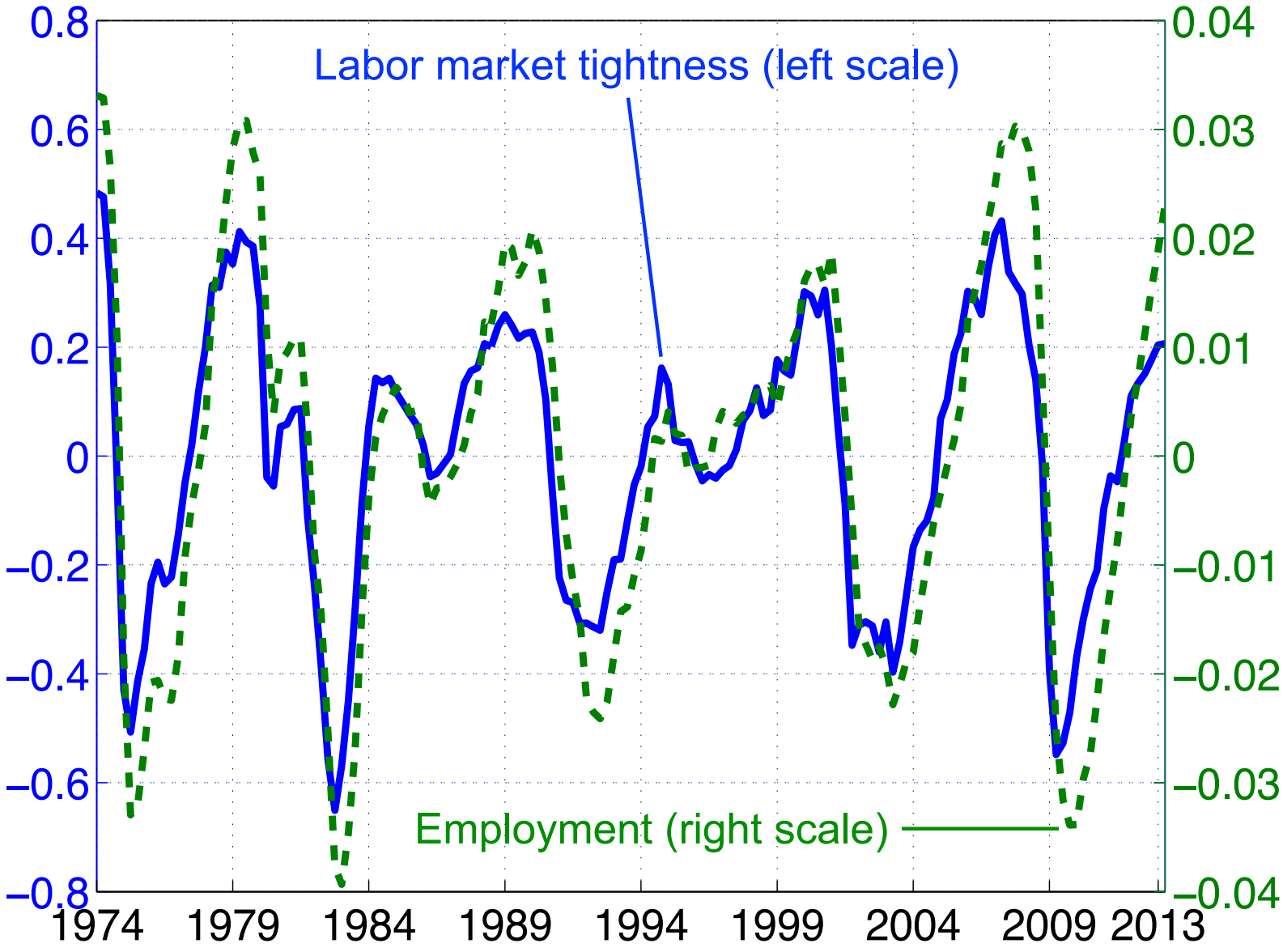
Fluctuations in labor market tightness: rigid real wage



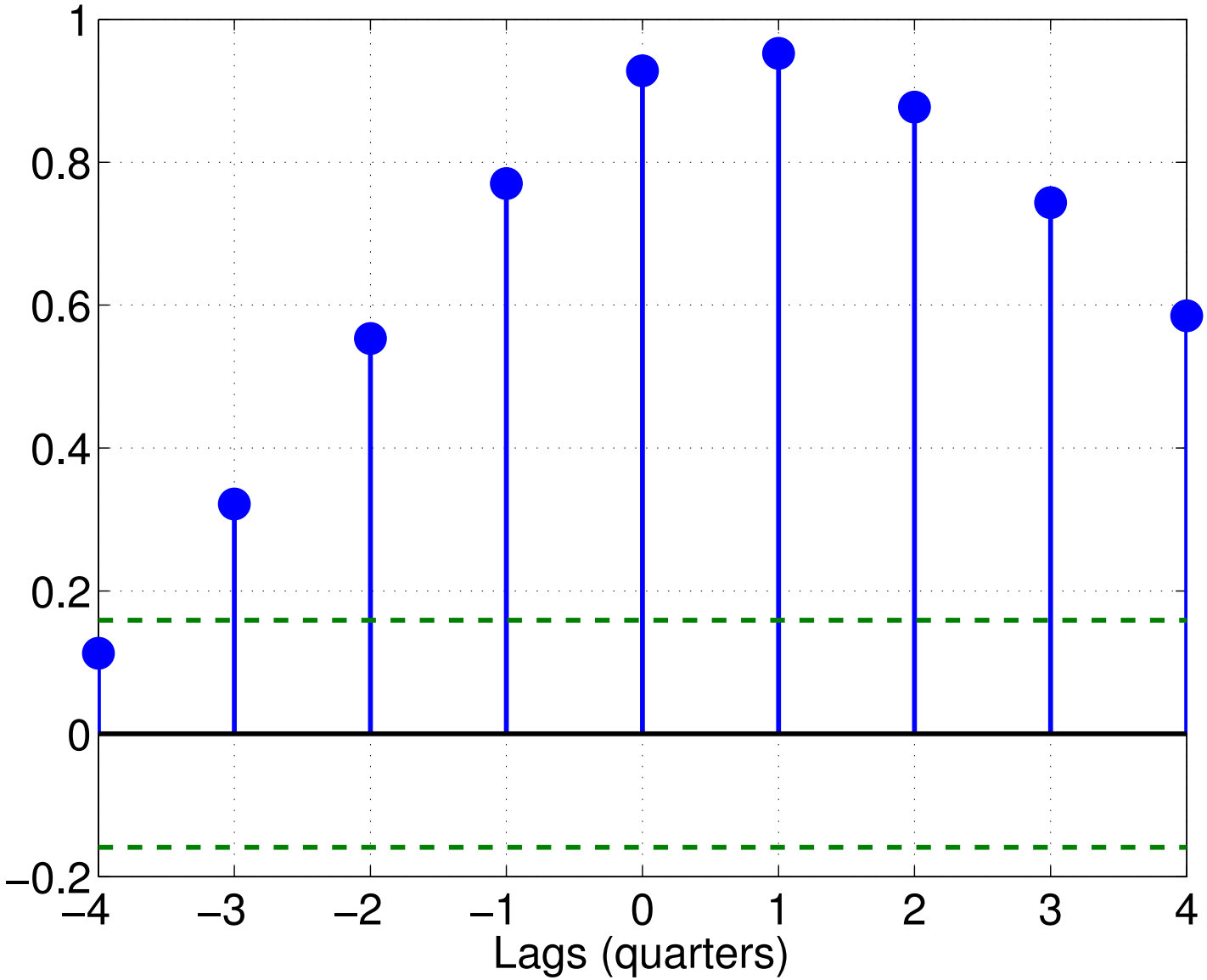
Effect of labor supply and demand shocks

- labor **supply** shocks: **negative** correlation between employment and labor market tightness
- labor **demand** shocks: **positive** correlation between employment and labor market tightness

Evidence of labor demand shocks



Cross-correlogram: labor market tightness and employment



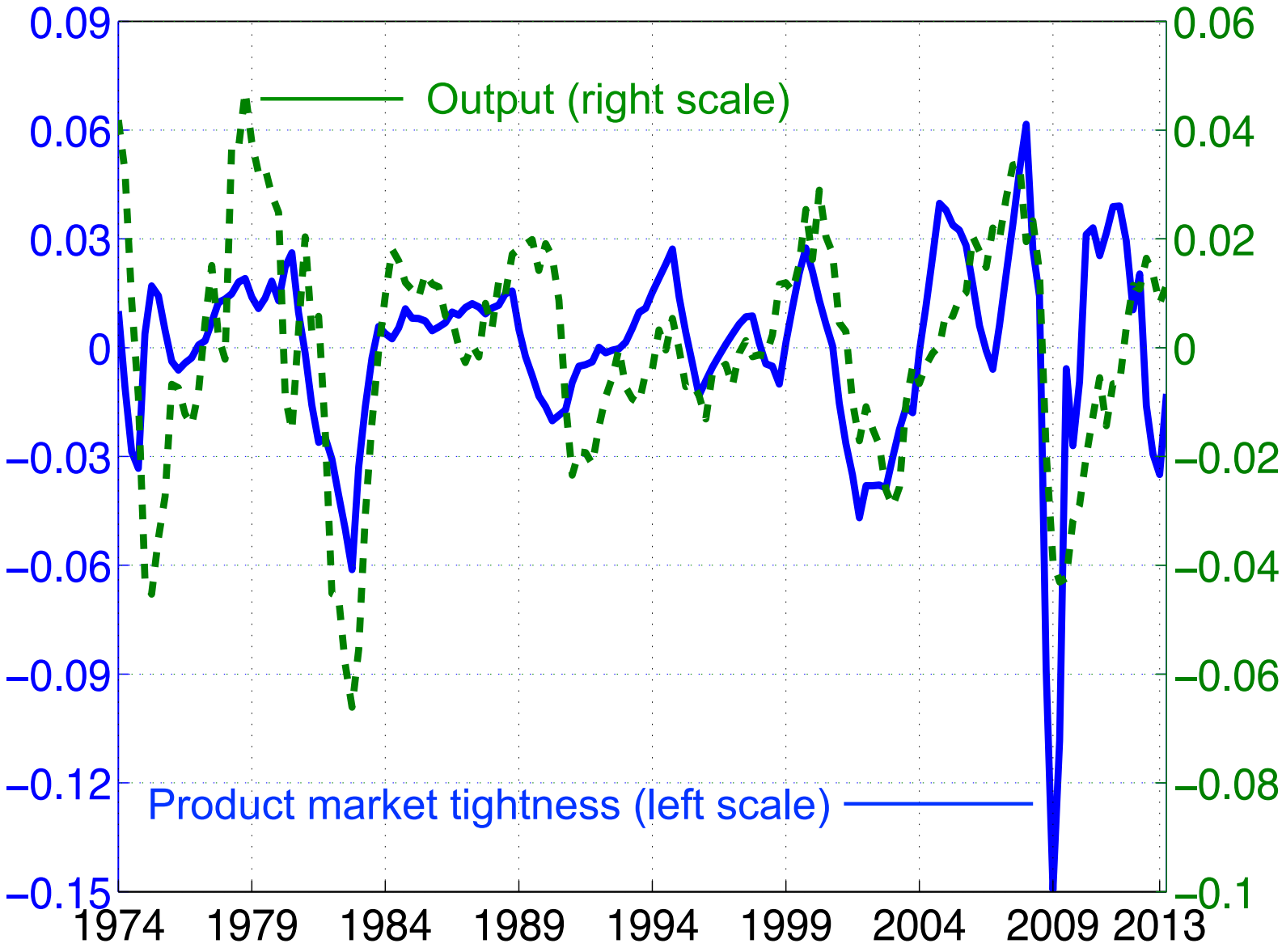
Labor demand shocks:

AD or technology shocks?

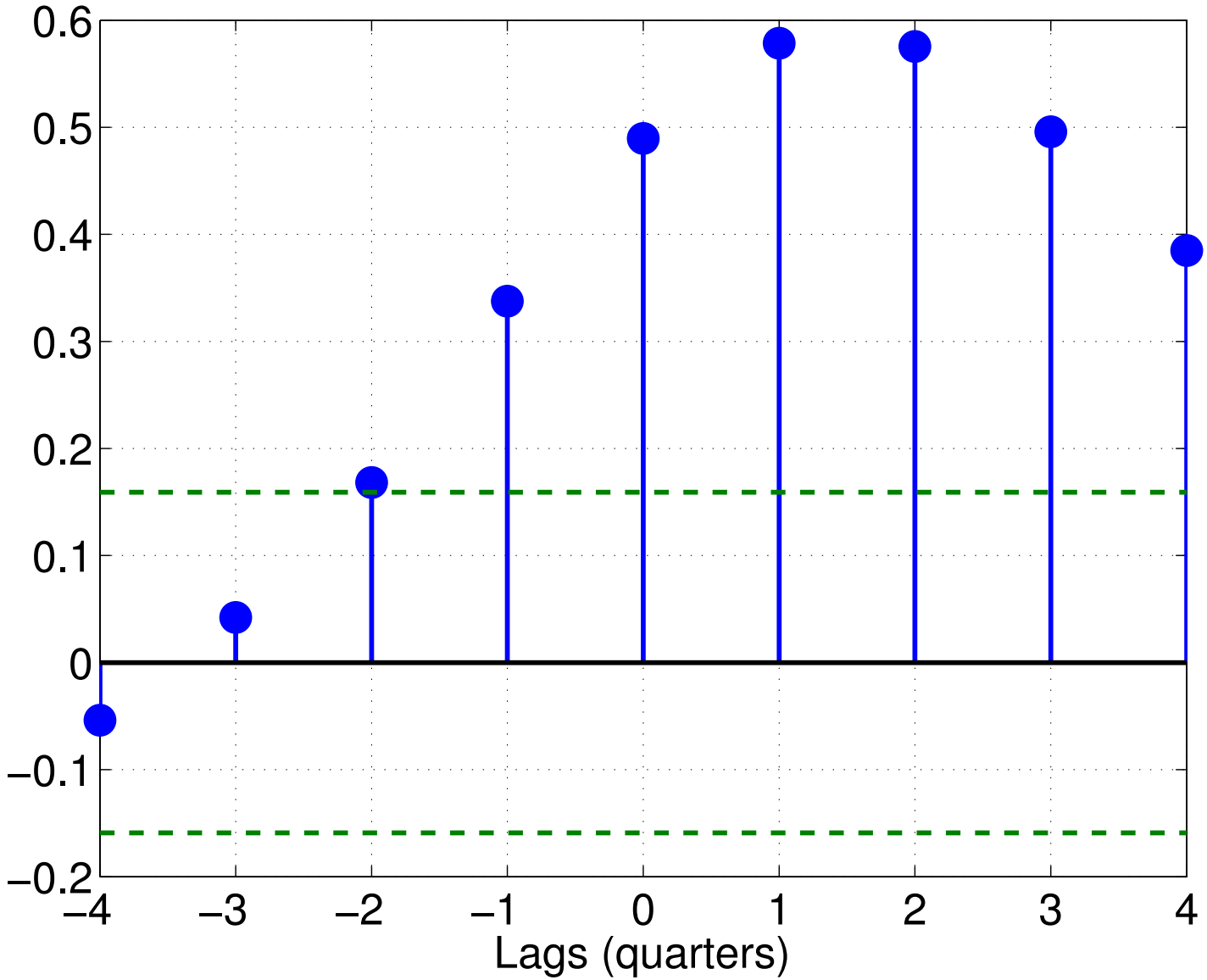
Effect of AD and technology shocks

- **AD** shocks: **positive** correlation between output and product market tightness
- **technology** shocks: **negative** correlation between output and product market tightness

Evidence of AD shocks



Cross-correlogram: product market tightness and output



Conclusion

- tractable model of unemployment fluctuations
- empirical series to measure tightness
  - product market tightness
  - labor market tightness
- origins of unemployment fluctuations
  1. importance of price and wage rigidity (not flexibility)
  2. importance of labor demand shocks (not labor supply)
  3. importance of AD shocks (not technology)