Notes on Markups

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July 2018

Markups

Recent papers examining behavior of markup = price/MC

- De Loecker and Eeckhout [2017] "The rise of market power"
- De Loecker and Eeckhout [2018] "Global market power"
- Karabarbounis and Neiman [2013], "The global decline of the labor share"
- Calligaris, Criscuolo, and Marcolin: "Markups in the digital era"
- Traina [2018], "Is aggregate market power increasing?"
- Hall [2018] "New evidence on the markup of prices over marginal cost"

NEWS

The Rise of Market Power
I have posted the draft of J. De Loecker, J. Eeckhout, "The Rise of Market Power and the Macroeconomic Implications".

Media coverage:
The Economist · The Wall Street Journal · Financial Times · NY Times · Bloomberg · Reuters · Quartz · Harvard Business Review · Pro Market · Noahpinion · Marginal Revolution · Growth Economics · The Weeds, Vox Podcast
Video: A funny take on Market Power by John Oliver

New paper: Global Market Power
This paper documents the evolution of markups for 134 countries around the world.

Sabbatical at Princeton
This academic year 2017-2018 I am the Louis A. Simpson visiting fellow and visiting professor at the Department of Economics at Princeton University.

Upcoming Seminars
This semester I give talks at ASU, Columbia, Yale, IMF, UPenn, McGill, Northwestern, Saint Louis Fed, Philadelphia Fed, UCLA, Banque de France, SED Mexico, Singapore (NUS and SMU).

DeLoecker and Eeckhout equation

$$\min \sum_i w_{it} x_{it} \text{ s.t. } y_t = A_t f(x_t)$$

$$\text{FOC: } w_{it} = \lambda_t A_t \frac{\partial f(x_t)}{\partial x_{it}}$$

$$\text{Multiply by } x_{it}/p_t y_t : \frac{w_{it} x_{it}}{p_t y_t} = \frac{\lambda_t}{p_t} \frac{\partial f(x_t)}{\partial x_{it}} \frac{x_{it}}{f(x_t)}$$

$$\text{define terms: } r_{it} = \frac{\lambda_t}{p_t} \theta_{it}$$

$$\text{rearrange: } \frac{p_t}{\lambda_t} = \frac{\theta_{it}}{r_{it}}$$

$$\text{in words: } \text{markup}_t = \frac{\theta_{it}}{\text{revenue share}_{it}}$$

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DeLoecker and Eeckhout assumption

$$\frac{\text{price}_t}{\text{marginal cost}_t} = \frac{p_t}{\lambda_t} = \frac{\theta_{it}}{w_{it}x_{it}/p_t y_t} = \frac{\text{output elastity of labor}_t}{\text{revenue share of labor}_t}$$

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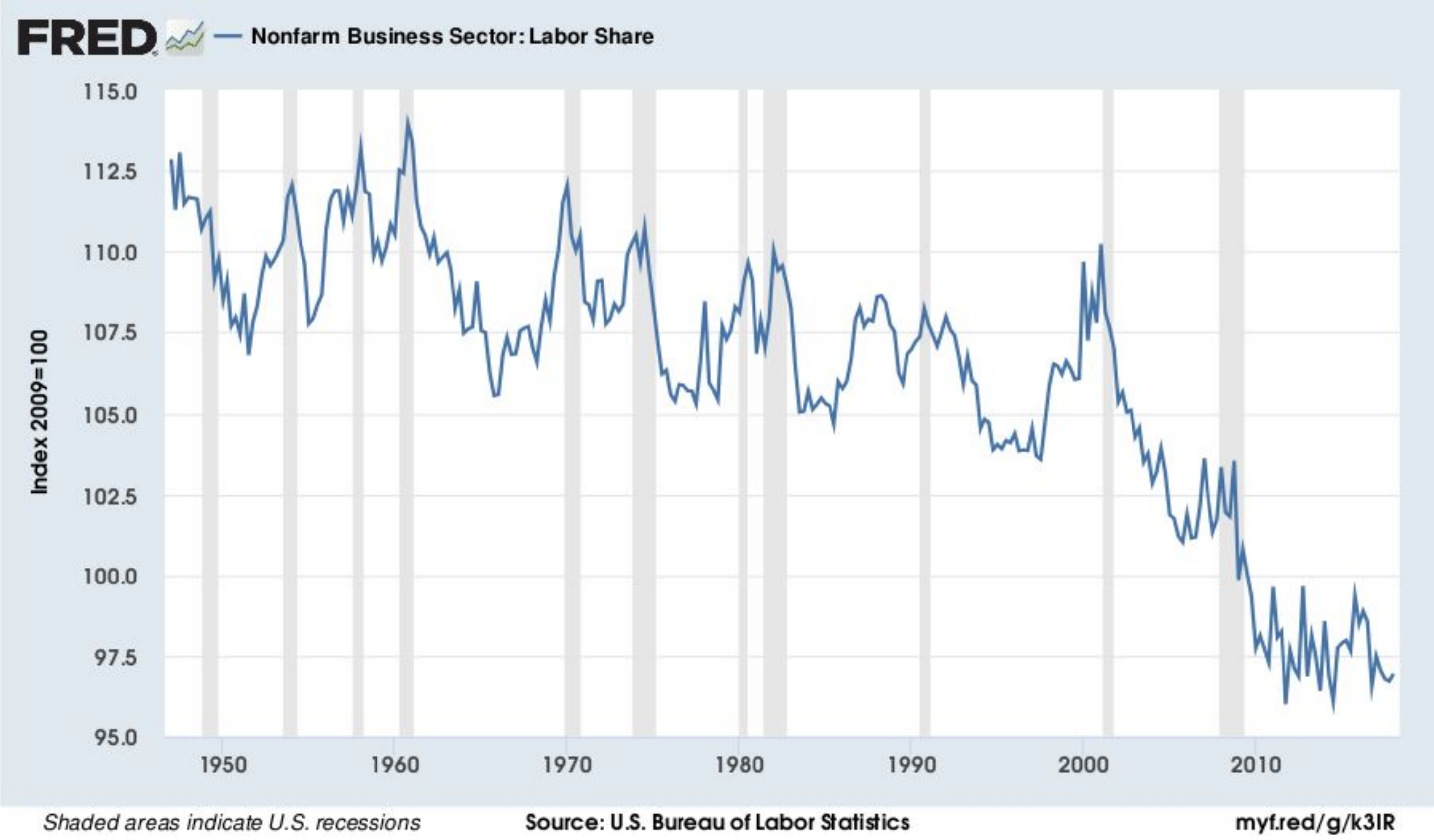
Assume Cobb-Douglas, making θ_{it} **constant** over time!

$$\frac{\text{price}_t}{\text{marginal cost}_t} = \frac{p_t}{\lambda_t} = \frac{\theta_{i}}{w_{it}x_{it}/p_t y_t} = \frac{\text{output elasticity of labor}}{\text{revenue share of labor}_t}$$

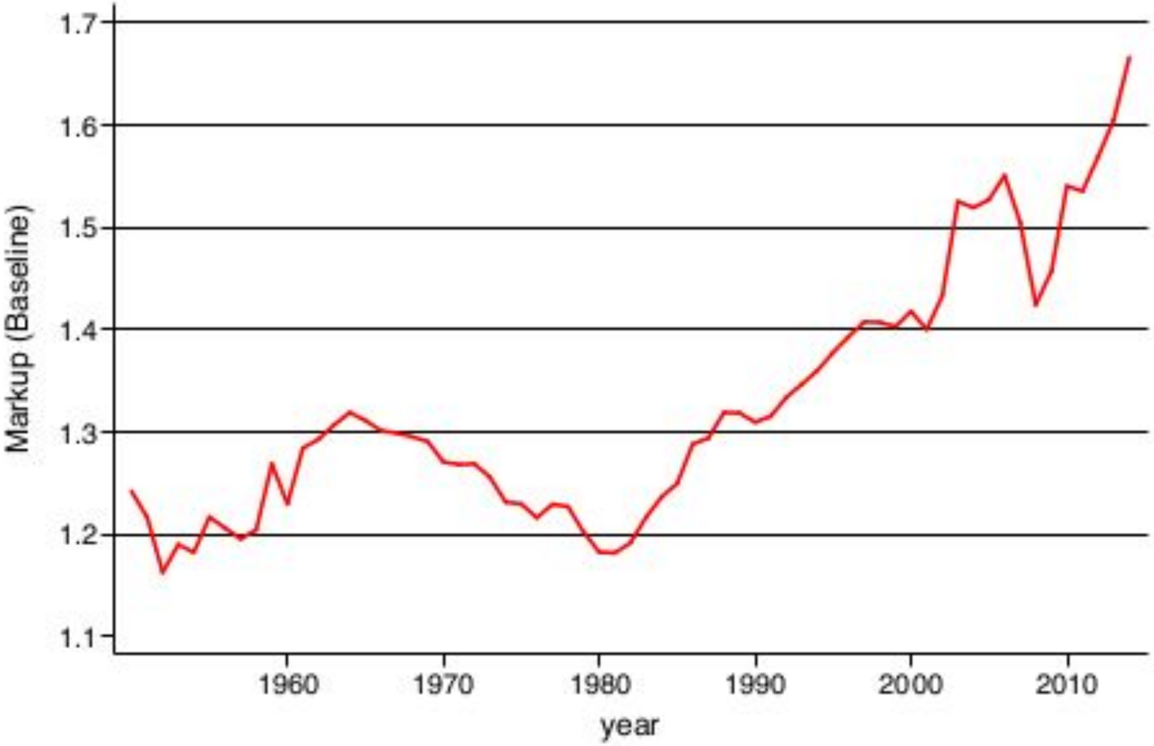
If you only care about about growth, don't need to estimate anything.

Labor share in US



Source: FRED

The evolution of average markups (1960 - 2014)



Source: [DeLoecker and Eeckhout]

Facts about labor share

- Labor share fell in essentially all OECD countries and all industries starting around 1980
- Which is more plausible?
  - All OECD countries decided to relax antitrust policy in all industries in 1980 and subsequently prices went up
  - There was a technological shock starting in 1980 and subsequently cost went down (among adopters)
- Of course, price and marginal cost can *both* fall while markup increases
  - I'll present some evidence on this in a minute

One equation, two unknowns

De Loecker and Eeckhout *assume* θ_{it} is constant, so margin is inversely proportional to revenue share. But you could just as well assume the margin is constant so θ_{it} *equals* revenue share.

$$\frac{\text{price}_t}{\text{marginal cost}_t} = \frac{p_t}{\lambda_t} = \frac{\theta_{it}}{w_{it}x_{it}/p_t y_t} = \frac{\text{output elasticity of labor}_t}{\text{revenue share of labor}_t}$$

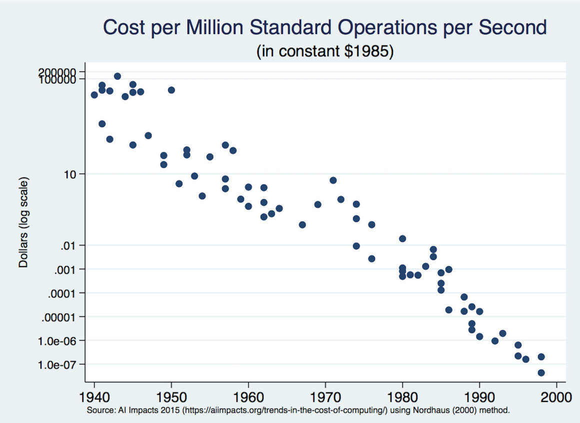
Is it plausible that in the last 35 years...

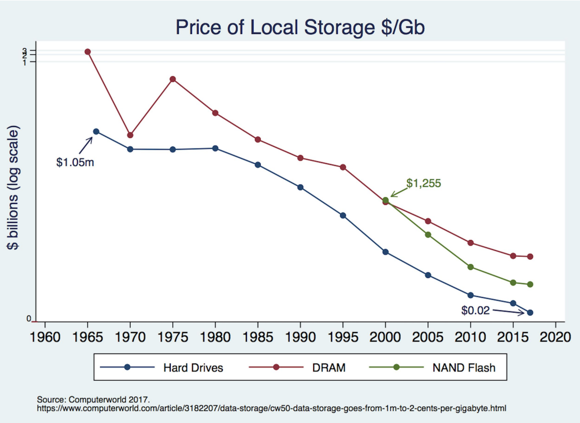
1. H1: Technology has been constant, markup has changed?
2. H2: Markup has been constant, technology has changed?
3. H3: Or has there been a mix of the two?

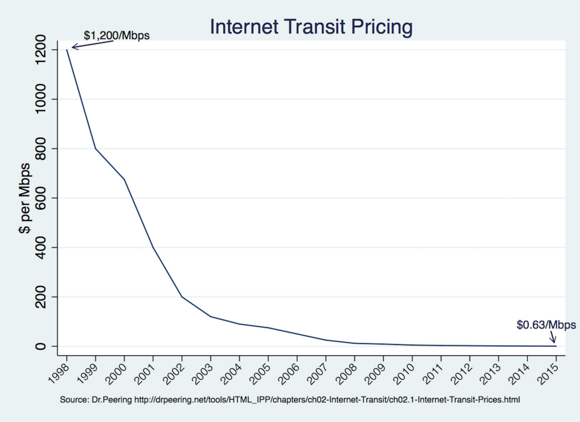
What could the 1980 technological shock be?

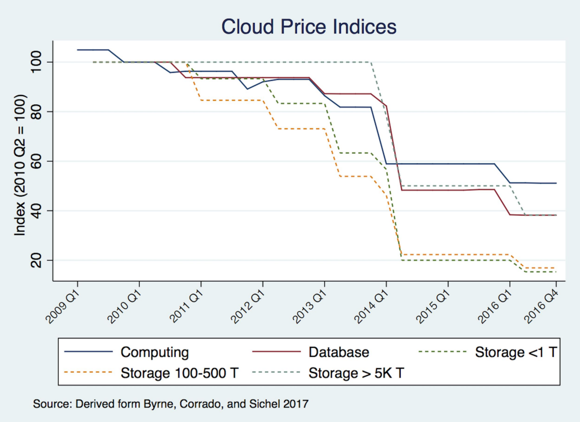
April 12, 1981

Cost reduction





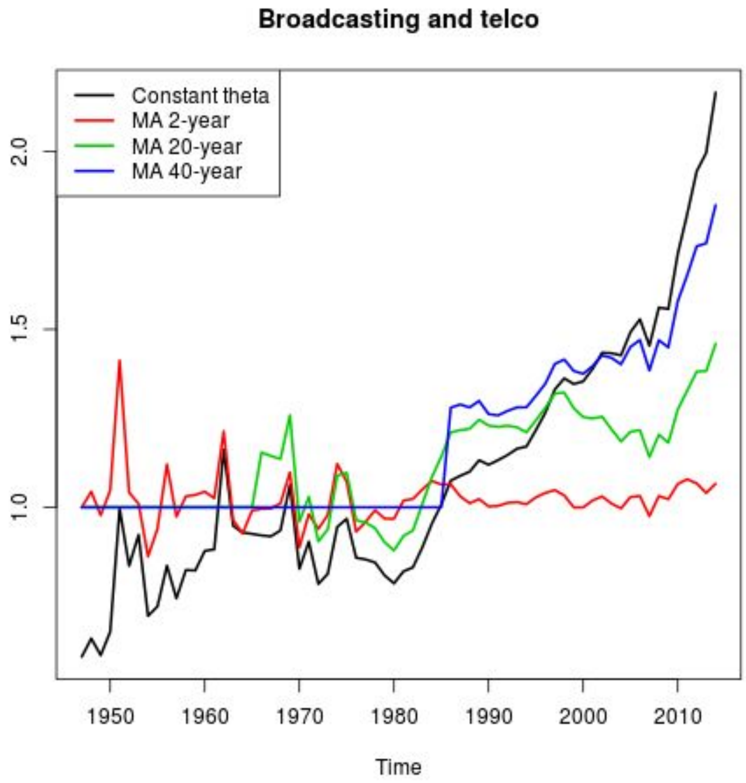




TPI

Simple model of diffusion

- DE model: θ_{it} constant, markup changes.
- HV model: markup, constant, θ_{it} changes.
- Blended model: θ_{it} is a k-year moving average of revenue share. Need k=40 to get something close to the constant θ_{it} model



Easy to estimate marginal cost separately

$$\text{FOC: } w_{it} = \lambda_t A_t \frac{\partial f(x_t)}{\partial x_{it}}$$

$$\text{multiply by } x_{it}/y_t : \frac{w_{it} x_{it}}{y_t} = \frac{\lambda_t}{} \frac{\partial f(x_t)}{\partial x_{it}} \frac{x_{it}}{f(x_t)}$$

$$\text{rewrite: } \lambda_t = s_{it}/\theta_{it}$$

$$\text{in words: marginal cost} = \text{labor share of output/labor elasticity}$$

But you can add price if you want...

$$\text{FOC: } w_{it} = \lambda_t A_t \frac{\partial f(x_t)}{\partial x_{it}}$$

$$\text{multiply by } x_{it}/y_t : \frac{w_{it} x_{it}}{y_t \, p_t} = \frac{\lambda_t}{p_t} \frac{\partial f(x_t)}{\partial x_{it}} \frac{x_{it}}{f(x_t)}$$

If you assume elasticity is constant, then you can estimate marginal cost. Or you can just multiply markup by price.

How does marginal cost change?

The output elasticity of labor is the percent change in output due to a 1% increase in labor We would expect that over time this would increase (or at worst stay constant) due to technological progress.

$$s_{it} = \lambda_t \theta_{it}$$

$$\log \lambda_t = \log s_{it} - \log \theta_{it}$$

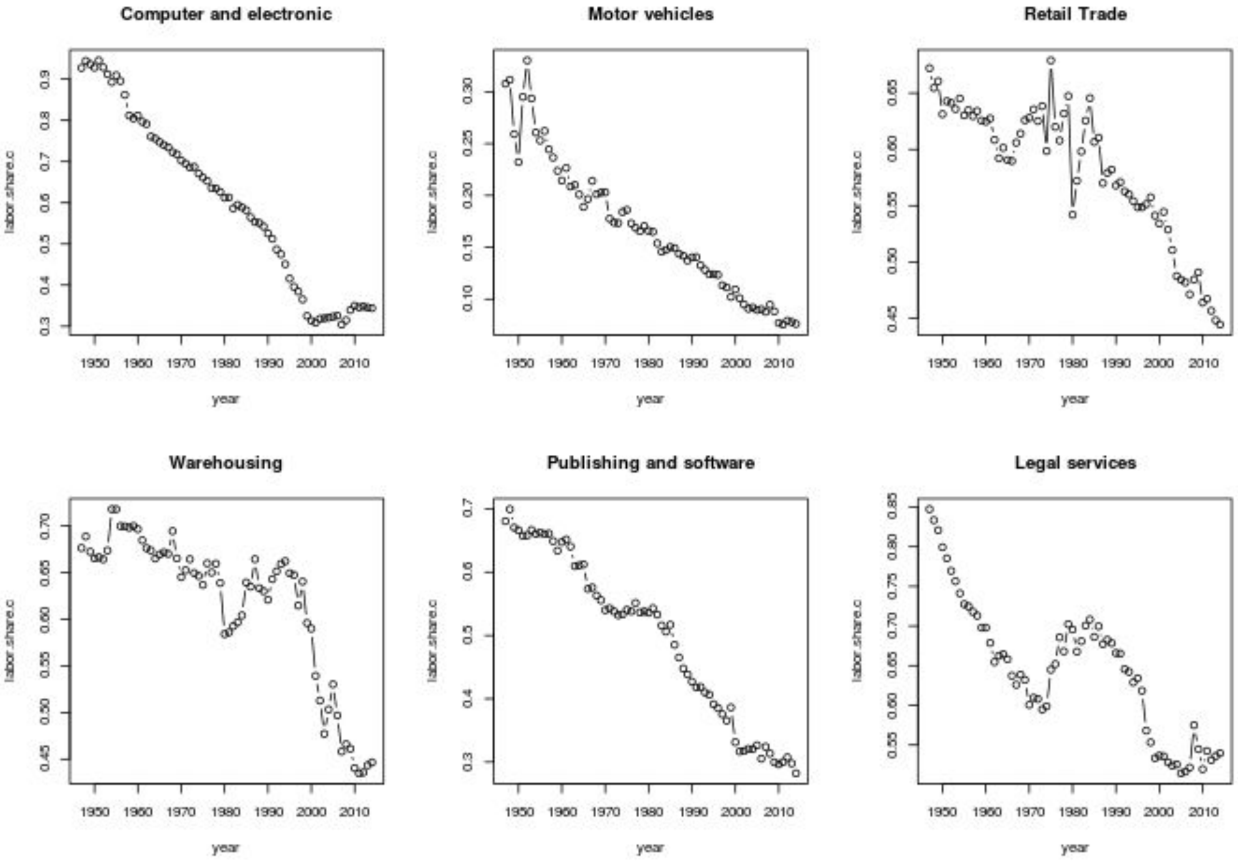
$$\frac{\dot{\lambda}_t}{\lambda_t} = \frac{\dot{s}_{it}}{s_{it}} - \frac{\dot{\theta}_{it}}{\theta_{it}}$$

(-) (-) (+)

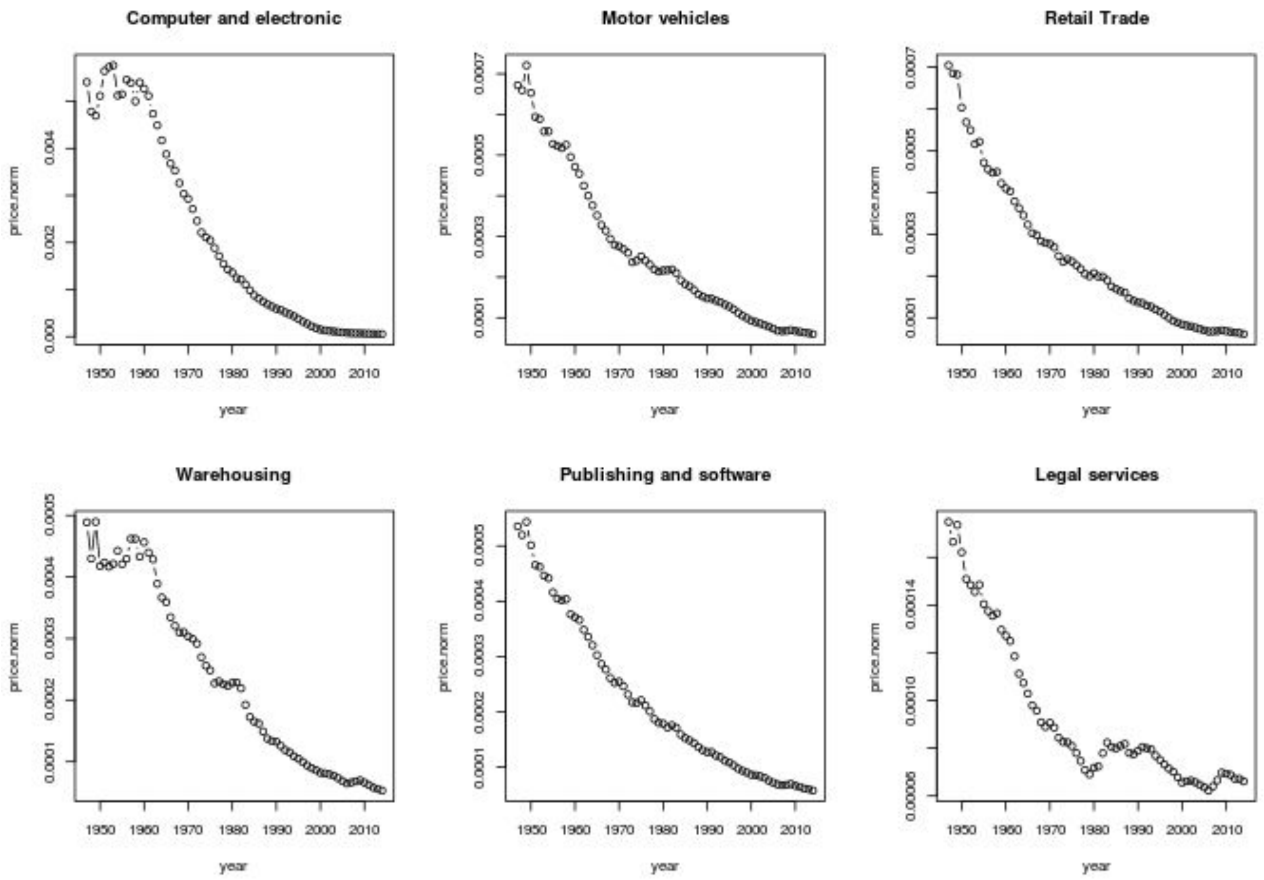
What price index should you use?

- Of course nominal prices have increased.
- Want to measure price normalized by income
  - $p1x1 + p2\ x2 = m$
  - $(p1/m)\ x1 + (p2/m\ )\ x2= 1$
  - $p1\ (x1/m) + p2\ (x2/m) = 1$
- But we know real output has increased in most industries so normalized price has decreased

Marginal cost (KLEMS data)



Price index (from KLEMS)



Summary

1. Labor share has decreased in virtually every country and every industry.
   a. Constant output elasticity of labor implies markups have increased.
   b. Constant markup implies output elasticity of labor has increased.
2. Both price and marginal cost have fallen over estimation period.
3. Heterogeneity in productivity is large and persistent. Why? Perhaps because it takes time to adopt new technology.

Calligaris, Criscuolo and Marcolin (CCM)

- Firm level data for 2.5 million firms, 26 countries, 2001-2014
- Intermediate factor share, rather than labor share
- Translog as well as Cobb-Douglas
  - More flexible but still production function is constant except for Hicks neutral technological change
- Findings
  - Heterogeneity: top markups got bigger
  - Digital intensity: markups were bigger in digital industries

Possible interpretations of findings

Finding	Interpretation?
Markups have increased	Marginal costs have decreased
Driven by firms at top of distribution	Those who adopted digital teh saw significant cost reduction
Markups are higher in digital industries	Digital tech can lower costs
Markups in digital industries have increased	Internet has reduced costs the most

Important to recognize that increasing markups may not be due to “market power”. They can just as easily be due to “lower cost”. Same point holds for “concentration”: is this due to more market power or more efficiency?

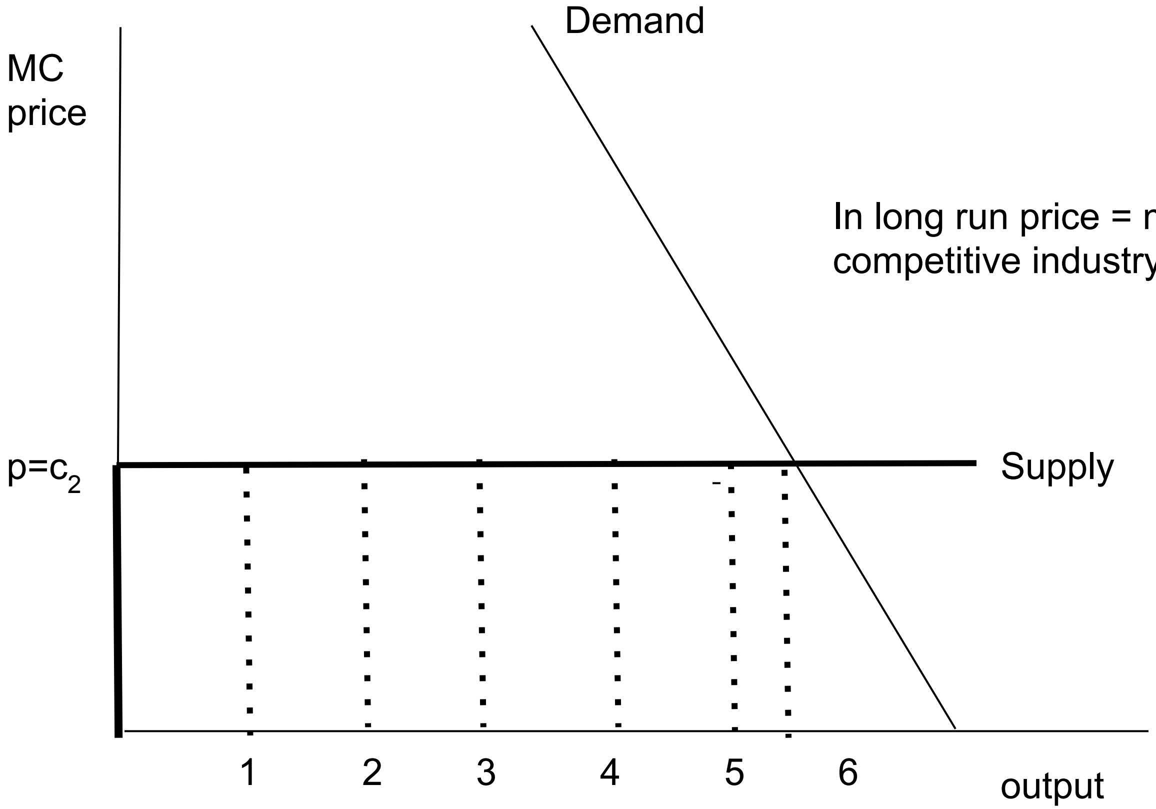
Monopoly power or competitive quasi-rent?

A barrel of oil cost $2 to produce in Saudi Arabia but $50 to produce in the North Sea. The low cost producer faces a market price of $50 but has capacity constraints.

Result: market price is $50 = the marginal cost of extraction of the most inefficient producer. Producers with lower cost earn a competitive quasi-rents.

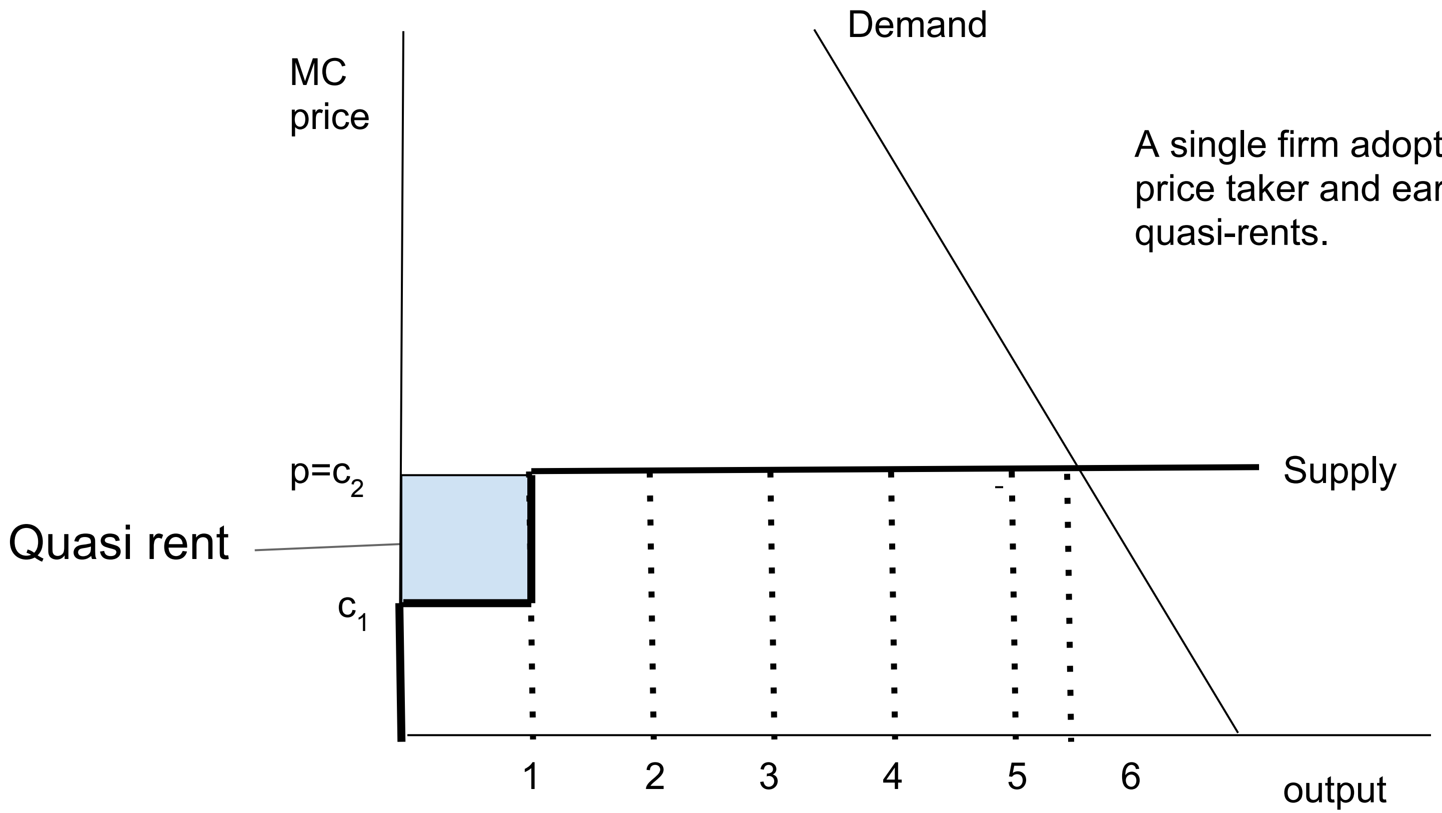
Example: Diffusion of technology is remarkably slow; see Comin & Hobijn [2018].

Simple model of technology diffusion



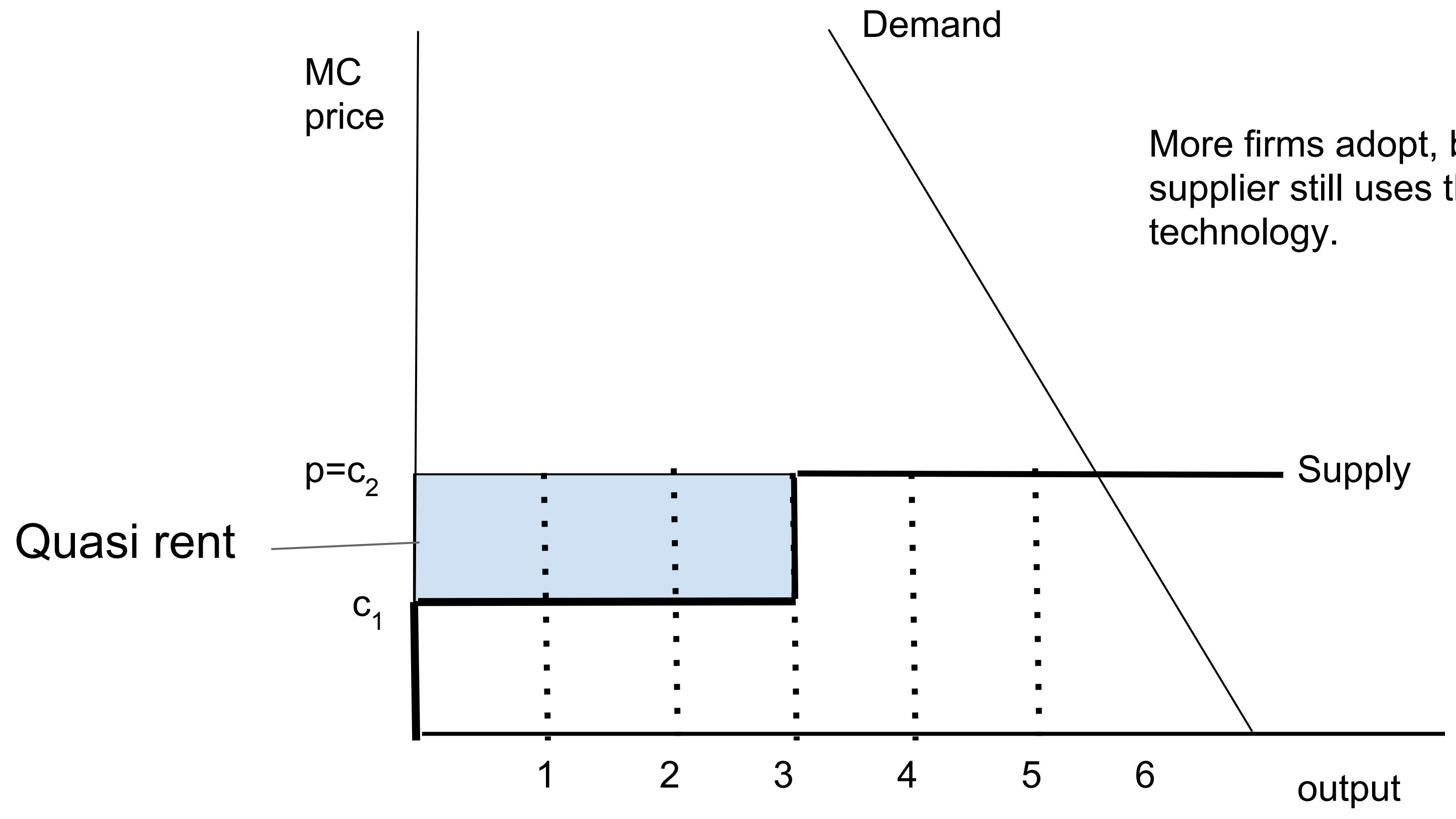
In long run price = marginal cost in competitive industry with CRS.

Initial adoption of technology w capacity constraint



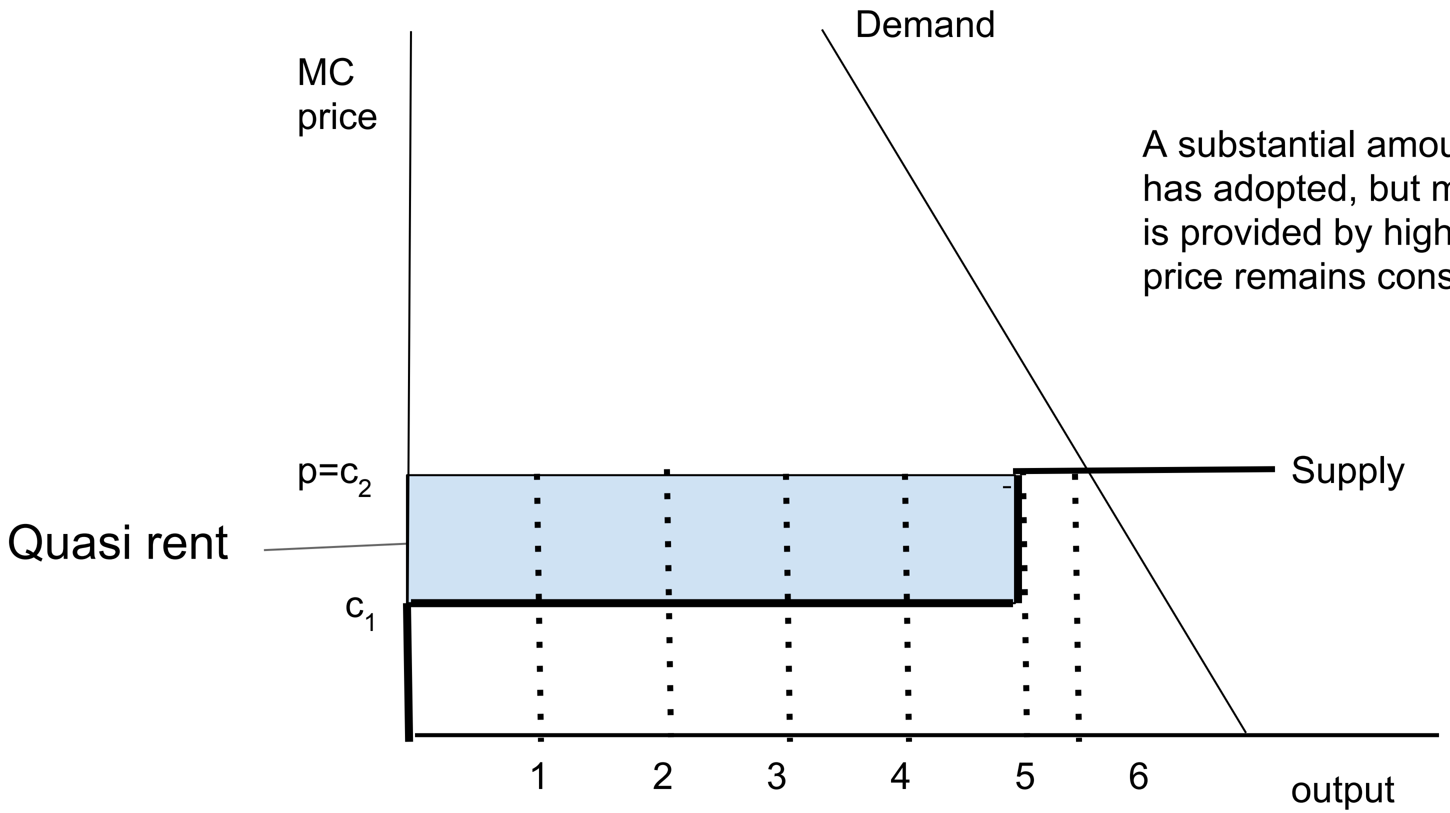
A single firm adopts, but it is a price taker and earns (competitive) quasi-rents.

More adopters...



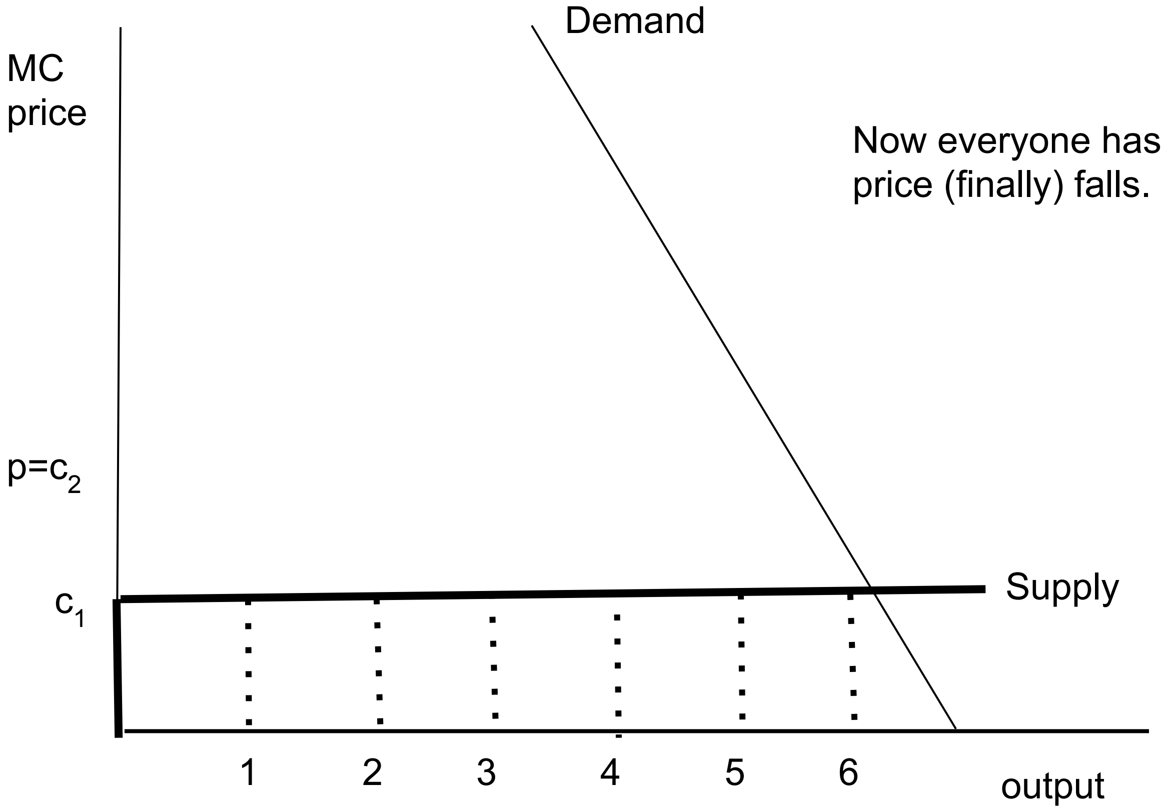
More firms adopt, but marginal supplier still uses the inefficient technology.

Almost there...



A substantial amount of industry has adopted, but marginal output is provided by high cost firm, so price remains constant.

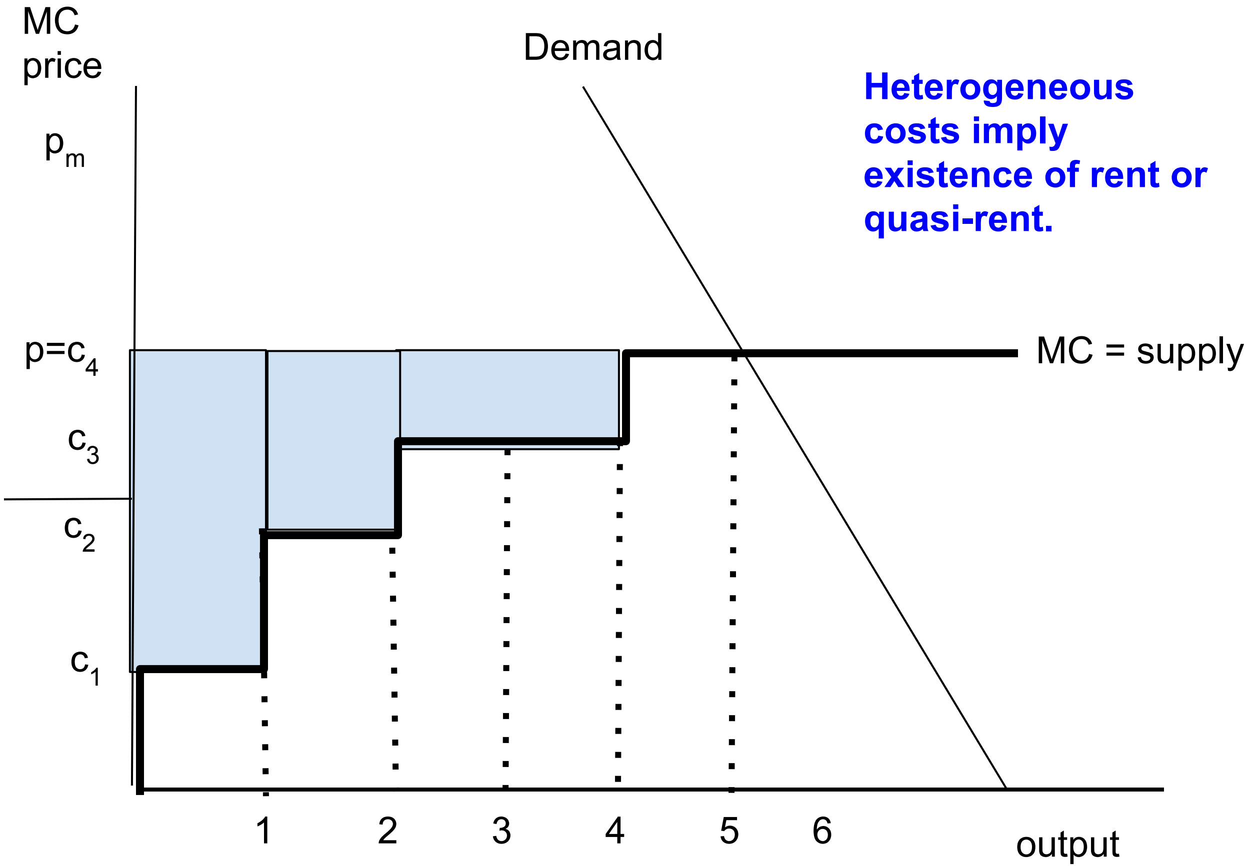
Long run equilibrium



Now everyone has adopted and price (finally) falls.

Producer surplus and cost heterogeneity

Many firms each with one plant

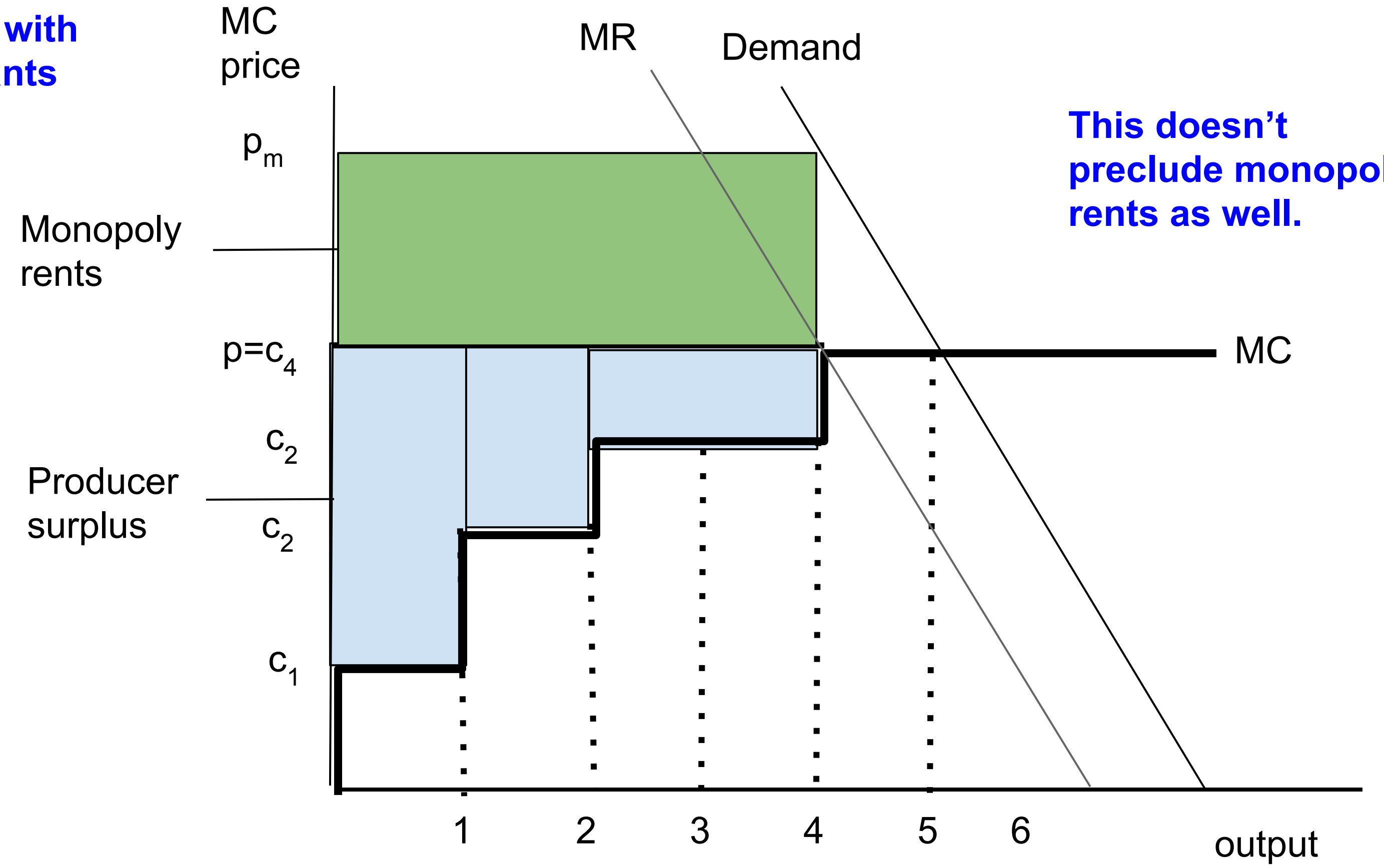


Producer surplus = integral of p - MC

Heterogeneous costs imply existence of rent or quasi-rent.

Producer surplus and monopoly surplus

One firm with many plants



This doesn't preclude monopoly rents as well.

Summary

What did we learn?

- Empirical observation: labor share of revenue has decreased everywhere
- Cost minimization implies markup = $p_t/mc_t = \theta_{it} / r_{it}$
  - One equation, two unknowns (θ_{it} and markup)
    - Constant θ_{it} -> markups increase
    - Constant markup -> θ_{it} decreases
- Markup (p_t/mc_t) can increase when both p_t and mc_t decrease
- Technology adoption takes time and cost heterogeneity is persistent
- Market price can be above cost of capacity constrained, inframarginal firms which implies competitive quasi-rents can be earned

The End

Calligaris, Criscuolo, and Marcolin (CCM)

- Firm level data for 2.5 million firms, 26 countries, 2001-2014
- Intermediate good share, rather than labor share
- Translog as well as Cobb-Douglas
  - However, function is still time invariant.
- Findings
  - Heterogeneity in cost
  - Digital intensity associated with higher margines