Emerging Issues in Antitrust Economics & Competition Policy

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CEMFI Summer School 2021

Antitrust

~~Anti-trust~~

History

- Market power has always been part of economics
  - Ancient Greece: Monopoly power granted by sovereign
  - British East India Company: built on exclusive monopoly power (origin of US independence)
  - First formal models economics: Cournot oligopoly in 1838
  - Any business person knows: gain and exploit market power to make money
  - Schumpeter: (temporary) market power is necessary for growth (through creative destruction)
- We will mostly focus on the IO aspects of market power, but ...
- ... it also plays an important role in labor, macro, innovation, and many other fields of economics.

Market Power and Markups

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Introduction

- Recent renewed interest
  - Political anti-monopoly movement
  - Sharp rise of economy-wide market power since 1980?
- Measurement
  - Macro: broad cross section, long time series
  - Using micro tools and micro data to answer macro questions
- Challenge: what is market structure?
  - We may have an idea for narrow markets: cement, breakfast cereal, yogurt, ...
  - But not for the entire economy ... because that's not what IO economists study!
  - HHI is inadequate precisely because we do not know who competes and how
  - Why don't we *estimate* markups at the economy-wide level?

Introduction

- Causes
  - Technology
  - Policy: M&A, lax antitrust enforcement, flawed patent policy, ...
- Consequences
  - Decline in the labor share
  - Wage stagnation and decline in labor force participation
  - Decline in business dynamism
    - Decline in labor reallocation rate
    - Decline in startups
    - Decline in migration rate
  - Huge reallocation of market share to high markup (superstar) firms

Introduction

- Welfare cost is significant (7-8% of GDP)
- Antitrust policy
  - Independent Antitrust Authority (like independent Central Bank)
  - Dedicate more resources, research-based rather than politically motivated
  - Specific policies:
    - Depends on origin: Mergers vs Technology (interoperability)
    - Revise patent policy: source of market power, not innovation (e.g., patent thickets)
    - Change merger review: burden of proof, reporting thresholds, ...
- Taxation
  - Profit taxes (entrepreneurial income)
  - Wage taxes and/or subsidies
  - Sales taxes

Overview

1. Measuring Markups
2. Economy-wide Implications of Market Power

I. Measuring Markups

Markups

- Define markup $\mu \equiv \frac{P}{c}$
- Challenge: how to measure c
  1. Accounting approach: directly observe c

$$\frac{P}{c} = \frac{PQ}{cQ}$$

     - Assumes $c = AC$ and therefore CRTS (no fixed costs)
     - Factors of production are perfect substitutes
     - cQ is not equal to MC if costs include any item invariant with output
  2. Demand approach (BLP 1995, Bresnahan 1989)
     - Assumptions on demand system, market structure, conduct
     - Need detailed data on prices, costs, market participants and behavior & over time
     - Works well for specific industries; aggregate across different industries?
     - Estimate demand to back out c from profit maximization
  3. Production approach
     - aggregates (Hall 1989)
     - firm level (De Loecker & Warzynski 2012)

Production Approach

Cost Minimization

- Production technology

$$Q_{it} = Q_{it}(\Omega_{it}, \boldsymbol{V}_{it}, K_{it})$$

where

  - $\boldsymbol{V} = (V^1, ..., V^J)$ variable inputs of production (including labor, intermediate inputs, electricity,...) $\rightarrow$ use scalar V
  - K_{it} is the capital stock
  - Ω_{it} is productivity
- Key assumption: within one period, variable inputs adjust frictionlessly
- Firm's cost minimization:

$$\mathcal{L}(V_{it}, K_{it}, \lambda_{it}) = P_{it}^{V} V_{it} + r_{it} K_{it} + F_{it} - \lambda_{it}(Q(\cdot) - \overline{Q}_{it}),$$

where

  - P^V is the price of the variable input
  - r is the user cost of capital
  - F_{it} is the fixed cost
  - λ is the Lagrange multiplier

Production Approach

Cost Minimization

- Cost minimization, FOC: We consider the first order condition with respect to the variable input V, and this is given by:

$$\frac{\partial \mathcal{L}_{it}}{\partial V_{it}} = P_{it}^{V} - \lambda_{it} \frac{\partial Q(\cdot)}{\partial V_{it}} = 0$$

- Define the output elasticity of input V:

$$\theta_{it}^{v} \equiv \frac{\partial Q(\cdot)}{\partial V_{it}} \frac{V_{it}}{Q_{it}}$$

- Then we can write the FOC as

$$P_{it}^{V} = \lambda_{it} \theta_{it} \frac{P_{it} Q_{it}}{V_{it}} \frac{1}{P_{it}}$$

or, letting $\mu = \frac{P}{\lambda}$ since the Lagrange multiplier λ is a direct measure of marginal cost

$$\mu_{it} = \theta_{it}^{v} \frac{P_{it} Q_{it}}{P_{it}^{V} V_{it}}$$

Data

$$\mu_{it} = \theta_{it}^{v} \frac{P_{it} Q_{it}}{P_{it}^{V} V_{it}}$$

- Very limited information needed to calculate markups: accounting data
  - Revenue (PQ) and variables costs ($P^V V$)
  - Other inputs in production: capital (K)
- Estimate production function to obtain θ later
- Use data on:
  1. Accounting data publicly traded firms in US: revenue, cost of goods sold (COGS)
     - Long time series 1955–2016
     - Broad cross section (40% of GDP)
  2. Different parts of the US Census: manufacturing, retail, wholesale
  3. Global firms

Individual → Average Markups

- Individual Markup ⇒ distribution of markups
- Average markup, weighted by m_{it} (sales, costs, employment,...):

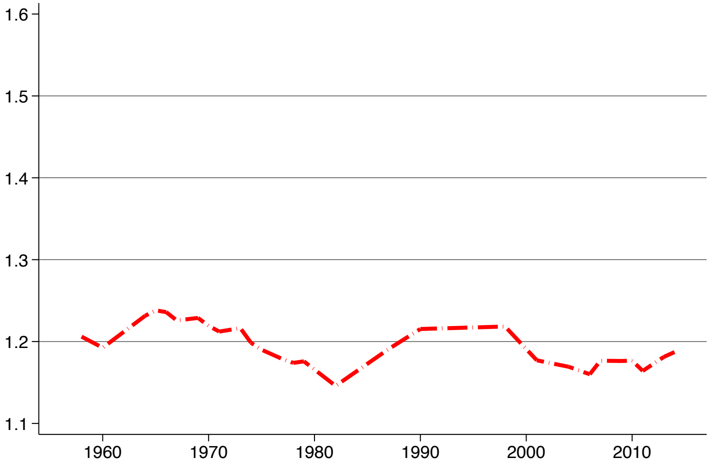
$$\mu_t = \sum_i m_{it} \mu_{it}$$

Discussion

- Estimated technology (θ_{it}): time-varying, sector/firm specific
- COGS: bundle of all variable inputs; hence perfect substitutes
- Non-variable inputs: need to solve a dynamic FOC
- Markups $\neq$ Profits: calculate profit rate $\rightarrow$ Fixed Costs
  - SG&A: Selling, General and Administrative Expenditures
  - Determines Profits
  - Can also be a factor of production (not variable)
- Input Markets:
  - Generally assume firm is price taker in input markets: p^V is constant
  - But, allows for double-marginalization: price taker but not price equal MC
  - With data on input market prices: can allow for market power in inputs
  - See De Loecker, Goldberg, Khandelwal, Pavcnik (2016), Morlacco (2020), Rubens (2020)
  - Later in these lectures we will discuss an obvious input distortion: monopsony power

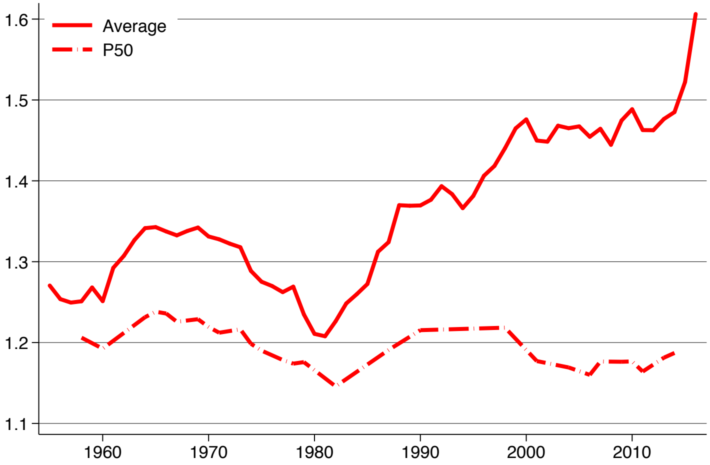
Heterogeneity

No change ... in the median markup



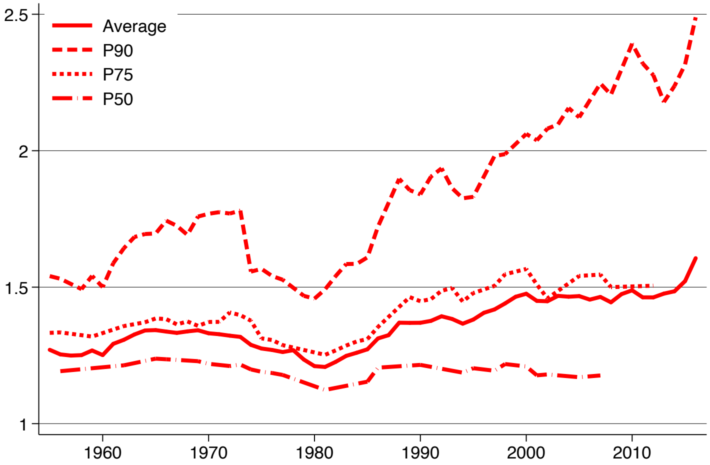
Heterogeneity

Increase in average markup since 1980



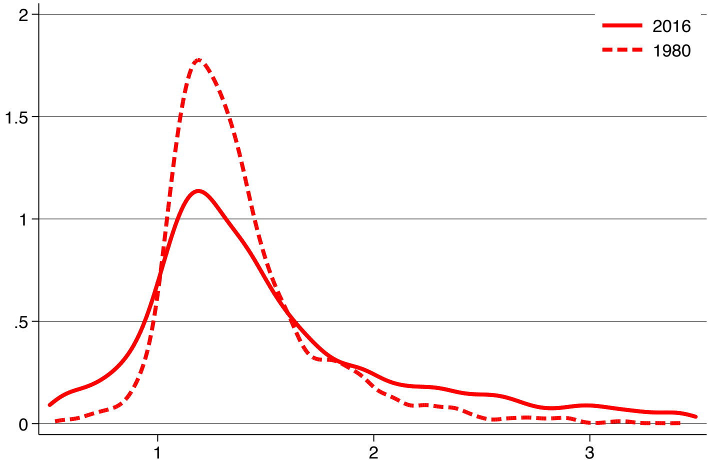
Heterogeneity

All the action is in the upper half of the distribution

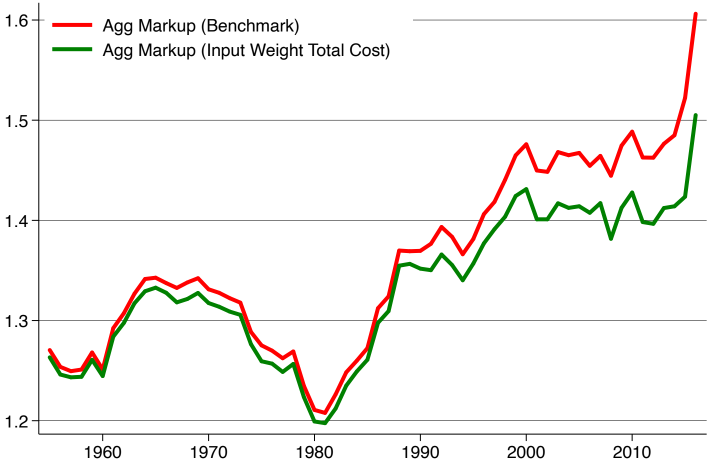


Heterogeneity

Kernel Density 1980, 2016



Weighting: Input Weight



- See Grassi (2016) and Edmond, Midrigan and Xu (2019)

Reallocation

$$\Delta\mu_t = \underbrace{\sum_i m_{i,t-1}\Delta\mu_{it}}_{\Delta \text{ within}} + \underbrace{\sum_i \mu_{i,t-1}\Delta m_{i,t}}_{\Delta \text{ market share}} + \underbrace{\sum_i \Delta\mu_{i,t}\Delta m_{i,t}}_{\Delta \text{ cross-term}}$$

$$+ \underbrace{\sum_{i \in \text{Entry}} \mu_{i,t} m_{i,t} - \sum_{i \in \text{Exit}} \mu_{i,t-1} m_{i,t-1}}_{\text{net entry}}$$

Reallocation

$$\Delta\mu_t = \underbrace{\sum_i m_{i,t-1}\Delta\mu_{it}}_{\Delta \text{ within}} + \underbrace{\sum_i \mu_{i,t-1}\Delta m_{i,t}}_{\Delta \text{ market share}} + \underbrace{\sum_i \Delta\mu_{i,t}\Delta m_{i,t}}_{\Delta \text{ cross-term}}$$

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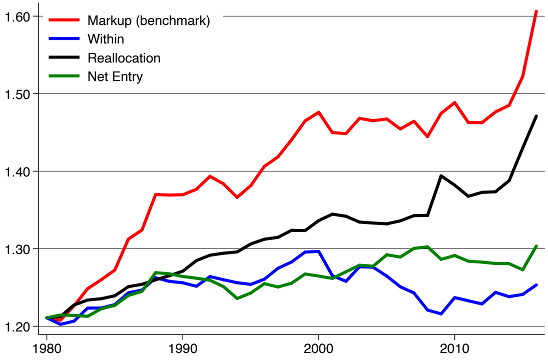


See also Superstar Firms (Autor, Dorn, Katz, Patterson, Van Reenen 2019)

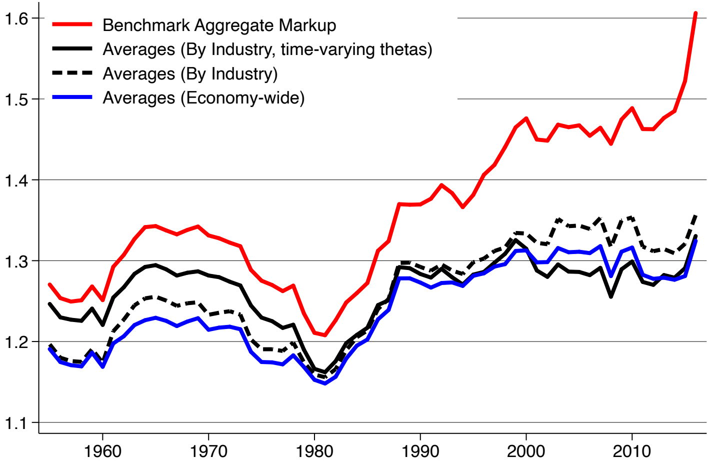
Within vs. Between Sector Changes in Markups

$$\Delta\mu_t = \underbrace{\sum_s m_{s,t-1}\Delta\mu_{st}}_{\Delta\text{ within}} + \underbrace{\sum_s \mu_{s,t-1}\Delta m_{s,t}}_{\Delta\text{ between}} + \underbrace{\sum_s \Delta\mu_{s,t}\Delta m_{s,t}}_{\Delta\text{ cross term}}$$

	Markup	Δ Markup	Δ Within	Δ Between	Δ Cross
1966	1.337	0.083	0.057	-0.017	0.041
1976	1.270	-0.067	-0.055	0.002	-0.014
1986	1.312	0.042	0.035	0.010	-0.003
1996	1.406	0.094	0.098	0.004	-0.008
2006	1.455	0.049	0.046	0.007	-0.005
2016	1.610	0.154	0.133	0.014	0.007

Magnitude of Increase

Aggregation: Industry Averages: +20 points

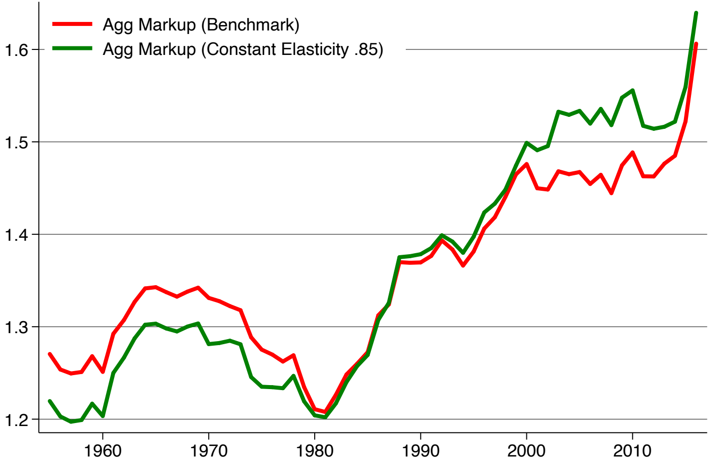


- See also Hall (2018)

Technology

Technological change?

$$\mu_{it} = \theta_{it}^{v} \frac{P_{it} Q_{it}}{P_{it}^{V} V_{it}}$$



Technology

Which Technology?

- Conventional production function: treat overhead as a fixed cost ("overhead is necessary, but does not increase the number of units manufactured")

$$\Pi = PQ(V, K) - p^V V - rK - F$$

- Conventional production function: treat overhead as a fixed cost ("overhead is necessary, but does not increase the number of units manufactured")

$$\Pi = PQ(V, K) - p^V V - rK - F$$

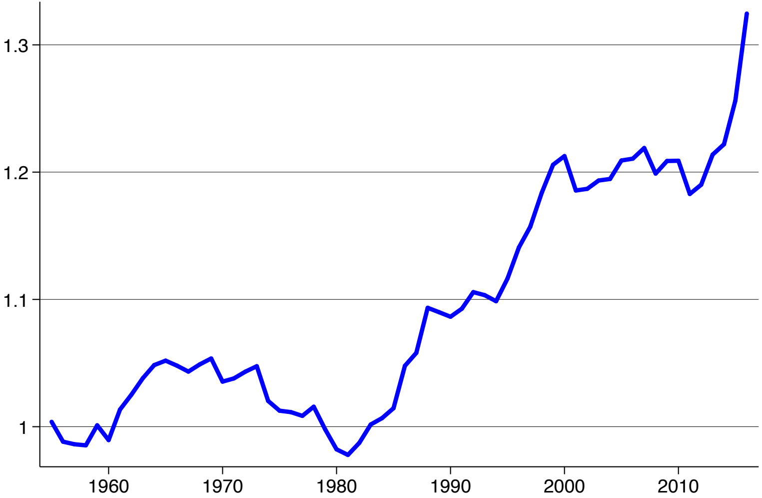
vs.

$$\Pi = PQ(V, K, X) - p^V V - rK - p^X X$$

- Overhead as an input of production: $Q(V, K, X)$ where $p^X X = F$
- In accounting, SG&A: Selling, General & Administrative Expenses

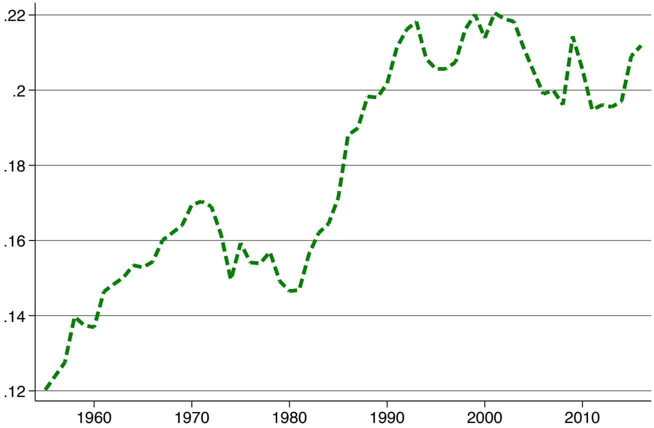
Technology

Overhead as Factor: +30 points



Technology

Rise in Overhead (SG&A)



Profitability

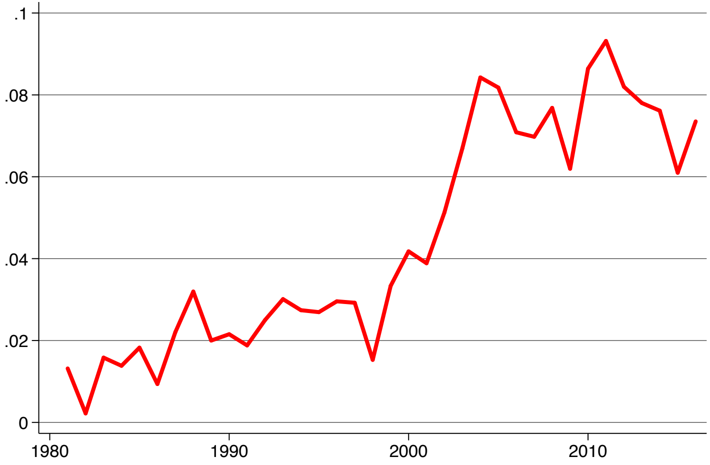
- Profit rate $\rightarrow$ economic profits:

$$\Pi_i = \underbrace{P_i Q_i}_{\text{Sales}} - \underbrace{p^V V_i}_{\text{COGS}} - \underbrace{rK_i}_{\text{User Cost of } K} - \underbrace{F_i}_{\text{SG\&A}}$$

  - Sales, COGS, SG&A: from income statement
  - User Cost of K: impute
    - K_i: from the balance sheet
    - r: imputed using risk free rate, CPI, depreciation (12%)
- Market Value
- Dividends

Profitability

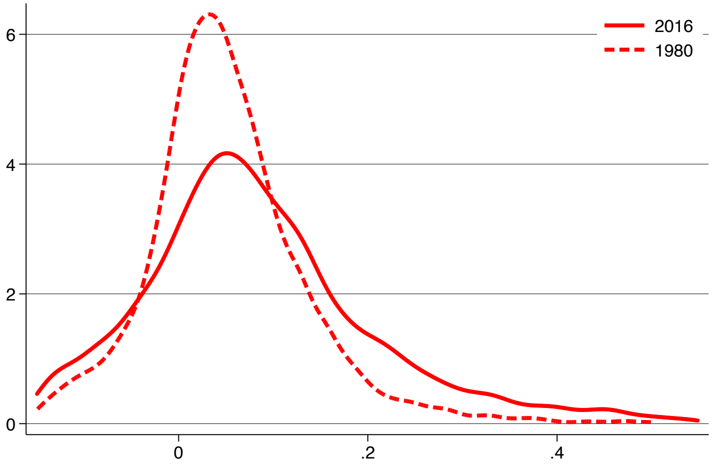
Profit Rate: +7-8 ppt



- Profits/Value Added: +15%

Profitability

Profit Rate Dispersion



Profitability

Profit Rate vs Markup

- The profit rate:

$$\pi_i = \frac{P_i Q_i - C(Q_i)}{P_i Q_i} = 1 - \frac{1}{\mu_i}\frac{AC_i}{MC_i}$$

$\Rightarrow$ With $\mu = 1.6$ in 2016, implied profit rate is $\pi = 1 - \frac{1}{1.61} = 0.38$!!

Profitability

Profit Rate vs Markup

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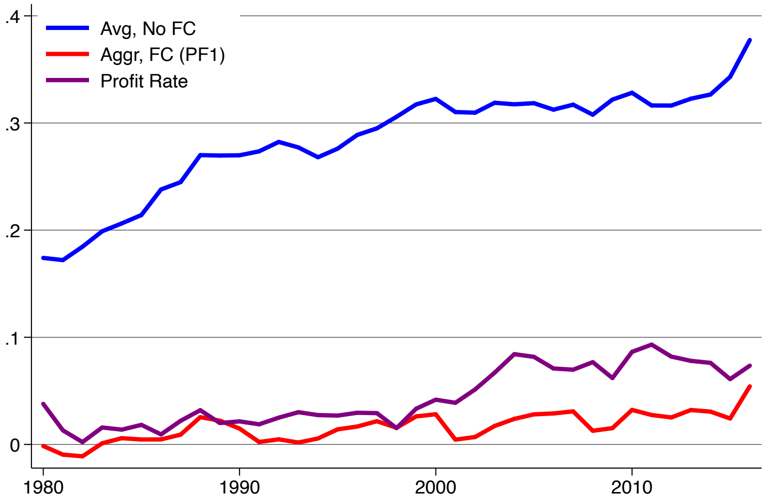
$\Rightarrow$ With $\mu = 1.6$ in 2016, implied profit rate is $\pi = 1 - \frac{1}{1.61} = 0.38$!!

- This logic uses:
  1. Representative Firm Economy but with aggregation
  2. Unchanged economies of scale ($AC = MC$): but $\frac{AC}{MC} \uparrow$ (Overhead $\uparrow$)

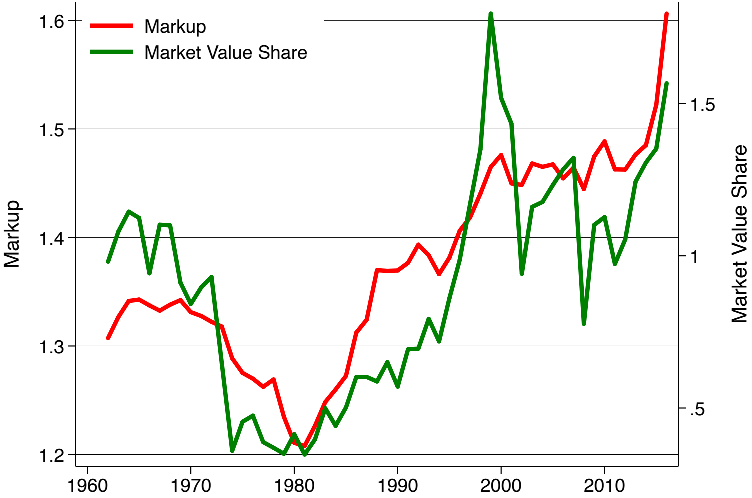
Profitability

Profit Rate vs Markup



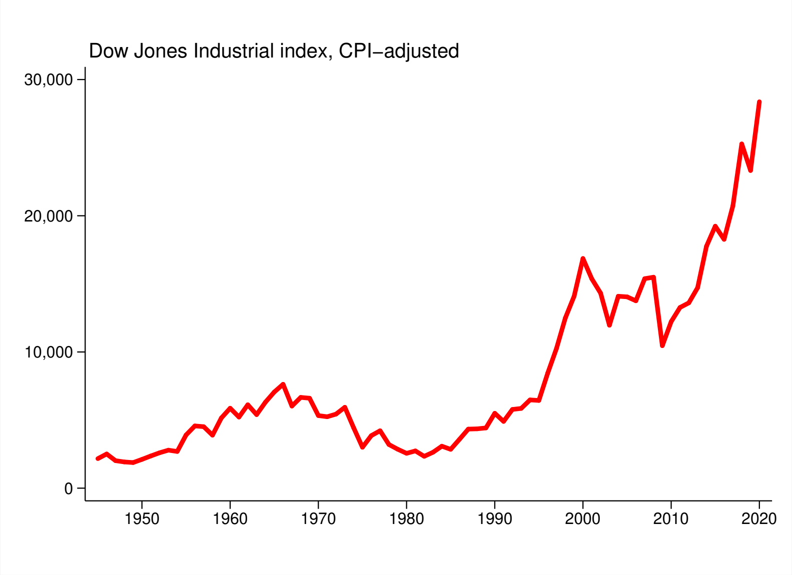
Profitability

Market Value



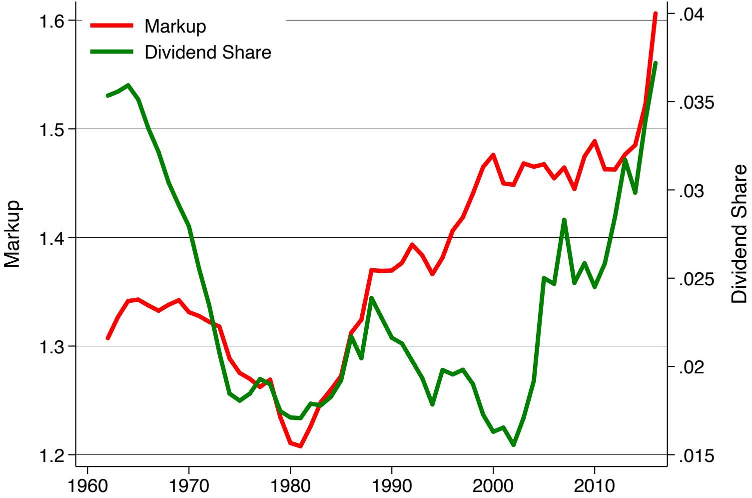
Profitability

Dow Jones, deflated



Profitability

Dividends



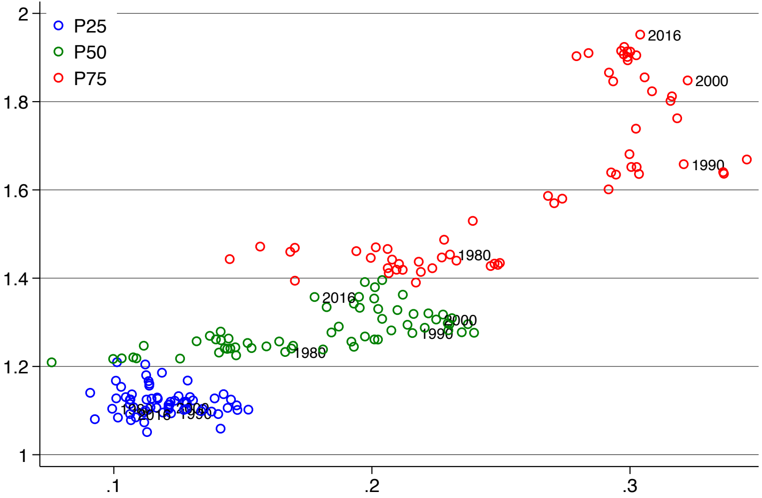
Profitability

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$\ln\left(\frac{\text{Market Value}}{\text{Sales}}\right)$				$\ln(\text{Market Value})$		
ln(Markup)	0.71	0.64	0.56	0.17	0.71	0.65	0.58	0.27
	(0.03)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
ln(Sales)					0.81	0.81	0.83	0.68
					(0.00)	(0.00)	(0.00)	(0.01)
Year Fixed Effects		✓	✓	✓		✓	✓	✓
Sector Fixed Effects			✓				✓	
Firm Fixed Effects				✓				✓
R^2	0.05	0.13	0.21	0.68	0.68	0.71	0.73	0.89

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		$\ln\left(\frac{\text{Dividends}}{\text{Sales}}\right)$				$\ln(\text{Dividends})$		
ln(Markup)	1.05	0.97	0.80	0.26	1.03	0.93	0.78	0.26
	(0.04)	(0.03)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)
ln(Sales)					0.94	0.92	0.93	0.76
					(0.01)	(0.01)	(0.01)	(0.02)
Year Fixed Effects		✓	✓	✓		✓	✓	✓
Sector Fixed Effects			✓				✓	
Firm Fixed Effects				✓				✓
R^2	0.06	0.11	0.17	0.70	0.66	0.68	0.70	0.89

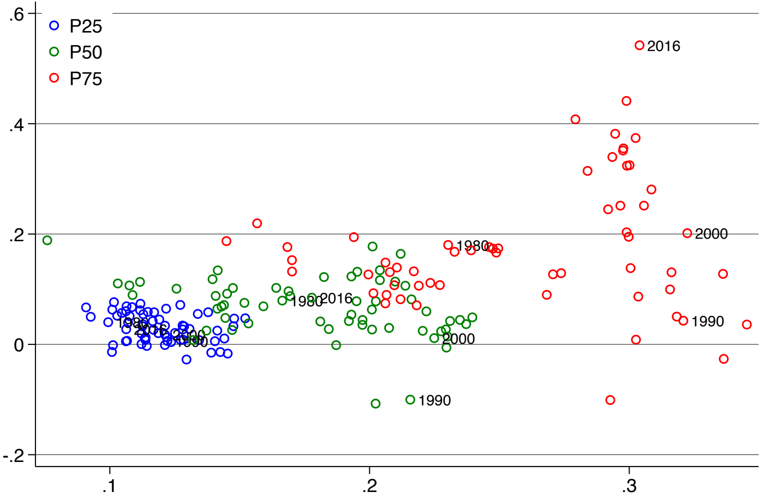
Profitability

Role of Overhead: markups



Profitability

Role of Overhead: profit share



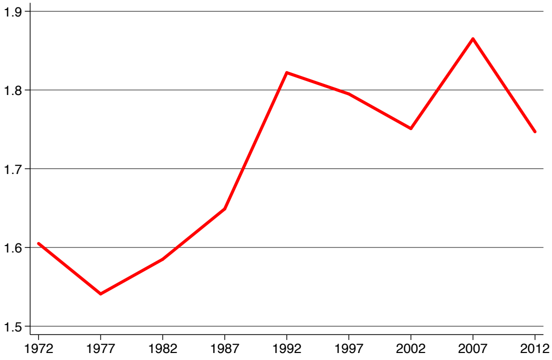
Profitability

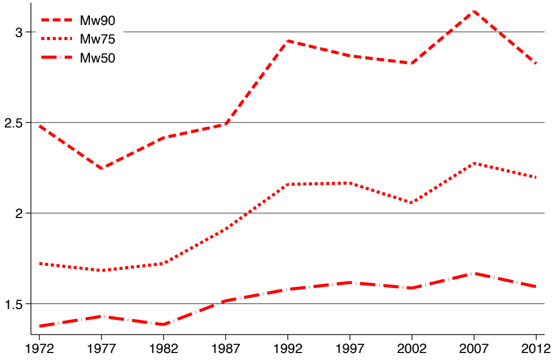
Role of Overhead

	Markup (log)			Profit Rate (log)	
	(1)	(2)	(3)	(4)	(5)
SG&A (log)	0.56			0.15	
	(0.01)			(0.03)	
R&D Exp. (log)		0.16			0.10
		(0.01)			(0.01)
Advertising Exp. (log)		0.05			0.03
		(0.00)			(0.01)
R&D dummy			0.06		
			(0.01)		
Advertising dummy			-0.00		
			(0.03)		
R^2	0.61	0.07	0.43	0.04	0.05
N	26,743		247,615	26,743	

US Censuses

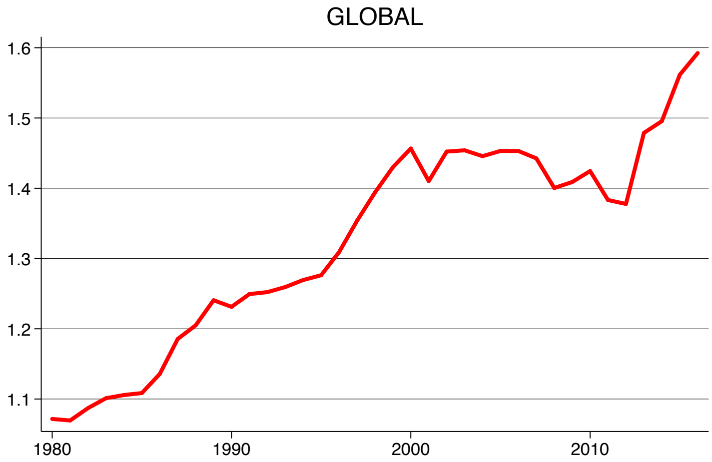
Manufacturing



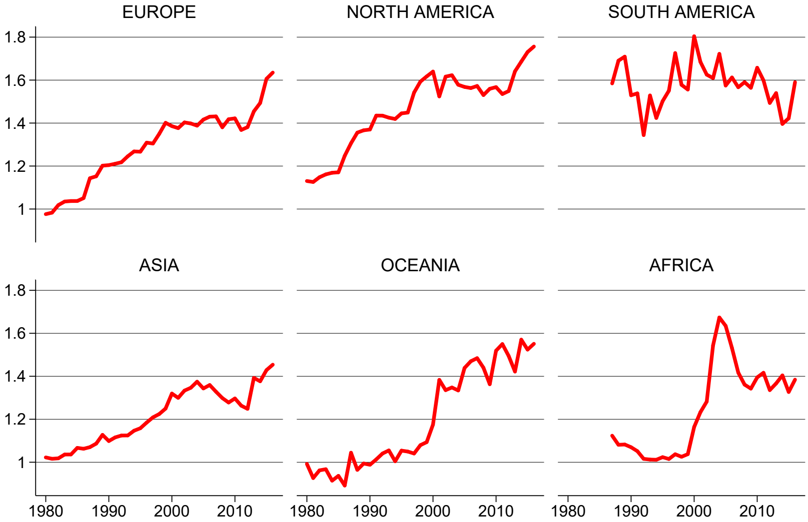


Global Markup

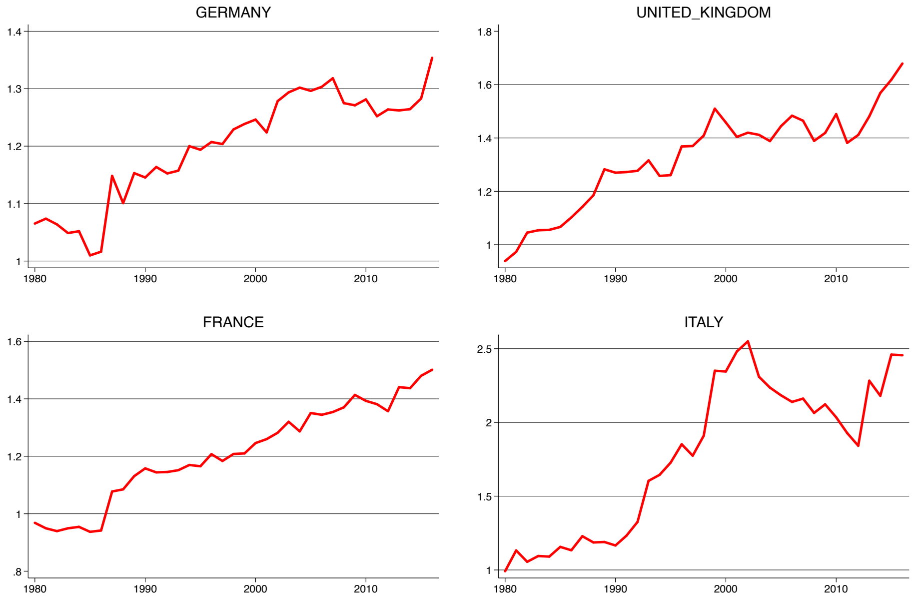
134 countries; 70,000 firms; 1980-2016



Markup Continents



Europe


GERMANY
1.4
1.3
1.2
1.1
1
1980
1990
2000
2010
UNITED_KINGDOM
1.8
1.6
1.4
1.2
1
1980
1990
2000
2010
FRANCE
1.6
1.4
1.2
1
.8
1980
1990
2000
2010
ITALY
2.5
2
1.5
1
1980
1990
2000
2010

Summary: Evidence of Rise of Market Power

- Heterogeneity: sharp rise for few firms; no rise for most
- Weighting matters
- Reallocation of sales from low to high markup firms (2/3)
- Within Sector
- Magnitude of the increase? Aggregation is crucial!
- Technology:
  - A No change in output elasticity
  - B Overhead as a factor: Markup increase is lower + RTS up
  - C Overhead cost (SG&A) $\uparrow$
- Profitability has increased: from 1% to 8%
- Robust for Censuses for Manufacturing
- US and Global: Europe is no different

Estimating the Output Elasticities

$$\mu_{it} = \theta_{it}^{v} \frac{P_{it} Q_{it}}{P_{it}^{V} V_{it}}$$

- There are no a priori restrictions on the output elasticity
- Two approaches:
  1. Estimate a parametric production function
  2. Non-parametrically estimate the elasticities using cost shares

Production Function Estimation

- Cobb Douglas production technology (in logs; small caps)

$$q_{it} = \theta_t^V v_{it} + \theta_t^K k_{it} + \omega_{it} + \epsilon_{it}$$

- Usually in the literature: θ_t^V constant. Here:
  - Time-varying: captures technological change (in a 5 year rolling window)
  - Sector-specific: wide cross section of firms in the economy
- Three major challenges:
  1. Simultaneity bias: unobserved productivity shocks ω_{it}
  2. Omitted variable (price) bias: how to extract units of output from revenue data
  3. Differentiated products: comparing goods of different quality in same firm/industry

Production Function Estimation

First challenge: simultaneity bias

- Build on Olley, Pakes 1996 to deal with selection bias
- V adjusts instantaneously; K does not, but it is correlated with persistence in productivity
- Error term contains the productivity: error $= \omega_{it} + \epsilon_{it} \Rightarrow$ need to account for endogeneity
- Use control function approach together with a law of motion for productivity

$$\omega_{it} = h_t(d_{it}, k_{it}, z_{it})$$

  - d_{it} is the control variable, either a variable input in production (in our case COGS, v), or investment, i (see Ackerberg, Benkard, Berry, Pakes 2007);
  - z_{it} market factors that generate variation in factor demand (for input d) across firms; allow for imperfect competition in product markets, and thus markup heterogeneity across firms $\Rightarrow$ input demand shifters that move around the optimal amount of a variable input, conditional on a firm's productivity and capital stock.

Production Function Estimation

First challenge: simultaneity bias

Two-stage approach:

1. Purge measurement error and unanticipated shocks using non-parametric projection, when $d_{it} = v_{it}$ using control function:

$$q_{it} = \phi_t(v_{it}, k_{it}, z_{it}) + \epsilon_{it}.$$

2. Obtain θ_{st}: assume productivity process: $\omega_{it} = g(\omega_{it-1}) + \xi_{it}$; implies moment condition to obtain the industry-year-specific output elasticity:

$$\mathbb{E}\left(\xi_{it}(\theta_t)\begin{bmatrix} v_{it-1} \\ k_{it} \end{bmatrix}\right) = 0,$$

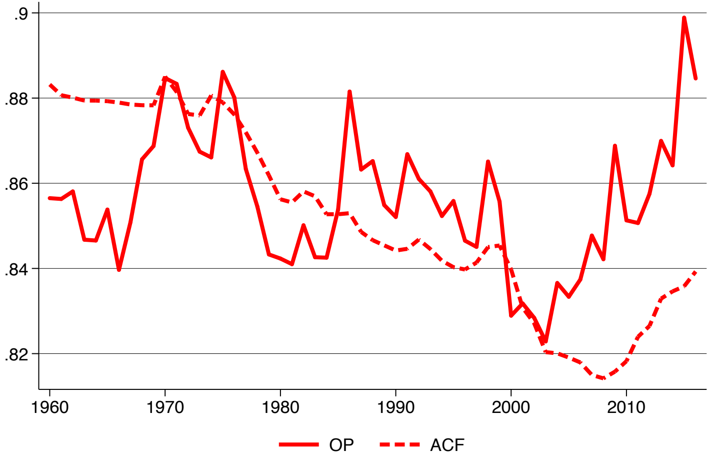
where

- $\xi_{it}(\theta_t)$ is obtained by projecting productivity $\omega_{it}(\theta_t)$ on its lag $\omega_{it-1}(\theta_t)$, with $\theta_t = \{\theta_t^V, \theta_t^K\}$
- productivity from $\phi_{it} - \theta_t^V v_{it} - \theta_t^K k_{it}$, using the estimate ϕ_{it} from the first-stage regression
- Assumption: v_t responds to shock; v_{t-1} does not

Production Function Estimation

First challenge: simultaneity bias

- Using v_{t-1} (OP) or i (ACF), we obtain the following estimates for θ_t^V



Production Function Estimation

Second challenge: omitted price bias

- Most data comes in revenue, not prices and quantities separately
- Error term ϵ_{it} contains output and input prices

$\Rightarrow$ omitted prices generate a downward bias (Klette, Griliches 1996)

Production Function Estimation

Second challenge: omitted price bias

- Bond, Hashemi, Kaplan, Zoch 2020: omitted price bias
  - $\theta_{PQ} = \frac{\partial P}{\partial Q}\frac{Q}{P}$: inverse demand (or price) elasticity
  - $\theta_{QV} = \frac{\partial Q}{\partial V}\frac{V}{Q}$: output elasticity
  - $\theta_{RV} = \frac{\partial PQ}{\partial V}\frac{V}{PQ}$: revenue elasticity

  $\Rightarrow$

$$\begin{aligned}
\theta_{RV} &= \frac{\partial P}{\partial V} Q \frac{V}{PQ} + \frac{\partial Q}{\partial V}\frac{V}{Q} \\
&= \frac{\partial P}{\partial Q}\frac{\partial Q}{\partial V}\frac{Q}{P}\frac{V}{Q} + \frac{\partial Q}{\partial V}\frac{V}{Q} \\
&= (\theta_{PQ} + 1)\,\theta_{QV}
\end{aligned}$$

- Using revenue elasticity θ_{RV} instead of output elasticity θ_{QV}

$$\hat{\mu} = \theta_{RV}\frac{PQ}{P^V V} = (\theta_{PQ}+1)\,\theta_{QV}\frac{PQ}{P^V V} = (\theta_{PQ}+1)\,\mu = 1$$

since $\mu = \frac{1}{1+\theta_{PQ}}$ from profit maximization: $P + \frac{\partial P}{\partial Q} Q = C'(Q) \quad \Rightarrow \quad \mu = \frac{P}{C'(Q)} = \frac{1}{1+\theta_{PQ}}$

Production Function Estimation

Second challenge: omitted price bias

- But: to get $\hat{\mu} = 1$ you need to regress revenue on quantities of inputs. No one does this!!

$$p_{it} + q_{it} = \theta_t^V v_{it} + \theta_t^K k_{it} + \omega_{it} + \epsilon_{it}$$

- Instead, we also have inputs in dollar terms, not in quantities:

$$p_{it} + q_{it} = \theta_t^V (p_{it}^V + v_{it}) + \theta_t^K (p_{it}^K + k_{it}) + \omega_{it} + \epsilon_{it}$$

- The structural error term is:

$$\omega_{it} - p_{it} + \theta_t^V p_{it}^V + \theta_t^K p_t^K,$$

- Solution: let wedge be a function of demand shifters and productivity difference, z_{it}
- Input price variation opposite: absorbs some of the output price variation

Production Function Estimation

Third challenge: differentiated products

- Differentiated goods – Ferrari vs Fiat Uno
- Products, often produced by the same firm or in the same sector has a very different technology
- Using quantity data does not give reasonable estimates for the production function (De Loecker, Goldberg, Khandelwal & Pavcnik 2016)
- Use revenue and expenditure data (dollars versus quantities) to express all units in values
  $\Rightarrow$ Unexpected benefit: revenue normalizes differentiated goods quantities

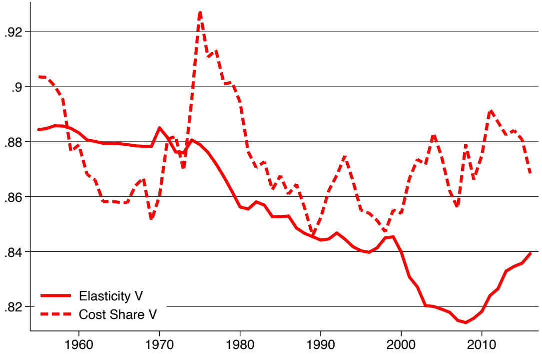
Production Function Estimation

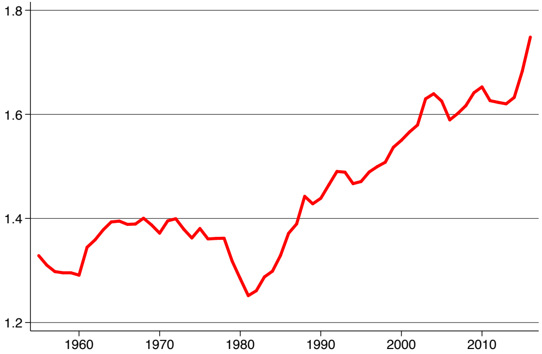
Nonparametric Estimates of θ_{it}: Cost Shares

- Cost share is a firm- and year-specific estimate of the elasticity:

$$\alpha_{it}^V = \frac{p_t^V V_{it}}{p_t^V V_{it} + r_t K_{it}}$$

- Similar values for the average elasticity, and hence similar markups
- But: "nonparametric"? CRTS, constant elasticity of substitution

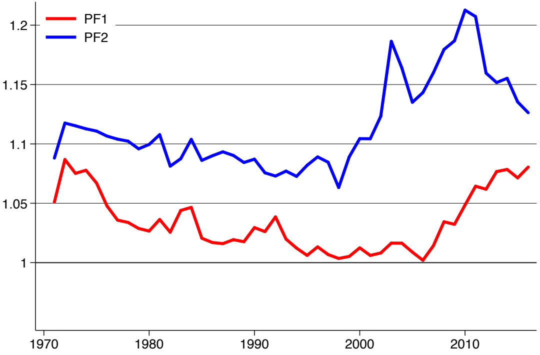


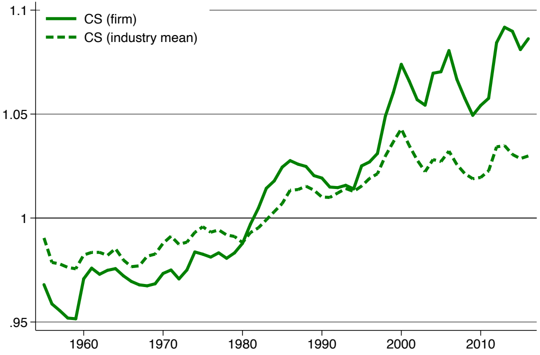


Returns to Scale

- Production function $\Rightarrow$ returns to scale: $\theta^V + \theta^K$ (alternative prod. function $\theta^V + \theta^K + \theta^X$)
- Introduce RTS when using cost shares

$$q = \gamma \left[\alpha_V v + \alpha_K k + \alpha_X x\right] + \omega$$





Production Function Estimation

- Returns to scale: from technology; use Syverson trick
- Different technologies: X as a factor; cost shares;

$$q_{it} = \theta_t^V v_{it} + \theta_t^K k_{it} + \theta_t^X x_{it} + \omega_{it} + \epsilon_{it}$$

- issue: non-balanced panel: Olley, Pakes 1996 shows that this leads to selection; but for publicly traded firms, there is both exit and M&A, so the sign of the selection bias is ambiguous
- Using different production technologies (e.g., translog, with varying elasticities); labor as an input;

Summary: Production Function Estimation

- Output elasticity is crucial for markup estimation if one uses production function estimation
- Using different measures and specifications De Loecker, Eeckhout & Unger argue that there is no systematic change in the output elasticities

Herfindahl-Hirschman Index (HHI)

Challenges for Measuring Market Power in Macro

- Powerful new result by Rossi-Hansberg, Sarte & Trachter (2020)

  National Concentration $\uparrow$ vs. Local Concentration $\downarrow$

- Driven by the rise of large firms that compete in many markets (e.g., chain stores)
- Economic implication: this is good news
- But is concentration really the same thing as market power (and markups)?

Herfindahl-Hirschman Index (HHI)

Challenges for Measuring Market Power

- Herfindahl-Hirschman Index, is a measure of concentration
- Other measures: $C(n)$ concentration (HHI) for top n firms

$$\text{HHI} = \sum_i s_i^2 \in [0; 10000]$$

  where s_i is the market share (revenue, employment, costs,...) of firm i in a *given* market
- Concentration = Market Power?
  1. Depends on the model of firm behavior

     Yes, Cournot: Market Power increases HHI; Not in Melitz (2003), Melitz-Ottaviano (2008)
  2. Depends on the Market Definition: who are the competitors?

  $\Rightarrow$ Answer:
    - IO: no, Bresnahan (1989), BLP (1995)
    - DOJ: yes, HHI $> 3,000$
    - What do non-IO economists think?

Herfindahl-Hirschman Index (HHI)

Who are the Competitors? What constitutes a market?

- HHI is mechanically related to number of firms/establishments
  - HHI increases in coarseness of market def: ZIP $>$ county $\lessgtr$ MSA $>$ State $>$ Nation
    $\rightarrow$ Can normalize and use change
  - Missing data is a problem; instead use $C(n)$
- Standard unit of market: "SIC $\times$ Geo"
  - One size does not fit all: Coffee shops (ZIP) vs Furniture (MSA) vs Manufacturing (Nation)
    - Cannot use same "SIC $\times$ Geo" market definition for all
  - Those markets are typically very large ($N > 10,000$) $\Rightarrow$ HHI is very small (< 1)
    - Imperfect Competition: $N > 15$ is perfect competition
    - Antitrust authorities start being concerned around HHI> 2500, $N = 5$, but this is obviously different ...

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$\rightarrow$ HHI is even more challenging in economy-wide exercises than in IO industry studies

Herfindahl-Hirschman Index (HHI)

Intertemporal Comparisons

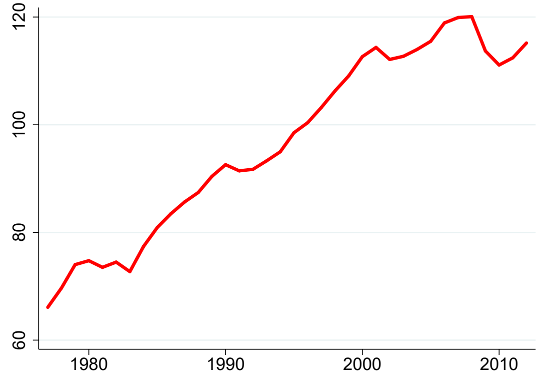
- Using fixed market definitions over time is a challenge

  The number of competitors changes for mechanical reasons

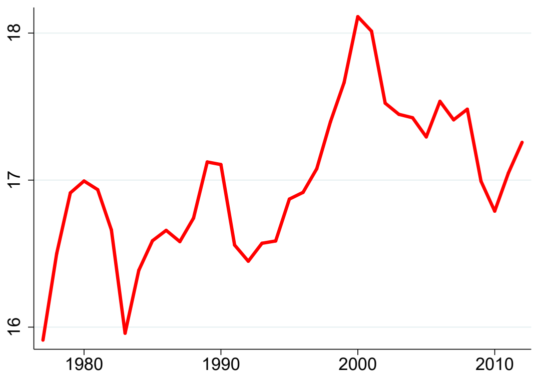
- 4 premises about demographics:
  1. there is population growth
  2. the average establishment size is constant
  3. the ratio of establishments to firms has increased
  4. the industry-location grid (local market definition) is constant

Herfindahl-Hirschman Index (HHI)

Intertemporal Comparisons



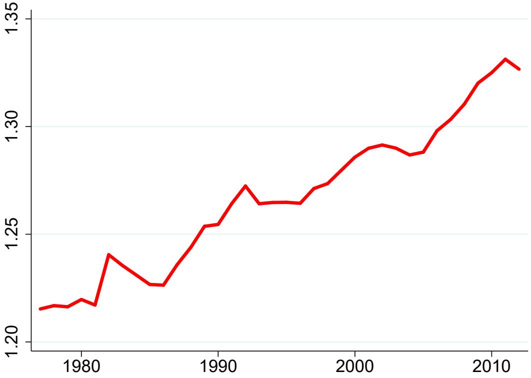
1. Employment



2. Establishment Size

Herfindahl-Hirschman Index (HHI)

Intertemporal Comparisons



3. Ratio of Establishments to Firms

Herfindahl-Hirschman Index (HHI)

Intertemporal Comparisons: A Toy Example

1980 – Baseline Economy

	SIC×Geo 1	SIC×Geo 2	Aggregate Local	National
	1,000 est	1,000 est	2,000 est	
Markets (10 est)	$1, \cdots, 100$	$1, \cdots, 100$	$1, \cdots, 200$	
Local HHI				
$\text{HHI}_{SIC \times Geo}$	10	10	10	5
HHI_{true}	1,000	1,000	1,000	1,000

Herfindahl-Hirschman Index (HHI)

Intertemporal Comparisons: A Toy Example

1980 – Baseline Economy

	SIC×Geo 1	SIC×Geo 2	Aggregate Local	National
	1,000 est	1,000 est	2,000 est	
Markets (10 est)	1,⋯,100	1,⋯,100	1,⋯,200	
Local HHI				
$HHI_{SIC\times Geo}$	10	10	10	5
HHI_{true}	1,000	1,000	1,000	1,000

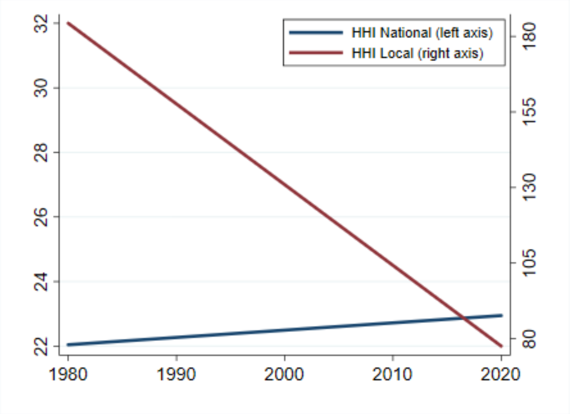
2020 – Increase Population; Decrease Competition; Multi-est Firms

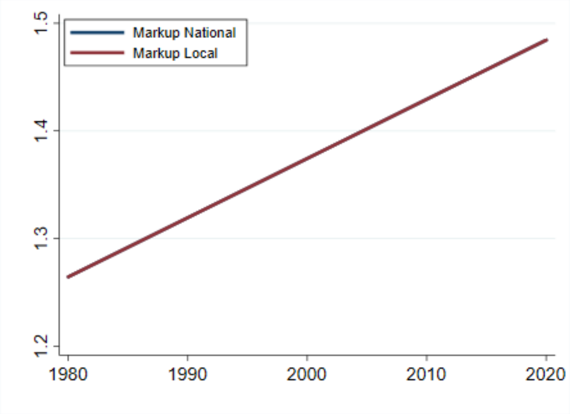
	2,000 est	2,000 est	4,000 est	
Markets (5 est)	1,⋯,400	1,⋯,400	1,⋯,800	
Local HHI				
$HHI_{SIC\times Geo}$	5	5	5	$10^{\star}$
HHI_{true}	2,000	2,000	2,000	2,000

$\rightarrow$ Local $HHI_{SIC\times Geo}$ $\downarrow$ – National $HHI_{SIC\times Geo}$ $\uparrow$

Herfindahl-Hirschman Index (HHI)

Also in a Not-so-Toy Example (De Loecker, Eeckhout & Mongey 2020)



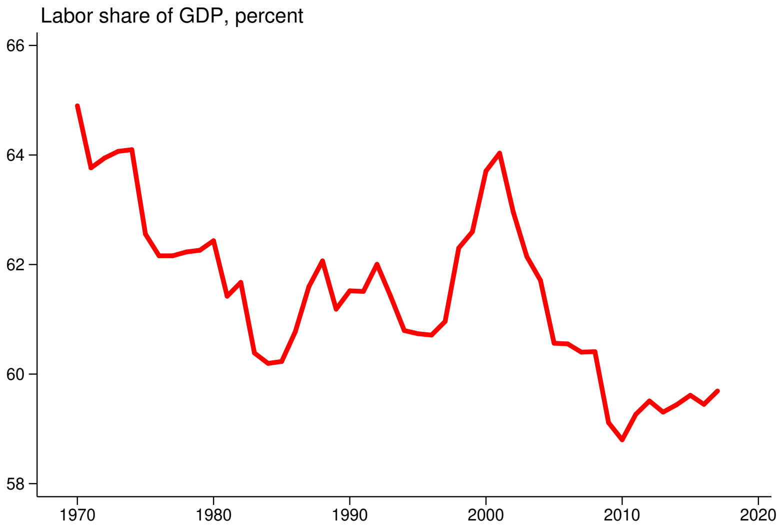


Summary: HHI

- HHI extremely popular in policy
- It is useful, but not conclusive
- Need to handle with care: HHI $\neq$ market power
- Especially in aggregate, economy-wide settings, it can be very misleading

II. Economy-wide Implications of Market Power

1. The Secular Decline in the Labor Share



1. The Secular Decline in the Labor Share

- Decline in aggregate: 0.65 to 0.59 (Karabarbounis-Neiman 2014)
- At the firm level: effect of markups

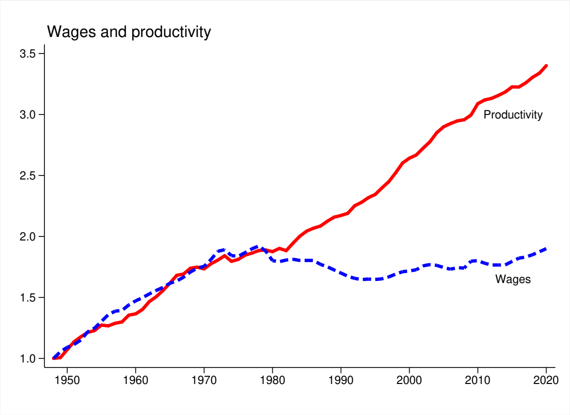
$$\frac{WL_i}{S_i} = \frac{\theta_i^L}{\mu_i}$$

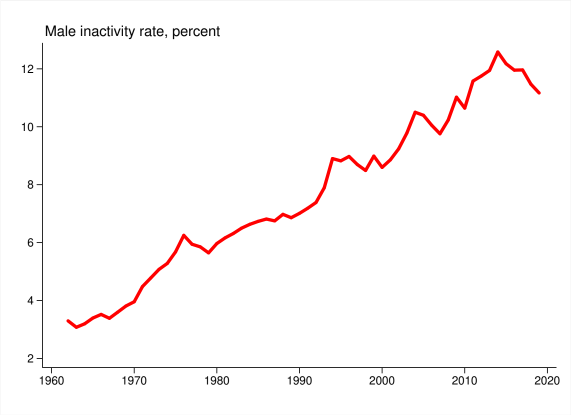
1. At a given wage $W \rightarrow L_i \downarrow$ (high markup firms have lower labor share)
2. GE effect on Wages $W \downarrow$: large!! (See Quantitative Model)

	Labor Share (log)			
	(1)	(2)	(3)	(4)
Markup (log)	-0.24	-0.23	-0.20	-0.24
	(0.03)	(0.03)	(0.03)	(0.03)
Year F.E.		✓	✓	✓
Industry F. E.			✓	
Firm F.E.				✓
R^2	0.02	0.08	0.21	0.88

1. The Secular Decline in the Labor Share

Wage Stagnation and Decline in Labor Force Participation





2. The Secular Decline in the Capital Share

	Capital Share (log)					
	(1)	(2)	(3)	(4)	(5)	(6)
Markup (log)	0.03	0.03	-0.02	-0.14	-0.90	-0.86
	(0.02)	(0.02)	(0.01)	(0.02)	(0.00)	(0.00)
Cost Share (log)					1.13	1.11
					(0.00)	(0.00)
Year F.E.		✓	✓	✓	✓	✓
Industry F. E.			✓		✓	
Firm F.E.				✓		✓
R^2	0.00	0.02	0.31	0.83	0.98	1.00
N			242,692			

2. The Secular Decline in the Capital Share

- Evidence of decline in capital share: Barkai 2020
- Kaldor: labor and capital shares sum up to one
- How can labor and capital shares both decline?

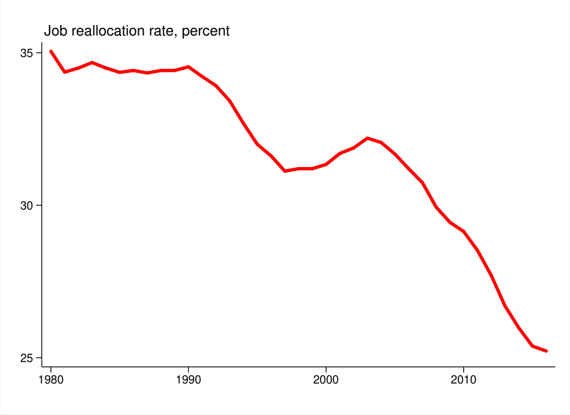
$$WL + rK + \Pi = PQ$$
$$\Updownarrow$$
$$\underbrace{\frac{WL}{PQ}\searrow}_{\text{labor share}} + \underbrace{\frac{rK}{PQ}\searrow}_{\text{capital share}} + \underbrace{\frac{\Pi}{PQ}\nearrow}_{\text{profit share}} = 1$$

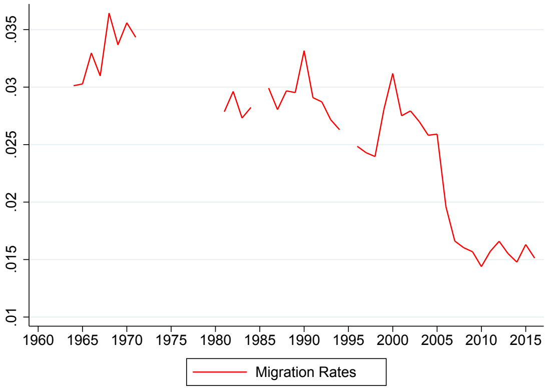
- Not all capitals are created equal; Samuelson: "painting" vs. "watching paint dry"

3. The Secular Decline in Business Dynamism

Labor Reallocation, Migration

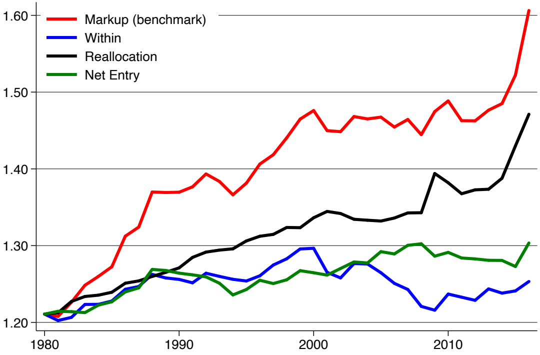
- Decker, Haltiwanger, Jarmin, Miranda (2020)
- No decline in volatility shocks, but decline in response to shocks: incomplete passthrough
- Migration: response to labor reallocation across MSAs, U.S. states, ...

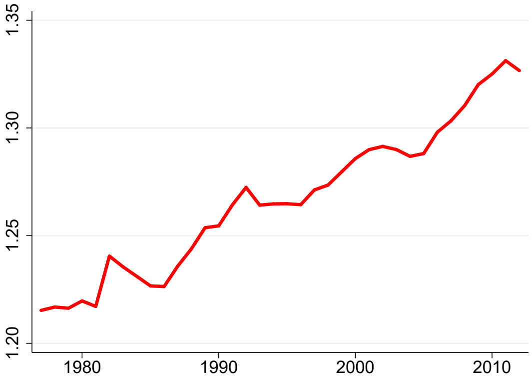




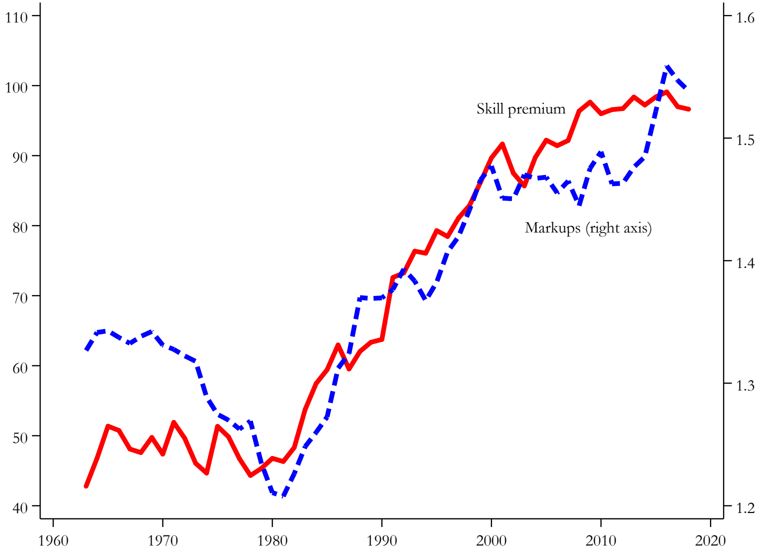
4. The Rise of Superstar Firms

- Rise of market power: mainly due to reallocation towards large firms
- Increase in firm size, not in establishment size; higher establishment-to-firm ratio
- See Author, Dorn, Katz, Patterson, Van Reenen 2020





5. Wage Inequality: the Rise of the Skill Premium



Summary: Economy-wide Implications

- Correlations between important macroeconomic outcomes and market power
  $\Rightarrow$ How can one show that these albeit interesting correlations are also causal?
- Need a formal model to quantify market power (De Loecker, Eeckhout & Mongey 2021)
  - Macro model with market power and free entry
  - Market power due to:
    1. Technology (fixed cost and shocks): to get markup dispersion
    2. Market Structure: to get labor reallocation decline

       Need both $\Rightarrow$ Net effect: Welfare loss 8%
  - Consequences: secular macroeconomic trends
    1. Decline in Business Dynamism: incomplete passthrough
    2. Wage Stagnation: equilibrium effect
    3. Labor Share decline: at firm level
    4. Reallocation of sales towards high markup, large superstar firms

Antitrust and Innovation

Florian Ederer

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CEMFI Summer School 2021

Preliminary Principles

Crucial Role of Innovation

- Innovation is the primary driver of rising standards of living over time, economic growth and welfare.
- Crucial role of market disrupters: firms that shake up the status quo, threaten incumbent firms, and sometimes transform entire industries
- Schumpeter famously called this process "creative destruction": disruptive firms promote economic growth and bring the benefits of new technologies and new business practices and business models to consumers
- What is the role of antitrust and competition policy?
  - Competition policy seeks to protect and promote a vigorous competitive process by which new ideas are transformed into realized consumer benefits.
  - Competition spurs innovation.
  - A significant amount of innovation is driven by disruptive firms.
  - Other foundational public policies: IP policy, government funding of research, education & training, ...

Innovation and Disruption as a Threat

- Disruptive firms do not use the same technology or business model as incumbents.
- A distinct value proposition, not just lower prices!
- But ... a disruptive firm can destroy a great deal of incumbent profit while creating consumer surplus.
  - Uber and Airbnb disrupting taxi and hotel industry
  - Walmart entering local retail markets
  - Netflix disrupting video delivery and producing content
- Healthy competitive process of churn in products and market shares ... but incumbent may want to inhibit it
  - Mergers
  - Exclusionary conduct
  - Preservation of profits at the expense of consumers

Incumbents as Innovators?

- Successful incumbent are often deeply conflicted.
- Process innovations that lower costs can be most valuable at the largest firms, and market leaders often invest substantial sums to introduce new generations of products
  - Intel developing a new generation of technology and building new fabs to manufacture microprocessors
  - Boeing developing a new generation of large commercial aircraft
  - Verizon investing to build its 5G wireless network
- Powerful incentive to preserve existing profits
  - Slowing down or blocking disruptive threats
  - Organizationally difficult to invest in disruptive technologies (Christensen 1997, Bresnahan et al. 2012)
- Competition increases the diversity of approaches taken to the development of new technology

Competition Spurs Innovation

- Market leaders may face competitive pressures to innovate from many sources
  - other large firms in the same market
  - other large firms in adjacent spaces
  - smaller, pesky disruptive firms
- "Contestability Principle"
  - Market leader is best motivated to innovate if it fears losing its leadership position to a disruptive rival (Shapiro 2012)
  - Pressure to innovate if market will be won by the firm that is most innovative (incumbent, disruptive challenger, leapfroggers)
  - Greater competition $\rightarrow$ greater contestability $\rightarrow$ greater innovation
- Competition policy must prevent today's market leaders from using their market power to disable disruptive threats (e.g., through acquisitions or anticompetitive conduct)

Mergers and Innovation

Business Stealing

- Some innovation is for serving entirely new uses or capturing sales from highly competitive industries with small price/cost margins
- Many of the rewards to innovation are commonly driven by the prospect of attracting customers that would otherwise purchase other products with significant price-cost margins
  - Firms race to be first to the market in a new product category
  - Firms leapfrog each other with successive product improvements
- One firm's innovation exerts a negative pecuniary externality on other firms
  - Close substitutes
  - Large price-cost margins
- Central role in innovation models including Arrow (1962), Reinganum (1989), d'Aspremont & Jacquemin (1988), ...

Incentives and Disincentives for Innovation

- Firms must undertake risky investments to develop new products
- Firms only invest if they have sufficient profit margins on the resulting products
- But those large profit margins also attract new challengers and give incentives to inhibit further innovation
- Industry conditions that stimulate innovation make business stealing effects more consequential
- Fundamental tension in antitrust and innovation (Segal & Whinston 2007)
  - Changing post-innovation rents changes pre-innovation behavior

Unilateral Price Effects

- If products are (imperfect) substitutes, mergers and multiproduct pricing lead to higher prices
  - Merging firms internalize price-related business stealing effects
  - Result is reversed with complements
- Antitrust law has a strong presumption against mergers of close substitutes that raise concentration
  - But can be rebutted by showing **merger-specific** synergies
  - Fundamental trade-off in all merger antitrust cases
    - Antitrust authorities demonstrate anticompetitive effects
    - Merging parties demonstrate synergies

Unilateral Innovation Effects

- Closely analogous to unilateral price effects
- Focus on firms' decisions to invest resources to develop new products rather than on pricing decisions.
  - Will merged firm innovate less intensely if it controls both of the research projects?
  - Are there significant merger-specific synergies that would lead to more innovation?
- Innovation-related business stealing effects vs merger-specific synergies
- innovation diversion ratio = expected lost profits at A / expected profits at B
  - Simplest and most direct way to measure unilateral innovation effects (Farrell & Shapiro 2010)
  - Includes price, quantity, and quality effects as well as probability of successful development

Innovation Synergies

- "It is incumbent upon the merging firms to substantiate efficiency claims."
  - Directly result from merger
  - Not achievable from alternative arrangement that preserves competition
  - Material so they can outweigh harm to current and future competition
- Internalization of involuntary spillovers
  - Can they be achieved without a full merger (e.g., research joint venture)?
- Facilitation of voluntary technology transfer
  - Again, could the same be achieved with a licensing agreement?
- Efficiencies in development
  - Do the firms have complementary capabilities?

The Dogma of the Inverted U

- Influential papers by Aghion et al. (2005) and Aghion & Griffith (2005) that argue that an intermediate level of competition is best for innovation
  - Mostly a theoretical argument about comparative statics of innovation with respect to market size and differentiation with some empirical evidence
  - Unsurprisingly, a very popular narrative to claim that "too much competition is bad for innovation" among merging parties and those who favor a non-interventionist approach
- Narrative confuses two fundamentally different questions (Shapiro 2012)
  - What is the impact on innovation when the underlying demand or cost conditions in an industry change?
  - What is the impact on innovation of a proposed merger between two rival firms, taken as given the underlying conditions in the industry?

Dispelling the Myth of the Inverted U

- Shapiro (2012) addresses the proposition that "too much competition might be bad for innovation."
  - Considerable empirical evidence that greater competition (i.e., future sales are more contestable) spurs innovation.
  - Theoretical models generally do not analyze the effects of mergers.
  - Non-academics misinterpret what the theoretical models actually show.
- Models typically consider variations in the intensity of product market competition (e.g., number of firms & products) (Vives 2008, Marshall & Parra 2018).
  - assets and products of one of the two firms simply disappear
  - no impact of post-merger coordination in R&D activities
  - no impact on consumer welfare resulting from the loss of product variety
- Changes in market-wide parameters (product differentiation, strength of competitive fringe, price elasticity of industry) are exogenous changes that are not good merger impact proxies.
- Recent models of oligopoly mergers and innovation (Igami & Uetake 2019, Motta & Tarantino 2018, Federico et al. 2018) do not support inverted U.

The Problem of Uncertainty

- Analyzing unilateral price effects for future products can be more challenging
  - uncertainty about whether and when those future products will actually be introduced, and what their attributes will be
  - very difficult to measure substitution patterns for future products, simply due to the paucity of available data
- Common argument: "If you can't measure it, then there is unlikely to be harm."
- Mergers combining innovation rivals are more worrisome than mergers that only combine rival products, because innovation is such a powerful contributor to consumer surplus and economic growth.
- Claims about innovation synergies are equally speculative and self-motivated.
  - See large literature on managerial hubris and mergers destroying value

Standard of Proof

- Current standard of proof requires antitrust authorities to show harm to consumers
  - Very difficult because of uncertainty in any innovation-related merger case
  - Makes theoretical analysis more important ... but judges often don't understand it
  - Some scholars have suggested shifting the burden of proof, especially in innovation-related cases
- "More likely than not" standard is uneconomic and harmful (Katz & Shelanski 2005, Crémer et al 2019)
  - Easy to understand for lawyers and judges: p_A sufficiently large
  - A merger could reduce **expected** consumer surplus by a lot even with low innovation success probability p_A, but would still pass in court
  - $p_A CS_{AB} + (1 - pA)CS_B > CS_B$ so loss of merger is $p_A(CS_{AB} - CS_B)$

Killer Acquisitions

Killer Acquisitions

- **The idea:**
  - Market incumbents have incentives to acquire and "kill" innovative targets
  - Preempt the "gale of creative destruction" to protect existing profits
- **Theoretical framework:**
  - Setting: a simple model of acquisition, innovation, and competition
  - Killer acquisitions can be optimal for incumbents
- **Empirical evidence:**
  - Setting: acquisition and drug development (1989-2010)
  - Evidence: test for existence and pervasiveness of "killer acquisitions"

Do "Killer Acquisitions" Exist?
FTC Against Mallinckrodt (Questcor)

- "By acquiring Synacthen, Questcor harmed competition by preventing another bidder from trying to develop the drug ... to challenge Questcor's monopoly over ACTH drugs."
- "Questcor has extinguished a nascent competitive threat to its monopoly."

Patrick Soon-Shiong accused of cancer drug 'catch and kill'

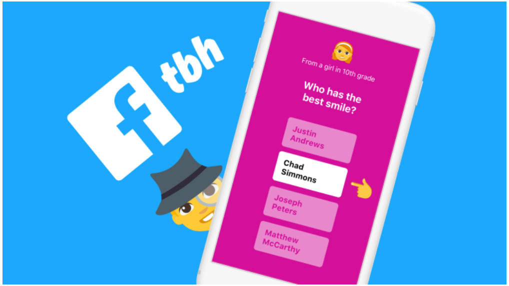
Biotech group says billionaire investor bought a treatment to prevent competition

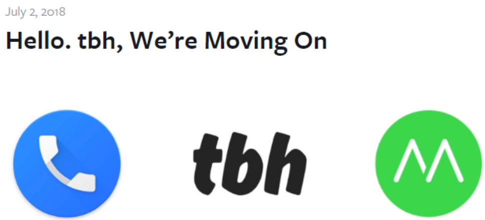
Sorrento is seeking more than $1bn in damages, plus punitive damages, against Patrick Soon-Shiong, the billionaire biotech investor © AP

Do Killer Acquisitions Occur Elsewhere?

Oct 16, 2017

July 2, 2018



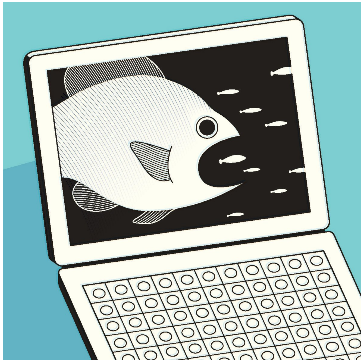


- Oct 2017: Facebook acquired teen compliment app tbh
- Jul 2018: Bye tbh

Continued...

THE WALL STREET JOURNAL.

The New York Times



Populist take:

"This happens because antitrust regulators are stuck in an outdated view of the world, while the Internet giants are more attuned to their **nascent** competitive threats."

—NYTimes, Aug 16, 2016

Continued...

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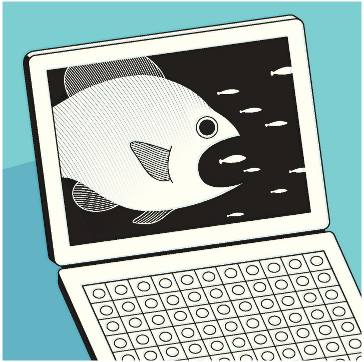

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Slightly more nuanced:

"If you're an app, are you better off getting acquired or competing against one of the big platforms?" While getting acquired can be "a very good win for the founders, that might be at the expense of a more competitive landscape." says Scott Stern —WSJ, Aug 9, 2017

Do Killer Acquisitions Occur Elsewhere?

FTC to Examine Past Acquisitions by Large Technology Companies

Agency Issues 6(b) Orders to Alphabet Inc., Amazon.com, Inc., Apple Inc., Facebook, Inc., Google Inc., and Microsoft Corp.

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FOR RELEASE

February 11, 2020

Well, Don't We Already Know...

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- ... **that acquisitions can be anti-competitive**?
  - Yes! Mostly focusing on horizontal mergers of **existing products** and **pricing implications**—ignoring innovation.
  - We argue that anti-competitive acquisitions can happen pre-market.

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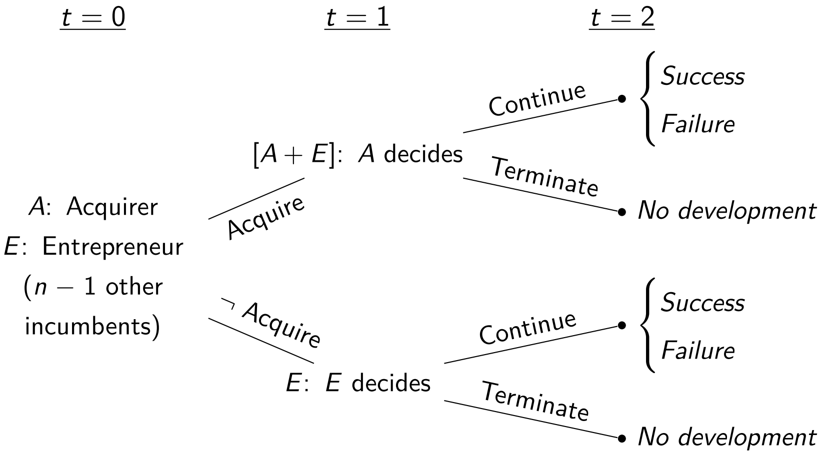
- ... **that acquisitions can be anti-competitive**?
  - Yes! Mostly focusing on horizontal mergers of **existing products** and **pricing implications**—ignoring innovation.
  - We argue that anti-competitive acquisitions can happen pre-market.
- ... **about cannibalization and innovation**?
  - Yes! Arrow's (1962) famous "replacement effect" shows that incumbents are disincentivized to **conduct internal R&D**.
  - We argue that disincentives to innovate are more extreme and incumbents may acquire to kill innovation.

Setup and Timeline



Intuition

- Development decision ($t = 1$)
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  - ... because successful development cannibalizes incumbent's profit
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- Incumbent's economic trade-off at acquisition ($t = 0$)
  - Acquiring the entrepreneur is costly (pay endogenous P), but ...
  - ... it prevents competition and business stealing relative to successful development by the entrepreneur
  - Replacement (Arrow 1962) vs efficiency (Gilbert & Newbery 1982) effect

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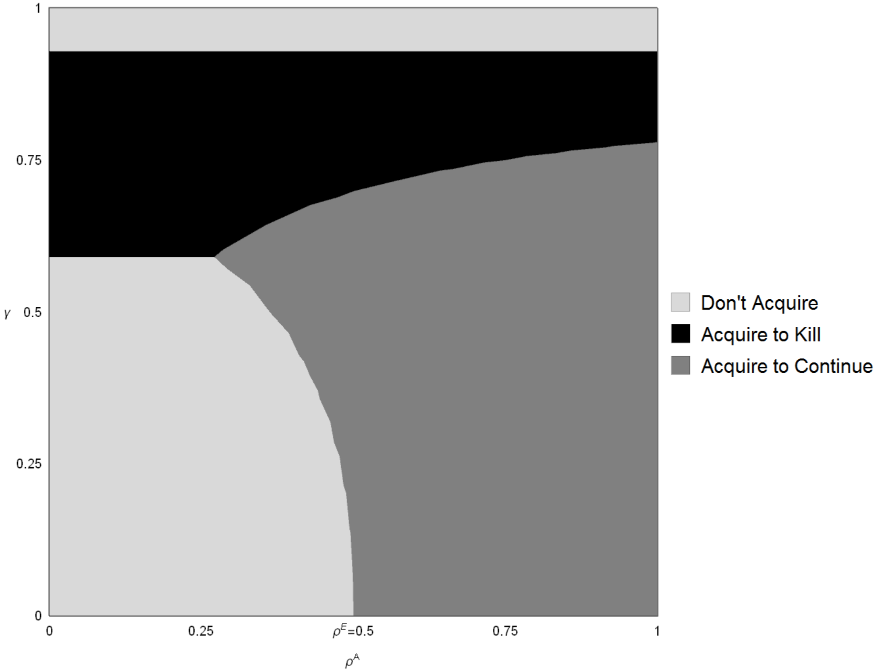
  - ... it prevents competition and business stealing relative to successful development by the entrepreneur
  - Replacement (Arrow 1962) vs efficiency (Gilbert & Newbery 1982) effect
- **Theoretical takeaways:** Killer acquisitions
  - Can arise as an optimal strategy for incumbents
  - Particularly when products overlap and current/future competition is low

More on Theory

Optimal Acquisition Strategies



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- Incumbent development advantages
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  - But acquisitions are more likely
- Asymmetric bidders
  - Will the least differentiated incumbent acquire?
  - Has highest acq'n value (with synergy more diff'd firm may acquire)

Main Conceptual Tests

- Test #1: Existence
  - Termination is more likely when incumbent and target products overlap.

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- Test #4: Acquisition Motives
  - Acquisition is more likely when products overlap.
- Empirical challenges
  - Projects and their development decisions
  - Market overlap and competition

Data Sources and Sample Structure

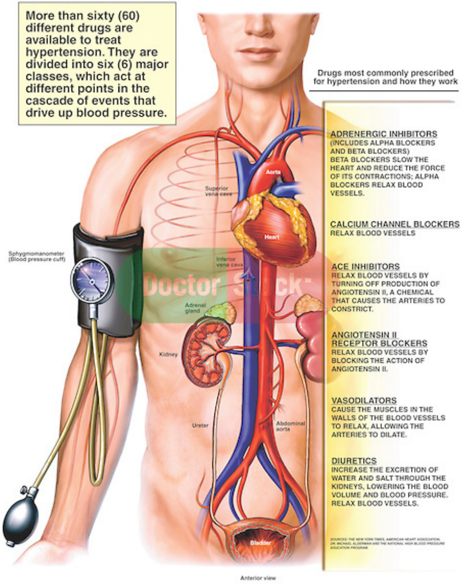
- Drug development record from Pharma Intelligence
  - 16,000+ drug development projects between 1989 and 2010
  - From origination to outcome, including clinical trial information
- Project-level profile
  - Chemical structure, therapeutic and mechanism of action
  - Drug patent and human capital obtained from USPTO data
- Acquisition data
  - SDC Platinum, Thomson Reuters Recap IQ (now Cortellis), VentureXpert
  - Each source is important in our final dataset

Empirical Specification

- Dependent variables
  - Pharmaprojects: development, termination, and neutral events
  - FDA clinical trials: trial phase progression
- Independent variables
  - Need to measure **the degree that new innovation affects incumbents**
  - This is **difficult in general**: demand, preferences, etc.
- Measurement: exploiting market delineations in the pharma industry
  - Same target market: the same therapeutic class (TC)
  - Similar technology: the same mechanism of action (MOA)

More Discussion

Example for Overlap



- **1 Therapeutic class**: Hypertension, or Antihypertensives
- **6 Mechanism of Actions**: how can we treat hypertension?
  - Adrenergic Inhibitors
  - Calcium Channel Blockers
  - ACE Inhibitors
  - Angiotensin II Receptor Blockers
  - Vasodilators
  - Diuretics

Main Result: Project Development Post Acquisition

	Development Event = 1			
	(1)	(2)	(3)	(4)
I(Acquired) × I(Post) × Overlap	-0.037***	-0.033**	-0.029*	-0.041**
	(0.013)	(0.014)	(0.015)	(0.019)
I(Acquired) × I(Post)	-0.020***	-0.016**	-0.017**	-0.024**
	(0.006)	(0.007)	(0.009)	(0.010)
I(Acquired) × Overlap	0.004	0.009	0.026**	
	(0.008)	(0.009)	(0.011)	
I(Acquired)	-0.002	-0.004	-0.011	
	(0.004)	(0.005)	(0.012)	
Observations	143,569	143,569	143,569	143,569
R-squared	0.038	0.256	0.294	0.370
Vintage FE	Y	Y	Y	Y
Age FE	Y			
Age FE X Therapeutic Class X MOA		Y	Y	Y
Originator [Target Company] FE			Y	
Project FE				Y

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- Takeaway: "Killer acquisitions" reduce development.

Propensity Reweighting

Pre-trends

Broader Overlap

Further Results: Effect of Competition

- **Competition:** number of drugs in the same therapeutic class & MOA

	Development Event = 1		
	(1)	(2)	(3)
	Low Competition	High Competition	Interacted
I(Acquired) $\times$ I(Post) $\times$ Overlap	-0.065**	0.017	0.017
	(0.026)	(0.035)	(0.035)
$\cdots$ $\times$ Low Competition			-0.082*
			(0.044)
Competition Measure	Existing Product Competition		
Observations	74,261	69,308	143,569
R-squared	0.415	0.399	0.408
Vintage FE	Y	Y	Y
Age FE X Therapeutic Class X MOA	Y	Y	Y
Project FE	Y	Y	Y

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Age FE X Therapeutic Class X MOA	Y	Y	Y
Project FE	Y	Y	Y

- Takeaway: "Killer acquisitions" are more likely in less competitive markets.

Further Results: Remaining Patent Life

	(1)	(2)
	Development Event = 1	
I(Post) × I(Near Patent Expiry)	0.013	0.406***
	(0.133)	(0.090)
I(Post)	-0.173*	-0.210***
	(0.092)	(0.067)
Observations	6,398	6.398
R-squared	0.212	0.450
Vintage FE	Yes	Yes
Age FE	Yes	Yes
Therapeutic Class X MOA FE	Yes	Yes
Age X Therapeutic Class X MOA FE	No	Yes

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Age X Therapeutic Class X MOA FE	No	Yes

- Takeaway: "Killer acquisitions" are less likely if patents are close to expiry.

Further Results: Overlap and Acquisitions

	(1)	(2)	(3)	(4)
	Acquisition = 1			
Overlap	0.626***		0.577***	
	(0.009)		(0.015)	
Overlap (Disease Only)		0.356***		0.300***
		(0.005)		(0.008)
Overlap × Low Competition			0.088***	
			(0.019)	
Overlap (disease only) × Low Competition				0.103***
				(0.011)
Observations	55,374	55,374	38,430	38,430
Pseudo R-squared	0.118	0.119	0.098	0.097
Deal FE	Y	Y	Y	Y
Matching Method	Random Matching			
No of Deals	9,229	9,229	9,229	9,229
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- Takeaway: Overlap greatly increases probability of acquisition.

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	(1)	(2)	(3)	(4)
	Acquisition = 1			
Overlap	0.194***		0.209***	
	(0.010)		(0.015)	
Overlap (Disease Only)		0.214***		0.200***
		(0.008)		(0.011)
Overlap × Low Competition			-0.027	
			(0.020)	
Overlap (disease only) × Low Competition				0.025*
				(0.015)
Observations	34,005	34,005	34,005	34,005
Pseudo R-squared	0.052	0.064	0.052	0.065
Deal FE	Y	Y	Y	Y
Matching Method	Matched by Pipeline Size			
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Alternative Interpretations

- Is lack of development is due to **optimal project selection**?
  - **No.** Results are unchanged for single-drug targets.
- Is lack of development is due to **real termination**?
  - **Yes.** Acquired projects are quickly terminated rather than just delayed.
- Are killer acquisitions **technology acquisitions**?
  - **No.** Acquirers do not re-use tech or develop molecularly similar drugs.
- Are killer acquisitions **acquihires**?
  - **No.** Most employees leave and those that stay are less productive.
- Are killer acquisitions **salvage acquisitions**?
  - **No.** There are no differences in pre-trend or acquisition values.

Early-stage Antitrust and FTC Review

- FTC Review – Hart-Scott-Rodino (HSR) Antitrust Improvements Act
  - No report: < 50 million (as adjusted)
  - Selected report: $[50, 200]$ million with both parties having big assets/sales
  - Mandatory report: > 200 million (as adjusted)
- Analysis design
  - Examine acquisitions and drug development decisions around the threshold

	5% Below Threshold	5% Above Threshold	Difference	t-statistic
Active	3.57%	7.58%	-4.00%	-1.176
Launched	1.79%	9.09%	-7.31%	-2.293**
Discontinued	94.64%	83.33%	11.31%	2.509**
N	112	66		

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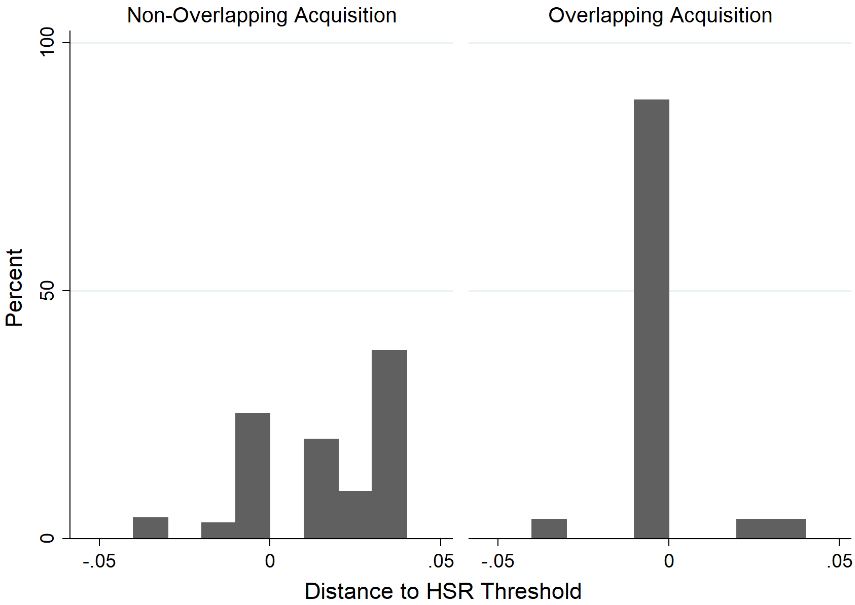
Non-Overlapping Acquisition
Overlapping Acquisition
Percent
100
50
0
-.05
0
.05
-.05
0
.05
Distance to HSR Threshold

Frequency and Importance of Killer Acquisitions

- 5.3% to 7.4% of all acquisitions are killer acquisitions
  - More than 50 acquisitions every year
  - Assumes binary type of acquisitions with overlap (pure "killer" vs non-overlapping) and equates development rate to non-overlapping acquisitions

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  - Assumes that development rate is the same as for non-acquired projects
  - Half the size of the Orphan Drug Act (13 per year)
- Impact of killer acquisitions is larger than pay-for-delay

Welfare Implications of Killer Acquisitions

Welfare Implications of Killer Acquisitions

[×] Reduce consumer surplus

- Higher prices and loss of variety—lowering consumer surplus

Welfare Implications of Killer Acquisitions

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[✓] Increase ex-ante incentives for innovation

- Additional acquisition channel may spur drug project origination
- Overall effect depends on elasticity of entrepreneur's idea generation
- ... but there are less inefficient ways to encourage new ideas!

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- ... but only relevant in markets with many existing incumbents anyway!

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[×] Distort direction of innovation

- Originate excessively similar "me-too" drug projects (entry for buyout)
- Without killer acquisitions entrepreneurs would focus effort elsewhere!

Beyond Killer Acquisitions

Background

- Current practice: start-up acquisitions are waved through.
  - Acquisitions by Google, Amazon, Apple, Facebook and Microsoft (31.6 billion USD in 2017).
  - Google acquired about one firm per month between 2001 and 2018.
- Recent concern about eliminating potential competition:
  - Crémer et al. (2019) ("EU Report"),
  - Furman et al. (2019) ("Furman Report"),
  - Scott Morton et al. (2019) ("Stigler Report").
- Anti-competitive motive particularly salient in the case of killer acquisitions.

INVESTIGATION OF COMPETITION IN DIGITAL MARKETS

MAJORITY STAFF REPORT AND RECOMMENDATIONS

SUBCOMMITTEE ON ANTITRUST, COMMERCIAL AND ADMINISTRATIVE LAW OF THE COMMITTEE ON THE JUDICIARY

Jerrold Nadler, Chairman, Committee on the Judiciary

David N. Cicilline, Chairman, Subcommittee of the Judiciary on Antitrust, Commercial and Administrative Law

UNITED STATES
2020

Intention to act against acquisition of start-ups

- Subcommittee report (p.395):

Since startups can be an important source of potential and nascent competition, the antitrust laws should also look unfavorably upon incumbents purchasing innovative startups. One way that Congress could do so is by codifying a presumption against acquisitions of startups by dominant firms, particularly those that serve as direct competitors, as well as those operating in adjacent or related markets.[2485]

- NY Times, December 9, 2020:

U.S. and States Say Facebook Illegally Crushed Competition

Regulators are accusing the company of buying up rising rivals to cement its dominance over social media.

Intention to act against acquisition of start-ups

- Chief Executive of the CMA, Andrea Coscelli, lecture on Febrary 9, 2021:

> Many of us are now familiar with the statistic that – between 2008 and 2018 of the 400 acquisitions made globally by the 5 largest digital firms – none has been blocked by competition authorities. But it remains a powerful one. It is very hard to look at those numbers, to look at the state of the relevant markets today, and conclude with hindsight that the balance has been struck correctly.

What is the right balance?

- Ex post effect:
  - Competition is preserved.
  - Loss of acquisition synergies.
- Ex ante effect:
  - Effect on entrants.
  - Effect on incumbents.
- Letina et al. (2021):
  - Focuses on the ex ante (innovation) effect.
  - Analyzes how innovation strategies of start-ups and incumbents react to policy interventions.
  - Analyzes both "killer acquisitions" and the "genuine acquisitions" acquisitions in one framework.

Model: Overview

- Two firms: incumbent and entrant
- Incumbent faces entry challenge.
- Contrary to incumbent, entrant has to innovate to produce.

- Stages:

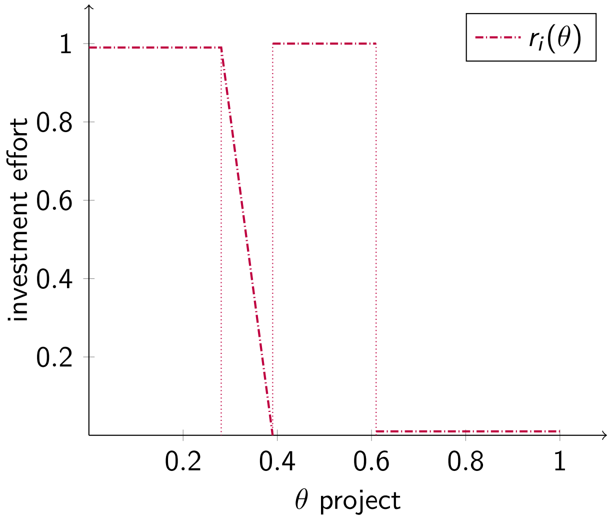
  Firms choose investments in R&D.

  Incumbent can acquire the entrant.

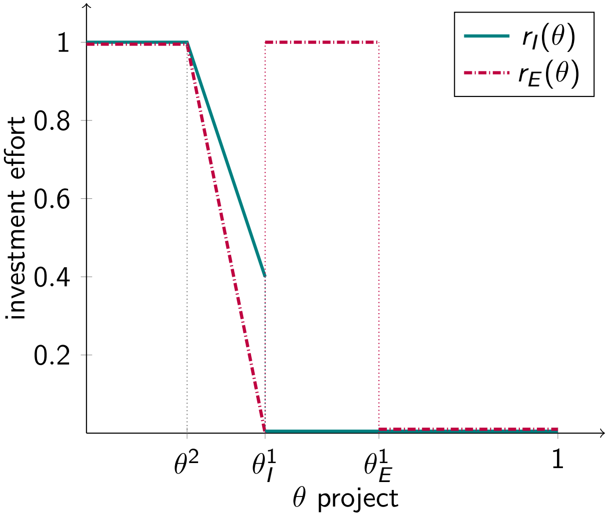
  Commercialization decision

  Product market competition

Model: Investment Stage



Equilibrium Investments



One equilibrium portfolio.

Main Results

- Prohibiting *killer acquisitions* has a strictly negative innovation effect.
- Prohibiting *genuine acquisitions* has a weakly negative innovation effect
  - Provide conditions under which the effect is zero
- Innovation effect is likely to be *small* (and prohibition of acquisitions justified) when
  - entrant has low bargaining power
  - incumbent's profits after entry are large
- Prohibiting acquisitions decreases entrant's duplication incentives but increases incumbent's duplication incentives.

Other policies

Restrictions on technology usage (e.g., Google/Fitbit case)

- Prevents acquisitions of promising start-ups
- Smaller negative effect than prohibition
- Turns some genuine acquisitions into killer ones

Prohibition of "killing" (OECD 2020)

- Prevents acquisitions of promising start-ups
- Smaller negative effect than prohibition
- Turns some killer acquisitions into genuine ones

Taxing acquisitions (Lemley & McCreary 2020)

- Prevents acquisitions of promising start-ups
- Smaller negative effect than prohibition

Increasing profitability of IPOs (Lemley & McCreary 2020)

- Prevents acquisitions of promising start-ups
- Positive effect on innovation (at a cost)
- Increases duplication of both firms

Kill Zone

Kill Zone (Kamepalli, Rajan & Zingales 2019)

- Venture capitalists are reluctant to fund investments in a space that is proximate to large digital platforms.
- "The Kill Zone is a real thing. The scale of these companies [digital platforms] and their impact on what can be funded, and what can succeed, is massive." – Albert Wenger, VC
- But the prospect of being acquired should spur, not stifle, innovation and investment, right?

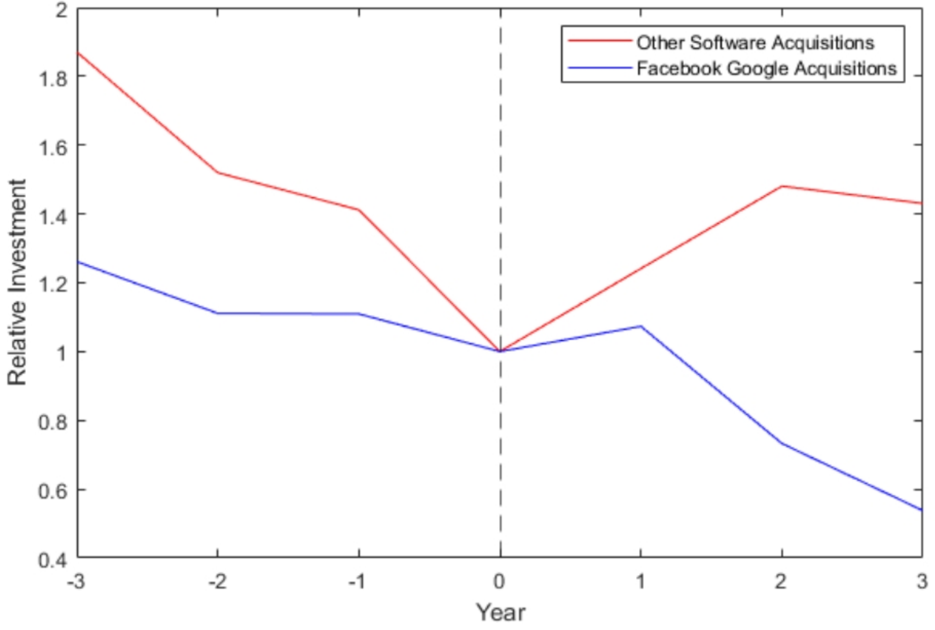
Simple Empirical Strategy

- Identify which acquisitions are big enough to matter
  - All Google and Facebook acquisitions $>$ \$ 500 million in the period 2006-2016
- Identify a set of "treated firms"
  - Similar to the acquired firms (possibly not too similar)
- Define a cycle-adjusted measure of investments
- Compute cycle-adjusted measure around acquisitions (+/- 3 years)
- Aggregate them in an event study across acquisitions

Events

Year	Acquirer	Target	Price paid ($M)	Software Sector	Complementarity
2006	Google	Youtube	1,650	Multimedia and Design	Substitute
2007	Google	DoubleClick	3,100	Internet	Complement
2009	Google	AdMob	750	Vertical Market	Complement
2009	Google	Postini	625	Network Management	Complement
2011	Google	ITA Software	676	Vertical Market	Substitute
2012	Facebook	Instagram	1,000	Social Platform	Substitute
2013	Google	Waze	966	Communication	Substitute
2014	Facebook	WhatsApp	19,000	Communication	Substitute
2016	Google	Apigee	625	Development Applications	Complement

Normalized relative investment



Acquisitions in a Digital Platform World

- One (or a few) gigantic incumbents
- Network externalities: the more the customers on a platform, the more each customer benefits
- Switching costs for some (no costless multi-homing)
- Two sided platforms
  - Price charged on one side of the platform equals zero

Model Intuition

- Acquisition price for entrant depends on competition among bidders and entrant's outside option to go it alone
  - If only one large incumbent platform, there is no competition
- Stand-alone value depends on
  - entrant's quality
  - number of customers the new entrant can attract (network effects)
- But customers decisions depend on decisions of app designers
  - App designers have switching costs so have incentive to start with incumbent
  - Acquisitions can tilt playing field even more in favor of incumbent. How?

Acquisitions Can Harm Ex-ante Incentives

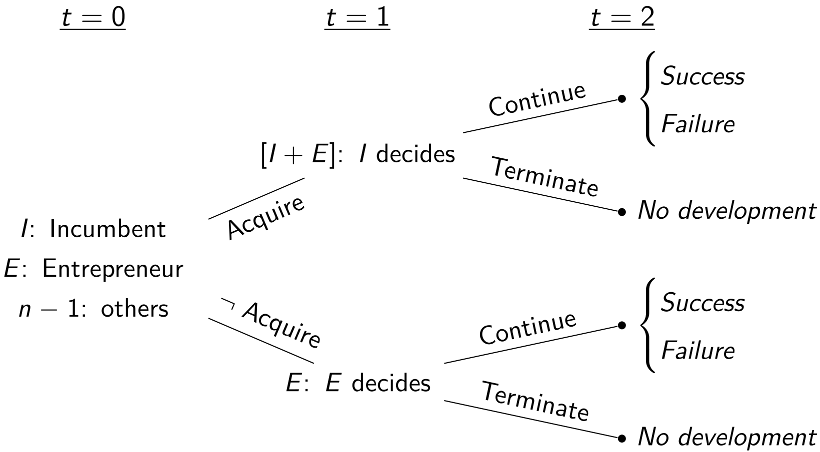
- Higher expectation of being acquired depresses the number of app designers switching because technology and consumer will be accessible post-acquisition anyway
- Depresses the attractiveness of the new platform for ordinary customers (expectation + network externalities)
- Depresses stand-alone valuations and thus acquisition prices
- Depresses investments by potential entrants

Is this really what's going on?

- Different history of digital platforms in the United States, China, and the EU
- EU entrants had to contend from the beginning with US incumbents, who built extensive networks in Europe early on.
- By contrast, Chinese entrants did not have the same problem.
- India banned a number of social media platforms.
- What is the optimal policy though?
  - Prohibiting acquisitions prevents ex-post efficiencies and may not be practical anyway
  - Instead mandate a common standard and interoperability ... but is this really enough?

Appendix

Setup and Timeline



Product Market Competition ($t = 2$)

- $\neg acq$: Entrepreneur remained independent
  - Killed project or failed development
    - E: $\pi(n, 0)$ I: $\pi(n, 1)$
  - Successful development
    - E: $\pi(n + 1, 1)$ I: $\pi(n + 1, 1)$

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  - Successful development
    - E: n/a I: $\pi(n+1, 2)$
- Setup is quite general
  - But, specifically, differentiated Bertrand (or Cournot) competition with linear demands, $0 < \gamma < \beta$ captures product homogeneity
  - Old and new products are the same, but easy to relax this assumption

Continuation Decision ($t = 1$)

- $\neg acq$: Entrepreneur remained independent
  - Continue development if $\rho[\pi(n+1,1) - \pi(n,0)] - k \geq L$
  - $\Delta^E \equiv \pi(n+1,1) - \pi(n,0)$ is E's marginal innovation benefit
  - Decision rule: continue if and only if $k \leq k^E$

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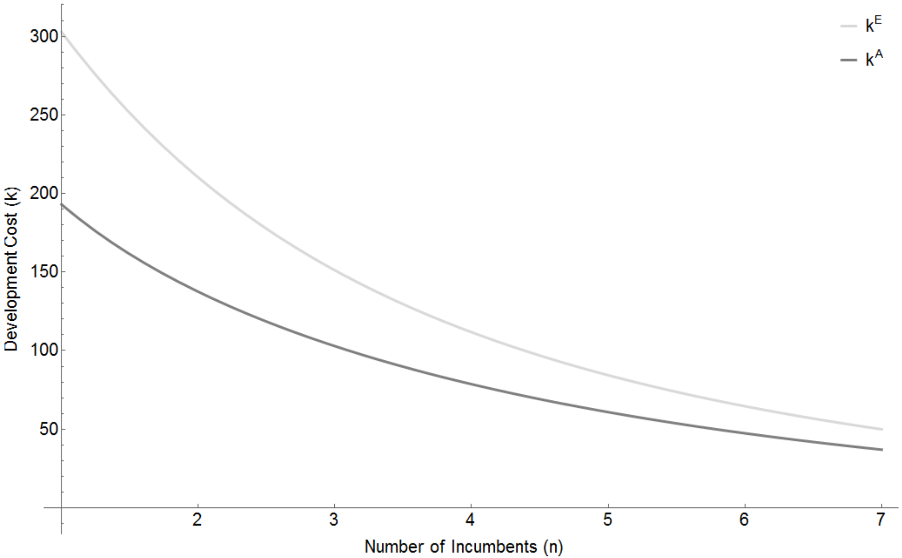
  - Decision rule: continue if and only if $k \leq k^I$
- Arrow's (1962) replacement effect
  - $\Delta^E - \Delta^I$ is the difference in marginal innovation benefits
  - Equal to 0 iff $\gamma = \{0, \beta\}$, > 0 otherwise, thus $k^E > k^I$
  - Development decision rules differ in region $[k^I, k^E]$



300
250
200
150
100
50
Development Cost (k)
2
3
4
5
6
7
Number of Incumbents (n)
k^E
k^A

Acquisition Regions

- $k > k^E$
  - E and I kill the project ($d^E = d^I = 0$)
  - Acquire if $\sigma \geq 0$

Back

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- $k^I \geq k$
  - E and I continue project ($d^E = d^I = 1$)
  - Acquire if $\sigma + \underbrace{\rho(\pi(n+1,2) - \pi(n,1))}_{\text{soften cannibalization}} \geq \underbrace{\rho(\Delta^E - \Delta^I)}_{\text{valuation difference}}$

Back

Discussion of the Empirical Approach

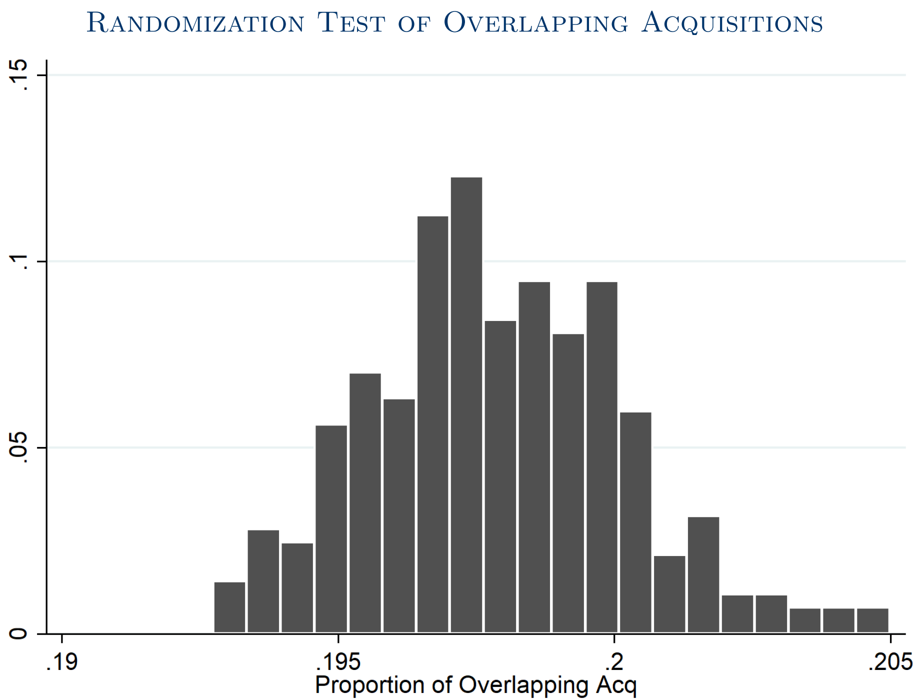
- Goal of our empirical analysis
  - Back out firms' (killer acquisition) motive from observable outcomes
  - Analyzing "randomly assigned" acquisitions is not meaningful
- Challenge (as a detective)
  - Observing an acquisition does not tell us what type of acquisition it is
  - Observing an acquisition + discontinuation does not either (euthanasia)
- Our approach: compare overlapping and non-overlapping acquisitions
  - Overlapping: combination of "killing" and "development" motives
  - Non-overlapping: only "development" motives
  - **Difference**: existence/size of the "killing" motive

Back

What Random Variation Could We Use?

- Random variation?
  - Deal-level variation: may not be the most appropriate
  - Aggregate variation: can help "identify" the aggregate effects
- Logic: shock the "benefit" of killer acquisitions at the aggregate level
  - Shock to the benefit of suppressing competition for some firms
  - Outcomes: aggregate acquisition level; post acquisition continuation
- Which aggregate shocks alter the intention to "kill"?
  - Short answer: no perfect shock yet
  - Candidates:
    - Medicare prescription drug coverage
    - Sudden discovery of new technologies
    - FDA public health advisories to competing drugs

Back


Randomization Test of Overlapping Acquisitions
.15
.1
.05
0
.19
.195
.2
.205
Proportion of Overlapping Acq

“Pre-trend”

	Continuation Event = 1			
d[t-3] × Overlap	-0.011	-0.011	-0.005	-0.031
	(-0.476)	(-0.369)	(-0.176)	(-0.982)
d[t-2] × Overlap	-0.025	0.015	0.024	0.012
	(-1.068)	(0.513)	(0.793)	(0.381)
d[t-1] × Overlap	-0.043**	-0.022	-0.018	-0.040
	(-1.988)	(-0.855)	(-0.690)	(-1.355)
d[t-3]	-0.001	0.010	0.013	0.015
	(-0.112)	(0.607)	(0.768)	(0.862)
d[t-2]	0.008	0.017	0.018	0.020
	(0.721)	(1.118)	(1.128)	(1.178)
d[t-1]	-0.010	-0.002	-0.000	-0.003
	(-0.993)	(-0.124)	(-0.030)	(-0.171)
Other variables	**Omitted**			
Observations	143,569	143,569	143,569	143,569
R-squared	0.038	0.256	0.294	0.370
Vintage FE	Y	Y	Y	Y
Age FE	Y			
Age FE X Therapeutic Class X MOA		Y	Y	Y
Originator [Target Company] FE			Y	
Project FE				Y

Back

Main Result: "Overlapping" Definition

	(1)	(2)	(3)	(4)
	Development Event = 1			
I(Acquired) × I(Post) × Overlap (TC-MOA)	–0.052***	–0.037**	–0.036**	–0.051**
	(0.014)	(0.015)	(0.016)	(0.020)
I(Acquired) × I(Post) × Overlap (TC)	–0.046***	–0.018	–0.022	–0.036*
	(0.012)	(0.017)	(0.018)	(0.021)
I(Acquired) × I(Post)	–0.005	–0.012	–0.010	–0.013
	(0.007)	(0.009)	(0.010)	(0.012)
I(Acquired) × Overlap (TC-MOA)	0.009	0.007	0.034**	
	(0.008)	(0.009)	(0.013)	
I(Acquired) × Overlap (TC)	0.013*	–0.007	0.015	
	(0.007)	(0.010)	(0.013)	
I(Acquired)	–0.007	–0.001	–0.015	
	(0.005)	(0.006)	(0.013)	
Observations	143,569	143,569	143,569	143,569
R-squared	0.037	0.252	0.289	0.366
Vintage FE	Y	Y	Y	
Age FE	Y			
Age FE × TC × MOA		Y	Y	Y
Originator [Target company] FE			Y	
Project FE				Y

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Vintage FE	Y	Y	Y	
Age FE	Y			
Age FE × TC × MOA		Y	Y	Y
Originator [Target company] FE			Y	
Project FE				Y

- Takeaway: "Killer acquisitions" exist for broader overlapping definitions.

Back

Further Results: Clinical Trials (From Phase I to Phase II)

	Phase II = 1			
	(1)	(2)	(3)	(4)
		Low Competition	High Competition	Interacted
I(Acq'd by Overlapping Firms)	-0.177***	-0.356***	-0.142***	-0.126***
	(0.028)	(0.071)	(0.031)	(0.030)
$\cdots \times$ Low Competition				-0.221***
				(0.077)
Competition Measure	Existing Product			
Observations	1,860	511	1,348	1,860
R-squared	0.151	0.286	0.156	0.161
Phase I Start Year FE	Y	Y	Y	Y

Back

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- Takeaway: Acquired overlapping projects are less likely to reach Phase II.

Back

Alternative Interpretations

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- Is lack of development due to **optimal project selection**.
  - **No.** Results are unchanged for single-drug targets.

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- Is lack of development due to **optimal project selection**.
    - **No.** Results are unchanged for single-drug targets.
- Is lack of development due to **real termination**?
- Are killer acquisitions **technology acquisitions**?
- Are killer acquisitions **acquihires**?
- Are killer acquisitions **salvage acquisitions**?

Actual Termination

- A purposefully terminated project should incur no post-acquisition development events
  - Focus only on the sample of acquired projects and examine whether they incur **any** development events post-acquisition
  - Post-acquisition, overlapping projects are 32.9 percentage points (54%) more likely to have no development events than non-overlapping projects

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  - Focus only on the sample of acquired projects and examine whether they incur **any** development events post-acquisition
  - Post-acquisition, overlapping projects are 32.9 percentage points (54%) more likely to have no development events than non-overlapping projects
- Confirm that main results are driven by acquired terminated projects
  - Re-run our main analyses but take out the "never-developed" projects
  - No significant differences in likelihood of development events between acquired-overlap and acquired-non-overlap projects

Alternative Specifications

	(1)	(2)	(3)
	Development Event =1		No Development = 1
I(Acquired) × I(Post) × Overlap	-0.050**	0.005	0.149***
	(0.023)	(0.035)	(0.033)
I(Acquired) × I(Post)	-0.024	-0.095***	0.401***
	(0.015)	(0.013)	(0.021)
Observations	27,784	7,916	9,227
R-squared	0.445	0.155	0.47
Sample:	Acquired Projects	w/o "never developed"	Acquired Projects
Therapeutic X MOA FE			Y
Age X Therapeutic X MOA FE	Y	Y	
Project FE	Y	Y	Y

Redeployment of Technologies

- Another alternative explanation is "project killed, technology re-used"
  - Do acquirers redeploy technologies from killed projects?

	(1)	(2)	(3)	(4)	(5)	(6)
	Chemical Similarity			Citation to Targets		
I(Post) $\times$ Overlap	0.001	0.000	0.002	-0.002	-0.002	-0.000
	(0.481)	(0.111)	(0.872)	(-1.078)	(-1.052)	(-0.788)
I(Post)	-0.002	-0.001	-0.004	0.000	0.001	-0.000
	(-0.609)	(-0.295)	(-1.364)	(0.056)	(0.931)	(-0.005)
Overlap	0.004	0.004		0.002	0.002	
	(1.263)	(1.206)		(1.078)	(0.929)	
Observations	154,896	154,896	154,896	154,896	154,896	154,896
R-squared	0.001	0.014	0.361	0.001	0.094	0.154
Acquirer FE	No	Yes	No	No	Yes	No
Case FE	No	No	Yes	No	No	Yes

Mobility and Productivity of Human Capital

- Another alternative explanation is "human capital >> project"
  - Not necessarily true in pharmaceutical and medical device industry (Gompers et al., 2017) because the project itself is key
  - Inventor data allow analysis on human capital mobility and productivity

	Before Acquisition	After Acquisition	Difference
Those Who Move to Acquirer After Acquisition (22%)	4.572	3.160	-1.412***
Those Who Move to Other Firms After Acquisition (78%)	4.357	4.089	-0.267*
Difference	-0.215	0.929***	1.144***

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	Before Acquisition	After Acquisition	Difference
Those Who Move to Acquirer After Acquisition (22%)	4.572	3.160	-1.412***
Those Who Move to Other Firms After Acquisition (78%)	4.357	4.089	-0.267*
Difference	-0.215	0.929***	1.144***

Mobility and Productivity of Human Capital

- Another alternative explanation is "human capital >> project"
  - Not necessarily true in pharmaceutical and medical device industry (Gompers et al., 2017) because the project itself is key
  - Inventor data allow analysis on human capital mobility and productivity

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Difference	-0.215	0.929***	1.144***

Salvage Acquisitions?

- Another alternative explanation is "salvage" of dead/dying projects
  - No significant pre-trend difference in development for overlap acquisitions
  - Plus: overlapping acquisitions **are not** significantly cheaper

	(1)	(2)	(3)
	Ln(Acquisition Value)		
Overlap	0.126	0.025	-0.082
	(0.101)	(0.067)	(0.114)
Observations	14,660	14,660	14,660
R-squared	0.844	0.905	0.940
Acquirer FE	Y	Y	Y
Age FE	Y	Y	
Therapeutic Class X MOA FE		Y	
Age X Therapeutic Class X MOA FE			Y

Common Ownership

Florian Ederer

Yale University

CEMFI Summer School 2021

Introduction

What is the Common Ownership Hypothesis?

- Economics starts from the premise that firms maximize profits.
  - Friedman (1953): natural selection of firms and billiards players.
  - Alternative interpretation: they answer to investors, maximize shareholder value.
- So what do investors want?
  - Some (large) investors may hold stakes in you *and your competitor*. These are called "common owners."
  - Common owners may want to maximize industry profits, not firm profits.
- As a theory of firm behavior in joint ventures this is an old idea. The recent innovation is to extend this approach to passive or institutional investors

Delta Air Lines	[%]
Berkshire Hathaway	8.25
BlackRock	6.84
Vanguard	6.31
State Street Global Advisors	4.28
J.P. Morgan Asset Mgt.	3.79
Lansdowne Partners Limited	3.60
PRIMECAP	2.85
AllianceBernstein L.P.	1.67
Fidelity	1.54
PAR Capital Mgt.	1.52

Southwest Airlines Co.	[%]
PRIMECAP	11.78
Berkshire Hathaway	7.02
Vanguard	6.21
BlackRock	5.96
Fidelity	5.53
State Street Global Advisors	3.76
J.P. Morgan Asset Mgt.	1.31
T. Rowe Price	1.26
BNY Mellon Asset Mgt.	1.22
Egerton Capital (UK) LLP	1.10

American Airlines	[%]
T. Rowe Price	13.99
PRIMECAP	8.97
Berkshire Hathaway	7.75
Vanguard	6.02
BlackRock	5.82
State Street Global Advisors	3.71
Fidelity	3.30
Putnam	1.18
Morgan Stanley	1.17
Northern Trust Global Inv	1.02

United Continental Holdings	[%]
Berkshire Hathaway	9.20
BlackRock	7.11
Vanguard	6.88
PRIMECAP	6.27
PAR Capital Mgt.	5.18
State Street Global Advisors	3.45
J.P. Morgan Asset Mgt.	3.35
Altimeter Capital Mgt.	3.26
T. Rowe Price	2.25
AQR Capital Management	2.15

Alaska Air	[%]
T. Rowe Price	10.14
Vanguard	9.73
BlackRock	5.60
PRIMECAP	4.95
PAR Capital Mgt.	3.65
State Street Global Advisors	3.52
Franklin Resources	2.59
BNY Mellon Asset Mgt.	2.34
Citadel	1.98
Renaissance Techn.	1.93

JetBlue Airways	[%]
Vanguard	7.96
Fidelity	7.58
BlackRock	7.33
PRIMECAP	5.91
Goldman Sachs Asset Mgt.	2.94
Dimensional Fund Advisors	2.42
State Street Global Advisors	2.40
Wellington	2.07
Donald Smith Co.	1.80
BarrowHanley	1.52

Common Ownership in the News

- The Atlantic: "Are Index Funds Evil?"
- The Economist: "Stealth Socialism"
- Bloomberg: "Index-Crazed Investors Turning S&P 500 Into One Gigantic Company"
- MoneyWeek: "Index Funds: Killing Capitalism?"
- Reuters: "When BlackRock Calls, CEOs Listen and do Deals"

Common Ownership in the News

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- MoneyWeek: “Index Funds: Killing Capitalism?”
- Reuters: “When BlackRock Calls, CEOs Listen and do Deals”
  - “There is no CEO that doesn’t return our call because typically we’re up high on the shareholder register,” Mark McCombe, global head of BlackRock’s institutional client business, told Reuters reporters and editors attending the Reuters Global Wealth Management Summit on Friday.
    “We are everybody’s largest shareholder.”

Old Theory, New Empirics

- Old theory: Rubinstein & Yaari (1983), Rotemberg (1984), Reynolds & Snapp (1986), Bresnahan & Salop (1986), O'Brien & Salop (2000)
- New empirics on price effects: Azar, Schmalz & Tecu (2016), Azar, Schmalz & Raina (2017).
- Remedies: Elhauge (2016) Posner, Scott Morton & Weyl (2016)
- A very active literature: Gramlich & Grundl (2017), Kennedy, O'Brien, Song & Waehrer (2017), Rock & Rubinfeld (2017), Patel (2017)
- New directions: Lopez & Vives (2018), Banal-Estañol, Seldeslachts & Newham (2018), Antón, Ederer, Giné & Schmalz (2021)

Agenda=

A Big Picture View of Common Ownership

- A brief theoretical overview
- Macro level view on the extent of and trends in common ownership

Industry Evidence on Common Ownership

- Airlines
- Ready-to-eat cereal

Common Ownership Mechanism

- How can common ownership actually influence firm behavior?

A Big Picture View of Common Ownership

From Rotemberg (1984)

- Investor s in firm f has cash flow rights β_{fs}.
- Investor payoffs depend on their portfolio, $\sum_g \beta_{gs}\pi_g$.
- The firm solves a social choice problem by placing Pareto weight γ_{fs} on the payoffs of investor s.
- Now, the firm maximizes

$$\begin{aligned} Q_f &= \sum_{s=1}^{S} \gamma_{fs} \sum_{g=1}^{G} \beta_{gs}\pi_g \\ &\propto \pi_f + \sum_{g \neq f} \underbrace{\frac{\sum_s \gamma_{fs}\beta_{gs}}{\sum_s \gamma_{fs}\beta_{fs}}}_{\equiv \kappa_{fg}} \pi_g = \pi_f + \sum_{g \neq f} \kappa_{fg}\pi_g . \end{aligned}$$

So what is κ?

$$
\begin{aligned}
Q_f &= \pi_f + \sum_{g \neq f} \kappa_{fg} \pi_g \\
\kappa_{fg} &= \frac{\sum_s \gamma_{fs} \beta_{gs}}{\sum_s \gamma_{fs} \beta_{fs}}
\end{aligned}
$$

- κ_{fg} is interpreted as a profit weight, where one dollar of profits at firm g are valued as κ_{fg} dollars in the objective function of firm f.
- Depends on two primitives: β and γ.

So what is β?

- β_{fs} is the cash flow right that investor s has in firm f.
- $\beta_{fs} = \frac{\text{shares}_{fs}}{\text{shares outstanding}_f}$.
- SEC requires large investors ($>$ \$100M AUM) to submit quarterly 13f filings
- $\rightarrow \beta$ is (mostly) observable in data.

So what is γ?

This is the firm's Pareto weight on investor s. Something we need to make assumptions about. Some intuitive properties we want for $\gamma = f(\beta)$:

- γ_{fs} increasing in β_{fs}
- $\gamma_{fs} \to 0$ as $\beta_{fs} \to 0$

The literature often assumes proportional control: $\gamma = \beta$.

- Proportional Control: $\gamma = \beta$ has some clean math
- We will expand this to $\gamma = \beta^{\alpha}$ to allow for convex weights on investors: $f(\beta) = [\sqrt{\beta}, \beta, \beta^2, \beta^3]$.
- Other alternatives $\gamma = f(\beta)$ (CLWY, GGL).

Helpful to treat β_f, γ_f as $S \times 1$ vectors:

$$\kappa_{fg} = \frac{\sum_s \gamma_{fs}\beta_{gs}}{\sum_s \gamma_{fs}\beta_{fs}} = \frac{\langle \beta_f, \beta_g \rangle}{\langle \beta_f, \beta_f \rangle}$$
$$= \frac{\cos(\beta_f, \beta_g)}{\cos(\beta_f, \beta_f)} \frac{\|\beta_f\| \, \|\beta_g\|}{\|\beta_f\| \, \|\beta_f\|} = \cos(\beta_f, \beta_g) \frac{\sqrt{IHHI_g}}{\sqrt{IHHI_f}}$$

- Small/Retail investors don't matter. In L_2 norm $\epsilon^2 \to 0$. Result not an assumption.
- Common ownership incentives are closely tied to investor concentration via IHHI and diverisification via $\cos(\beta_f, \beta_g)$.

A Simple Example (with $\gamma = \beta$)

- Firm 1 is controlled by an undiversified owner.
- Firms 2 and 3 have symmetric structures:
  - 60% undiversified, retail investors with no influence ($\gamma = 0$)
  - 20% two undiversified, institutional investors ($\gamma = 0.5$)
  - 20% commonly owned, institutional investor ($\gamma = 0.5$)

Then,

$$\kappa = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1/2 \\ 0 & 1/2 & 1 \end{bmatrix}$$

A Strange Example (still $\gamma = \beta$)

- Firm 1 has
  - N diversified, symmetric institutional investors with 1% each.
  - Undiversified retail investors ($\gamma = 0$) own remainder.
- Firms 2 has
  - Same N institutional investors with x% each.
  - Undiversified retail investors ($\gamma = 0$) own remainder.

Then,

$$\kappa = \begin{bmatrix} 1 & x \\ \frac{1}{x} & 1 \end{bmatrix}$$

Common Ownership and Pricing: Symmetric Cournot

$$\max_{q_f} \pi_f(q_f, q_{-f}) + \sum_g \kappa_{fg} \pi_g(q_f, q_{-f})$$

Taking the FOC:

$$\frac{P_f - MC_f}{P_f} = \frac{1}{\eta} \sum_g \kappa_{fg} s_g$$

Yielding the share-weighted average markup:

$$\sum_f s_f \frac{P_f - MC_f}{P_f} = \underbrace{\frac{1}{\eta} \sum_f \sum_g \kappa_{fg} s_g s_f}_{MHHI} = \frac{1}{\epsilon} \left[\underbrace{\sum_f s_f^2}_{HHI} + \underbrace{\sum_f \sum_{g \neq f} \kappa_{fg} s_f s_g}_{MHHID} \right]$$

MHHI vs κ's

- κ's characterize the objective function of a firm. MHHI is specific to Cournot.
- MHHI has the usual problem of market definition.
- MHHI requires more data – misleading if you exclude private and foreign firms.
- MHHI throws away cross-firm variation in κ_{fg} and instead create cross-market variation where it didn't exist. (by interacting κ_{fg} with endogenous shares s_f, s_g). This can lead to spurious results...
- But as a first start, it's not too terrible and it was used by antitrust authorities.

Common Ownership in the S&P 500

- Backus, Conlon & Sinkinson (2021) compute κ weights for the universe of S&P 500 firms from 1980 to 2017.
- Consider *every* pairwise combination of S&P firms.
- Useful for painting a broad picture of trends and features of common ownership.
- Caveat: This is by far not the first such exercise (Azar 2012)

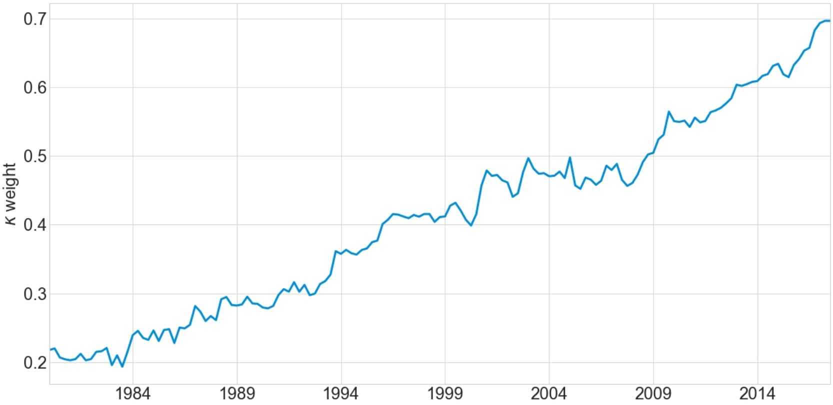
Some Eye-opening Facts

- Massive trend towards higher profit weights κ.
- Control is at best an assumption but doesn't drive results.
- Rising investor concentration (BlackRock, Vanguard, etc.) is not the right story.

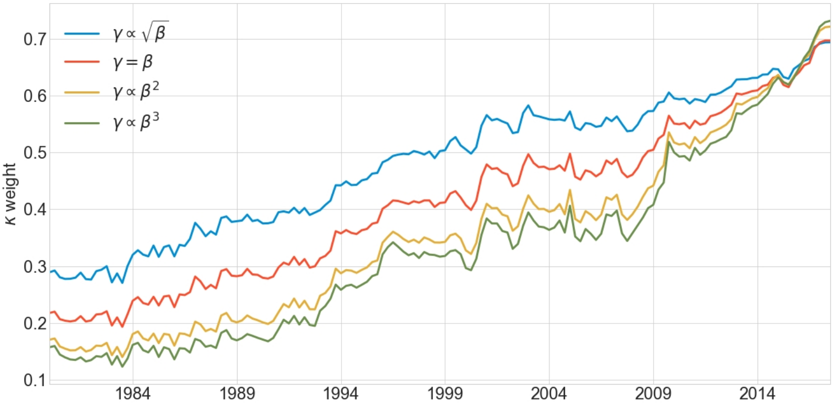
Some Eye-opening Facts

- Massive trend towards higher profit weights κ.
- Control is at best an assumption but doesn't drive results.
- Rising investor concentration (BlackRock, Vanguard, etc.) is not the right story.
- More likely culprits:
  - Widespread indexing/diversification.
  - High retail share
  - High market cap

Average κ: 1980–2017, Proportional Control



Average κ: 1980–2017, Alternative γ



Properties of κ (Proportional Control)

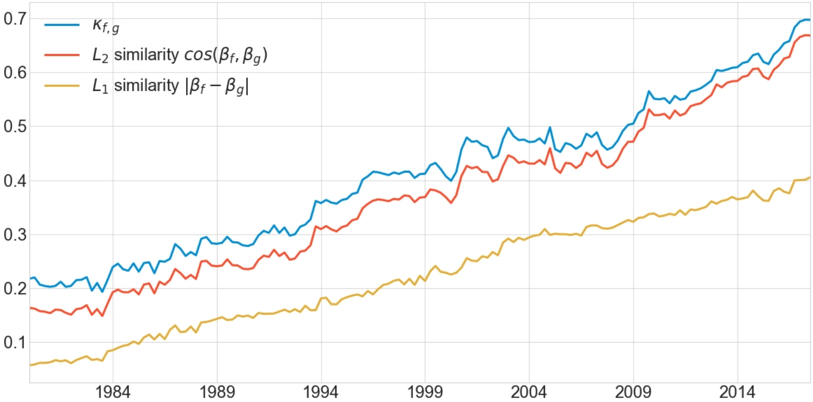
Helpful to treat β_f, γ_f as $S \times 1$ vectors:

$$\kappa_{fg} = \frac{\sum_s \gamma_{fs}\beta_{gs}}{\sum_s \gamma_{fs}\beta_{fs}} = \frac{\langle \gamma_f, \beta_g \rangle}{\langle \gamma_f, \beta_f \rangle}$$

$$= \frac{\cos(\gamma_f, \beta_g)}{\cos(\gamma_f, \beta_f)} \frac{\|\gamma_f\| \, \|\beta_g\|}{\|\gamma_f\| \, \|\beta_f\|} = \cos(\beta_f, \beta_g) \cdot \frac{\sqrt{IHHI_g}}{\sqrt{IHHI_f}}$$

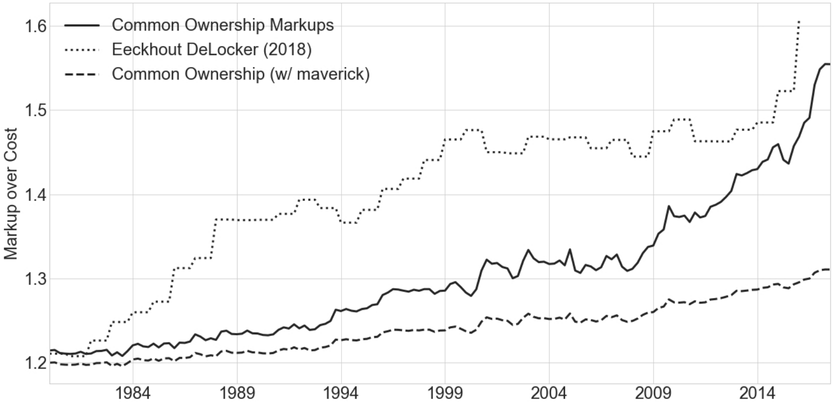
- More similar investor portfolios: angle between $(\beta_f, \beta_g) \to 0$ implies $\cos(\theta) \to 1$. This is likely driven by indexing
- $IHHI_f$ is the Investor HHI for firm f: $\|\beta_f\| = \sum_s \beta_{fs}^2$.
- You put less weight on your competitors when you have more concentrated investors.
- Common ownership incentives are closely tied to investor concentration, both in levels and in dispersion.

Investor Similarity and κ: 1980–2017



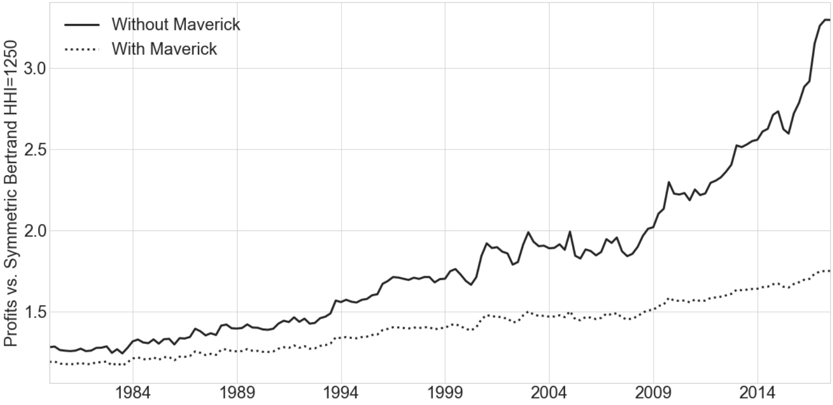
$$\kappa_{fg} = \cos(\beta_f, \beta_g)\frac{\sqrt{IHHI_g}}{\sqrt{IHHI_f}}$$

How much can common ownership explain?



- Eight symmetric firms (HHI = 1250), logit demand
- Calibrate to markup of 1.21 from De Loecker, Eeckhout & Unger (2019) yields price elasticity of -7 (Eaton and Kortum say -8)

And profits?



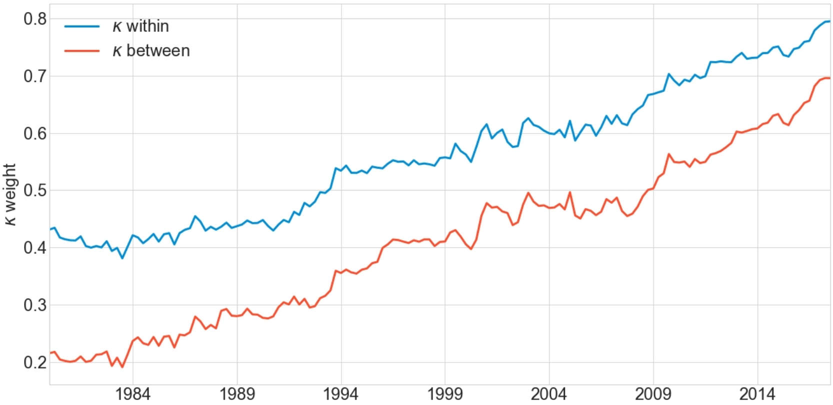
- Blue line depicts ratio of profits under common ownership to standard Bertrand
- "Maverick" is an entirely private firm

An Objection

This was all motivated with a story about price competition, but ...

- Pairs of S&P 500 Index firms may or may not be in direct competition
  - See Ederer & Pellegrino (2021) for a macro analysis with adequate industry definitions
- Indeed, if vertically related, common ownership may be a *good* thing.
- How does κ compare within and between industries?

Within and Between SIC

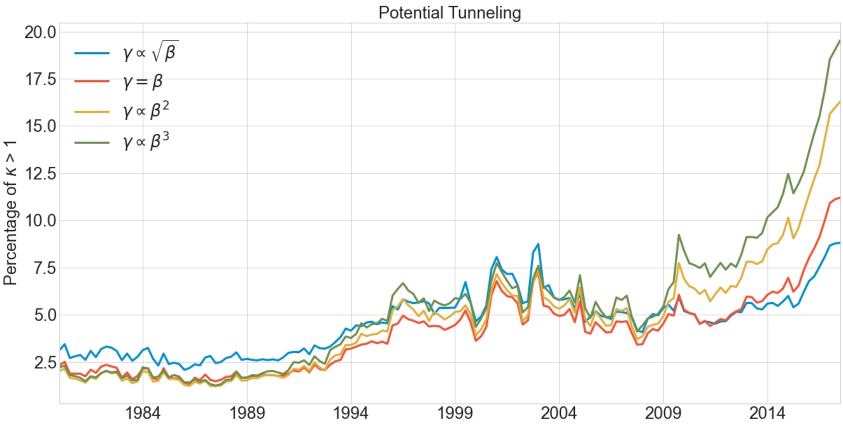


Higher within industry but not a huge difference

Background on Tunneling

- Control rights vs cash flow rights
- Suppose an investor has *control rights* in two firms, but different levels of *cash flow* rights
- Then the investor has an incentive to use their control rights to transfer assets from the low cash flow rights firm to the high cash flow rights firm
  - Setup equivalent to $\kappa > 1$
  - Lucrative procurement contracts offered to the latter?
  - Is this why Tesla bought SolarCity?
- However, this is not thought to happen in the US.
- Typically thought to happen when control rights are concentrated (e.g., dual-class shares)
- Not common in the world of the Berle & Means (1932) "widely-held firm"

κ and Tunneling

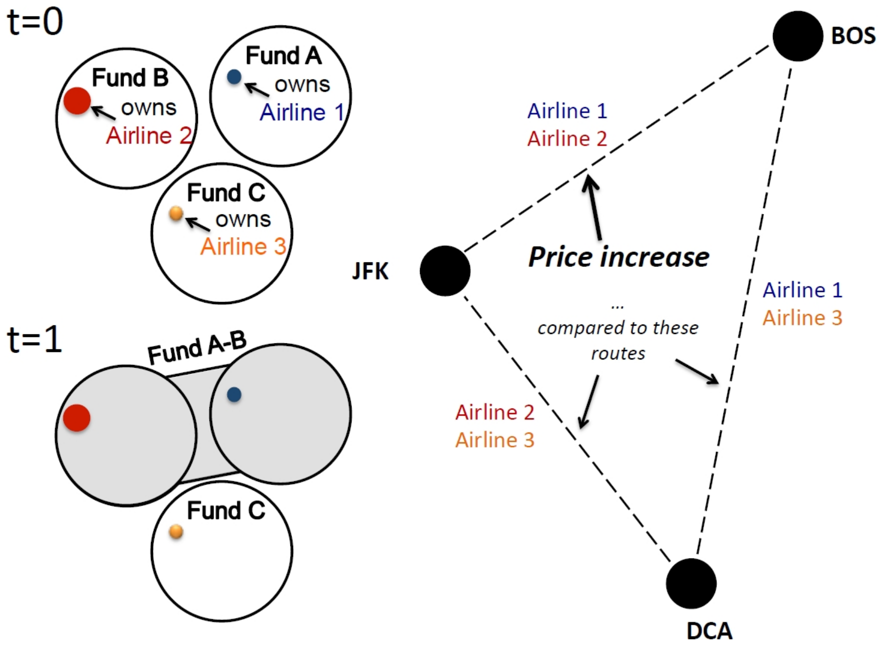


Industry Evidence on Common Ownership

Azar, Schmalz & Tecu (2018) Airlines

- Seminal paper that created an entire literature
- Much previous theory and broad empirics ...
- ... but no empirical evidence on anticompetitive effects of common ownership
- But like any seminal paper, it is just a first pass!

Main Idea


t=0
Fund B
owns
Airline 2
Fund A
owns
Airline 1
Fund C
owns
Airline 3
t=1
Fund A-B
Fund C
BOS
JFK
DCA
Airline 1
Airline 2
Price increase
...
compared to these routes
Airline 1
Airline 3
Airline 2
Airline 3

Main Results

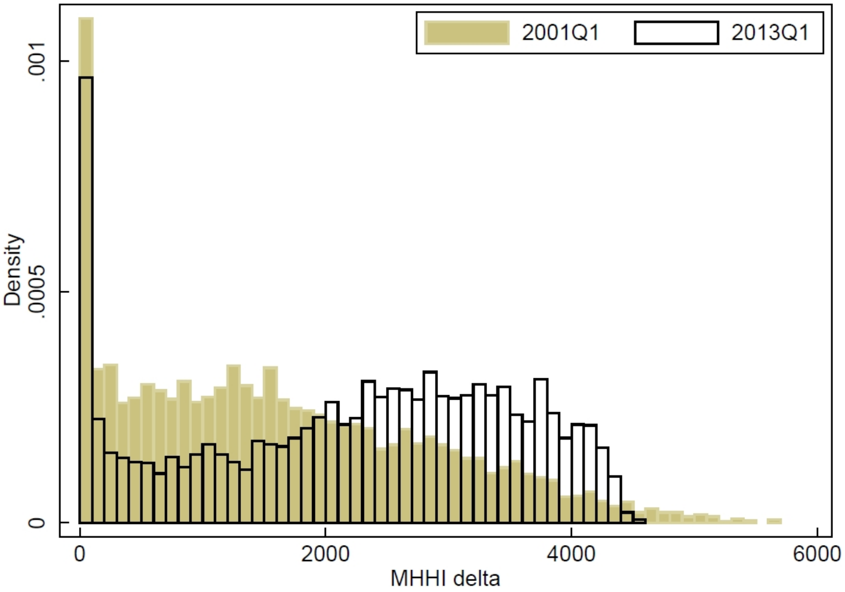
- Measure market ownership-adjusted concentration
  - Anti-competitive incentives due to common ownership in the average US airline route: 2,200 HHI points
  - 10 times larger than what DoJ/FTC horizontal merger guidelines presume "likely to enhance market power"
- Identify price effect
  - Prices 3-11% higher compared to separate ownership
  - Single merger of asset managers causes 0.6% price increase
  - Large compared to 1-4% proft margins (IATA)

- **Assumption**: firm j maximizes a weighted average of its owners' economic interests: their **portfolio** profits with control rights γ_{ij} and cash flow rights β_{ik}
- **Result**: Cournot $\implies$ markup $\propto$ MHHI $=$ HHI $+$ MHHI delta

$$\eta \sum_j s_j \frac{P - C_j'(x_j)}{P} = \sum_j s_j^2 + \sum_j \sum_{k \neq j} s_j s_k \frac{\sum_i \gamma_i j \beta_{ik}}{\sum_i \gamma_i j \beta_{ik}}$$

- **Unilateral effects**: no coordination or communication

Rise of Common Ownership at the Route Level



Panel Regressions

- Carrier regressions for carrier j in route r at time t

$$\log(p_{rjt}) = \beta \cdot MHHIdelta_{rt} + \gamma \cdot HHI_{rt} + \theta \cdot X_{rjt} + \alpha_t + \nu_{rj} + \epsilon_{rjt}$$

- Market regressions

$$\log(p_{rt}) = \beta \cdot MHHIdelta_{rt} + \gamma \cdot HHI_{rt} + \theta \cdot X_{rt} + \alpha_t + \nu_r + \epsilon_{rt}$$

Panel Results

	Dependent Variable: Log(Average Fare)					
	Market-carrier level			Market level		
	(1)	(2)	(3)	(4)	(5)	(6)
MHHI delta	0.194***	0.219***	0.149***	0.325***	0.311***	0.202***
	(0.0459)	(0.0387)	(0.0375)	(0.0446)	(0.0397)	(0.0356)
HHI	0.221***	0.230***	0.165***	0.365***	0.357***	0.255***
	(0.0247)	(0.0246)	(0.0209)	(0.0315)	(0.0313)	(0.0244)
Number of Nonstop Carriers			-0.00979***			-0.00810**
			(0.00269)			(0.00371)
Southwest Indicator			-0.120***			-0.149***
			(0.00928)			(0.0135)
Other LCC Indicator			-0.0618***			-0.100***
			(0.00717)			(0.00989)
Share of Passengers Traveling Connect, Market Level			0.124***			0.158***
			(0.0167)			(0.0189)
Share of Passengers Traveling Connect			0.0986***			
			(0.0143)			
Log(Population)			0.306***			0.343***
			(0.106)			(0.122)
Log(Income Per Capita)			0.374***			0.304***
			(0.102)			(0.110)
Log(Distance) × Year-Quarter FE		✓	✓		✓	✓
Year-Quarter FE	✓	✓	✓	✓	✓	✓
Market-Carrier FE	✓	✓	✓			
Market FE				✓	✓	✓
Observations	1,237,584	1,237,584	1,209,517	262,350	262,350	254,999
R^2	0.820	0.825	0.836	0.852	0.861	0.876
Number of market-carrier pairs	46,513	46,513	45,248			
Number of markets				7,185	7,185	6,906

Diff-in-diff and IV Strategies

- BlackRock announces acquisition of BGI in 2009:Q2, consummated in 2009:Q4
- Airlines are a small fraction of both firms' portfolios
  - Assume acquisition was not caused by differences across routes in expected ticket price changes
- Route-level treatment variable:
  - 2009:Q1-implied change in MHHI delta_r $=$ Hypothetically-combined MHHI delta_r - Separate MHHI delta_r,
- Average ticket prices 10% to 12% higher due to common ownership and 0.5% due to BlackRock-BGI merger.

Backus, Conlon & Sinkinson (2021) RTE Cereal

- If common ownership hypothesis is true, its effects should be widespread throughout economy.
- Long history in IO of conduct papers on RTE Cereal:
  - FTC Case and Schmalensee (1978) on product proliferation to deter entry.
  - Documented price wars in 1996 (Michel Weiergraeber 2018) and 2010.
  - Nevo (2000): static Bertrand is reasonable for 1988-1992.
  - Posner, Scott Morton & Weyl (2017) list cereal as a suspect in their Appendix.
- ($C_4 = 85\%$) with a privately-held fringe
- Lots going on in ownership that gives us (plausibly exogenous) variation in κ.
- Demanding exclusion restrictions might actually work.

Competitors

$24B

$29B

$160B

$5.7B

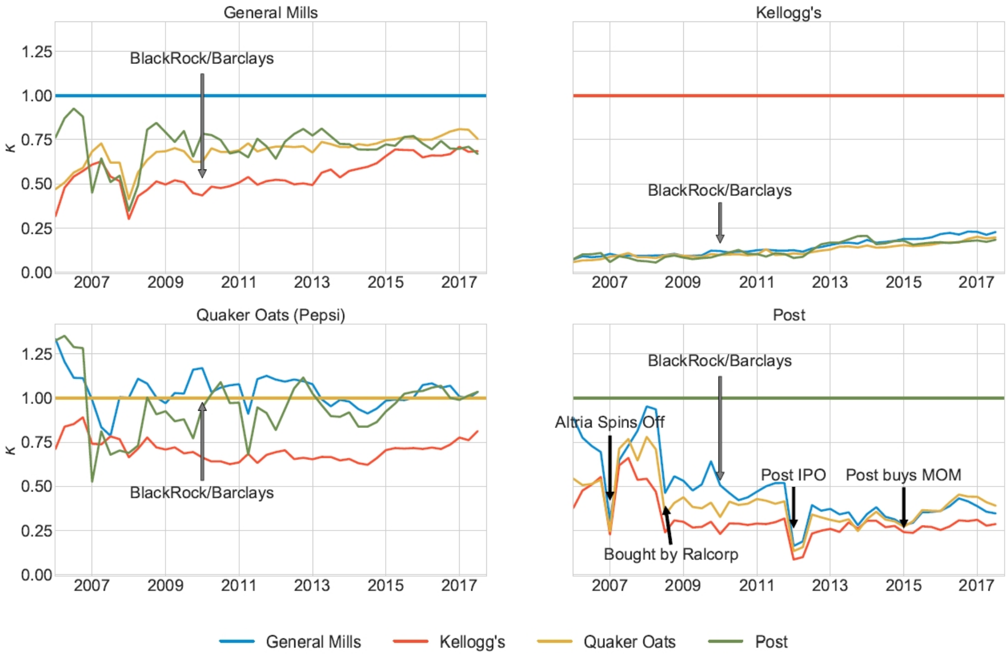
The Kellogg Foundation

- Early 20th Century at the Battle Creek Sanitarium: JH Kellogg was creating cereal (including "granula" and corn flakes) to combat the "solitary vice"
- Also, a pretty unlikeable guy (early supporter of eugenics, etc)
- In an explicit rebuke of JH Kellogg's views, brother (and partner) WK Kellogg donates a very large stake to found the Kellogg Foundation, to support children "without regard to sex, race, creed nationality"
- **The Kellogg Foundation (along with Gund family) are undiversified investors.**

Post's Adventure

- Origin: Another alum of the Battle Creek Sanitarium, this time a patient, invented Grape Nuts to cure appendicitis
- Since 1989, part of Kraft Foods, owned by Philip Morris/Altria
- Altria sells 80% stake in Kraft in Q1 2007
- **Kraft sells Post to Ralcorp in Q3 2008**
- **Post IPO in Q1 2012**
- December 31, 2012, Post acquired Attune Foods (Erewhon, Attune, Uncle Sam)
- May 4, 2015, Post buys private-label producer MOM Brands

Profit Weights (κ) for RTE Cereal



Testing Conduct

- "Conduct" is neither demand nor supply, it is about the equilibrium restrictions that join them.
- Equilibrium means MR $=$ MC, but which MR/MC?
  - MR $=$ demand? (Perfect competition)
  - MC includes opportunity cost of sales diverted from portfolio brands? (Multiproduct oligopoly)
  - MC includes opportunity cost of sales diverted from other firms? (Collusion and common ownership)
- Simple if we observe prices, market shares, and marginal costs ... but we don't observe all of them!

Common Ownership and Pricing: Bertrand

Let κ represent the weight a firm places on competitors. Starting with the objective function,

$$\max_{p_j \,:\, j \in \mathcal{J}_f} \sum_{j \in \mathcal{J}_f} (p_j - mc_j) \cdot s_j(\mathbf{p}) + \sum_{g \neq f} \kappa_{fg} \sum_{j \in \mathcal{J}_g} (p_k - mc_k) \cdot s_k(\mathbf{p})$$

We obtain first order conditions

$$\begin{aligned} s_j(p) + \frac{\partial s_j}{\partial p_j}(\mathbf{p}) \cdot (p_j - mc_j) + \sum_{k \in \mathcal{J}_f} \frac{\partial s_k}{\partial p_j}(\mathbf{p}) \cdot (p_k - mc_k) \\ + \sum_{g \neq f} \kappa_{fg} \sum_{k \in \mathcal{J}_g} \frac{\partial s_k}{\partial p_j}(\mathbf{p}) \cdot (p_k - mc_k) = 0. \end{aligned}$$

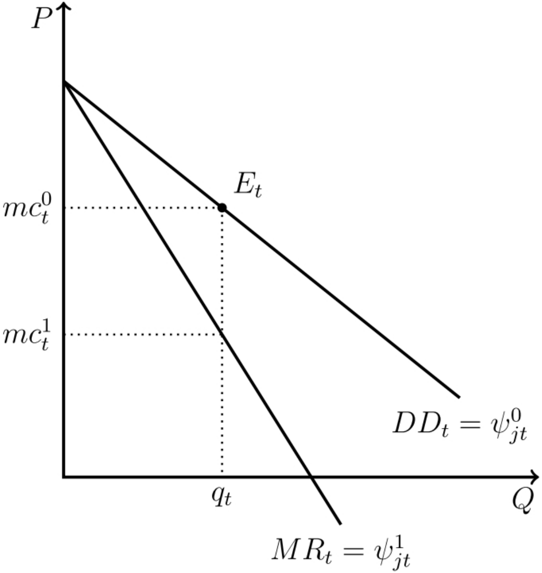
Conduct Testing in Industrial Organization

Literature on “conduct testing” begins as a response to the critique of market structure regressions.

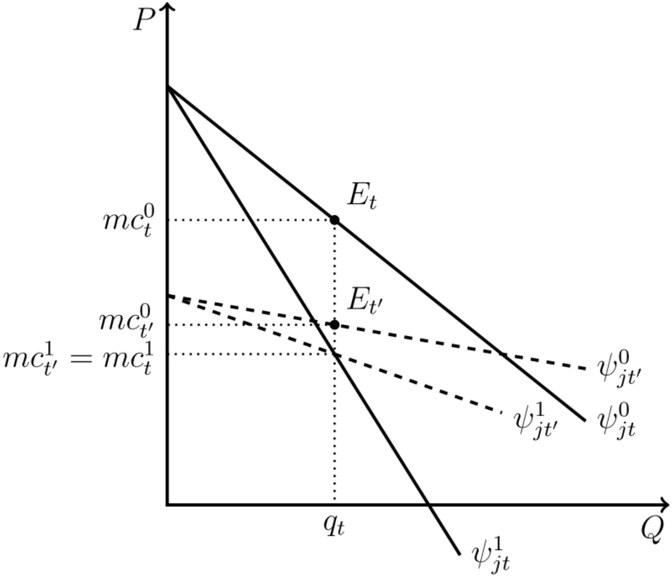
- Early work: Porter (1983), Bresnahan (1982, 1987)
- Subsequent work defined the “menu” approach: Nevo (1998, 2001), Villas-Boas (2007)
- Recent revival of conduct parameters: Miller and Weinberg (2017), Crawford, Lee, Whinston, and Yurukoglu (2017), Pakes (2017)

Is conduct testable? Berry and Haile (2014) emphatically say “Yes.”

Conduct Testing in Pictures (Berry & Haile 2014)



Conduct Testing in Pictures (Berry & Haile 2014)



Main Results

	Others' Costs	Demographics	BLP Inst.	Dmd. Opt. Inst.
Own Profit Max vs.	Panel 1: $A(\mathbf{z}_t) = \mathbf{z}_t$, linear $h_s(\cdot)$			
Common Ownership	-2.4732	-0.0079	-1.2333	-4.9099
Common Ownership (MA)	-2.5918	0.0070	-1.2105	-4.9215
Common Ownership (Lag)	-2.5208	0.0075	-1.2125	-4.9351
Perfect Competition	0.8611	-2.3033	-3.1652	-10.9229
Monopolist	-2.4166	-0.8783	-3.5162	-6.0048
Own Profit Max vs.	Panel 2: $A(\mathbf{z}_t) = \mathbb{E}[\Delta\eta^{12}\|\mathbf{z}_t]$, linear $h_s(\cdot)$ and $g(\cdot)$			
Common Ownership	-1.2859	-0.2126	-0.8317	-5.2361
Common Ownership (MA)	-1.3993	-0.2071	-0.8340	-5.3019
Common Ownership (Lag)	-1.3506	-0.2093	-0.8367	-5.3271
Perfect Competition	1.1732	-0.8843	-1.4708	-10.7559
Monopolist	-1.4038	-0.3243	-1.0613	-5.3183
Own Profit Max vs.	Panel 3: $A(\mathbf{z}_t) = \mathbb{E}[\Delta\eta^{12}\|\mathbf{z}_t]$, random forest $h_s(\cdot)$ and $g(\cdot)$			
Common Ownership	-4.8893	-5.4460	-5.4412	-5.9585
Common Ownership (MA)	-5.4345	-6.1348	-5.8757	-6.4357
Common Ownership (Lag)	-5.1770	-5.9221	-5.7041	-6.2255
Perfect Competition	-7.7749	-8.7051	-8.9758	-10.0654
Monopolist	-5.2711	-6.7789	-5.9158	-6.5933

Conduct Parameter Estimation

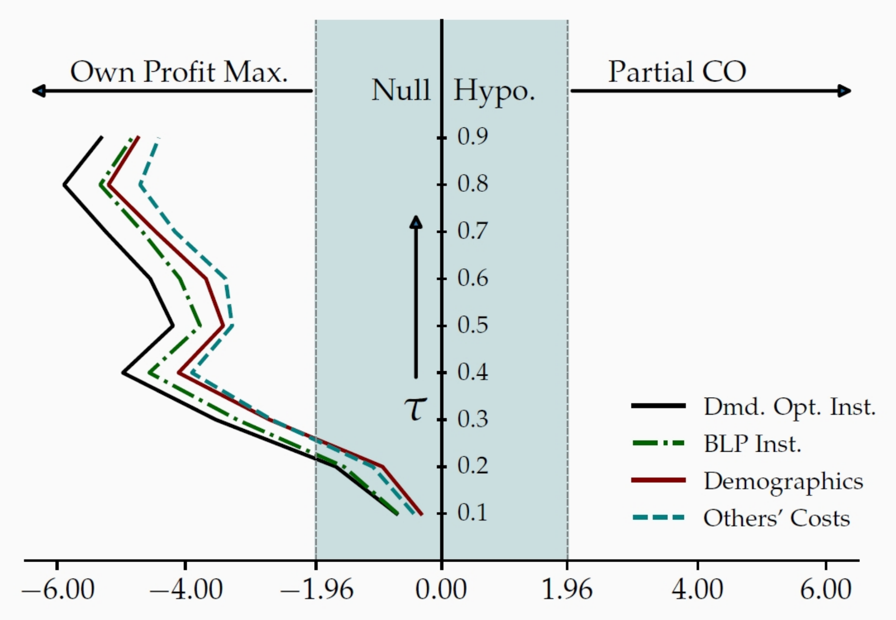
Let κ represent the weight a firm places on competitors and τ the internalization of those weights.

$$arg \max_{p_j \, : \, j \in \mathcal{J}_f} \sum_{j \in \mathcal{J}_f} (p_j - mc_j) \cdot s_j(\mathbf{p}) + \sum_{g \neq f} \tau \kappa_{fg} \sum_{j \in \mathcal{J}_g} (p_k - mc_k) \cdot s_k(\mathbf{p})$$

- $\tau = 0$ implies own-profit maximization
- $\tau = 1$ implies common ownership pricing
- τ in between is partial internalization

Test $\tau \in (0.1, \ldots, 0.9)$ against own-profit maximization

Conduct Parameter Results



Common Ownership Mechanism

Why do we need a (plausible) mechanism?

"... areas of research that I, as an antitrust enforcer, would like to see developed before shifting policy on common ownership [are]: Whether a clear mechanism can be identified ..."

—FTC Commissioner Noah J. Phillips
FTC Hearing on Common Ownership, December 6, 2018

"The organizational complexity of today's largest public companies makes it far from clear how–even if top managers receive an anticompetitive signal from their pay packages–those incentives affect those making pricing decisions throughout the organization. [...] For these reasons, I worry that the evidence we have today may not carry the heavy burden that, as a Commissioner sworn to protect investors, I would require to impose costly limitations."

—SEC Commissioner Robert J. Jackson Jr.
FTC Hearing on Common Ownership, December 6, 2018

A Direct Mechanism

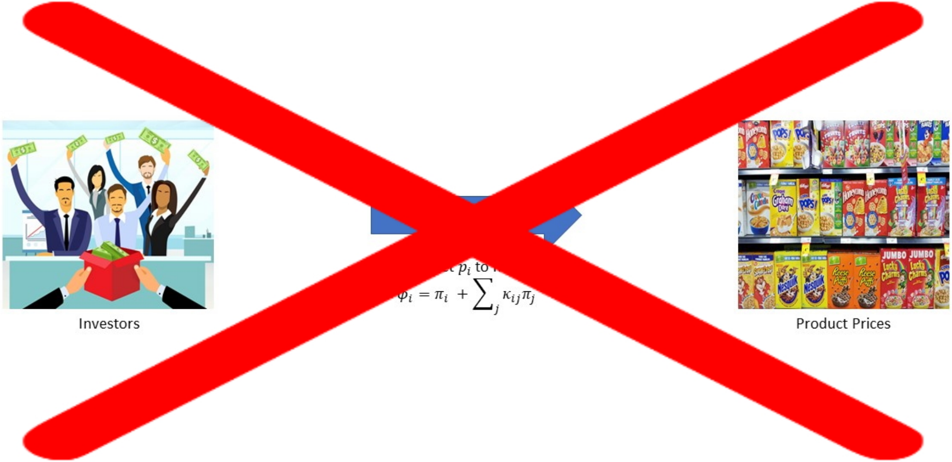
Investors

Directly set p_i to maximize

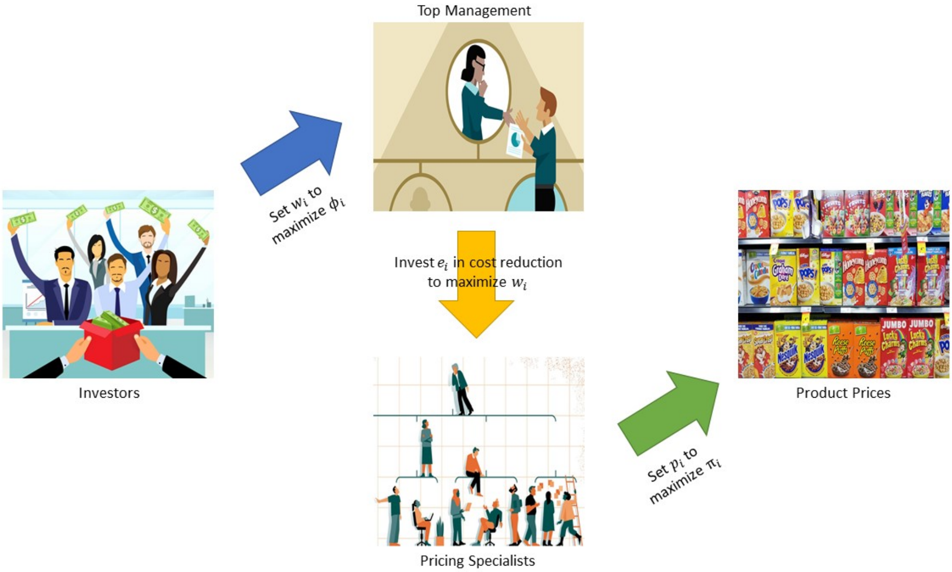
$$\phi_i = \pi_i + \sum_j \kappa_{ij} \pi_j$$

Product Prices

A Direct Mechanism



An Indirect Mechanism



Theoretical Framework

- 3 ingredients from 3 different fields
  - Organizational Economics: incentive design (managers) with delegation in multiproduct firms
  - Industrial Organization: strategic product market competition (pricing specialists)
  - Corporate Finance: common ownership (investors)
- More common ownership at the firm level leads to
  - **lower managerial incentives at the top of the firm** and lower productivity, and
  - higher prices and lower quantities at the industry and market level, and
  - price and quantity cross-market variation even within the same firm,
  - ... but does **not** lead to higher markups.
- A plausible mechanism that reconciles the (seemingly conflicting) empirical evidence

Empirical Analysis

- Evidence on central part of mechanism (common ownership $\uparrow \implies$ CEO incentives $\downarrow$)
  - Profit weight measures of common ownership ("kappas") (Backus et al., 2020)
  - Comprehensive measure of CEO incentives ("WPS") (Edmans et al., 2009)
- Negative empirical relationship between common ownership and managerial incentives
  - 25^{th} to 75^{th} percentile increase in common ownership reduces managerial WPS by 6.6%
  - Comparable in magnitude to the effect of firm volatility on managerial incentives
- Difference-in-differences design based on competitor index additions confirms result
  - Index addition of a competitor increases common ownership (Boller and Scott Morton, 2020)
  - Competitor index addition reduces WPS of CEOs of index incumbents by 13.4%

- Realistic features of firm organization
  - n multiproduct firms each with an organizational hierarchy (Tirole, 1986)
    - In each firm 1 top manager who makes high-level decisions (Bandiera et al., 2020) ...
    - ... but product-specific pricing (or quantity) decisions are delegated to m middle managers (e.g., divisional/regional managers) (Alonso et al., 2008; Rantakari, 2008; Bloom et al., 2012b; Alonso et al., 2015)
  - Owners do not use product-level incentives for middle managers.
  - Top & middle managers do not know their owners' portfolio shareholdings in other firms.
- Top manager can improve firm productivity through costly private effort
  - Large and persistent differences in productivity levels across businesses (Syverson, 2011)
  - Strongly influenced by management practices (Bloom et al., 2012a, 2019)
- No collusion or coordination between investors or managers

Model Setup

Equation	Description
$q_{i,l} = A - bp_{i,l} + a\sum_{j\neq i} p_{j,l}$	Product Demand for Firm i in Market l
$c_i = \bar{c} - e_i$	Productivity Improvement
$\pi_i = \sum_{l=1}^{m} \{[p_{i,l} - (\bar{c} - e_i)]q_{i,l}\} + \varepsilon_i$	Total Multiproduct Profits for Firm i
$w_i = s_i + \alpha_i \pi_i$	Top Manager Compensation
$\max_{e_i} CE_i = s_i + \alpha_i \pi_i - \frac{r}{2}\alpha_i^2\sigma^2 - \frac{1}{2}q_i e_i^2$	Top Manager Utility
$\max_{p_{i,l}} \pi_{i,l} = [p_{i,l} - (\bar{c} - e_i)]q_{i,l} + \varepsilon_i$	Middle Manager Objective Function
$\max_{s_i,\alpha_i} \phi_i = \pi_i - w_i + \sum_{j\neq i} \kappa_{ij}(\pi_j - w_j)$	Owner Objective Function

Key Intuition of the Model

- Stronger managerial incentives α_i encourage more productivity-improving effort e_i.
- Productivity-improving effort e_i by the manager has three effects:

  Margin effect increases price-cost margin: $p_i - (\bar{c} - e_i)$

  Price effect decreases price set by specialist: $p_i = \frac{1}{2b}A + b(\bar{c} - e_i) + a\sum_{j \neq i} p_j$

  Competition effect reduces competitor profits π_j through lower price p_i

- Different types of owners care differently about these three effects
  - Undiversified owner ($\kappa_{ij} = 0$) only cares about 1 and 2 which influence π_i.
  - Common owner ($\kappa_{ij} > 0$) cares about 1, 2, and 3 with concern for 3 increasing in κ_{ij}.

$$\frac{\partial \phi_i}{\partial \alpha_i} = \frac{\partial \pi_i^*}{\partial \alpha_i} - r\sigma^2\alpha_i^2 - q_i^*\alpha_i - \frac{\alpha_i^2}{2}\frac{\partial q_i^*}{\partial \alpha_i} + \sum_{j \neq i} \kappa_{ij}\left(\frac{\partial \pi_j^*}{\partial \alpha_i} - \frac{\alpha_j^2}{2}\frac{\partial q_j^*}{\partial \alpha_i}\right)$$

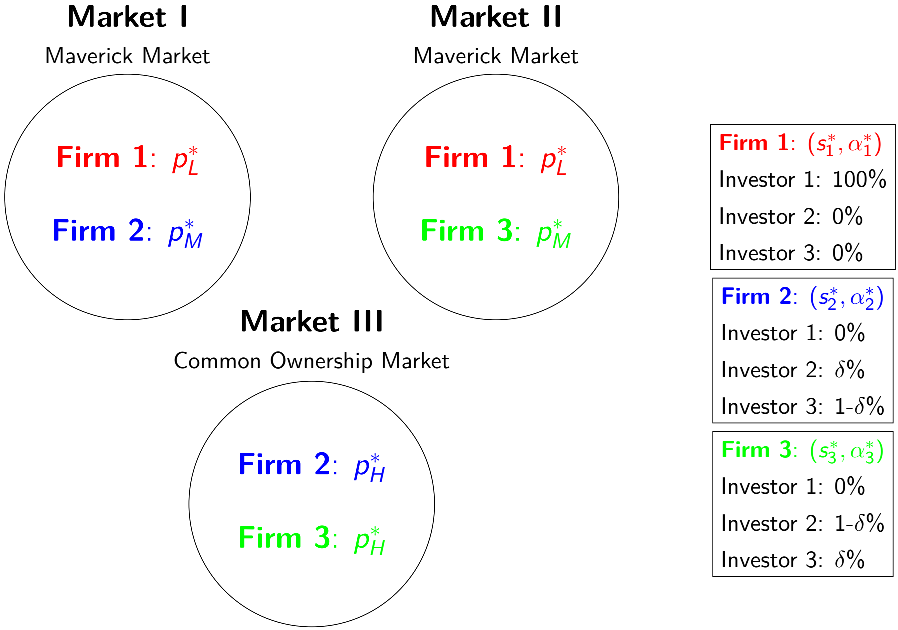
Proposition 1 (Managerial Incentives)

The equilibrium incentives α_i^* given to managers decrease with the degree of common ownership κ_i, that is $\frac{\partial \alpha_i^*}{\partial \kappa_i} < 0$.

- Managers (optimally) face weaker incentives to improve firm efficiency as common ownership at the firm level increases.
- Strategic (product market) interaction is crucial to this result.
  - Without product market competition managerial actions would have no impact on the profits of other firms.
  - But any setting in which incentivizing managerial actions has negative repercussions on the profits of competitors would generate a similar result.

Corporate Governance and Common Ownership

- Common owners are "excessively deferential" toward managers or even "lazy owners"
  - At least when compared to the standard benchmark of undiversified owners
- Model does not assume but explains **why** common owners are passive (Proposition 5)
  - Common owners do not want to incur governance cost $g > 0$ to design incentive compensation for top managers ... but undiversified ("maverick") owners do and so they are more active.
  - Common owners do not have the same strong interest to **push** for high-powered incentive plans as undiversified ("maverick") owners.
  - Managers "enjoy the quiet life" (Bertrand and Mullainathan, 2003).



Market I
Maverick Market
Firm 1: p_L^*
Firm 2: p_M^*
Market II
Maverick Market
Firm 1: p_L^*
Firm 3: p_M^*
Market III
Common Ownership Market
Firm 2: p_H^*
Firm 3: p_H^*
Firm 1: (s_1^*, α_1^*)
Investor 1: 100%
Investor 2: 0%
Investor 3: 0%
Firm 2: (s_2^*, α_2^*)
Investor 1: 0%
Investor 2: δ%
Investor 3: 1-δ%
Firm 3: (s_3^*, α_3^*)
Investor 1: 0%
Investor 2: 1-δ%
Investor 3: δ%

Key Intuition for Price Effects

- Investor 1 only cares about π_i, but common owners 2 and 3 care about $\pi_i + \kappa_{ij}\pi_j$.
  - Manager of firm 1 has stronger incentives than firm 2 and 3: $\alpha_1 > \alpha_2 = \alpha_3$
  - Therefore, firm 1 has lower costs than firm 2 and 3: $c_1 < c_2 = c_3$
- Firm 1 sets lower prices than firm 2 and 3 in the maverick markets I and II:

$$p^*_{1,\mathrm{I}} = p^*_{1,\mathrm{II}} = p^*_L < p^*_M = p^*_{2,\mathrm{I}} = p^*_{3,\mathrm{II}}$$

- Firm 2 and 3 set even higher prices in common ownership market III:

$$p^*_{2,\mathrm{III}} = p^*_{3,\mathrm{III}} = p^*_H$$

- **Price effects are not driven by collusion, but by endogenously determined costs.**
  - Markups are essentially unaffected because common owners have to strike a balance between "productive inefficiency" and "softer competition."

Reconciling the Empirical Evidence

Theory	Prediction	Level	Empirical Evidence
Prop. 1 & 2	Incentives $(-)$	Firm	**This Paper**
	Costs $(+)$	Firm	Aslan (2019)
	Markups $(\pm)$	Firm & Market	Aslan (2019), Koch et al. (2020), Backus et al. (2021)
Coro. 1	Profits $(+)$	Firm	Boller and Scott Morton (2020)
Coro. 2	Prices $(+)$	Firm & Market	Azar et al. (2018), Park and Seo (2019), Aslan (2019), Azar et al. (2019), Torshizi and Clapp (2019)
Coro. 3	Output $(-)$	Market	Azar et al. (2018)
	Concentration $(-)$	Market	Azar et al. (2018), Azar et al. (2019)
Prop. 5	Governance $(-)$	Firm	Bubb and Catan (2018), Heath et al. (2020)
	Entry $(-)$	Firm & Market	Newham et al. (2019), Ruiz-Pérez (2019), Xie and Gerakos (2020)
	Investment $(-)$	Industry	Gutiérrez and Philippon (2018)

Recognizing Agency Problems and Organizational Structure

- What would happen if ...
  - ... common owners could directly set prices $p_{i,l}$?
  - ... common owners could directly set optimal incentives for pricing specialists?
  - ... common owners could centralize pricing decisions with the top manager?
- All of these assumptions are arguably less realistic (no delegation and/or direct interventions by common owners), but they ...
  - ... provide useful benchmarks.
  - ... help rule out alternative.
- Common ownership would have **large markup effects** but would create **little (or even no) productive inefficiency** (Proposition 3 and 4).
  - Existing studies provide evidence of higher costs, but **not** of markup effects of common ownership ...
  - ... which, together with our theoretical analysis, casts doubt on such direct mechanisms.

Direct Mechanisms of Common Ownership $\longrightarrow$ Markup Effects

~~Productive Inefficiency~~

Investors

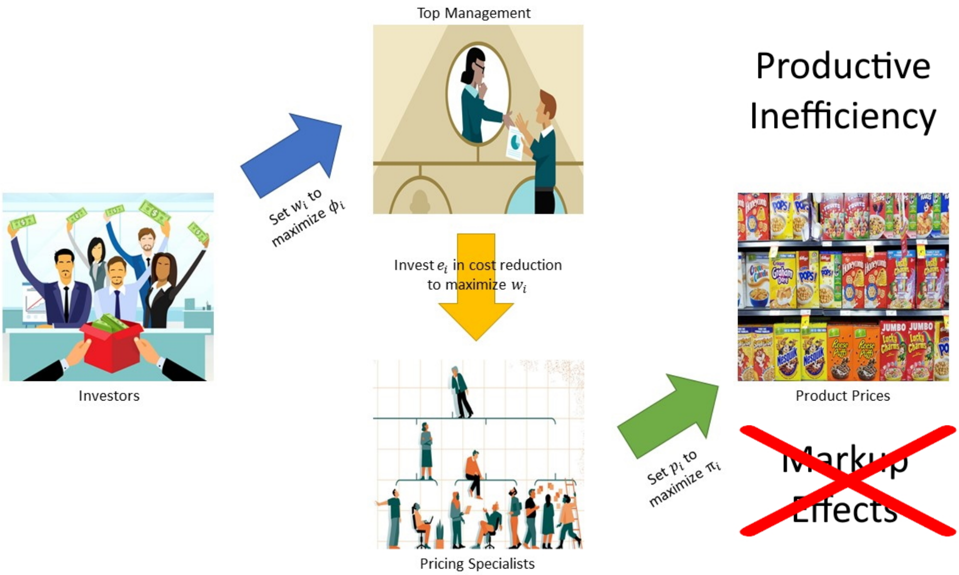
Directly set p_i to maximize

$$\phi_i = \pi_i + \sum_j \kappa_{ij}\pi_j$$

Product Prices

Markup Effects

Our Indirect Mechanism $\longrightarrow$ Productive Inefficiency



Implications for Industrial Organization and Antitrust

- Looking for common ownership effects in markups while taking costs, investments, entry, and product choices as given may miss a crucial channel of common ownership
  - Common investors can only influence high-level decisions.
- Hybrid models may be more suited
  - Airlines choosing **entry for shareholder portfolio profits ($\max \phi_i$)**, but choosing **prices to maximize own firm profits ($\max_{p_i} \pi_i$)** fits data best (Ruiz-Pérez, 2019)
  - No effect of common ownership on prices **conditional** on entry choices
  - This is exactly what our model predicts if top managers make entry decisions and pricing decisions are delegated to route specialists.
- Common ownership may cause productive inefficiency rather than higher markups.
  - Negative welfare effects can be even higher.

Linking theory and empirics

- Theory considers totality of managerial incentives ... and so does the empirical analysis
  - **Wealth-performance sensitivity** rather than pay-performance sensitivity (Edmans et al., 2017)
  - Relevant WPS measure depends on whether CEO productivity is additive, linear or **multiplicative** for firm profits (Baker and Hall, 2004; Edmans et al., 2009)
  - Robustness checks using other WPS measures

- Theory uses profit weight model ... and so does the empirical analysis
  - Theory uses "**kappas**" given by $\phi_i = \pi_i - w_i + \sum_{j \neq i} \kappa_{ij}(\pi_j - w_j)$ as in Backus et al. (2020)
  - Empirics use $\overline{\kappa}_i = \sum_{j \neq i} \kappa_{ij} \frac{\omega_j}{\sum_{j \neq i} \omega_j}$ where ω_j is the stock market value weighting
  - Robustness checks using other common ownership measures

Empirical specification for panel regressions

- Our baseline analysis uses the following specification

$$WPS_{ijzt} = \beta \cdot CO_{it} + \gamma \cdot X_{ijzt} + \eta_{zt} + \mu_i + \varepsilon_{ijzt},$$

  where i indexes firms, j indexes managers, z denotes industries at the four-digit level.
  - Specification closely follows Edmans et al. (2009) but uses variation in common ownership
- Fixed effects to difference out potentially confounding variation
  - η_{zt} to take out unobserved industry trends in common ownership that are correlated with trends in managerial incentive slopes
  - μ_i to take out unobserved omitted firm characteristics that are correlated with common ownership and incentive slopes
  - Avoid spurious inferences from industry-wide trends or time-invariant firm compensation policies and base inferences only on within-firm and within-year variation
- Battery of robustness checks: WPS, common ownership, industry definitions, ...

Negative relationship between common ownership and managerial WPS

Dependent Variable	ln(Wealth-performance Sensitivity EGL)					
Industry Definition	SIC CRSP		SIC COMP		HOBERG-PHILLIPS	
	(1)	(2)	(3)	(4)	(5)	(6)
Common Ownership (Kappa EW)	-0.133***		-0.114***		-0.101**	
	(-2.953)		(-2.973)		(-2.428)	
Common Ownership (Kappa VW)		-0.128***		-0.114**		-0.0771*
		(-3.045)		(-2.669)		(-1.828)
Volatility	1.363***	1.370***	1.023***	1.022***	1.050***	1.051***
	(4.898)	(4.914)	(3.533)	(3.525)	(3.855)	(3.846)
ln(Market Equity)	0.346***	0.348***	0.343***	0.345***	0.368***	0.369***
	(17.91)	(18.06)	(18.21)	(18.23)	(15.68)	(15.61)
Leverage	0.0377	0.0384	0.0141	0.0153	0.0332	0.0348
	(0.581)	(0.591)	(0.231)	(0.250)	(0.456)	(0.479)
HHI	-0.113	-0.116	-0.0158	-0.0162	0.0116	0.0150
	(-1.528)	(-1.569)	(-0.172)	(-0.177)	(0.203)	(0.262)
ln(Tenure)	0.487***	0.486***	0.479***	0.479***	0.493***	0.492***
	(16.43)	(16.47)	(16.60)	(16.65)	(13.99)	(13.97)
Observations	42,788	42,788	45,670	45,670	34,161	34,161
R-squared	0.682	0.682	0.687	0.687	0.698	0.698
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry $\times$ Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Alternative common ownership measures

Dependent Variable	ln(Wealth-performance Sensitivity EGL)						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
CO (Kappa)	-0.133***						
	(-2.953)						
CO (Cosine Similarity)		-0.280***					
		(-5.868)					
CO (Top 5 Overlap)			-0.177***				
			(-4.404)				
CO (Anton and Polk)				-0.423***			
				(-5.813)			
CO (Harford, Jenter and Li)					-0.410***		
					(-5.811)		
CO (MHHID)						-0.338***	
						(-5.638)	
CO (MHHID 1/N)							-0.260***
							(-5.162)
Observations	42,788	42,788	42,030	42,788	42,788	42,794	42,794
R-squared	0.682	0.683	0.681	0.683	0.683	0.682	0.682
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry $\times$ Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Alternative wealth-performance sensitivity measures

Dependent Variable	ln(WPS JM)			ln(WPS HL)		
	(1)	(2)	(3)	(4)	(5)	(6)
CO (Kappa)	-0.164***			-0.120**		
	(-3.872)			(-2.616)		
CO (Cosine Similarity)		-0.258***			-0.192***	
		(-5.964)			(-4.265)	
CO (Top 5 Overlap)			-0.196***			-0.131***
			(-5.630)			(-3.706)
Observations	42,788	42,788	42,030	42,788	42,788	42,030
R-squared	0.791	0.792	0.792	0.792	0.792	0.792
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Summary of panel regression results

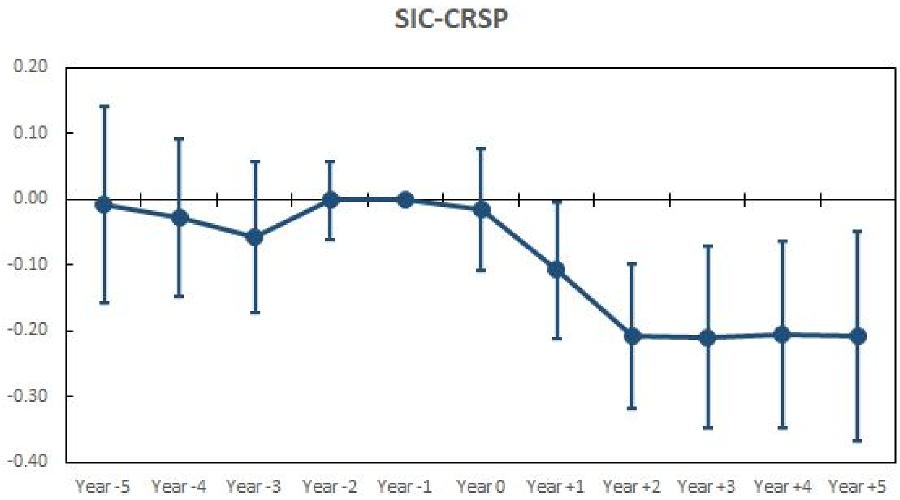
- Negative relationship between common ownership and managerial incentives
  - Across all dimensions of the full matrix of robustness checks our results remain consistently negative, with similar economic magnitudes and statistical significance levels
- Shifting a firm's $\overline{\kappa}_i$ from 25th to 75th percentile associated with $-$**6.6%** of CEO WPS
  - Quite similar in magnitude to our (and others') estimated effect of firm volatility: one-standard deviation reduction implies $-$**7%** in CEO WPS
- Not merely the case that firms with high common ownership versus firms with low common ownership have low managerial wealth-performance sensitivity.
  - Firms appear to change WPS based on whether or not their shareholders currently place a lot of weight on the profits of industry competitors.

Difference-in-differences estimation using competitor index additions

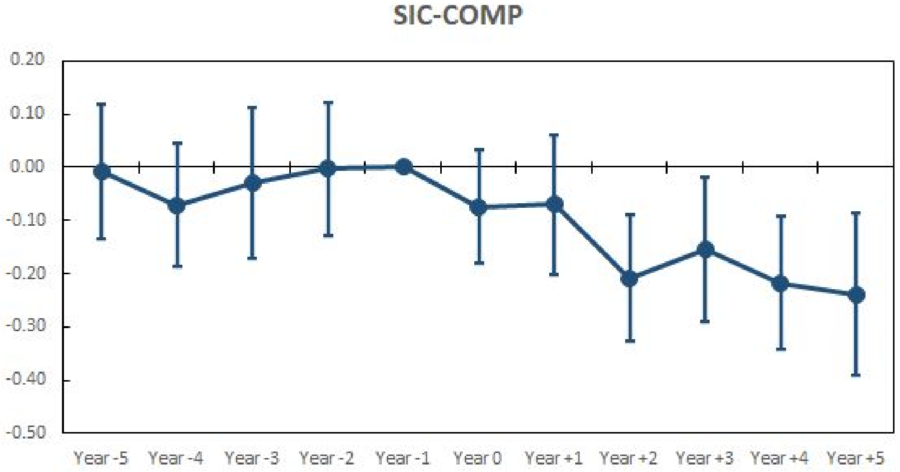
- Use addition of industry competitors as an exogenous shock to common ownership (Boller and Scott Morton, 2020)
  - Industry with 3 firms (A, B, and C), 2 of which (A and B) are already in the S&P500.
  - When C is added to the index, index funds that already own shares in A and B will be forced to buy shares in C as well.
  - Both A and B will experience an increase in common ownership.

- This is **not** a problematic shock like index additions, mergers of institutional investors, index reconstitutions, ...
  - Ownership of treated companies (i.e., index incumbents) remains **completely the same**
  - Common ownership weights κ_{ij} change due to ownership changes at **other firms**

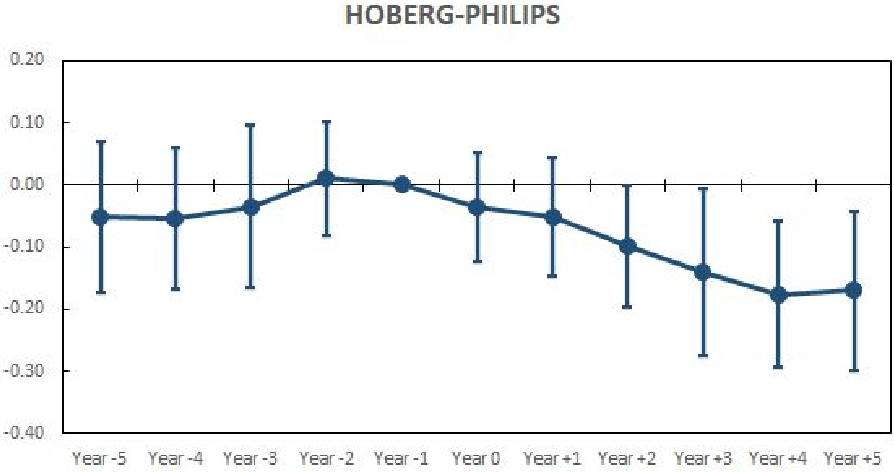
Event study graphs



Event study graphs



Event study graphs



Summary of difference-in-differences results

- Negative relationship between common ownership and managerial incentives persists
  - Allays empirical concern that endogenous ownership confounds the interpretation of the negative correlation in the panel regressions
- Index addition of competitor leads to a reduction of CEO WPS at index incumbents between $-$**10.2%** and $-$**16.1%** depending on industry definitions
- Negative effect of competitor index inclusion on index incumbent CEO WPS is not present before inclusion event and increases in magnitude afterwards

Conclusion

- Mechanism is important
  - Managerial compensation is a simple mechanism through which common ownership can affect product market outcomes including *intra-industry cross-market* variation in prices
  - Mechanism does not rely on implausible assumptions about what investors or managers do
  - Theoretical predictions can explain existing empirical evidence on product market outcomes
  - Empirical evidence confirms $-$ve link between common ownership and managerial incentives
  - Crucial insight for indirect (productivity) and direct (markup) effect of common ownership
- But this does **not** mean
  - Managerial incentives are the only (or even the primary) mechanism of common ownership
  - Common ownership is necessarily welfare-reducing (let alone, "index funds are evil")

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Monopsony and Labor Market Power

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Introduction

Motivation

- Product Market (Monopoly) vs Labor Market (Monopsony) power:
  - “the ability of a firm to set prices above marginal cost"
  - “the ability of a firm to set wages below marginal revenue product of labor"
- Evidence
  - Rise of market power in output markets (see previous lecture)
  - Monopsony power: Inconclusive evidence

Motivation

- Product Market (Monopoly) vs Labor Market (Monopsony) power:
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  - "the ability of a firm to set wages below marginal revenue product of labor"
- Evidence
  - Rise of market power in output markets (see previous lecture)
  - Monopsony power: Inconclusive evidence
- Problem: marginal cost/revenue directly not observable
  - Concentration measures (HHI) are perhaps not adequate
  - Traditional cost-based methods: no data on inputs and outputs

Concentration and Antitrust

- Decline in the labor share (Autor et al. 2017, Barkai 2016)
- In theory, antitrust authorities can block mergers based on anticompetitive effects on consumer prices, or input prices (including labor)
- Until recently, enforcement was focused on consumer prices due to belief that labor markets are robust
- Misguided emphasis on "consumer welfare standard"?
- FTC enforcement policy: "We've told the staff that they're supposed to look at potential effects on the labor market with every merger they review" (Simons, 10/03/2018)

Intellectual History

- Labor market monopsony traditionally not considered by antitrust, though nominally covered by Sherman Act.
- Exception: no-poaching agreements across firms and explicit collusion
- Monopsony in labor market either thought to be exceptional (by economists) or handled through labor law (by lawyers)
  - American institutionalist labor economists (e.g., Slichter 1950) recognized monopsony as potentially pervasive in labor markets.
  - Monopsony theoretically developed during period of high union density, strong internal labor markets, and binding minimum wages, so perhaps not empirically as relevant.
  - Post-1980 period of labor market deregulation did not result in more competitive labor markets, but rather dismantling of countervailing institutions.

Evidence on Monopsony in United States

- Long-held belief among economists that most labor markets were perfectly competitive.
- Exceptions were pro sports, nurses, and company towns.
- Theoretical development of dynamic monopsony (Burdett and Mortensen 1989/1998) and empirical evidence on minimum wages (Card and Krueger 1994) renewed interest in monopsony.
- Dube, Lester & Reich (2016): minimum wages decrease new hires as well as separations, consistent with dynamic monopsony.
- Monopsony can also rationalize gender wage gap, patterns of training, and existence of vacancies (Manning 2003).

More Recent Evidence

- Observational evidence from matched worker firm data (Card, Cardoso, Hening and Kline 2018, Webber 2015)
- Evidence on negative correlations between employment concentration and wages (Azar et al 2020, Benmelech et al. 2018)
- Recent direct evidence on monopsony
  - Experimental estimates on MTurk from Dube, Jacobs, Naidu & Suri (2020)
  - Regression discontinuity estimates from low-wage retailer in Dube, Giuliano & Leonard (2019)
  - ... and many, many more!

Measuring Labor Market Concentration

Big Picture View of Labor Market Concentration

- For product markets concentration measures are relatively readily available, but not for labor markets
  - Big picture view to get a sense of concentration (and maybe market power)
- But recall that concentration indices per se may not all be that informative
- Still a good first step (Azar, Marinescu, Steinbaum & Taska 2020)

HHI as hypothetical monopsonist test for occupations

- FTC/DOJ: HHI above 1500 is moderately concentrated, above 2500 is highly concentrated
- Hypothetical monopolist test used in merger reviews
  - Relevant antitrust market is the smallest market for which a hypothetical monopolist that controlled the market would find it profitable to implement a "small significant non-transitory increase in price" (SSNIP)
  - Small price increase of 5%
- Critical Loss Analysis (Harris 1991)
  - Method to determine SSNIP based on a critical price elasticity of demand
  - If the elasticity is below the critical level, then the market is well defined, otherwise the market is too broad.
- Can apply same method for a hypothetical **monopsonist** test

HHI as hypothetical monopsonist test for occupations

- Hypothetical monopsonist objective function

$$\pi(L) = (a - w)L$$

- If the monopsonist changes wages by Δw, and this generates a change in labor supply ΔL, the change in profits is

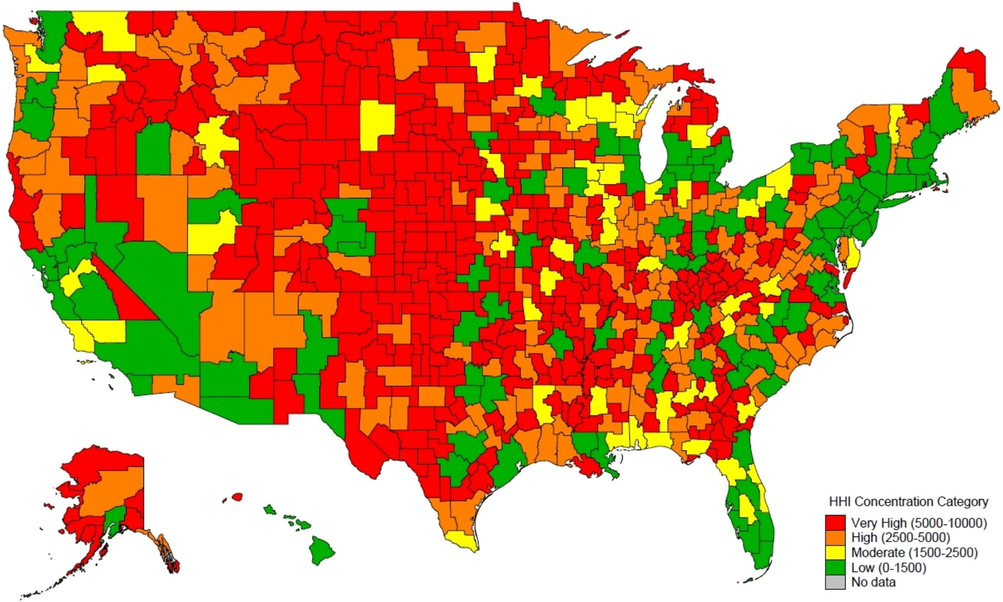
$$\Delta\pi = \Delta L \times (a - w - \Delta w) - \Delta w \times L$$

- Reducing wages by 5% is profitable if and only if

$$\frac{\Delta L/L}{\Delta w/w} < \frac{1}{\mu - \Delta w/w}$$

- If $\mu = 0.45$, critical elasticity is 2.
  - Labor supply elasticity estimates to the individual firm usually below critical elasticity
  - If that's the case, the firm is already a plausible market.

HHI by Commuter Zone



Labor Market Concentration

	Mean	Min	Max	25th Pct.	75th Pct.	Fraction Moderately Concentrated	Fraction Highly Concentrated
Baseline market definition:							
HHI (Unweighted)	4378	4	10000	1232	7279	0.11	0.60
HHI (Weighted by BLS Employment)	1638	4	10000	187	1774	0.08	0.20

Labor Market Concentration

	Mean	Min	Max	25th Pctile.	75th Pctile.	Fraction Moderately Concentrated	Fraction Highly Concentrated
Baseline market definition:							
HHI (Unweighted)	4378	4	10000	1232	7279	0.11	0.60
Alternative occupational definition:							
HHI (By Job Title)	5892	11	10000	2896	10000	0.08	0.78
HHI (By BGT Occupation)	4384	4	10000	1230	7333	0.11	0.60
HHI (By BGT Broader Occupation Group)	2943	6	10000	568	4744	0.12	0.40

Occupational Concentration & Industry Concentration

- Occupational concentration
  - Hershbein, Macaluso and Yeh (2018): BGT data.
  - Qiu & Sojourner (2019): Dun & Bradstreet + Census, concentration based on occupation shares within industry.
  - Martins (2018): Portuguese administrative data on employment
- Industry concentration (of employment)
  - Benmelech, Bergman and Kim (2018), Rinz (2018), Lipsius (2018)
- All find high levels of concentration, though exact magnitudes vary
- Occupational concentration seems more relevant for labor: within industry heterogeneity larger than within occupation
- Implication: cannot assume policy concern about labor market competition is addressed through enforcement in product markets.

Trends in Concentration over Time

- Occupation-based HHI declined 2000-2010, and increased since 2010 (Qiu and Sojourner, 2018)
- Industry-based HHI decreased since 1970: Rinz (2018), Lipsius (2018), Hershbein et al (2018)
- Entry of large firms in new CZs contributes to decline in industry-based employment HHI (Rinz, 2018)
- Ganapati (2018) points out data limitations for a panel of very local labor markets

Interpretation

"60% of labor markets are highly concentrated … suggesting that employers have market power in many US labor markets"

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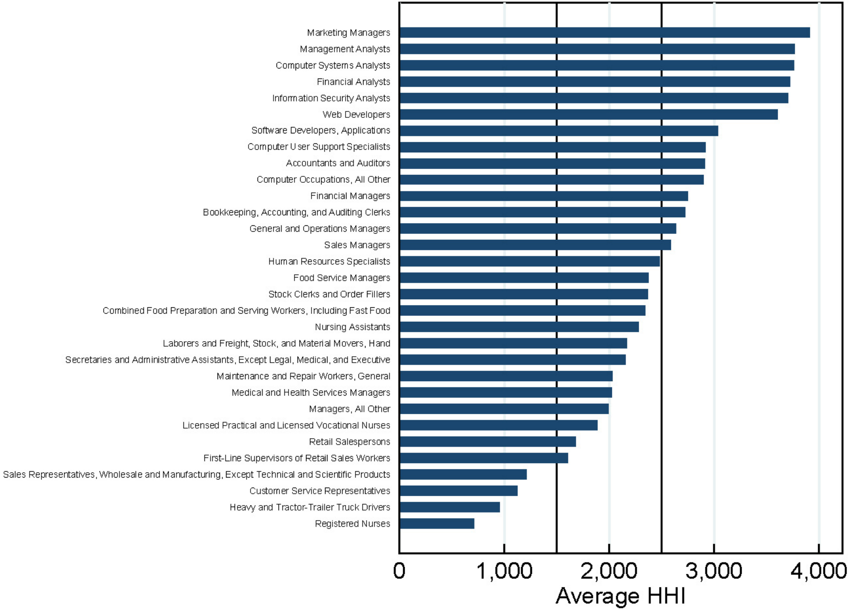
- Only 20% of workers are in a concentrated market
  - Worker-weighted most relevant for the motivations
  - Differential representation from small towns?

Interpretation

"60% of labor markets are highly concentrated ... suggesting that employers have market power in many US labor markets"

- Only 20% of workers are in a concentrated market
  - Worker-weighted most relevant for the motivations
  - Differential representation from small towns?
- DOJ cutoffs for HHI come from product market
  - For the most part, a product doesn't care who buys it
  - Small towns have both fewer employers but also fewer applicants
  - Similar problems with comparison across occupations
- Still plenty of interesting descriptive points to be made without emphasizing these discrete cutoffs

Are these really the occupations we should worry about?



Validation

Does market concentration correlate with other characteristics in a sensible manner?

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Does market concentration correlate with other characteristics in a sensible manner?

- Skill requirements: Are firms choosier in more concentrated markets? (Hershbein, Macaluso& Yeh 2018)
- Vacancy yield/time to fill (perhaps from CareerBuilder.com): Do firms have an easier time attracting workers in more concentrated markets?
- Turnover/job durations: Are workers less mobile/match quality lower in more concentrated markets?
- External data sources can be useful

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- External data sources can be useful
- Want some idea of whether these measures pass the smell test

So What?

Is market concentration related to outcomes of interest?

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- Wages (Hershbein, Macaluso & Yeh 2018)
- Firm-level profitability/productivity (Compustat)
- Are changes over time/across space correlated with labor share, between firm inequality, etc.?

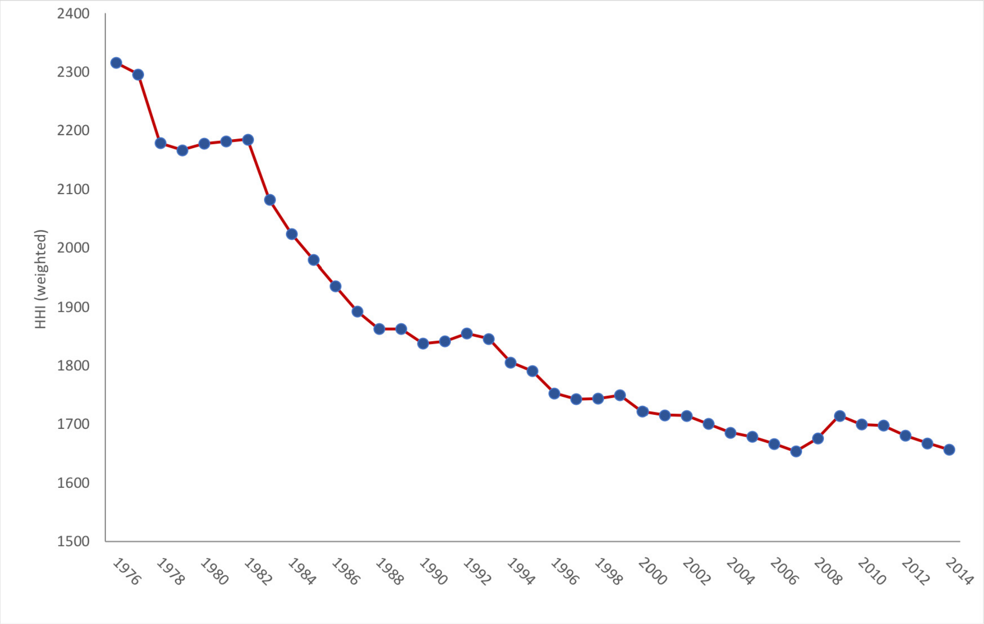
So What?

Is market concentration related to outcomes of interest?

- Wages (Hershbein, Macaluso & Yeh 2018)
- Firm-level profitability/productivity (Compustat)
- Are changes over time/across space correlated with labor share, between firm inequality, etc.?
- Link BGT to external measures of these (Hershbein and Kahn 2018, Deming and Kahn 2018)
  - Job ads contain **very little** information on wages ($<$ 20% post wages)
  - Occupational Employment Statistics or American Community Survey would be better
- "From these complementary papers, we learn much more about the implications of labor market concentration for outcomes of interest."

Hershbein, Macaluso & Yeh (2018): Concentration over Time (BGT)

Hershbein, Macaluso & Yeh (2018): Concentration over Time (LBD)

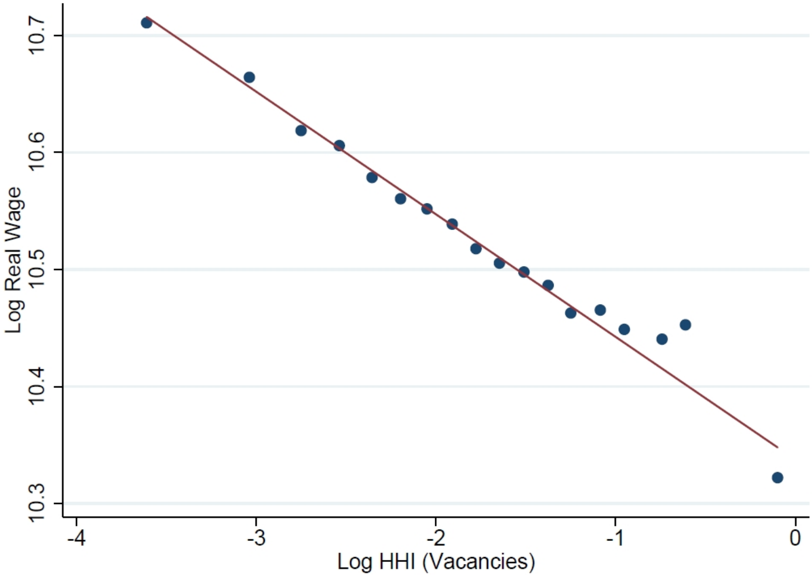


Labor Market Concentration and Wages

Azar, Marinescu & Steinbaum 2020

- Use more granular data from CareerBuilder.com
  - Better wage information and information on number of applicants for each vacancy
  - But only 20% post salary information online!
- Broadly representative of jobs and job seekers in the US
- Job seekers can use the site for free, but firms must pay several hundred dollars to post a job opening for one month
- Use most frequent occupations, especially manufacturing and construction

Binned scatter: log HHI based on vacancies and log real wage



OLS Panel Regression

$$\log(w_{m,t}) = \beta \cdot \log(HHI_{m,t}) + \gamma \cdot X_{m,t} + \alpha_t + \nu_m + \epsilon_{m,t}$$

where $\log(w_{m,t})$ and $\log(HHI_{m,t})$ are the log real wage and log HHI in market m in year-quarter t

OLS Panel Regression

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where $\log(w_{m,t})$ and $\log(HHI_{m,t})$ are the log real wage and log HHI in market m in year-quarter t

- Aren't there massive identification problems?
  - Market-specific changes in labor demand or labor supply could influence both posted wages and HHI
  - Decrease in labor demand can lower wages and number of firms hiring in the market, leading to higher concentration
  - Decrease in labor supply can increase wages and lower number of firms hiring, also leading to higher concentration
- Control for labor market tightness: time-varying measure of labor supply & demand at the market level

IV using the inverse number of employers in other markets

- Instrument the HHI with the average of $\log(1/N)$ number of firms in other commuting zones for the same occupation and period
- Use $\log(1/N)$ instead of HHI as the instrument because it is less likely to be endogenous because it does not depend on market shares
- Variation in market concentration that is driven by national-level changes in the occupation, not by changes in the occupation in that particular local market
- Commonly used IV in IO to address endogeneity of prices in a local product market (Nevo 2001) ... but very rarely used in labor!
- Identification?
  - Labor demand or supply shocks could be correlated across areas
  - Instrument protects against a spurious correlation between concentration and outcomes due to market-specific changes
  - But not against national-level changes that influence both local concentration and other outcomes

Discussion of IV Strategy

- Example of "good" sources of variation driving $1/N$ in other markets
  - Exogenous mergers of companies operating in several markets
- Example of "bad" source of variation driving $1/N$ in other markets
  - Productivity shocks in the occupation at the national level
- Market for lawyers is especially diffuse because there are lots of law firms. Meanwhile the market for cashiers is really concentrated because only Walmart posts online and everyone else has help wanted signs on the door. Do I want to compare lawyers wages to cashiers wages? Does it matter if I instrument for those wages with wages of the neighboring CZ?
- But authors are aware of shortcomings of this reduced-form approach (Azar, Berry & Marinescu 2019)

Market-level Regressions

	Dependent Variable: Log(Real Wage)							
	OLS					IV		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log HHI (Vacancies)	-0.103***	-0.0347***	-0.0399***	-0.0378***	-0.0300***	-0.141***	-0.143***	-0.127***
	(0.00456)	(0.00377)	(0.00392)	(0.00406)	(0.00422)	(0.0191)	(0.0181)	(0.0176)
Log Tightness			0.0113***	0.0132***	0.00686*		0.0283***	0.0305***
			(0.00320)	(0.00357)	(0.00360)		(0.00427)	(0.00479)
Year-quarter FE	✓	✓	✓			✓	✓	
Market (CZ × 6-digit SOC) FE		✓	✓	✓	✓	✓	✓	✓
Year-quarter FE × CZ FE				✓	✓			✓
Year-quarter FE × 6-digit SOC FE					✓			
Observations	61,017	59,485	58,642	56,679	56,677	59,485	58,642	56,679
R-squared	0.042	0.674	0.672	0.715	0.738	-0.018	-0.015	-0.012
Kleibergen-Paap F-stat						854.3	1051	996.7

Vacancy-level Regressions

	Dependent Variable: Log(Real Wage)							
	OLS				IV			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log HHI (Vacancies)	-0.0327***	-0.0331***	-0.0314***	-0.0154***	-0.200***	-0.192***	-0.188***	-0.116***
	(0.00453)	(0.00476)	(0.00500)	(0.00377)	(0.0398)	(0.0361)	(0.0370)	(0.0184)
Log Tightness		0.000665	0.00429	0.00818***		0.0540***	0.0737***	0.0315***
		(0.00342)	(0.00462)	(0.00297)		(0.0133)	(0.0180)	(0.00601)
CZ × 6-digit SOC FE	✓	✓	✓		✓	✓	✓	
Year-quarter FE	✓	✓		✓	✓	✓		✓
Year-quarter FE × CZ FE			✓				✓	
CZ × Job-Title FE				✓				✓
Observations	1,023,295	1,021,185	1,020,510	955,641	1,023,295	1,021,185	1,020,510	955,641
R-squared	0.533	0.533	0.541	0.849	0.522	0.524	0.534	0.847
Kleibergen-Paap F-stat					45.62	56.18	58.72	150.1

What does all of this mean?

- 10% increase in concentration is associated with a 0.38% (OLS) to a 1.3% (IV) decline in posted wages
- Going from the 25th percentile to the 75th percentile in concentration is associated with a 17% decline in posted wages
- Is that a large effect? Yes!
- How does it compare to other estimates?
  - Schuber, Stansbury & Taska (2019): moving from the median to the 95th percentile of employer concentration reduces wages by 3%
  - Rinz (2021): local concentration actually declined while national concentration decreased and then increased, effect on level of earnings and income inequality much smaller

Mergers and Wages

From Big Picture to Granular Events

- Let's remember what the original motivation for this research is:
  - Declining labor share of income
  - Sluggish wage growth and wage stagnation
- Claim in the literature: monopsonistic labor markets are (partly) to blame
  - Labor market concentration is rising and higher than we thought (Benmelech et al 2018, Dube et al 2017, Azar et al 2020)
  - Negative **correlation (?)** between concentration and wages (Benmelech et al 2018, Azar et al 2020, Qiu & Sojourner 2019, Jarosch, Nimczik & Sorkin 2019)

Hospital Mergers – Prager & Schmitt (2021)

- Recent literature requires strong assumptions for identifying causal effects
- Regresses wage on employment HHI
  - Must assume that all determinants of HHI changes are otherwise exogenous to wage changes
  - Example 1: economic decline $\rightarrow$ employer exit $\rightarrow$ HHI increases & wages fall
  - Example 2: diminishing MPL $\rightarrow$ firm size increases & wages fall
- Can we use smaller events like mergers instead? Ideally in an industry with lots of data, labor market power, mergers, ...
  - Airlines? Hospitals?

Why Hospital Mergers?

- With mergers, require only that determinants of mergers are otherwise exogenous to wage changes
  - Can check for other mechanisms
  - management changes, layoffs, labor composition, economic conditions, pre-trends
- Focus on single, well-suited industry
  - Account for institutional context (Berry, Gaynor & Scott Morton 2019)
  - Hospital labor markets are relatively local
  - Hospital mergers are driven largely by output market concerns
  - Large number of hospital mergers, within and across markets

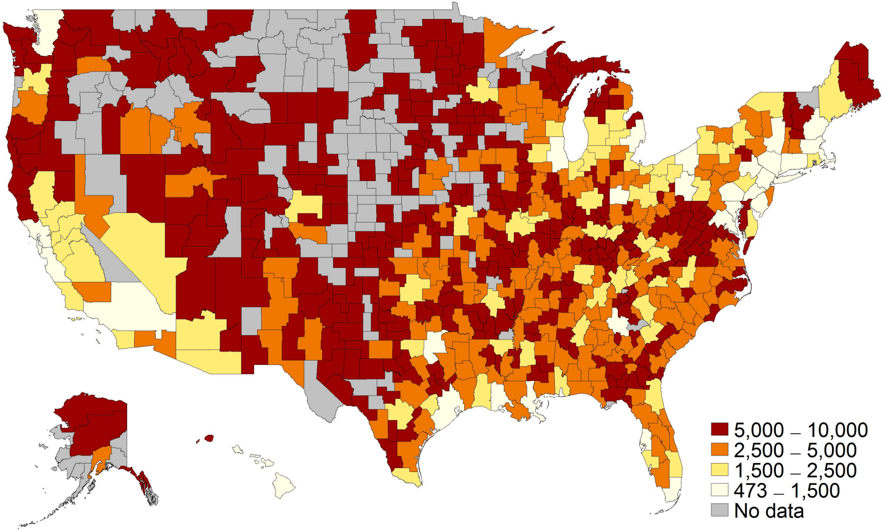
More Practical Reasons

- Regulators cannot act on concentration per se, but can act on mergers
  - Well, maybe under the new antitrust regime they can
- Existing evidence insufficient to inform regulators
  - Many papers focus on outcomes within the merging firms ...
  - ... but they do not measure the magnitude of the merger with respect to the affected labor market
  - ... and do not distinguish employer market power from within-firm changes.

Data

- Wage and employment data from HCRIS hospital cost reports
- Data at the hospital-year level for 1996-2014
- Workers in three categories: unskilled, skilled non-medical, nursing admin & pharmacy
- But no individual data, instead wages measured as employer-level payroll

Hospital Employer HHI



Difference-in-differences for Wage Trajectories

Baseline estimation for hospital i in commuting zone m in year t

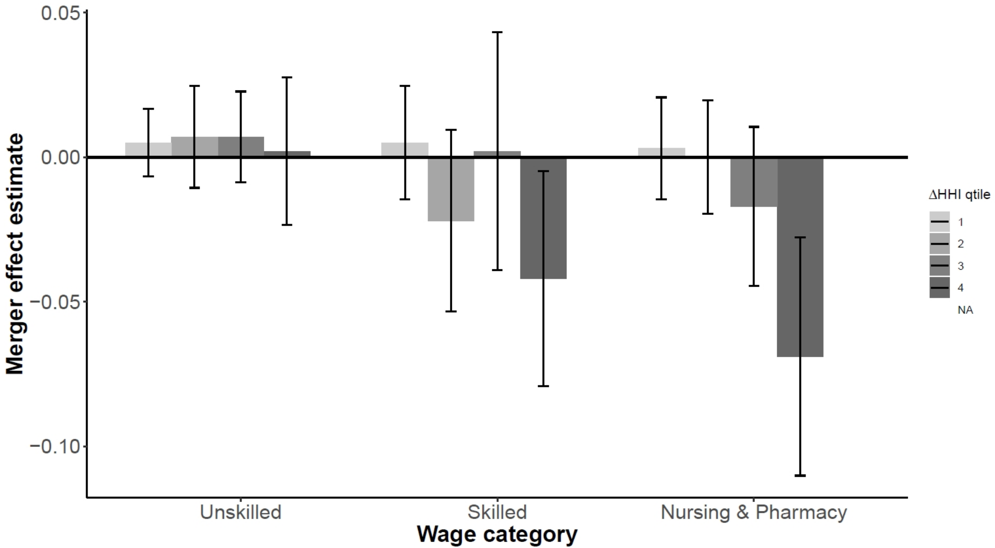
$$\log(w_{imtc}) = \alpha post_{mt} + \beta x_{imt} + \delta_i + \tau_t + \epsilon_{imtc}$$

- w_{imtc} is log of wages for worker category c
- x_{imt} is hospital and market characteristics
- τ_t and δ_i are year and hospital fixed effects
- $post_{mt}$ is 1 if commuting zone m experienced a within-market hospital merger in year $t' \leq t$

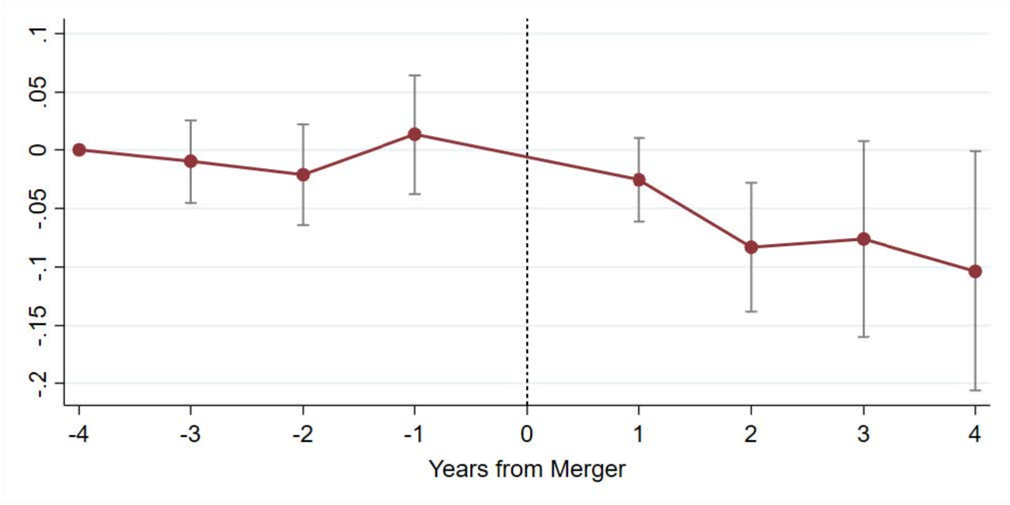
Characteristics of Merger-Treated Commuting Zones

	Hospital FTEs	ΔHHI (hospitals)	HC employment	ΔHHI (HC)
1st quartile ΔHHI	19,505	64	63,626	10
2nd quartile ΔHHI	9,925	239	25,886	58
3rd quartile ΔHHI	6,953	632	22,034	94
4th quartile ΔHHI	2,166	2,780	4,951	859

Wages following mergers: diff-in-diff by ΔHHI



Checking Pre-trends (top quartile of ΔHHI

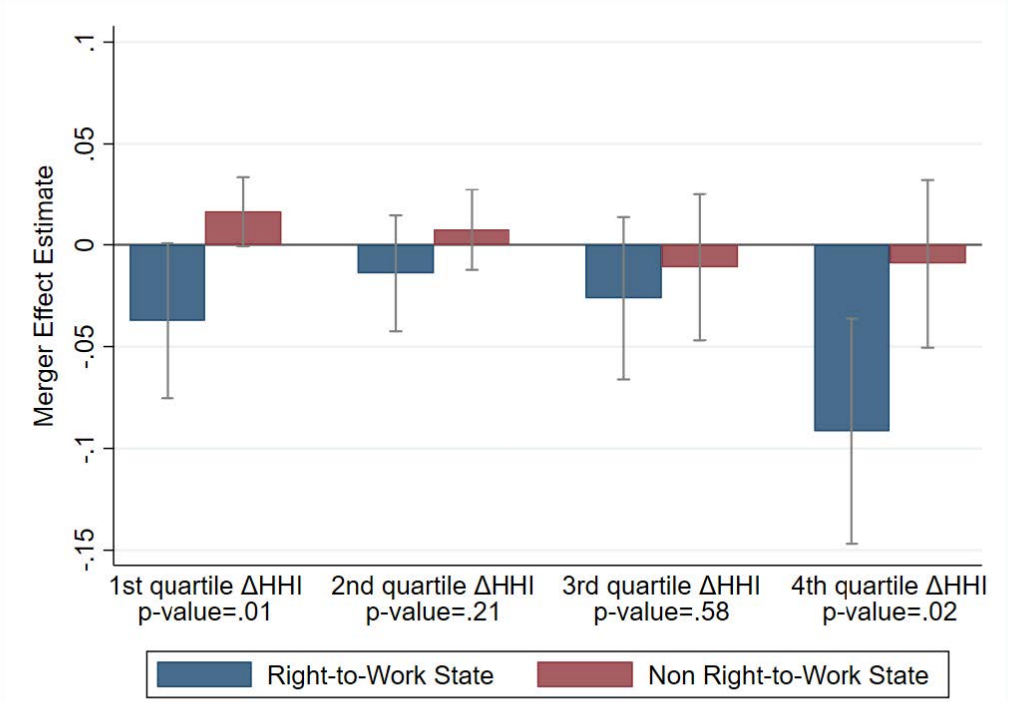


Is this output market power?

- Larger hospital mergers increase health care prices in the local market (Dafny 2009, GNT 2015, Lewis and Pflum 2017)
  - Higher post-merger prices may raise worker compensation via health insurance
- Need 59% market-level price increase to offset nursing & pharmacy wage slowdown
  - Large relative to estimates from literature
  - Not consistent with unskilled estimates

Is this labor market power?

- Results are also consistent with ΔHHI-dependent effects of
  - Changes in management
  - Changes in production technology $\rightarrow$ changes in MPL
- Ideal test: examine mergers that do not change managerial practices or production technology
- Instead: examine mergers that do not change employer concentration
  - Effects only for large within-market mergers (meaningful HHI increases)
  - Effects are larger for worker categories with narrower labor markets
- What about unions and right-to-work states?


Merger Effect Estimate
.1
.05
0
-.05
-.1
-.15
1st quartile ΔHHI
p-value=.01
2nd quartile ΔHHI
p-value=.21
3rd quartile ΔHHI
p-value=.58
4th quartile ΔHHI
p-value=.02
Right-to-Work State
Non Right-to-Work State

Is this labor market power?

- Wage effects only after large concentration increases
- Wage slowdowns are dampened by union power
- No wage slowdowns when labor market power is ruled out
- Fail to find effects for changing labor composition (but noisy)
- Fail to find effects on employment levels

Summary

- Evidence that some mergers raise employer market power and suppress wage growth
  - But less widespread than longitudinal relationship suggests
- Provides guidance for regulators
  - FTC public hearings: "Does available evidence suggest a causal relationship between employer concentration and labor market outcomes?" (October 2018)
  - DOJ public hearings: "reaffirmed that antitrust law seeks to preserve the free market opportunities of buyers and sellers of employment services" (Asst. AG Makan Delrahim, September 2019)

Antitrust Challenges of Big Tech

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Introduction

This hardly needs any motivation really ...

Selected Lawsuits and Antitrust Investigations

- FTC 6(b) study on past (killer) acquisitions of technology companies
- Stricter reporting thresholds for tech acquisitions
- European Commission against Google-Fitbit
- FTC lawsuit against Facebook for illegal buy-or-bury scheme to crush competition
- DC AG antitrust lawsuit against Amazon for "most favored nation" (MFN) agreements
- Japan FTC and Korean antitrust agency against Apple and Google for app store monopolization
- Epic v. Apple & Epic v. Google on app store monopolization

Other Concerns

- Repeat privacy violations (Facebook, Google)
- Anticompetitive elimination of potential competitors (Instagram, WhatsApp)
- Operating platform and selling own products on platform (Amazon)
- Very long-term predatory pricing (Amazon)

Kill Zone

Kill Zone (Kamepalli, Rajan & Zingales 2019)

- Venture capitalists are reluctant to fund investments in a space that is proximate to large digital platforms.
- "The Kill Zone is a real thing. The scale of these companies [digital platforms] and their impact on what can be funded, and what can succeed, is massive." – Albert Wenger, VC
- But the prospect of being acquired should spur, not stifle, innovation and investment, right?

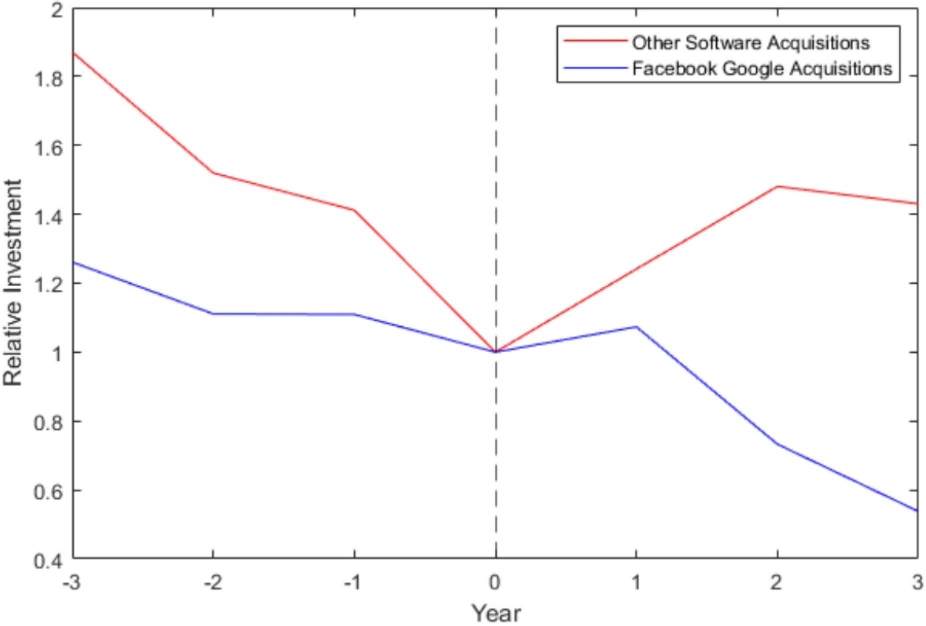
Simple Empirical Strategy

- Identify which acquisitions are big enough to matter
  - All Google and Facebook acquisitions $>$ \$ 500 million in the period 2006-2016
- Identify a set of "treated firms"
  - Similar to the acquired firms (possibly not too similar)
- Define a cycle-adjusted measure of investments
- Compute cycle-adjusted measure around acquisitions (+/- 3 years)
- Aggregate them in an event study across acquisitions

Events

Year	Acquirer	Target	Price paid ($M)	Software Sector	Complementarity
2006	Google	Youtube	1,650	Multimedia and Design	Substitute
2007	Google	DoubleClick	3,100	Internet	Complement
2009	Google	AdMob	750	Vertical Market	Complement
2009	Google	Postini	625	Network Management	Complement
2011	Google	ITA Software	676	Vertical Market	Substitute
2012	Facebook	Instagram	1,000	Social Platform	Substitute
2013	Google	Waze	966	Communication	Substitute
2014	Facebook	WhatsApp	19,000	Communication	Substitute
2016	Google	Apigee	625	Development Applications	Complement

Normalized relative investment



Acquisitions in a Digital Platform World

- One (or a few) gigantic incumbents
- Network externalities: the more the customers on a platform, the more each customer benefits
- Switching costs for some (no costless multi-homing)
- Two sided platforms
  - Price charged on one side of the platform equals zero

Model Intuition

- Acquisition price for entrant depends on competition among bidders and entrant's outside option to go it alone
  - If only one large incumbent platform, there is no competition
- Stand-alone value depends on
  - entrant's quality
  - number of customers the new entrant can attract (network effects)
- But customers decisions depend on decisions of app designers
  - App designers have switching costs so have incentive to start with incumbent
  - Acquisitions can tilt playing field even more in favor of incumbent. How?

Acquisitions Can Harm Ex-ante Incentives

- Higher expectation of being acquired depresses the number of app designers switching because technology and consumer will be accessible post-acquisition anyway
- Depresses the attractiveness of the new platform for ordinary customers (expectation + network externalities)
- Depresses stand-alone valuations and thus acquisition prices
- Depresses investments by potential entrants

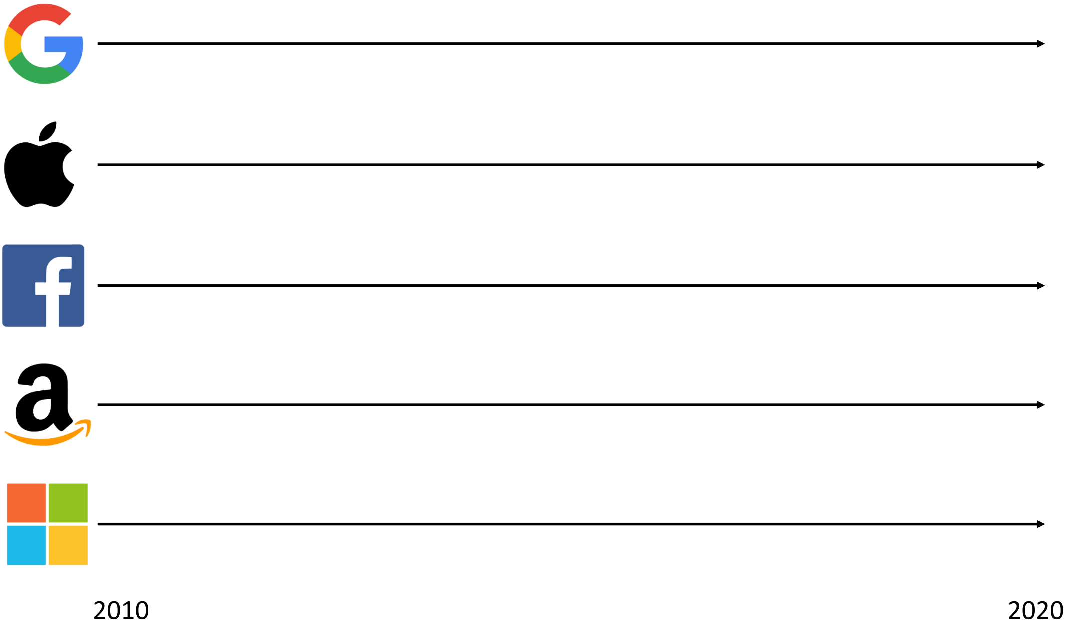
Is this really what's going on?

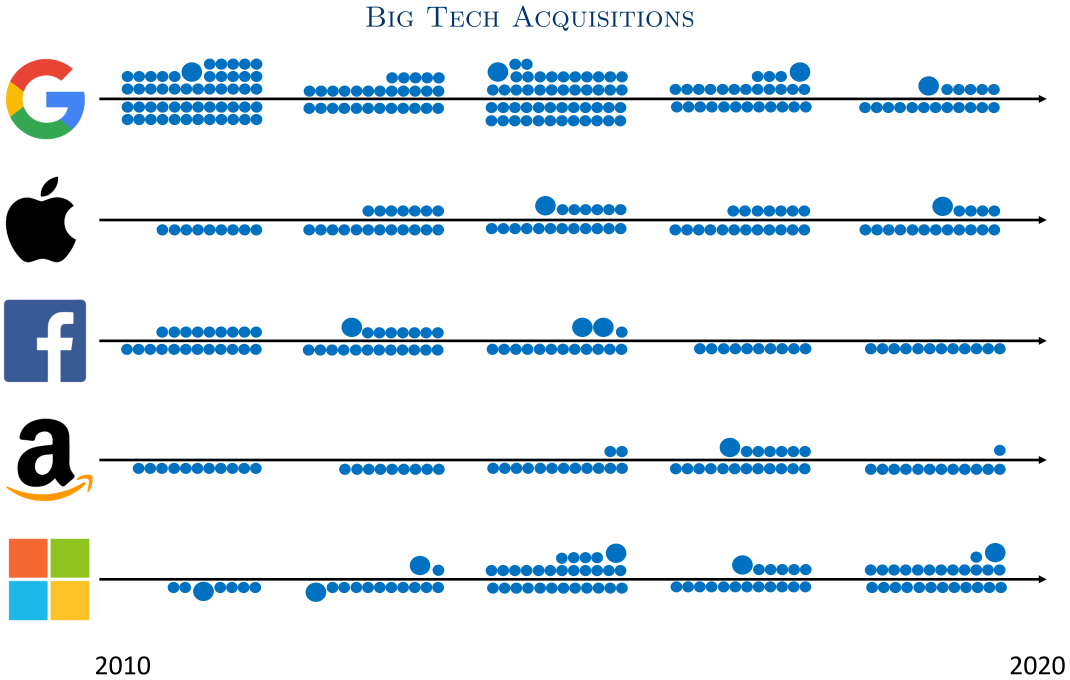
- Different history of digital platforms in the United States, China, and the EU
- EU entrants had to contend from the beginning with US incumbents, who built extensive networks in Europe early on.
- By contrast, Chinese entrants did not have the same problem.
- India banned a number of social media platforms.
- What is the optimal policy though?
  - Prohibiting acquisitions prevents ex-post efficiencies and may not be practical anyway
  - Instead mandate a common standard and interoperability ... but is this really enough?

Big Tech Acquisitions (Affeldt & Kesler 2021)

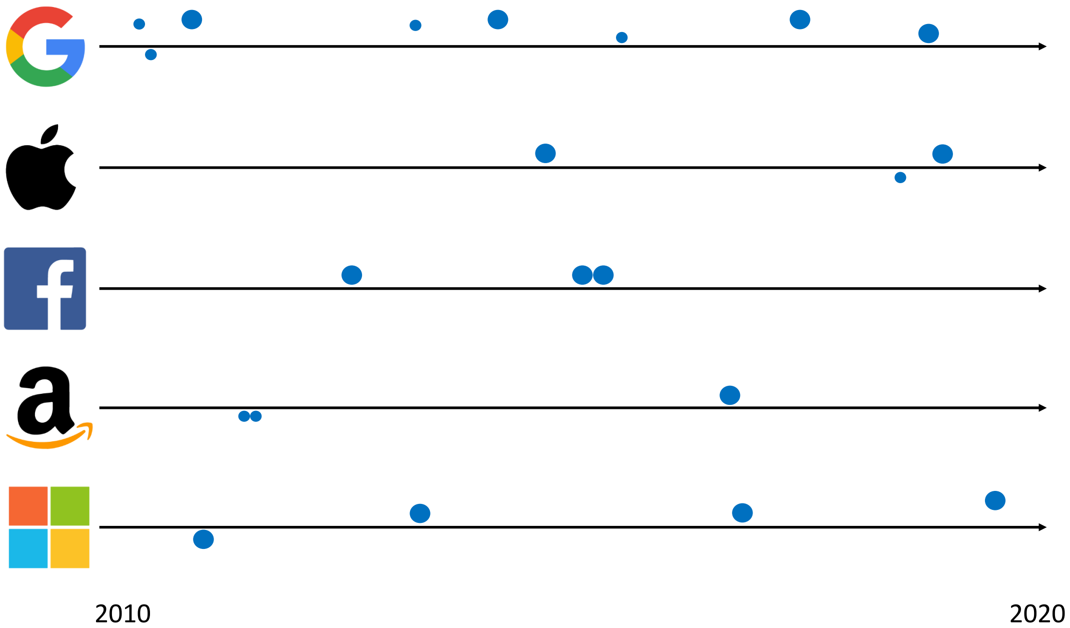
Big Tech Acquisitions

Big Tech Acquisitions




Big Tech Acquisitions
2010
2020

Big Tech Acquisitions



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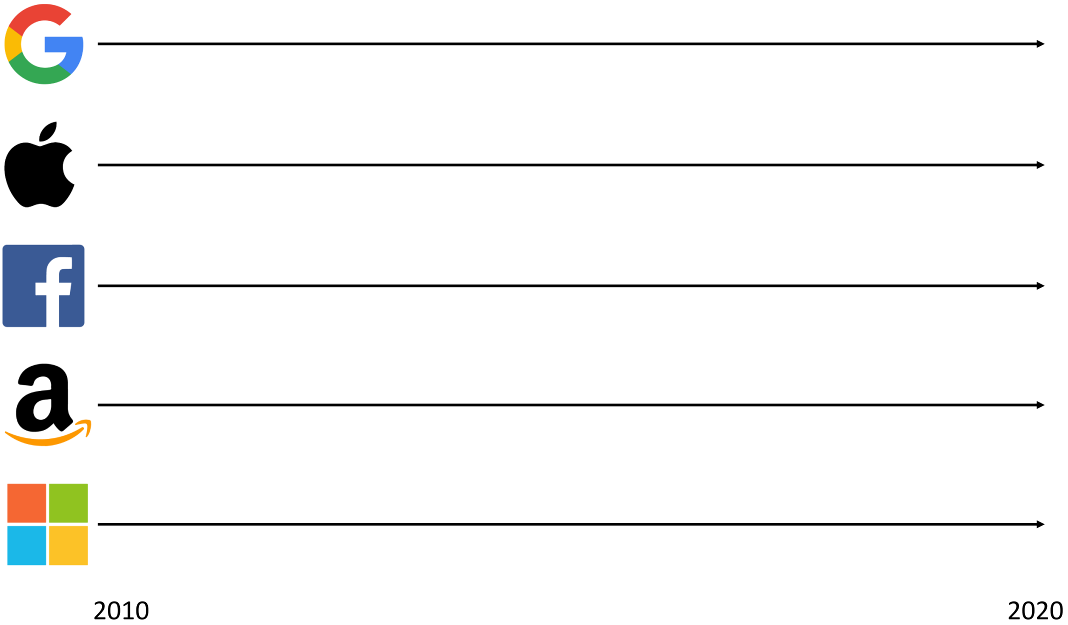

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Google is on a shopping spree – what does it mean for Android?

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Google is on a shopping spree – what does it mean for Android?

- Research question: What are the competitive effects of big tech acquisitions in the Google Play Store?

Web-Scraped Data from Google Play Store

- Observe 1 to 2.5 million apps quarterly from 2015 to 2019, resulting in more than 30 million observations.
- Rich set of characteristics including measures for monetisation strategy, functionality, and quality.

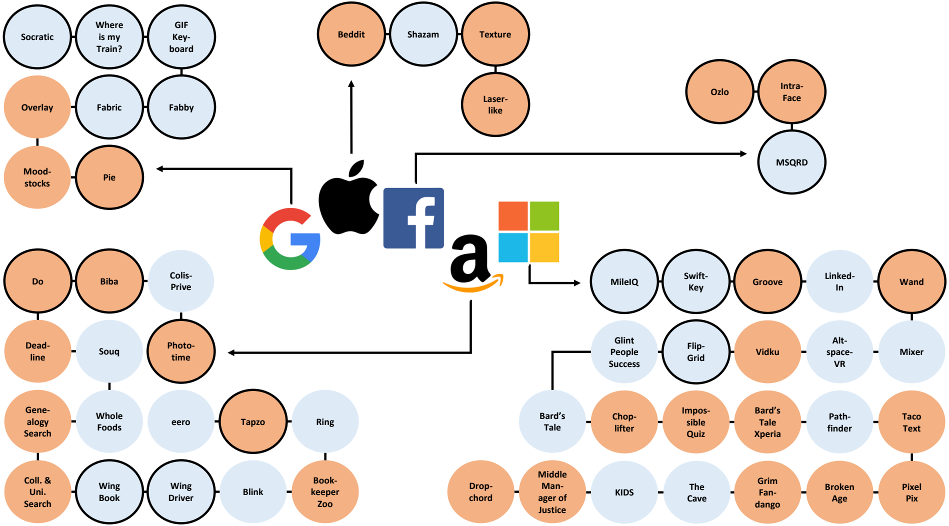
Identify apps acquired by GAFAM:

- Desk research of more than 200 acquisitions with standardised procedure to look whether target company has an app on the Google Play Store.
- Results in 54 apps acquired by GAFAM successfully identified in the dataset.

Identify competitors:

- Up to 50 similar apps considered as ‘close’ competitors (Wen and Zhu, 2019; Kesler et al., 2020).
- Alternatively, markets defined based on textual similarity of app descriptions.

GAFAM Acquisitions Involving Apps



- Acquisitions can be characterized into, whether the acquired app:
  - is discontinued (highlighted in orange), and
  - constitutes the main part of the target company (outline in bold).

Empirical Analysis

Study effects of GAFAM app acquisitions on competitors:

- Outcome variables involve innovation, data collection, and (prices).

Event study:

- Each GAFAM app acquisition is considered an event.
- Compare competing apps of acquired app pre- and post-acquisition.

Results:

- While no effect on competing apps' privacy-sensitive permissions, they react to GAFAM app acquisition by innovating less.
- Affected developers reallocate innovation efforts to unaffected apps and affected markets experience less entry post-acquisition.

Privacy (Kesler, Kummer & Schulte 2021)

Privacy as an Antitrust Issue

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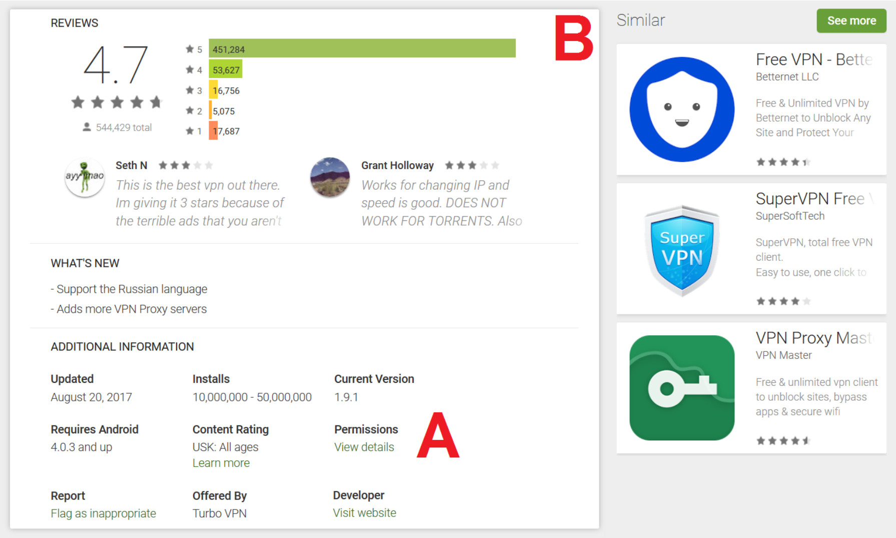
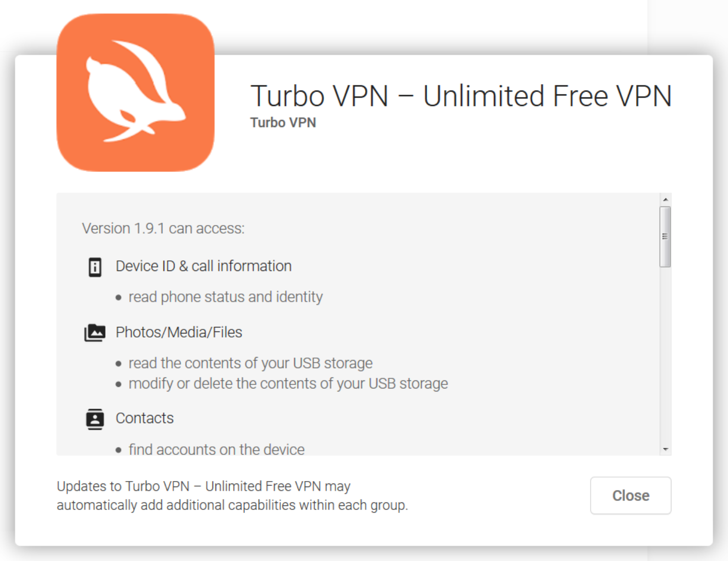
- **Our research question:** How is competition related to privacy in the online market for mobile apps?
  - **Our contribution:** First large-scale empirical study in a relevant (online) market, with novel measures, and attempts to identify causal effects.

Data from Google Play Store

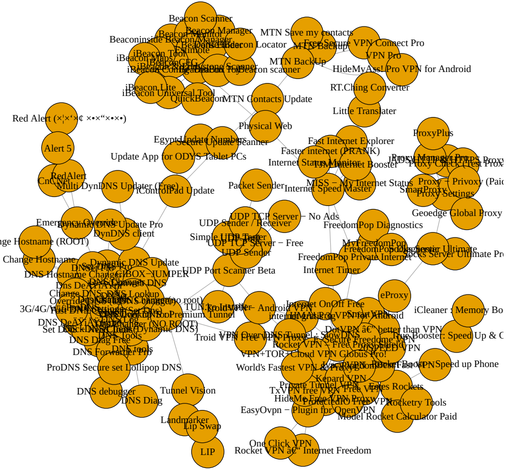


- We observe everything Play Store users can see about an app.
- Specifically here: Permissions (A) and an app's similar apps (B).

Measuring Privacy

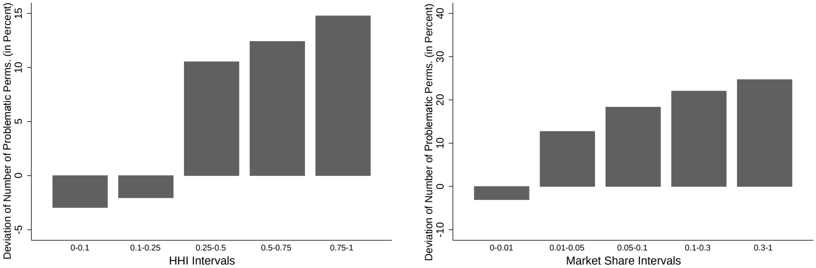


- Permissions can be divided into clean and privacy-sensitive ones.
- The latter may allow the app to track or identify the user, e.g., their contacts.



- We find clusters on the network formed by "similar apps."
- Each of our clusters is a market of its own.

User Data and Competition



- Apps in more concentrated environments and with a higher market share request more data.

Estimation Strategy

- Baseline estimation:

$$Data_{it} = \alpha + \beta_1 MC_{it} + \beta_2 MS_{it} + \theta X_{it} + \psi_i + \phi_t + \epsilon_{it}$$

- $Data_{it}$ measured as data collection ($\#_{DataCollection}$).
- MC_{it} measured as HHI of respective market based on cluster of similar apps.
- MS_{it} measured as the (logarithmic) market share of

  Number of ratings, and

  Predicted installations.
- X_{it} comprising a rich set of app characteristics.
- In panel:
  - ψ_i: App fixed effect
  - ϕ_t: Wave fixed effect

Baseline Results

	#DataCollection							
	CS1	CS2	Panel1	Panel2	CS1	CS2	Panel1	Panel2
HHI	0.141***	0.126***	0.004***	0.004***	0.079***	0.079***	0.009***	0.008***
	(0.007)	(0.006)	(0.001)	(0.001)	(0.007)	(0.006)	(0.001)	(0.001)
Log. Market Share					0.013***	0.012***	0.002***	0.002***
					(0.000)	(0.000)	(0.000)	(0.000)
Log. Ratings	-0.068***	-0.068***	-0.018***	-0.018***	-0.078***	-0.079***	-0.020***	-0.020***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
D_{Paid}	-0.334***	-0.334***	0.028***	0.028***	-0.330***	-0.330***	0.028***	0.028***
	(0.004)	(0.004)	(0.009)	(0.009)	(0.004)	(0.004)	(0.009)	(0.009)
#CleanPerms.	0.312***	0.312***	0.267***	0.267***	0.312***	0.312***	0.267***	0.267***
	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
$D_{InAppProduct}$	-0.120***	-0.120***	-0.025***	-0.025***	-0.118***	-0.118***	-0.025***	-0.025***
	(0.004)	(0.004)	(0.006)	(0.006)	(0.004)	(0.004)	(0.006)	(0.006)
Avg. Rating	0.001	0.001	-0.008***	-0.008***	0.000	0.000	-0.008***	-0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
More Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Category	Yes	Yes	No	No	Yes	Yes	No	No
Wave	No	No	Yes	Yes	No	No	Yes	Yes
Mean #DataCollection	1.325	1.325	1.356	1.356	1.325	1.325	1.356	1.356
Observations	1,336,625	1,336,625	11,477,730	11,477,730	1,336,625	1,336,625	11,477,730	11,477,730
Num. of Groups			1,705,215	1,705,215			1,705,215	1,705,215
Adjusted R^2	0.52	0.52	0.28	0.28	0.52	0.52	0.28	0.28

- Positive relationship between market concentration/shares and data collection.

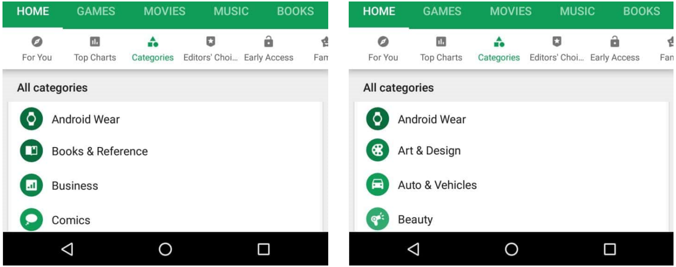
Robustness Checks

- Alternative measures of data collection and competition gives similar results.
- Varying the sample, demand, and market definitions does not change the relationship qualitatively.
- The results can be extended to sharing user data with third parties as a dependent variable.

Mechanisms

- The results are only present in markets with predominantly free apps.
- Relationship is more pronounced in markets that are important in terms of
  - Number of apps in a market, or
  - Total amount of installations in a market.
- The correlation is stronger in categories with more privacy-sensitive data.

- In September 2016, Google added eight new app categories:



- Motivation:
  - Similar to Ershov (2018), consumer search improved for recategorized apps.
  - We hypothesize that competition intensified for apps in these new categories.
  - Announcement and changes were not anticipated.

- Recategorized apps request less privacy-sensitive permissions following the policy change.

Summary

- How is competition related to privacy in the online market for mobile apps?
- Apps in markets with higher concentration request more privacy-sensitive user data. In such markets, apps with a higher market share collect more.
  - Relationship remains for alternative measurements and data sharing.
  - Effect more pronounced for markets relying on data and economically relevant.
  - Preliminary causal analyses confirm findings qualitatively.
- Evidence suggests data to become a means of payment.
  - However, estimates, so far, reveal the relationship to be small.
- Results complement the current policy debate and raise questions about data being an entry barrier.

Google-Fitbit Concerns

- Pre-empting the emergence of a new access point for personal data in third-party hands
  - Wearables could be potentially the next Android
  - Acquisition is intended to pre-empt the emergence of a potential rival who could otherwise develop by exploiting a key access point for the collection of data and for access to attention (Prat & Valletti 2021)
- Creating the opportunity to combine a unique set of intimate personal data with other sets of personal data about the same individual, generating even more powerful signals in multiple dimensions
  - Quality reduction if consumers value their privacy
  - Google's lack of interest in enhancing and protecting privacy?
- Impact on markets that depend on data acquisition
  - Google is dominant in ad-tech and wants to limit rivals' ability to track and target ads
  - Plan to abolish cookies
- Impact on adjacent markets (e.g., insurance, healthcare)
  - DeepMind acquisition involved breach of privacy rules with NHS

Platforms and Marketplaces (Hagiu, Teh & Wright 2021)

Should platforms be allowed to sell on their own marketplaces?

- Increasing number of e-commerce players acting as marketplaces and sellers
    - Amazon, Flipkart (in India), JD.com (China), Target, Walmart
- Many other examples
    - Apple's App Store, Google's Play Store, Microsoft's Windows Apps
    - Intuit's Quickbooks App Store, Salesforce's AppExchange
    - Amazon's AWS Marketplace, Azure Marketplace, Google's Cloud Marketplace
    - Microsoft's Windows Games Store and Xbox Games, Nintendo's Game Store, Sony's PlayStation Store
- Should platforms be allowed to play this dual role?

Policymakers grappling with this question

- India (Feb, 2019): prohibits Amazon and Flipkart from selling their own products via their marketplaces
  - Amazon, Flipkart (in India), JD.com (China), Target, Walmart
- FTC (Sep, 2019) and EC (Jun, 2020): investigate Amazon for using 3rd-party sales data to gain unfair advantage
  - "As a last resort, it could even mean breaking up companies to protect competition." (Margrethe Vestager)
- Ending Platform Monopolies Act proposed in U.S. includes provisions to stop "Big Tech firms" from selling their own competing products or apps in competition with third-parties on their respective marketplaces

Blanket ban on dual mode?

- Dual mode across different products can be efficient (pro-competitive)
  - certain products better supplied by 3rd-parties on marketplace
  - others better supplied by seller
- Benefits of combining these two sets of products on one site
  - one-stop shopping benefits
  - improved across-product recommendations
  - cost savings from having a common website
  - cost savings from combining products in shipping
- Implies blanket ban on dual mode makes little sense

Ban at product level?

- Less obvious case: ban dual mode at the product (category) level
- Develop a model to analyze this case that takes into account
  - endogenous innovation by 3rd-party sellers
  - endogenous choice by platform of being a reseller or marketplace if dual mode banned
  - sellers can sell on platform or outside, but platform helps with discovery
  - anticompetitive behavior concerns
    - using data to imitate popular 3rd-party products could reduce innovation incentives
    - steering consumers towards own offerings might limit effective competition (e.g., Amazon BuyBox)

Ban at product level?

- A ban on dual mode has following effects
  - takes away the price squeeze that the platform would use dual mode to impose on 3rd-party sellers with market power, so hurts consumers and efficiency
  - does not suppress innovation because in the empirically most realistic case the platform would choose to switch to being a reseller and 3rd party seller cannot be discovered
- Anticompetitive behavior policy options (ban imitation and/or self-preferencing) lead to better outcomes than ban on dual mode
  - preserve benefits of dual mode and remove main harms

Practical considerations

- Behavioral remedies are more difficult to implement
- Banning imitation of innovative 3rd party products
  - in-house opportunism $\implies$ require “Chinese wall”: private labels team can access only public information
  - can actually benefit platform by allowing it to commit not to opportunistically imitate
- Banning self-preferencing
  - requiring public APIs to allow approved outsiders to audit recommendation algorithms

Most Favored Nation Clauses

Basic Idea

- Seller promises buyer not to give any other buyer a lower price
- Buyer promises seller not to pay any other seller a higher price
- Example: Seller offers price protection to Buyer A along with a sales price of \$10.
- If the seller offers Buyer B a price of \$9, it must offer A a price of \$9 also.

Retail platform competition

- Established Platform A charges provider 30% commission
  - Provider sets an end price of $10 on platform A and earns $7
  - Platform A requires provider agree to an MFN clause
- Entering Platform B is lower quality, less fancy, and charges 10%
  - Platform B says to provider, charge $9 on our platform, we will keep $.90 and you will keep $8.10
  - We will gain by attracting consumers who like buying at $9
- Provider says: I cannot because the MFN contract would mean lowering my price on A to $9 (and I will keep only $6.30)
- MFN eliminates price competition on fees and makes low cost entry hard

Potential Harms

- Collusive Theories
  - Dampening competition
- Exclusionary theories
  - Raising rivals' or entrants' costs
- Harm to innovation through penalizing asymmetric business model
- Evidence
  - MFNs lead to higher equilibrium prices (Cooper 1986, 1991, Scott Morton 1997, Moshary 2015)
  - Strong incentives to adopt MFNs (Besanko 1993, Schnitzer 1994)
  - Platform MFNs are also anticompetitive (Boik & Corts 2016)

Clause at the heart of the lawsuit

Pricing practices that harm customer trust include, but are not limited to:

- Setting a reference price on a product or service that misleads customers;
- Setting a price on a product or service that is significantly higher than recent prices offered on or off Amazon; or
- Selling multiple units of a product for more per unit than that of a single unit of the same product.
- Setting a shipping fee on a product that is excessive. Amazon considers current public carrier rates, reasonable handling charges, as well as buyer perception when determining whether a shipping price violated our fair pricing policy.

Source: Amazon Marketplace Fair Pricing Policy

Amazon MFNs

- Amazon removed clause in Europe after British and German antitrust regulators began investigating in 2013
- Amazon deleted clause globally in 2019 amid scrutiny from US antitrust regulators ...
- ... but is allegedly down-ranking companies who list lower prices outside Amazon platform.

Economics of Social Data (Bergemann, Bonatti & Tan 2021)

Individual and Social Data

- Central feature of individual data is its social dimension.
- Data about an individual user is informative about similar users.
- Social dimension of data drives the value of digital services.
- An individual's shopping data conveys information about the willingness to pay of consumers with similar purchase histories.
- Social nature of data generates a data externality not signed a priori.

Data Externality

- social dimension of data simultaneously leads to a loss of privacy and a gain in information
- sign and magnitude of data externality depend on structure of data and downstream use of information
- presence of significant data externality suggest inefficient market outcomes
- data informs algorithms, thus externality may operate multiple times and at extensive scale

Three Central Questions

- How does the social dimension of the data impact the terms of trade between consumers, data buyers, and large digital platforms?
- How does the social dimension of the data magnify the value of individual data for platforms, and facilitate its acquisition?
- How does market power change the granularity and the precision of the information that platforms provide about individual consumers?

Welfare Effects of Data Sharing

- Consumers' and social welfare increase with consumers' information gains, and decrease with the firms' information gains.
- If consumers know their types, data sharing is socially harmful.
- If consumers' types <u>and</u> error terms are independent, data sharing is socially harmful.
- If individual consumers are uninformed (but the complete dataset is informative), data sharing benefits consumers.

Summary of Results

Optimal ($\neq$ complete) data sharing:

- uniform price rather than personalized prices;
- personalized recommendations

Far from socially efficient allocation of data:

- consumers compensated for individual harm, but not for social harm;
- socially efficient anonymization, not intermediation decisions;
- cost of acquiring information vanishes, gains persist as market grows.

Concluding Thoughts

- Property rights over data insufficient for efficient data allocation.
- Consumers are not earning the social value of their input.
- Here, a single producer; in practice, data informs algorithms—the externality may operate multiple times and at extensive scale.
- Future regulations: consumer protection and fair payment for data.
- Market design challenge: align broker incentives to consumers'.