Are Managers Paid for Market Power?

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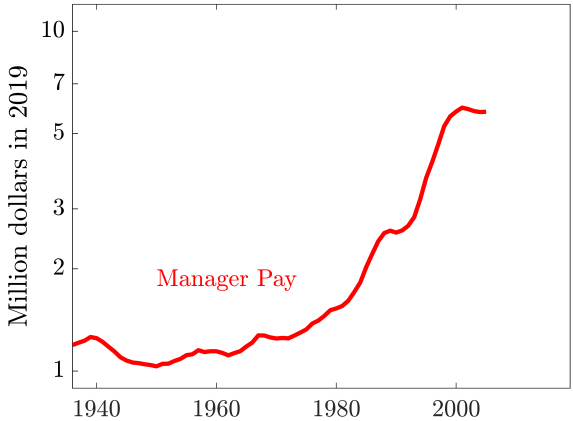
Motivation

- Increase in income inequality – most in top percentiles (Piketty and Saez, 2003)
- Manager pay
  - in top percentiles of earnings
  - rise since the late 1970s (Frydman and Saks, 2010)

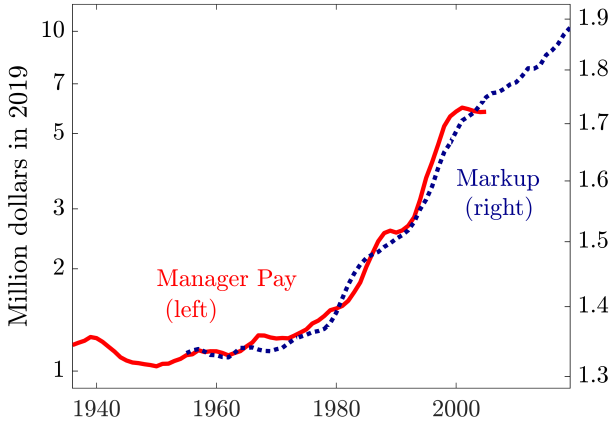
Manager Pay

Frydman and Saks (2010), 1936–2005



Manager Pay vs. Markup

Frydman and Saks (2010) + Compustat, 1955–2019



Introduction

- Decompose Manager Pay into two channels
  1. Firm Size: conventional wisdom
  2. Market Power: new mechanism

Introduction

- Decompose Manager Pay into two channels
  1. Firm Size: conventional wisdom
  2. Market Power: new mechanism
- Method
  1. Structural model: a combination of
     - Competitive matching market (Gabaix and Landier, 2008; Terviö, 2008)
     - Oligopolistic competition (Atkeson and Burstein, 2008)
  2. Estimation
     - Technology: productivity and complementarity
     - Market structure: the number of firms competing with each other

Introduction

Quantification

- The rise of Manager Pay:
  1. On average, Market Power 45.8% vs. Firm Size 54.2%
  2. Over time, market power contributes from 38.0% (1994) to 48.8% (2019)
     — accounts for 57.8% of increase in Pay

Introduction

Quantification

- The rise of Manager Pay:
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  2. Over time, market power contributes from 38.0% (1994) to 48.8% (2019)
     — accounts for 57.8% of increase in Pay
- Cross-section of managers: *heterogeneity*
  - Low-ability managers: Firm Size channel dominates ≈ 100%
  - Top-ability managers: Market Power channel dominates 80.3%

Model

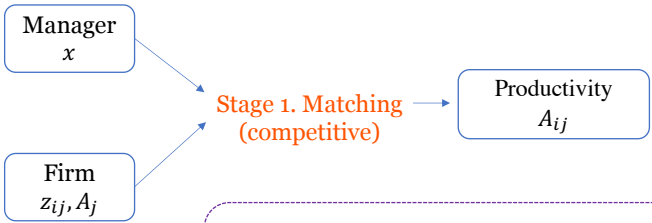
Setup

Manager
x

Firm
z_{ij}, A_j

- Same measure of firms and managers
- Market structure
  - A continuum of markets $j \in [0,1]$
  - I_j firms in market j
- Heterogeneity between managers, firms and markets

Setup

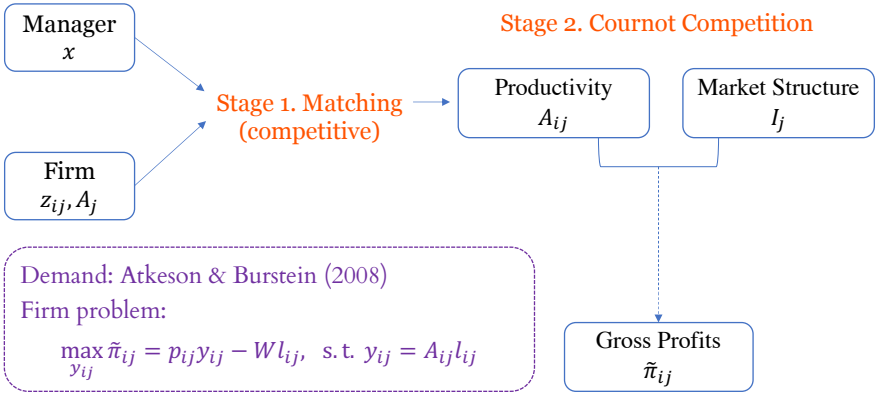


Firm problem:

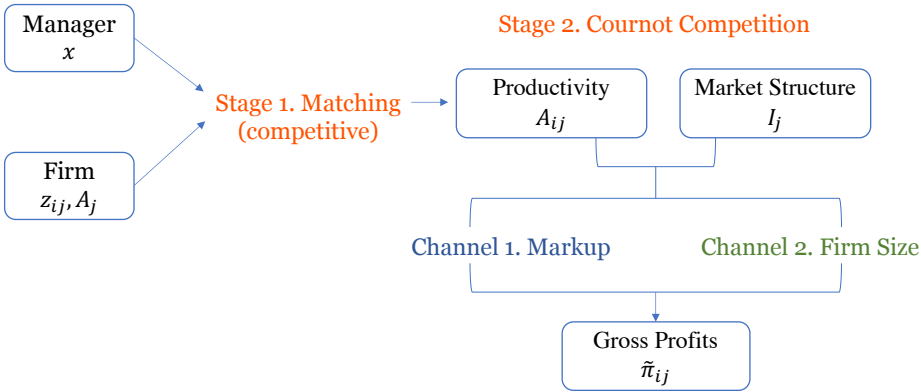
$$\max_x \pi_{ij} = \tilde{\pi}_{ij}\left(A_{ij}|A_{-ij}\right) - \omega(x)$$

where $A_{ij} = A_j \cdot \mathcal{A}\left(x_{ij}, z_{ij}\right)$ with $\mathcal{A}_x > 0$, $\mathcal{A}_z > 0$, and $\mathcal{A}_{xz} > 0$

Setup


Manager
x
Firm
z_{ij}, A_j
Stage 1. Matching
(competitive)
Stage 2. Cournot Competition
Productivity
A_{ij}
Market Structure
I_j
Gross Profits
$\tilde{\pi}_{ij}$
Demand: Atkeson & Burstein (2008)
Firm problem:
$\max_{y_{ij}} \tilde{\pi}_{ij} = p_{ij} y_{ij} - W l_{ij}, \quad \text{s.t. } y_{ij} = A_{ij} l_{ij}$

Setup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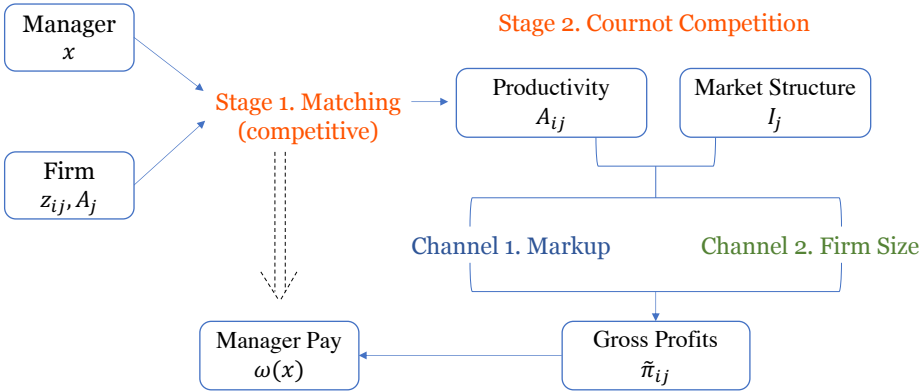
Setup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Gross Profits
$\tilde{\pi}_{ij}$
Manager Pay
$\omega(x)$

First Order Condition

Stage 2: $$p_{ij} \underbrace{\left(1+\varepsilon_{ij}^{P}\right)}_{\mu_{ij}^{-1}} = W/A_{ij} \quad \Leftrightarrow \quad \widetilde{\pi}_{ij} = (\mu_{ij}-1)Wl_{ij}$$

Stage 1: $$\max_{x} \pi_{ij} = \widetilde{\pi}_{ij} - \omega(x) \quad \Rightarrow \quad \frac{\partial \widetilde{\pi}_{ij}}{\partial A_{ij}} \frac{\partial A_{ij}}{\partial x_{ij}} = \frac{d}{dx}\omega(x_{ij})$$

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- Managers contribute in two channels:

$$\widetilde{\pi}_{ij} = (\mu_{ij}-1)Wl_{ij} \quad \Rightarrow \quad \frac{\partial \widetilde{\pi}_{ij}}{\partial A_{ij}} = \frac{\partial \mu_{ij}}{\partial A_{ij}} Wl_{ij} + (\mu_{ij}-1)W\frac{\partial l_{ij}}{\partial A_{ij}}$$

First Order Condition

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$$\Rightarrow \quad \omega(x_{ij}) = \omega_0 + \int_{\underline{x}}^{x_{ij}} \left[\underbrace{\frac{\partial \mu_{i'j'}}{\partial A_{i'j'}}Wl_{i'j'}}_{\text{Market power}} + \underbrace{\left(\mu_{i'j'}-1\right)W\frac{\partial l_{i'j'}}{\partial A_{i'j'}}}_{\text{Firm size}} \right] \times \left[\frac{\partial A_{i'j'}}{\partial x_{ij}} \right] dx_{i'j'}$$

Matching

- Complementarity ⇒ PAM between managers and firms...

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- But, externality from competition
  - Productivity is not the correct criterion for firm ranking
  - Impossible to find the exact matching with a large number of firms

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- But, externality from competition
  - Productivity is not the correct criterion for firm ranking
  - Impossible to find the exact matching with a large number of firms
- Approximate stable matching: *find a proxy for firms' profitability with externality*
  1. Compute $\partial\widetilde{\pi}_{ij}/\partial x_{ij}|_{\overline{x}}$ by assigning all firms the *average* manager
  2. Construct PAM allocation between the manager types x and $\partial\widetilde{\pi}_{ij}/\partial x_{ij}|_{\overline{x}}$

▸ Efficiency

Quantitative Exercise

Assumptions & Parametrization

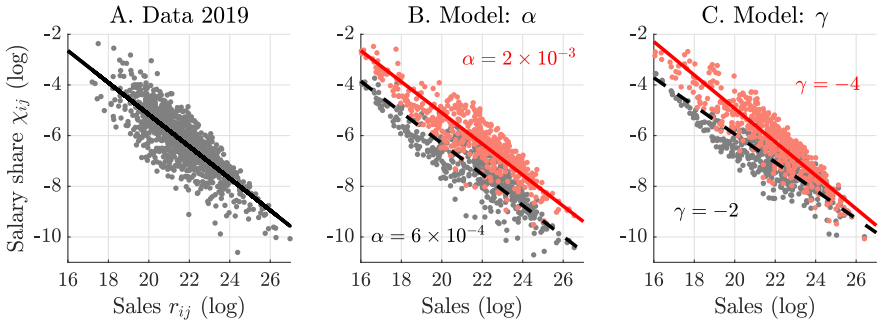
- Simulated Methods of Moments - year by year
- Market structure: $I_j \sim \mathcal{N}(m_I, \sigma_I)$ and $I_j \in \{1, 2, ...\}$
- Types $\{x_{ij}, z_{ij}, A_j\}$: independently drawn from lognormal distribution
- TFP – CES form:

$$A_{ij} = A_j \left[\alpha x_{ij}^{\gamma} + (1 - \alpha) z_{ij}^{\gamma} \right]^{\frac{1}{\gamma}},$$

$\Rightarrow$ flexibility of CES setup

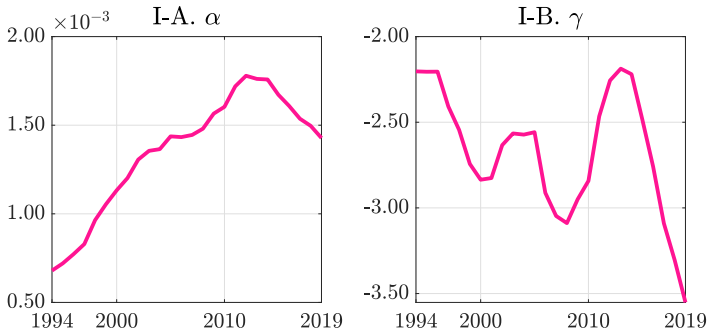
Targeted Moments

		Key Parameter(s)	Meaning
I. Match	Average salary share	α	$A_{ij} = A_j \left[\alpha x_{ij}^{\gamma} + (1-\alpha) z_{ij}^{\gamma} \right]^{\frac{1}{\gamma}}$
	Slope Salary-Sales	γ	



Estimation

I. Match



Estimation

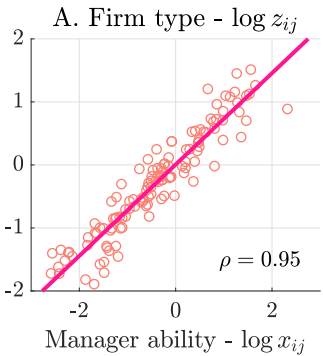
Other Parameters

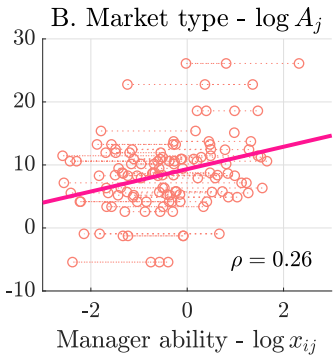
- Other parameters are consistent with the literature
  - Increasingly concentrated market structure
  - Higher heterogeneity across firms

Main Results

Matching Correlation

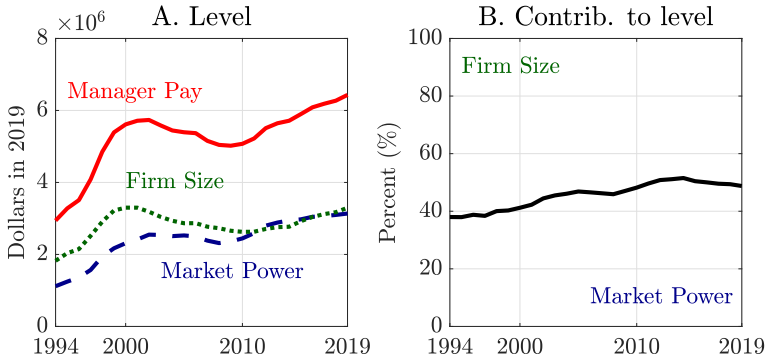
Estimated Economy (2019)





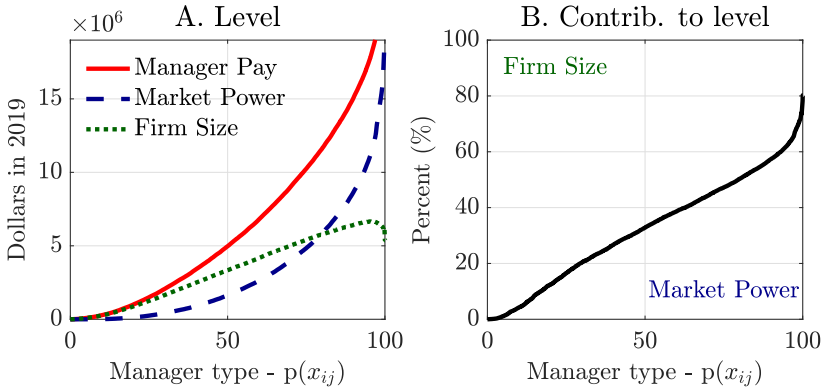
Market Power vs. Firm Size

Time Series



Market Power vs. Firm Size

Crosssectional Heterogeneity (2019)



Conclusion

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- Market Power contributes 45.8% to Manager Pay, from 38.0% (1994) to 48.8% (2019)
- Heterogeneity: the bottom (all via Firm Size) and the top (80.3% via Market Power)
- A general story for all managers and superstar workers (coders, athletes,...)

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Appendix

Robustness & Additional Exercises

- Elasticity of productivity ▸ Elasticity
- Cournot vs. Bertrand ▸ Bertrand
- An alternative decomposition: interpreting revenue as firm size ▸ Revenue

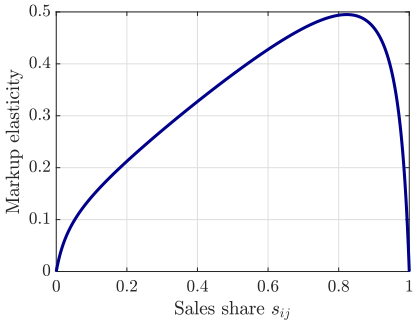
Market Power vs. Firm Size

Markup Elasticity of Productivity

$$\varepsilon_{ij}^{\mu} := \frac{\partial \mu_{ij}}{\partial A_{ij}} \frac{A_{ij}}{\mu_{ij}} = \underbrace{\left[\frac{(\eta-1)\left(1-\phi_{ij}\right)}{1+(\eta-1)\left(\frac{1}{\theta}-\frac{1}{\eta}\right)\mu_{ij}s_{ij}} \right]}_{\frac{\partial s_{ij}}{\partial A_{ij}} \frac{A_{ij}}{s_{ij}},\ \downarrow \text{in } s_{ij}} \times \underbrace{\left[\left(\frac{1}{\theta}-\frac{1}{\eta}\right)\mu_{ij}s_{ij} \right]}_{\frac{d\mu_{ij}}{ds_{ij}} \frac{s_{ij}}{\mu_{ij}},\ \uparrow \text{in } s_{ij}} \in [0,1)$$

- ϕ_{ij} is a weight for firm's importance
- First increase with s_{ij}, then decreases, where

$$\lim_{s_{ij}\to 0} \varepsilon_{ij}^{\mu} = \lim_{s_{ij}\to 1} \varepsilon_{ij}^{\mu} = 0$$



Market Power vs. Firm Size

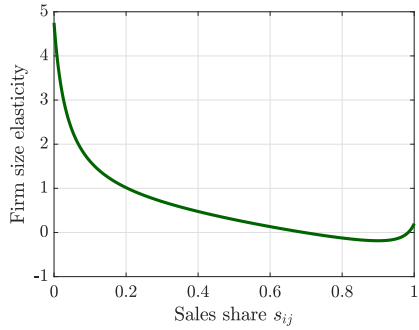
Firm Size Elasticity of Productivity

$$\varepsilon_{ij}^{l} := \frac{\partial l_{ij}}{\partial A_{ij}} \frac{A_{ij}}{l_{ij}} = \phi_{ij} \underbrace{\left[\theta - 1\right]}_{\text{Monopoly}} + \left(1 - \phi_{ij}\right) \underbrace{\left[\frac{\eta}{1 + \left(\frac{1}{\theta} - \frac{1}{\eta}\right)(\eta - 1)\,\mu_{ij} s_{ij}} - 1\right]}_{\text{Strategic interaction, } \downarrow \text{ in } A_{ij}},$$

- ε_{ij}^{l} can be negative when s_{ij} is moderately large
- First decreases with s_{ij}, then increases, with

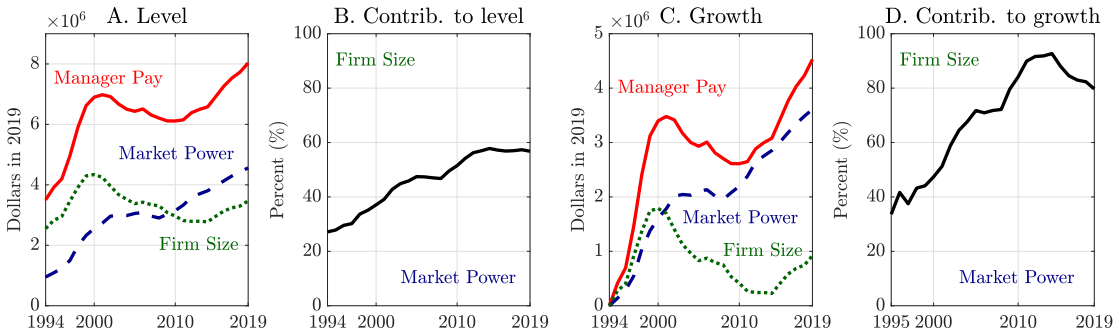
$$\lim_{s_{ij} \to 0} \varepsilon_{ij}^{l} = \eta - 1 > 0 \quad , \quad \lim_{s_{ij} \to 1} \varepsilon_{ij}^{l} = \theta - 1 > 0$$

Back



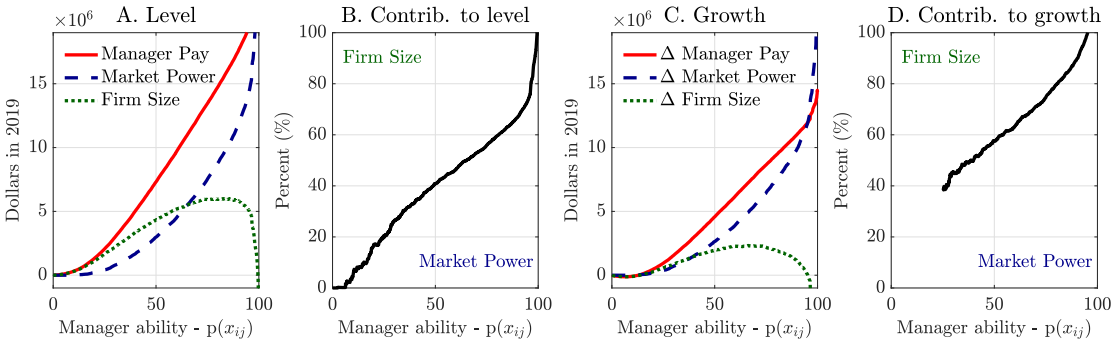
Bertrand

Decomposing the Level of Manager Pay



Bertrand

Decomposing the Distribution of Manager Pay



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Revenue as Firm Size

- We can also write the equilibrium gross profit $\widetilde{\pi}_{ij}$ as:

$$\widetilde{\pi}_{ij} = \left(1 - \frac{1}{\mu_{ij}}\right) r_{ij} \quad \text{since} \quad r_{ij} = \mu_{ij} W l_{ij}$$

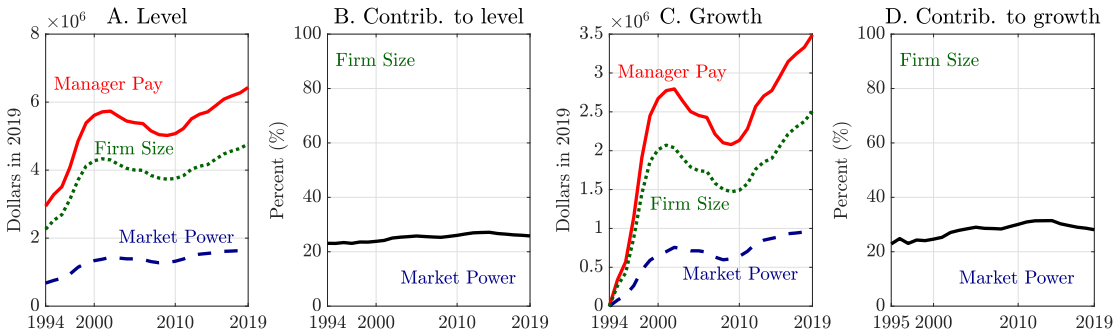
- This gives us:

$$\omega(x_{ij}) = \omega_0 + \int_{\underline{x}}^{x_{ij}} \left[\underbrace{\frac{1}{\mu_{ij}} \left(\frac{\partial \mu_{i'j'}}{\partial A_{i'j'}} W l_{i'j'} \right)}_{\text{Markup channel}} + \underbrace{\left(1 - \frac{1}{\mu_{i'j'}}\right) \frac{\partial r_{i'j'}}{\partial A_{i'j'}}}_{\text{Firm size channel}} \right] \times \underbrace{\left[\alpha z_{j'} \left(\frac{A_{i'j'}}{z_{j'} x_{i'j'}} \right)^{1-\gamma} \right]}_{\partial A_{i'j'} / \partial x_{i'j'}} dx_{i'j'}$$

- Underestimate the market power effect

Revenue as Firm Size

Decomposing the Level of Manager Pay



Revenue as Firm Size

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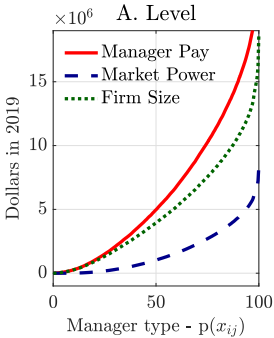

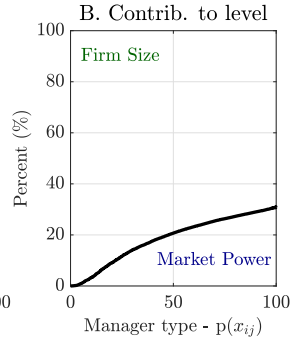

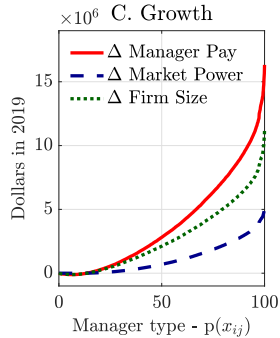

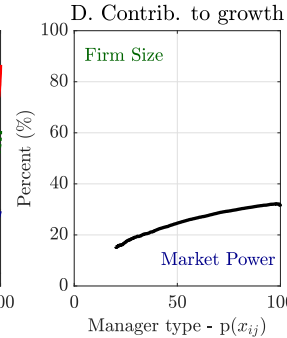

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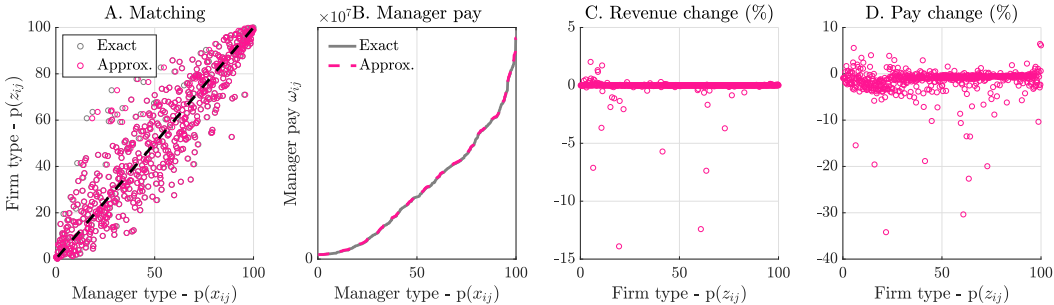
Efficiency: Matching Algorithm

- An example with $J = 200$
  - The average revenue difference is 0.001%
  - The average manager pay difference is 1.17%



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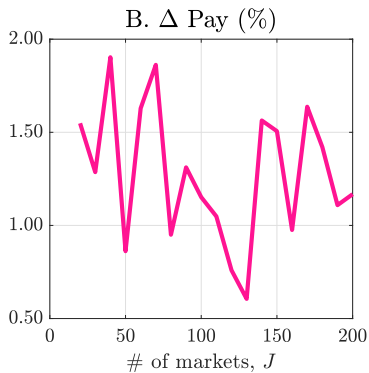

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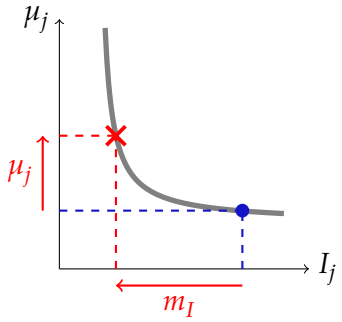
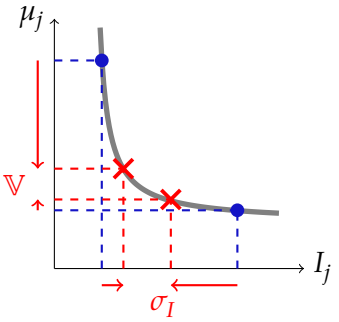
Targeted Moments

II. Market

		Moment(s)	Key Parameter(s)
II. Market	Average markup	$\mathbb{E}(\mu_{ij})$	m_I
	Variance markup (between)	$\mathbb{V}(\log \mu_j)$	σ_I

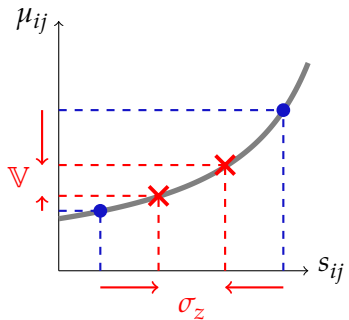


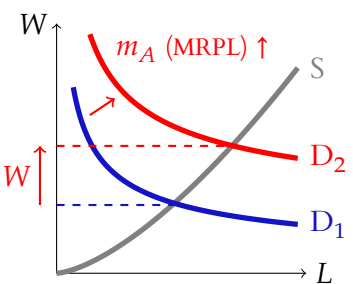


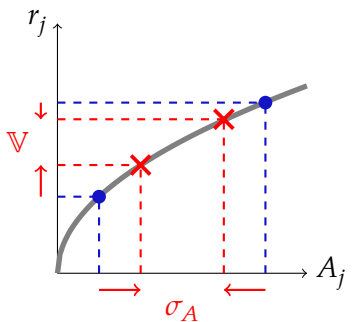
Targeted Moments

III. Firm

		Moment(s)	Key Parameter(s)
III. Firm	Variance markup (within)	$\mathbb{V}(\log \mu_{ij}\|j)$	σ_z
	Average worker's wage	$\mathbb{E}(W)$	m_A
	Variance sales	$\mathbb{V}(\log r_{ij})$	σ_A







Targeted Moments

IV. Aggregates

		Moment(s)	Key Parameter(s)
IV. Aggregates	Average employment	$\mathbb{E}(l_{ij})$	$\overline{\varphi}$
	Average manager salary	$\mathbb{E}_x(\omega(x))$	ψ
	Manager salary, p1	$\omega(x\|p1)$	ω_0

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