Union and Firm Labor Market Power

Miren Azkarate-Askasua
University of Mannheim

Miguel Zerecero
University of California, Irvine

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Introduction

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- What are the **efficiency** and **welfare** effects of labor market power?

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- Labor **wedge** between marginal revenue product of labor (**MRPL**) and **wage**.

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- Effects:
  1. **Distributional**: λ splits output into labor and profit shares.
  2. **Efficiency**: $\lambda_i \neq \lambda_j \Rightarrow MRPL_i \neq MRPL_j$. Potential misallocation.

Results

1. **Empirical evidence:** employer labor market power (markdown).
   - Establishmen level: emp. share endogenous → IV mass layoffs to competitors: ↑ local **employment share**, ↓ **wages**.

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2. **Structural model:**
    - Static GE model where employers and unions **bargain** over wages internalizing the generation of rents.
3. **Quantification:** counterfactuals removing (i) unions, and (ii) both labor market powers.
    - Without unions, **output** reduced by 0.21% and LS by 10 p.p.
    - Key mechanism: larger **reallocation** of rents to workers in more **productive** firms.
    - Competitive labor market increases **output** by 1.62% and LS by 21 p.p.

Literature

- **Labor market power:**
  Benmelech, Bergman, and Kim (2018), Azar et al. (2020a), Azar et al. (2020b), Lipsius (2018), Berger et al. (2022), Lamadon et al. (2022), Jarosch et al. (2019), Hershbein et al. (2020), Wong (2019), Dodini et al. (2020).

  \+ **bargaining**.
- **Wage bargaining:**
  Osborne and Rubinstein (1990), Breda (2015), Cahuc et al. (2006), Jäger et al. (2020).

  \+ **employer** labor market power.
- **Market power and LS:**
  Barkai (2020), De Loecker et al. (2020), Gutiérrez and Philippon (2016).

  \+ **labor** market power.
- **Misallocation:**
  Hsieh and Klenow (2009), Restuccia and Rogerson (2008), Edmond et al. (2021), Morlacco (2018) .

  \+ **structural labor** wedges.
- **Trade:**
  Eaton and Kortum (2002), Atkeson and Burstein (2008), Costinot and Rodríguez-Clare (2014).

Data

- French manufacturing firms 1994-2007.
  1. Firm balance sheet (*FICUS*): value added, capital and industry classification.
  2. Universe of salaried workers (*DADS Postes*): location, occupation, wages and employment.

- 364 commuting zones (CZ) **n**.
- 97 3-digit industries **h** that belong to 20 2-digit **b**.
- 4 occupations **o**: top management, supervisor, clerical, blue collar.
- 57900 **Local labor market m**: Commuting Zone (CZ) **n** × 3-digit Industry **h** × Occupation **o**.

Stats Transitions Evidence LS

Wages and Concentration

- Concentration: employment share within the local labor market.
- Reduced form model:

$$\log(w_{io,t}) = \beta\, s_{io|m,t} + \psi_{\mathbf{J}(i),o,t} + \delta_{\mathbf{N}(i),t} + \varepsilon_{io,t},$$

$s_{io|m,t}$: employment share of the plant i occupation o at the local labor market m
$\psi_{\mathbf{J}(i),o,t}$: firm-occupation-year FE
$\delta_{\mathbf{N}(i),t}$: commuting zone-year FE.

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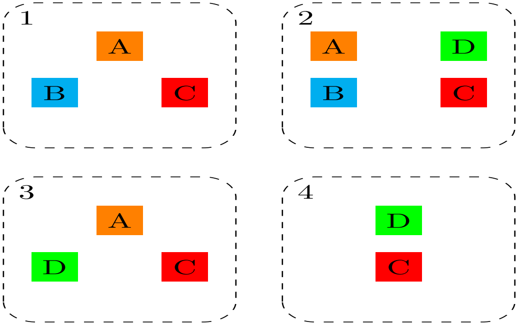
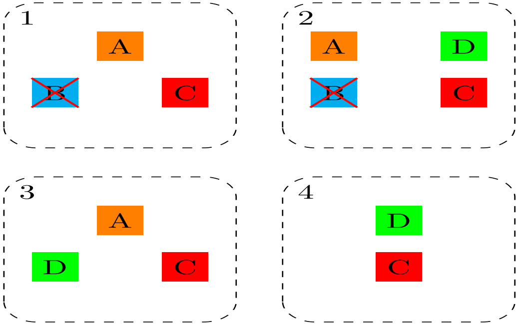
- **Issue**: **Endogeneity** of $s_{io|m,t}$.

Labor Shock to Competitors



Labor Shock to Competitors



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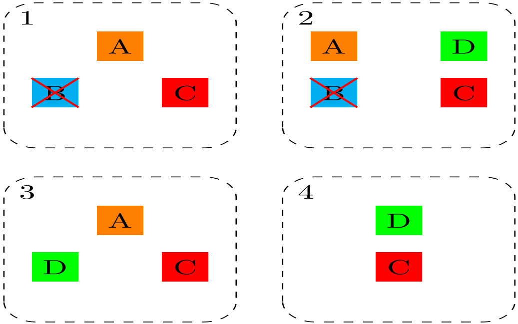

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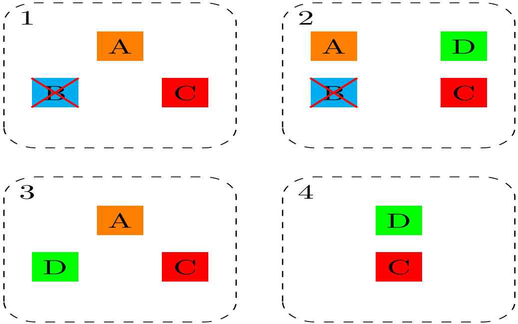
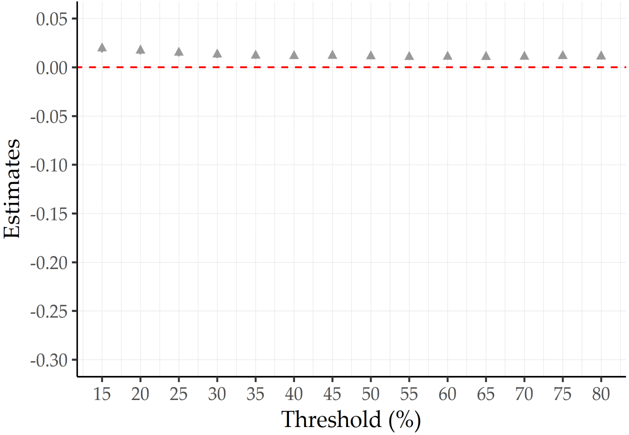


- Employment shock at **national** level → exogenous change of $s_{io|m}$ for competitors.
- **Assumption**: **location** of competitors **independent** to the mass layoff shock.
- National mass layoffs of *jo* if **all** establishments are affected: $L_{io,t} < \kappa \, L_{io,t-1} \; \forall$ plants *i* of *jo*.

Employment Share on Wages



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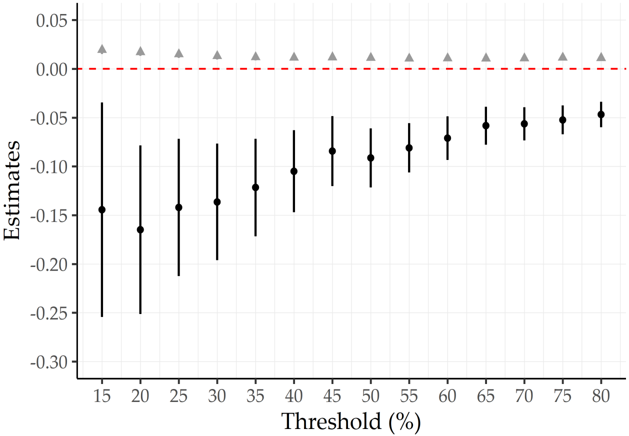

- Semi-elasticity between -0.17 and -0.04. From Q1 to Q3, reduction of 1000 euros.

Lagged Concentration Robustness Estimation Fit

Unions

- Low unionization rates in France (8.1%) compared to the U.S. (10.1%) or Norway (50.5%).
- Collective agreements extend to non-unionized workers. Coverage (98.5%).
- Bargaining at the industry, occupation, firm or plant level. Half of biggest industries had agreements below minimum wage in 2007. (Breda, 2015).
- Naouas and Romans (2014):
  - Collective agreements at firm level (2010): 92% of mono-establishment firms and 45% of multi-establishment firms.

Model Setup

- **Static** general equilibrium model.
- Output and capital markets competitive. Exogenous interest rate.
- Perfectly substitutable occupation specific output.
- Industry b specific technology: $y_{io} = \widetilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b}$

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- **Workers** homogeneous in ability but heterogeneous **preferences** for workplaces.
- **Discrete** set of **establishments** per local labor market.
- Nash **bargaining** where establishments and unions **internalize** the labor supply.

Output

Labor Supply

- Exogenous measure L of workers.
- **Heterogeneous** only in **tastes** (extreme value):
  1. Observe sub-market taste shock u_m: choose local labor market m.
  2. Observe z_{io}: choose establishment i.

Labor Supply

- Exogenous measure L of workers.
- Worker's indirect utility $\mathcal{U}_{io} = w_{io}\, z_{io}\, u_m$.
- Probability to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$.

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- Probability to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$.
- Employment share $s_{io|m}$:

$$s_{io|m} = \frac{T_{io} w_{io}^{\varepsilon_b}}{\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b}}.$$

- $\boldsymbol{\varepsilon_b}$ governs the mobility within the local labor market.

Labor Supply

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- Probability to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$.
- Employment share s_m:

$$s_m = \frac{\kappa_b\, \omega_m^{\eta}}{\sum_{m' \in \mathcal{M}} \kappa_{b'}\, \omega_{m'}^{\eta}}, \quad \omega_m \equiv \left(\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b} \right)^{1/\varepsilon_b}.$$

- η governs the mobility across local labor markets.

Details

Bargaining

- Quasi-rents from decreasing returns to scale ($\alpha_b + \beta_b < 1$).
- Bilateral Nash bargaining at the establishment-occupation level.

Bargaining

- Quasi-rents from decreasing returns to scale ($\alpha_b + \beta_b < 1$).
- Bilateral Nash bargaining at the establishment-occupation level.
- In the wage setting **both** sides
  - internalize how they move along the **labor supply**,
  - bargain with zero as outside option.
- Union **bargaining** power: φ_b.

Details

Equilibrium Wages

- Equilibrium wages:

$$w_{io} = \underbrace{\left[(1-\varphi_b)\,\mu(s) + \varphi_b \frac{1}{1-\delta} \right]}_{\text{Wedge } \lambda(\mu_{io},\varphi_b)} \times MRPL_{io},$$

where **markdown** $\mu(s)$ oligopsonistic competition and **markup** $\dfrac{1}{1-\delta}$, $1-\delta = \frac{\beta_b}{1-\alpha_b}$.

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where **markdown** $\mu(s)$:

$$\mu(s) = \frac{e_{io}}{e_{io}+1}, \quad e_{io} = \varepsilon_b(1 - s_{io|m}) + \eta s_{io|m}.$$

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$$\mu(s) = \frac{e_{io}}{e_{io}+1}, \quad e_{io} = \varepsilon_b(1-s_{io|m}) + \eta s_{io|m}.$$

- **Heterogeneity** of $\lambda(\mu_{io},\varphi_b)$ **distorts** relative wages and labor supply.

Markdown Distribution Efficiency Output MP

Estimation

Parameters: elasticities of substitution $\{\varepsilon_b\}, \eta$, returns to scale δ, output elasticities $\{\beta_b\}, \{\alpha_b\}$ and union bargaining powers $\{\varphi_b\}$.

1. Identify η and δ by leveraging on full monopsonists and exploiting differences in the covariance matrix of shocks across occupations.

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1. Identify η and δ by leveraging on full monopsonists and exploiting differences in the covariance matrix of shocks across occupations.
2. Estimate $\{\varepsilon_b\}$ instrumenting for the wages on the labor supply equation.
3. $\{\varphi_b\}$ and $\{\alpha_b\}$ match industry labor and capital shares.

Results

η and δ ϵ_b φ_b and α_b

Counterfactuals: Efficiency and Welfare

		Gains (%)		
	LS (%)	ΔY	Δ Wage	Δ Welfare (L)
Baseline	50.62	-	-	-
Counterfactuals				
No wedges $\lambda(\mu, \varphi_b) = 1$	72.26	1.62	45.06	42.07
Bargain $\lambda(1, \varphi_b) = 1 + \varphi_b \frac{\delta}{1-\delta}$	73.38	1.60	47.27	44.34
Oligosonistic $\lambda(\mu, 0) = \mu_{io}$	40.94	-0.21	-19.29	-20.53

Why unions reduce misallocation?

- Labor share:

$$\frac{w_{io}L_{io}}{P_bY_{io}} = \beta_b\lambda_{io} = \underbrace{\beta_b}_{\text{Perf. Comp.}} - \underbrace{\beta_b(1-\mu_{io})}_{\text{Oligopsonistic Rents}} + \underbrace{\varphi_b \overbrace{\left[\underbrace{(1-\alpha_b-\beta_b)}_{\text{DRS Rents}} + \underbrace{\beta_b(1-\mu_{io})}_{\text{Oligopsonistic Rents}}\right]}^{\text{Total Rents}}}_{\text{Bargaining gains}}$$

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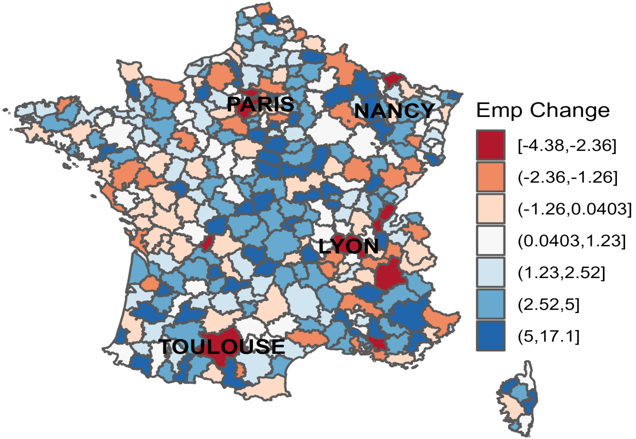
- **Bargain** over remaining **rents**.
- **More productive** firms have (in general) **more rents** to split.
- Bargaining ⇒ wedges increase by more in productive firms.
- ⇒ **compression** of wedges ⇒ reduced misallocation.

Geographical Labor Adjustment: Perfect Competition



Productivity Extentions

Conclusion

- Empirical evidence suggests larger firms pay lower wages compared to MRPL.
- Model: bargaining not only plays a distributional role $\Rightarrow$ increase efficiency through wedge compression via rents reallocation.
- Extra stuff in the paper:
  - Discussion about identification of parameters in the presence of strategic interaction.
    - Complete argument by Berger et al. (2022) about SUTVA violation in these settings.
  - Extensions: agglomeration, endogenous labor force participation.

Thank you!

Summary Statistics: Establishment-Occupation

	Mean	Pctl(25)	Median	Pctl(75)	St. Dev.
All Sample					
L_{iot}	11.1	1.1	2.3	6.2	59.5
$w_{iot}L_{iot}$	367.2	31.6	71.8	196.6	2,379.5
w_{iot}	34.0	20.9	27.4	39.5	117.1
$s_{io\|m}$	0.20	0.01	0.05	0.24	0.30
(a) Monolocation					
L_{iot}	7.4	1.0	2.1	5.1	29.7
$w_{iot}L_{iot}$	216.7	29.7	64.5	159.6	925.2
w_{iot}	32.8	20.3	26.6	38.5	35.5
$s_{io\|m}$	0.18	0.01	0.04	0.19	0.29
(b) Multilocation					
L_{iot}	26.6	1.3	4.1	15.1	120.3
$w_{iot}L_{iot}$	1,004.7	45.7	139.3	533.0	5,052.4
w_{iot}	39.0	23.6	30.7	43.7	257.7
$s_{io\|m}$	0.29	0.02	0.11	0.48	0.35

Notes: The top panel shows summary statistics for the whole sample. Panels (a) and (b) present respectively summary statistics of monolocation and multi-location firm-occupations. Number of observations for All Sample is 4,151,892. For the Monolocation sample is 3,359,236; and for the Multilocation sample is 792,656. L_{iot} is full time equivalent employment at the establishment-occupation io, $w_{iot}L_{iot}$ is the wage bill, w_{iot} is establishment-occupation wage or wage per FTE, $s_{io|m}$ is the employment share out of the local labor market. All the nominal variables are in thousands of constant 2015 euros.

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Summary Statistics

Table: Local Labor Market Summary Statistics. Baseline Year

Variable	Obs.	Mean	Pctl(25)	Median	Pctl(75)	St. Dev.
N_m	57,940	4.755	1	2	4	14.400
L_m	57,940	51.005	2.786	9.421	34.912	196.201
$\overline{w}_m$	57,940	36.619	24.264	30.224	42.492	36.078
$\text{HHI}(s_{io\mid m})$	57,940	0.671	0.384	0.683	1.000	0.320
$\text{HHI}(s^{w}_{io\mid m})$	57,940	0.676	0.392	0.698	1.000	0.318

Table: Sub-industry Summary Statistics.

Variable	Obs.	Mean	Pctl(25)	Median	Pctl(75)	St. Dev.
N_h	97	2,840.000	493	1,261	2,639	4,530.496
L_h	97	30,466.030	7,559	15,070	50,036	33,899.330
$\overline{w}_h$	97	34.607	29.562	32.990	37.531	6.902
LS_h	97	0.520	0.482	0.527	0.581	0.098
KS_h	97	0.261	0.165	0.233	0.316	0.133

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Transition Rates

Occup. Ch.	CZ Ch.	Ind. Ch.	Trans. Prob. FTE	Trans. Prob.
0	0	0	91.39	91.01
0	0	1	2.37	2.36
0	1	0	0.02	0.02
1	0	0	6.03	6.40
1	0	1	0.20	0.21
1	1	0	0.00	0.00
1	1	1	0.00	0.00

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Labor Share and Concentration

- Sub-industry **Labor share** $LS_h = \frac{WageBill_h}{VA_h}$.
- Employment share of establishment **i**, occupation **o**: $s_{io|m} = \frac{L_{io}}{L_m}$.
- **Concentration** at local labor market **m**: **Herfindahl** Index,

$$HHI_m = \sum_{i \in \mathcal{I}_m} s^2_{io|m}.$$

- HHI at sub-industry level **h** ($\overline{HHI}_{h,t}$): employment weighted average of HHI_m.

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Empirical Evidence: ↑ Concentration, ↓ Labor Share

$$\ln(LS_{h,t}) = \delta_{b,t} + \beta \ln(\overline{HHI}_{h,t}) + \varepsilon_{h,t}$$

	$\ln(LS_{h,t})$		
	(1)	(2)	(3)
$\ln(\overline{HHI}_{h,t})$	-0.064^{***}	-0.054^{***}	-0.056^{***}
	(0.013)	(0.013)	(0.014)
Industry FE	N	Y	N
Industry-year FE	N	N	Y
Observations	1357	1357	1357
R^2	0.017	0.290	0.343
Adjusted R^2	0.017	0.280	0.170
Note:			*p<0.1; **p<0.05; ***p<0.01

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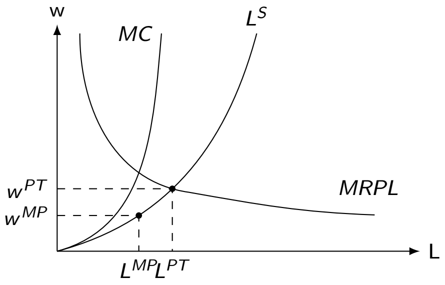
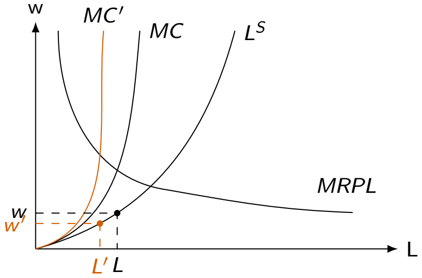
Identification Strategy



(a) Equilibrium wage in the absence of bargaining



(b) Instrument

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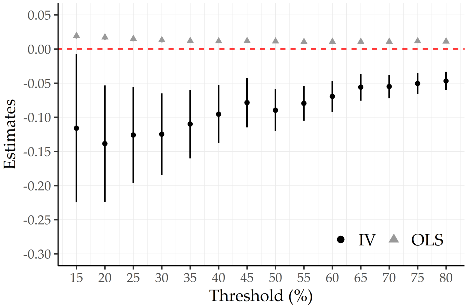
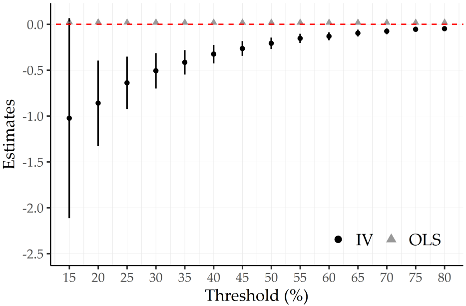
Robustness Checks



(a) Instrument: Intensive Share



(b) Local Labor Market

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Alternative Instrument: Lagged Concentration

	Dependent variable:			
	Plant log(Wage)			
	OLS	IV	OLS	IV
$s_{io\|m,t}$	0.010***	−0.030***	0.007***	−0.030***
	(0.001)	(0.002)	(0.001)	(0.002)
Firm-Occ-Year FE	Y	Y	Y	Y
CZ FE	Y	Y	N	N
CZ-Year FE	N	N	Y	Y
Observations	792,656	733,576	792,656	733,576
R^2	0.833	0.861	0.853	0.862
Adjusted R^2	0.763	0.802	0.790	0.802

Note: *p<0.1; **p<0.05; ***p<0.01

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Unions

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- Proxy of rents: value added per worker at the firm.

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- Proxy of rents: value added per worker at the firm.
- Reduced form model:

$$\log(w_{io,t}) = \beta_b \log(y_{\mathbf{J}(i),t}) + \delta_{b,o,t} + \varepsilon_{io,t},$$

$y_{\mathbf{J}(i),t}$: firm value added per worker
$\delta_{b,o,t}$: industry-occupation-year FE

- Industry elasticities range from 0.22 (metallurgy) to 0.43 (food). Results

Bargaining heterogeneity: relevant of industry differences as opposed to occupational.

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Rent Sharing: Industries

Industry Code	Industry Name	Rent Sharing	SE Rent Sharing
15	Food	0.40	0.00
17	Textile	0.22	0.00
18	Clothing	0.31	0.00
19	Leather	0.31	0.00
20	Wood	0.32	0.00
21	Paper	0.22	0.00
22	Printing	0.34	0.00
24	Chemical	0.17	0.00
25	Plastic	0.23	0.00
26	Other Minerals	0.25	0.00
27	Metallurgy	0.14	0.00
28	Metals	0.37	0.00
29	Machines and Equipments	0.30	0.00
30	Office Machinery	0.33	0.01
31	Electrical Equipment	0.25	0.00
32	Telecommunications	0.23	0.00
33	Optical Equipment	0.32	0.00
34	Transport	0.22	0.00
35	Other Transport	0.31	0.00
36	Furniture	0.37	0.00

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Rent Sharing: Occupations

Occupation	Rent Sharing	SE Rent Sharing
Top management	0.38	0.00
Supervisor	0.27	0.00
Clerical	0.29	0.00
Blue collar	0.30	0.00

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Output

- **Establishment** i produces with occupation specific capital K_{io} and labor L_{io}:

$$y_{io} = \widetilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b}, \quad y_i = \sum_{o=1}^{O} y_{io}.$$

  Assume constant elasticity of labor demand of transformed production function: $\frac{\beta_b}{1-\alpha_b} = 1 - \delta \quad \forall\, b$ (CRS when $\delta = 0$).

- **Industry** output: $Y_b = \sum_{m \in \mathcal{M}_b} \sum_{i \in \mathcal{I}_m} y_i$.

- **Aggregate** output: $Y = \prod_{b \in \mathcal{B}} Y_b^{\theta_b}$.

Back Assumption Prod. Alternative Prod.

Production Function

$$y_{io} = G_b A_{io} L_{io}^{\frac{\beta_b}{1-\alpha_b}}, \quad A_{io} = \widetilde{A}_{io}^{\frac{1}{1-\alpha_b}} \text{ and } G_b \equiv P_b^{\frac{\alpha_b}{1-\alpha_b}}.$$

- **Assume** constant elasticity of labor demand: $\frac{\beta_b}{1-\alpha_b} = 1 - \delta \quad \forall\, b$ (CRS when $\delta = 0$).

Back to Output Back to Model

Production Function

$$y_{io} = G_b A_{io} L_{io}^{1-\delta}.$$

- **Assume** constant elasticity of labor demand: $\frac{\beta_b}{1-\alpha_b} = 1 - \delta \quad \forall\, b$ (CRS when $\delta = 0$).
- Assumption allows for **separability** of local labor markets.
- **Keep heterogeneity** of production function (α_b, β_b).

Back to Output Back to Model

Alternative Production Function

- Labor H_i as occupation composite:

$$y_i = \widetilde{A}_i K_i^{\alpha_b} H_i^{\beta_b} = \widetilde{A}_i K_i^{\alpha_b} \left(\prod_{o \in \mathcal{O}} L_{io}^{\gamma_o} \right)^{\beta_b},$$

$$\sum_o \gamma_o = 1, \quad \alpha_b + \beta_b \leq 1.$$

- Wage FOC:

$$w_{io} = \beta_b \gamma_o \lambda(\mu_{io}, \varphi_b) P_b \frac{y_i}{L_{io}}$$

Back to Output　　Back to Model

Production

- Final good: $Y = \prod_{b \in \mathcal{B}} Y_b^{\theta_b}$.
- Demand for industry good: $\theta_b Y = P_b Y_b$.
- Industry output: $Y_b = \sum_{m \in \mathcal{M}_b} \sum_{i \in \mathcal{I}_m} y_i$.
- Establishments use occupation specific capital K_{io} and labor L_{io} to produce with DRS technology. Production linearly separable in occupations:

$$y_i = \sum_o \widetilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b}.$$

Back to Output Back to Model

Workers

- Worker's indirect utility:

$$\mathcal{U}_{io} = w_{io}\, z_{io}\, u_m,$$

Workers

- Worker's indirect utility:

$$\mathcal{U}_{io} = w_{io}\, z_{io}\, u_m,$$

where idiosyncratic taste shocks are distributed Fréchet:

$$P(z) = e^{-Tz^{-\varepsilon_{\boldsymbol{b}}}}, \quad T > 0, \varepsilon_{\boldsymbol{b}} > 1$$

within local labor market preference shifter. **Amenity** related and **industry** specific.

Workers

- Worker's indirect utility:

$$\mathcal{U}_{io} = w_{io}\, z_{io}\, u_m,$$

where idiosyncratic taste shocks are distributed Fréchet:

$$P(u) = e^{-u^{-\eta}}, \quad \eta > 1$$

across local labor market preference shifter.

Workers

- Worker's indirect utility:

$$\mathcal{U}_{io} = w_{io}\, z_{io}\, u_m,$$

ε_b and η act as elasticities.

Back

Labor Supply

- Workers choose where to work to maximize indirect utility.
- **Probability** to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$,

Labor Supply

- Workers choose where to work to maximize indirect utility.
- **Probability** to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$,
- Employment share $s_{io|m}$:

$$s_{io|m} = \frac{T_{io} w_{io}^{\varepsilon_b}}{\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b}}.$$

- $\boldsymbol{\varepsilon_b}$ governs the mobility within the local labor market.

Labor Supply

- Workers choose where to work to maximize indirect utility.
- **Probability** to work in establishment **i** occupation **o** is: $\Pi_{io} = s_{io|m} \times s_m$,
- Employment share s_m:

$$s_m = \frac{\kappa_b \, \omega_m^{\eta}}{\sum_{m' \in \mathcal{M}} \kappa_{b'} \, \omega_{m'}^{\eta}}, \quad \omega_m \equiv \left(\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b} \right)^{1/\varepsilon_b} .$$

- η governs the mobility across local labor markets.

Back

Markdown μ

- **Strategic interaction**:

$$\mu(s) = \frac{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m}}{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m} + 1}$$

- When $\boldsymbol{\varepsilon_b > \eta}$, $\mu(s)$ decreasing in employment share.

- **No strategic** interaction when continuum of establishments, $\boldsymbol{\mu_b = \frac{\varepsilon_b}{\varepsilon_b + 1}}$.

Back

Absence of Bargaining

- Establishment i's problem is:

$$\max_{\{w_{io}\},\{K_{io}\}} \sum_o \widetilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b} - \sum_o w_{io} L_{io}(w_{io}) - R_b \sum_o K_{io}$$

$$\text{s.t. } L_{io}(w_{io}) = \frac{T_{io} w_{io}^{\varepsilon_b}}{\Phi_m} \frac{\Phi_m^{\eta/\varepsilon_b} \Gamma_b^{\eta}}{\Phi} L \quad \forall o$$

Back

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- Wage FOC:

$$w_{io} = \underbrace{\frac{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m}}{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m} + 1}}_{\text{Markdown } \mu(s)} \underbrace{\beta_b P_b \widetilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b - 1}}_{\text{MRPL}},$$

where $s_{io|m}$ is the employment share out of m.

Back

Bargaining Details

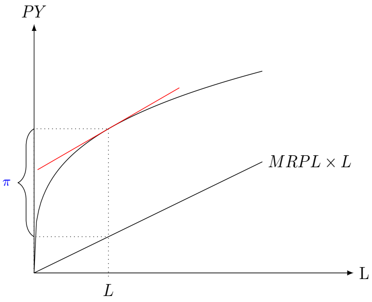
- Separability of occupation output in the production function.
- Occupation profit functions $(1-\alpha_b)pF(L_{io}) - w^u_{io}L_{io}$, with optimal demand for capital.
- Zero outside option for both parties.
- Bilateral Nash bargaining:

$$\max_{w^u_{io}} (w^u_{io}L_{io})^{\varphi_b}((1-\alpha_b)pF(L_{io}) - w^u_{io}L_{io})^{1-\varphi_b} \quad \text{s.to } L_{io}(w_{io}),$$

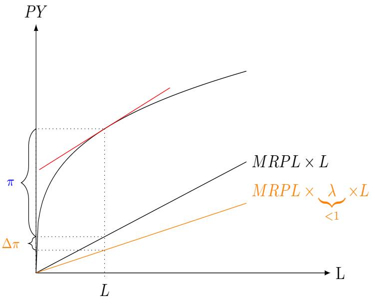
Back

Distribution: Split Y into LS and PS

(a) Perfect Competition



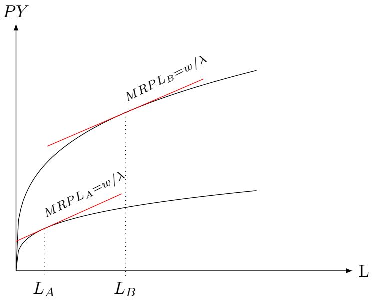
(b) Labor Market Power



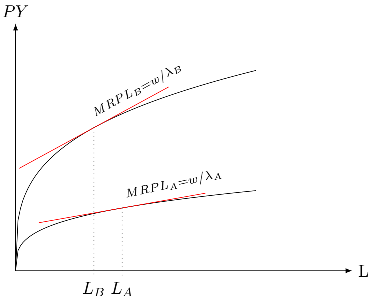
Back

Efficiency: Heterogeneity of $\lambda \Rightarrow$ Distortions

(a) Homogeneous Markdown



(b) Heterogeneous Markdown



Back

Output Market Power. No Occupations

- Industry good Y_b CES aggregator with elasticity of substitution σ.
- Establishment price: $p_i = \left(\frac{y_i}{Y_b}\right)^{-1/\sigma} P_b$.
- Wage in the absence of bargaining:

$$w_i = \underbrace{\frac{\varepsilon_b(1-s_{io|m}) + \eta s_{io|m}}{\varepsilon_b(1-s_{io|m}) + \eta s_{io|m} + 1}}_{\text{Markdown } \boldsymbol{\mu(s)}} \times \underbrace{\frac{\sigma - 1}{\sigma}}_{\text{Inverse PC Markup}} \times MRPL$$

Back

Output Market Power. No Occupations

- Bargaining with output market power:

$$w_{io} = \underbrace{\left[(1-\varphi_b)\,\mu(s) + \varphi_b \, \frac{1}{\beta_b} \left(\frac{\sigma}{\sigma - 1} - \alpha_b \right) \right]}_{\text{Wedge } \lambda(\mu_{io}, \varphi_b)} \times \frac{\sigma - 1}{\sigma} \times MRPL$$

- Bargaining without output market power $\frac{1}{1-\delta} = \frac{1-\alpha_b}{\beta_b}$:

$$w_{io} = \underbrace{\left[(1-\varphi_b)\,\mu(s) + \varphi_b \, \frac{1}{1-\delta} \right]}_{\text{Wedge } \lambda(\mu_{io}, \varphi_b)} \times MRPL$$

- Lower overall wages due to the inverse price-cost markup and higher rent extraction from unions.

Back

Characterization

- Wages decomposed into an individual (establishment-occupation) component and aggregate component at the local labor market.
- Solve in two steps:
  1. Individual components. Build industry level productivity.
  2. (Transformed) industry prices G_b.

Proposition

An equilibrium exists and is unique.

Back GE

General Equilibrium

- For given industry required rates $\{R_b\}_{b=1}^{B}$, the general equilibrium of this economy will be a set of wages $\{w_{io}\}_{io=1}^{IO}$, output prices $\{P_b\}_{b=1}^{B}$, a measure of labor supplies to every establishment and occupation $\{L_{io}\}_{io=1}^{IO}$, capital $\{K_{io}\}_{io=1}^{IO}$ and output $\{y_{io}\}_{io=1}^{IO}$, industry $\{Y_b\}_{b=1}^{B}$ and economy wide outputs Y, such that:
    - Firms choose capital optimally.
    - Wages solve a reduced form bargaining problem.
    - Aggregation: $\{y_{io}\}_{io\in\mathcal{I}_b} \to Y_b \quad \forall\, b$, $\{Y_b\}_{b\in\mathcal{B}} \to Y$.
    - Industries' goods markets clear.

Back

Estimation: η and δ

- Focus on establishment-occupations are alone in their local labor markets.
- Their local equilibrium is a standard price-quantity system.
- Equilibrium wage of **full monopsonists** ($\mu(s=1)=\frac{\eta}{\eta+1}$) and labor supply:

$$w_{io} = \left[(1-\varphi_b)\frac{\eta}{\eta+1} + \varphi_b \frac{1}{1-\delta}\right] \beta_b P_b^{\frac{1}{1-\alpha_b}} A_{io} L_{io}^{-\delta}$$

$$L_{io} = \frac{T_{io}^{\eta/\varepsilon_b} w_{io}^{\eta} \kappa_b}{\Phi} L$$

Estimation: η and δ

- Focus on establishment-occupations are alone in their local labor markets.
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- Equilibrium wage of **full monopsonists** ($\mu(s=1) = \frac{\eta}{\eta+1}$) and labor supply:

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$$L_{io} = \frac{T_{io}^{\eta/\varepsilon_b} w_{io}^{\eta} \kappa_b}{\Phi} L$$

- **Issue:** OLS estimates **biased** to zero.

Back

Estimation: η and δ

- Demeaned logarithm of the system in matrix form:

$$\begin{pmatrix} \ln(L_{io}) \\ \ln(w_{io}) \end{pmatrix} = \frac{1}{1+\eta\delta} \begin{pmatrix} 1 & -\eta \\ \delta & 1 \end{pmatrix} \begin{pmatrix} \frac{\eta}{\varepsilon_b} \ln(T_{io}) \\ \ln(A_{io}) \end{pmatrix}$$

- If only one category, 3 moments (Cov(L,w)) and 5 unknowns (Cov(A,T),δ,η).

Estimation: η and δ

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$$\begin{pmatrix} \ln(L_{io}) \\ \ln(w_{io}) \end{pmatrix} = \frac{1}{1+\eta\delta} \begin{pmatrix} 1 & -\eta \\ \delta & 1 \end{pmatrix} \begin{pmatrix} \frac{\eta}{\varepsilon_b} \ln(T_{io}) \\ \ln(A_{io}) \end{pmatrix}$$

- If only one category, 3 moments (Cov(L,w)) and 5 unknowns (Cov(A,T),δ,η).
- Group the 4 occupations into 2 categories S: white collar, blue collar.
- **Identifying assumption:** Restriction on the variance covariance matrix of structural shocks. Similar relationships between productivity and amenities (e.g. working hours, repetitiveness) within category.

Back Details

Estimation: Heteroskedasticity

- Group the 4 occupations into 2 **categories** S: white collar, blue collar.
- Equilibrium wage:

$$w_{io} = \left[(1-\varphi_b)\,\mu(s) + \varphi_b\,\frac{1}{1-\delta}\right]\beta_b P_b^{\frac{1}{1-\alpha_b}} A_{io} L_{io}^{-\delta}$$

Estimation: Heteroskedasticity

- Group the 4 occupations into 2 **categories** S: white collar, blue collar.
- Equilibrium wage of **full monopsonists** ($\mu(s=1)=\frac{\eta}{\eta+1}$):

$$w_{io} = \underbrace{\left[(1-\varphi_b)\frac{\eta}{\eta+1} + \varphi_b \frac{1}{1-\delta}\right]}_{\lambda(\frac{\eta}{\eta+1},\varphi_b)} \beta_b P_b^{\frac{1}{1-\alpha_b}} A_{io} L_{io}^{-\delta}$$

Estimation: Heteroskedasticity

- Group the 4 occupations into 2 **categories** S: white collar, blue collar.
- Equilibrium wage of **full monopsonists** ($\mu(s=1) = \frac{\eta}{\eta+1}$):

$$w_{io} = \underbrace{\lambda(\frac{\eta}{\eta+1}, \varphi_b)\beta_b P_b^{\frac{1}{1-\alpha_b}}}_{C_b} A_{io} L_{io}^{-\delta}$$

- Logarithm of the labor supply and demand of occupation o:

$$\frac{\eta}{\varepsilon_b} \ln(T_{io}) = \ln(L_{io}) - \eta \ln(w_{io}) - \eta \ln(\Gamma_b),$$
$$\ln(A_{io}) = \delta \ln(L_{io,S}) + \ln(w_{io,S}) - \ln(C_b).$$

Estimation: Heteroskedasticity

- Group the 4 occupations into 2 **categories** S: white collar, blue collar.
- Equilibrium wage of **full monopsonists** ($\mu(s=1)=\frac{\eta}{\eta+1}$):

$$w_{io} = \underbrace{\lambda(\eta/(\eta+1), \varphi_b)\beta_b P_b^{\frac{1}{1-\alpha_b}}}_{C_b} A_{io} L_{io}^{-\delta}$$

- (Demeaned) logarithm of the labor supply and demand of occupation o:

$$\frac{\eta}{\varepsilon_b}\ln(T_{io}) = \ln(L_{io}) - \eta\ln(w_{io}),$$
$$\ln(A_{io}) = \delta\ln(L_{io,S}) + \ln(w_{io,S}).$$

Back   Back to η and δ

Estimation: Heteroskedasticity

- Variance-covariance in matrix form:

$$\Psi_o = D\widehat{V}_o D^T, \quad D = \begin{pmatrix} 1 & -\eta \\ \delta & 1 \end{pmatrix},$$

$$\Delta_S \equiv \Psi_o - \Psi_{o'} = D[\widehat{V}_o - \widehat{V}_{o'}]D^T, \quad \{o, o'\} \in S$$

- **Identifying assumptions:**
  - $\sigma_{AT,o} = \sigma_{AT,o'}$ within category S, i.e. similar relationships between productivity and amenities (e.g. working hours, repetitiveness)
  - Different Δ_S across categories, i.e. categories differ in variances - *heteroskedasticity*

Back

User Cost of Capital

- Data: Capital Input Data from the EU KLEMS database, December 2016 revision.
- Following Barkai (2020) R_{sb} user cost of capital type s at industry b is:

$$R_{sb} = \left(i^D - \mathbb{E}\left[\pi_{sb}\right] + \delta_{sb} \right),$$

i^D: cost fo debt borrowing
π_{sb}: inflation
δ_{sb}: depreciation rate

- Industry user cost R_b is a capital expenditure weighted sum of different capital types s.

Back

Estimation: ε_b

- Structural labor supply equation (in logs) for non-full monopsonists:

$$\ln(L_{iot}) = \varepsilon_b \ln(w_{iot}) + f_{m,t} + \ln(T_{iot})$$

- High amenity establishment-occupations theoretically should pay lower wages.
- Instrument the wages with a measure of TFP:

$$\widehat{A}_t = \frac{P_{bt} Y_{Jt}}{\sum_{io} L_{iot}^{1-\delta}}$$

- Lagged instrument.

Back

Calibration: Bargaining Power and Output Elasticities

- Calibrate **capital elasticities** α_b to match industry capital shares. ▸ Cost Capital
- Labor elasticities β_b from the **assumption**: $\beta_b = (1-\delta)(1-\alpha_b)$.

Calibration: Bargaining Power and Output Elasticities

- Calibrate **capital elasticities** α_b to match industry capital shares. ▸ Cost Capital
- Labor elasticities β_b from the **assumption**: $\beta_b = (1-\delta)(1-\alpha_b)$.
- Industry labor share in the model:

$$LS^M_{bt}(\varphi_b) = \frac{\beta_b \sum_{io \in \mathcal{I}_b} w_{iot} L_{iot}}{\sum_{io \in \mathcal{I}_b} w_{iot} L_{iot} / \lambda(\mu_{io}, \varphi_b)}.$$

- Calibrate industry specific **bargaining powers** φ_b to match average industry labor shares.

Back

Estimation Results

Param.	Name	Estimate	Identification
η	Across market elast.	0.42	Heteroskedasticity
δ	1 - Returns to scale	0.04	Heteroskedasticity
$\{\varepsilon_b\}$	Within market elast.	1.2 - 4	Labor supply
$\{\beta_b\}$	Output elast. labor	0.57 - 0.85	Capital share and δ
$\{\varphi_b\}$	Union bargaining	0.06 - 0.7	Industry LS

Fundamentals Validation Back Non-targeted

Estimation Fit

1. **Industry evidence:** **Strategic interaction** and **unions** key to match the relationship between concentration and the labor share.
2. **Micro evidence:**
   - **Simulate productivity shocks** and assess the relationship between wages and employment concentration at the local labor market.
   - Exogenous change in **market structure**: shocks to weighted average productivity of competitors.
   - Estimated semi-elasticity is -0.203 matching the strongest estimates of the empirical evidence.

Industry Wages Empirical Evidence Back

Estimation Fit - Industry

	Data: $\ln(LS^{D}_{h,t})$		Oligopsony: $\ln(LS^{M,MP}_{h,t})$	Model: $\ln(LS^{M}_{h,t})$
	(1)	(2)		
$\ln(\overline{HHI}_{h,t})$	-0.054^{***}	-0.056^{***}		
	(0.013)	(0.013)		
Ind FE	Y	N		
Ind-Year FE	N	Y		
Obs.	1357	1357		
R^2	0.29	0.343		
Adj. R^2	0.280	0.172		
Note:				$^{*}p<0.1$; $^{**}p<0.05$; $^{***}p<0.01$

Estimation Fit - Industry

	Data: $\ln(LS^{D}_{h,t})$		Oligopsony: $\ln(LS^{M,MP}_{h,t})$		Model: $\ln(LS^{M}_{h,t})$
	(1)	(2)	(1)	(2)	
$\ln(\overline{HHI}_{h,t})$	-0.054^{***}	-0.056^{***}	-0.388^{***}	-0.416^{***}	
	(0.013)	(0.013)	(0.009)	(0.003)	
Ind FE	Y	N	Y	N	
Ind-Year FE	N	Y	N	Y	
Obs.	1357	1357	1357	1357	
R^2	0.29	0.343	0.901	0.903	
Adj. R^2	0.280	0.172	0.899	0.878	
Note:					*p<0.1; **p<0.05; ***p<0.01

- **Strategic interactions** key to generate negative relationship.

Back Other Fit Fundamentals

Estimation Fit - Industry

	Data: $\ln(LS^{D}_{h,t})$		Oligopsony: $\ln(LS^{M,MP}_{h,t})$		Model: $\ln(LS^{M}_{h,t})$	
	(1)	(2)	(1)	(2)	(1)	(2)
$\ln(\overline{HHI}_{h,t})$	-0.054^{***}	-0.056^{***}	-0.388^{***}	-0.416^{***}	-0.175^{***}	-0.161^{***}
	(0.013)	(0.013)	(0.009)	(0.003)	(0.007)	(0.005)
Ind FE	Y	N	Y	N	Y	N
Ind-Year FE	N	Y	N	Y	N	Y
Obs.	1357	1357	1357	1357	1357	1357
R^2	0.29	0.343	0.901	0.903	0.946	0.909
Adj. R^2	0.280	0.172	0.899	0.878	0.945	0.936
Note:				*p$<$0.1; **p$<$0.05; ***p$<$0.01		

- **Strategic interactions** key to generate negative relationship.

Back Other Fit Fundamer

Estimation Fit - Micro

- Fundamentals identified for 2007, simulate $\propto$ changes in *io* productivities.

- Link between employment shares and normalized wages:

$$\log(w_{io}) = f_b + \beta\, s_{io|m} + u_{io},$$

f_b captures the prices of TFPRs

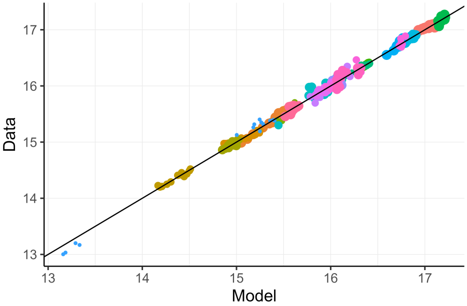
- Exogenous change in local structure: weighted average productivity Δ of competitors

$$\sum_{jo \in \{m \setminus io\}} \frac{Z'_{jo}}{Z_{jo}} \frac{L_{jo}}{\sum_{ko \in \{m \setminus io\}} L_{ko}},$$

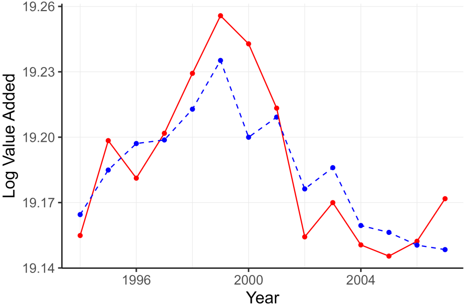
Z'_{jo} simulated revenue productivity for establishment-occupation *jo*
L_{jo} employment in the baseline year 2007.

Back

Model Fit: Non Targeted Moments



(a) Industry Value Added



(b) Aggregate VA (M: blue, D: red)

Back

Fundamentals

- Amenities match observed employment shares. ▸ Details
- Underlying **productivities** $\widetilde{A}_{io}$ **not observed** but rather can back out Revenue Total Factor Productivity (TFPR) $= P \times P_b \times \widetilde{A}_{io}$.
- Transformed **TFPR**: $Z_{io} \equiv A_{io} P \, P_b^{\frac{1}{1-\alpha_b}}$

Back

Fundamentals

- Observe:

$$Pw_{io} = \beta_b \lambda(\mu_{io}, \varphi_b) Z_{io} L_{io}^{-\delta}.$$

- Back out transformed revenue productivities Z_{io}. Function of endogenous prices.
- Solve **relative counterfactuals** observing wage and employment.
- Rewrite in terms of relative industry prices (counterfactual to baseline).

$$w'_{io} = \beta_b \lambda'_{io} Z_{io} \frac{\widehat{G}_b^{\frac{1}{\alpha_b}}}{P} {L'_{io}}^{-\delta}$$

Back

Counterfactuals: Hat Algebra

- Revenue Total Factor Productivity (TFPR) $= P \times P_b \times \widetilde{A}_{io}$.

- Transformed TFPR: $Z_{io} \equiv A_{io} P \, P_b^{\frac{1}{1-\alpha_b}}$

- Observe: $Pw_{io} = \beta_b \lambda(\mu, \varphi_b) Z_{io} L_{io}^{-\delta}$.

- Given Pw_{io} and L_{io}, back out transformed TFPRs Z_{io} and amenities T_{io}.

- Hat variables $\widehat{X} \equiv \frac{X'}{X}$.

- Counterfactual wage:

$$\begin{aligned} w'_{io} &= \beta_b \lambda'_{io} Z'_{io} {L'_{io}}^{-\delta} \frac{1}{P'} \\ &= \beta_b \lambda'_{io} Z_{io} \frac{\widehat{P}_b^{\frac{1}{1-\alpha_b}}}{P} {L'_{io}}^{-\delta} \end{aligned}$$

Back

Counterfactuals: Hat Algebra

- Counterfactual output:

$$
\begin{aligned}
y'_{io} &= G'_b A_{io} {L'_{io}}^{1-\delta} \\
&= \frac{\widehat{G}_b}{PP_b} Z_{io} {L'_{io}}^{1-\delta}.
\end{aligned}
$$

- Counterfactual industry output relative to baseline:

$$
\widehat{Y}_b = \widehat{G}_b \widehat{Z}_b \widehat{L}_b^{1-\delta},
$$

where $Z_b(\mathbf{s}') \equiv \sum_{io \in \mathcal{I}_b} Z_{io} \times (s'_{io|m} s'_{m|b})^{1-\delta}$

Back

Fundamentals: Amenities

- Employment share within the local labor market:

$$s_{io|m} = \frac{T_{io} w_{io}^{\varepsilon_b}}{\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b}} = \frac{T_{io} w_{io}^{\varepsilon_b}}{\omega_m^{\varepsilon_b}}, \quad \omega_m \equiv \left(\sum_{j \in \mathcal{I}_m} T_{jo} w_{jo}^{\varepsilon_b} \right)^{1/\varepsilon_b}.$$

- Local labor market employment:

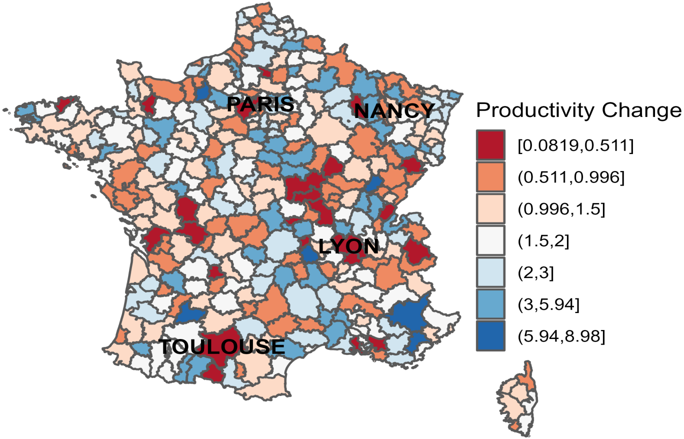
$$L_m = \frac{\kappa_b \, \omega_m^{\eta}}{\sum_{m' \in \mathcal{M}} \kappa_{b'} \, \omega_{m'}^{\eta}} L.$$

- Normalize one local labor market. Back out amenities, up to a constant:

$$T_{io} \propto \frac{s_{io|m}}{w_{io}^{\varepsilon_b}} \left(\frac{L_m}{\kappa_b^{1/\eta}} \right)^{\varepsilon_b/\eta}.$$

Back to Fundamentals
Back to Estim Results

Productivity Changes: Free Mobility



Back

Extentions

1. Endogenous Labor Force Participation:
   - Output gains up to 1.98%.
   - Not only productivity gains but also increase in total labor force. Endog. Part.
2. Agglomeration:
   - Agglomeration externalities within the local labor market.
   - Increases output gains from removing distortions. Agglom.

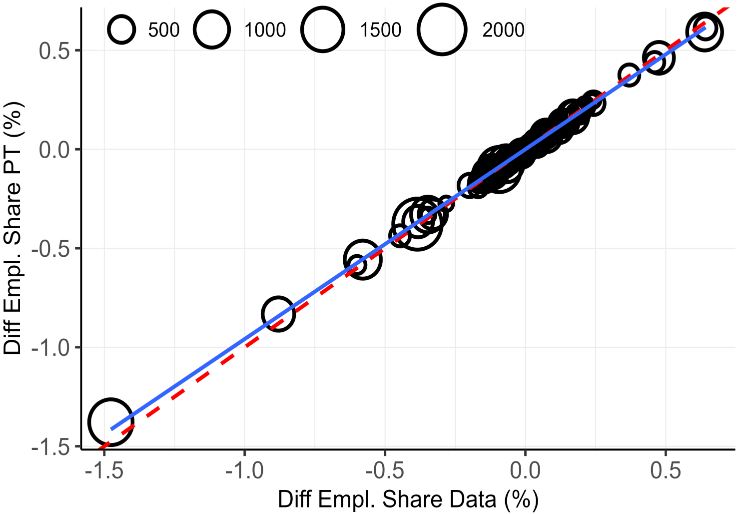
Back Additional

Additional Results

- Labor market distortions account for a third of urban-rural wage gap. ▸ Gap
- Counterfactual suggests movements to rural areas. But, counterfactual de-industrialization process similar to the observed one. ▸ De-indus

Back

De-industrialization Differences



Back

Wage Gap

	Wage No City	Wage City	Gap (%)
Baseline	33.321	45.210	36
Counterfactual (PT)	49.486	60.675	23

Note: Wages in thousands of constant 2015 euros. Cities are the 10 biggest commuting zones: Paris, Marseille, Lyon, Toulouse, Nantes, and the Paris surrounding, Boulogne-Billancourt, Creteil, Montreuil, Saint-Denis and Argenteuil.

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Extensions: (I) Endogenous Labor Force Participation

	ΔY (%)	Δ Prod (%)	Δ L (%)	Contribution (%)	
				Sh. Prod	Sh. Labor
Fixed L	1.62	1.33	-	83	8
Endogenous Part.					
No wedges $\lambda(\mu, \varphi_b) = 1$	1.98	1.18	1.00	60	29
Not internalize $\lambda(1, \varphi_b) = 1 + \varphi_b \frac{\delta}{1-\delta}$	2.04	1.18	1.04	58	32
Oligopsonistic $\lambda(\mu, 0) = \mu_{io}$	-1.29	-0.59	-0.75	46	53

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Extensions: (II) Agglomeration

- Agglomeration **externality** within the local labor market: $\widehat{A}_{io} = \widetilde{A}_{io} L_m^{\gamma(1-\alpha_b)}$.
- Wage FOC:

$$Pw_{io} = \beta_b \lambda(\mu_{io}, \varphi_b) Z_{io} L_{io}^{-\delta} L_m^{\gamma}.$$

- Additional **condition** for existence and uniqueness of the equilibrium: $\gamma \neq \frac{1}{\eta} + \delta$.
- Check for different γ.
- Output gains increasing in agglomeration.

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Extensions: (II) Agglomeration

	ΔY (%)	Δ Prod (%)	Contribution (%)		
			Sh. GE	Sh. Prod	Sh. Labor
No Agglomeration	1.62	1.33	9	83	8
Agglomeration					
$\gamma = 0.05$	1.73	1.40	8	82	10
$\gamma = 0.1$	1.84	1.48	7	81	12
$\gamma = 0.15$	1.96	1.57	6	81	13
$\gamma = 0.2$	2.08	1.66	5	80	15
$\gamma = 0.25$	2.22	1.75	3	80	17

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