Introduction

• Can union and firm labor market power counteract each other?

• What are the efficiency and welfare effects of labor market power?
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- Can union and firm labor market power **counteract** each other?
- What are the **efficiency** and **welfare** effects of labor market power?
- Labor **wedge** between marginal revenue product of labor (MRPL) and **wage**.

\[ w = \lambda_i \times MRPL_i \]
Introduction

• Can union and firm labor market power *counteract* each other?

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

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

\[ w = \lambda_i \times MRPL_i \]

• Effects:

  1. **Distributional**: \( \lambda \) 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*. 

   • 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.
Results

1. **Empirical evidence**: employer labor market power (markdown).
   - Establishmen level: emp. share endogenous $\rightarrow$ IV mass layoffs to competitors: $\uparrow$ local employment share, $\downarrow$ wages.

2. **Structural model**:
   - Static GE model where employers and unions *bargain* over wages internalizing the generation of rents.
Results

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

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:**
  + bargaining.

- **Wage bargaining:**
  + employer labor market power.

- **Market power and LS:**
  + labor market power.

- **Misallocation:**
  + structural labor wedges.

- **Trade:**
Data

  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) $n \times$ 3-digit Industry $h \times$ Occupation $o$. 
Wages and Concentration

- Concentration: employment share within the local labor market.

- Reduced form model:

\[
\log(w_{io,t}) = \beta s_{io|m,t} + \psi J(i,o,t) + \delta N(i,t) + \epsilon_{io,t},
\]

- \(s_{io|m,t}\): employment share of the plant \(i\) occupation \(o\) at the local labor market \(m\)
- \(\psi J(i,o,t)\): firm-occupation-year FE
- \(\delta N(i,t)\): commuting zone-year FE.
Wages and Concentration

- Concentration: employment share within the local labor market.

- Reduced form model:

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

- **Issue**: **Endogeneity** of \( s_{io|m,t} \).

\( s_{io|m,t} \): employment share of the plant \( i \) occupation \( o \) at the local labor market \( m \)

\( \psi_{J(i),o,t} \): firm-occupation-year FE

\( \delta_{N(i),t} \): commuting zone-year FE.
Labor Shock to Competitors

1. Employment shock at national level → exogenous change of \( s \) for competitors.
2. Assumption: location of competitors independent to the mass layoff shock.
3. National mass layoffs of jobs if all establishments are affected: \( L_{io}, t < \kappa L_{io}, t - 1 \) for all plants \( i \) of job \( j \).
• Employment shock at **national** level $\rightarrow$ exogenous change of $s_{io|m}$ for competitors.
Labor Shock to Competitors

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Labor Shock to Competitors

- Employment shock at national level → exogenous change of $s_{io|m}$ for competitors.

- Assumption: location independent to the mass layoff shock.

- National mass layoffs of $jo$ if all establishments are affected:
  $$L_{io,t} < \kappa L_{io,t-1} \forall \text{ plants } i \text{ of } jo.$$
Employment Share on Wages
Employment Share on Wages

- Semi-elasticity between -0.17 and -0.04. From Q1 to Q3, reduction of 1000 euros.
**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: $y_{io} = \tilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b}$
Model Setup

- **Static** general equilibrium model.
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- Perfectly substitutable occupation specific output.
- Industry $b$ specific technology: $y_{io} = \tilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b}$
- **Workers** homogeneous in ability but heterogeneous **preferences** for workplaces.
- **Discrete** set of **establishments** per local labor market.
Model Setup

- **Static** general equilibrium model.
- Output and capital markets competitive. Exogenous interest rate.
- Perfectly substitutable occupation specific output.
- Industry $b$ specific technology: $y_{io} = \tilde{A}_{io}K_{io}^{\alpha_b}L_{io}^{\beta_b}$
- 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.
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 $U_{io} = w_{io} z_{io} u_m$.
- Probability to work in establishment $i$ occupation $o$ is: $\Pi_{io} = s_{io|m} \times s_m$. 
Labor Supply

- Exogenous measure $L$ of workers.

- Worker’s indirect utility $U_{io} = w_{io} z_{io} u_m$.

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

- Employment share $s_{io|m}$:

\[
s_{io|m} = \frac{T_{io} w_{io}^{\varepsilon_b}}{\sum_{j \in I_m} T_{jo} w_{jo}^{\varepsilon_b}}.
\]

- $\varepsilon_b$ governs the mobility within the local labor market.
Labor Supply

- Exogenous measure $L$ of workers.
- Worker’s indirect utility $U_{io} = w_{io} z_{io} u_m$.
- Probability to work in establishment $i$ occupation $o$ is: $\Pi_{io} = s_{io|m} \times s_m$.
- Employment share $s_m$:
  \[
  s_m = \frac{\kappa_b \omega_m^n}{\sum_{m' \in \mathcal{M}} \kappa_{b'} \omega_{m'}^{\eta}}, \quad \omega_m \equiv \left( \sum_{j \in \mathcal{I}_m} T_{j_{io}} w_{j_{io}}^{\varepsilon_b} \right)^{1/\varepsilon_b}.
  \]
- $\eta$ governs the mobility across local labor markets.
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: \(\varphi_b\).
Equilibrium Wages

- Equilibrium wages:

\[
W_{io} = \left( (1 - \varphi_b) \mu(s) + \varphi_b \frac{1}{1 - \delta} \right) \times MRPL_{io},
\]

Wedge \( \lambda(\mu_{io}, \varphi_b) \)

where markdown \( \mu(s) \) oligopsonistic competition and markup \( \frac{1}{1 - \delta} \),

\[
1 - \delta = \frac{\beta_b}{1 - \alpha_b}.
\]
Equilibrium Wages

- Equilibrium wages:

\[ w_{io} = \left[ (1 - \varphi_b) \mu(s) + \varphi_b \frac{1}{1 - \delta} \right] \times MRPL_{io}, \]

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

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

• Equilibrium wages:

\[ w_{io} = \left( (1 - \varphi_b) \mu(s) + \varphi_b \frac{1}{1 - \delta} \right) \times MRPL_{io}, \]

where \textbf{markdown} \( \mu(s) \):

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

• \textbf{Heterogeneity} of \( \lambda(\mu_{io}, \varphi_b) \) \textbf{distorts} relative wages and labor supply.
Estimation

**Parameters**: elasticities of substitution \( \{ \varepsilon_b \} \), \( \eta \), returns to scale \( \delta \), output elasticities \( \{ \beta_b \} \), \( \{ \alpha_b \} \) and union bargaining powers \( \{ \varphi_b \} \).

1. Identify \( \eta \) and \( \delta \) by leveraging on full monopsonists and exploiting differences in the covariance matrix of shocks across occupations.
Estimation

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

1. Identify \(\eta\) and \(\delta\) 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.
Parameters: elasticities of substitution \( \{ \varepsilon_b \} \), \( \eta \), returns to scale \( \delta \), output elasticities \( \{ \beta_b \} \), \( \{ \alpha_b \} \) and union bargaining powers \( \{ \varphi_b \} \).

1. Identify \( \eta \) and \( \delta \) 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.
Counterfactuals: Efficiency and Welfare

<table>
<thead>
<tr>
<th>Gains (%)</th>
<th>LS (%)</th>
<th>Δ Y</th>
<th>Δ Wage</th>
<th>Δ Welfare (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>50.62</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Counterfactuals</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No wedges $\lambda(\mu, \varphi_b) = 1$</td>
<td>72.26</td>
<td>1.62</td>
<td>45.06</td>
<td>42.07</td>
</tr>
<tr>
<td>Bargain $\lambda(1, \varphi_b) = 1 + \varphi_b \frac{\delta}{1-\delta}$</td>
<td>73.38</td>
<td>1.60</td>
<td>47.27</td>
<td>44.34</td>
</tr>
<tr>
<td>Oligosonistic $\lambda(\mu, 0) = \mu_i0$</td>
<td>40.94</td>
<td>-0.21</td>
<td>-19.29</td>
<td>-20.53</td>
</tr>
</tbody>
</table>
Why unions reduce misallocation?

- Labor share:

\[
\frac{w_{io}L_{io}}{P_b Y_{io}} = \beta_b \lambda_{io} = \beta_b \lambda_{io} - \beta_b (1 - \mu_{io}) + \phi_b \left(1 - \alpha_b - \beta_b\right) + \beta_b (1 - \mu_{io})
\]

- Bargaining gains

- Total Rents

- DRS Rents

- Oligopsonistic Rents

- Perf. Comp.

- Oligopsonistic Rents

- Bargaining gains
Why unions reduce misallocation?

- Labor share:

\[
\frac{w_{io}L_{io}}{P_b Y_{io}} = \beta_b \lambda_{io} = \beta_b \lambda_{io} - \beta_b (1 - \mu_{io}) + \varphi_b \left(1 - \alpha_b - \beta_b\right) + \beta_b (1 - \mu_{io})
\]

\[
\begin{align*}
\text{Total Rents} &= \text{DRS Rents} + \text{Oligopsonistic Rents} \\
\text{Bargaining gains} &= \left(1 - \alpha_b - \beta_b\right) + \beta_b (1 - \mu_{io})
\end{align*}
\]

- **Bargain** over remaining rents.
- **More productive** firms have (in general) more rents to split.
- Bargaining \(\Rightarrow\) wedges increase by more in productive firms.
- \(\Rightarrow\) **compression** of wedges \(\Rightarrow\) reduced misallocation.
Geographical Labor Adjustment: Perfect Competition

Productivity

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Conclusion

• Empirical evidence suggests larger firms pay lower wages compared to MRPL.

• Model: bargaining not only plays a distributional role ⇒ 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

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

**Notes:** The top panel shows summary statistics for the whole sample. Panels (a) and (b) present respectively summary statistics of monolocation and multilocation 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. $L_{io}$ is full time equivalent employment at the establishment-occupation $io$, $w_{io}L_{io}$ is the wage bill, $w_{io}$ 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.
### Summary Statistics

**Table:** Local Labor Market Summary Statistics. Baseline Year

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Pctl(25)</th>
<th>Median</th>
<th>Pctl(75)</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( N_m )</td>
<td>57,940</td>
<td>4.755</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>14.400</td>
</tr>
<tr>
<td>( L_m )</td>
<td>57,940</td>
<td>51.005</td>
<td>2.786</td>
<td>9.421</td>
<td>34.912</td>
<td>196.201</td>
</tr>
<tr>
<td>( w_m )</td>
<td>57,940</td>
<td>36.619</td>
<td>24.264</td>
<td>30.224</td>
<td>42.492</td>
<td>36.078</td>
</tr>
<tr>
<td>HHI(( s_{io</td>
<td>m} ))</td>
<td>57,940</td>
<td>0.671</td>
<td>0.384</td>
<td>0.683</td>
<td>1.000</td>
</tr>
<tr>
<td>HHI(( s_{wio</td>
<td>m} ))</td>
<td>57,940</td>
<td>0.676</td>
<td>0.392</td>
<td>0.698</td>
<td>1.000</td>
</tr>
</tbody>
</table>

**Table:** Sub-industry Summary Statistics.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Obs.</th>
<th>Mean</th>
<th>Pctl(25)</th>
<th>Median</th>
<th>Pctl(75)</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>( N_h )</td>
<td>97</td>
<td>2,840.000</td>
<td>493</td>
<td>1,261</td>
<td>2,639</td>
<td>4,530.496</td>
</tr>
<tr>
<td>( L_h )</td>
<td>97</td>
<td>30,466.030</td>
<td>7,559</td>
<td>15,070</td>
<td>50,036</td>
<td>33,899.330</td>
</tr>
<tr>
<td>( w_h )</td>
<td>97</td>
<td>34.607</td>
<td>29.562</td>
<td>32.990</td>
<td>37.531</td>
<td>6.902</td>
</tr>
<tr>
<td>( LS_h )</td>
<td>97</td>
<td>0.520</td>
<td>0.482</td>
<td>0.527</td>
<td>0.581</td>
<td>0.098</td>
</tr>
<tr>
<td>( KS_h )</td>
<td>97</td>
<td>0.261</td>
<td>0.165</td>
<td>0.233</td>
<td>0.316</td>
<td>0.133</td>
</tr>
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## Transition Rates

<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>91.39</td>
<td>91.01</td>
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<td>0</td>
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<td>1</td>
<td>2.37</td>
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<td>0</td>
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<td>0</td>
<td>0.02</td>
<td>0.02</td>
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<tr>
<td>1</td>
<td>0</td>
<td>0</td>
<td>6.03</td>
<td>6.40</td>
</tr>
<tr>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0.20</td>
<td>0.21</td>
</tr>
<tr>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0.00</td>
<td>0.00</td>
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<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Labor Share and Concentration

- **Sub-industry Labor share** $LS_h = \frac{\text{WageBill}_h}{VA_h}$.

- Employment share of establishment $i$, occupation $o$: $s_{io|m} = \frac{L_{io}}{L_m}$.

- **Concentration** at local labor market $m$: Herfindahl Index, 
  
  $$HHI_m = \sum_{i \in \mathcal{I}_m} s_{io|m}^2.$$  

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

Empirical Evidence: ↑ Concentration, ↓ Labor Share

\[
\ln(LS_{h,t}) = \delta_{b,t} + \beta \ln(HHI_{h,t}) + \varepsilon_{h,t}
\]

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>\ln(HHI_{h,t})</td>
<td>-0.064***</td>
<td>-0.054***</td>
<td>-0.056***</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
<td>(0.013)</td>
<td>(0.014)</td>
</tr>
<tr>
<td>Industry FE</td>
<td>N</td>
<td>Y</td>
<td>N</td>
</tr>
<tr>
<td>Industry-year FE</td>
<td>N</td>
<td>N</td>
<td>Y</td>
</tr>
<tr>
<td>Observations</td>
<td>1357</td>
<td>1357</td>
<td>1357</td>
</tr>
<tr>
<td>R²</td>
<td>0.017</td>
<td>0.290</td>
<td>0.343</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.017</td>
<td>0.280</td>
<td>0.170</td>
</tr>
</tbody>
</table>

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

(a) Equilibrium wage in the absence of bargaining

(b) Instrument
Robustness Checks

(a) Instrument: Intensive Share

(b) Local Labor Market
### Alternative Instrument: Lagged Concentration

<table>
<thead>
<tr>
<th>Dependent variable:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant log(Wage)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>OLS</th>
<th>IV</th>
<th>OLS</th>
<th>IV</th>
</tr>
</thead>
<tbody>
<tr>
<td>$s_{io</td>
<td>m,t}$</td>
<td>0.010***</td>
<td>$-0.030***$</td>
<td>0.007***</td>
</tr>
<tr>
<td></td>
<td>(0.001)</td>
<td>(0.002)</td>
<td>(0.001)</td>
<td>(0.002)</td>
</tr>
</tbody>
</table>

| 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
Unions

\[ w = \lambda \times MRPL. \]
Unions

\[ w = \underbrace{\sigma}_{\text{Markup}} \times MRPL. \]

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

\[ w = \sigma \times MRPL. \]

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

- Reduced form model:
  \[ \log(w_{io,t}) = \beta_b \log(y_{j(i),t}) + \delta_{b,o,t} + \varepsilon_{io,t}, \]

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

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

Bargaining heterogeneity: relevant of industry differences as opposed to occupational.
## Rent Sharing: Industries

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

<table>
<thead>
<tr>
<th>Occupation</th>
<th>Rent Sharing</th>
<th>SE Rent Sharing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top management</td>
<td>0.38</td>
<td>0.00</td>
</tr>
<tr>
<td>Supervisor</td>
<td>0.27</td>
<td>0.00</td>
</tr>
<tr>
<td>Clerical</td>
<td>0.29</td>
<td>0.00</td>
</tr>
<tr>
<td>Blue collar</td>
<td>0.30</td>
<td>0.00</td>
</tr>
</tbody>
</table>
Establishment $i$ produces with occupation specific capital $K_{io}$ and labor $L_{io}$:

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

Assume constant elasticity of labor demand of transformed production function:

$$\frac{\beta_b}{1-\alpha_b} = 1 - \delta \quad \forall \ b \ (\text{CRS when } \delta = 0).$$

Industry output:

$$Y_b = \sum_{m \in M_b} \sum_{i \in I_m} y_i.$$ 

Aggregate output:

$$Y = \prod_{b \in B} Y_{b}^{\theta_b}.$$
Production Function

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

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

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

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

- Assumption allows for **separability** of local labor markets.

- **Keep heterogeneity** of production function \((\alpha_b, \beta_b)\).
Alternative Production Function

- Labor $H_i$ as occupation composite:

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

$$\sum_{o} \gamma_o = 1, \quad \alpha_b + \beta_b \leq 1.$$

- Wage FOC:

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

- Final good: \[ Y = \prod_{b \in B} Y^\theta_b. \]

- Demand for industry good: \[ \theta_b Y = P_b Y_b. \]

- Industry output: \[ Y_b = \sum_{m \in M_b} \sum_{i \in I_m} y_i. \]

- Establishments use occupation specific capital \( K_{i_0} \) and labor \( L_{i_0} \) to produce with DRS technology. Production linearly separable in occupations:

\[ y_i = \sum_o \tilde{A}_{i_0} K_{i_0}^{\alpha_b} L_{i_0}^{\beta_b}. \]
Workers

• Worker’s indirect utility:

\[ U_{io} = w_{io} z_{io} u_m, \]
Workers

- Worker’s indirect utility:

\[ U_{io} = w_{io} z_{io} u_m, \]

where idiosyncratic taste shocks are distributed Fréchet:

\[ P(z) = e^{-Tz^{\varepsilon_b}}, \quad T > 0, \varepsilon_b > 1 \]

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

- Worker’s indirect utility:

\[ U_{io} = w_{io} z_{io} u_m, \]

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:

\[ U_{io} = w_{io} z_{io} u_m, \]

\( \varepsilon_b \) and \( \eta \) act as elasticities.
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 \(s_{io|m}\):

\[
s_{io|m} = \frac{T_{io} w_{io}^\varepsilon_b}{\sum_{j \in I_m} T_{jo} w_{jo}^\varepsilon_b}.
\]

- \(\varepsilon_b\) 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: $\Pi_{i o} = s_{i o| m} \times s_m$,

- Employment share $s_m$:

  $$s_m = \frac{\kappa \omega^\eta_m}{\sum_{m' \in \mathcal{M}} \kappa \omega^\eta_{m'}}$$

  $\omega_m \equiv \left( \sum_{j \in \mathcal{I}_m} T_{j o} \omega^{b}_{j o} \right)^{1/\varepsilon_b}$.

- $\eta$ governs the mobility across local labor markets.
• 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 \( \varepsilon_b > \eta \), \( \mu(s) \) decreasing in employment share.

• **No strategic** interaction when continuum of establishments, \( \mu_b = \frac{\varepsilon_b}{\varepsilon_b + 1} \).
Absence of Bargaining

- Establishment $i$’s problem is:

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

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

- Establishment $i$’s problem is:

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

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

- Wage FOC:

$$w_{io} = \frac{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m}}{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m} + 1} \left[ \beta_b P_b \tilde{A}_{io} K_{io}^{\alpha_b} L_{io}^{\beta_b - 1} \right]$$

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

Azkarate-Askasua & Zerecero 'Union and Firm LMP'
Bargaining Details

• Separability of occupation output in the production function.

• Occupation profit functions $(1 - \alpha_b)pF(L_{io}) - w_{io}^u L_{io}$, with optimal demand for capital.

• Zero outside option for both parties.

• Bilateral Nash bargaining:

$$\max_{w_{io}^u} (w_{io}^u L_{io})^{\phi_b} ((1 - \alpha_b)pF(L_{io}) - w_{io}^u L_{io})^{1-\phi_b} \quad \text{s.to} \quad L_{io}(w_{io}),$$
Distribution: Split $Y$ into LS and PS

(a) Perfect Competition

(b) Labor Market Power
Efficiency: Heterogeneity of $\lambda \Rightarrow$ Distortions

(a) Homogeneous Markdown

(b) Heterogeneous Markdown
Output Market Power. No Occupations

- Industry good $Y_b$ CES aggregator with elasticity of substitution $\sigma$.

- Establishment price: $p_i = \left( \frac{y_i}{Y_b} \right)^{-1/\sigma} P_b$.

- Wage in the absence of bargaining:

$$w_i = \frac{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m}}{\varepsilon_b(1 - s_{io|m}) + \eta s_{io|m} + 1} \times \frac{\sigma - 1}{\sigma} \times MRPL$$

Markdown $\mu(s)$
Inverse PC Markup
Output Market Power. No Occupations

• Bargaining with output market power:

\[ w_{io} = \left[ (1 - \varphi_b) \mu(s) + \varphi_b \frac{1}{\beta_b} \left( \frac{\sigma}{\sigma - 1} - \alpha_b \right) \right] \times \frac{\sigma - 1}{\sigma} \times \text{MRPL} \]

\[ \text{Wedge } \lambda(\mu_{io}, \varphi_b) \]

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

\[ w_{io} = \left[ (1 - \varphi_b) \mu(s) + \varphi_b \frac{1}{1 - \delta} \right] \times \text{MRPL} \]

\[ \text{Wedge } \lambda(\mu_{io}, \varphi_b) \]

• Lower overall wages due to the inverse price-cost markup and higher rent extraction from unions.
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.
For given industry required rates $\{R_b\}_{b=1}^B$, the general equilibrium of this economy will be a set of wages $\{w_{io}\}_{i_0=1}^I$, output prices $\{P_b\}_{b=1}^B$, a measure of labor supplies to every establishment and occupation $\{L_{io}\}_{i_0=1}^I$, capital $\{K_{io}\}_{i_0=1}^I$ and output $\{y_{io}\}_{i_0=1}^I$, 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: $\{y_{io}\}_{i_0 \in I_b} \rightarrow Y_b \quad \forall b$, $\{Y_b\}_{b \in B} \rightarrow Y$.
- Industries’ goods markets clear.
Estimation: $\eta$ and $\delta$

- 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:

\[
\begin{align*}
\omega_{io} &= \left[ (1 - \varphi_b) \frac{\eta}{\eta + 1} + \varphi_b \frac{1}{1 - \delta} \right] \beta_b P_b^{1-\alpha_b} A_{io} L_{io}^{-\delta} \\
L_{io} &= \frac{T_{io}^{\eta/\varepsilon_b} \omega_{io}^{\eta} \kappa_b}{\phi} L
\end{align*}
\]
Estimation: $\eta$ and $\delta$

- 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:

\[
\begin{align*}
 w_{io} &= \left[ (1 - \varphi_b) \frac{\eta}{\eta + 1} + \varphi_b \frac{1}{1 - \delta} \right] \beta_b P_b^{\frac{1}{\alpha_b}} A_{io} L_{io}^{-\delta} \\
 L_{io} &= \frac{T_{io}^{\eta/\varepsilon_b} w_{io}^{\eta/\kappa_b}}{\Phi} L
\end{align*}
\]

- **Issue**: OLS estimates **biased** to zero.
Estimation: $\eta$ and $\delta$

- Demeaned logarithm of the system in matrix form:

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

- If only one category, 3 moments ($\text{Cov}(L,w)$) and 5 unknowns ($\text{Cov}(A,T), \delta, \eta$).
Estimation: $\eta$ and $\delta$

- Demeaned logarithm of the system in matrix form:

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

- If only one category, 3 moments ($\text{Cov}(L,w)$) and 5 unknowns ($\text{Cov}(A,T), \delta, \eta$).

- 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.
Estimation: Heteroskedasticity

- Group the 4 occupations into 2 categories $S$: white collar, blue collar.

- Equilibrium wage:

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

• Group the 4 occupations into 2 categories $S$: white collar, blue collar.

• Equilibrium wage of full monopsonists $(\mu(s = 1) = \frac{\eta}{\eta + 1})$:

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

- Group the 4 occupations into 2 categories $S$: white collar, blue collar.

- Equilibrium wage of full monopsonists ($\mu(s = 1) = \frac{\eta}{\eta + 1}$):

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

- 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 ($\mu(s = 1) = \frac{\eta}{\eta + 1}$):

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

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

$$\frac{\eta}{\varepsilon_b} \ln(T_{io}) = \ln(L_{io}) - \eta \ln(w_{io}),$$

$$\ln(A_{io}) = \delta \ln(L_{io,S}) + \ln(w_{io,S}).$$
Estimation: Heteroskedasticity

- Variance-covariance in matrix form:

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

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

- 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 \(\Delta_S\) across categories, i.e. categories differ in variances - *heteroskedasticity*
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:

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

$i^D$: cost of debt borrowing
$\pi_{sb}$: inflation
$\delta_{sb}$: depreciation rate

• Industry user cost $R_b$ is a capital expenditure weighted sum of different capital types $s$. 
Estimation: $\varepsilon_b$

- 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:

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

- Lagged instrument.
Calibration: Bargaining Power and Output Elasticities

- Calibrate **capital elasticities** $\alpha_b$ to match industry capital shares.

- Labor elasticities $\beta_b$ from the assumption: $\beta_b = (1 - \delta)(1 - \alpha_b)$.
Calibration: Bargaining Power and Output Elasticities

- Calibrate **capital elasticities** $\alpha_b$ to match industry capital shares.

- Labor elasticities $\beta_b$ from the **assumption**: $\beta_b = (1 - \delta)(1 - \alpha_b)$.

- Industry labor share in the model:

$$LS_{bt}^M(\varphi_b) = \frac{\beta_b \sum_{io \in I_b} w_{iot}L_{iot}}{\sum_{io \in I_b} w_{iot}L_{iot}/\lambda(\mu_{io}, \varphi_b)}.$$

- Calibrate industry specific **bargaining powers** $\varphi_b$ to match average industry labor shares.
## Estimation Results

<table>
<thead>
<tr>
<th>Param.</th>
<th>Name</th>
<th>Estimate</th>
<th>Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\eta$</td>
<td>Across market elast.</td>
<td>0.42</td>
<td>Heteroskedasticity</td>
</tr>
<tr>
<td>$\delta$</td>
<td>1 - Returns to scale</td>
<td>0.04</td>
<td>Heteroskedasticity</td>
</tr>
<tr>
<td>${\varepsilon_b}$</td>
<td>Within market elast.</td>
<td>1.2 - 4</td>
<td>Labor supply</td>
</tr>
<tr>
<td>${\beta_b}$</td>
<td>Output elast. labor</td>
<td>0.57 - 0.85</td>
<td>Capital share and $\delta$</td>
</tr>
<tr>
<td>${\varphi_b}$</td>
<td>Union bargaining</td>
<td>0.06 - 0.7</td>
<td>Industry LS</td>
</tr>
</tbody>
</table>
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.
### Estimation Fit - Industry

<table>
<thead>
<tr>
<th></th>
<th>Data: $\ln(\text{LS}^D_{h,t})$</th>
<th>Oligopsony: $\ln(\text{LS}^{M,MP}_{h,t})$</th>
<th>Model: $\ln(\text{LS}^M_{h,t})$</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(1)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\ln(\text{HHI}_{h,t})$</td>
<td>$-0.054^{***}$</td>
<td>$-0.056^{***}$</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$(0.013)$</td>
<td>$(0.013)$</td>
<td></td>
</tr>
<tr>
<td>Ind FE</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>Ind-Year FE</td>
<td>N</td>
<td>Y</td>
<td></td>
</tr>
<tr>
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<td>1357</td>
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<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
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</tr>
</tbody>
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*Note:*

$p<0.1$; $**p<0.05$; $***p<0.01$
Estimation Fit - Industry

<table>
<thead>
<tr>
<th></th>
<th>Data: $\ln(LS_{h,t}^D)$</th>
<th>Oligopsony: $\ln(LS_{h,t}^{M,MP})$</th>
<th>Model: $\ln(LS_{h,t}^M)$</th>
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<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(1)</td>
</tr>
<tr>
<td>$\ln(\text{HHI}_{h,t})$</td>
<td>$-0.054^{***}$</td>
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<td>$-0.388^{***}$</td>
</tr>
<tr>
<td></td>
<td>(0.013)</td>
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<td>(0.009)</td>
</tr>
<tr>
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<td>Y</td>
<td>N</td>
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</tr>
<tr>
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Note: *p<0.1; **p<0.05; ***p<0.01

- **Strategic interactions** key to generate negative relationship.
**Estimation Fit - Industry**

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<th>Data: $\ln(\text{LS}^D_{h,t})$</th>
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<th>Model: $\ln(\text{LS}^M_{h,t})$</th>
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*Note:* *p<0.1; **p<0.05; ***p<0.01

- **Strategic interactions** key to generate negative relationship.
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 $\Delta$ 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.
Model Fit: Non Targeted Moments

(a) Industry Value Added

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

- Amenities match observed employment shares.

- Underlying productivities $\tilde{A}_{io}$ not observed but rather can back out Revenue Total Factor Productivity (TFPR) $= P \times P_b \times \tilde{A}_{io}$.

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

• Observe:

\[ Pw_{io} = \beta_b \lambda(\mu_{io}, \varphi_b)Z_{io}L_{io}^{-\delta} \cdot \]

• 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).

\[ w'_{io} = \beta_b \lambda'_{io} Z_{io} \frac{1}{P} \left( \frac{G^\alpha_b}{P} \right) L'_{io}^{-\delta} \]
Counterfactuals: Hat Algebra

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

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

- 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 $\hat{X} \equiv \frac{X'}{X}$.

- Counterfactual wage:

$$w'_{io} = \beta_b \lambda_{io}' Z_{io}' L_{io}'^{-\delta} \frac{1}{P'}$$

$$= \beta_b \lambda_{io}' Z_{io} \frac{1}{P_b^{1-\alpha_b}} \frac{1}{P} L_{io}'^{-\delta}$$
Counterfactuals: Hat Algebra

- Counterfactual output:
  \[ y'_{io} = G'_b A_{io} L'_{io}^{1-\delta} \]
  \[ = \frac{\hat{G}_b}{PP_b} Z_{io} L'_{io}^{1-\delta}. \]

- Counterfactual industry output relative to baseline:
  \[ \hat{Y}_b = \hat{G}_b \hat{Z}_b \hat{L}_b^{1-\delta}, \]

where \( Z_b(s') \equiv \sum_{io \in \mathcal{I}_b} Z_{io} \times (s'_{io|m} s'_m|b)^{1-\delta} \)
• Employment share within the local labor market:

\[ s_{io|m} = \frac{T_{io} \omega_{io}^{\varepsilon_b}}{\sum_{j \in I_m} T_{jo} \omega_{jo}^{\varepsilon_b}} = \frac{T_{io} \omega_{io}^{\varepsilon_b}}{\omega_m^{\varepsilon_b}}, \quad \omega_m \equiv \left( \sum_{j \in I_m} T_{jo} \omega_{jo}^{\varepsilon_b} \right)^{1/\varepsilon_b}. \]

• Local labor market employment:

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

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

\[ T_{io} \propto s_{io|m} \frac{L_m^{\varepsilon_b/\eta}}{\omega_{io}^{\varepsilon_b/\eta}}. \]
Productivity Changes: Free Mobility
Extentions

1. Endogenous Labor Force Participation:
   - Output gains up to 1.98%.
   - Not only productivity gains but also increase in total labor force.

2. Agglomeration:
   - Agglomeration externalities within the local labor market.
   - Increases output gains from removing distortions.
Additional Results

- Labor market distortions account for a third of urban-rural wage gap.

- Counterfactual suggests movements to rural areas. But, counterfactual de-industrialization process similar to the observed one.
De-industrialization Differences
<table>
<thead>
<tr>
<th></th>
<th>Wage No City</th>
<th>Wage City</th>
<th>Gap (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baseline</td>
<td>33.321</td>
<td>45.210</td>
<td>36</td>
</tr>
<tr>
<td>Counterfactual (PT)</td>
<td>49.486</td>
<td>60.675</td>
<td>23</td>
</tr>
</tbody>
</table>

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.
Extensions: (I) Endogenous Labor Force Participation

<table>
<thead>
<tr>
<th></th>
<th>(\Delta Y) (%)</th>
<th>(\Delta) Prod (%)</th>
<th>(\Delta L) (%)</th>
<th>Sh. Prod</th>
<th>Sh. Labor</th>
</tr>
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<tbody>
<tr>
<td><strong>Fixed L</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.62</td>
<td>1.33</td>
<td>-</td>
<td>83</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td><strong>Endogenous Part.</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>No wedges (\lambda(\mu, \varphi_b) = 1)</td>
<td>1.98</td>
<td>1.18</td>
<td>1.00</td>
<td>60</td>
<td>29</td>
</tr>
<tr>
<td>Not internalize (\lambda(1, \varphi_b) = 1 + \varphi_b \frac{\delta}{1-\delta})</td>
<td>2.04</td>
<td>1.18</td>
<td>1.04</td>
<td>58</td>
<td>32</td>
</tr>
<tr>
<td>Oligopsonistic (\lambda(\mu, 0) = \mu_{io})</td>
<td>-1.29</td>
<td>-0.59</td>
<td>-0.75</td>
<td>46</td>
<td>53</td>
</tr>
</tbody>
</table>
Extensions: (II) Agglomeration

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

- Wage FOC:

\[
P_{w_{io}} = \beta_b \lambda(\mu_{io}, \varphi_b) Z_{io} L_{io}^{-\delta} L_m^\gamma.
\]

- Additional **condition** for existence and uniqueness of the equilibrium: \( \gamma \neq \frac{1}{\eta} + \delta \).

- Check for different \( \gamma \).

- Output gains increasing in agglomeration.
Extensions: (II) Agglomeration

<table>
<thead>
<tr>
<th></th>
<th>( \Delta Y ) (%)</th>
<th>( \Delta \text{ Prod} ) (%)</th>
<th>( \Delta \text{ GE} )</th>
<th>( \Delta \text{ Prod} )</th>
<th>( \Delta \text{ Labor} )</th>
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<tr>
<td>No Agglomeration</td>
<td>1.62</td>
<td>1.33</td>
<td>9</td>
<td>83</td>
<td>8</td>
</tr>
<tr>
<td>Agglomeration</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \gamma = 0.05 )</td>
<td>1.73</td>
<td>1.40</td>
<td>8</td>
<td>82</td>
<td>10</td>
</tr>
<tr>
<td>( \gamma = 0.1 )</td>
<td>1.84</td>
<td>1.48</td>
<td>7</td>
<td>81</td>
<td>12</td>
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<tr>
<td>( \gamma = 0.15 )</td>
<td>1.96</td>
<td>1.57</td>
<td>6</td>
<td>81</td>
<td>13</td>
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<tr>
<td>( \gamma = 0.2 )</td>
<td>2.08</td>
<td>1.66</td>
<td>5</td>
<td>80</td>
<td>15</td>
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<tr>
<td>( \gamma = 0.25 )</td>
<td>2.22</td>
<td>1.75</td>
<td>3</td>
<td>80</td>
<td>17</td>
</tr>
</tbody>
</table>