Labor Economics, Week 4
Wage inequality, labor demand, Competitive model, and monopsony

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Takeaways for week 3 - Labor demand

1. Estimating labor demand
   - Regressions of relative wages on relative labor supply (possibly with instrument).
   - To asses the impact of migration or technical change on inequality.
   - Motivated by the competitive model of wage setting.
2. Minimum wages
   - The competitive model predicts that increasing minimum wages lowers employment.
   - Studies use difference-in-differences design across US states to estimate this effect.
   - Most find no effect on employment.
3. Monopsony
   - This has renewed interest in monopsony models of labor demand.
   - An employer has monopsony power if their labor supply is not infinitely responsive.
   - Monopsony power implies a non-monotonic relationship between minimum wages and employment.

Roadmap

Estimating labor demand

Minimum wages

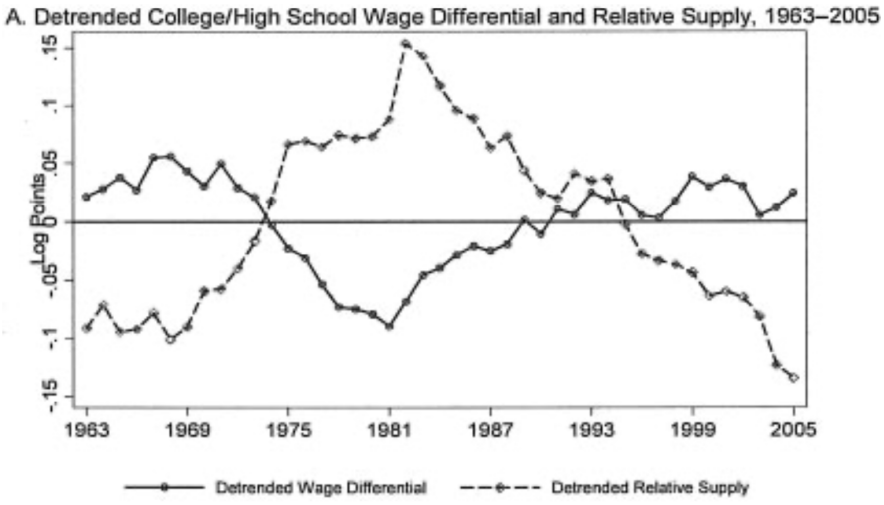
Monopsony

- Earned income is the largest source of household incomes (ca. 60%).
- $\Rightarrow$ Wage inequality matters for income inequality.
- Many factors might affect the wage distribution:
  1. Labor **supply** of different "types" of workers
     - 1.1 Education
     - 1.2 Demographic change
     - 1.3 Migration
  2. Labor **demand**
     - 2.1 Technology
     - 2.2 Trade
  3. **Institutions** and policy
     - 3.1 Collective bargaining
     - 3.2 Social norms
     - 3.3 Minimum wages
     - 3.4 Tax system

What is the impact of labor supply on wages?

Large, controversial literatures on:

- What is the impact of immigration on native wage inequality?
- What is the impact of expanding / stagnating access to higher education on wage inequality?


A. Detrended College/High School Wage Differential and Relative Supply, 1963–2005
Log Points
.15
.1
.05
0
-.05
-.1
-.15
1963
1969
1975
1981
1987
1993
1999
2005
Detrended Wage Differential
Detrended Relative Supply

Setup

- Types of workers $j = 1, \ldots, J$
  by level of education, country of birth, ...
- Cross-section of labor markets $i = 1, \ldots, n$
  e.g., metropolitan areas
  (some papers: time series $t = 1, \ldots, T$, or panel i, t)
- Wages w_{ij}
- Labor supply N_{ij}

A typical regression

- Many papers estimate regressions such as:

$$\log\left(\frac{w_j}{w_{j'}}\right) = controls + \beta \cdot \log\left(\frac{N_j}{N_{j'}}\right) + \varepsilon_{j,j'},$$

- possibly instrumenting for labor supply.
- We will discuss economic models justifying this regression.
- But don't need to believe models for general interpretation!

Questions for you

Interpret this regression.
What is the meaning of β?

Assumption 1

- Output Y_i in region i is described by an aggregate production function:

$$Y_i = f_i(N_{i1}, \ldots, N_{iJ}).$$

- Marginal productivity theory of wages:

$$w_{ij} = \frac{\partial f_i(N_{i1}, \ldots, N_{iJ})}{\partial N_{ij}}$$

- Justified by competitive, profit maximizing firms

Reasons marginal productivity theory might not hold

- If effort / the qualification of applicants depend on wages, employers will not set wage = marginal productivity.
- If employers face upward sloping labor supply (search frictions!) they depress wages below marginal productivity, acting as a “monopsony.”
- With search frictions, there is match specific surplus, leaving room for bargaining.
- Who knows what the marginal productivity is, especially in large, complex firms?
- Social norms for remuneration.
- Collective bargaining.
- Labor markets do not clear.
- ...

Assumption 2

- Constant elasticity of substitution (CES) production function:

$$f_i(N_{i1}, \ldots, N_{iJ}) = \left(\sum_{j=1}^{J} \gamma_j N_{ij}^{\rho} \right)^{1/\rho}$$

- Restricts the way different types of labor interact
- $\rho - 1$: "inverse elasticity of substitution"
  (we will see why)
- γ: type-specific productivity

Questions for you

- Combine assumptions 1 and 2 to derive w_{ij}.
- Take the ratio of w_{ij} and $w_{ij'}$.
- Take logarithms on both sides of the equation.

Answer: The wage equation

- Combining assumptions 1 and 2:

$$w_{ij} = \frac{\partial f_i(N_{i1}, \ldots, N_{iJ})}{\partial N_{ij}} = \left(\sum_{j'=1}^{J} \gamma_j N_{ij'}^{\rho} \right)^{1/\rho - 1} \cdot \gamma_j \cdot N_j^{\rho - 1}$$

- Taking ratios:

$$\frac{w_{ij}}{w_{ij'}} = \frac{\gamma_j}{\gamma_{j'}} \cdot \left(\frac{N_{ij}}{N_{ij'}} \right)^{\rho - 1}$$

- Taking logs:

$$\log\left(\frac{w_j}{w_{j'}} \right) = \log\left(\frac{\gamma_j}{\gamma_{j'}} \right) + \beta_0 \cdot \log\left(\frac{N_j}{N_{j'}} \right),$$

where $\beta_0 = \rho - 1$.

Aside: Capital, labor, and the long run evolution of capitalism

- Aggregate production functions show up in many debates
- More general form with capital goods K, technology A:

$$Y = f(N_1, \ldots, N_J, K_1, \ldots, K_M, A)$$

- Wages and rates of return:

$$w_j = \frac{\partial f}{\partial N_j}$$

$$r_m = \frac{\partial f}{\partial K_m}$$

- Wealth (market value of capital), given interest rate r:

$$\sum_m \frac{r_m}{r} \cdot K_m$$

Long standing debates

- Does technical change lead to increased inequality?
- What's the distributional impact of international trade / globalization?
- Does the production function *determine* wages and profits, or leave room for power / collective action?
- What is the relationship between capital and wealth (capital times market prices)?
- Does an increase in K lead to a fall in profit rates?
  cf. Marxist discussions about capitalist crises, imperialism.
  Answer depends on elasticities of substitution, technical change.

References

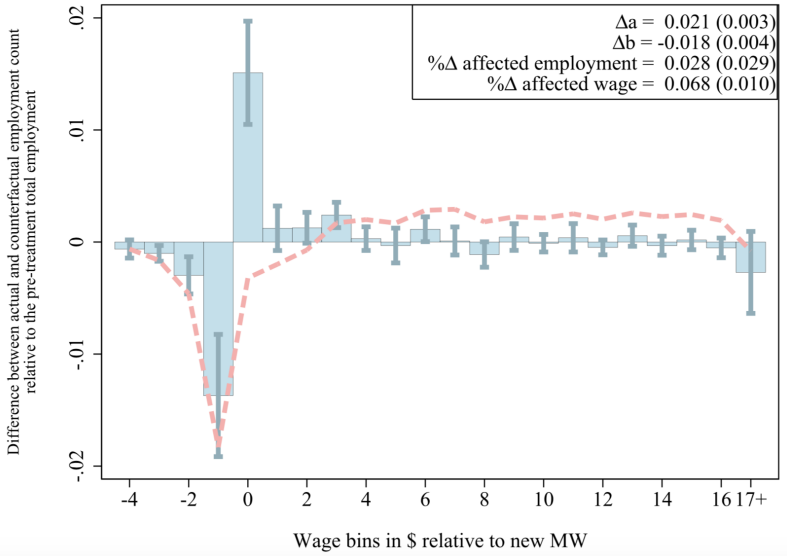
- Impact of migration:
  Card, D. (2009). Immigration and inequality. The American Economic Review*, 99(2):1–21.*
- Domestic migration of African Americans:
  Boustan, L. P. (2009). Competition in the promised land: Black migration and racial wage convergence in the north, 1940–1970. The Journal of Economic History*, 69(03):755–782.*
- Technical change:
  Autor, D. H., Katz, L. F., and Kearney, M. S. (2008). Trends in US wage inequality: Revising the revisionists. The Review of Economics and Statistics*, 90(2):300–323.*

Minimum wages

- The competitive model predicts that raising minimum wages decreases employment.
- What does the evidence say?
- Many studies use a difference-in-differences design:
  Minimum wage raised in one state of the US but not other, similar states.
- Compare the changes in employment and earnings in similar states.
- Majority of recent studies finds no effect on employment.
- Cengiz et al. (2019) combine the evidence from lots of state minimum wage changes.
  Look at the effect on employment numbers across fine-grained wage cells.

Cengiz et al. (2019)

- 138 state-level minimum wage changes between 1979 and 2016 in the United States.
- Estimate the effect of the minimum wage increase on employment changes by wage bins, relative to the new minimum wage.
- Compare the number of excess jobs paying at or slightly above the new minimum wage to the missing jobs paying below it to infer the employment effect.
- The overall number of low-wage jobs remained essentially unchanged over the five years following the increase.


Δa = 0.021 (0.003)
Δb = -0.018 (0.004)
%Δ affected employment = 0.028 (0.029)
%Δ affected wage = 0.068 (0.010)
Difference between actual and counterfactual employment count relative to the pre-treatment total employment
.02
.01
0
-.01
-.02
-4
-2
0
2
4
6
8
10
12
14
16
17+
Wage bins in $ relative to new MW

Monopsony

- This seems to contradict the competitive model: Raising wages yet not changing employment?
- This consistent empirical finding has renewed interest in monopsony models of the labor market.
- An employer has monopsony power if their labor supply is not infinitely elastic to the wage.
- Many reasons (static and dynamic) can lead to upward sloping labor supply for the employer.

The static monopsony model

- A firm chooses the number L of workers it hires.
- Revenues equal $R(L)$ when hiring L workers.
- In order to hire L workers, it needs to pay a wage of $w(L)$.
- Competitive case: $w(L)$ is flat in L.
  Monopsony power: $w(L)$ is upward sloping.
- Firm profits:

$$\pi(L) = R(L) - w(L) \cdot L.$$

Questions for you

Solve for the profit maximizing wage and employment level in this model.

Solution

- First order condition:

$$0 = \pi'(L) = R'(L) - \left(w(L) + w'(L)L\right).$$

- Denote the inverse elasticity of labor supply by

$$\eta = \frac{w'(L)L}{w}.$$

- Rearranging the FOC gives

$$\frac{R'(L) - w(L)}{w} = \eta.$$

- The marginal revenue product $R'(L)$ exceeds the wage by a factor of η.
- Competitive benchmark: $R'(L) = w(L)$.

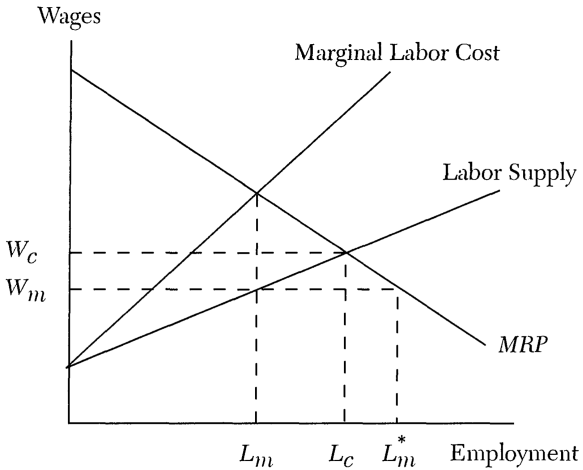


Figure 1. Wage and Employment Determination under Monopsony

- $MRP = R'(L)$
  (marginal revenue product)
- Labor Supply: $w(L)$
- Marginal Labor Cost:
  $(w(L) \cdot L)' = (w(L) + w'(L)L)$

Minimum wage in the monopsony model

- Now suppose that the firm is not allowed to pay a wage below w_m.
- How will it choose L to maximize profits?

$$\underset{L}{\operatorname{argmax}} \ (R(L) - \max(w(L), w_m) \cdot L)$$

Questions for you

Solve for the profit maximizing wage and employment level in the monopsony model when there is a minimum wage.
Hint: Distinguish between 3 different ranges for the minimum wage.

Solution

3 cases:

1. w_m is less than the solution of the monopsony FOC:
   $L^* = \text{argmax}_L (R(L) - w(L) \cdot L)$.
2. w_m is great than the solution of the competitive FOC:
   $L^* = \text{argmax}_L (R(L) - w_m \cdot L)$.
3. w_m is between these two values:
   Corner solution $w(L) = w_m$.

Comparative statics:

- For low w_m, employment is constant in w_m.
- For intermediate w_m, employment is increasing in w_m.
- For high w_m, employment is decreasing in w_m.

Sources of monopsony power

- Market Concentration
- Employer Collusion
- Employer Use of Non-Compete Agreements
- Search Costs and Labor Market Frictions
- Regulatory Barriers to Worker Mobility
- ...

References

- *Cengiz, D., Dube, A., Lindner, A., and Zipperer, B. (2019). The Effect of Minimum Wages on Low-Wage Jobs.* The Quarterly Journal of Economics, *134(3):1405–1454*
- *Council of Economic Advisers (2016). Labor market monopsony: Trends, consequences, and policy responses.* Council of Economic Advisers Issue Brief, *October 2016*
- *Boal, W. M., Ransom, M. R., et al. (1997). Monopsony in the labor market.* Journal of Economic Literature, *35(1):86–112*