14.03/003 Micro Theory & Public Policy, Fall 2025

Lecture 1. Introduction and a First Application

David Autor (Prof), MIT Economics and NBER

Salome Aguilar Llanes (TA), Nagisa Tadjfar (TA), Emma Zhu (TA)

What is 14.03/003 about?

- **A class in modern applied economics as economists actually do it**
  - Build models to form hypotheses, derive testable implications
  - Design research to test implications
  - Deploy data and experiments to verify or falsify those implications
  - Interpret findings, improve thinking, refine research, design policy

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  - Interpret findings, improve thinking, refine research, design policy
- **Three themes**
  1. **Economic theory and models** – What they predict and why
  2. **Causality** – What it is, how we establish it
  3. **Evidence** – Testing theory, learning from data

How we'll learn from data

1. Multiple **research designs** for drawing causal inferences from data
    - Difference-in-difference designs
    - Regression discontinuity designs
    - Instrumental variables designs
    - Randomized Controlled Trials (RCTs)

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   - Example: New Vaccine.

3. **Quasi-experiments**
   - Unintentionally creates conditions similar to a randomized experiment.
   - Example: Lottery.

Rules of the road

Instructor and TAs

- Instructor: Prof. David Autor (dautor@mit.edu).
  - Office hours Wednesdays, 2:30-4:00pm in E52-532 (5th floor conference room of Economics department)
- Teaching assistants:
  - Salome Aguilar Llanes ([redacted]), OH Tuesdays, 4:30pm – 6:00pm, [redacted]
  - Nagisa Tadjfar ([redacted]), OH Wednesdays, 5:00pm – 6:30pm, [redacted]
  - Emma Zhu ([redacted]), OH Thursdays, 1:00pm – 2:30pm, [redacted]
  - You have three great TAs. Treat them well and use them wisely
- Class meetings: Monday & Wednesday, 10:30am - 11:55am, 32-124
- Recitations: Fridays 9–10am, E52-164, 10–11am, E51-057

Rules of the road

Course website

Canvas hosts our class website (https://canvas.mit.edu/[redacted])

1. Class material will be posted in the Modules section: syllabus, schedule, readings, course notes, slides, etc.

2. Communication to the class in the Announcements section. *Set up your Canvas so that you receive new class announcements by email.*

3. The class **Slack channel** (available from Canvas) is our forum for class-related questions and discussions, monitored by Salo, Nagisa, Emma, and myself.

   Request to join the Slack channel from Canvas, we will approve you immediately

Rules of the road

Class material

1. Syllabus: You need to read it!
2. Lecture slides and lecture notes
3. Research papers
4. **No required textbook**. Two *recommended* reference books, available via online course reserves
   - Angrist, Joshua D. and Jorn-Steffen Pischke, *Mastering 'Metrics: The Path from Cause to Effect*, Princeton: Princeton University Press, 2014
   - Banerjee, Samiran. *Intermediate Microeconomics: A Tool-Building Approach*, 2nd Edition, New York: Routledge, 2021
5. Plickers: In class polls, participation, *attendance—mandatory*
6. Class participation: *You'll be doing that*
7. Tablets (iPad, etc.) are permitted in class—but no *phones or laptops*

Rules of the road

Grading rubric

1. **This is an *interactive* class: Attendance, participation, and in-class quizzes mandatory** 20% of your grade (and yes, we do take attendance)
2. **Five problem sets**: 20% (we count your best 4 of 5, drop one automatically)
3. **Two midterms and a final**: 20% for each midterm, 20% for the final, 80 minutes per exam. See class schedule for midterm dates; final date TBA

Plickers Interlude #1 and#2

Outline

For today and next week

1. Textbook model of competitive labor market.
   - Impact of minimum wage on employment in the textbook model.
   - Assumptions behind this model.
2. Relax a key assumption: price-taking by firms.
   - Impact of min. wage on employment when employers have market power.
   - Testing the textbook model and alternatives.
3. Natural experiments in economics.
4. The Fundamental Problem of Causal Inference.
5. Estimating causal effects using "Differences-in-Differences" (DD).
6. The Card and Krueger minimum wage study.

Competitive Equilibrium – Why Does it Arise, and When Does it Go Wrong?

Equilibrium in competitive markets

Baseline model

- Consider a (product) market with:
  - One good, e.g., tube socks
  - Traded at one price
  - With many consumers of the good
  - And with many producers of the good

- The market **equilibrium** is where supply equals demand.
  - Supply function $S(p)$: quantity of the good produced at price p.
  - Demand function $D(p)$: quantity of the good consumed at price p.

Equilibrium in competitive markets

Graphical interpretation

Exogeneity and endogeneity

Definition (Exogenous)

Determined outside the model

Definition (Endogenous)

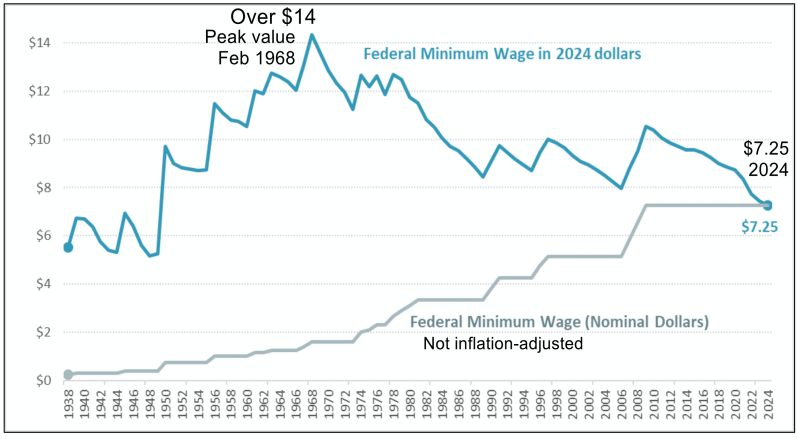
Determined by the model

- Only exogenous variables can be *causes*
- Endogenous variables are affected by exogenous variables — but not the other way around
- We'll have much more to say about exogenous and endogenous variables—and causal inference—as the semester goes on

The Contentious Economics of the Minimum Wage

Plickers Interlude #3

Nominal and real value of federal minimum Wage, 1950–2024



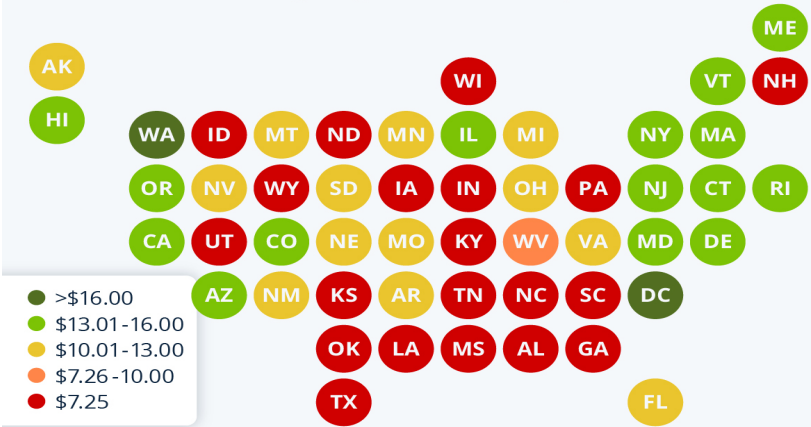
Source: Figure created by CRS using data from the DOL Wage and Hour Division, https://www.dol.gov/whd/minwage/chart.htm.

https://crsreports.congress.gov/product/pdf/R/R43792

Notes: The inflation-adjusted minimum wage is expressed in dollars for the first half of 2024 (i.e., January through June 2024) based on the average of the Consumer Price Index for All Urban Consumers (CPI-U); U.S. City Average for January through June 2024.

The U.S. Minimum Wage By State

State minimum wage legislation as of Sep. 30, 2024*



MN/MO/MT/NY/NJ/OH/OK: Smaller employers can pay less. NYC: $16. Non-rural OR: $14.70-15.95

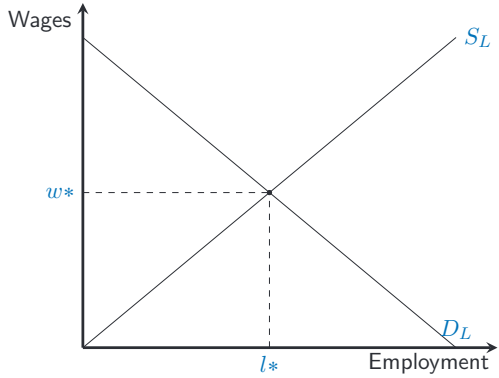
* Federal minimum wage ($7.25) applies for qualifying employees in states with no state minimum wage or if state minimum wage is lower

Source: National Conference of State Legislatures

Textbook model of wages and employment

Competitive labor market

- D_L: Labor demand curve
- S_L: Labor supply curve



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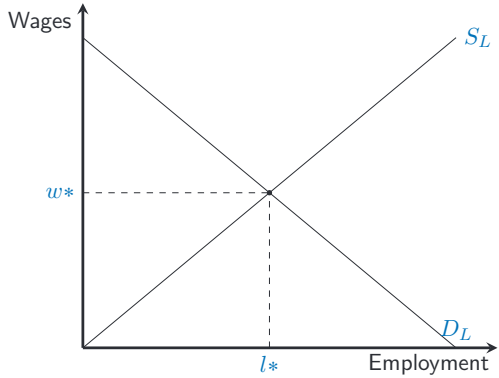
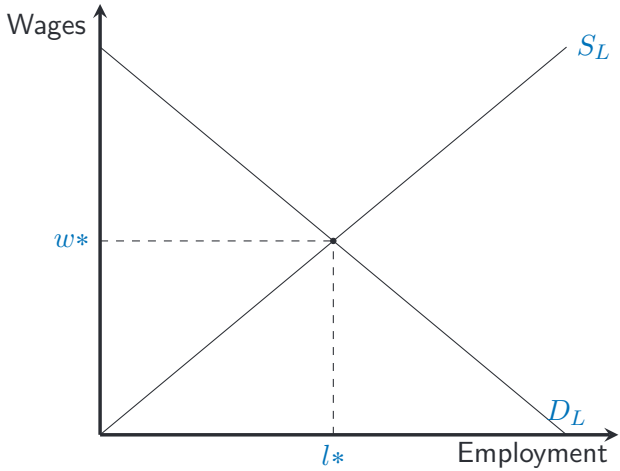


- **Exogenous parameters are...?**
- **Endogenous outcomes are...?**

Effect of a (binding) minimum wage



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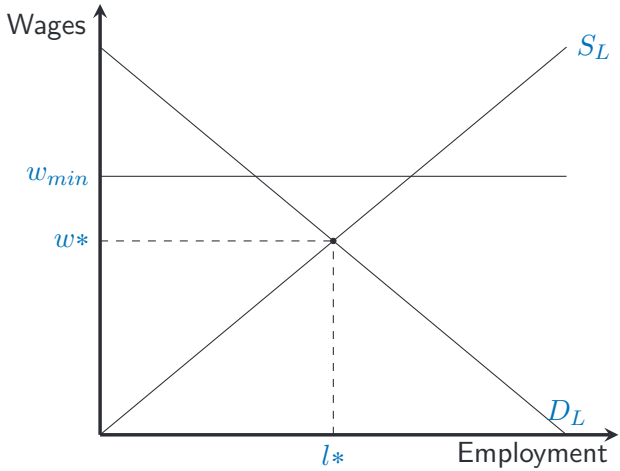

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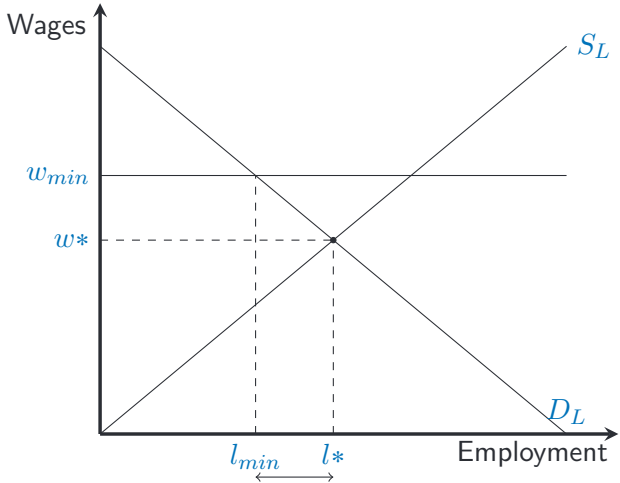

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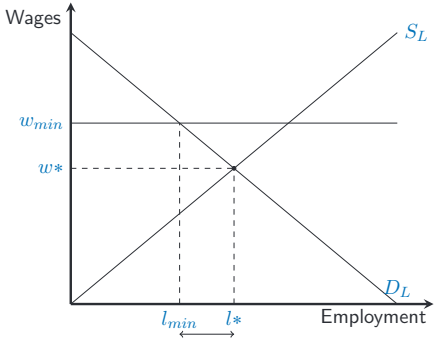

- Wages:

$$w_{\min} > w^*$$

- Employment:

$$l_{\min} < l^*$$

Plickers Interlude #4

Should we impose a minimum wage?

- Employment might fall
- Could total earnings increase? *Depends on...*

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Should we impose a minimum wage?

- Employment might fall
- Could total earnings increase? *Depends on...*
- Depends on elasticity of demand at equilibrium (price sensitivity)
  - Percentage change in quantity demanded when prices increase by one percent.

$$\sigma = \frac{\partial l}{l}\frac{w}{\partial w} \gtrless -1.$$

Definition (Elasticity of Y with respect to X)

The ratio of the proportional change in a variable Y caused by a given proportional change in a variable X.

Elasticity of demand in various markets

Product	Demand Elasticity
Electricity	-0.2
Gasoline (short run)	-0.2
Gasoline (long run)	-0.7
Private schools	-1.1
Automobiles	-0.4 to -1.0
Airline travel	-1.2 to -3.0
Restaurant meals	-2.3

Elasticity of demand in various markets

Demand elasticities for various car models (1990)

Model	Demand Elasticity
Nissan Sentra	-6.5
Ford Escort	-6.0
Ford Taurus	-4.2
Nissan Maxima	-4.8
Lincoln TownCar	-4.3
Lexus LS400	-3.1
BMW 735i	-3.5

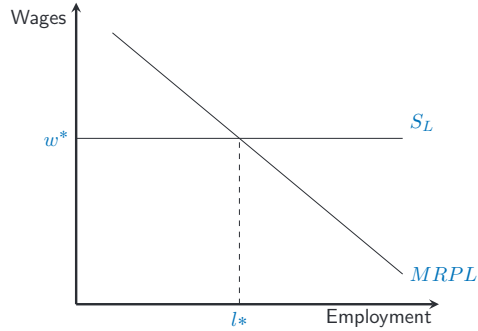
Source: "Automobile prices in market equilibrium", by Berry, Levinsohn, and Pakes, *Econometrica* 1995.

Why might the minimum wage reduce employment?

An individual firm's perspective

Why might employment fall?

An individual firm's perspective



- Each firm is a price-taker in the competitive model.
- Marginal Revenue Product of Labor (MRPL).
  - What the marginal worker produces.
  - Decreasing in employment due to decreasing returns in the production function.

Why might the imposition of a minimum wage cause employment to fall?

- Why is $w^* = MRPL$?
- Firm's profit maximization problem:

$$\max \ \pi = p \cdot f(l) - w(l) \cdot l,$$

  - Assume that $f'(\cdot) > 0$ and $f''(\cdot) < 0$, and p is exogenous.

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- FOC:

$$\frac{\partial \pi}{\partial l} = p \cdot \frac{\partial f(l)}{\partial l} - w(l) - \frac{\partial w(l)}{\partial l} \cdot l = 0$$

Rearranging:

$$\overbrace{pf'(l)}^{MRPL} = \overbrace{w(l)}^{\text{wage of new hire}} + \overbrace{w'(l)l}^{\Delta\text{total labor costs}}$$

An individual firm's perspective

$$\overbrace{pf'(l)}^{MRPL} = \overbrace{w(l)}^{\text{wage of new hire}} + \overbrace{w'(l)l}^{\Delta\text{total labor costs}}$$

- Third term is potentially important
  - Adding one worker could raise the cost of all other workers!
- **Competitive model assumes**

$$w'(l) = 0 \iff \text{Price taking firms,}$$

therefore, $pf'(l) = w^*$.

Plickers Interlude #5

Monopsonistic employer

Definition (Monopoly)

One seller, many buyers

Definition (Monopsony)

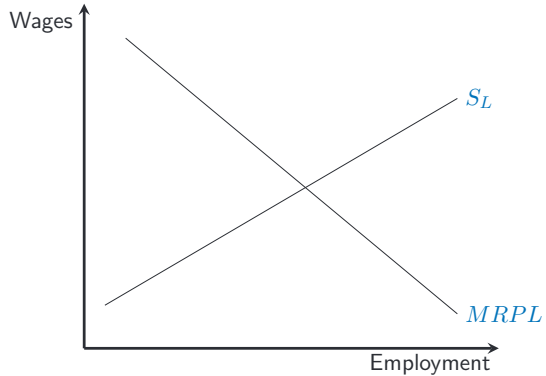
One buyer, many sellers

- More generally, a market where a buying agent is not a *price-taker*
- If a firm has labor market power—it is not a price-taker—its own demand for labor affects the market wage
- Examples?

Monopsonistic employer

1. S_L is upward sloping for a monopsonist.
2. If all workers receive the same wage, the marginal cost of a worker includes a raise given to all inframarginal workers.
3. Thus, MC_L is *even more* upward sloping than S_L.

Monopsonistic employer



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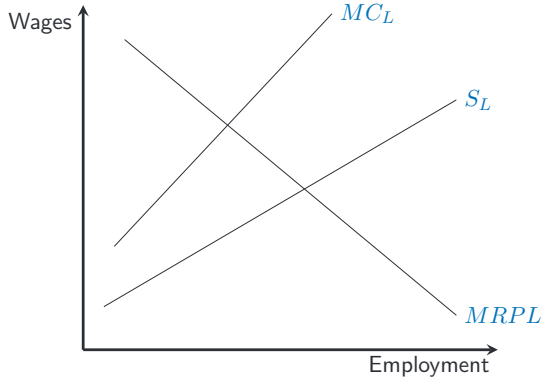

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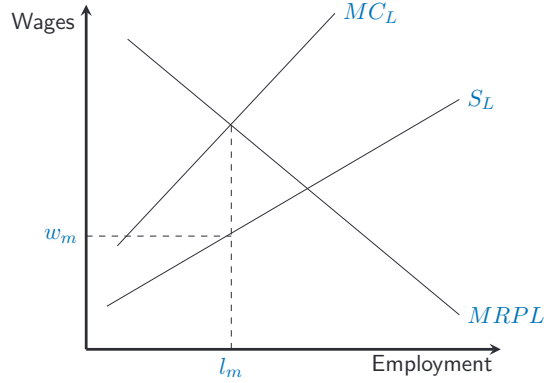

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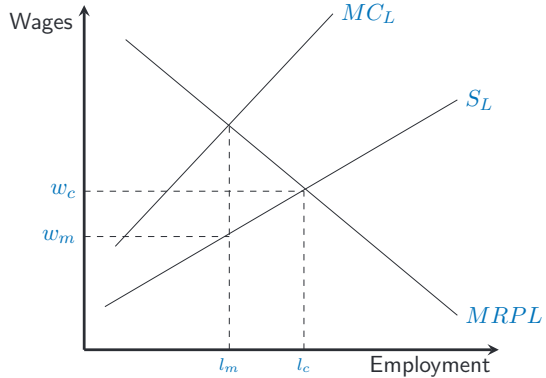

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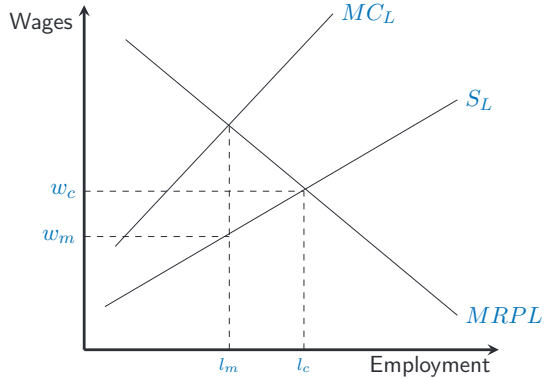
Raising the minimum wage on a monopsonistic employer



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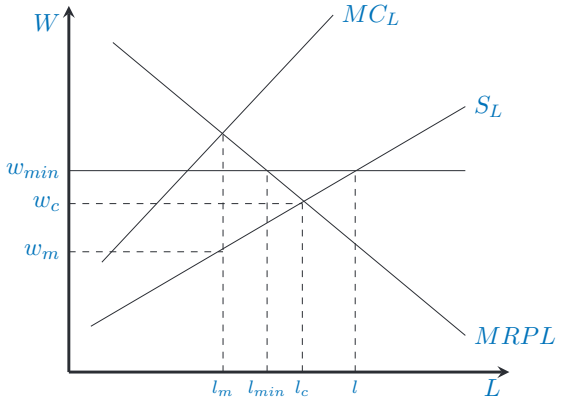

- Why did we get $w_{\min} > w_m, l_{\min} > l_m$?
  - The firm is now a *price-taker* for labor at $w_{\min}$
  - Firm chooses $l_{\min}$ so that $w_{\min} = MRPL$

Raising the minimum wage on a monopsonistic employer

- Does raising minimum wage to monopsonists *always* increase employment?

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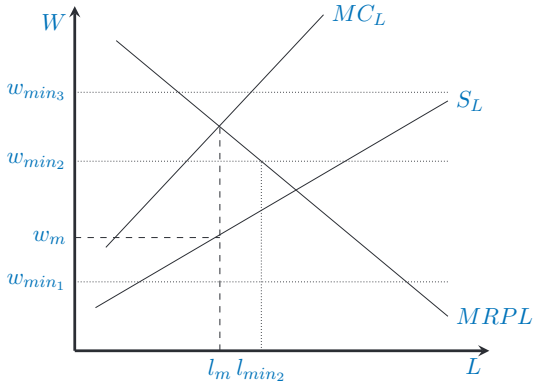

Relationship between labor supply elasticity and marginal cost of labor

- Why is $w^* = MRPL$?
- Firm's profit maximization problem:

$$\max \ \pi = p \cdot f(l) - w(l) \cdot l,$$

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- Third term is critical for monopsonist
- *Competitive* model

$$w'(l) = 0 \Longleftrightarrow \text{Price taking firm}$$

- *Monopsonistic* model

$$w'(l) > 0 \Longleftrightarrow \text{Monopsonistic firm}$$

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- Re-arranging in terms of the elasticity of labor supply (σ_s)

$$MRPL = w\left(1 + \frac{\partial w}{\partial l}\frac{l}{w}\right) = w\left(1 + \frac{1}{\sigma_s}\right)$$

- If the firm is not a price taker ($\sigma_s < \infty$) in the labor market, then the wage it pays is *strictly less* than MRPL.

Testing for monopsony in the labor market

- Where would you expect to find monopsony power?

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  - How about fast food restaurants located in nearby towns in New Jersey and Pennsylvania?

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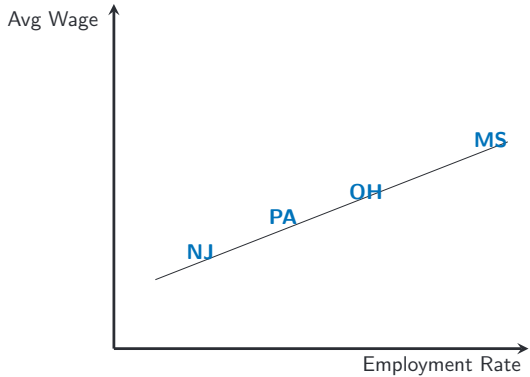
- Where would you expect to find monopsony power?
  - Company towns
  - Very specialized labor markets (e.g., Tesla mechanics)
  - How about fast food restaurants located in nearby towns in New Jersey and Pennsylvania?
- How do we test for monopsony in the labor market?

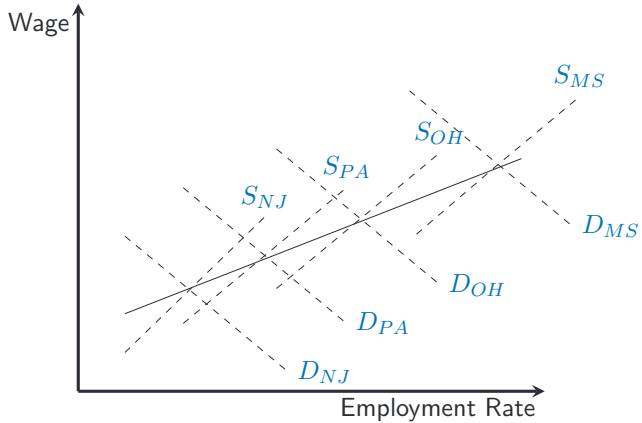
Testing for monopsony in the labor market

- Let's suppose you find the following pattern:



- Would this convince you that higher wage levels *caused* higher employment?

Testing for monopsony in the labor market



Testing for monopsony in the labor market

- An empirical problem:
  - We do not ever see supply and demand curves
  - We observe *only* equilibrium wage and quantity employed.
- Cannot directly see if individual firms face upward sloping labor supply.
- How do we overcome this problem?

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- Cannot directly see if individual firms face upward sloping labor supply.
- How do we overcome this problem?
  - **We need an experiment!**
  - Specifically, one in which wages are raised exogenously

David Card and Alan B. Krueger, 1994 (American Economic Review)

Minimum Wages and Employment: A Case Study of the Fast-Food Industry in New Jersey and Pennsylvania

By David Card and Alan B. Krueger*

On April 1, 1992, New Jersey's minimum wage rose from $4.25 to $5.05 per hour. To evaluate the impact of the law we surveyed 410 fast-food restaurants in New Jersey and eastern Pennsylvania before and after the rise. Comparisons of employment growth at stores in New Jersey and Pennsylvania (where the minimum wage was constant) provide simple estimates of the effect of the higher minimum wage. We also compare employment changes at stores in New Jersey that were initially paying high wages (above $5) to the changes at lower-wage stores. We find no indication that the rise in the minimum wage reduced employment. (*JEL* J30, J23)

Testing for monopsony in the labor market

- **How do we use this 'natural experiment' to test the competitive model against alternatives?**

Testing for monopsony in the labor market

- **How do we use this 'natural experiment' to test the competitive model against alternatives?**
- **Use key empirical implications**
  - In the competitive model, an increase in the minimum wage always reduces employment: $w_{min} \uparrow \rightarrow l \downarrow$
  - In the monopsonistic model, an increase in the minimum wage *may* raise employment: $w_{min} \uparrow \rightarrow l \uparrow$
  - Downward sloping $\rightarrow$ competitive market, upward sloping $\rightarrow$ monopsony

Today's concepts

- Experiments and quasi-experiments.
- Exogenous and endogenous variables.
- Supply, demand, elasticity.
- Competitive labor markets.
- Monopsonistic labor markets.
- Marginal revenues, marginal costs.