Transport Economics

Lecture 9

9 February 2023

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Policy debate evaluations

- Clarity of presentation and coherence of reasoning (/4)
  - 50% peer assessment, 50% my assessment
- Incorporation of economic concepts (/4)
  - 100% my assessment
- Use of empirical evidence (/2)
  - 50% peer assessment, 50% my assessment
- Rebuttal and response to questions (/4)
  - 50% peer assessment, 50% my assessment (based on all 3 criteria above)

- Policy outlines (/5)
  - Focus on completeness more than accuracy. Everyone did great!

- Winner (/1)
  - Voted by everyone in class, including me.

Policy debate winners

1. Should inter-city railway tracks be publicly owned?
    - **YES**
2. Should urban street parking spots be privately owned?
    - **NO** (rated highest for the most clear and coherent presentation)
3. Should US cities invest more in expanding their bus transit network rather than their rail transit network?
    - **YES**
4. Should Helsinki price discriminate on its City Bikes fares across time and space?
    - **NO**
5. Should prices of public transit season tickets be income-dependent?
    - **NO** (rated highest for the use of real-world evidence)

Mid-period feedback survey

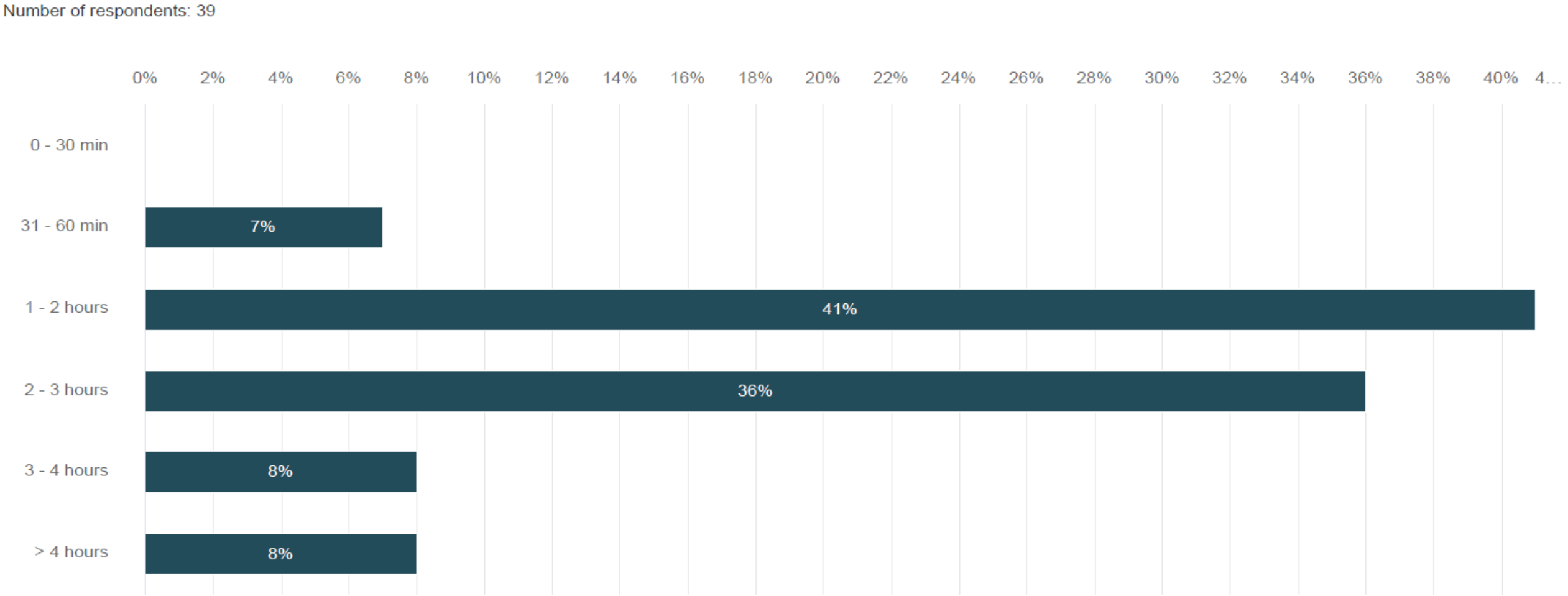
39 (out of 40) responses

→Useful feedback for me and future students!

→3 (out of 2) for everyone on Worksheet 6!

Some aggregate feedback

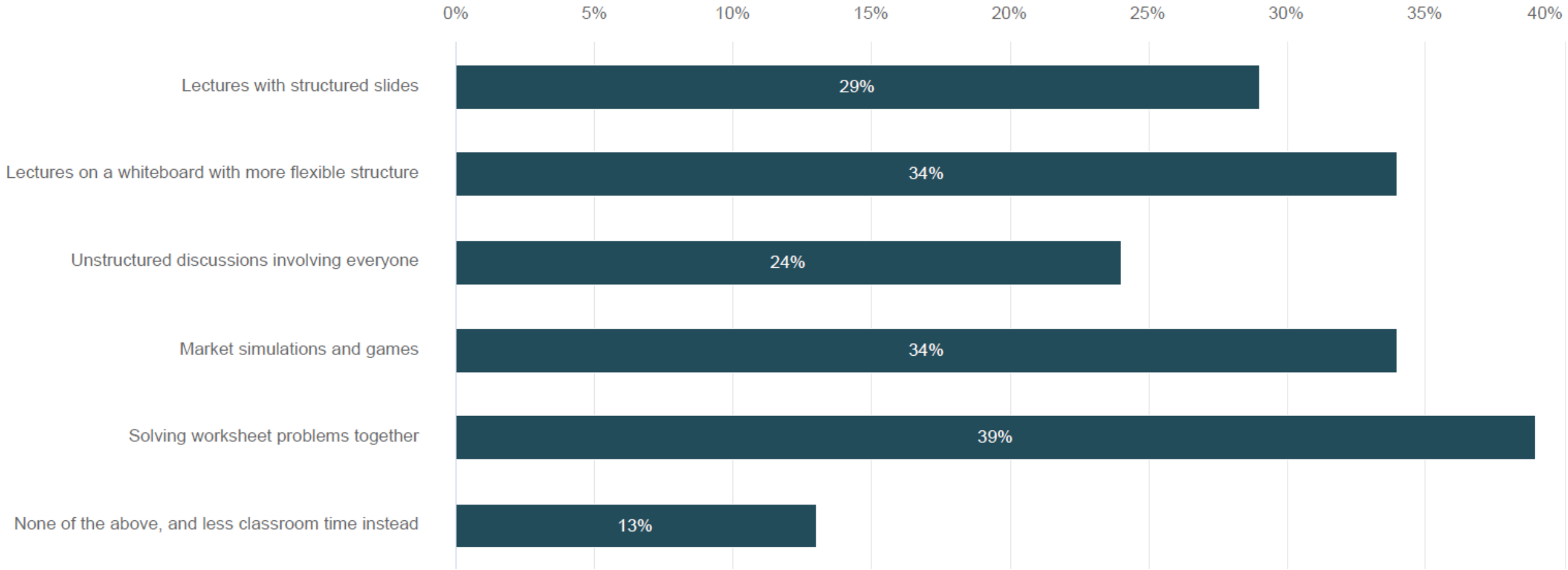
How long does it take you on average to complete each homework problem?



Some aggregate feedback

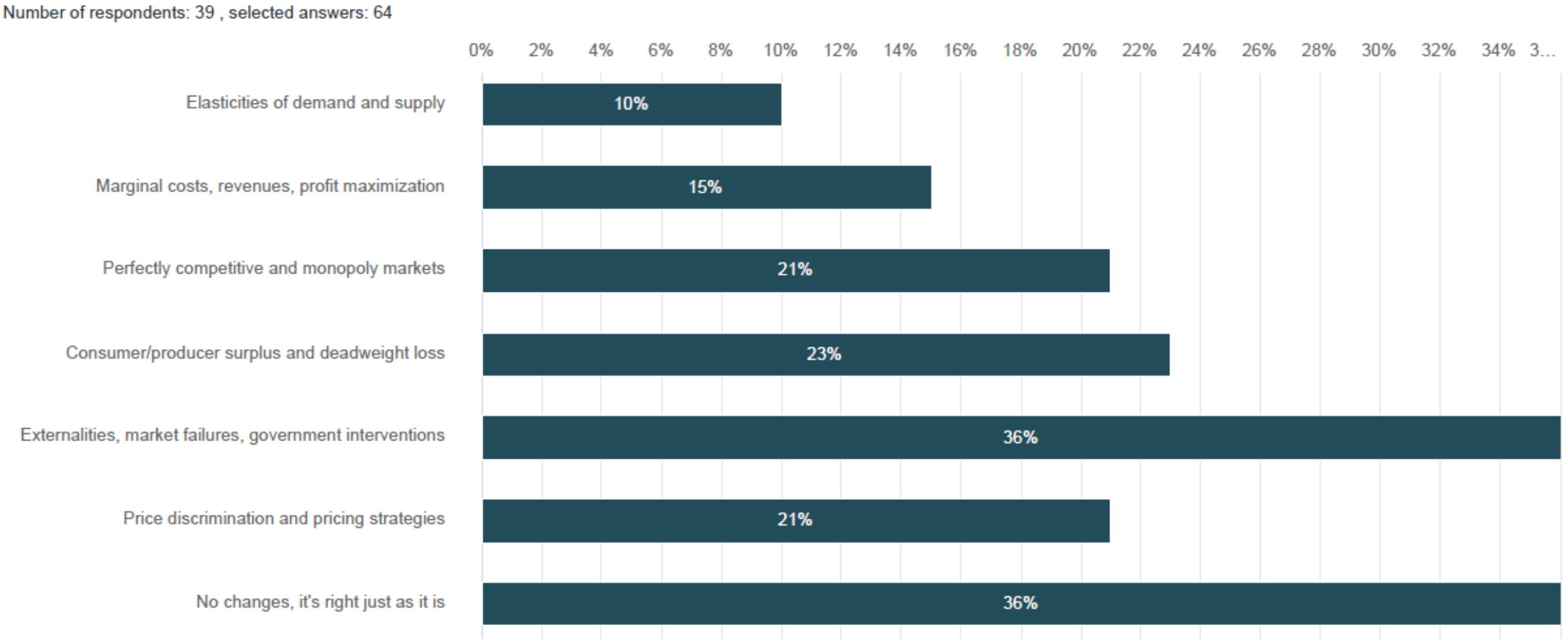
Which learning method(s) would you have liked more lecture time spent on?

Number of respondents: 38 , selected answers: 66



Some aggregate feedback

Which of the core conceptual topics would you have liked more lecture time dedicated to?



Hello, second-year bachelor's student or first-year master's student - how are you?

Please respond to the study wellbeing questionnaire through the link you will receive by email.

You will get personal feedback and help the university to support your wellbeing.

Aalto-yliopisto
Aalto-universitetet
Aalto University

The questionnaire is open from 15 February to 1 March 2023.

Today's agenda

- Review
  - It's been a while since I presented!
- Learning from observational data: 2 case studies
- Hanna, Kreindler, and Olkein (2017)
- Causal inference methods

Road price discrimination (review+)

- Demand for road space varies over time and space
  - → congestion at peak hours.

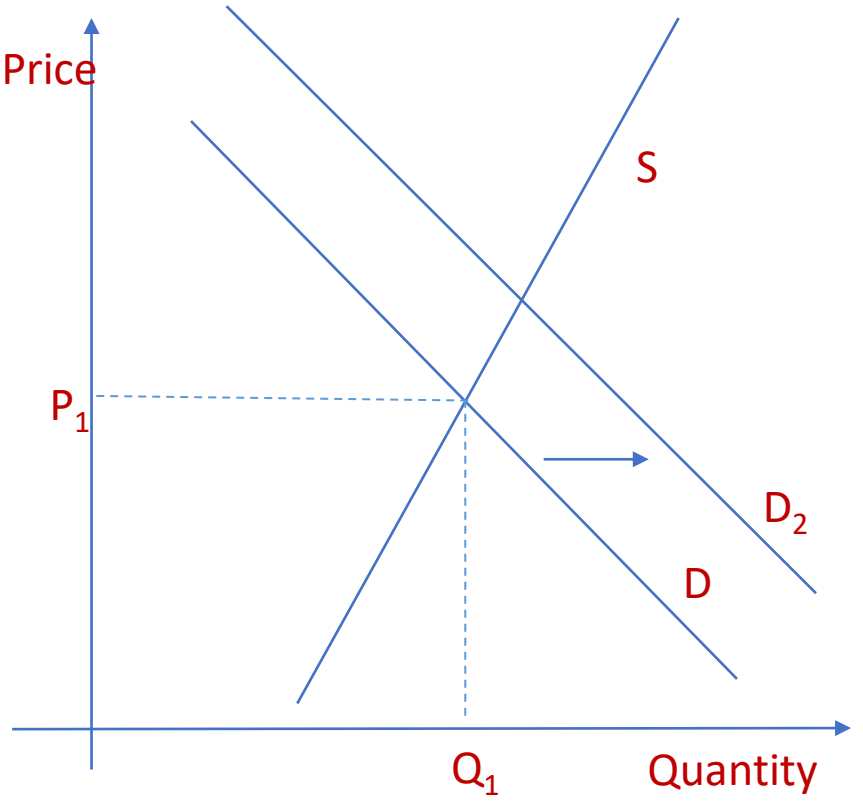
- Instead of an external intervention (e.g., taxing cars), directly price roads to be able to price discriminate.
  - But how to set prices?

- Private road suppliers?
  - Competition among road suppliers could lead to optimal pricing.
  - Public may be more accepting of privately funded roads (rather than taxpayer-funded)

- Also needs government intervention
  - Lack of competition may lead to over-pricing
  - Private suppliers may ignore other externalities of road usage (pollution, land use, …)
  - Public-private partnerships are not uncommon

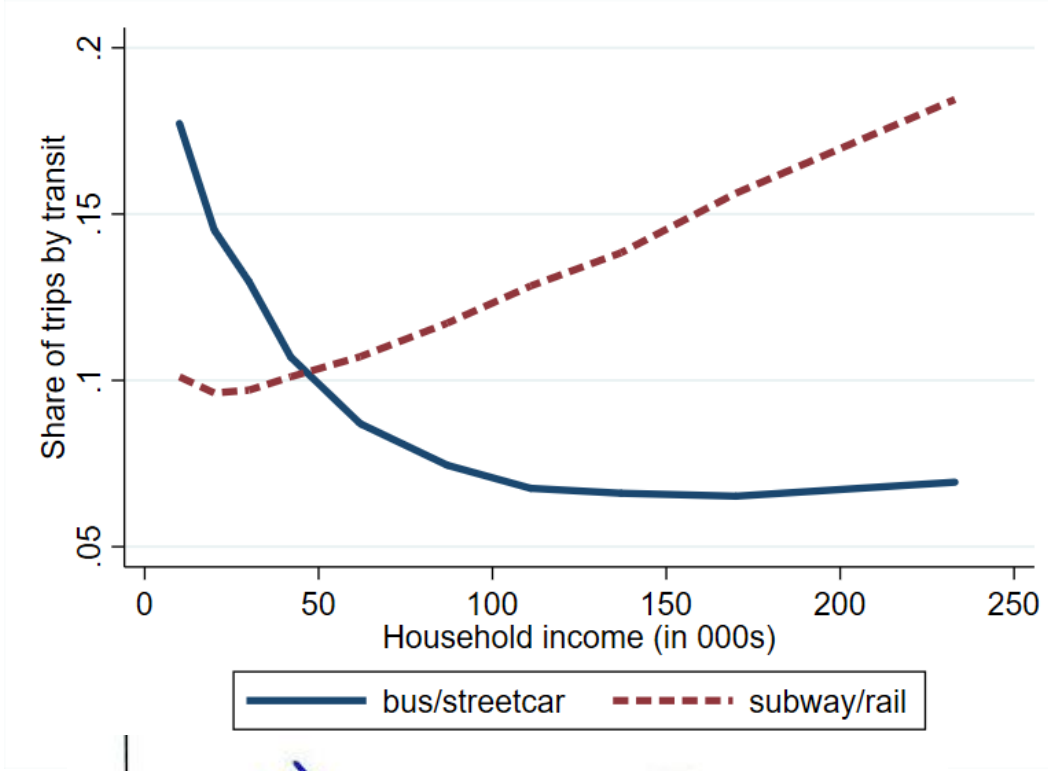
Externalities via prices in other markets (review)

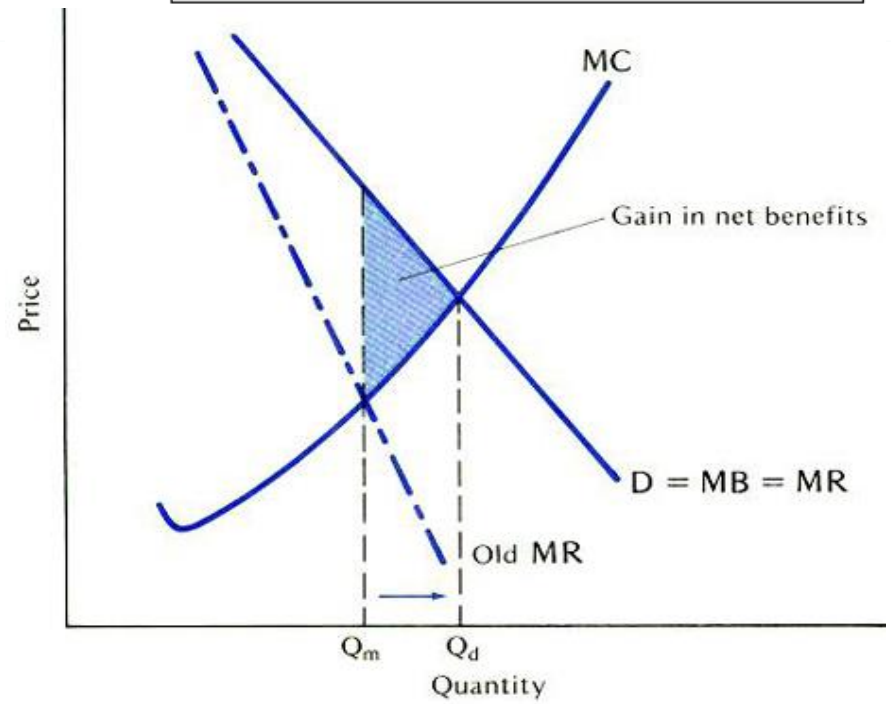
- We can control some prices (e.g., monetary), but costs may get passed down
  - in other forms (e.g. travel times) and to other markets (e.g. as externalities)
- E.g., new subway station may increase demand (and prices) for housing in the neighborhood
- Because subway fares are set below market equilibrium, the additional willingness to pay for it is captured by housing prices to landlords (as opposed to transit operators)
- So, even when formal prices are fixed, there may be discrimination in "shadow" prices via externalities in other markets e.g., housing.



Price discrimination in public transit access

- High- & low-income households may pay different housing prices to access different public transit services.
  - A form of (shadow) price discrimination!
- More ridership (and net surplus?) from price discrimination
  - If not in transit fares, in service type/quality
- Profitable transit operations in US cities tend to serve:
  - Bus routes through mostly high-density areas with low-income people and short trip lengths, OR
  - Commuter rail, rapid transit, and express buses from affluent suburbs to large employment centers

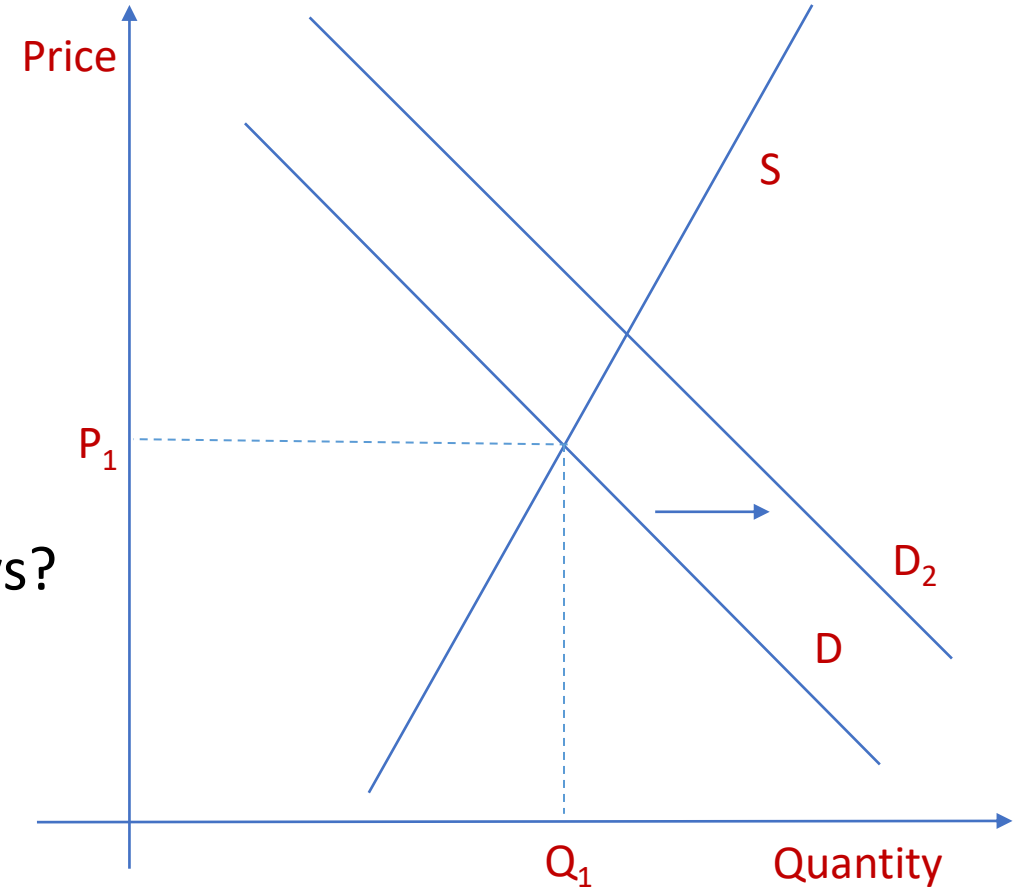




Public transit access and housing market

To internalize the shadow price, should govt. intervene in local housing market?

- Rent controls?
  - Excess demand, deadweight loss
  - Benefits people who live there, but fewer people with access to subway
- Shift housing supply?
  - E.g., subsidy to developers?
- Relax restrictions on housing density / zoning laws?
  - More elastic housing supply: smaller price increase, greater access for more people
- Price discrimination in the housing market?
  - Affordable housing units, etc.



How to quantify costs and benefits?

- What are the size of externalities?
  - And the size of government interventions?
- How responsive are demanders and suppliers to these interventions?
  - Elasticities relative to price, income, prices of related goods/services, …
- **Rest of the course:** how to learn from data?
- But first, why?
  - 2 examples

Example 1: A driving restriction in Mexico City in 1989

- Mexico City introduced a program, *Hoy No Circula*, that bans most drivers from using their vehicles one weekday per week on the basis of the last digit of the vehicle's license plate.

- License plate restrictions have been common in many other fast-growing cities e.g., Bogotá, Beijing, São Paulo, Santiago, etc.

- One of the goals: to improve the city's air quality

Worksheet 9: what's happening?

- Let's speculate. Say, you have the following yearly data on adjacent markets within the city:
  1. Concentration of pollutants in the air: CO, NO_2, SO_2…
  2. Gasoline sales
  3. Subway and bus ridership
  4. Number of registered taxis
  5. Advertised taxi prices
  6. Vehicle registrations and sales

- What do you expect to happen with each of the above following the license plate restriction?

Worksheet 9: what do we expect to see?

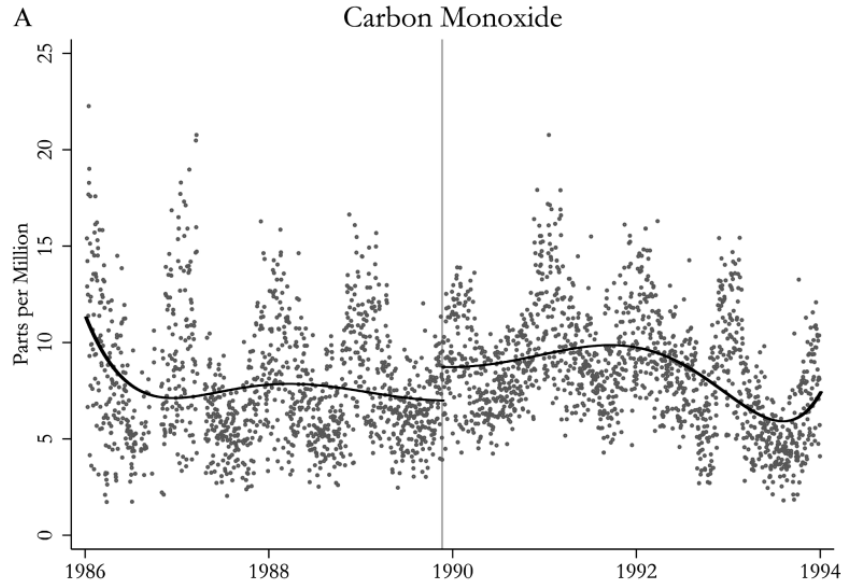
https://forms.gle/X4Skcai8RsFgSu9JA

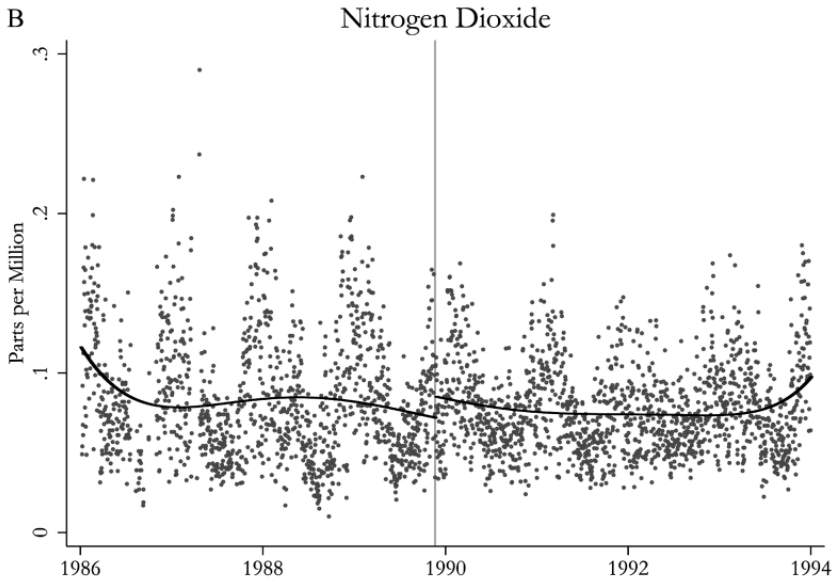
1. Concentration of pollutants in the air: CO, NO_2, SO_2…
2. Gasoline sales
3. Subway and bus ridership
4. Number of registered taxis
5. Advertised taxi prices
6. Vehicle registrations and sales

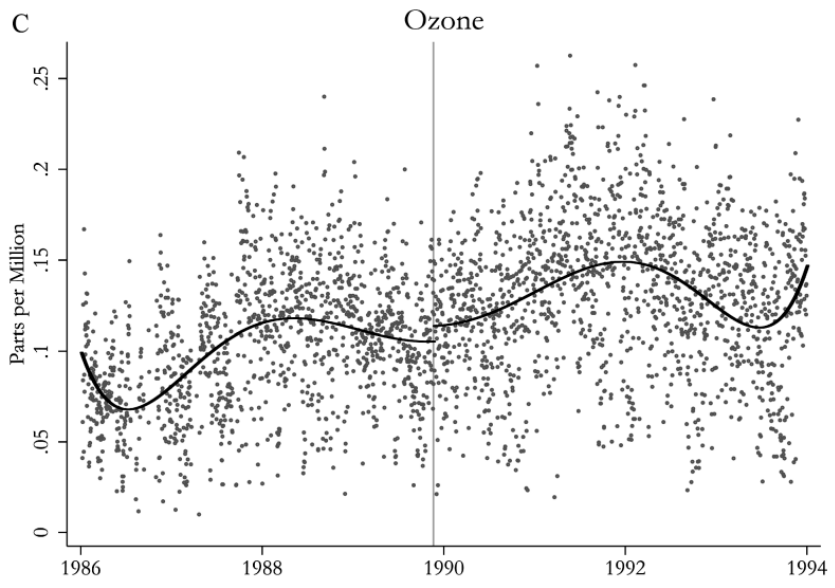
Example 1: What was its effect?

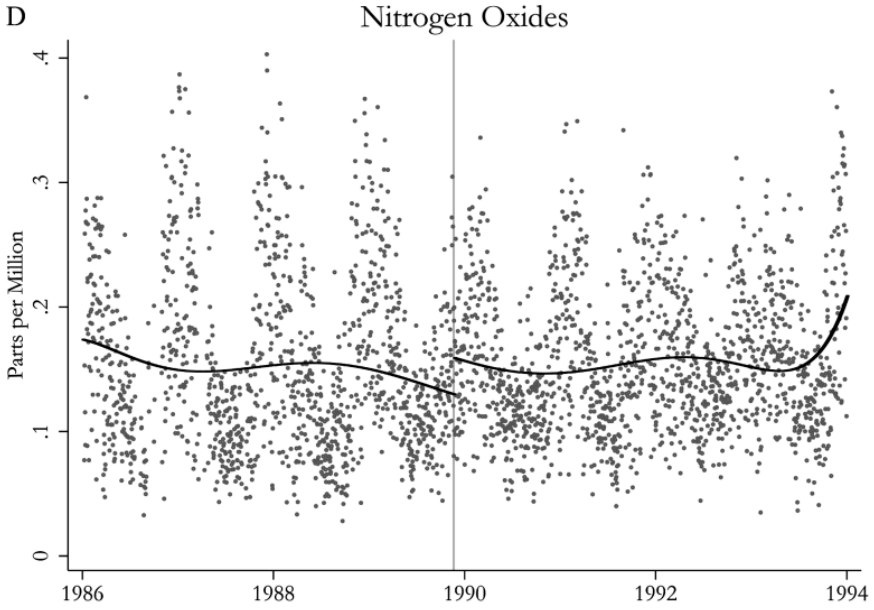
Davis, L. (2008). "**The Effect of Driving Restrictions on Air Quality in Mexico City**". *Journal of Political Economy*, 116(1)

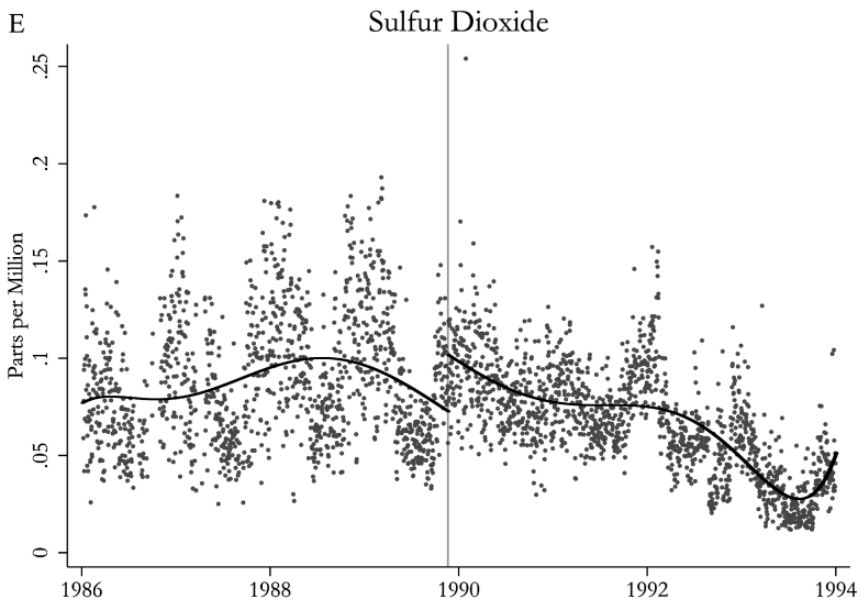
No notable effect on observed air quality in Mexico City!











Gasoline sales (Davis, 2008)

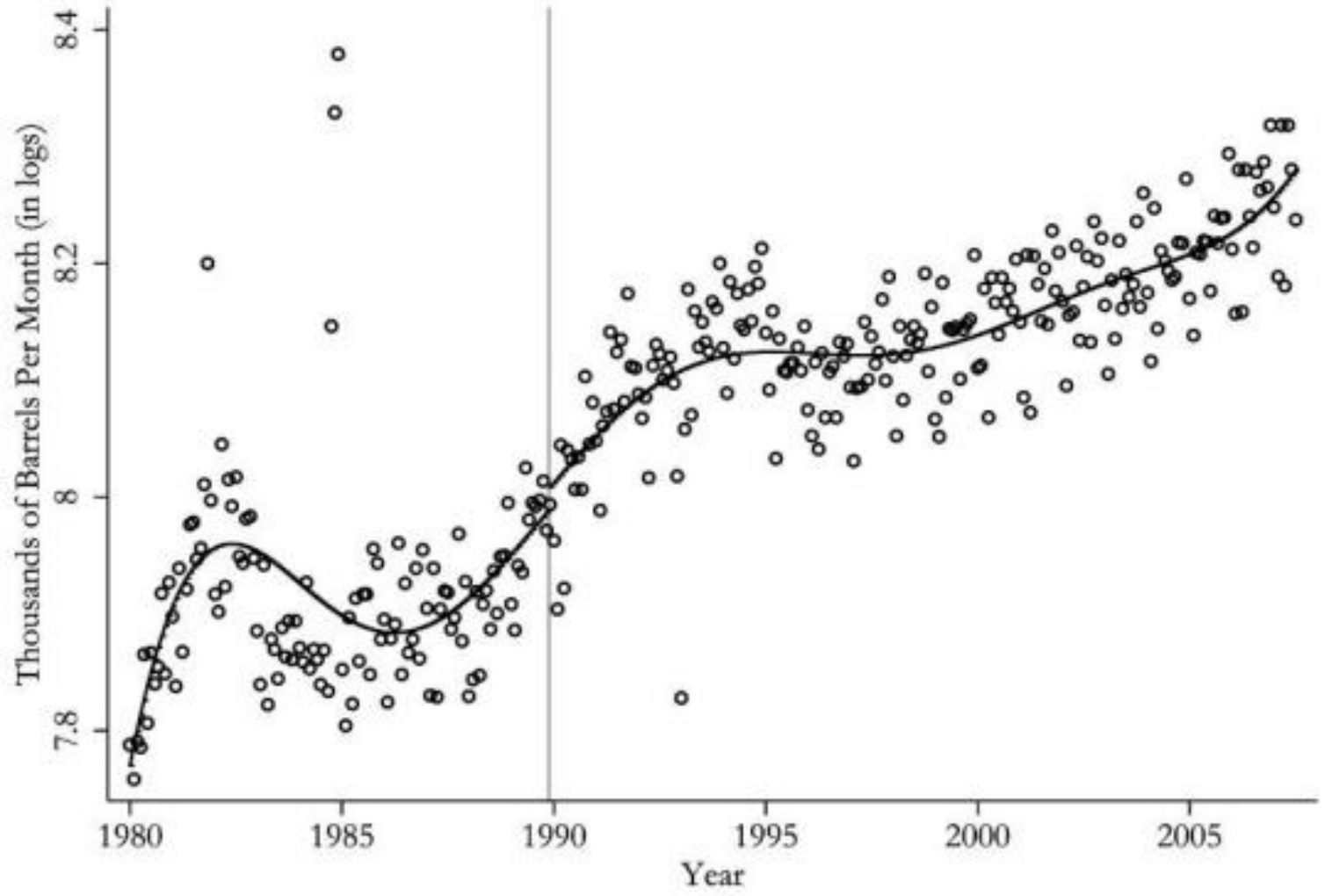


FIG. 6.—Gasoline sales in Mexico City, 1980–2007. Source: Gobierno de México, Secretaría de Energía, 2007.

Subway ridership (Davis, 2008)

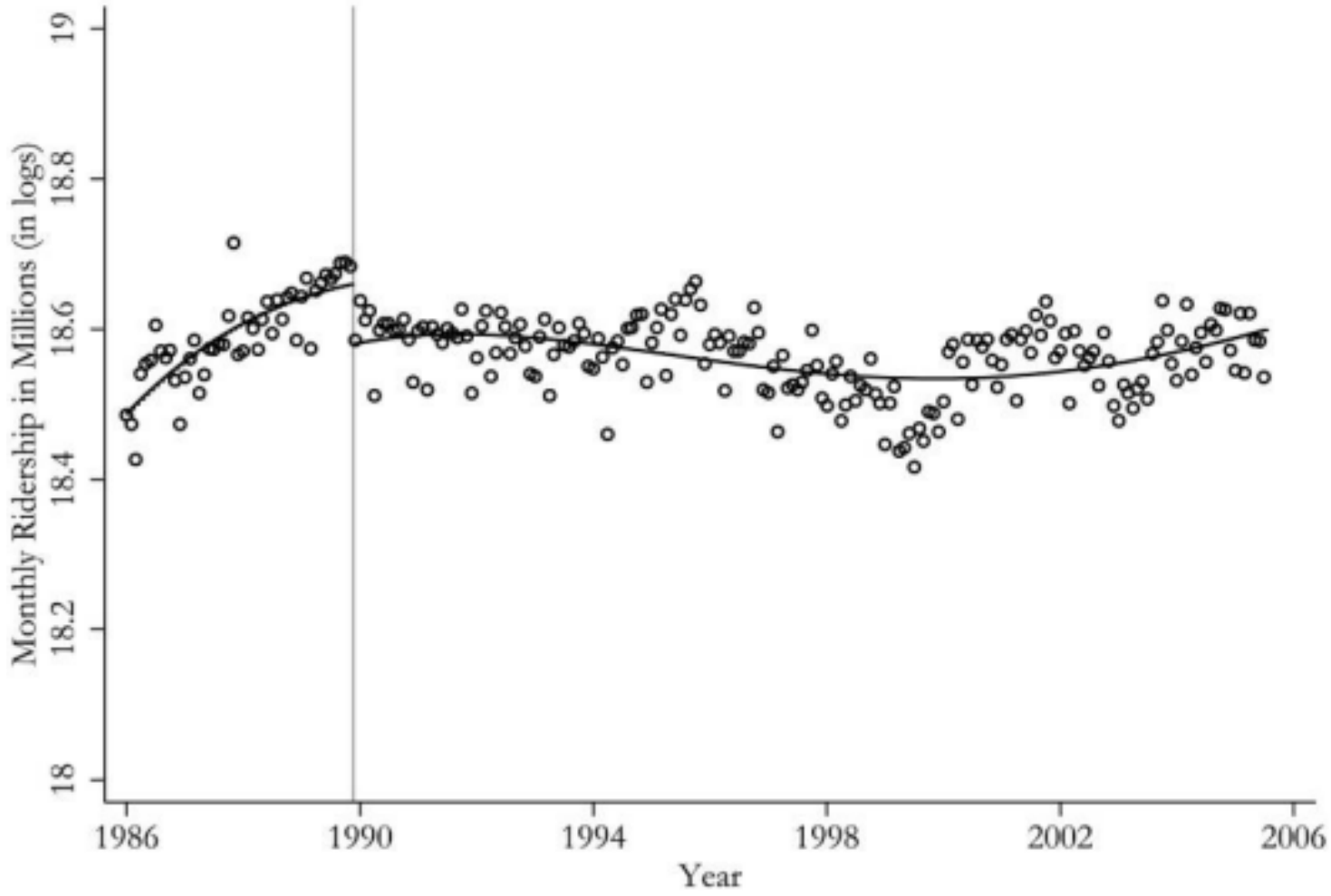


FIG. 7.—Subway ridership in Mexico City, 1986–2005. Source: INEGI, Gobierno del Distrito Federal, Sistema de Transporte Colectivo Metro, 2006.

Bus ridership (Davis, 2008)

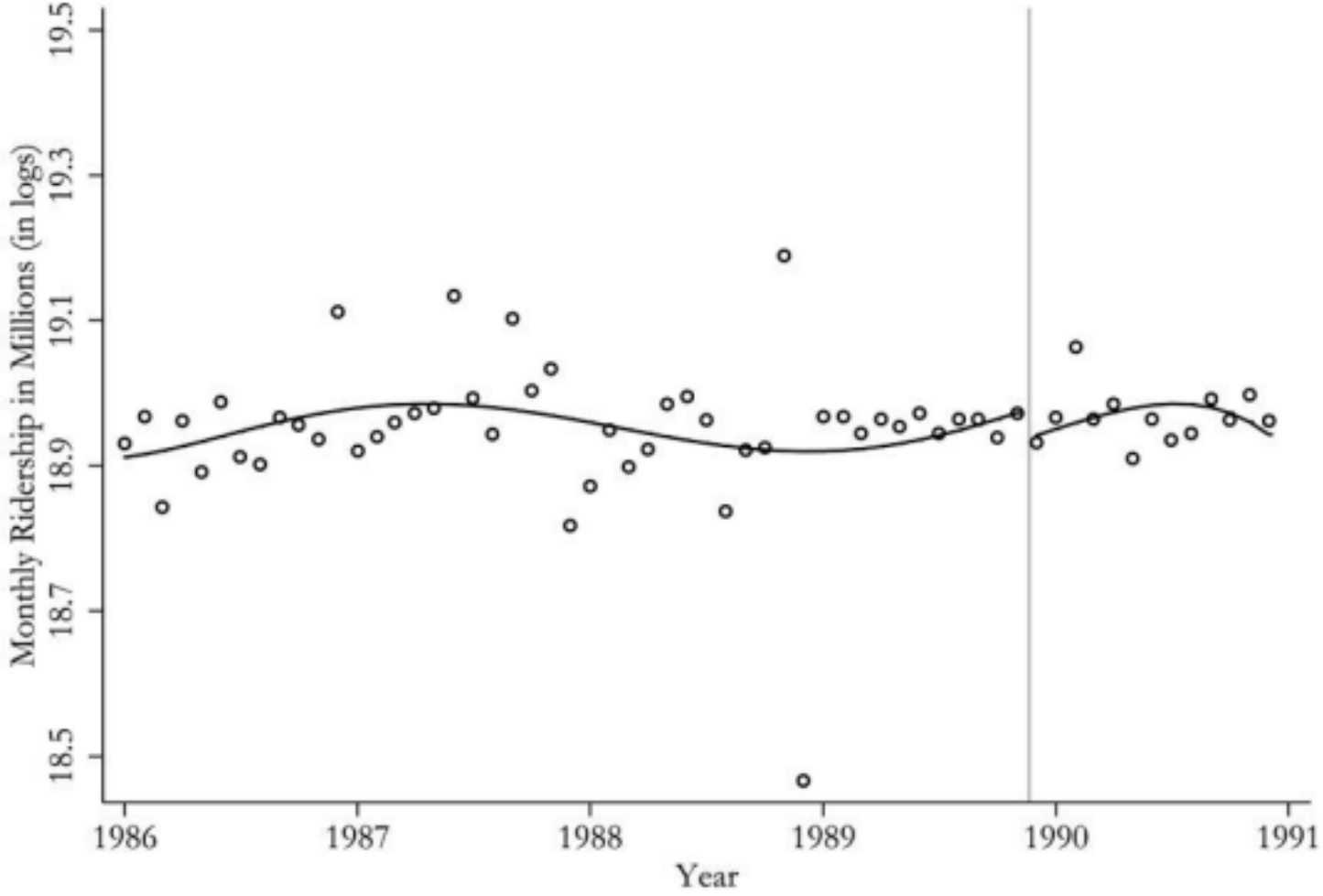


FIG. 8.—Public bus ridership in Mexico City, 1986–90. Source: INEGI, Gobierno del Distrito Federal, Red de Transporte de Pasajeros, 2006.

Taxis (Davis, 2008)

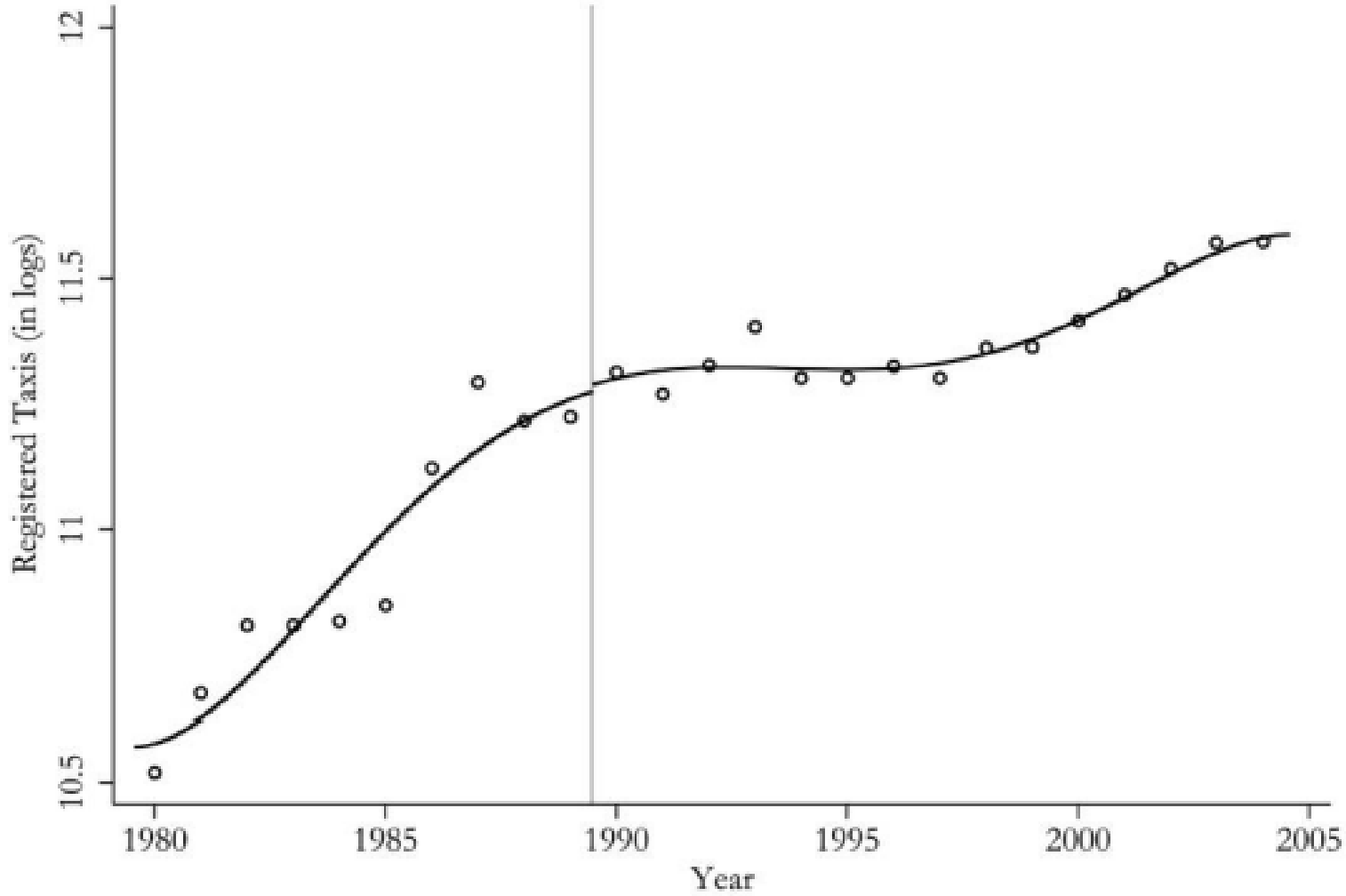


FIG. 11.—Taxis in Mexico City, 1980–2004. Source: INEGI, Estadísticas de Transportes, Vehículos de Motor Registrados en Circulación, 2007.

Taxi prices (Davis, 2008)

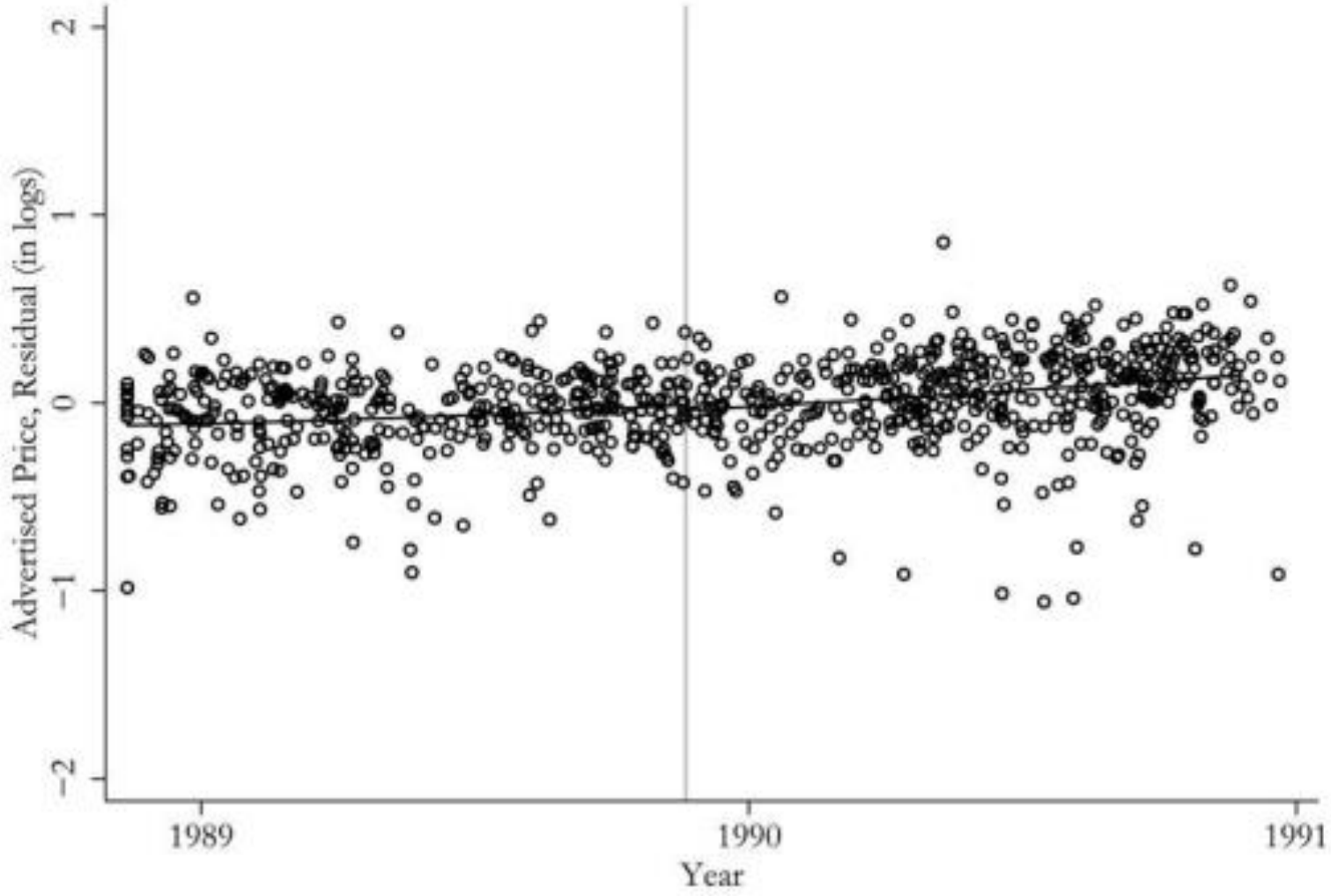


FIG. 12.—Taxi prices in Mexico City, 1988–90. Source: *El Universal*, Sunday vehicle section, November 1988–November 1990.

Registered vehicles (Davis, 2008)

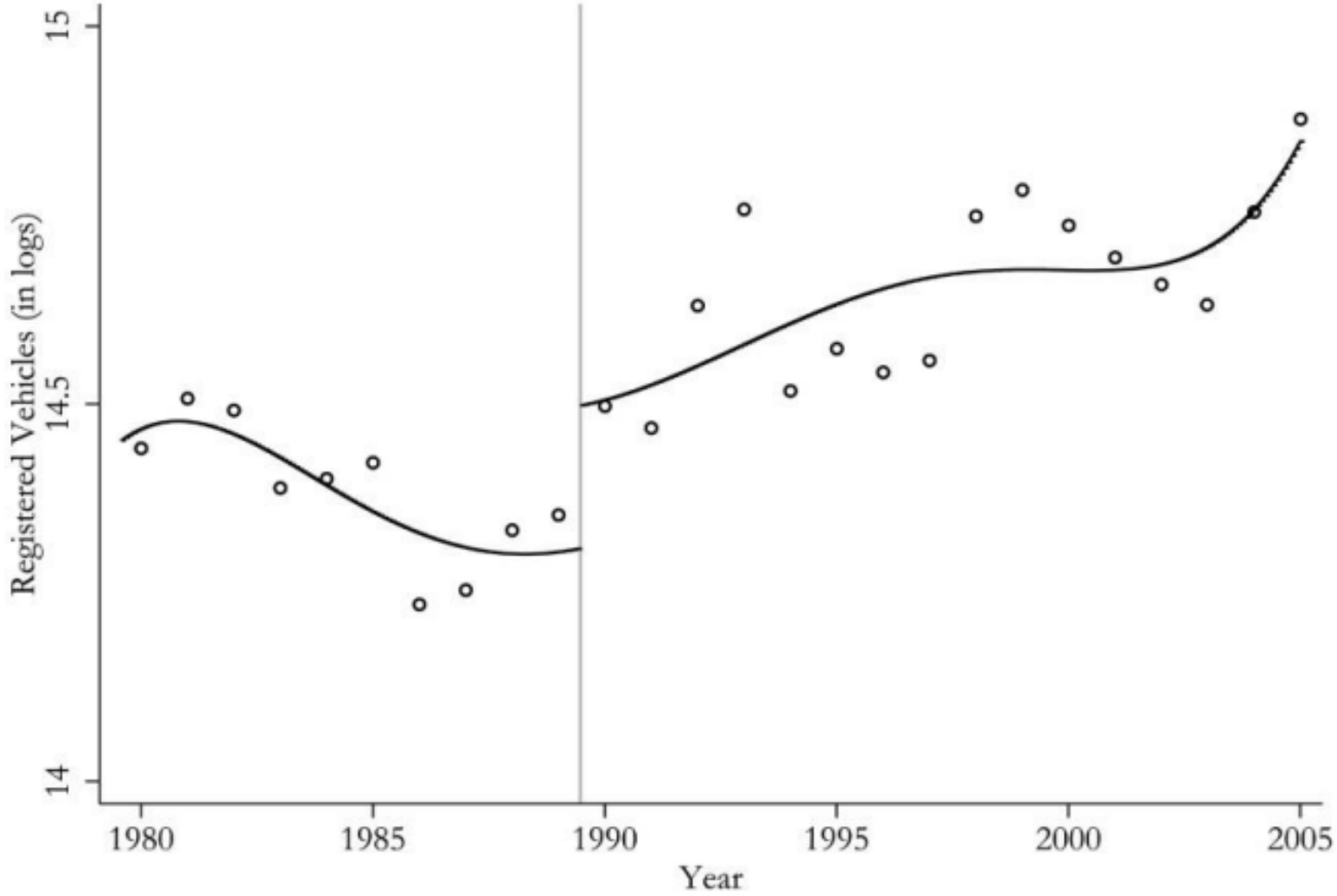


FIG. 9.—Registered vehicles in Mexico City, 1980–2005. Source: INEGI, Estadísticas de Transportes, Vehículos de Motor Registrados en Circulación, 2007.

Example 1: Driving restriction in Mexico City

Davis (2008):

- License plate restriction
  - didn’t seem to reduce fuel consumption
  - didn’t seem to increase mass transit ridership (or alternative travel modes)
  - increased car registrations!
- Policy targeted license plates, not drivers
  - Driving per vehicle decreased, but not necessarily overall amount of driving

- External interventions in markets are always “second-best” solutions
  - Imperfect targeting, limited information, etc.

Learning from data

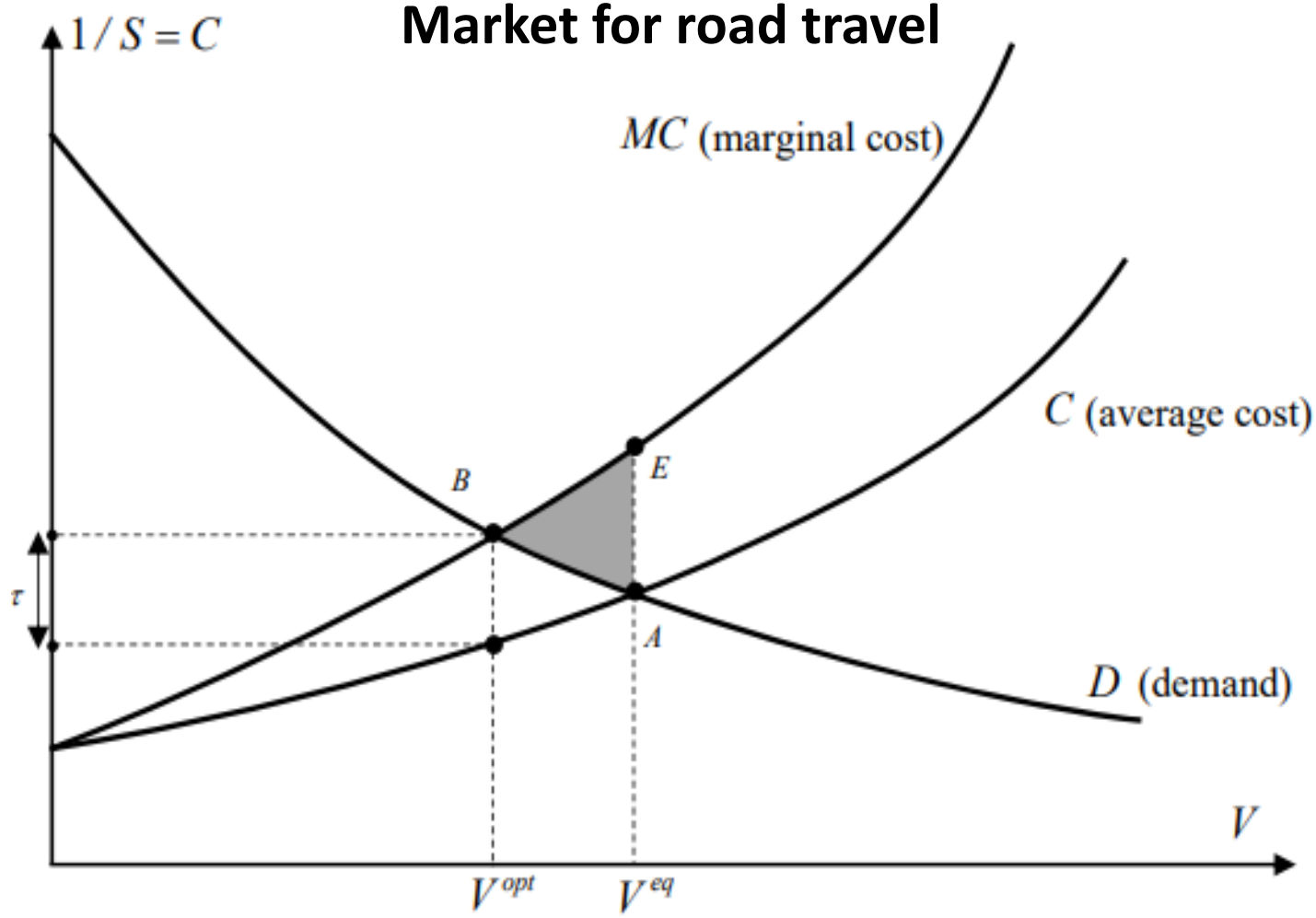
Example 2

Congestion pricing (review)

- Price = inverse travel speed (1/S)
- Quantity = travel volume (V)

- Speed is determined by volume of travelers on the road.

- Historically, congestion externality is the focus of traditional transportation economics.

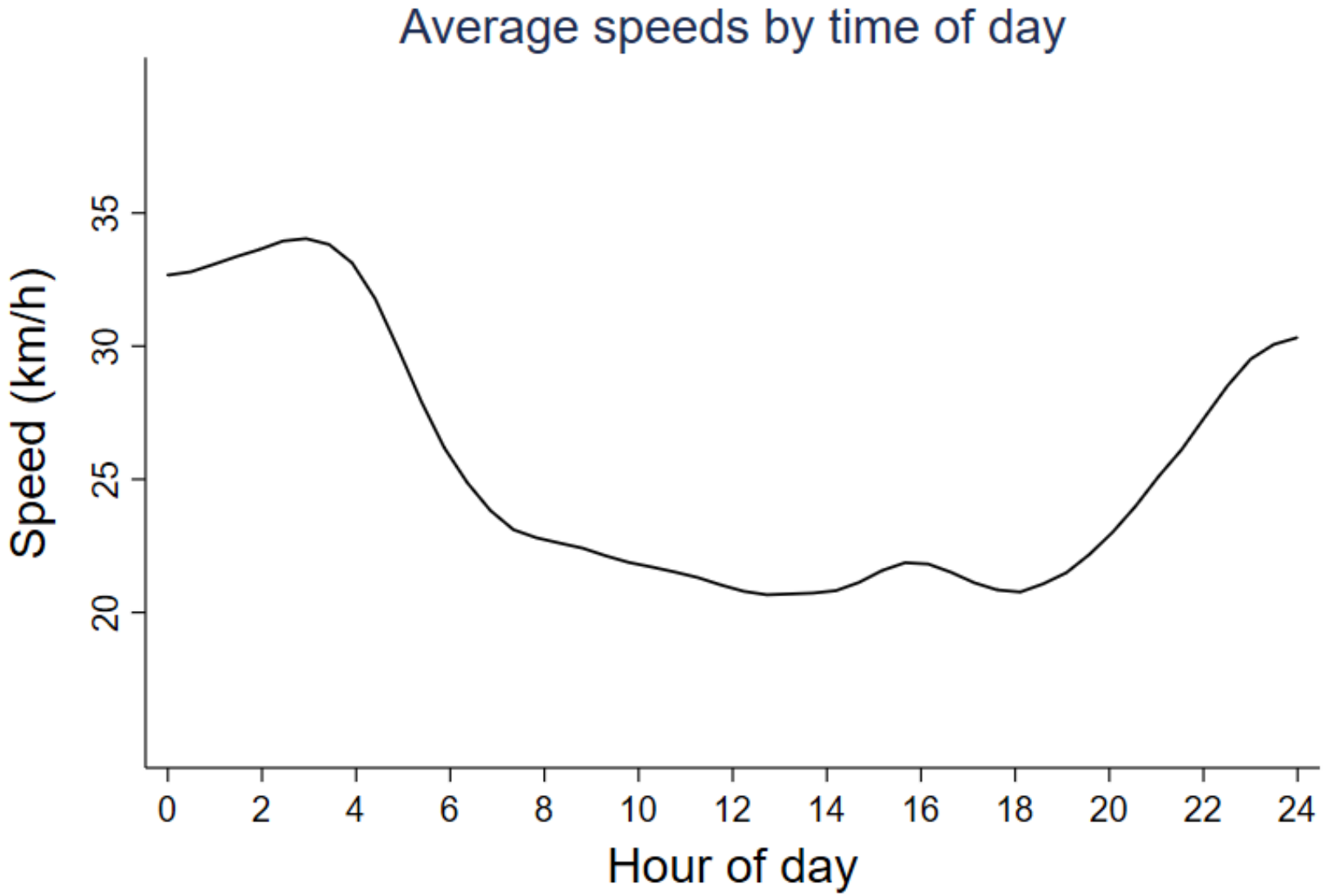


Example 2: How important is congestion for urban mobility?

Average travel speeds on trips simulated on Google Maps

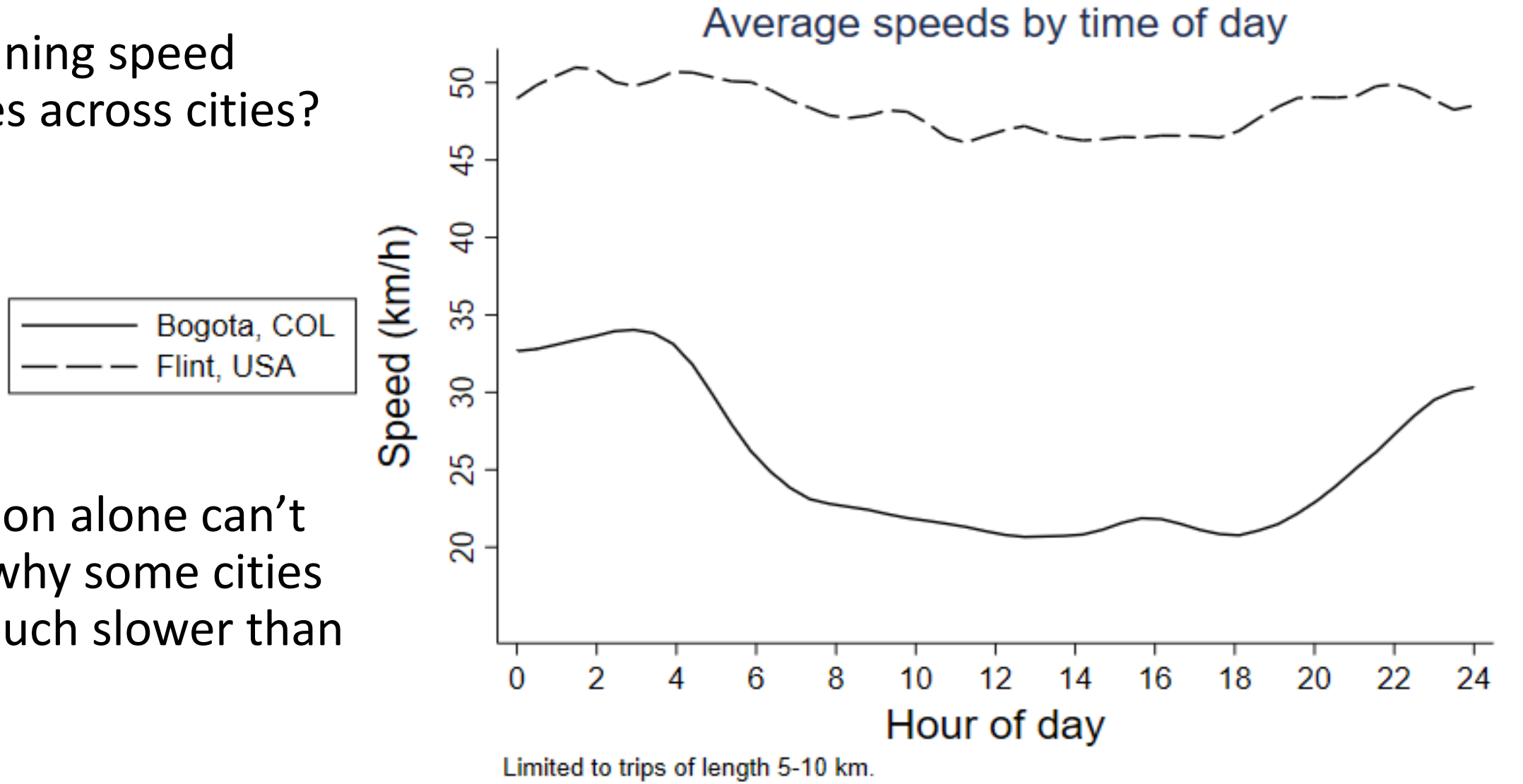
(Akbar, Couture, Duranton, and Storeygard, 2023a)

Lower speeds during peak hours of travel



Example 2: How important is congestion?

…in explaining speed differences across cities?

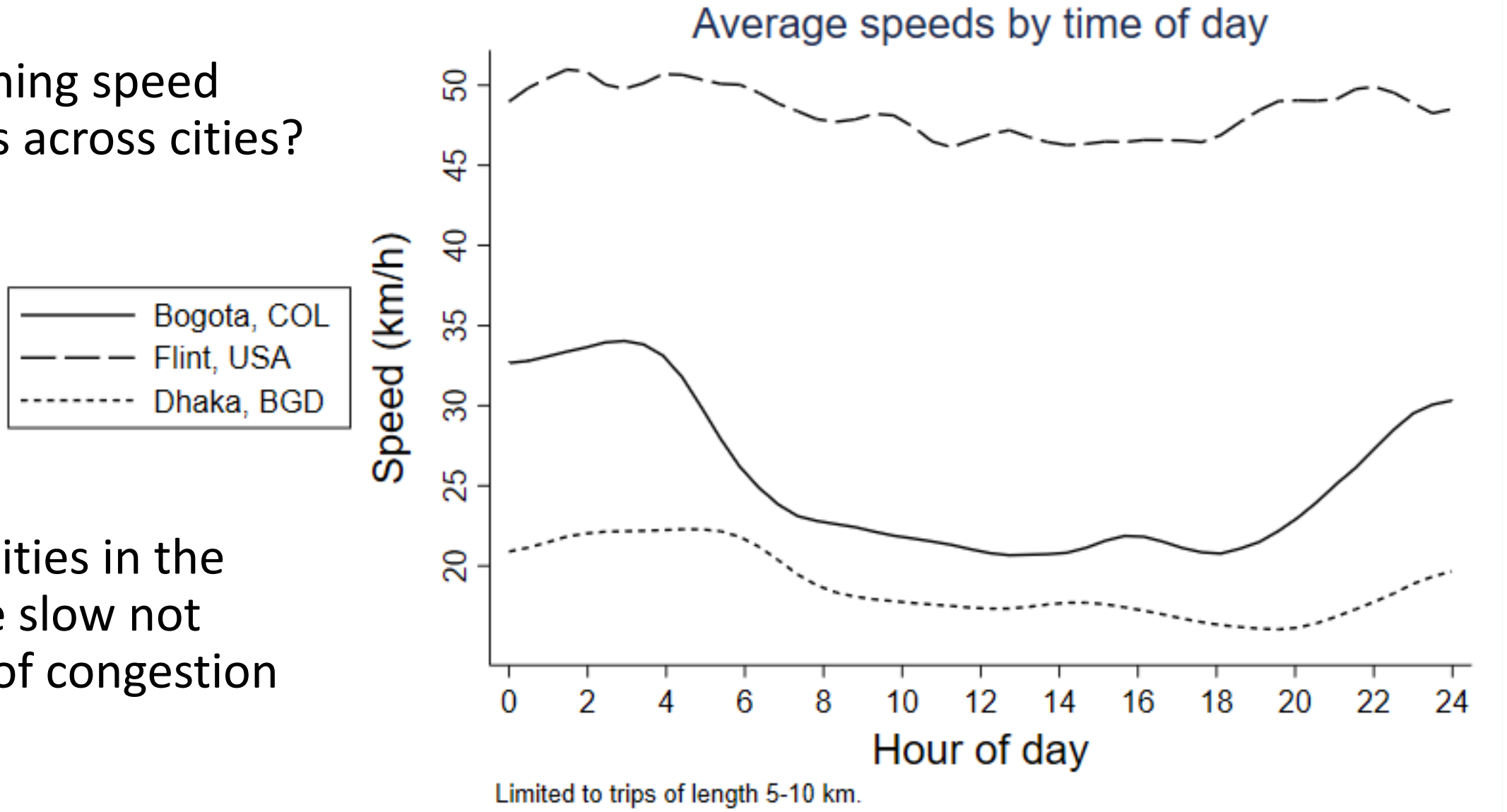


Congestion alone can't explain why some cities are so much slower than others

Akbar, Couture, Duranton, and Storeygard (2023b)

Example 2: How important is congestion?

…in explaining speed differences across cities?

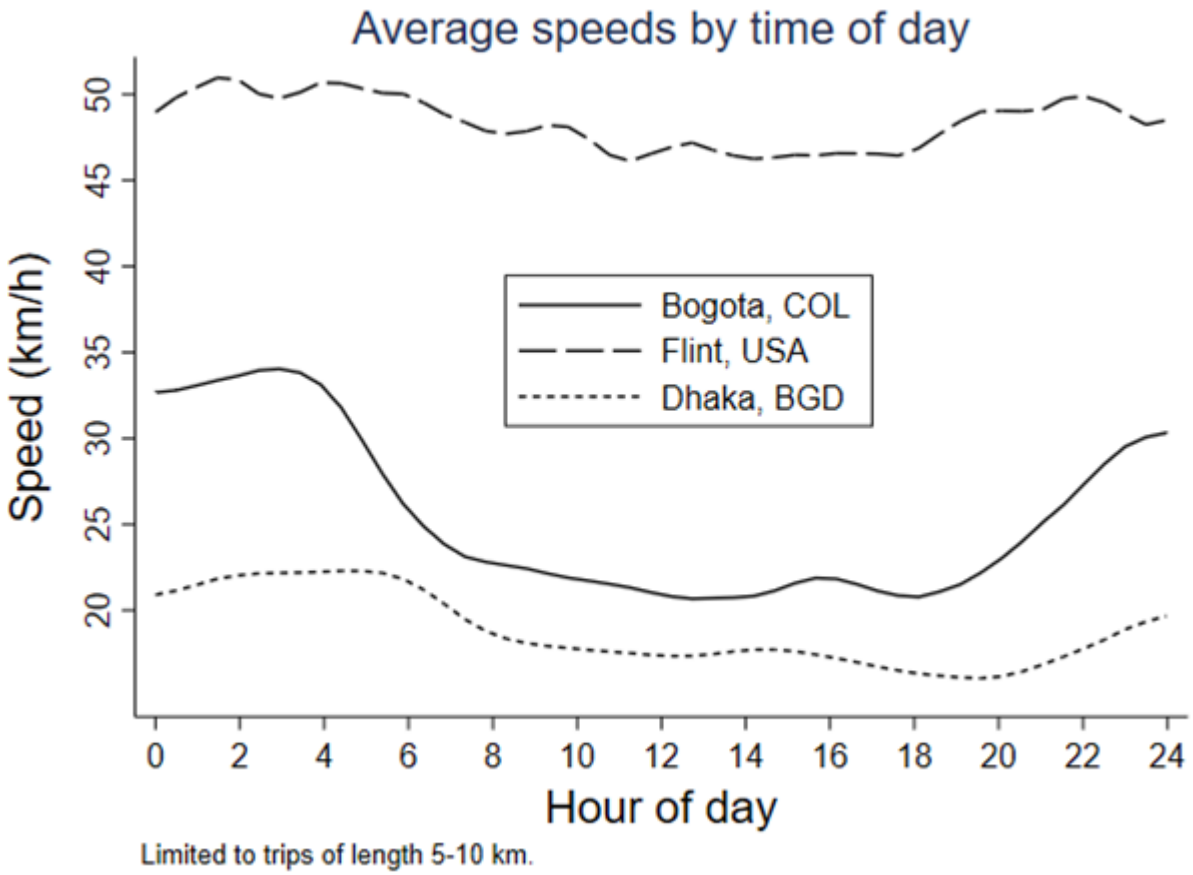


Slowest cities in the world are slow not because of congestion

Akbar, Couture, Duranton, and Storeygard (2023b)

Example 2: How important is congestion?

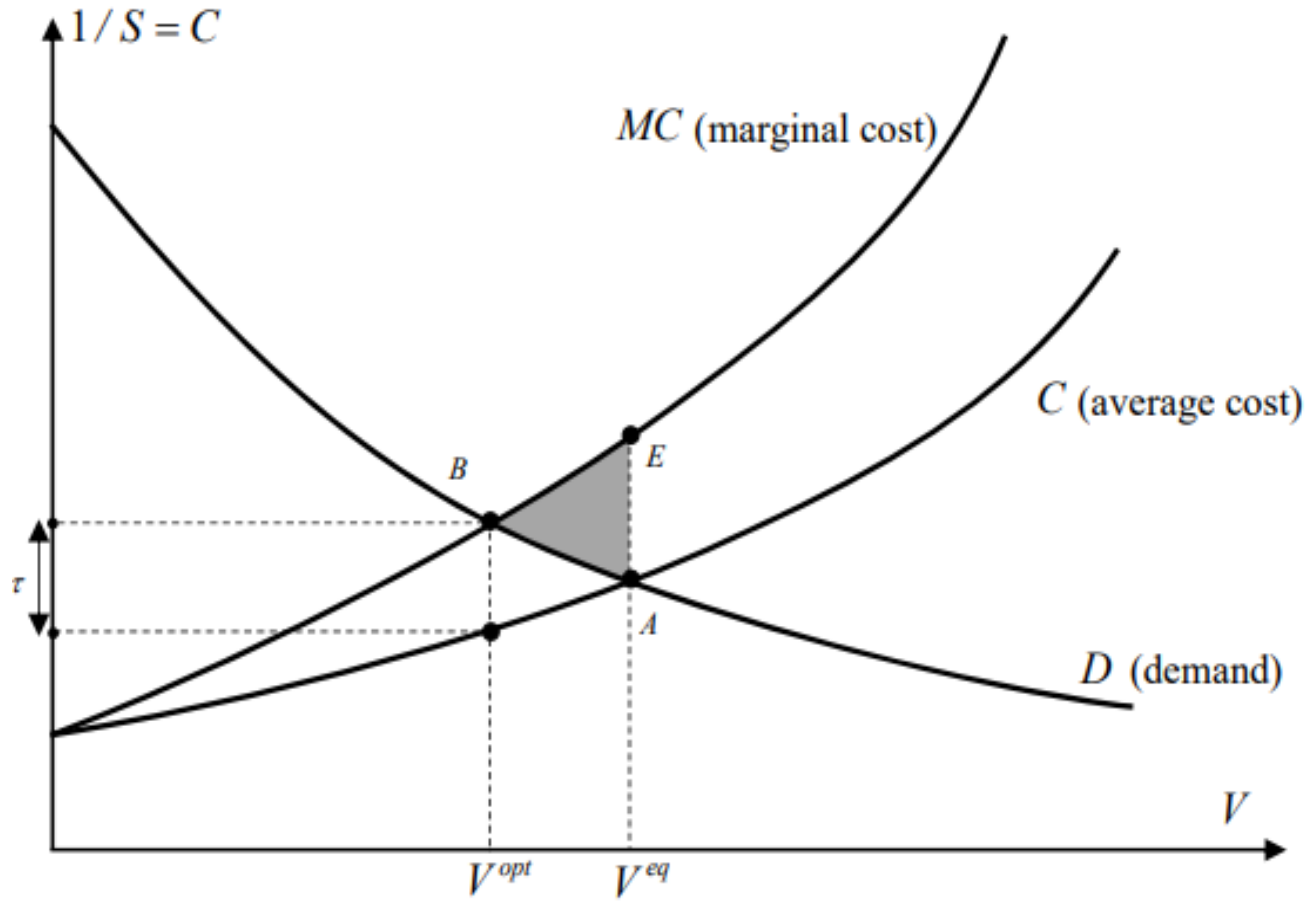
- Large policy focus on congestion-alleviation mechanisms that re-allocate travelers across space and time e.g., HOV lanes, license plate restrictions, congestion pricing, etc.
- Can improve mobility in some of the most congested cities in the world…
- but most slow cities are slow even in the absence of peak-hour traffic!



Akbar, Couture, Duranton, and Storeygard (2023b)

Example 2 → marginal cost of road travel

Is not very steep in most cities?



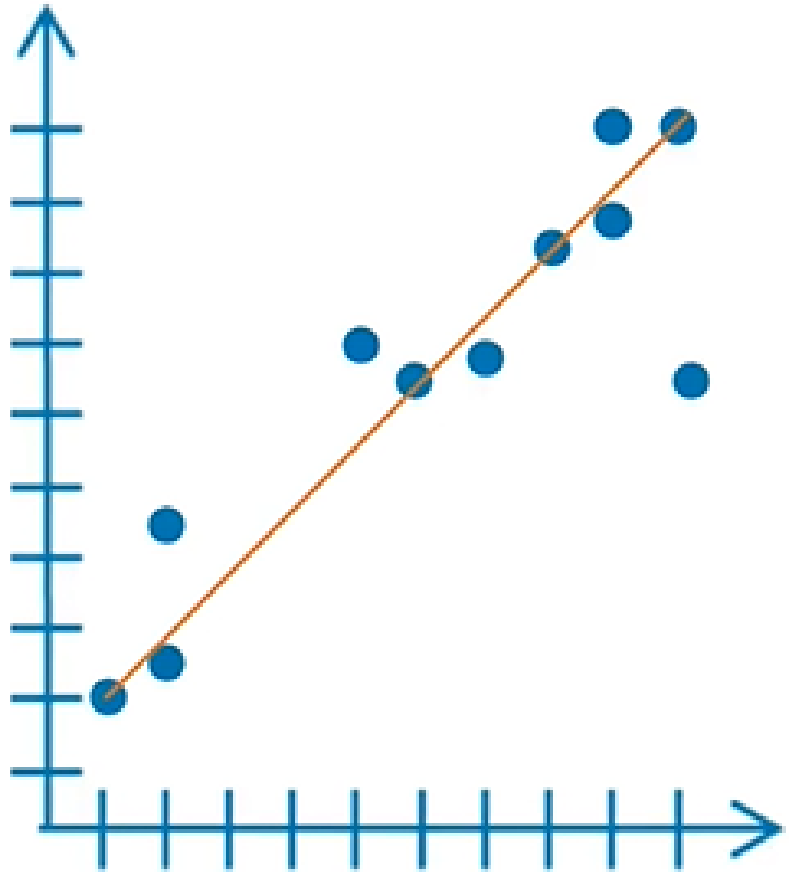
Translating concepts to policymaking

- What is the size of externalities? What and how large an intervention is needed?
  - E.g., by how much would congestion reduction improve urban mobility?
- How do markets actually respond to the intervention?
  - Is it having the intended effect on the behavior of demanders/suppliers?
- How to evaluate impacts on suppliers, demanders and external stakeholders?
- **Rest of the course:** how to learn from data?

Linear regression

Demand/supply, Y, for a service is dependent on:

$$Y = \beta_0 + \beta_1 (\text{Price}) + \beta_2 X_2 + \beta_3 X_3 + \ldots + \varepsilon$$



- Explanatory variables: Price, X_2 , X_3, …
  - That we observe
- Coefficients: β_0, β_1, β_2, …
  - Unknown parameters of interest
- Random error term ε
  - that are unobservable/“unpredictable” to us
- If we have data on the dependent and explanatory variables, we can “estimate” the coefficients that would best “fit” the data
  - i.e., choose coefficients to minimize distance between actual data points and prediction
  - Once coefficients are estimated, we can predict what Y would look like under a different price, different market characteristics, etc.

Hanna, Kreindler, and Olkein (2017)

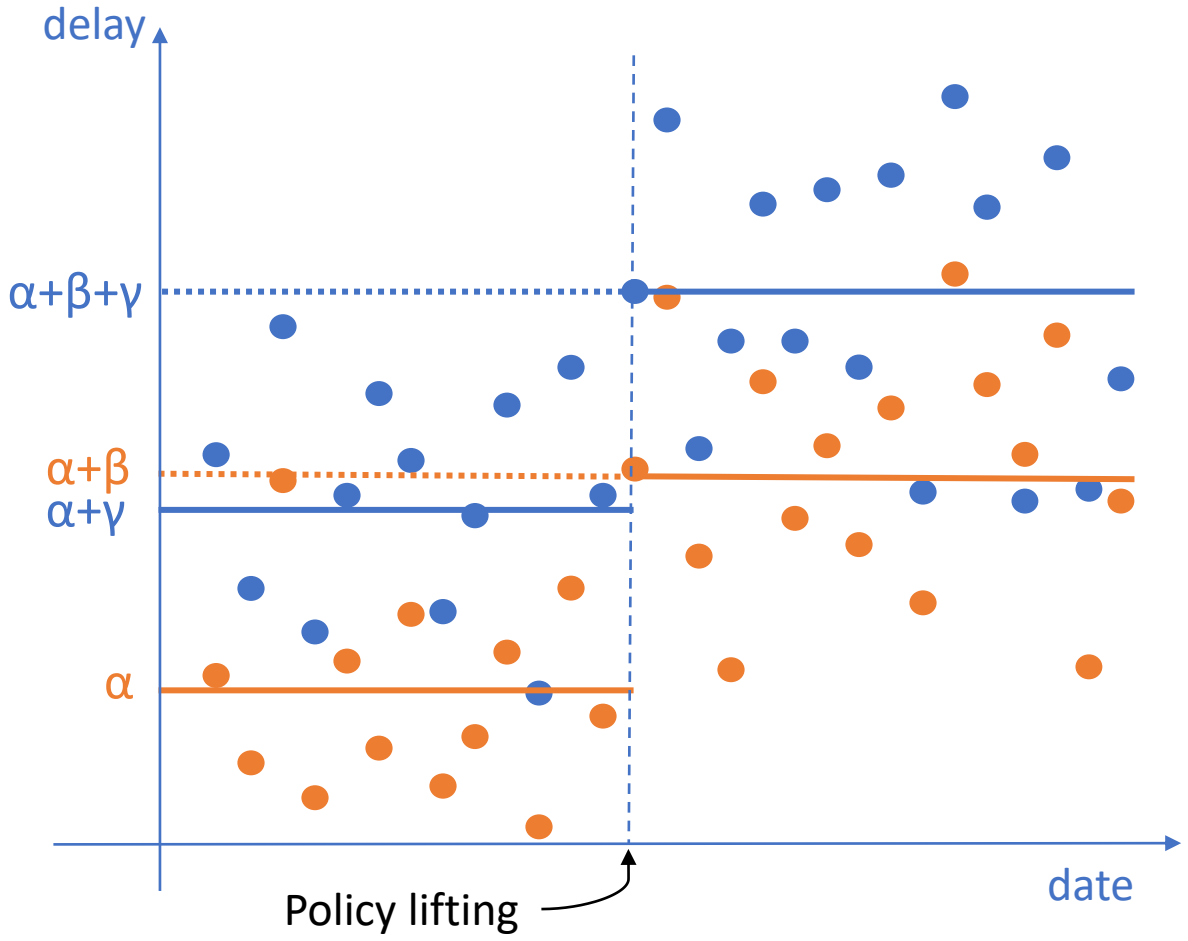
Citywide effects of high-occupancy vehicle restrictions: Evidence from "three-in-one" in Jakarta

Linear regression in Hanna, Kreindler, and Olkein (2017)

An “event study”

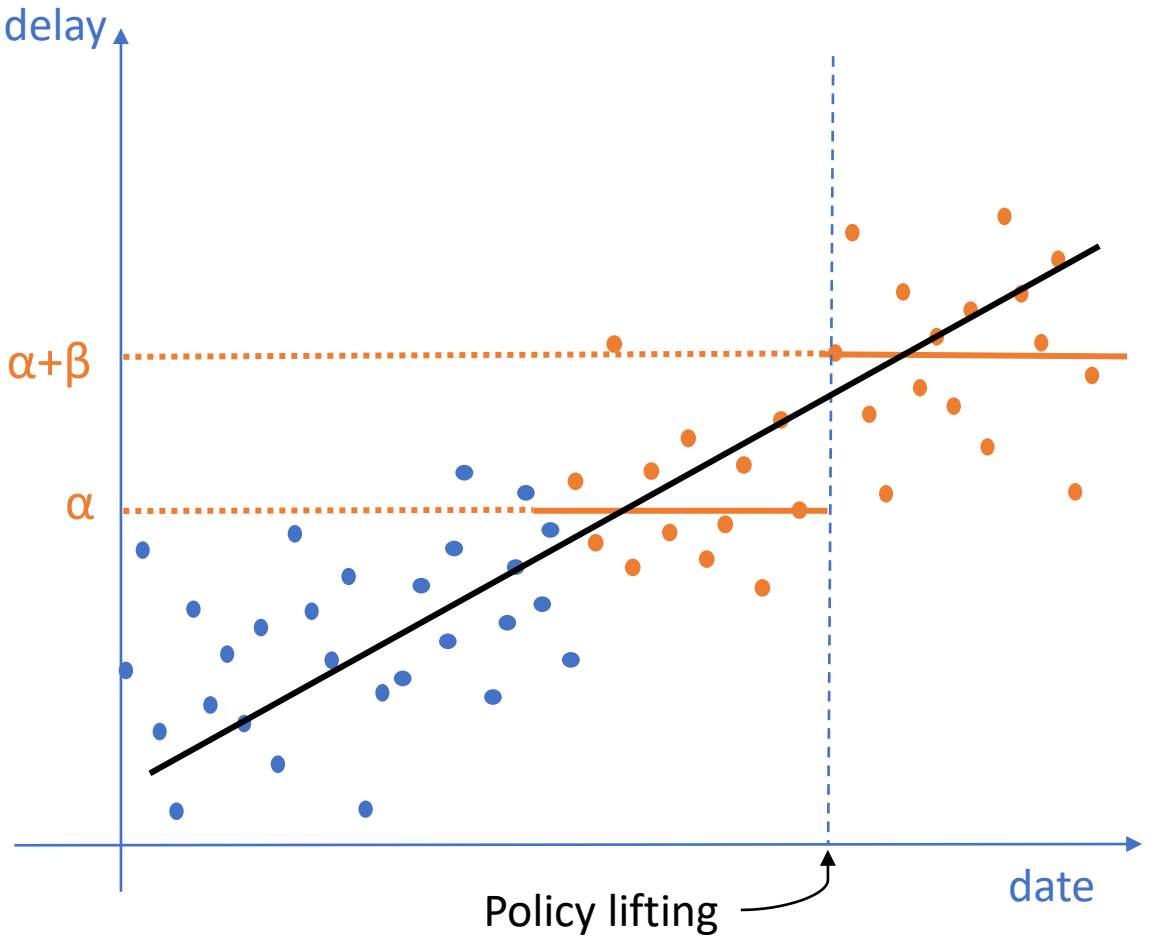
$$delay_{idh} = \alpha + \beta \cdot post_d + \gamma \cdot north_i + \varepsilon_{idh}$$

- Dependent/outcome variable: travel delay on segment *i*, on date *d* and departure hour *h*
- Independent/explanatory variable of interest: indicator for whether date *d* is after the policy lifting
  - $post_d$ = 0 before policy lifting (“control” group)
  - $post_d$ = 1 after policy lifting (“treatment” group)
- ‘Conditional’ on direction
  - north or not
  - $north_i$ = 1 if heading north, and =0 otherwise



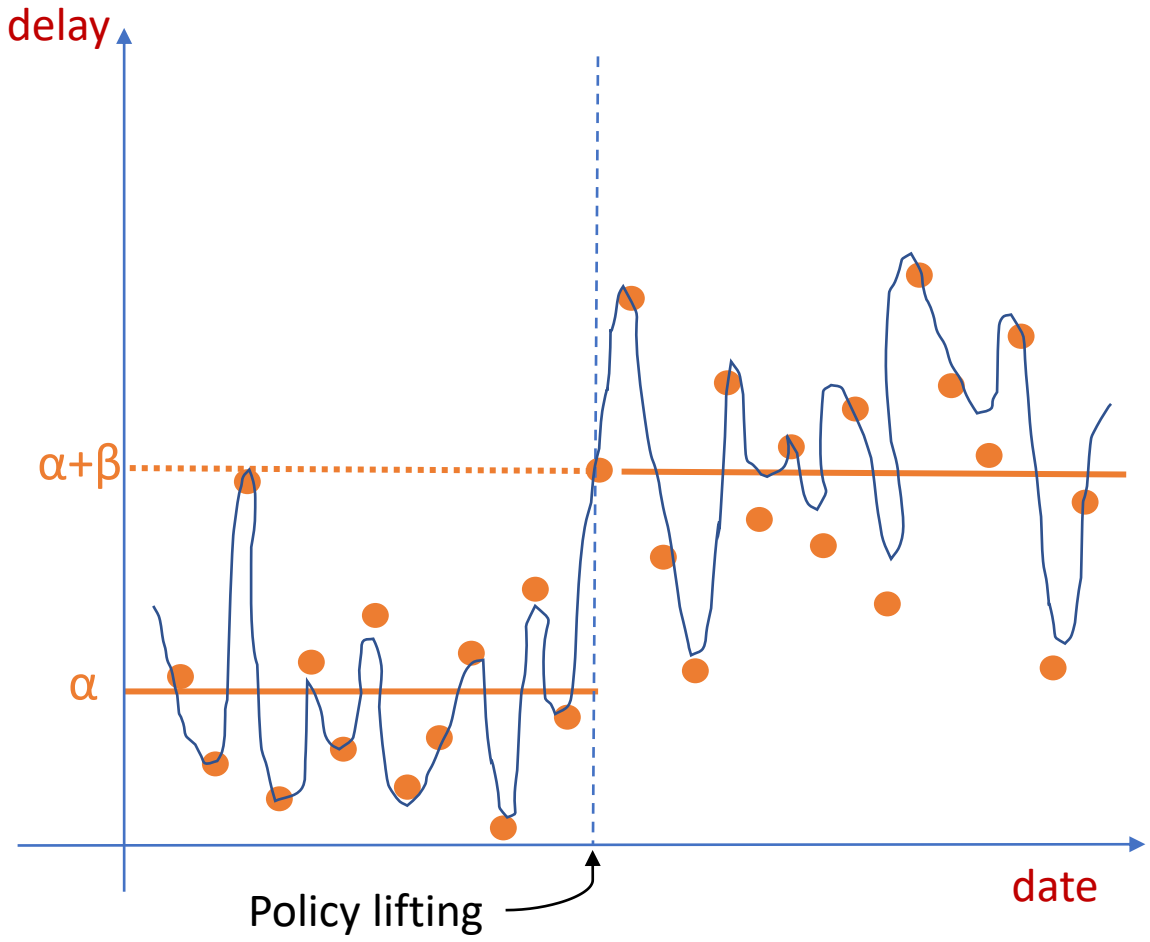
‘Identification’ of **causal effect** in event studies

- What if the timing of event is intended to coincide with the changes in outcomes?
  - As opposed to the changes being caused by the event?
  - E.g. the delay would have occurred anyway (even in the absence of the policy lifting)
  - Key assumption of event studies: Event is uncorrelated with trends in outcomes
- What would outcomes have looked like in the absence of the policy?
  - Would the average delay have stayed at α?
  - Key assumption: ‘Treated’ observations would resemble ‘control’ observations in the absence of the event



We don’t want to overfit the data

- We could try to fit more complicated models to the data
  - The world is usually more complicated than a single linear shift
- But our model and estimates won’t be very generalizable
- Linear regressions are the most popular estimation techniques.



Homework Problem 7

Hall, Jonathan D., Craig Palsson, and Joseph Price, "**Is Uber a substitute or complement for public transit?**", Journal of Urban Economics, 108 (2018): 36-50.

- Slightly longer paper (30 pages)
- May help to go through the homework questions first
  - so you know what to look for
- Useful skill: you usually don't need to know all the details of an academic paper

References

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