Public Policies in Space

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Public Policies in Space

- I discuss several topics on public policies in a spatial setting
- I first discuss **place-based policies**
- I then discuss **housing policies**
- I finally discuss **transportation policies**
- Note: I have already mentioned many papers that deal with policies (taxes, public school, public transportation etc) as examples of particular methods (e.g., hedonic approach, QSE models).
    - This lecture is more directly focused on policy discussions, rather than pedagogical aspects of research methods

Place-based policies

- Place-based policies are policies that target *location* rather than people
  - Tax cut and subsidies for business, infrastructure construction, public-sector employment etc.
  - In stark contrast to usual redistributive policies (e.g., income taxes and welfare spending), whose eligibility are based on an individual basis (e.g., individual income) but not on residential location
- As this definition illustrates, as long as we do not care about regional inequality *per se*, we can just target those who need help regardless of where they live
  - When we cannot perfectly observe those in need, place-based policies might help better targetting those in need (Gaubert, Kline Yagan 2023, AER R&R)
- Therefore, a rationale for place-based policies crucially depends on whether the equilibrium distribution of economic activities is efficient (Glaeser and Gottlieb 2008, Brookings)
  - If certain locations have too few population, then it makes sense to support these areas to approach a more efficient outcome
  - However, if the equilibrium is efficient, such efforts can never induce Pareto improvement as they harm other un-targeted locations

Efficiency of spatial equilibrium

- Is spatial equilibrium efficient or inefficient?
- In general, spatial equilibrium can be inefficient because of externalities:
  - Agglomeration and congestion forces are often externalities that do not have explicit markets (e.g., knowledge spillovers, traffic congestion)
  - As we have learned in the microeconomics classes, the equilibrium is efficient in the presence of externalities
- We illustrate this point using a simple formulation of Fajgelbaum and Gaubert (2020 QJE, Section 2)
  - Similar to the classic "system of cities" model (Henderson 1974 AER), but the number of cities is exogenously given in FG's framework
  - See also Albouy, Behrens, Robert-Nicoud, Seegert (2019 JUE) for more on the system of cities

Efficiency of spatial equilibrium

- Consider locations $j = 1, ..., N$.
- The utility of location j is $u_j = a_j c_j$, where a_j is residential amenity and c_j is consumption
    - Agglomeration forces in amenities: $a_j = A_j L_j^{\gamma_A}$
- Per-capita production of freely-tradable numeraire goods in location j: $z_j = Z_j L_j^{\gamma_P}$
    - Agglomeration forces in productivity are captured by γ_P
    - Total production $Y_j = z_j L_j$. Aggregate output $Y = \sum_j Y_j$
- If there is no tax and transfer across regions, $c_j = z_j$ holds in equilibrium
- However, since the government can implement such a system, $c_j \neq z_j$ is possible
    - "Place-based policy" in this setting

Efficiency of spatial equilibrium

Equilibrium conditions:

- $u = a_j c_j$ (spatial equilibrium condition, where u is the common utility level)
- $\sum_j L_j c_j = \sum_j L_j z_j$ (resource constraint)
- $\sum_j L_j = L$ (population constraint, closed economy assumption)

Using the first and second equations, the equilibrium utility can be written as

$$u = \frac{\sum_j L_j z_j}{\sum_j \frac{L_j}{a_j}}$$

Efficiency of spatial equilibrium

- The social planner maximizes the utility u subject to the resource and population constraints
  - Assume that the planner can manipulate the equilibrium population distribution through appropriately designing the transfer system
- Starting from the situation that there is no transfer ($c_j = z_j$), manipulating the population distribution brings the following change in the equilibrium utility:

$$\frac{du}{u} = (\gamma_P + \gamma_A) \sum_j \left(\frac{Y_j}{Y} \right) \frac{dL_j}{L_j}$$

- Therefore, a transfer leading to a reallocation of dL workers from j to i yields

$$\frac{du}{u} = (\gamma_P + \gamma_A)(z_j - z_i) \frac{dL}{Y}$$

Efficiency of spatial equilibrium

$$\frac{du}{u} = (\gamma_P + \gamma_A)(z_j - z_i)\frac{dL}{Y}$$

- This suggests that there is welfare gain by bringing more people to high-productivity location j fron a lower-productivity location i
- Intuitively, it is more efficient to concentrate workers in a high-productivity location, and redistribute output to other locations
  - Produce more first, since we can redistribute resources across locations anyway
- In the initial equilibrium with $c_j = z_j$, $u = a_j z_j$.
- This implies that low-amenity location j has a higher output z_j, and it would be better to move more people to such location
  - Equilibrium production in location j is inefficiently small because workers do not like to work in j due to bad amenities
- Note that if $\gamma_P = \gamma_A = 0$, then population reallocation brings no welfare gain
  - Equilibrium is efficient in the absence of agglomeration spillovers
  - Therefore, presence of agglomeration forces is needed to justify place-based policies

Place-based policies: Examples

- There is large empirical literature investigating the effect of place-based policies
- See Neumark and Simpson (2015 Handbook of Regional and Urban Economics) for an extensive literature review
- Some examples I flag:
  - Kline and Moretti (2014 QJE): The Tennessee Valley Authority in the New Deal era
  - Zou (2018 JLE): Military bases in the US
  - Becker, Heblich, Sturm (2021 JUE): Public-sector employment in Bonn
  - LaPoint and Sakabe (2024 wp): Tax cuts for high-tech manufacturers in Japan
  - Fujishima, Hoshino, Sugawara (2024 JRS R&R): The Act on Vitalization in City Center in Japan

Housing policies

- We now turn to housing policies
- Specifically, we talk about the following issues in housing policies
    - Housing policies for low-income households (housing subsidy and public housing)
    - Discrimination in the housing market
    - Taxes about housing (property taxes and housing transaction taxes)

Housing policies for low-income households

- As housing is almost a necessity for everyone, securing housing for the poor is a central policy issue
- Often, the government provides housing subsidies or public housing for the poor
- Giving housing *in-kind* is way more popular than just giving money sufficient to cover housing cost (Currie and Gahvari 2008 JEL)
    - Theoretically, giving money increases the welfare of the poor by more
    - But probably paternalism and political feasibility matter for this choice

Chetty, Hendren, Katz (2016 AER)

- Providing better housing and neighborhoods may help the children, above and beyond helping the poor adults
- Chetty, Hendren, Katz (2016 AER) analyzes the Moving to Opportunity (MTO) experiment
- 4,604 low-income families living in five US cities (Baltimore, Boston, Chicago, Los Angeles, and New York) from 1994 to 1998.
- Families were eligible to participate in MTO if they had children and resided in public housing or project-based Section 8 assisted housing in high-poverty census tracts (those with a 1990 poverty rate of 40 percent or more).
- Housing voucher is provided to the randomly-selected poor households
    - One treatment group receives voucher that can be used only in "good" neighborhoods (poverty rate $< 10\%$)
    - The other treatment group receives the usual voucher without location restriction
    - The control group receives nothing

Chetty, Hendren, Katz (2016 AER)

- When children are young, the MTO treatment has a large positive impact on later earnings
  - Section 8 voucher is less effective, as it is less effective in improving the neighborhood quality
- No positive earnings effect on adults
- Chyn (2018 AER) finds a similar pattern using public housing's demolition, which affects broader population

TABLE 3—IMPACTS OF MTO ON CHILDREN'S INCOME IN ADULTHOOD

	W-2 earnings ($) 2008–2012 ITT (1)	Individual earnings 2008–2012 ($) ITT (2)	Individual earnings 2008–2012 ($) ITT w/ controls (3)	Individual earnings 2008–2012 ($) TOT (4)	Individual earnings ($) Age 26 ITT (5)	Individual earnings ($) 2012 ITT (6)	Employed (%) 2008–2012 ITT (7)	Hhold. inc. ($) 2008–2012 ITT (8)	Inc. growth ($) 2008–2012 ITT (9)
Panel A. Children < age 13 at random assignment									
Exp. versus control	1,339.8**	1,624.0**	1,298.9**	3,476.8**	1,751.4*	1,443.8**	1.824	2,231.1***	1,309.4**
	(671.3)	(662.4)	(636.9)	(1,418.2)	(917.4)	(665.8)	(2.083)	(771.3)	(518.5)
Sec. 8 versus control	687.4	1,109.3	908.6	1,723.2	551.5	1,157.7*	1.352	1,452.4**	800.2
	(698.7)	(676.1)	(655.8)	(1051.5)	(888.1)	(690.1)	(2.294)	(735.5)	(517.0)
Observations	8,420	8,420	8,420	8,420	1,625	2,922	8,420	8,420	8,420
Control group mean	9,548.6	11,270.3	11,270.3	11,270.3	11,398.3	11,302.9	61.8	12,702.4	4,002.2
Panel B. Children age 13–18 at random assignment									
Exp. versus control	−761.2	−966.9	−879.5	−2,426.7	−539.0	−969.2	−2.173	−1,519.8	−693.6
	(870.6)	(854.3)	(817.3)	(2,154.4)	(795.4)	(1,122.2)	(2.140)	(11,02.2)	(571.6)
Sec. 8 versus control	−1,048.9	−1,132.8	−1,136.9	−2,051.1	−15.11	−869.0	−1.329	−936.7	−885.3
	(932.5)	(922.3)	(866.6)	(1,673.7)	(845.9)	(1213.3)	(2.275)	(11,85.9)	(625.2)
Observations	11,623	11,623	11,623	11,623	2,331	2,331	11,623	11,623	11,623
Control group mean	13,897.1	15,881.5	15,881.5	15,881.5	13,968.9	16,602.0	63.6	19,169.1	4,128.1

Discrimination in the housing market

- Due to discrimination, minorities may finding difficulty in finding an appropriate housing at a reasonable price
- Experimental approaches for detecting discrimination
    - Audit study: Yinger (1986 AER)
    - Correspondence study: Bertrand and Mullanaithan (2004 AER)
- Note: these experimental methods are not just used in urban but also in labor and other fields too.

Audit study: Yinger (1986 AER)

- As the title (“caught in the act”) suggests, the paper uses actors in an experimental setting to detect discrimination in real life
- Send two actors (“auditors”), one majority (“white”) and one minority (“black”) to the same real estate agency
    - They are given the same characteristics, such as income, current residence, etc.
- They ask about the availability of housing at the real estate agency, and record
    - The number of housing units offered
    - The number of housing units the auditors were invited to inspect
    - The number of units the auditor actually inspected

Audit study: Yinger (1986 AER)

- Serious discrimination: blacks had about 1/3 less housing units in all measures
- Christensen and Timmins (2022 JPE) reports the updated audit study results in the US
  - The number of offered housing units now got the same
  - But blacks are offered housing units with less favorable characteristics (worse safety, pollution etc)

TABLE 1—THE LEVEL OF DISCRIMINATION IN HOUSING AVAILABILITY

	Measure of Availability					
	Rental Audits			Sales Audits		
	Possi-bilities	Invited To See	Inspected	Possi-bilities	Invited To See	Inspected
Measures of Treatment (Number of Housing Units)						
White Average = Constant Term	2.077	1.959	1.308	2.195	2.119	1.322
Level of Discrimination Against Blacks $= -b$	0.594	0.712	0.433	0.576	0.542	0.314
Test Statistics for the Level of Discrimination						
Bivariate Regression[a]						
Standard Error	0.153	0.150	0.101	0.172	0.178	0.097
t-Statistic[b]	3.877	4.734	4.302	3.343	3.055	3.247
R-Squared	0.046	0.067	0.056	0.046	0.038	0.043
Paired Difference-of-Means Test[c]						
Standard Error	0.119	0.123	0.089	0.125	0.139	0.077
t-Statistic[b]	5.007	5.779	4.883	4.623	3.902	4.074
R-Squared[d]	0.715	0.688	0.634	0.753	0.708	0.699
Number of Audits	156	156	156	118	118	118

Source: Author's calculations based on the Feins et al. 1981 Boston data.
Notes: Possibilities = number of housing units discussed as serious possibilities; Invited to see = number of housing units invited to inspect; Inspected = number of housing units actually inspected.
[a]And standard difference-of-means test.
[b]A t-statistic above 3.291 occurs by chance only once in 2000 trials.
[c]And bivariate regression plus audit dummies or *GLS* regression.
[d]Only applies to regression with audit dummies.

Correspondence study: Bertrand and Mullanaithan (2004 AER)

- Correspondence study, initiated by Bertrand and Mullanaithan (2004 AER), sends fictitious applications to opening housing units
- Send two applications with the same contents, but one under the majority name ("Emily") and the other under the minority name ("Lakisha")
- See whether the majority is more likely to receive a reply
- Bertrand and Mullanaithan uses this design in job applications, finding lower callback rates for minority names

Housing correspondence study: Sugasawa and Harano (2023 JJIE)

- To detect housing market discrimination in Japan, Sugasawa and Harano (2023 JJIE) conducts the correspondence study
  - See Christensen, Sarmiento-Barbieeri, Timmins (2022 REStat) for a recent application of correspondence study in the US housing market
- Send the following email with different names to ask aboug housing unit availability
- Using Chinese or Korean sounding names decreases the number of positive responses by 13%, compared with Japanese-sounding names

Appendix 2. The text of an inquiry

The text of an inquiry (Text 1) in English[16]
Title: Room-viewing request
Hi, my name is ∞ (*Family name*).
I saw the ad about the room (*URL*) for rent on your HP.
I am wondering if it's still available. I would be interested in seeing the room if it's still available.
Thank you, ∞ (*Full name*).
The text of an inquiry (Text 1) in Japanese
件名:入居希望問い合わせ
担当者様
お世話になります,○○ (*Family name*)と申します.
御社HPで,賃貸物件 (*URL*) を拝見し,関心を持っております.
まだ入居は可能でしょうか∝ 可能でしたら,内見などできればと存じます.
よろしくお願いいたします.
∞ (*Full name*)

Housing market discrimination in Japan

- Despite Sugasawa and Harano (2023), experimental analysis of discrimiantion in the Japanese market has been quite limited,
- Nakagawa (2003) conducts an audit study, finding that the elderly (Japanese) people also face serious discrimination in the housing market
    - Fear of the stigma of in-home death (*jiko bukken*) in Japanese context? See Sugasawa et al. (2024 wp).
- Both for the elderly and foreigners, public housing has played a key role in accommodating them
    - Interaction of public housing and discrimination could be an interesting research topic
    - More generally, how can policies address discrimination in the housing market?

Property taxes

- Property taxes: (ad valorem) taxes levied on the value of property values
  - In practice, there is difficulty in measuring the market value of properties (Avenacio-León and Howard 2022 QJE)
- Both land and housing structure are subject to this tax
- Important source of local tax revenue in the US and Japan (and many other countries).

Upsides of property taxes

What is a theoretical justification for using property taxes?

- Benefit-tax view: Local public goods should be financed by their beneficiaries, like local property owners (Zodrow 2001 National Tax Journal)
  - Then, the Tiebout sorting mechanism could lead to efficient sorting
- Incentive view (Glaeser 1996 Public Choice): Local politicians, who try to maximize the government size, end up maximizing residents' welfare under property taxation
  - Recall Brueckner (1982 JPUBE) that optimal level of public goods provision maximizes land value
  - Then, since property tax revenue is proportional to land value, politicians have an incentive to choose this optimal level *even if they do not directly care about residents' welfare but care just about tax revenues*

Downsides of property taxes: Tax competition

On the other hand, local taxes like property taxation may induce tax competition, leading to inefficiently low tax rates (Zodrow and Mieszkowski 1986 JUE; Agrawal, Hoyt, Wilson 2022 JEL)

- In deciding property tax rates, a local government does not take into account that it attracts tax base (people, business etc) from other locations
- They decrease the tax revenue of other jurisdictions, which is a negative (fiscal) externality
- As a result, each local government chooses too low tax rates compared with the optimum
  - "Race to the bottom"
- Note: this argument applies not just to property taxes, but also other taxes and other local policies
  - Yamagishi (2019 CJE) analyzes a model in which local governments compete in environmental regulation

Housing transaction taxes

- Housing transactions, or more precisely a transfer of housing ownership from one to another, are also subject to taxes
- This may limit the functioning of the housing market
- Housing transaction taxes: Best and Kleven (2018 RES)
- Inheritance taxes of housing: Seko, Sumita, Yoshida (2023 wp)

Best and Kleven (2018 RES)

- UK property transaction tax (Stamp Duty Land Tax, SDLT) is imposed on transactions of land and any construction on it.
- The statutory incidence on buyers. They are required to report the transaction to the government.
- Annual revenue: 0.6% of GDP
- Interesting feature: notches in the tax liability.
  - See Kleven (2016 Annual Review of Economics) for more details on the analysis of tax notches

Best and Kleven (2018 RES)

Tax liability changes discontinuously in the value of housing

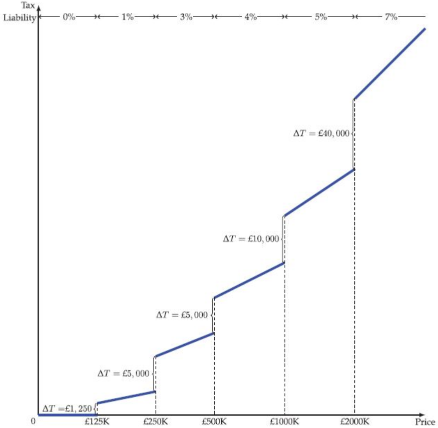


FIGURE 1

Stamp duty schedule in 2012–13

Notes: The figure shows the stamp duty land tax schedule for residential properties in the tax year from 6 April 2012 to 5 April 2013. The tax liability jumps discretely at the notches at £125,000, £250,000, £500,000, £1,000,000, and £2,000,000. Within the brackets defined by these notches, the tax rate is constant, and applied to the whole transaction price at the rates shown along the top of the figure.

Best and Kleven (2018 RES)

There are also several reforms in the thresholds and the tax rate

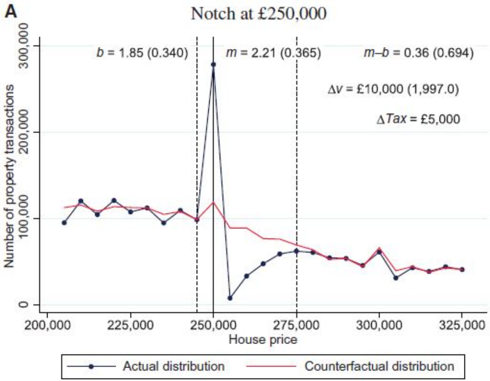
TABLE 1
Residential property tax notches

<table>
<tr><th>Date range
Price range</th><th>1 December 2003
to
16 March 2005</th><th>17 March 2005
to
22 March 2006</th><th>23 March 2006
to
2 September 2008</th><th>3 September 2008
to
31 December 2009</th><th>1 Jan 2010
to
5 April 2011</th><th>6 April 2011
to
21 March 2012</th><th>22 March 2012
to
April 2013</th></tr>
<tr><td>0 - 60K</td><td>0</td><td rowspan="2">0</td><td rowspan="3">0</td><td rowspan="4">0</td><td rowspan="3">0</td><td rowspan="3">0</td><td rowspan="3">0</td></tr>
<tr><td>£60K–£120K</td><td rowspan="4">1</td></tr>
<tr><td>£120K–£125K</td><td rowspan="3">1</td></tr>
<tr><td>£125K–£175K</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">1</td><td rowspan="2">1</td></tr>
<tr><td>£175K–£250K</td><td>1</td></tr>
<tr><td>£250K–£500K</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td><td>3</td></tr>
<tr><td>£500K–£1000K</td><td rowspan="3">4</td><td rowspan="3">4</td><td rowspan="3">4</td><td rowspan="3">4</td><td rowspan="3">4</td><td>4</td><td>4</td></tr>
<tr><td>£1000K–£2000K</td><td rowspan="2">5</td><td>5</td></tr>
<tr><td>£2000K–∞</td><td>7</td></tr>
</table>

Notes: The table shows how the stamp duty land tax schedule for residential property has varied over time. Each column represents a time period during which the tax schedule was constant. The rows represent price ranges, and the entry in each cell is the tax rate that applies to that price range in the time period.

Best and Kleven (2018 RES)

- Housing transaction volumes are quite responsive to the tax system, as seen in the bunching at the threshold
  - Rational people have an incentive to manipulate the housing prices to reduce the tax burden (Kleven 2016)
  - Real increase in transaction volume, or just a manipulation of housing prices?



Best and Kleven (2018 RES)

By comparing brackets with and without the tax cut, transaction volume actually increases by the tax cut

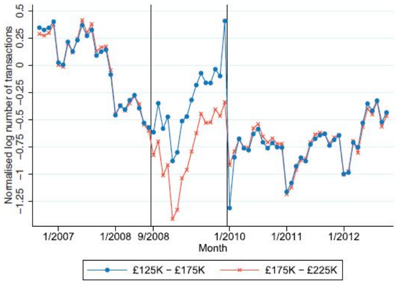


FIGURE 7

Effects of the stamp duty holiday stimulus: naive diff in diff

Notes: The figure shows how the level of housing market activity changed over time in the price range affected by the stamp duty holiday (£125,000–£175,000) and the neighbouring price range £175,000–£225,000. The figure shows the normalized log monthly number of transactions defined as the log of the number of transactions in that month minus the average of the log of the number of transactions in the 24 months leading up to the start date of the Stamp Duty Holiday (September 2006 to August 2008).

Seko, Sumita, Yoshida (2023 wp)

When bequeathing housing in Japan, one can receive a inheritance tax reduction

- But the amount of tax reduction depends on the lot size
- Exemption lot size increased from $240m^2$ to $330m^2$ in 2015

Source of figure: `https://souzoku.asahi.com/article/13646590`

Seko, Sumita, Yoshida (2023 wp)

- Seko, Sumita, Yoshida uses this policy change as an exogenous change in the strength of bequest motives, depending on the size of the current housing
- Using a Japanese panel dataset, they find that a stronger bequest motive
  - reduces geographical mobility
  - increases renovations
- These effects lead households to reside in "too large" houses, compared with the current household size
  - "Empty nest problem:" Households do not fully adjust to changes in the household size, such as children leaving parents' house

Transportation policies

- Aside from some discussions in the QSE, we mostly skip transportation economics in this class
  - But this is an important congestion force (recall Ahlfeldt and Pietrostefani 2019)
  - Indeed, there is adjacent (but separate) field called “transportation economics”
- How can we manage congestion?
  - Build more roads?
  - Tax traffics (congestion pricing)?
- Of course transportation economics has many more issues. Suggested further readings for those interested in transportation economics:
  - Redding and Turner (2015 Handbook of Regional and Urban Economics), Small, Verhoef, Lindsey (2024 book)

Duranton and Turner (2011 AER)

- Building more roads seems a good strategy for reducing congestion
  - But building more roads may induce new traffic
- "Fundamental law of road congestion:" 1% increase in road capacity increases 1% increase in vehicle travel, leading to no change in congestion
- Regression equation:
$$\ln Q_{it} = A_0 + \rho_R^Q \ln R_{it} + A_1 X_{it} + \epsilon_{it},$$
  where ρ_R^Q is the elasticity of travel amount with respect to road capacity R.
- Duranton and Turner (2011) estimate this equation using the US data
  - See Hsu and Zhang (2014 JUE) for a similar analysis using Japanese data

Duranton and Turner (2011 AER)

- IVs for addressing endogeneity of road construction
  - Past plans for highways
  - Past train network
  - Expeditions of exploration, 1835–1850
- Duranton and Turner argue that conditional on population size and geography, these plans provide exogenous variation of road amount

Duranton and Turner (2011 AER)

The elasticity is close to one $\rightarrow$ fundamental law of road congestion (approximately) holds!

- Decomposition exercise shows that commercial traffic (trucks) and the increased travel of each household are main drivers of the increased travel

Table 6—VKT as a Function of Lane Kilometers, IV

	(1)	(2)	(3)	(4)	(5)
Panel A (TSLS). Dependent variable: ln *VKT for interstate highways, entire MSAs*					
Instruments: ln *1835 exploration routes,* ln *1898 railroads, and* ln *1947 planned interstates*					
ln (IH lane km)	1.32***	0.92***	1.03***	1.01***	1.04***
	(0.04)	(0.10)	(0.11)	(0.12)	(0.13)
ln (population)		0.40***	0.30***	0.34***	0.23*
		(0.07)	(0.09)	(0.10)	(0.12)
Geography			Y	Y	Y
Census divisions			Y	Y	Y
Socioeconomic characteristics				Y	Y
Past populations					Y
Overidentification *p*-value	0.60	0.11	0.26	0.24	0.29
First-stage statistic	42.8	16.5	11.8	11.5	8.84

Duranton and Turner (2011 AER)

Building public transportation (bus) does not help in reducing travel

- Decreased congestion in private road induces increases in travel
- But this can be specific to the US, which is notorious for inconvenient public transportation?
  - The effect is zero because buses are so inconvenient that few use them anyway?

TABLE 7—VKT AS A FUNCTION OF LANE KILOMETERS AND BUSES, POOLED REGRESSIONS

	OLS (1)	OLS (2)	OLS (3)	OLS (4)	OLS (5)	OLS (6)	LIML (7)	LIML (8)	LIML (9)	LIML (10)
Dependent variable: ln *VKT for interstate highways, entire MSAs*										
ln(IH lane km)	1.07***	0.82***	0.86***	0.86***	1.06***	1.06***	1.38***	0.96***	1.09***	1.18***
	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.08)	(0.10)	(0.13)	(0.17)
ln(bus)	0.14***	−0.023	0.026	0.039**	0.021**	0.012*	−0.035	−0.081*	0.12	0.21
	(0.02)	(0.017)	(0.019)	(0.018)	(0.009)	(0.008)	(0.049)	(0.046)	(0.10)	(0.14)
ln(population)		0.51***	0.40***	0.26**		0.32***		0.50***	0.079	−0.15
		(0.05)	(0.05)	(0.12)		(0.10)		(0.12)	(0.207)	(0.27)
Geography			Y	Y					Y	Y
Census divisions			Y	Y					Y	Y
Socioeconomic characteristics				Y						Y
Past populations				Y						Y
MSA fixed effects					Y	Y				
R^2	0.90	0.94	0.95	0.96	0.94	0.94	—	—	—	—
Overidentification *p*-value							0.90	0.46	0.47	0.38
First-stage statistic							23.3	21.1	9.53	5.68

Notes: All regressions include a constant and year effects. Robust standard errors clustered by MSA in parentheses; 684 observations corresponding to 228 MSAs for each regression. Instruments for buses and lane kilometers are ln 1898 railroads, ln 1947 planned interstates, and 1972 presidential election share of democratic vote.

***Significant at the 1 percent level.
**Significant at the 5 percent level.
*Significant at the 10 percent level.

Congestion pricing

- Given that building more roads and introducing more public transportation do not reduce congestion, how can we mitigate congestion?
- Congestion pricing is one possible way
  - Impose a tax on using congested roads
- Tang (2021 JUE) evaluates the London Congestion Charge (LCC), using a capitalization approach
  - There exist many other studies on congestion pricing (see literature review of Tang).

Tang (2021 JUE)

- Given that building more roads and introducing more public transportation do not reduce congestion, how can we mitigate congestion?
- Congestion pricing is one possible way
  - Impose a tax on using congested roads
  - A common example of Pigouvian taxation
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Tang (2021 JUE)

- Entering CCZ costs 5 pounds from 2003.
  - WEZ also temporarily had a similar toll
- Focus on housing transactions within 1km from the border
  - Border design approach

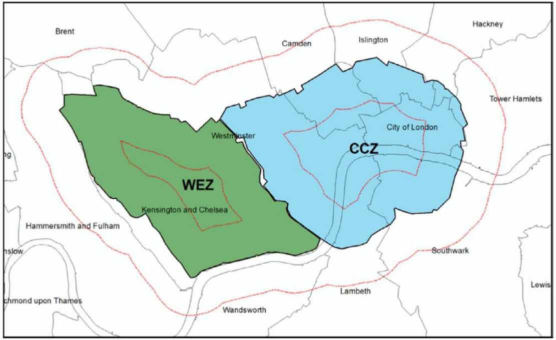


Fig. 4. The London Congestion Charge Zone (CCZ & WEZ) and 1 km buffers (in dash line) from the LCC boundary.

Tang (2021 JUE)

- Essentially, the regression model is

$$\ln(\text{housing price})_{it} = \beta \ln(\text{Local road congestion})_{it} + \text{error}_{it}$$

- Local road congestion is the congestion level of the road closest to the housing transaction point
  - This declines sharply within the tolled zone after the implementation of the congestion pricing (8.77% compared to locations just outside the tolled area)
  - Debatable how much the congestion of nearest road is relevant for a household that travels around the city
- Use the introduction of the congestion pricing as an IV
  - Interaction of after-policy dummy and within-CCZ dummy

Tang (2021 JUE)

- 1% increase in local congestion reduces housing prices by 0.3%
  - Using this result, the LCC has generated more than 3.8 billion pounds of benefits for homeowners in the zone.
- Congestion declined due to substitution toward public transportation
  - London's developed public transportation system facilitated substitution (unlike the US case?)

Table 2
First Stage, Reduced form, IV and OLS estimates from sample 1000m to 500m from the LCC Boundary.

	(1) 1000m	(2) 900m	(3) 800m	(4) 700m	(5) 600m	(6) 500m
Panel A: First Stage (Log Traffic)						
LCC	-0.0918***	-0.0965***	-0.0985***	-0.1009***	-0.0987***	-0.0982***
	(0.0168)	(0.0175)	(0.0187)	(0.0200)	(0.0209)	(0.0220)
R2	0.98	0.98	0.98	0.98	0.98	0.98
Mean Traffic	17,797	17,769	17,761	17,717	17,716	17,650
Δ Traffic	-1562	-1635	-1667	-1700	-1665	-1651
Panel B: Reduced Form (Log House Price)						
LCC	0.0280***	0.0315***	0.0375***	0.0357***	0.0338***	0.0278**
	(0.0100)	(0.0105)	(0.0112)	(0.0118)	(0.0127)	(0.0133)
R2	0.76	0.75	0.75	0.75	0.75	0.75
Mean HP	653,898	653,376	652,714	651,308	650,083	648,806
Δ HP	18,555	20,931	24,958	23,655	22,381	18,320
Panel C: IV Regressions						
ln(Traffic)	-0.3047***	-0.3267***	-0.3808***	-0.3536***	-0.3430**	-0.2835*
	(0.1176)	(0.1188)	(0.1281)	(0.1307)	(0.1440)	(0.1474)
R2	0.08	0.07	0.07	0.06	0.07	0.07
No.of Postcodes	5077	4646	4253	3843	3432	2996
1st Stage F-Statistics	29.84	30.54	27.73	25.46	22.31	19.88
Panel D: Naive OLS Regressions						
ln(Traffic)	-0.0197	-0.0170	-0.0250	-0.0225	-0.0250	-0.0262
	(0.0216)	(0.0224)	(0.0236)	(0.0249)	(0.0278)	(0.0316)
Obs	53,490	49,654	45,168	40,789	35,770	31,689
R2	0.76	0.75	0.75	0.75	0.75	0.75

Kreindler (2024 ECMA)

- However, Kreindler (2024) finds that congestion pricing may not work very well in a developing country (Bangalore).
  - A city with substantial road congestion (one of the slowest cities in India)
- Using a smartphone app with GPS information, he runs an experiment that
  - imposes a penalty on peak-hour trip departues
  - suggests an alternative uncongested (but more time-consuming) trip, while imposes a penalty on a trip that goes through congested areas

Kreindler (2024 ECMA)

- Imposing peak-hour penalty reduces peak-hour trips
  - The decline is increaseing in the size of the penalty
  - Simply providing advice for avoiding peak hours does not reduce them
- No impact on extensive margin: people simply changed the timing of the trips

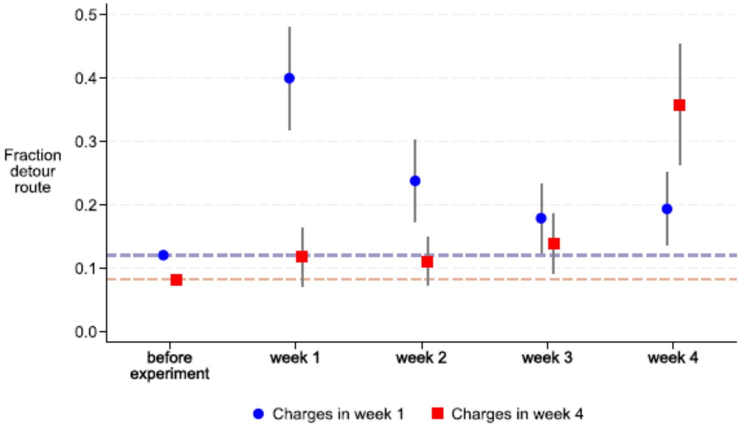
TABLE I

IMPACT OF DEPARTURE TIME CHARGES ON DAILY OUTCOMES.

	(1)	(2)	(3)	(4)	(5)	(6)
Outcome	Total Hypothetical Rates Today			Number of Trips Today		
Time of Day	AM & PM	AM	PM	AM & PM	AM	PM
Commuter FE	X	X	X	X	X	X
Panel A. All Departure Time Sub-Treatments						
High Rate × Post	−12.94	−7.27	−5.68	−0.09	−0.03	−0.05
	(6.04)	(3.76)	(3.41)	(0.14)	(0.07)	(0.07)
Low Rate × Post	−8.85	−3.60	−5.25	−0.10	−0.02	−0.09
	(6.13)	(3.58)	(3.80)	(0.14)	(0.07)	(0.07)
Information × Post	−0.19	−0.05	−0.15	0.07	0.05	0.03
	(5.40)	(3.26)	(3.32)	(0.13)	(0.06)	(0.07)
Post	0.93	−1.07	2.00	0.04	−0.01	0.06
	(4.87)	(2.85)	(3.06)	(0.11)	(0.05)	(0.06)
Observations	15,574	15,574	15,574	15,574	15,574	15,574
Control Mean	96.88	48.36	48.52	3.06	1.16	1.30

Kreindler (2024 ECMA)

- Suggesting alternative un-tolled routes induces changes route usage
- Persistence in route choice
  - Consistent with fixed switching cost or learning cost of new routes (c.f., Larcom et al. 2017 QJE).



Kreindler (2024 ECMA)

- Kreindler then constructs a trip choice model, and estiamtes its parameters to match the experimental results.

- In terms of utility from each itinerary, his utility function v looks like

$$v = -\alpha T - \beta_E |h + T - h^A| - \beta_L |h + T - h_A|,$$

  where T is travel time, h is departure time, and h^A is the desired arrival time.

- α is the "value of travel time (VOTT)"

- β_E and β_A are scheduling cost parameters
  - β_E is the cost of arriving early
  - β_L is the cost of arriving late

- In addition to v, people incur tolls (congestion fee), switching cost of changing their trips, and logit shock for each route and departure time choice
  - The model in the paper also includes dynamic route choice and endogenous determination of congestion level

Kreindler (2024 ECMA)

- Using the estimated model, he compares the Nash equilibrium and social optimum
- In the optimum, 6.5% reduction in travel and 2.3% welfare gain
    - Not very large welfare gain, given that congestion pricing involves expensive policy implementation cost
- The welfare gain is sensitive to
    - Relationship between traffic and speed (convex relationship induces more welfare gain as reducing large traffic induces more speed gain)
    - Extensive margin of trips (more welfare gain if congestion pricing prevents more people from making car trips)

TABLE IV

POLICY SIMULATIONS: COMMUTER WELFARE GAINS FROM OPTIMAL PEAK-HOUR PRICING.

	(1) Nash	(2) Social Optimum	(3) Improvement	(4) Improvement (% of Nash)
Panel A. Benchmark Model: Travel Time and Commuter Welfare				
Travel Time (minutes)	37.5	35.0	2.4	6.6%
	(31.9, 44.6)	(30.8, 39.8)	(0.4, 5.1)	(1.3, 12.7)
Travel Time above Free Flow	14.4	11.9	2.4	17.2%
	(8.7, 21.5)	(7.6, 16.8)	(0.4, 5.1)	(4.1, 28.1)
Welfare (INR)	−390	−381	8.9	2.3%
	(−636, 62)	(−613, 71)	(1.0, 31.1)	(0.3, 9.1)
Welfare above Free Flow (INR)	−157	−148	8.9	5.7%
	(−270, −61)	(−243, −59)	(1.0, 31.1)	(1.1, 13.6)

Transportation and environment

- Transportation policies are closely related to environmental issues
  - Automobiles are often seen as main culprits of air pollution, global warming etc.
  - And many policies aim to mitigate environmental damage due to automobiles
- I cannot comprehensively cover this vast literature, but let me give a recent illustrative example in a Japanese context

Kang, Ota, Ushijima (2024 JEEM)

- To be added.

Taking stock

- Place-based policies can correct inefficiency in spatial equilibrium, which might happen in the presence of agglomeration forces (externalities)
  - But we should think whether place-based policies are really needed: Maybe it is better to target people, not locations
- Housing policies for vulnerable population are important
  - the poor households
  - minorities
- Property taxes are prevalent, but they have both upsides and downsides
- Housing transaction are also often taxed, but there is evidence that these taxes distort the market
- We also had a brief discussion of transportation policies
- While we have seen various topics, this lecture is by no means a comprehensive review of public policies in the spatial economy
  - There are many important policies in the spatial setting, which are worth exploring!