Ride-hailing and Congestion Policy in NYC

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Q1. Motivations Behind Evaluating Congestion Policies

- Ride-hailing expansion exacerbates urban congestion challenges.
- NYC adopted congestion policies targeting the ride-hailing industry seeking to address the issue
- Analyzing the effectiveness of the policy will also inform NYC's congestion pricing plans

In NYC, on February 2, 2019, the Taxi and Limousine Commission (TLC) introduced a surcharge fees on three types of trips beginning, ending, or passing through a designated "congestion zone" in Manhattan:

- street-hailing trips ($2.50/ride)
- non-shared e-hailing trips($2.75/ride)
- pooled e-hailing trips ($0.75/ride)

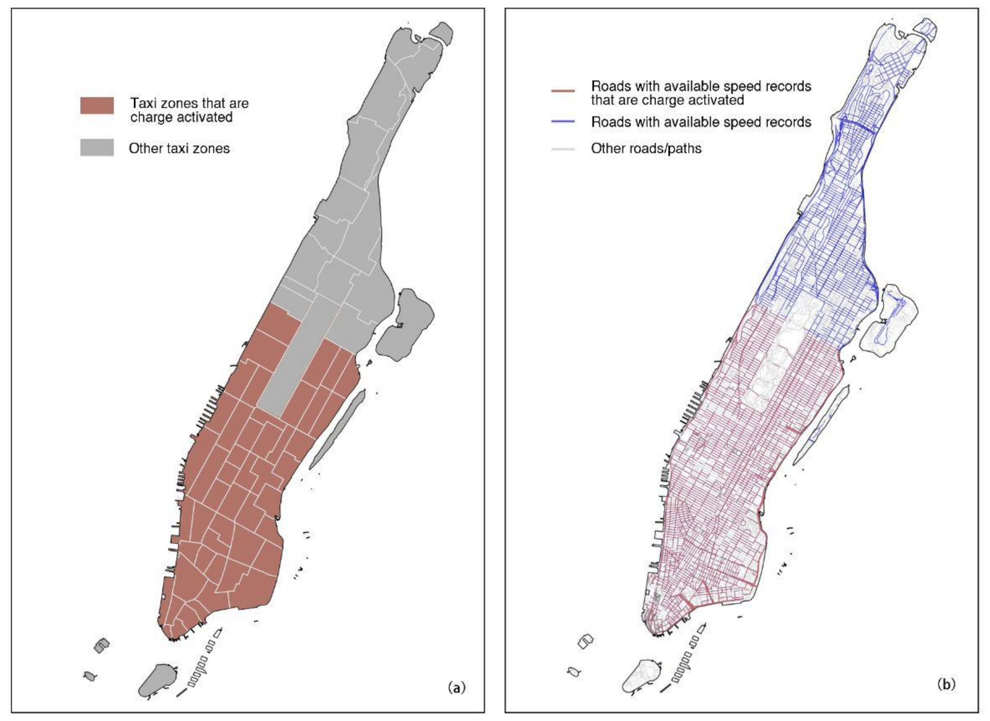

Fig 1. (a) Taxi zones affected by the policy. (b) Manhattan has over 30,000 road links with available vehicle speed. Road links highlighted in red pertain to the area south of 96th street, where vehicles are subject to surcharge fees when passing through.

Q2. Research Questions

- Is the congestion surcharge policy effective in reducing street-hailing demand in NYC?
- Is the congestion surcharge policy successful in reducing traffic congestion within the congestion zone?
- What are the mechanisms through which the stated policy acts to affect ride-hailing demand and congestion?

Q3. Methods and Data

- Difference-in-difference (DiD) Regression

$$ln(Y_{a,d,t}) = \beta_0 + \beta_1 \cdot Treat_a + \beta_2 \cdot Post_d + \beta_3 \cdot (Treat_a \times Post_d) + \boldsymbol{\beta}_4^T \cdot \boldsymbol{H} + \boldsymbol{\beta}_5^T \cdot \boldsymbol{Z} + \boldsymbol{\beta}_6^T \cdot \boldsymbol{W} + \varepsilon_{a,d,t}$$

The coefficient of the interaction term $Treat_a xpost_d$ can provide insights for the policy impact.

- Data
  - Street hailing trip data
  - Traffic speed data;
  - Weather data
  - NYC subway station locations
  - NYC Citi Bike ridership records
  - Annual household income data

Q4. Did the Pricing Policy Alleviate Travel Demand in NYC?

- Reduced **11.6 %** street-hailing travel demand after the policy implemented

Q5. Mechanisms of the Policy Impacts on Traffic Demand

• Policy effectiveness depends on different travel distances

- Trips shorter than 1 mile are the most affected by the surcharge policy.
- As the travel distance increases, the policy's impact gradually decreases while remaining statistically significant.

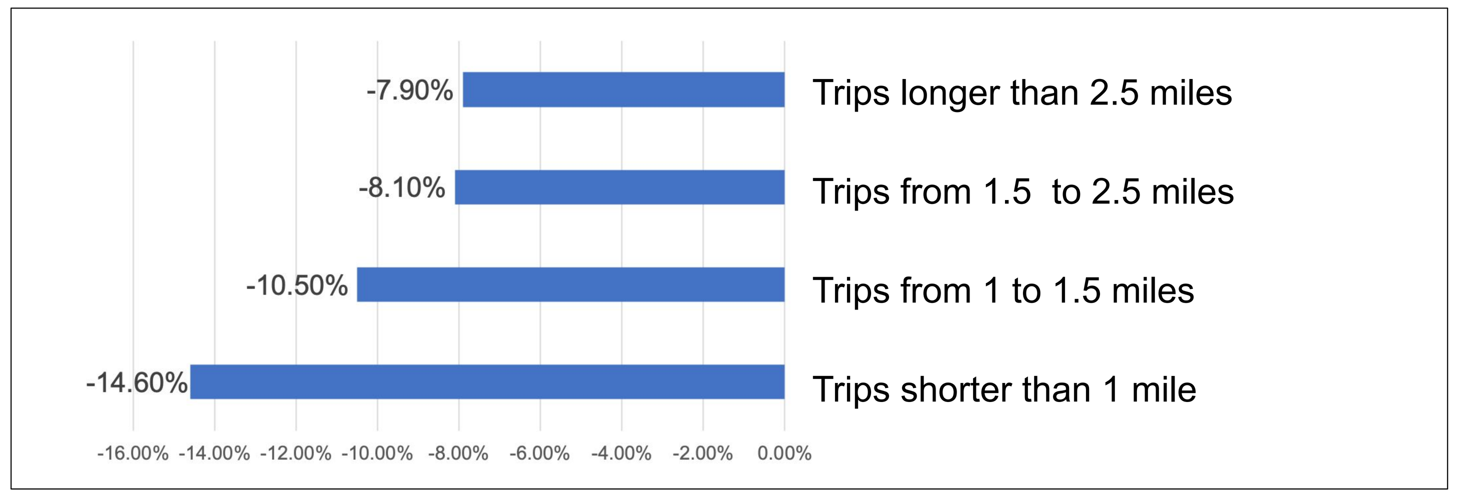

Fig 2. Treatment effect on travel distances

• Policy effectiveness depends on alternative modes of subway and Citi Bike

- Trips with no available substitute modes are the least affected by the policy, while those with options are more affected.
- Findings reveals that travelers may have switched to Citi Bike and subway systems.

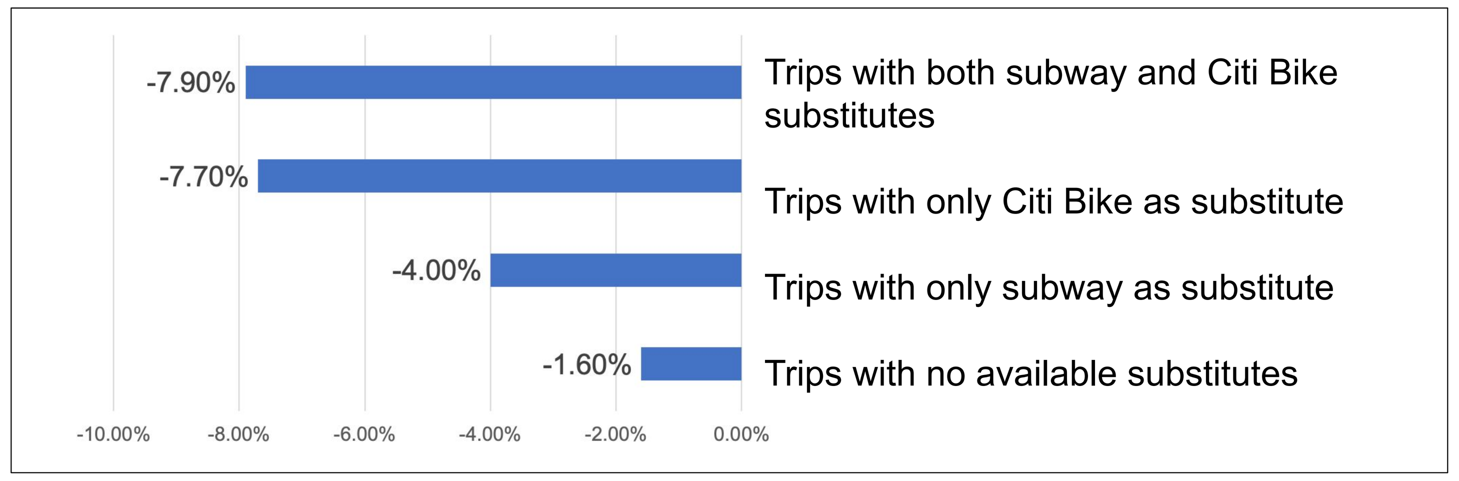

Fig 3. Treatment effect on alternative travel modes

Can we trust this explanation on travel modes substitution?

- We cross-validated with the direct analysis of demand change of Citi Bike, and found surcharge policy led to an increase in the use of Citi Bike as a substitute.

bike travel demand due to the surcharge policy **+10.03%**

• Policy effectiveness differs on individuals' willingness to pay

- Individuals with higher incomes naturally possessed a greater willingness to pay (WTP) capacity and were thus less sensitive to the increased taxi fares resulting from the surcharge policy
- Policy consistently reduces travel demand throughout the day but is less effective during late night hours

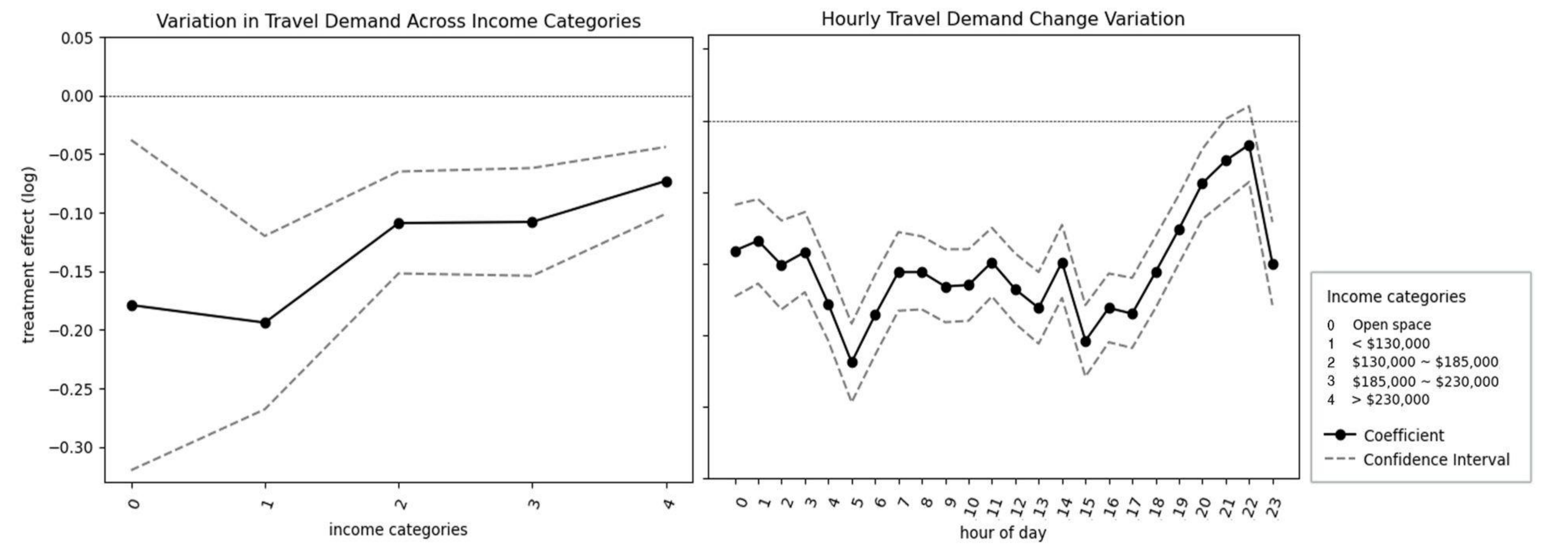

Fig 4. (a) In these five distinct spatial location groups, the policy treatment effect consistently showed a decrease in travel demand, albeit with varying degrees of reduction and statistical significance. (b) The pattern of travel demand reduction followed a noticeable trend over the course of the day.

Q6. Did the Pricing Policy Alleviate Traffic Congestion in NYC?

- Though travel demand decreased, yet no obvious traffic speed increased, with a increment of only **0.07%**

Table 1: Effect of Surcharge Policy on Travel Demand and Congestion

	ln(**Pick-up trips**)			ln(**Speed**)
	40 **days**	50 **days**	60 **days**	40 **days**
Treat × Post	−0.1229 ***	−0.1225 ***	−0.1226 ***	0.0007
	(0.0099)	(0.0098)	(0.0100)	(0.0017)
Treat	−0.1331 ***	−0.1326 ***	−0.1323 ***	−0.0684 ***
	(0.0066)	(0.0064)	(0.0065)	(0.0034)
Post	0.0487 ***	0.0397 ***	0.0413 ***	−0.0002
	(0.0096)	(0.0096)	(0.0097)	(0.0018)
Hour of day FE	Y	Y	Y	Y
Week FE	Y	Y	Y	Y
Month FE	Y	Y	Y	Y
Year FE	Y	Y	Y	
Location FE	Y	Y	Y	
Road Link FE				Y
Weather control	Y	Y	Y	Y
Observations	186,949	233,766	280,601	1,205,184
R-Squared	0.844	0.843	0.843	0.723

p < 0.01 : ***; p < 0.05 : **; p < 0.1$: *. Standard errors are in parenthesis. Standard errors clustered at the taxi zone level FE: Fixed effect.

Q7. Conclusions

- We employed a DiD framework to evaluate the impact of New York City's congestion surcharge policy on ride-hailing travel demand and traffic congestion.
- While the surcharge policy effectively reduced travel demand and industry revenue, it did not lead to a corresponding decrease in traffic congestion.
- We also highlighted the need for a comprehensive approach that addresses both supply and demand to effectively tackle ride-hailing-induced congestion in NYC.
- Our findings hold significant implications for policymakers as New York City prepares to implement congestion pricing.