Tax avoidance and environmental implications: Vehicle Registrations in Mexico

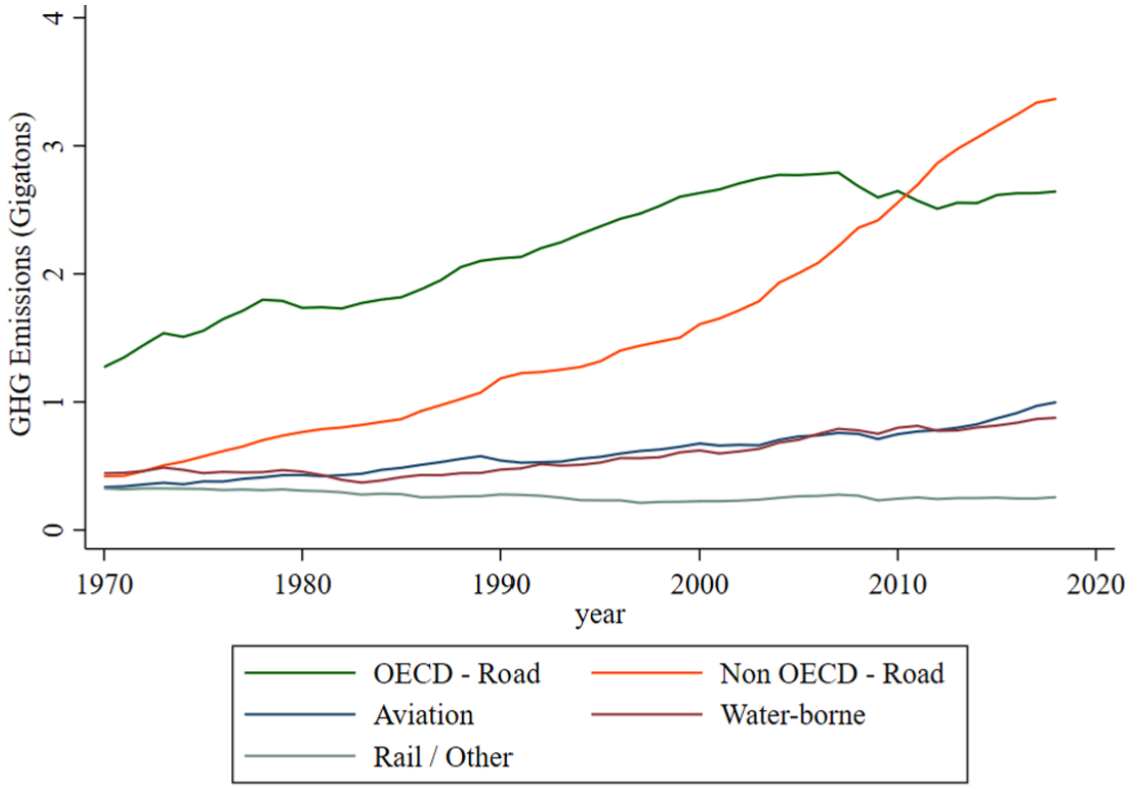
Pedro Liedo and Shaun McRae

pliedo@ucdavis.edu

2024

UC Davis

Transportation accounts for roughly 1/5 of global CO_2 emissions, and on road emissions from the developing world are on the rise.



Source: Emissions Database for Global Atmospheric Research (European Commission (2023))

However, CO_2 emissions is only one outcome related with vehicles. Others include:

- Local pollution
- Congestion
- Fatalities

Using discrete cutoff in policies to address this issue is common

- CAFE standards on average MPG
- Cash for clunkers on vehicle age
- EV rebate on individuals' income and vehicle price

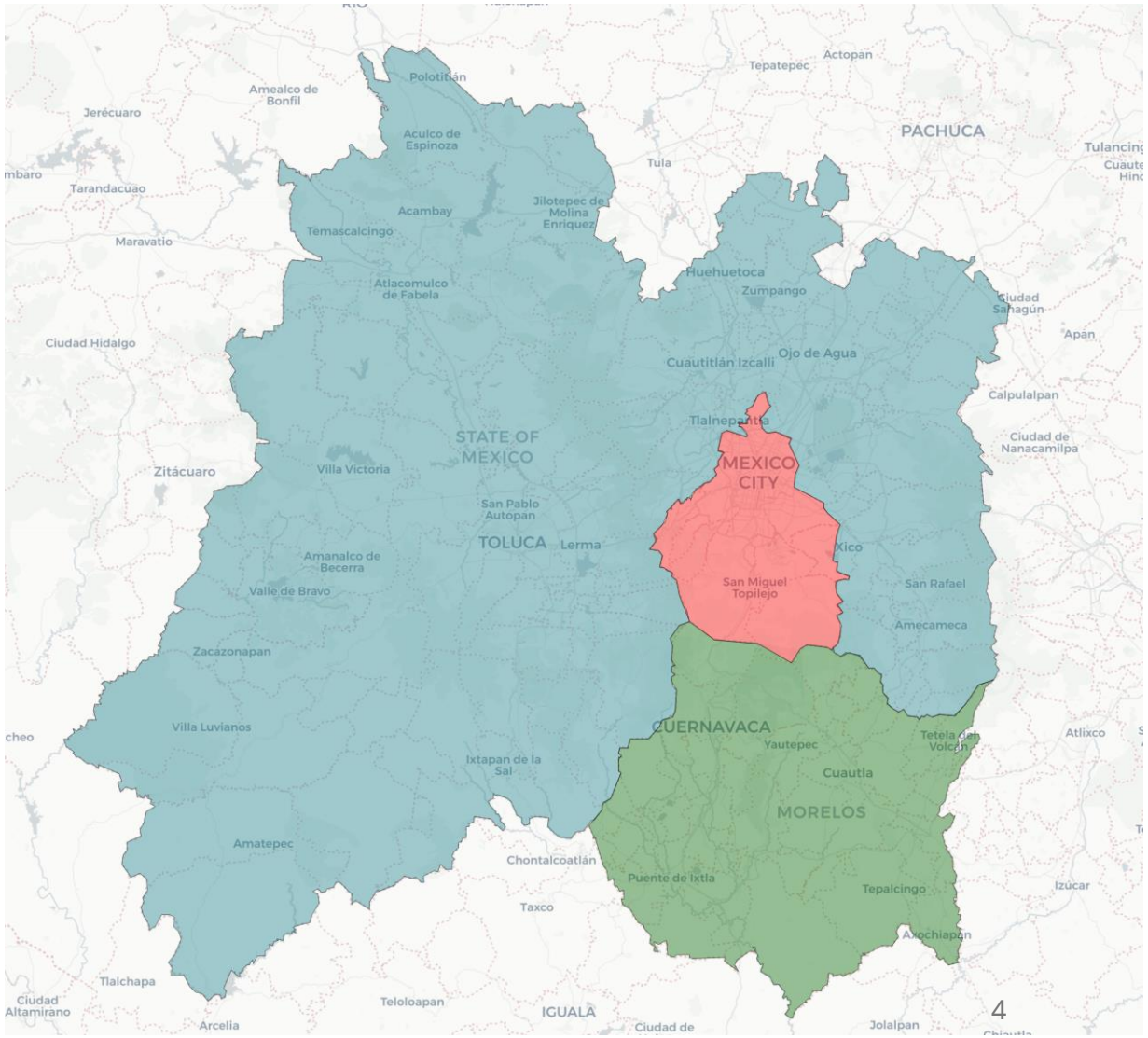
How do discrete cutoffs in tax policy and imperfect compliance shape environmental outcomes?

Context

- Decentralization of the vehicle registration fee in Mexico

- Different tax schedules adopted
  - Annual tax calculated as an increasing block schedule starting at 3% of the car's price with an exemption threshold based on vehicle's price.
    - **Mexico City** exemption threshold $250,000 (12,500 USD)
    - **State of Mexico** exemption threshold $406,000 (17,000 USD)
  - Low fixed fee independent of the price.
    - **Morelos** charged roughly $500 (25 USD)

- Easy to avoid the tax by registering elsewhere.



How do discrete cutoffs in tax policy and imperfect compliance shape environmental outcomes?

Findings

- Arbitrary tax exemption thresholds increase the popularity of the cheaper cars below the cutoff.
- Cheaper vehicles improve the average fuel efficiency of the fleet but worsen tail pipe emissions.
- Avoidance mitigates distortionary effects on the vehicle fleet.
  - Vehicle owners that cheat choose the car they want since they are avoiding the tax

Those who wanted to own a car, but pay less in registration fees could buy a cheaper vehicle (price response)

or...

Good, pretty, and cheap! This are the cars that do not pay registration fee in Mexico City

EL FINANCIERO
Economía, Mercados y Negocios en alianza con Bloomberg
Síguenos
Economía Mercados Nacional

Mis Finanzas

¡Bueno, bonito y barato! Estos son los autos que no pagan tenencia en CDMX

Para exentar el pago de tenencia en CDMX, los vehículos deben cumplir con las condiciones estipuladas por la Secretaría de Finanzas.

Avoid the tax (avoidance response) by registering elsewhere

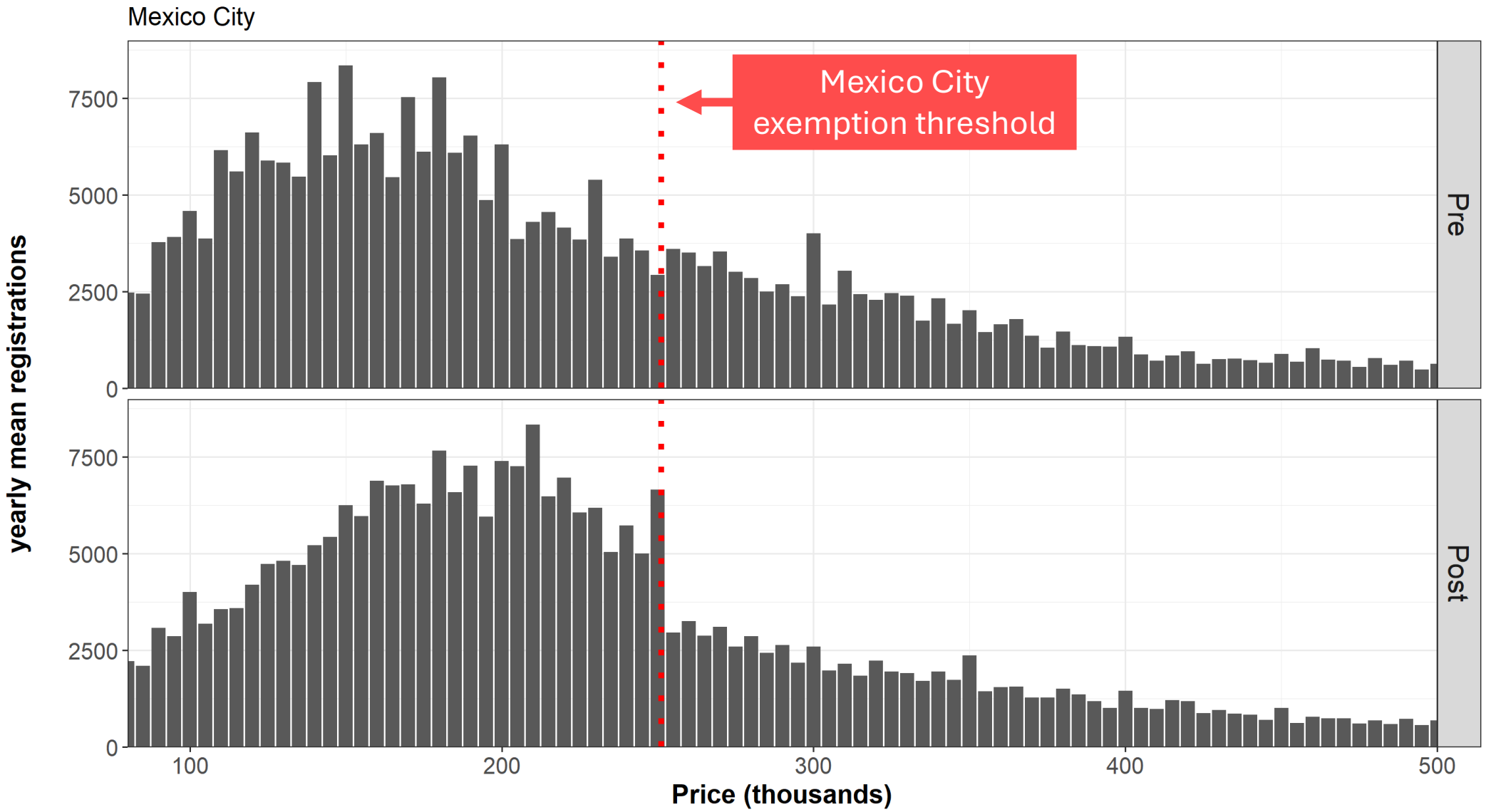
This is how they transported a Ferrari Monza valued more than 3 million pesos for its smog check In Morelos.

In Morelos, the registration fee is 672, while in Mexico City the owner would have paid...

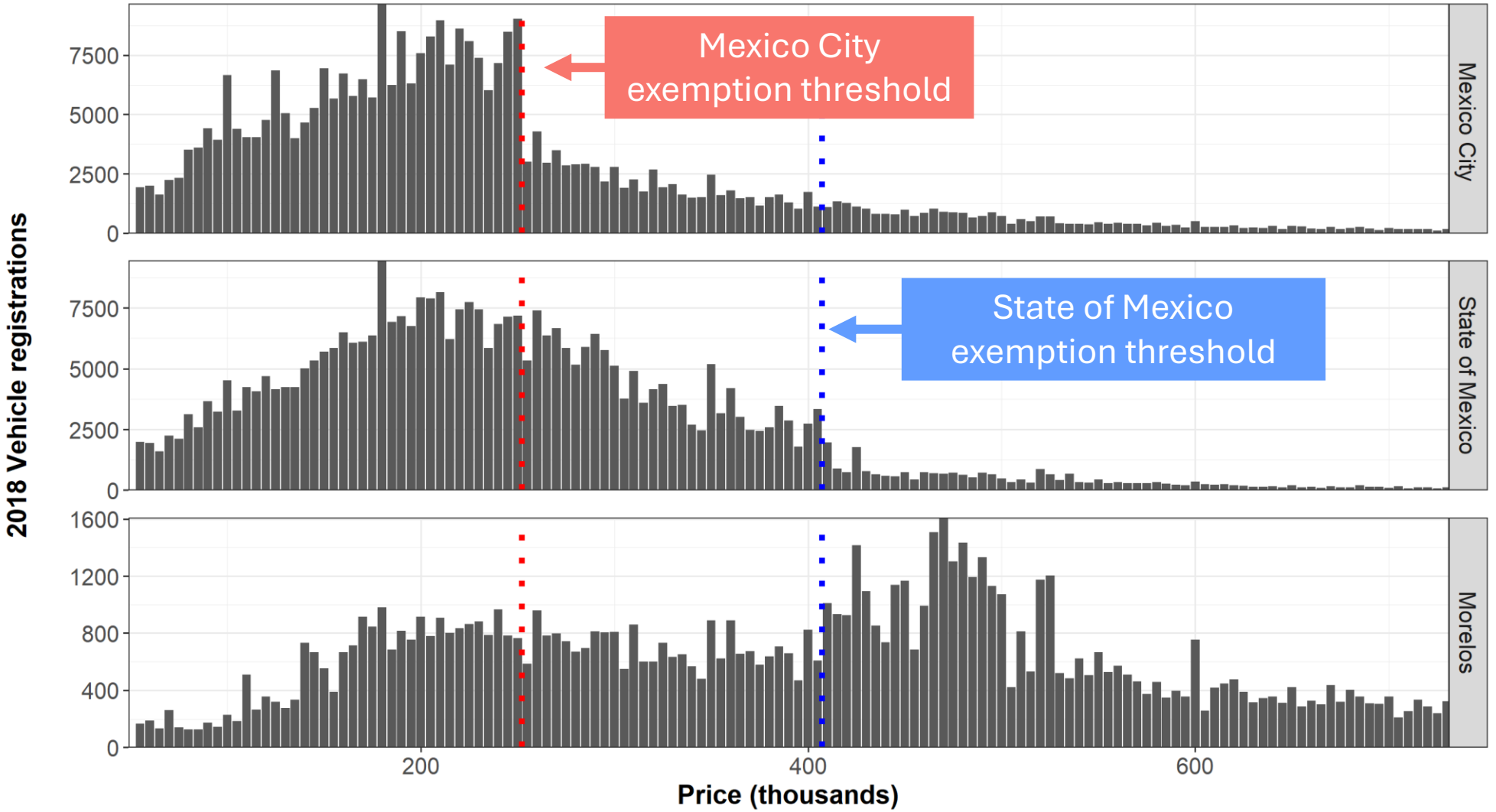
Data requests and publicly available data

- Vehicle registry for 6 states (~50%) of country's vehicle registrations
  - Zip code
  - First price
  - Date of registration
  - Make and model
  - Plate number
- Smog check data for Mexico City
- Census 2010 and 2020
- Reported vehicle's fuel efficiency

Missing registrations above the threshold and some bunching right below the threshold.



Some vehicles avoided the tax by registering in other states, but also cutoff vehicles became more popular.



Estimate the response in vehicle registrations of the policy by estimating a DiD per price bin i.

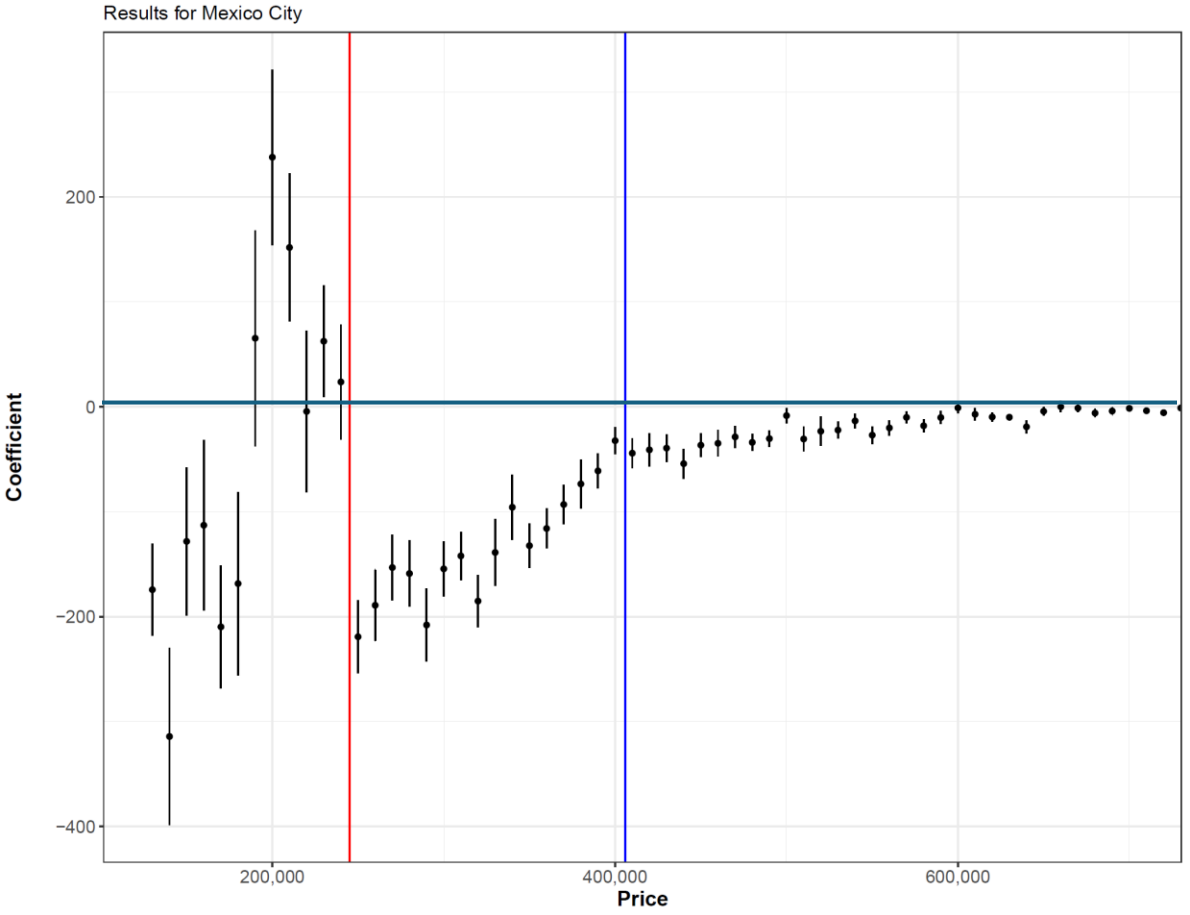
$$y_{z,t,i} = \beta_i(post_t * treat_z) + \gamma_t + \theta_z + \epsilon_{z,t}$$

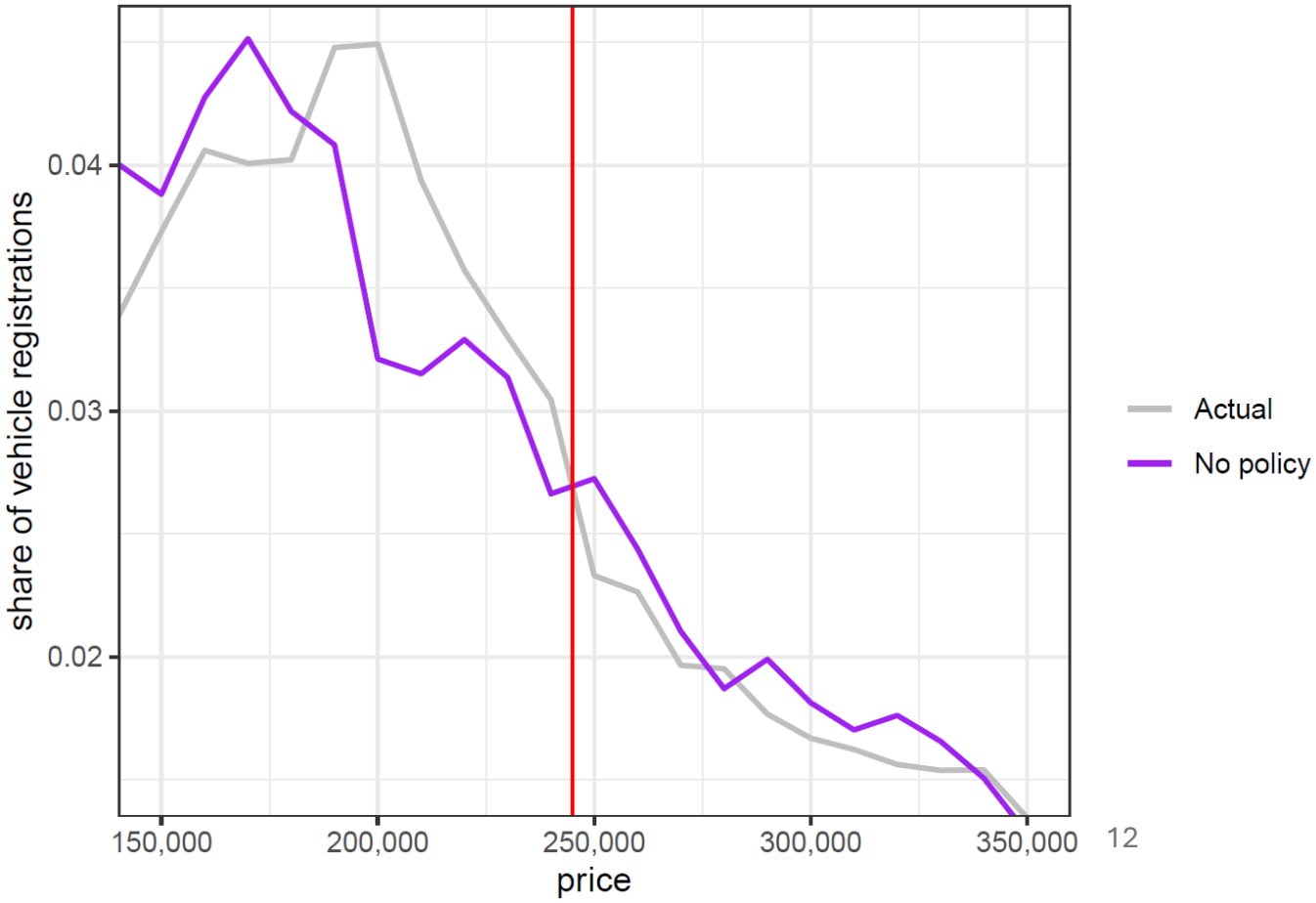
- $y_{z,t,i}$ number of registrations in zip code z, month-year t,of vehicles in price bin i.
- post dummy with value of one for years after 2011 and 0 otherwise.
- treat dummy with value of one for Mexico City and 0 for the control zip codes.
- γ_t monthly fixed effects.
- θ_z zip code fixed effects.

Control group is built by matching Mexico City, State of Mexico, and Morelos urban zip codes on census covariates to other states.

- **Coefficients for Mexico City show evidence of avoidance and price response.**
  - **$484 M forgone in tax revenue (10% of reported collection for that tax)**

- **There seems to be a substitution between vehicles above and blow the threshold when we add the 3 states .**



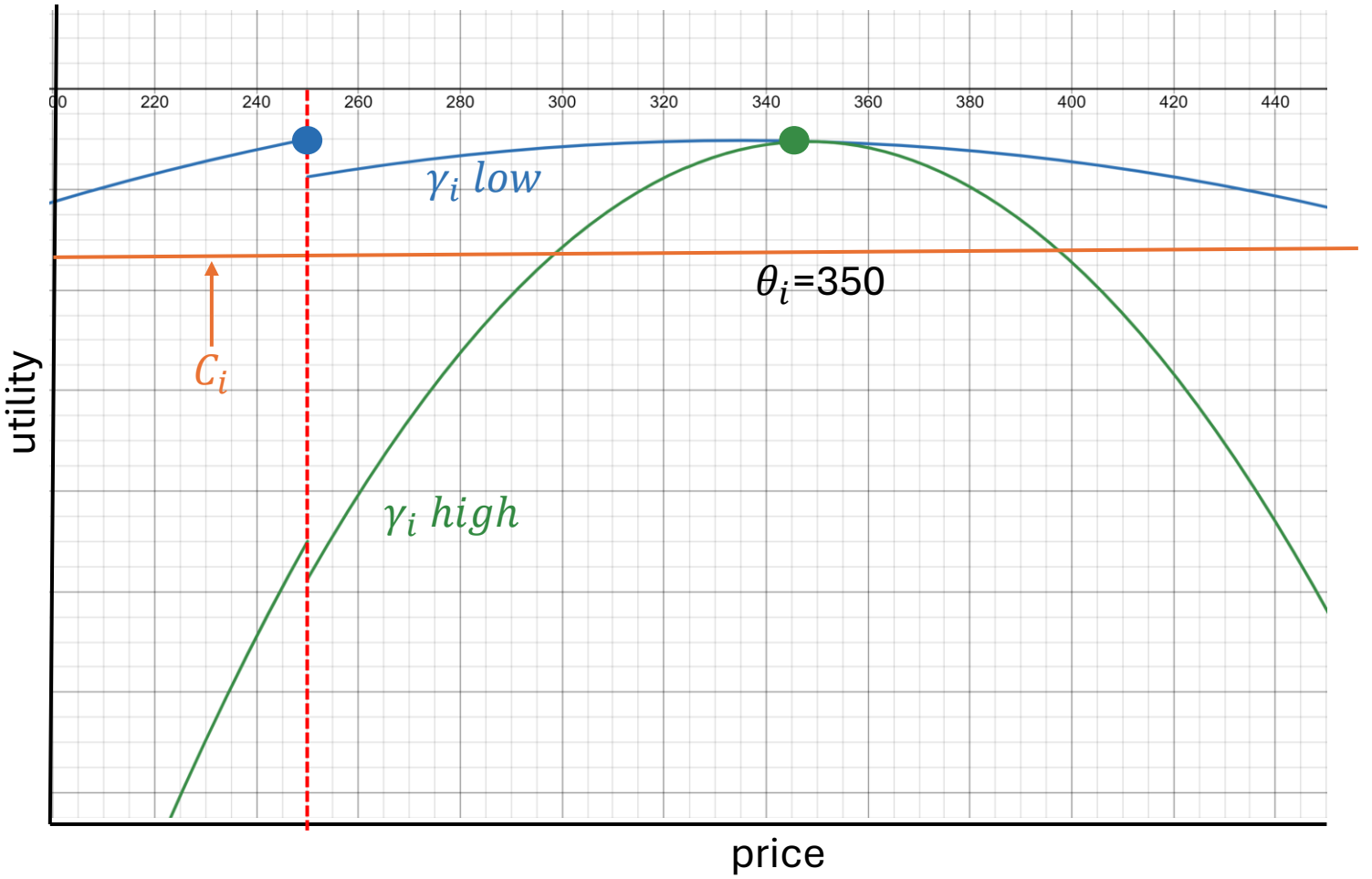


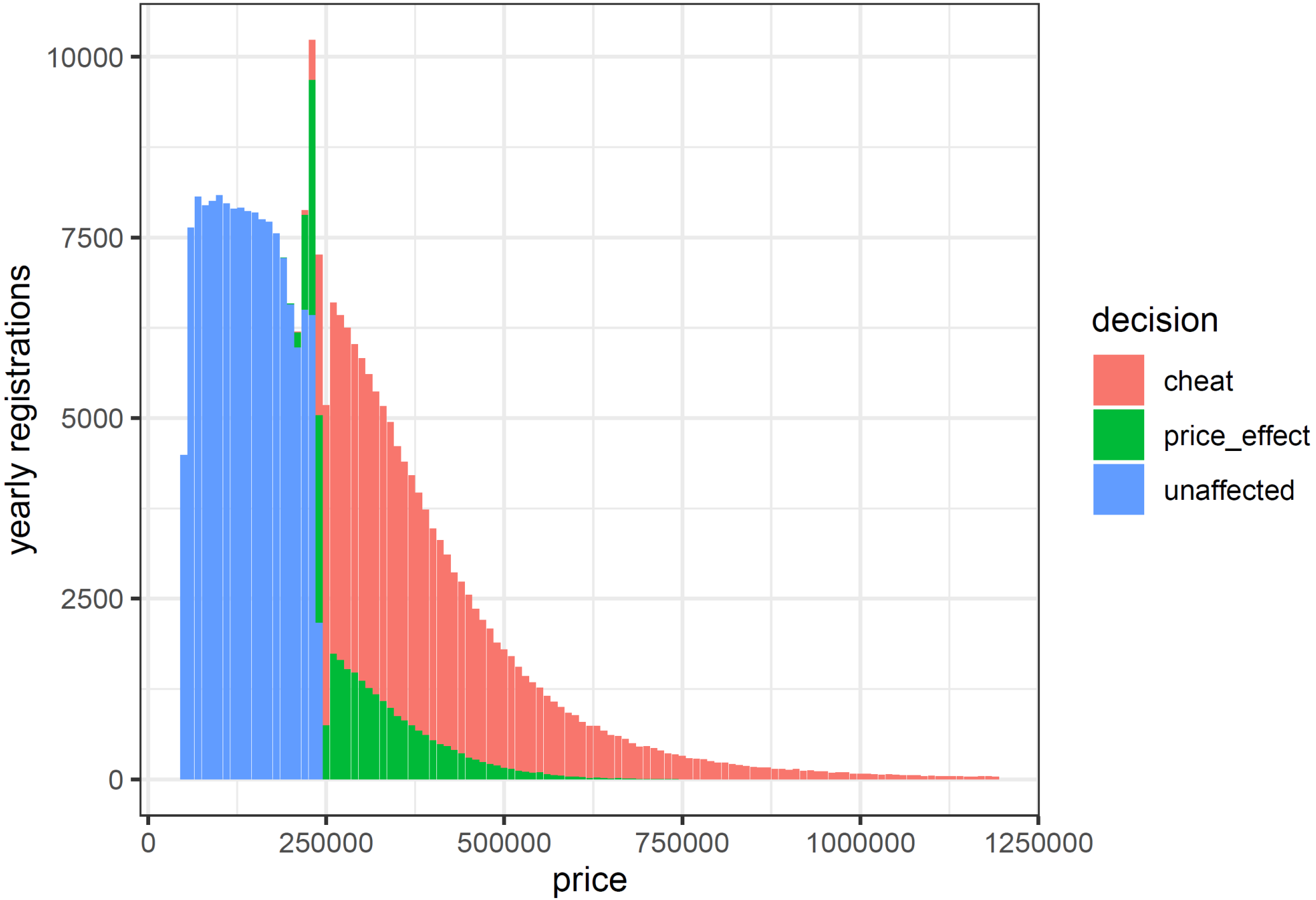
What is the role of avoidance?

Model

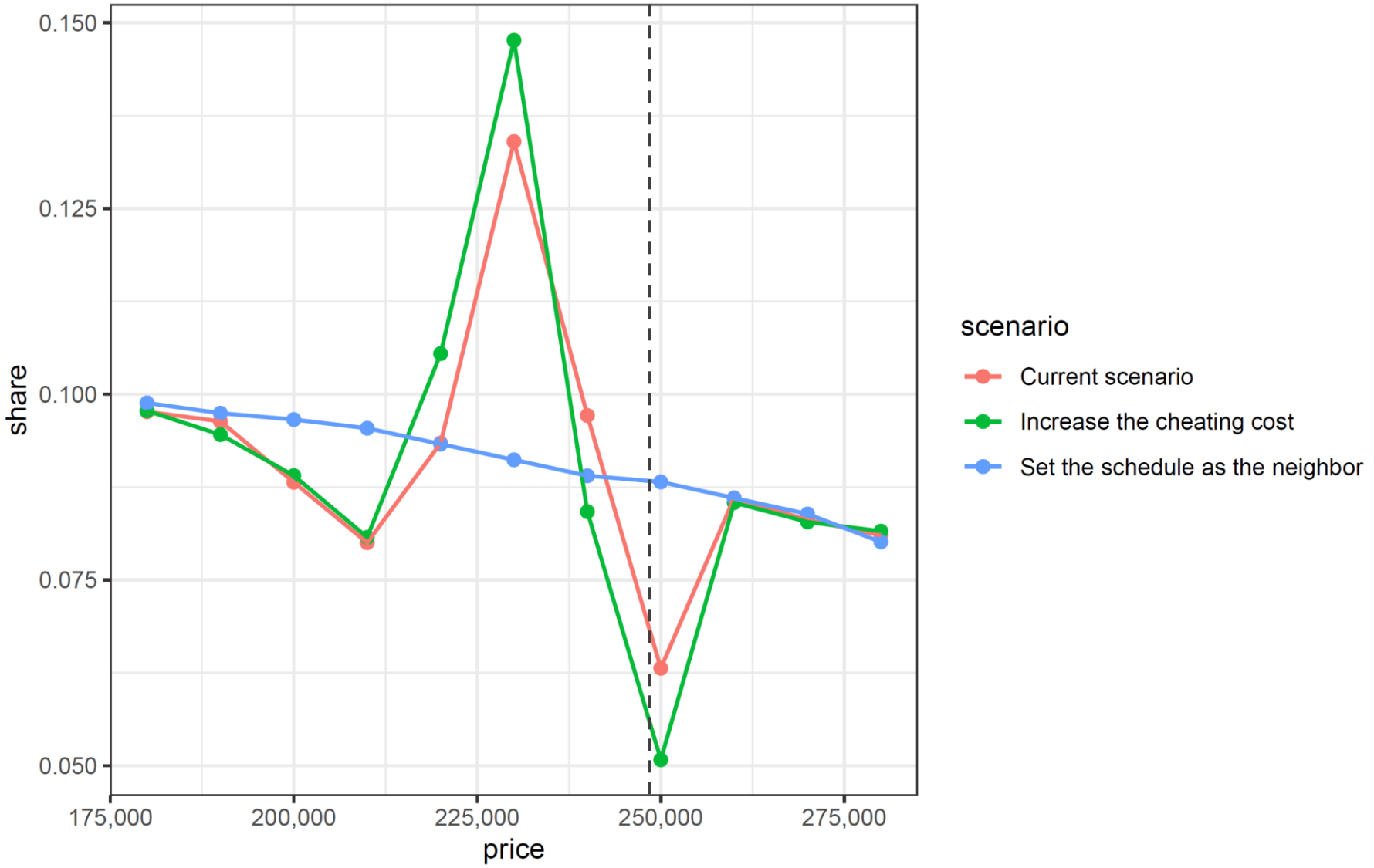
$$\max_{P} \{-\gamma_i(\theta_i - P)^2 - \tau P, -C_i\}$$

- γ_i disutility to choose another car
- θ_i ideal car price
- τ tax rate based on price P
- C_i cheating cost

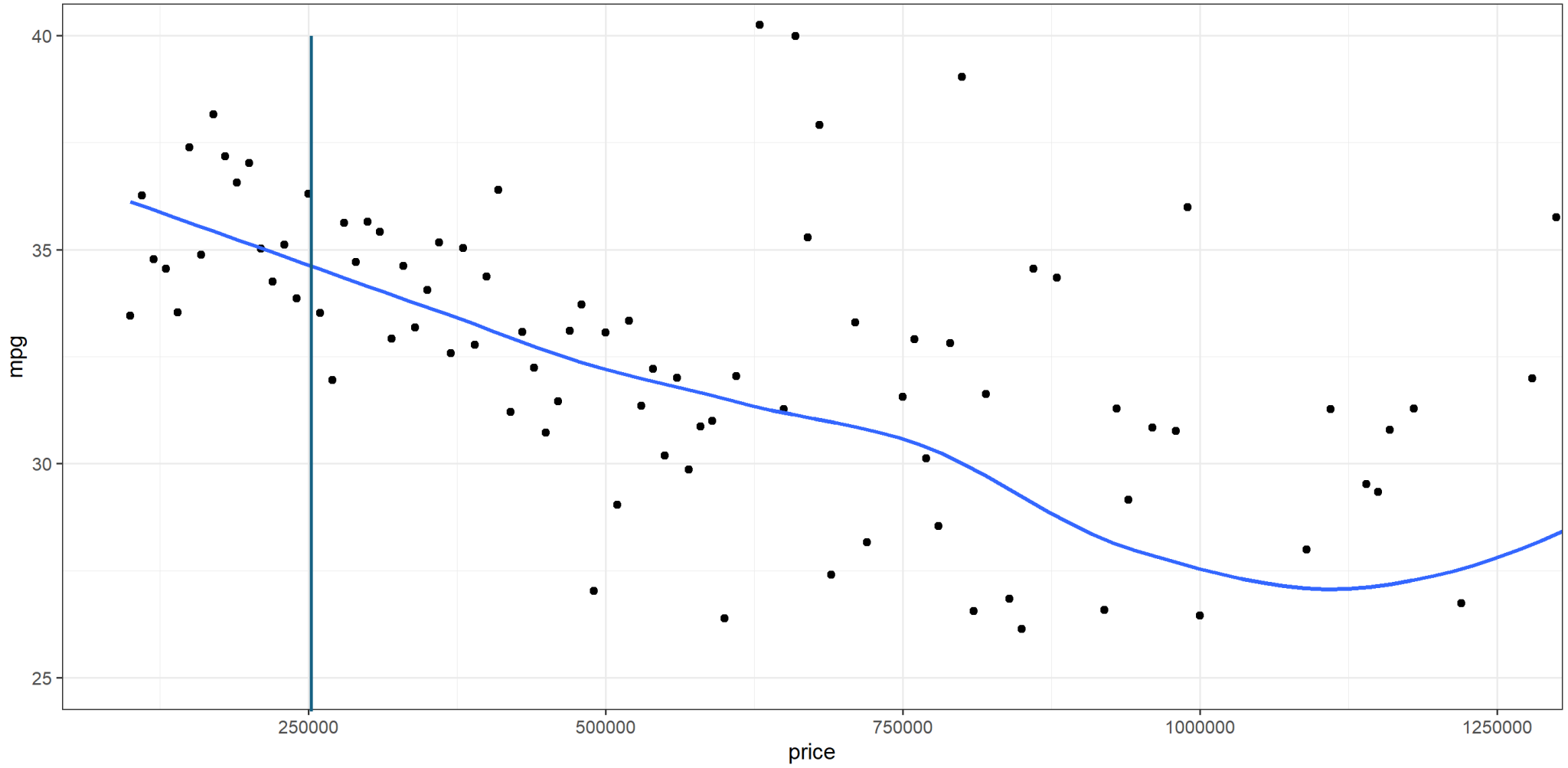



10000
7500
5000
2500
0
yearly registrations
0
250000
500000
750000
1000000
1250000
price
decision
cheat
price_effect
unaffected

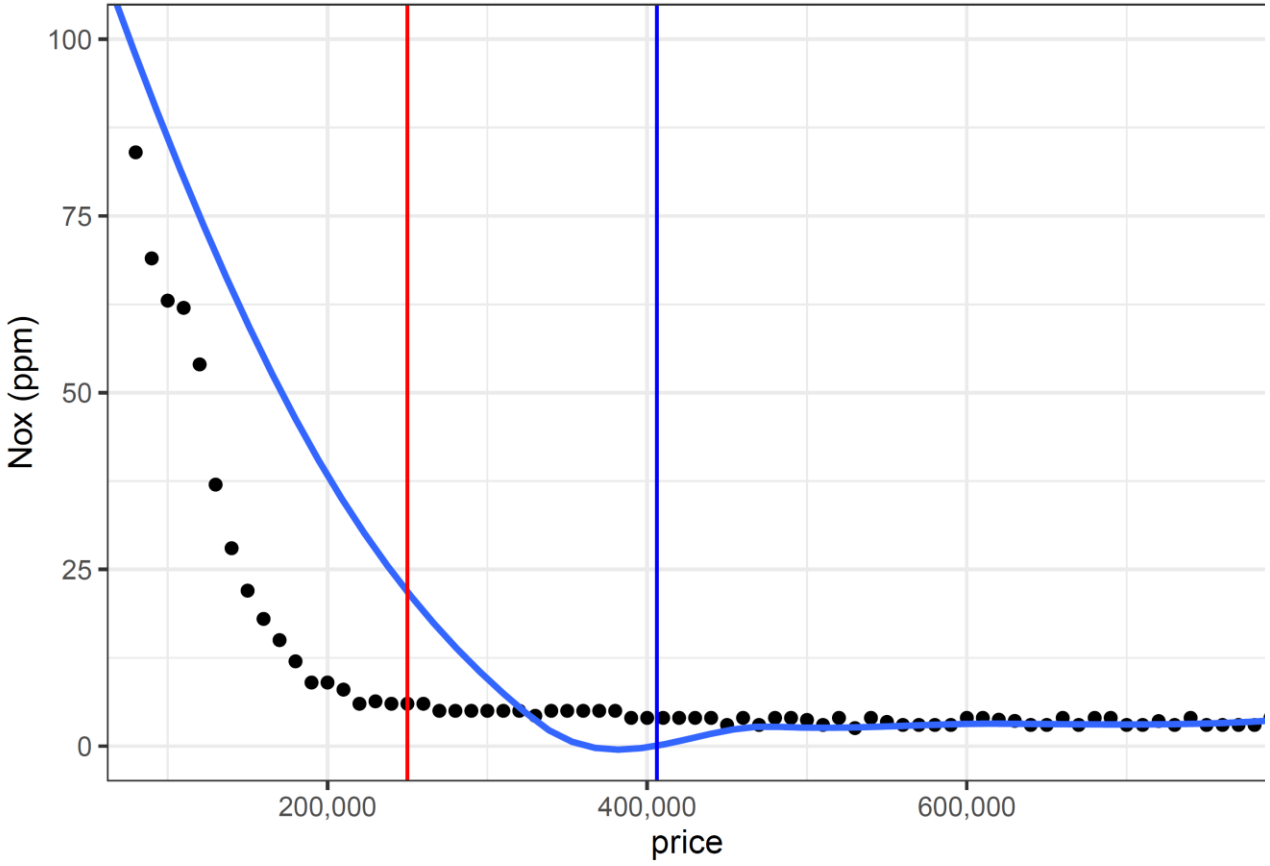
Avoidance mitigates distortions of discrete cutoff policy. However, there is still some substitution between vehicles around the threshold

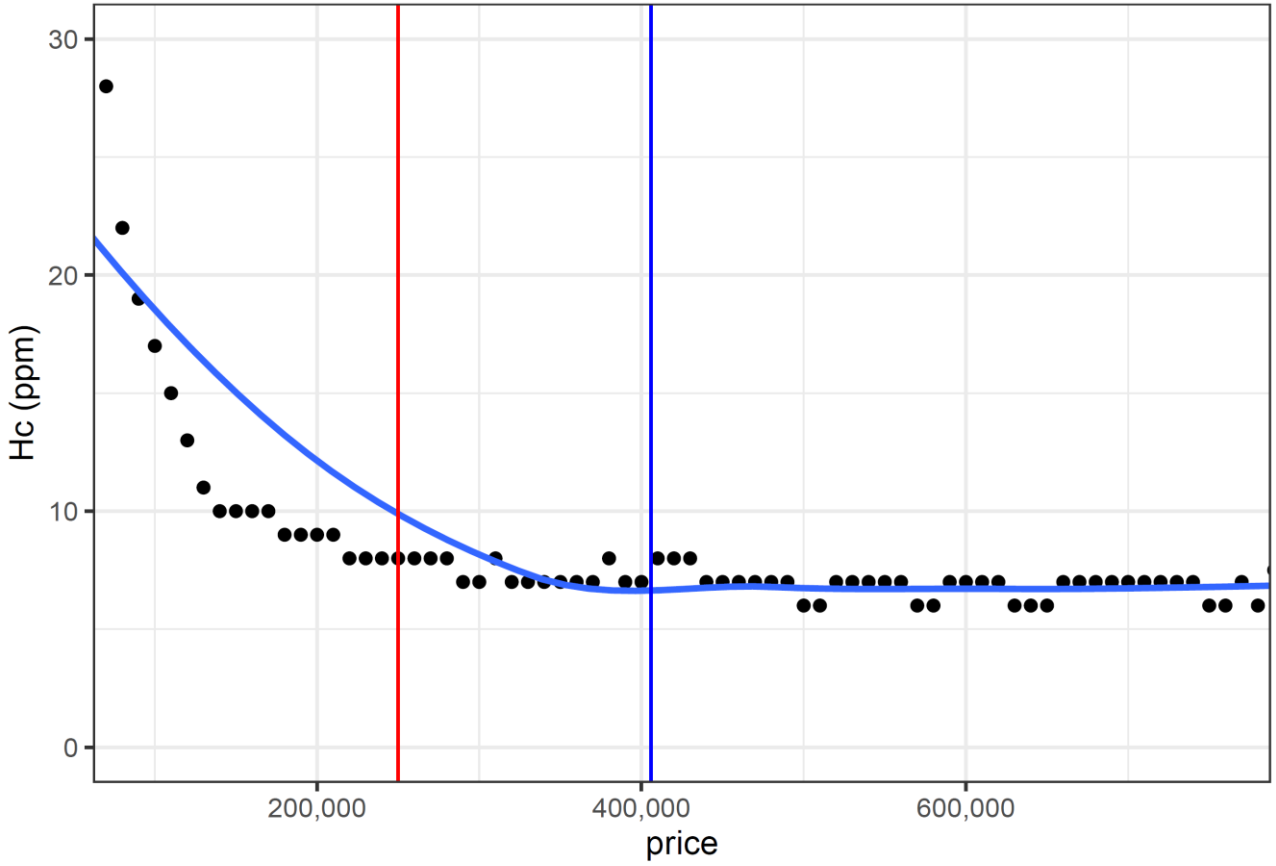


Cheaper cars have better fuel efficiency



Cheaper cars have worse tailpipe emissions





Findings and conclusion

- Environmental effects are modest when compared to the revenue effect.
- Environmental effect depends on where the cutoff is placed.
- In any case, evasion mitigates the distortionary effects of cutoff policies.

Results between $190,000 - 270,000

	Below cutoff	Above cutoff	Weighted average
Fuel efficiency (mpg)			
Current outcome	36.54	33.67	35.73
Increase cheating cost	36.52	33.60	35.74
No exemption and reduce rate	36.09	33.78	35.36
NOX (ppm)			
Current outcome	7.29	5.64	6.82
Increase cheating cost	7.27	5.62	6.83
No exemption and reduce rate	7.43	5.68	6.88
HC (ppm)			
Current outcome	8.45	8.00	8.32
Increase cheating cost	8.44	8.00	8.32
No exemption and reduce rate	8.51	8.00	8.35