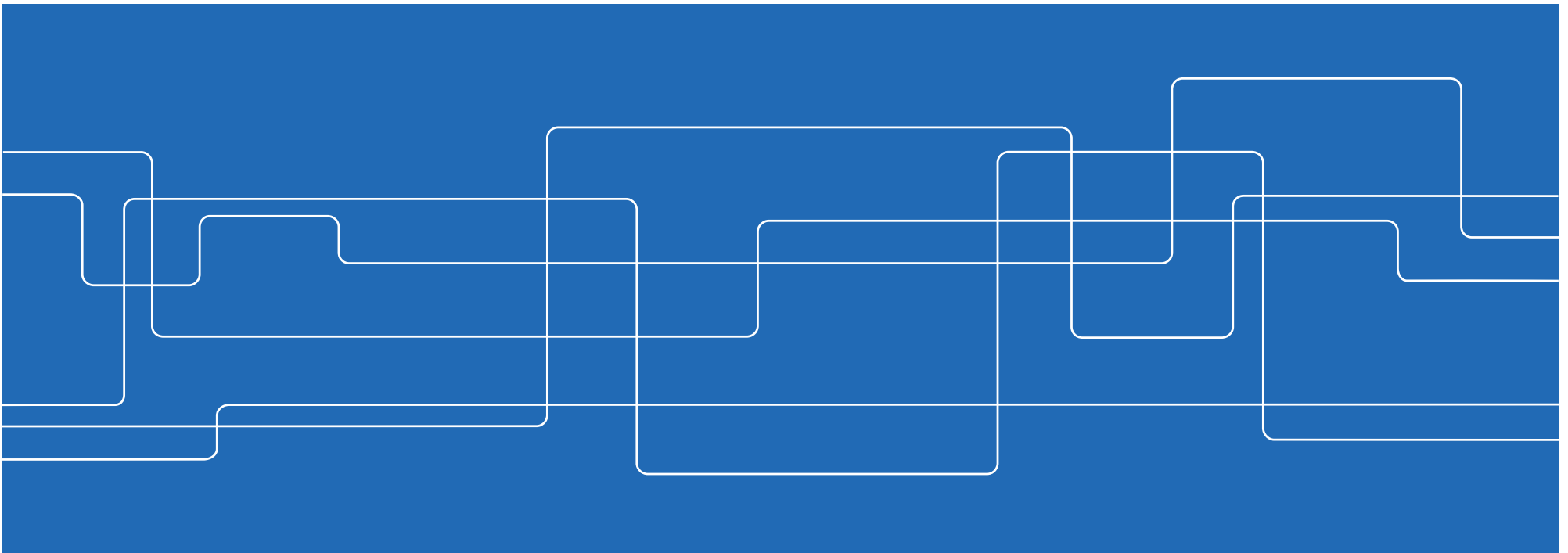




Congestion Charging and Green Vehicle Exemptions: Evidence from Stockholm

Dr. Joel P. Franklin

KTH Royal Institute of Technology

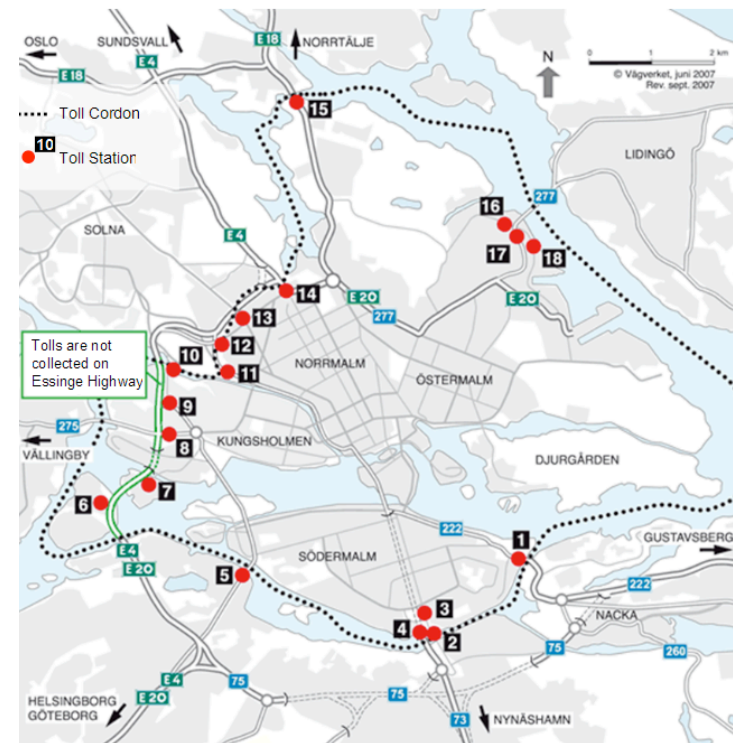


Design of Stockholm's Congestion Pricing

Type: Cordon-based

Area: ~30 sq km

Variations: fixed schedule,
0 to 20 SEK per crossing



History of Stockholm's Congestion Pricing

2005

- **August:** Expanded Public Transport

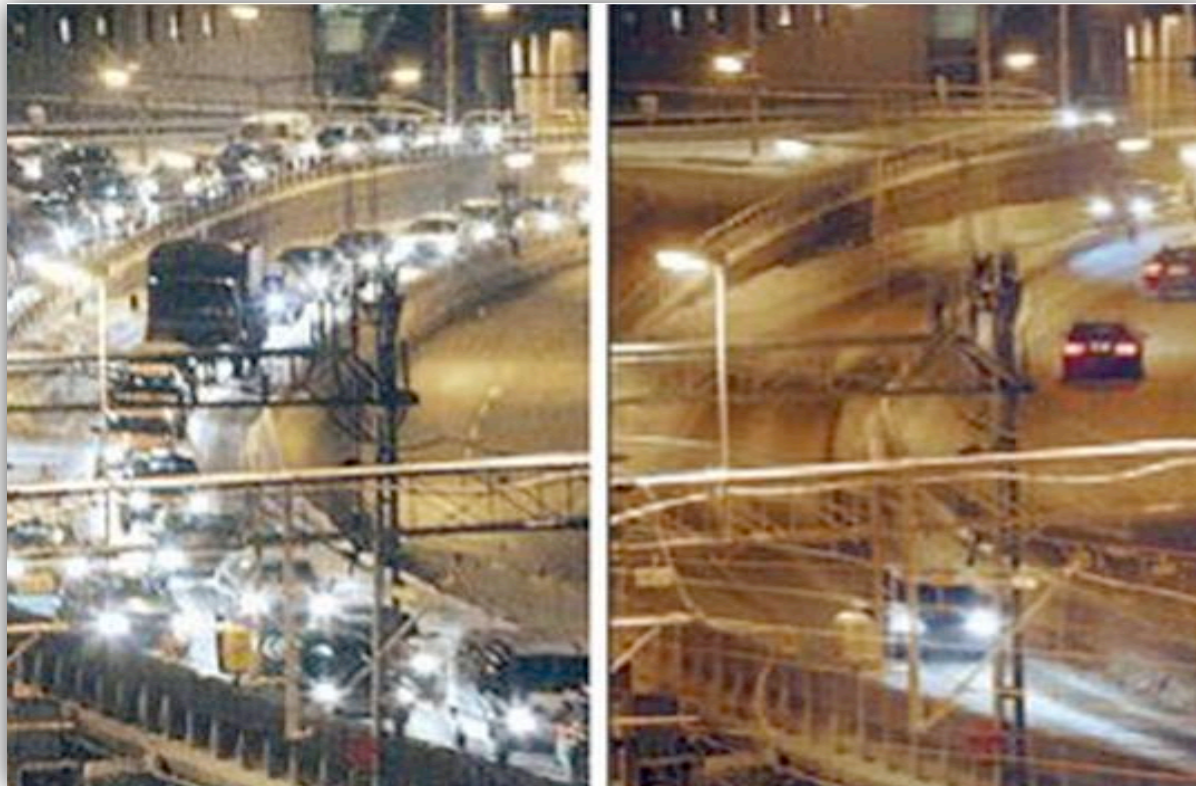
2006

- **January:** Trial Begins
- **June:** Trial Ends
- **September:** Referendum

2007

- **August:** Permanent Installation

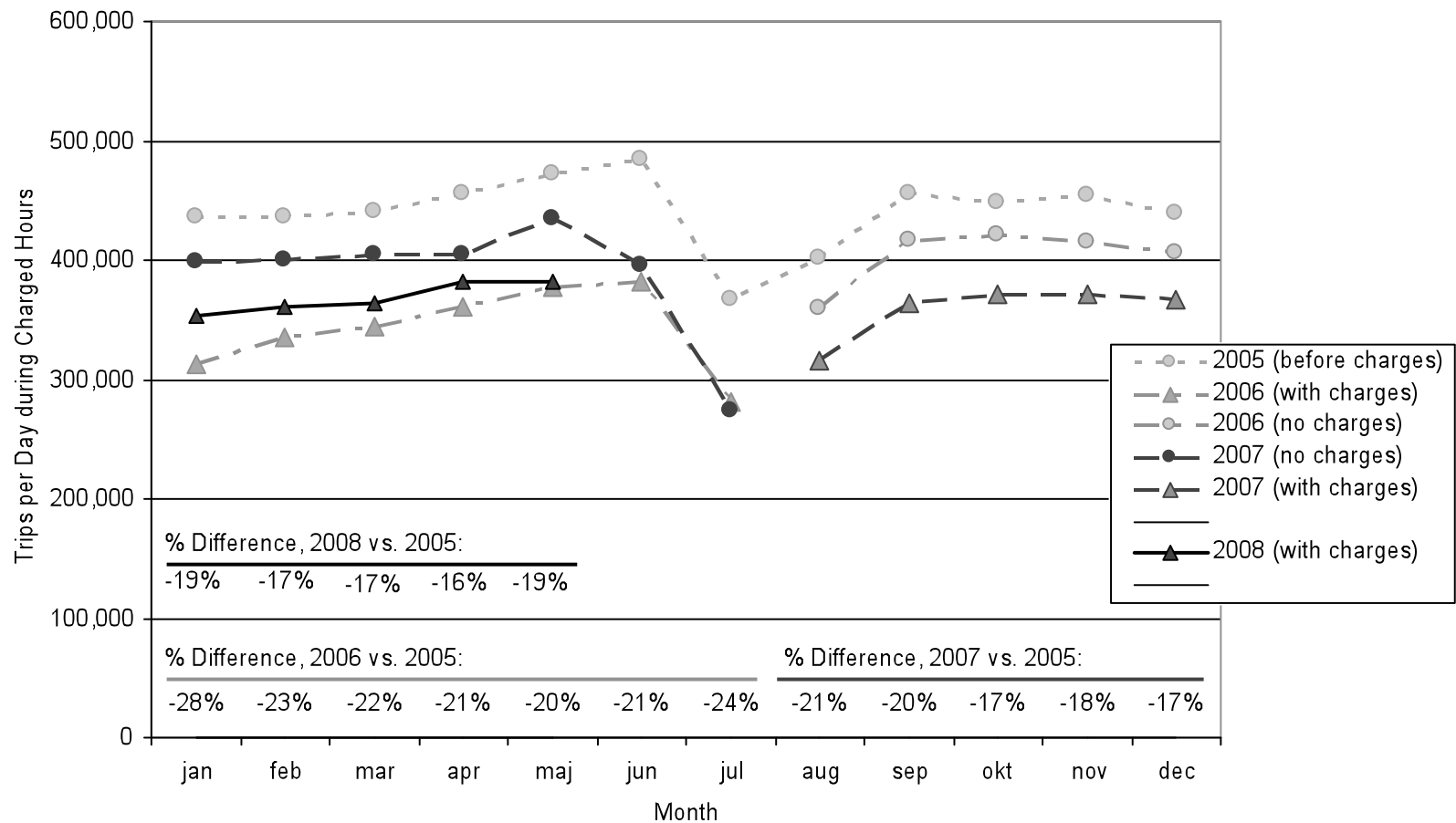
What Happened?



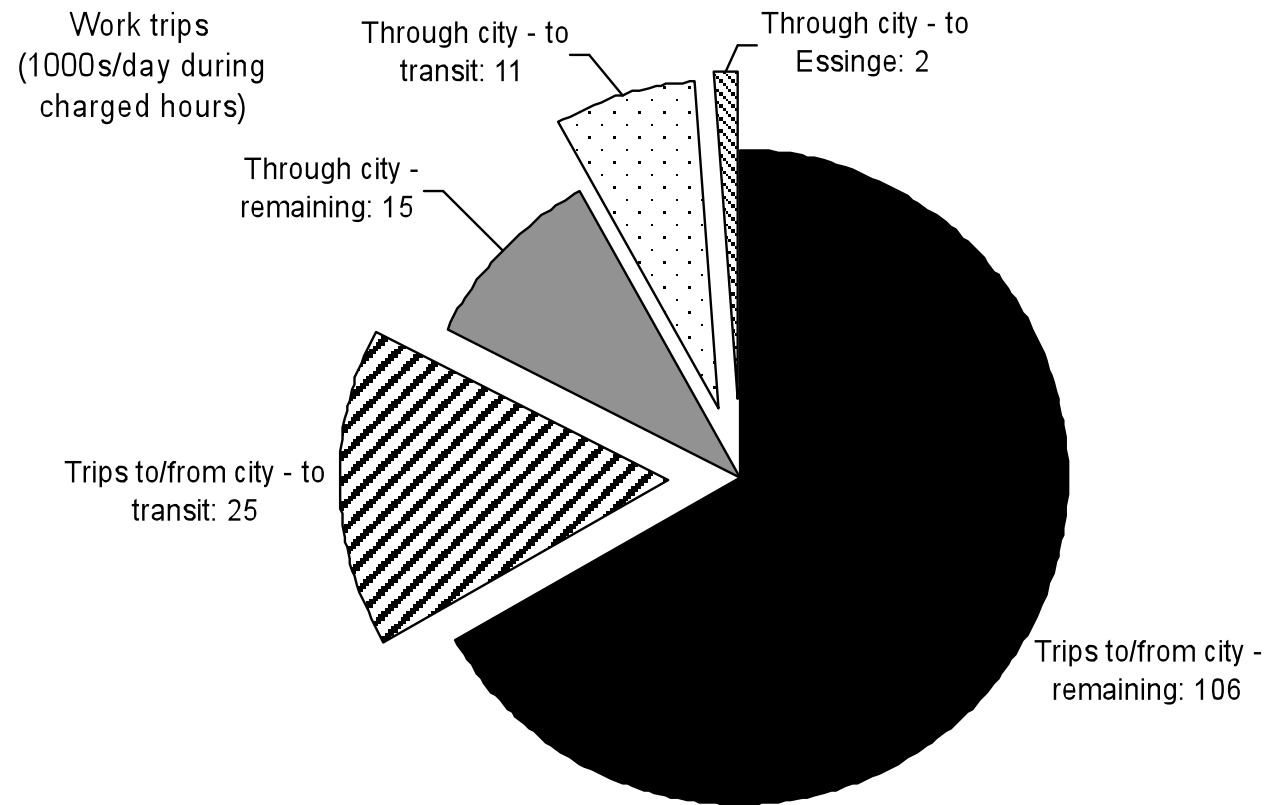
Day Before Tolls

First Day of Tolls

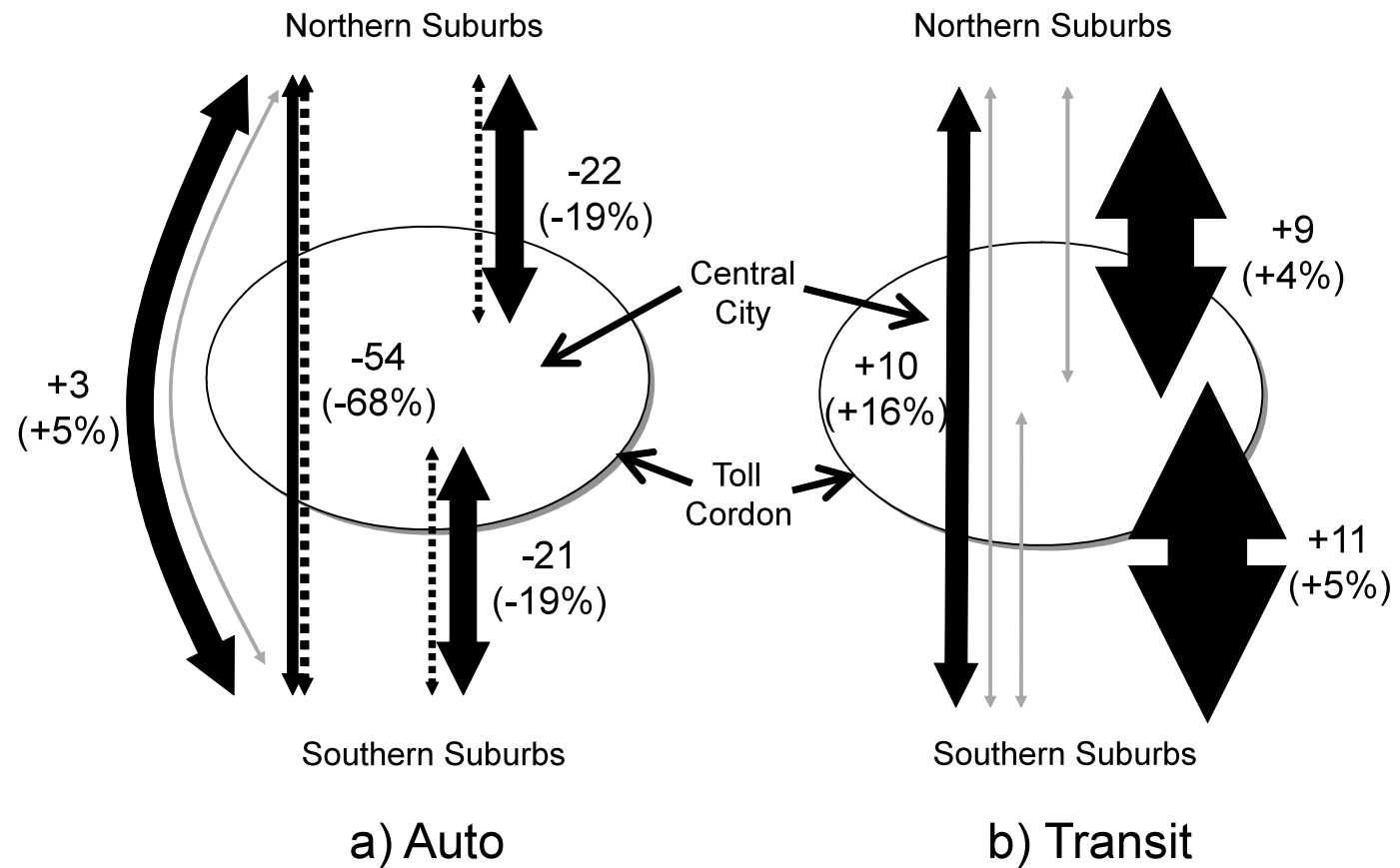
How did traffic change across the cordon?



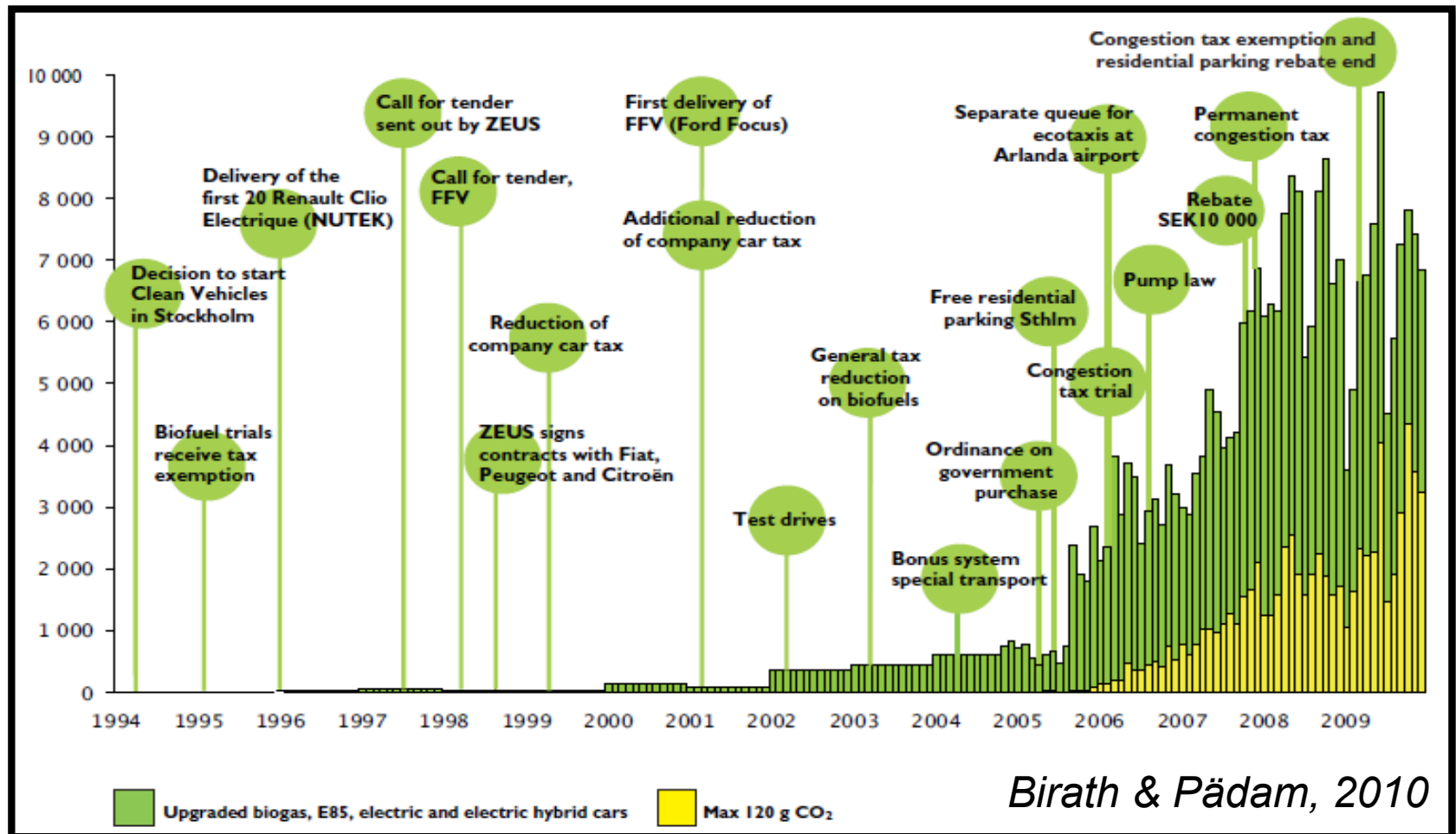
How did people adjust?



How did routes change?



Meanwhile, Green Vehicles became a





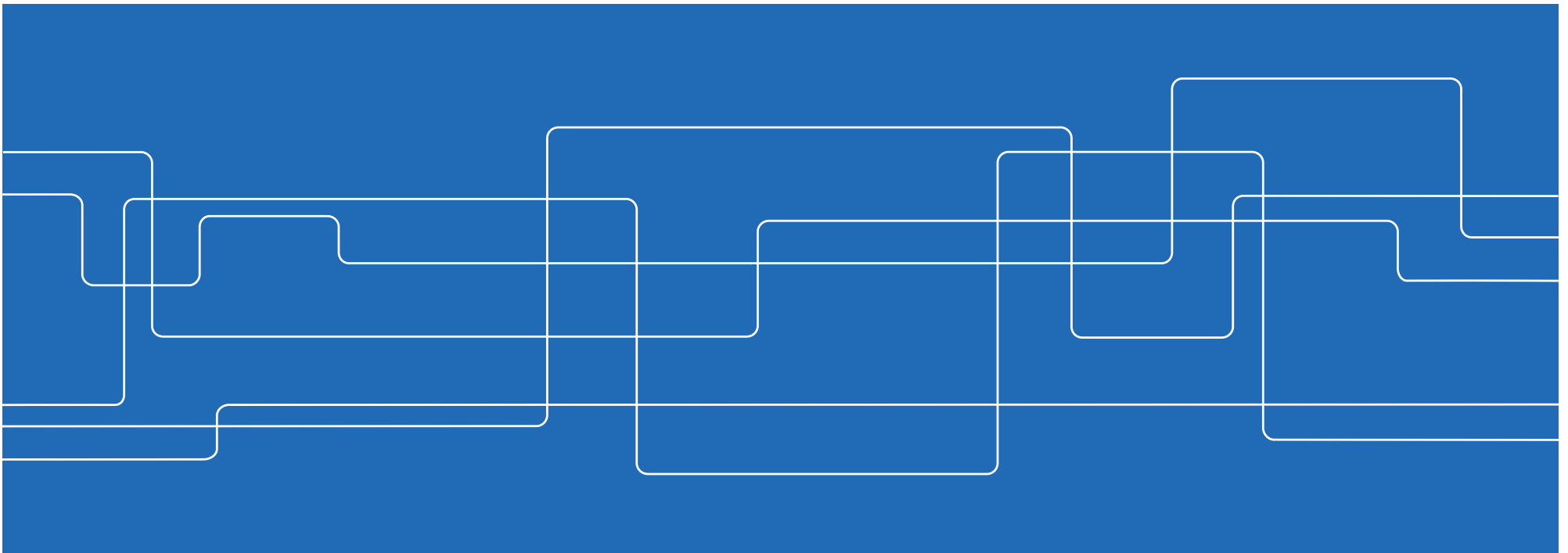
Effects of Toll Exemption for Green Vehicles

Hypotheses:

1. A Toll Exemption can **shift the car fleet** to cleaner fuel vehicles, thus **reducing** CO2 emissions
2. A Toll Exemption can **increase total travel**, thus **increasing** CO2 emissions for *those* vehicles.
3. A Toll Exemption can **increase congestion**, thus **increasing** CO2 emissions for *all* vehicles.



Question 1: **Did the Exemption Encourage Green Vehicle Purchases?**



Incidence of Green Vehicle Incentives

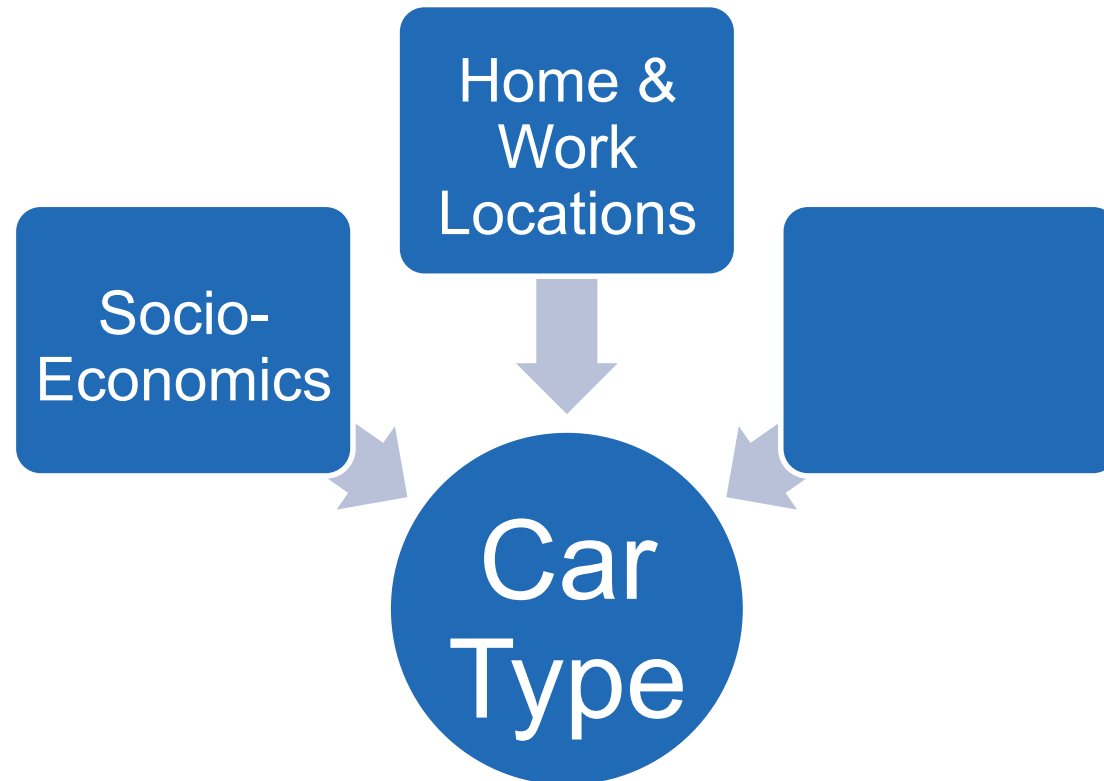
Residential Parking Exemption (2005—2009)

Congestion Charging Exemption (2006—2009/2012)

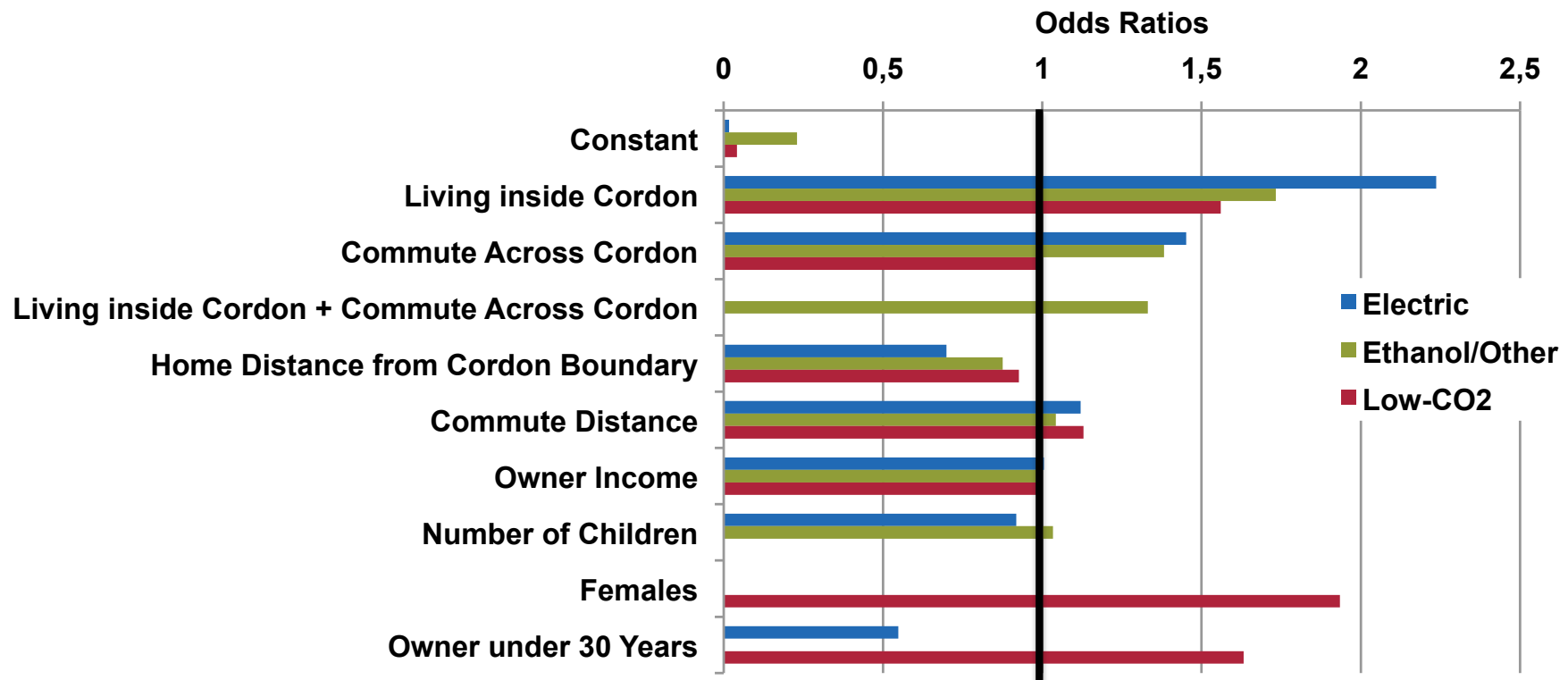
Purchase Rebate (2007—)

	Living inside Cordon		Living outside Cordon	
	Working inside Cordon	Working outside Cordon*	Working inside Cordon*	Working outside Cordon
Conventional	1153 (64%)	703 (49%)	5015 (71%)	14048 (76%)
Low CO2	168 (9%)	163 (11%)	553 (8%)	1631 (9%)
Electric	47 (3%)	41 (3%)	94 (1%)	149 (1%)
Ethanol/ Other	425 (24%)	534 (37%)	1405 (20%)	2732 (15%)
Total	1793 (100%)	1441 (100%)	7067 (100%)	18560 (100%)

Approach: **Associate Vehicle Choice with Explanatory Variables**



Results: Factors Associated with Choice of Green Vehicle (over Conventional Vehicle)

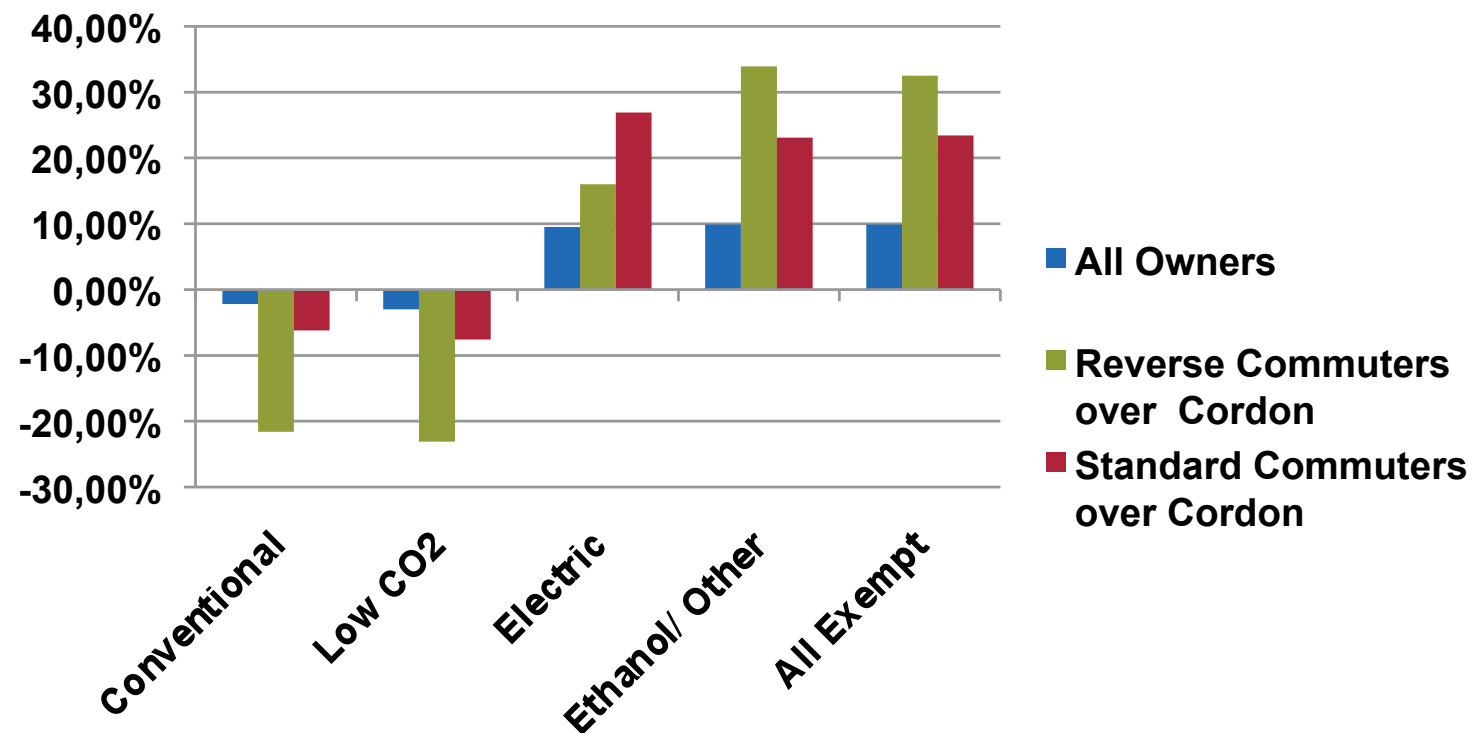




Results: **Key Findings**

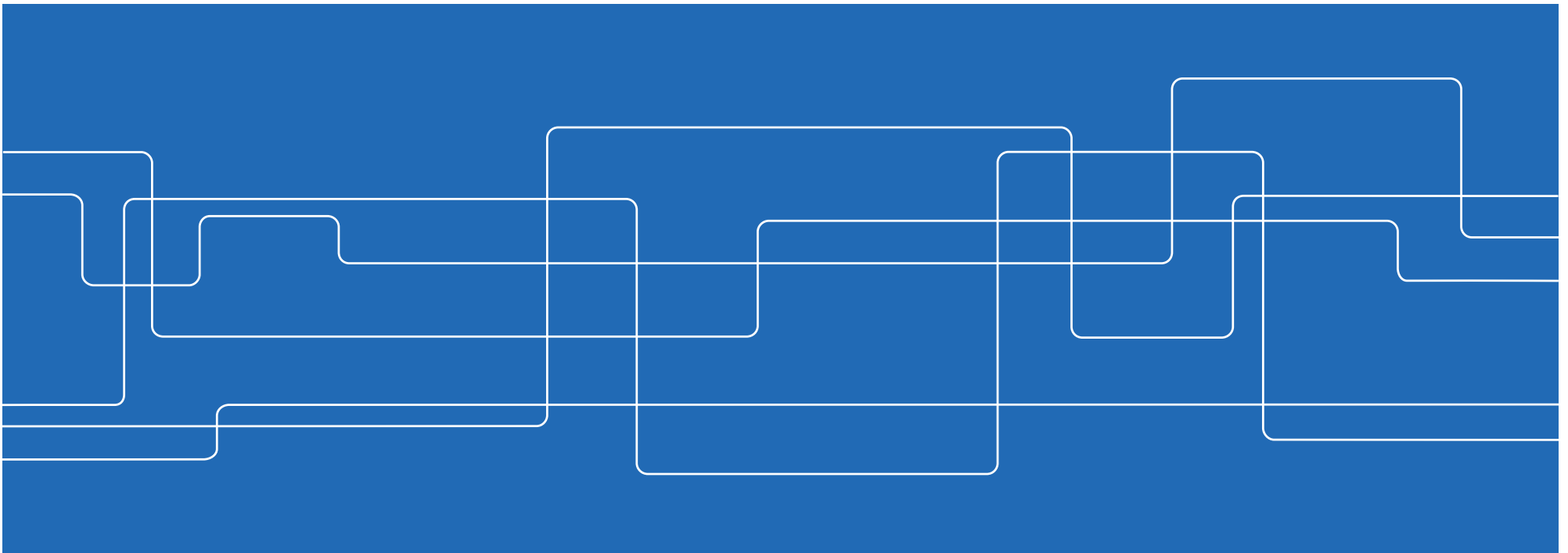
- All else equal, conventional vehicles are far preferred
- Residents of City Center are far more favourable to all alternate fuels than others
- Are Commuters across Cordon are additionally favorable?
 - Yes for Exempt vehicles: Electric & Ethanol
 - No for Low-CO2: same as Conventional
- Does Home Distance from the Cordon make a difference?
 - Longer distances, less likely to buy any kind of green car
- Effect of Work Location?
 - Impossible to say here

Results: Simulated Effect of Exemption on Green Vehicle Ownership

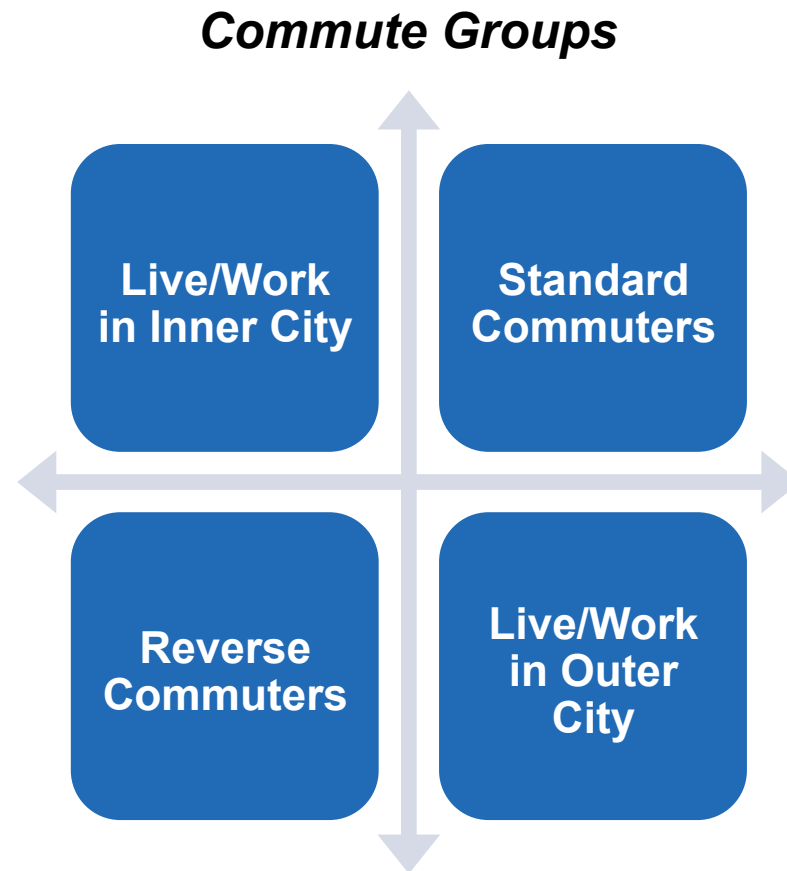




Question 2: Did the Exemption Lead to Rebound Effects in Total Travel?



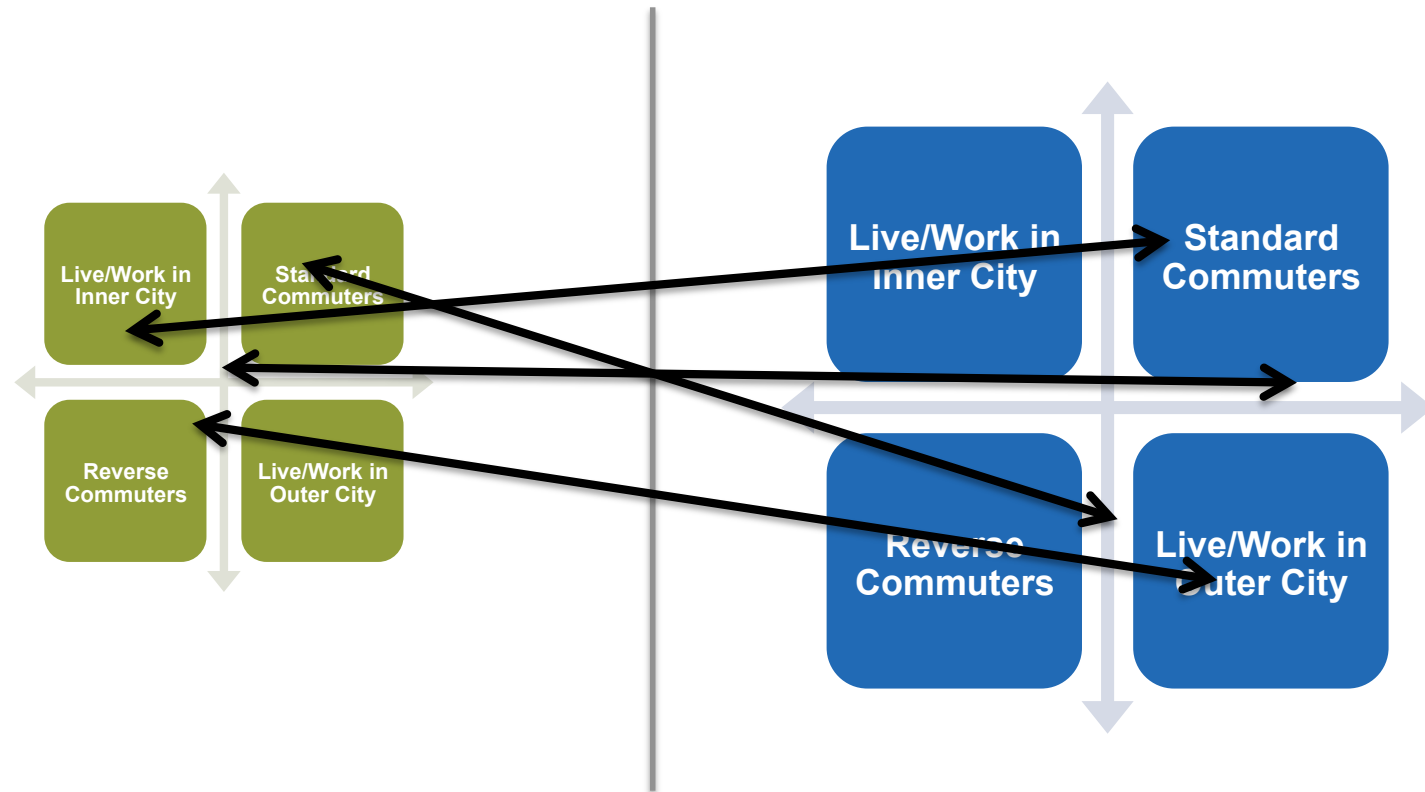
Approach: **Propensity Score Matching**



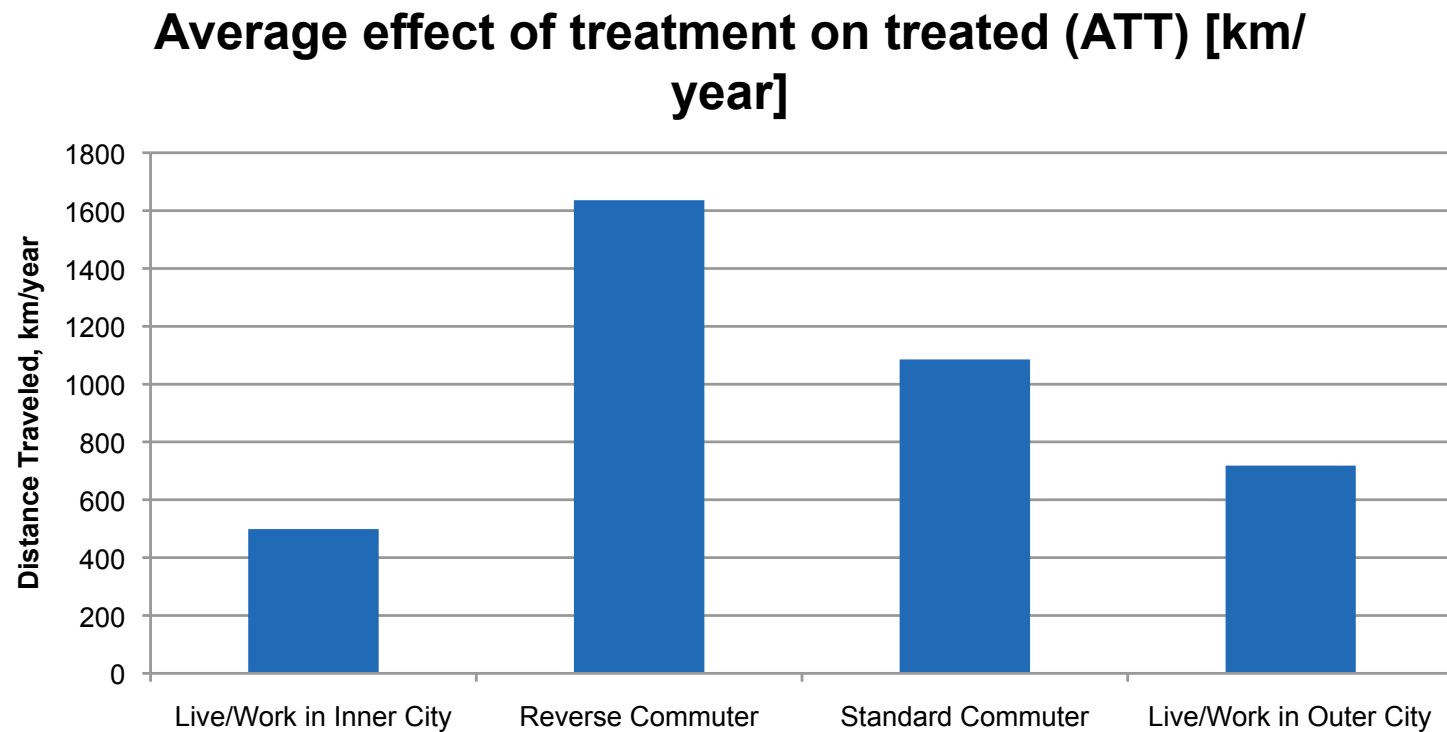
Approach: **Propensity Score Matching**

Green Vehicle Owners

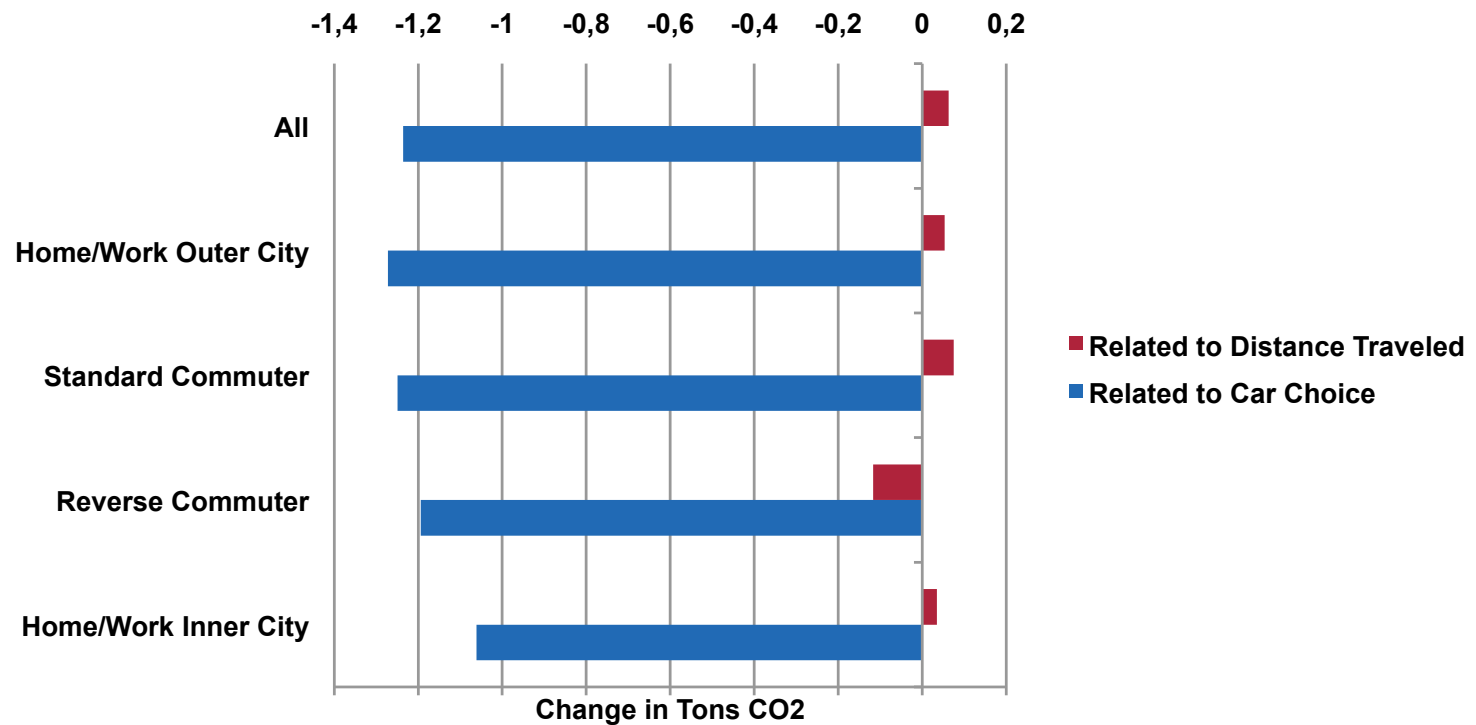
Conventional Vehicle Owners



Results: Increase in Travel Associated with the Green Vehicle Exemption



Results: Estimated Change in Emissions



Free Parking for Green Vehicles

2005

- Free Residential Parking for Alternatively Fueled Vehicles

2009

- Free Residential Parking Discontinued

2012

- Some Free Visitor Parking for “Super-Environmental Vehicles”

Residence Location vs. Car Type – Parking Effect?

Residential Parking Exemption (2005—2009)

Congestion Charging Exemption (2006—2009/2012)

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Concluding Thoughts

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Findings:

- Yes, car choice seems affected.
- Yes, an exemption seems to increase total travel.
- But, the net effect is still a significant reduction in CO2.
- Free parking may have helped, but hard to isolate
- Congestion effects so far unknown.