

**CONGESTION PRICING
AS A PANACEA?**
*EVALUATING THE IMPACTS OF
EXISTING PRICING FOR GUIDANCE*

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Introduction

- Congestion Pricing as a tool to manage congestion
- Existing program with (potential) significance for other facilities: PANYNJ Off-Peak Incentives
- Analysis of benefits (Wolff and Vilain (2007))
- Relevance of findings

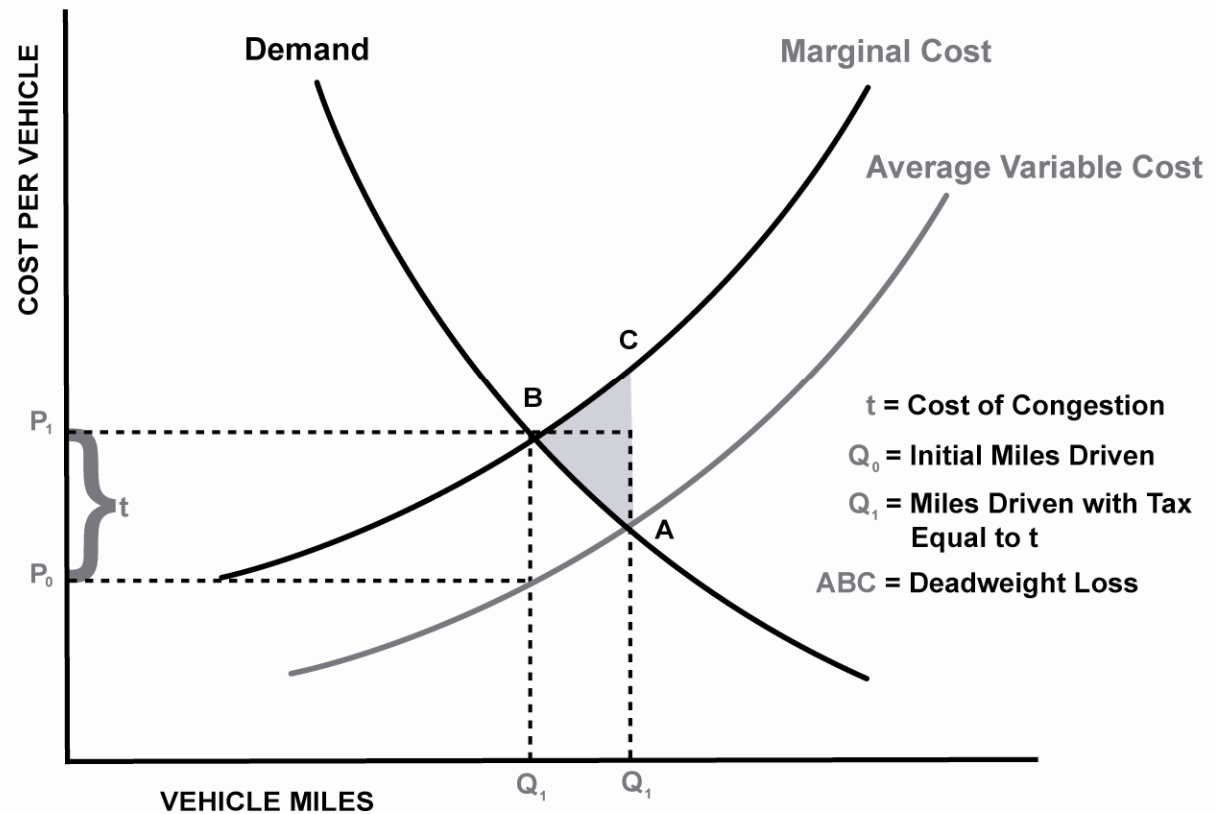
Congestion Pricing as a Policy Tool

- Rationale for Congestion Pricing (CP) of roads dates to at least the 1920s
- Associated most closely with Nobel Laureate William Vickrey
- A remedy for market failure where users of a congested facility are not accounting for the costs they impose on the facility



Congestion Pricing as a Policy Tool

Unpriced Congestion and Deadweight Loss in Transportation



Examples of Existing Congestion Pricing Programs & Impacts

- Singapore Area Licensing Scheme (ALS) pioneer program
 - Large initial response to the pricing program
 - Later price increases yield elasticity response equal to -0.33
- State Road 91 Express Lanes elasticity response of -0.7 to -1.0
- London Congestion Charge reduces vehicles in the charging zone by 12% (cars 34%)
- Lee County, FL elasticity response of -0.02 to -0.24

New York City Congestion Pricing Proposal

- April 2007 Mayor Bloomberg proposes a charge on vehicles entering Manhattan below 86th Street weekdays (6 a.m. to 6 p.m.)
- Wide public support but notable opposition
- Approved by City Council...but dies in the Assembly (March 2008), forfeiting \$345 million in Federal funds

Congestion Pricing at Port Authority of New York and New Jersey Facilities

- In March 2001 CP instituted at the six PANYNJ crossings
- For Eastbound E-ZPass autos, \$4 toll in off-peak compared to \$5 in peak (\$6 for cash users)
- PANYNJ CP program affects crossings that carry roughly 300,000 users daily

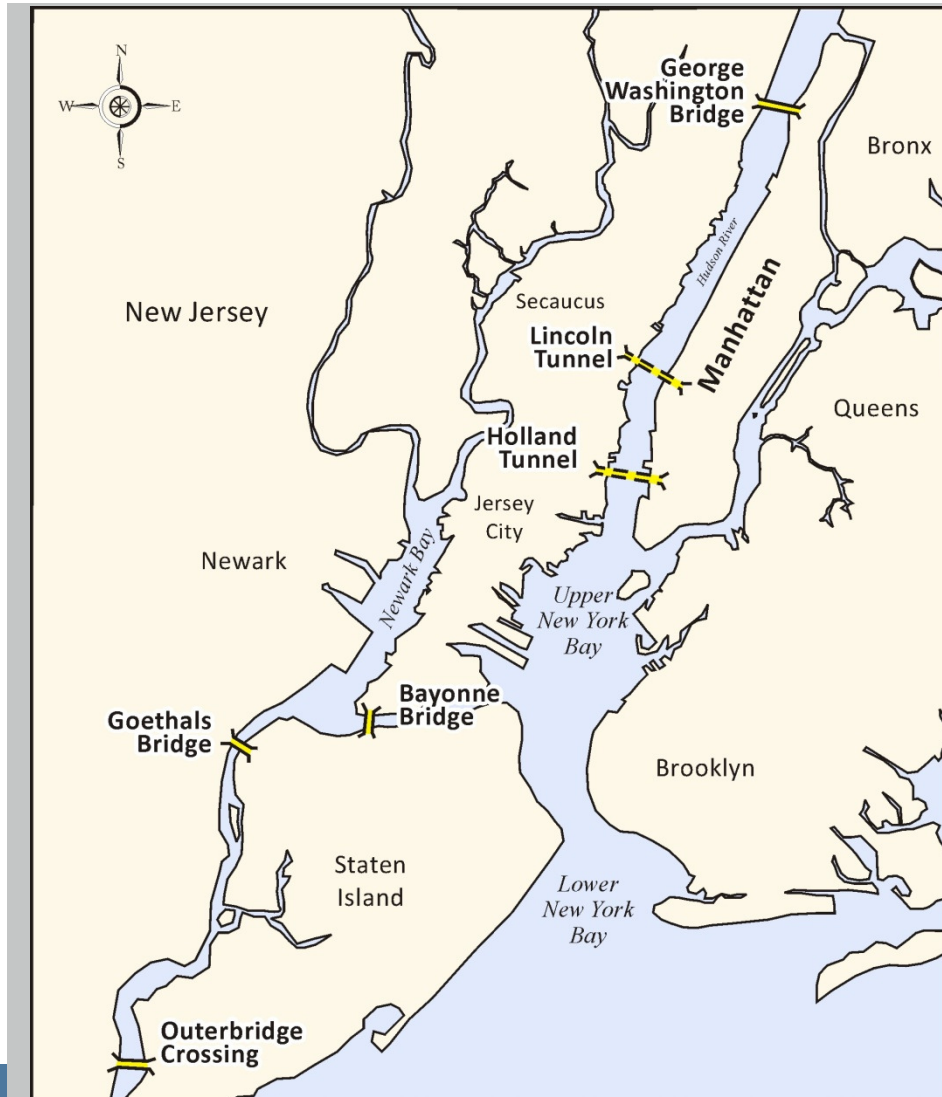


CP at PANYNJ Facilities

- PANYNJ crossings:
 - George Washington Bridge
 - Lincoln Tunnel
 - Holland Tunnel
 - Bayonne Bridge
 - Goethals Bridge
 - Outerbridge Crossing

Key point: PANYNJ crossings only road option until Tappan Zee Bridge

From Paramus, TPZ adds 32 miles and 38 minutes



CP at PANYNJ Facilities

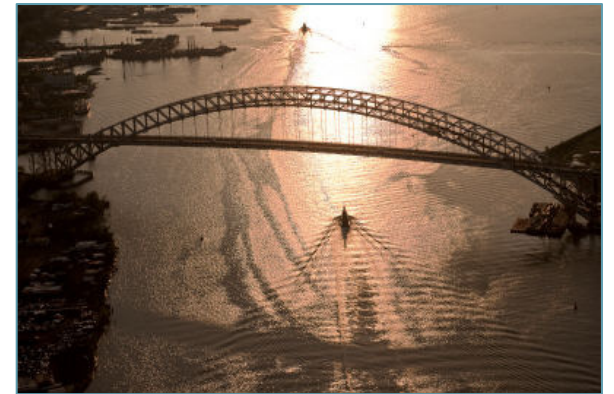
- The impacts have been assessed by Muriello & Jiji and Holguin-Veras et al.
- We use a format similar to Holguin-Veras et al.
- Key differences:
 - More data points (quarterly 2000 to 2005)
 - “Fixed effects” to control for unobserved characteristics of individual crossings
 - Control for “peak spreading” using PANYNJ data on queue length at the crossings

Modeling Approach

- Findings:
 - Autos are the only vehicle class with significant shift from peak to the off-peak
 - The effect is particularly strong for E-ZPass users (as expected)
 - Need correct statistical model to assess the impacts correctly

Modeling the Impacts of Congestion Pricing

- In general, traffic at the crossings fairly inelastic:
 - Lack of route alternatives
 - High journey-to-work
 - High incomes
- Model the impacts of value pricing on the following market shares:
 - Peak / shoulders (1 hour or 2 hours)
 - Peak / off-peak
 - Peak / overnight (trucks)
 - Peak / total off-peak (shoulders, off-peak, and overnight)



Modeling the Impacts of Congestion Pricing

- Problem is analysis finds cash users ALSO shifting
 - No reason for this response
- Is the response due to congestion rather than congestion pricing?
- Introduce delay variable to test for this
 - Minutes of Delay measured at each of the crossings except Bayonne



Modeling the Impacts of Congestion Pricing

- E-ZPass Autos
 - No significant response to delay
 - Toll coefficients are not significantly different from previous model and are significant at the 95% level

E-ZPass AUTOS	Week	
	Toll Coefficient	Delay Coefficient
Morning Peak/Morning After Peak	-0.13**	-0.0003
Evening Peak/Evening Before Peak	-0.20**	-0.04
Evening Peak/Evening After Peak	-0.17**	0.04

*** 99% Significance level

** 95% Significance level

* 90% Significance level

Modeling the Impacts of Congestion Pricing

- Cash Autos

- Positive response in the morning peak could signal a move of motorists back into the peak
- Otherwise, no significant response to value pricing or delay

CASH AUTOS	Week	
	Toll Coefficient	Delay Coefficient
Morning Peak/Morning After Peak	0.11^{***}	0.03
Evening Peak/Evening Before Peak	-0.07	-0.06
Evening Peak/Evening After Peak	0.02	-0.03

*** 99% Significance level

** 95% Significance level

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Modeling the Impacts of Congestion Pricing

Facility-Specific Effects

- Facility-specific toll allows us to analyze the effect at each crossing independently
- Model the share of total volume at each facility for each time period (peak, offpeak, and overnight)
 - The share of crossings in any given time period may be related to the share of crossings in other time periods.
 - Need to estimate the model jointly using Seemingly Unrelated Regression (SUR) model to obtain efficient estimates
- Analysis performed for E-ZPass users only
- Find mixed results by crossing

Modeling the Impacts of Congestion Pricing

E-ZPass Autos

- Results generally conform to expectations with 3 exceptions: Bayonne (morning peak), Goethals (morning peak), Holland (evening peak)

Crossing Facility	Morning Peak Toll Coefficient	Evening Peak Toll Coefficient	Off-Peak Toll Coefficient
Bayonne Bridge	0.37 ^{***}	-0.25 ^{***}	0.07 ^{***}
Goethals Bridge	0.22 ^{***}	-0.48 ^{***}	0.12 ^{***}
Holland Tunnel	-0.11	0.23 ^{***}	0.01
Lincoln Tunnel	-0.34 ^{**}	-0.27 ^{***}	0.11 ^{**}
Outerbridge Crossing	-0.07	-0.18 ^{***}	0.04
George Washington Bridge	-0.40 ^{***}	-0.06 ^{***}	0.10 ^{***}

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Modeling the Impacts of Value Pricing

E-ZPass Light Trucks

- Holland Tunnel excluded due to inconsistencies in the traffic data
- Only a few crossings have a significant response in each time period, with mixed results in the off-peak

Crossing Facility	Peak Toll Coefficient	Off-Peak Toll Coefficient	Overnight Toll Coefficient
Bayonne Bridge	0.13	-0.27**	0.08
Goethals Bridge	-0.24**	0.09	0.40**
Lincoln Tunnel	-0.22	0.32***	-0.14
Outerbridge Crossing	0.15	0.002	-0.09
George Washington Bridge	-0.31***	0.13***	0.30**

*** 99% Significance level

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* 90% Significance level

Modeling the Impacts of Value Pricing

E-ZPass Heavy Trucks

- Holland Tunnel excluded because of 9/11 restrictions on truck traffic
- Limited significant response of heavy trucks

Crossing Facility	Peak Toll Coefficient	Off-Peak Toll Coefficient	Overnight Toll Coefficient
Bayonne Bridge	-0.07	-0.08	-0.05
Goethals Bridge	0.03	-0.07	0.06
Lincoln Tunnel	-0.20	-0.07	0.11
Outerbridge Crossing	-0.57*	-0.19	0.32
George Washington Bridge	-0.11	-0.12**	0.15***

*** 99% Significance level

** 95% Significance level

* 90% Significance level

Modeling the Impacts of Value Pricing

Implied Traffic Shifts

- Calculate shifts in E-ZPass auto traffic out of the peak due to value pricing



Crossing Facility	Morning Peak Change	Evening Peak Change
Autos:		
Bayonne Bridge	9.2%	-6.2%
Goethals Bridge	5.4%	-12.0%
Holland Tunnel	No change	5.7%
Lincoln Tunnel	-8.5%	-6.8%
Outerbridge Crossing	No change	-4.5%
George Washington Bridge	-10.1%	-1.4%
Light Trucks:		Total Peak
Goethals Bridge		-6.0%
George Washington Bridge		-7.7%
Heavy Trucks:		
Outerbridge Crossing		-14.3%

Modeling the Impacts of Value Pricing

Implied Traffic Shifts

- Significant response of E-ZPass autos
 - 8.7% reduction in morning peak traffic
 - 2.5% reduction in evening peak traffic
- Limited response of E-ZPass trucks



Conclusion

- With correct modeling approach we find:
 - Congestion pricing **does** have an effect on traffic volumes and congestion at the PANYNJ facilities
 - Impact on the users we expect: Autos using E-Zpass
 - Time shift much greater from AM than PM peak

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