Fostering the Acceptance of Congestion Charges

Experimental Evidence for Europe

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Outline

1.1 Overview - Congestion Charges

Congestion charge = Fee, payable when entering a city by car

- Often applied during the busiest hours of the day only (e.g. 7:00 am - 19:00 pm)
- Implementation through: license plate recognition cameras, plaquette systems, and others

1.1 Overview - Congestion Charges

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- Implementation through: license plate recognition cameras, plaquette systems, and others

Current examples:

- London (since 2003)
- Milan (since 2012)
- Stockholm (since 2007)

1.1 Overview - Congestion Charges

Consistently positive effects:

- Reduction of traffic volume and travel times (Green et al. 2016, Eliasson et al. 2009)
- Reduction of number and rate of car accidents (Leape 2006)
- Improvement of air quality and lower prevalence of health issues (Gibson and Carnovale 2015, Simeonova et al. 2018, Zheng et al. 2010)

1.2 Implementation Hurdles

If they are so effective, why aren't they more prevalent?

- Lack of political and public support widely cited as the main hurdle for congestion charges (Gu et al. 2018, Altshuler 2010, Schuitema et al. 2010)
- Lack of information leads to uncertainty (Shatanawi et al. 2016, Gu et al. 2018, Odeck and Kjerkreit 2010)
- Status quo bias leads to hestitation about new policies (Börjesson et al. 2016)
  - Congestion Charges in Stockholm and Göteborg were seen much more favorably *after* they had been implemented (Börjesson et al. 2012)

⇒ This study: Information Treatment Experiment

2.1 International online survey (Nov-Dec 2022)

- 7 countries: France, Italy, Poland, Greece, Spain, the UK, and Germany
- 15,822 participants (1,500 per country, 6,000 from Germany)
- Each country sample representative regarding age, education, and gender distributions
- Conducted in November and December 2022
- Collection of socioeconomic characteristics and additional information:
  - Mobility habits, proximity to public transport, etc.
  - Opinions on current traffic problems (general and personal)
  - Previous knowledge of congestion charges

2.2 Experimental Design

1. Briefly explain concept of congestion charges
2. Split sample into three groups and apply treatment
3. **3 randomly assigned treatment groups:**
   - Effectiveness Information Treatment
   - Public Opinion Information Treatment
   - Control

Reasoning:

- Providing information about (personal) benefits of potential policy may alter acceptance
  $\Rightarrow$ "Effectiveness Information Treatment"
- Providing frame of reference by explaining how approval was affected by the policy may act against status quo bias
  $\Rightarrow$ "Public Opinion Information Treatment"

2.2 Information Treatments

Group 1: Effectiveness Information Treatment

"The introduction of a congestion charge has had a demonstrable positive impact in the previously mentioned cities. Here are a few examples:

- The volume of traffic in the city centre decreased in the long term by 18% in Stockholm and by 12% in Gothenburg.
- Congestion has improved significantly in Gothenburg, with journey times on the main traffic routes decreasing by a third.
- In London, the overall number of accidents has decreased by 35% since the congestion charge was introduced."

2.2 Information Treatments

Group 2: Public Opinion Information Treatment

"Gothenburg and Stockholm have already had congestion charges for years.
Before they were introduced, surveys of the local population revealed that the schemes had little support, with only 30% to 40% of respondents finding them a good idea.
However, after the charges were introduced, acceptance of them grew noticeably, with over 50% of respondents in both cities in favour of them."

Group 3: Control Group

2.2 Experimental Design

1. Briefly explain concept of congestion charges
2. Split sample into three groups and apply treatment
3. **Elicit general approval of congestion charge:**
   Between 1 (Strongly disapprove) and 5 (Strongly approve)
   - 4 (Approve) and 5 (Strongly approve) coded as "approval" in analysis
4. Randomly assign a charge level:
   - Low charge level (£2 or equiv.)
   - Medium charge level (£5 or equiv.)
   - High charge level (£10 or equiv.)
5. **Elicit approval (yes/no) for the charge at that price level**

2.3 Models

$$y_{1i} = \beta_0 + \beta_T T_i + \beta_X X_i + \beta_c country_i + \epsilon_i \quad (1)$$

$$y_{2i} = \gamma_0 + \gamma_T T_i + \gamma_X X_i + \gamma_c country_i + \gamma_p price_i + v_i \quad (2)$$

y_{1i}: Approval of congestion charge (0/1)
y_{2i}: Approval of congestion charge at $price_i$
$country_i$: Country dummy
T_i: Treatment group
X_i: Matrix of covariates

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  - Also estimated using Probit (same results)

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$country_i$:	Country dummy		

- Estimated using Linear Probability Models (LPM)
  - Also estimated using Probit (same results)
- Covariates: socioeconomic vars, lives in city, distance and frequency nearest public transport, car ownership and commute behavior, prior knowledge of congestion charges, perception of current traffic problems

4.1 Descriptive results - Previous knowledge

Table 1: Results of survey question CM1a - Have you ever heard of the concept of a 'congestion charge' before?

	The UK	France	Italy	Poland	Spain	Greece	Germany
Yes	76.9%	36.8%	13.8%	18.8%	34.5%	32.9%	62.7%
No	19.4%	60.8%	79.4%	72.1%	62.1%	63.5%	36.2%
Don't know	3.7%	2.5%	6.9%	9.1%	3.4%	3.6%	1.2%

4.1 Descriptive results - before prices

Acceptance rates across intervention groups:
(before concrete charge level is presented to the participants)

Table 2: Congestion Charge Approval by country

	UK	France	Italy	Poland	Spain	Greece	Germany
Control group	34.0%	18.4%	22.3%	29.7%	24.4%	27.2%	34.0%
Effectiveness info	43.3%	27.0%	29.1%	25.6%	33.3%	33.1%	44.0%
Public opinion info	41.2%	27.5%	25.4%	28.5%	29.3%	31.2%	42.7%

- Lowest: France with 18.4%
- Highest: UK and Germany with 34.0%
- Information treatments consistently raise acceptance

4.1 Descriptive results - with prices

Acceptance rates (after specifying prices) across intervention groups:

Table 3: Congestion Charge Approval by country

	UK	France	Italy	Poland	Spain	Greece	Germany
Control group	28.6%	12.1%	16.6%	31.9%	17.7%	30.9%	41.9%
Effectiveness info	35.8%	13.3%	17.8%	36.4%	22.1%	39.4%	47.2%
Public opinion info	38.9%	17.2%	17.9%	33.9%	22.6%	32.1%	47.4%

- Control group: lower acceptance than before prices, except Poland and Germany
- Information treatments still consistent positive effect on acceptance

4.1 Descriptive results - with prices

Acceptance rates (after specifying prices) across prices:

Table 4: Congestion Charge Approval by country

Price level	UK	France	Italy	Poland	Spain	Greece	Germany
Low	46.5%	21.8%	24.4%	42.5%	28.4%	43.7%	62.3%
Medium	33.0%	11.6%	16.2%	33.0%	21.5%	30.4%	44.6%
High	23.7%	9.5%	11.9%	27.0%	12.8%	28.3%	30.1%

- Lowest price: higher acceptance than in control group before prices!
- Acceptance decreases with increasing price

4.2 Regression results

Table 5: Regression results - Coefficients for effects on approval

	No charge levels specified	With specified charge levels
Effectiveness information treatment	0.093**	0.074*
Public opinion information treatment	0.071*	0.100**
Medium level charge (5 Euro or equ.)		-0.140**
High level charge (10 Euro or equ.)		-0.226**
Constant (no treatment)	0.340**	0.408**
Country *X* treatment dummies	Yes	Yes
Country *X* price dummies		Yes

Note: ** and * indicate statistical significance at the 1% and 5% level respectively.

4.2 Regression results - Country heterogeneity

Table 6: Linear Probability Estimations Results on the Acceptance of a Congestion Charge based on Equation (1)

	No charge levels specified		With specified charge levels	
	Coeff.	Std. E.	Coeff.	Std. E.
Effectiveness Information	0.093**	(0.031)	0.074*	(0.030)
Public opinion information	0.071*	(0.030)	0.100**	(0.030)
France	-0.156**	(0.031)	-0.212**	(0.038)
Italy	-0.118**	(0.030)	-0.170**	(0.039)
Poland	-0.043	(0.030)	-0.005	(0.040)
Spain	-0.097**	(0.030)	-0.154**	(0.038)
Greece	-0.069*	(0.030)	-0.004	(0.038)
Germany	-0.000	(0.024)	0.179**	(0.030)
Constant	0.340**	(0.022)	0.408**	(0.027)
Country X price dummies			Yes	
# Observations	14,892		14,020	

Note: ** and * indicate statistical significance at the 1% and 5% level respectively.

4.2 Regression results - Treatment effect heterogeneity

Table 7: Linear Probability Estimations Results on the Acceptance of a Congestion Charge based on Equation (1)

	No charge levels specified		With specified charge levels	
	Coeff.	Std. E.	Coeff.	Std. E.
Effectiveness Information	0.093**	(0.031)	0.074*	(0.030)
Public opinion information	0.071*	(0.030)	0.100**	(0.030)
Effectiveness Information × France	-0.007	(0.043)	-0.061	(0.042)
Effectiveness Information × Italy	-0.025	(0.043)	-0.067	(0.042)
Effectiveness Information × Poland	-0.134**	(0.043)	-0.030	(0.043)
Effectiveness Information × Spain	-0.003	(0.043)	-0.028	(0.042)
Effectiveness Information × Greece	-0.034	(0.043)	0.006	(0.042)
Effectiveness Information × Germany	0.007	(0.034)	-0.016	(0.033)
Public opinion information × France	0.019	(0.043)	-0.050	(0.042)
Public opinion information × Italy	-0.040	(0.043)	-0.090*	(0.043)
Public opinion information × Poland	-0.083	(0.043)	-0.079	(0.043)
Public opinion information × Spain	-0.022	(0.043)	-0.054	(0.042)
Public opinion information × Greece	-0.031	(0.043)	-0.089*	(0.042)
Public opinion information × Germany	0.015	(0.034)	-0.050	(0.034)
Constant	0.340**	(0.022)	0.408**	(0.027)
Country X price dummies	Yes			
# Observations	14,892		14,020	
Adjusted R-Squared	0.02		0.11	

Note: ** and * indicate statistical significance at the 1% and 5% level respectively.

5. Conclusions

- Effectiveness information has significant effect on approval
  - Between 7.4% and 9.3% higher approval
- Public opinion information has significant effect on approval
  - Between 7.1% and 10.0% higher approval
  - Information campaigns vital to garner policy support!
- A low charge level leads to higher approval than not specifying any price at all
  - Giving complete price information important for accurate assessment

5. Conclusions

- Prior knowledge about charge leads to generally higher approval
- Having full information about pricing defines acceptances rates
- Both information treatments are effective in raising acceptance

$\Rightarrow$ Information campaigns vital for garnering policy support!
$\Rightarrow$ Consistent and repeated information about the reason for, design of, and benefits of a policy should be a staple in any policymaker's approach to implementing a new policy.

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Price levels by country

Table 8: Levels of congestion charge fee, allocated randomly to respondents before survey question CM4a, in local currency

Fee Level	The UK	France	Italy	Poland	Spain	Greece
Low	£2.00	2.00 €	1.50 €	3.00 Zloty	1.50 €	1.00 €
Medium	£5.00	5.00 €	4.00 €	8.00 Zloty	3.00 €	2.50 €
High	£10.00	10.00 €	8.00 €	16.00 Zloty	6.00 €	5.00 €

Regression results - Effects of prior knowledge

Table 9: Linear Probability Model Estimations Results on the Acceptance of a Congestion Charge when Interaction Terms on Prior knowledge about congestion charge and Country Indicators are Included

	No Charge Levels		Charge Levels	
	Coeff.	Std. E.	Coeff.	Std. E.
Effectiveness Information	0.099**	(0.031)	0.067*	(0.030)
Public opinion information	0.073*	(0.031)	0.092**	(0.030)
Prior knowledge congestion charges	-0.078*	(0.032)	0.087**	(0.031)
France × Prior knowledge	0.110**	(0.041)	-0.010	(0.040)
Italy × Prior knowledge	0.219**	(0.047)	0.143**	(0.046)
Poland × Prior knowledge	0.245**	(0.044)	0.177**	(0.044)
Spain × Prior knowledge	0.118**	(0.041)	-0.026	(0.040)
Greece × Prior knowledge	0.170**	(0.041)	0.088*	(0.040)
Germany × Prior knowledge	0.193**	(0.034)	0.050	(0.034)
Constant	0.403**	(0.034)	0.342**	(0.038)
# Observations	14,536		13,739	

Note: ** and * indicate statistical significance at the 1% and 5% level respectively.

Regression results - Covariate coefficients

Table 10: LPM Results on the Acceptance of a Congestion Charge

	No charge levels specified		With specified charge levels	
	Coeff.	Std. E.	Coeff.	Std. E.
Effectiveness Information	0.093**	(0.031)	0.074*	(0.030)
Public opinion information	0.071*	(0.030)	0.100**	(0.030)
Female	-0.013	(0.009)	-0.013	(0.009)
Age	-0.000	(0.000)	-0.000	(0.000)
University education	0.054**	(0.009)	0.044**	(0.009)
Medium income	0.031**	(0.011)	0.031**	(0.011)
High income	0.024*	(0.011)	0.038**	(0.011)
Lives in a city	-0.003	(0.010)	-0.023*	(0.010)
Distance to nearest stop ¡ 10 min	0.008	(0.009)	-0.011	(0.009)
Owns a car	-0.170**	(0.018)	-0.141**	(0.019)
Commutes by car	-0.075**	(0.009)	-0.078**	(0.009)
Owns public transport ticket	0.073**	(0.010)	0.087**	(0.010)
Frequent public transport (¡10 min)	0.038**	(0.012)	0.043**	(0.012)
Believes in man-made climate change	0.143**	(0.009)	0.130**	(0.008)
Prior knowledge congestion charges	0.066**	(0.009)	0.112**	(0.009)
Societal view on traffic problems	0.051**	(0.010)	0.050**	(0.010)
Personal view on traffic problems	0.007	(0.008)	-0.020*	(0.008)
Constant	0.216**	(0.042)	0.328**	(0.046)
# Observations	11,867		11,225	

Note: ** and * indicate statistical significance at the 1% and 5% level respectively.

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