Long-term effects of the Swedish congestion charges

Roundtable on Social Impacts of T
Pricing (30 November - 1 Decembe

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This presentation

- Cities, systems and revisions
- Effects over time
- Effects of the revisions
- Public and political support
- System costs
- (Land-use and agglomeration)
- Distribution effects
- Summary and recommendations

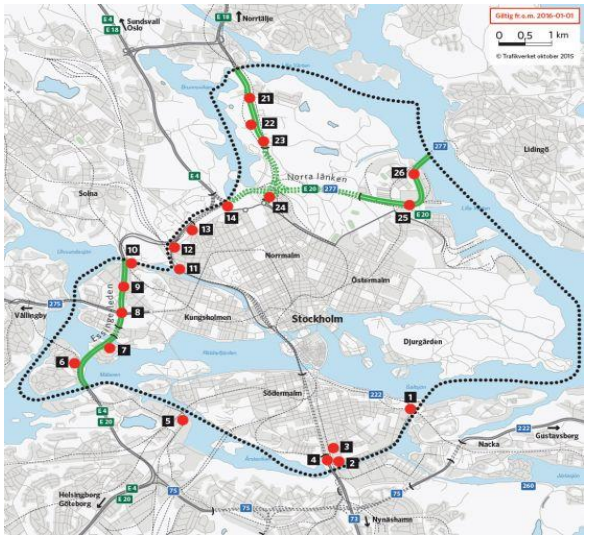
Gothenburg

0.8 million inhabitants
PT share (26% for commuters)
Some congestion (on highway hub)
Freight hub

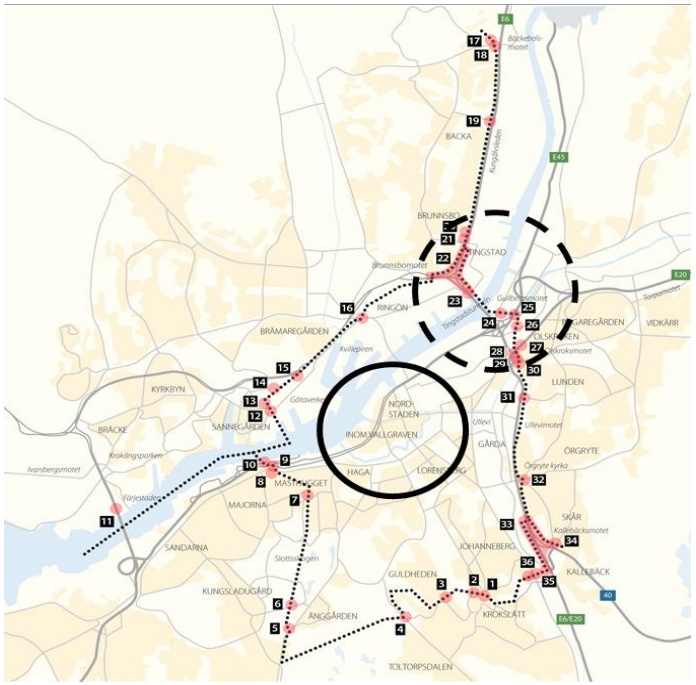
Stockholm

2.2 million inhabitants
PT share (75% peak to CBD)
Bottlenecks on bridges

Systems and Revision



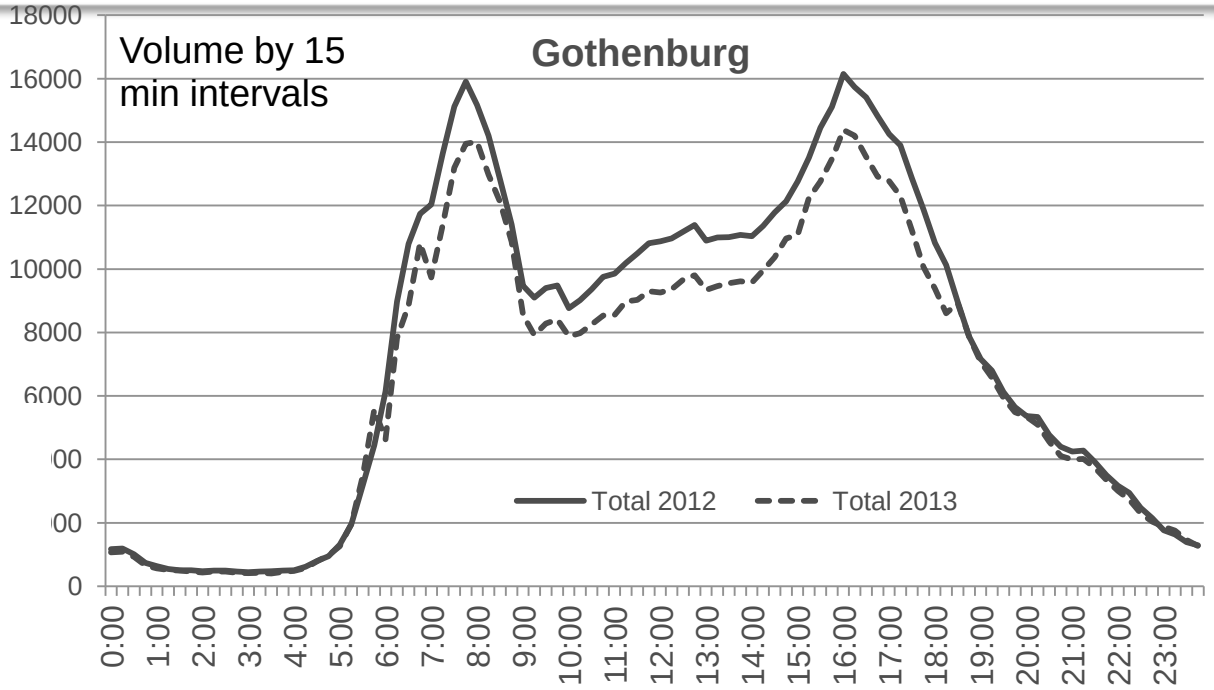
- 2006: 1-2 € per cordon crossing, depending on time of day
- 2016: Peak charge 3.5 € /crossing; Extended to the Essinge bypass
- Max 6 €/day increased to 100 €/day
- No charge evenings and weekends

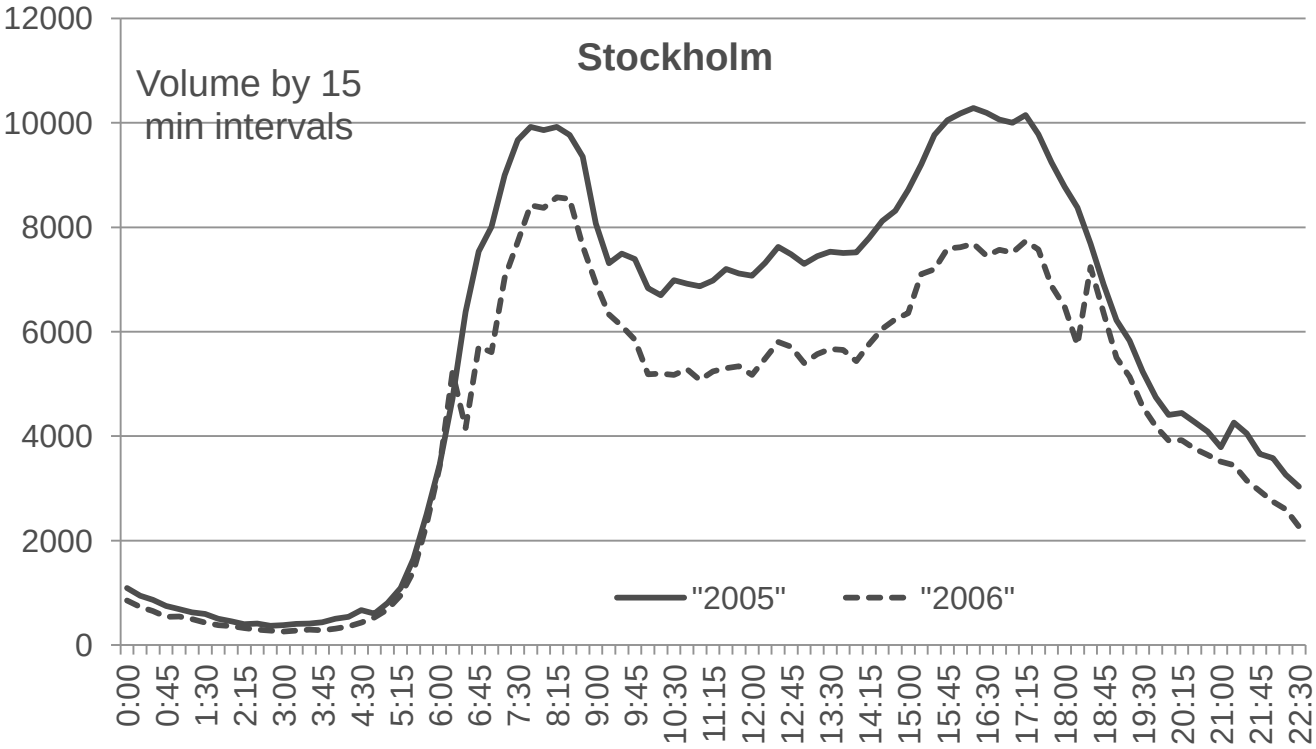


- 2013: 0.8-1.8 €/crossing, depending on time of day
- 2015: Peak charge 2.2 €/crossing
- Max 6 €/day
- No charge evenings and weekends

Short-term effect: It works!

Göteborg -12%





Stockholm -22%

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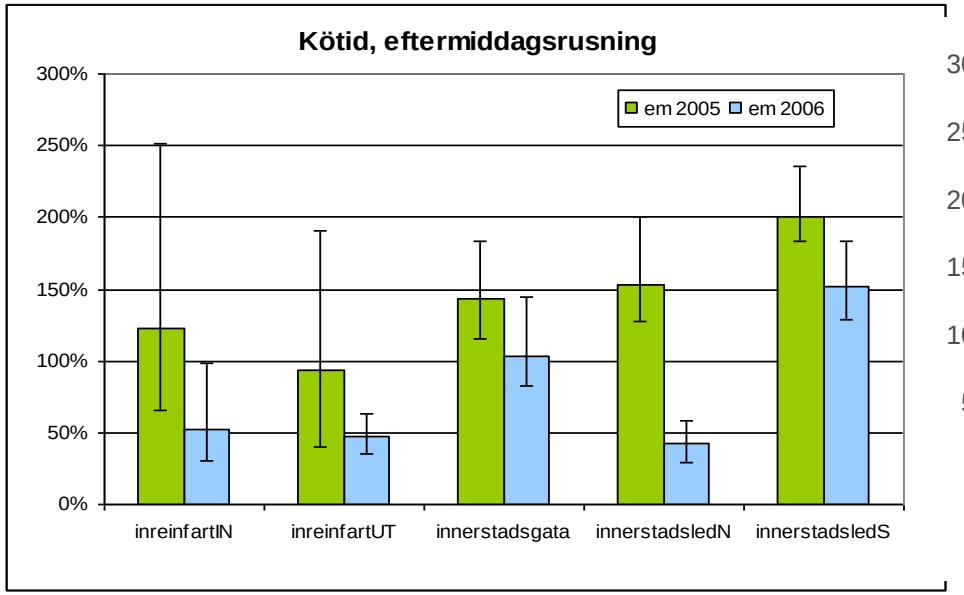
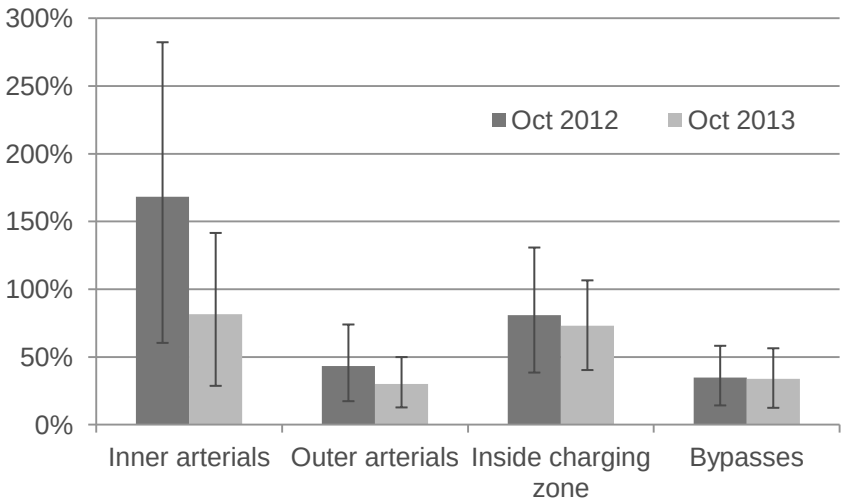
Travel time improvements more local in Gothenburg!

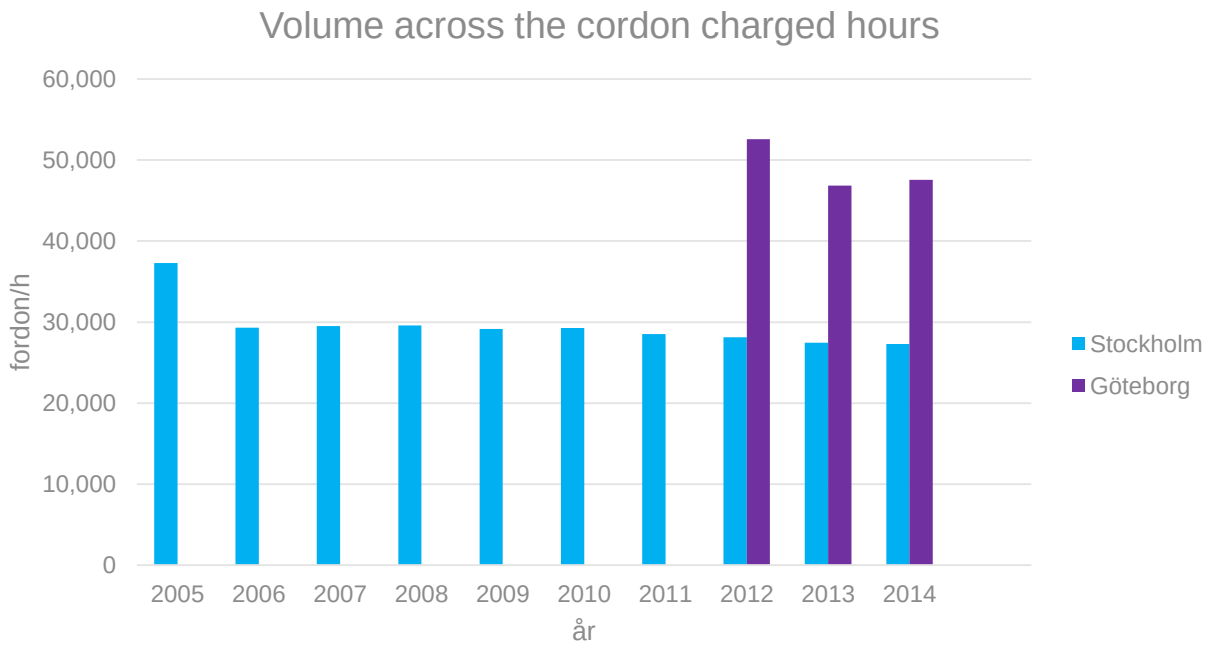
Stockholm



Göteborg



Increasing effect over time in Stockholm decreasing in Gothenburg



- Adjusted for i) total employment in the county, ii) private cars per employed person, iii) fuel price

Effects of the revisions: Elasticities

$$E_{x \to y} = \frac{LOG(D_y) - LOG(D_x)}{LOG(P_y) - LOG(P_x)}$$

$$P_y = real\ charge\ after + distance\ cost$$

$$P_x = real\ charge\ before + \ distance\ cost$$

$$V_y = volume\ befor\ revision\ or\ introdcution$$

$$V_x = volume\ after\ revision\ oror\ introdcution\ (adjusted\ for\ external\ factors)$$

- Stockholm: average distance 17 km
- Gothenburg: average distance 15 km

Smaller elasticities after the increase

	Stockholm	Gothenburg
Traffic volume across the cordon in peak without charge increase (veh/h)	30 898	56 609
Traffic volume across the cordon in peak with charge increase (veh/h)	29 315	56 258
Real average trip cost excluding the charge (EUR)	3.15	2.78
Real average charge (EUR) without charge increase	1.37	0.63
Real average charge (EUR) with charge increase	2.31	0.77
Peak elasticity	-0.28	-0.16
Peak elasticity at introduction	-0.67	-0.53

- Small in Stockholm, tiny in Gothenburg
- The (most) price sensitive traffic already priced-off the road

- Stockholm: peak and off-peak volume both reduce 5%!

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Transaction costs low (only 25% pay charge manually by a paper invoice)

- Automatic number plate recognition

Essinge bypass and the original cordon

Peak

	The original cordon	Essinge bypass (E4/E20)
Real average trip cost excluding the charge (EUR)	3.15	5.92
Traffic volume in peak 2015 (veh/h)	30 898	9245
Traffic volume in peak 2016 (veh/h)	29 315	8816
Change in traffic volume, peak	-5%	-5%
Real average charge (EUR) 2015, Peak, total traffic	1.37	-
Real average charge (EUR) 2016, Peak, total traffic	2.31	2.11
Elasticity peak total	***-0,28***	***-0,16***
Traffic volume in peak 2015, private (veh/h)	13 570	4686
Traffic volume in peak 2016 private (veh/h)	11 878	3990
Change in peak traffic volume, private	-12%	-15%
Real average charge (EUR) 2015, peak, private	1.79	-
Real average charge (EUR) 2016, peak, private	3.07	2.65
Elasticity peak private	***-0,57***	***-0,44***
Traffic volume in peak 2015, trucks (veh/h)	4914	1719
Traffic volume in peak 2016 trucks (veh/h)	4632	1811
Change in peak traffic volume, trucks	-6%	5%
Real average charge (EUR) 2015, peak, trucks	1.79	-
Real average charge (EUR) 2016, peak, trucks	3.07	2.65
Elasticity peak trucks	***-0,25***	***0,14***
Traffic volume in peak 2015, company car (veh/h)	7843	1790
Traffic volume in peak 2016 company car (veh/h)	8175	1977
Change in peak traffic volume, company car	4%	10%
Real average charge (EUR) 2015, peak, company car	0.00	0.00
Real average charge (EUR) 2016, peak, company car	0.00	0.00
Elasticity peak company car	-	-

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Support is unstable

”Charges heading for the ditch”

”Bypass threatened by chaos”

”Charging chaos continues”

”Stockholm loves the charges”

”Charges a success”

”Thumbs up for the charges”

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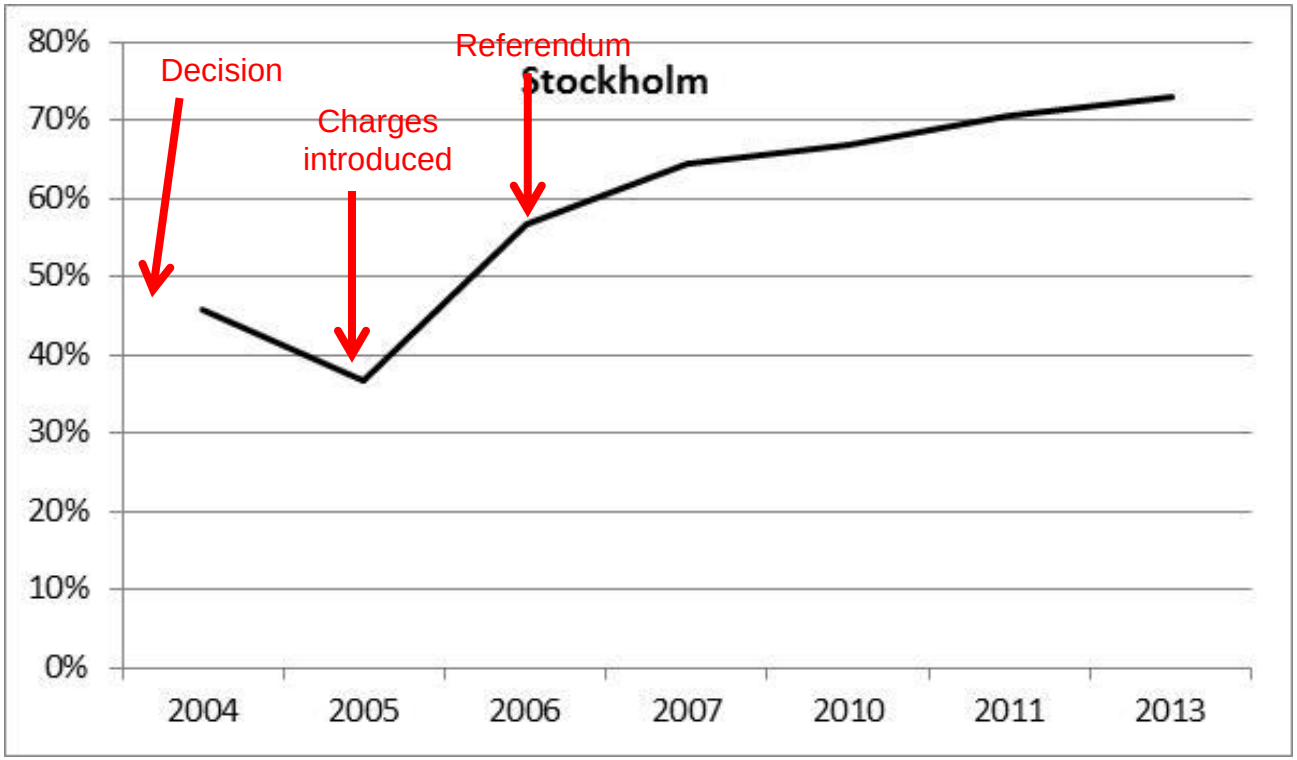
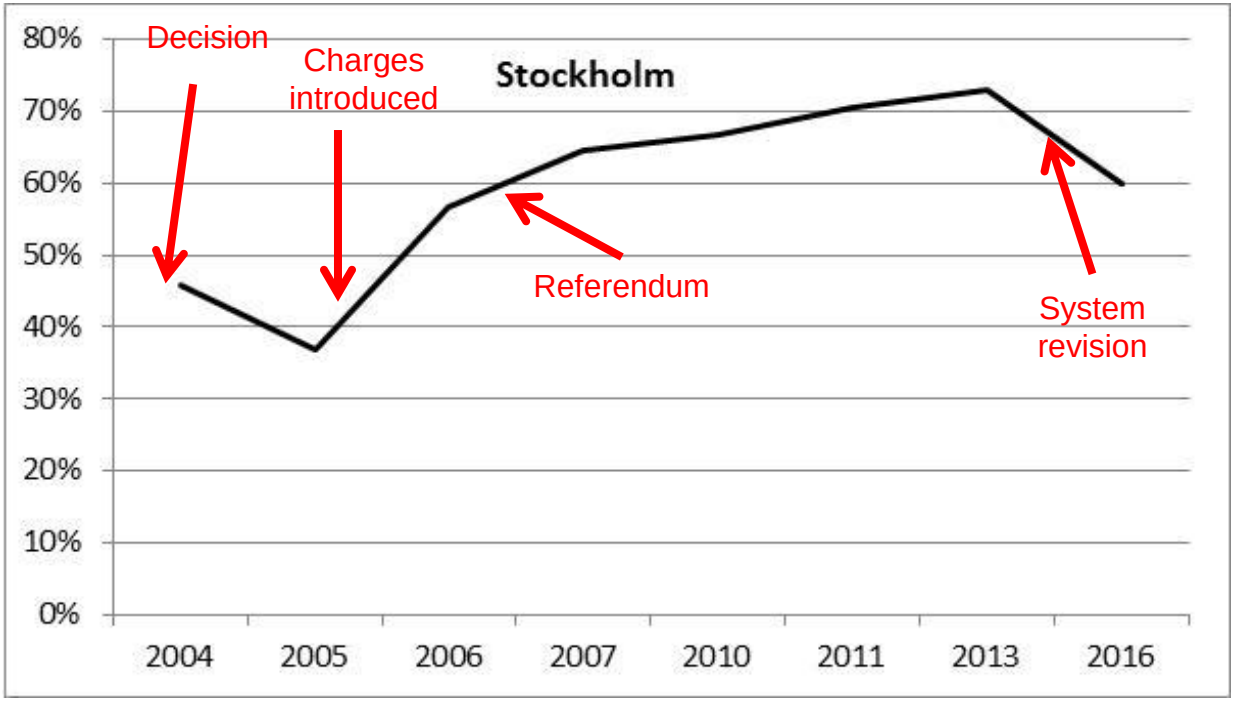
Increasing support since introduction



- Status quo bias

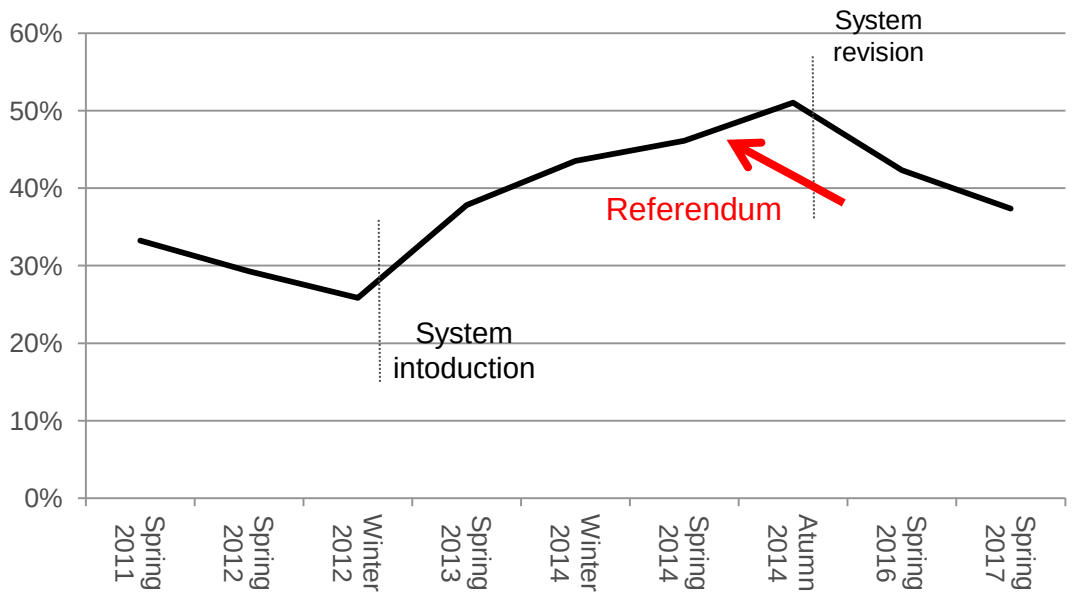
Börjesson, M., Eliasson, J. and Hamilton, C. 2016. "Why Experience Changes Attitudes to Congestion Pricing: The Case of Gothenburg." Transportation Research Part A, 85, 1–16.

Declined after the revision



- In 2013, 47% in favour of charges on the Essinge bypass
- Increased to 53% in 2016

Declining support in Gothenburg



Success story of Stockholm should not be take for granted

- Why does support declines after revisions?
- Trust
- Small traffic effects
- Spending of revue on rail infrastructure with low value for money
- Just another tax instrument

Political support

- 2006: all political parties in Stockholm against the charges except for the green party
- 2007: all political parties in Stockholm in favour!
- Co-fund infrastructure package with national funds (50/50)

- 2012: All established political parties in Gothenburg in favour of charges co-funding a large infrastructure package
- Referendum September 2014, forced through
- 57 percent voted against the charges but they were kept
- Peak charge increased were in January 2015.

- Focus shift to fiscal instrument also in Stockholm: increase again 2020.Co-fund low value for money rail investment

Operation costs and revenue

- Investment in Stockholm 2006: 200 MEUR (Eliasson, 2009)
- Investment cost of Gothenburg 42 MEUR (Börjesson and Kristoffersson, 2015)

	Revenue (M€/year)	Passages (M/year)	Operation Cost (M€/year)	Cost/Revenue (%)
Stockholm 2008	70.9	82.0	22.0	31
Stockholm 2013	86.5	77.5	10.2	12
Stockholm 2015	91.4	80.5	9.6	11
Stockholm 2016	140.0	93.4	10.3	7
Gothenburg 2013	81.0	120.0	13.8	17
Gothenburg 2014	80.0	131.0	12.8	16
Gothenburg 2015	99.5	134.0	12.5	13

- London system 90.1 M£ in 2016 (35% of revenue)
- The Swedish systems automated ANPR (the London system partly manual)

Distribution impacts

- The revenue similar in the two cites
- Most commuters (including low income) are car dependent in Gothenburg
- Company cars: the charge included in the fringe benefit tax
- Neutral/regressive tax instrument!
- Might be OK for internalizing external cost
- But more of a problem when used as fiscal policy
- Recycling of revenues decisive

Summary

Experience mostly positive:

- Increase welfare, reduce travel times and emissions
- The long run effects increased over time in Stockholm
- Public support can be increased: by smart design and status quo bias
- Professional traffic price insensitive
- Investment cost and operating cost decline
- No effects on the agglomeration

But

- Long run effects decreased in Gothenburg.
- Revisions have small effects
  - Remaining traffic price insensitive
  - Large sums redistributed compared to net surplus
- Distributional impacts (worse considering company cars). Recycling of revenues decisive!

Recommendations

- Congestion charges a good idea: Just do it!
- Design carefully and use transport model
- Avoid referendum just before introduction
- Ideal: have a trial
- Don’t take public opinion for granted – get designs right in the first place
- Dynamic pricing: small effects and reduce predictability over revenues
- Build political support without creating incentives for prestigious investments with low value for money

Increasing in Stockholm decreasing in Gothenburg

	2005 (without)	2006 (with)	2007 (with)	2008 (with)	2009 (with)	2010 (with)	2011 (with)	2012 (with)	2013 (with)	2014 (with)
Total effect on traffic volume from external factors		0.51%	2.70%	3.15%	4.61%	3.59%	3.93%	3.50%	6.13%	8.51%
Real average trip cost excluding the charge (EUR)	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55	2.55
Non-exempt volume across the cordon adjusted to 2005 levels wrt external factors (veh/h)	30 021	21 114	21 783	21 614	20 839	21 153	20 721	20 843	20 697	20 550
Real average charge (EUR)		1.28	1.06	1.04	1.06	1.03	0.99	0.94	0.92	0.91
Elasticity charged hours		-0.87	-0.93	-0.96	-1.05	-1.03	-1.13	-1.16	-1.21	-1.24
Elasticity charged hours private		-1.57	-1.93	-2.06	-2.36	-2.26	-2.43	-2.38	-2.42	-2.49

	2012 (without)	2013 (with)	2014 (with)	2015 (with)
Total effect on traffic volume from external factors	-	-0.10%	2.20%	3.42%
Real average trip cost excluding the charge €	2.78	2.78	2.78	2.78
Traffic volume across the cordon adjusted to 2005 levels wrt external factors (veh/h)	52 597	46 855	47 581	47 525
Real average charge (EUR)	-	0.51	0.50	0.59
Elasticity charged hours	-	-0.69	-0.60	-0.52
Elasticity charged hours private	-	-1.18	-1.01	-0.85

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