Congestion pricing

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Content

- Stockholm – a case study
- Effects
- Designing and forecasting
- Determinants of public acceptability
- Institutional context and political acceptability
Background
Stockholm

- 2 million people
- Good public transport – but many cars
- Severe road congestion
A brief history of the Stockholm charges

- Discussed since early 1990’s, but no public or political support
- Introduced as a trial January-July 2006 - extremely controversial!
- Referendum September 2006 – majority *in favour* of charges!
- Charges reintroduced permanently August 2007
- Large majority in favour now (60-70%)
The Stockholm charges

- 10-20 SEK (1-2 €) per cordon crossing, depending on time of day
- No charge evenings or weekends
- Alternative-fuel cars exempt
- Max 60 SEK/day
First transponders, now replaced with ANPR

Free-flow identification
No driver action necessary
Invoice each month – can pay either manually or automatically

Transponder handling expensive
Automatic number plate recognition very effective
Effects
It worked...

"Stockholmers, where did you go?"
"Every fourth car disappeared"
Persistent decrease (\(\approx 20\%\) across cordon)
30-50% less time in queues, and less variability
April 2005/2006

Delay time, PM peak
What happened to disappearing traffic?

Trips

- Discretionary - to Ess.
- Work - to transit
- Discretionary - "disappeared"
- Professional traffic - "disappeared"
- Professional traffic - remaining
- Work - remaining

remaining
Cost-benefit analysis

<table>
<thead>
<tr>
<th>M€ per year</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time gains</td>
<td>56</td>
</tr>
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<td>Reduced emissions</td>
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<tr>
<td>Marginal cost of public funds, shadow price of public funds</td>
<td>13</td>
</tr>
<tr>
<td><strong>Total socioeconomic surplus, excl. investment costs</strong></td>
<td><strong>76</strong></td>
</tr>
<tr>
<td>Annualised investment cost (over 20 years)</td>
<td>-16</td>
</tr>
</tbody>
</table>
Designing and forecasting
## Forecast compared to outcome

<table>
<thead>
<tr>
<th></th>
<th>Forecast</th>
<th>Actual</th>
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</thead>
<tbody>
<tr>
<td><strong>Traffic across cordon</strong></td>
<td>-16%</td>
<td>-20%</td>
</tr>
<tr>
<td><strong>Rush hours</strong></td>
<td>-17%</td>
<td>-18%</td>
</tr>
<tr>
<td><strong>Public transport</strong></td>
<td>+6%</td>
<td>+5%</td>
</tr>
<tr>
<td><strong>Congestion reduction within cordon</strong></td>
<td>294</td>
<td>282</td>
</tr>
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<td><strong>Congestion reduction within cordon</strong></td>
<td>266</td>
<td>201</td>
</tr>
<tr>
<td><strong>Congestion reduction outside cordon</strong></td>
<td>460</td>
<td>-87</td>
</tr>
</tbody>
</table>
Designing charges is difficult
Were forecasts accurate enough?

- Effects on travel demand fairly OK
  - Aggregate flow forecasts OK
  - Effect on leisure trips somewhat underestimated
- Increased transit demand OK
- Effects on travel times vastly underestimated

- If modellers are aware of model limitations – then conclusions are trustworthy, and useful for system design
  - No major design changes if we had had access to ”perfect forecast”
Public opinion
Attitudes change after introduction

"Charges heading for the ditch"
"Bypass threatened by chaos"
"Charging chaos continues"

"Stockholm loves the charges"
"Charges a success"
"Thumbs up for the charges"
Support for congestion charges in Stockholm

- Decision
- Charges introduced
- Referendum
- Govt. decision


Percentage: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%
Development of CC support (Goodwin, 2006)
Determinants of CC support

- Benefits – personal and societal
  - Need objective, comprehensive, independent measurement of effects!
- Experience
  - It’s better than you think
  - It’s not as bad as you thought
- Honesty, consistency, responsiveness of decision makers
- Association to existing strong attitudes
Support depends on personal benefits…

Support for congestion charges

- Have no car
- Pays seldom
- Pays sometimes
- Pays often


Percentage: 0%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%
Support depends on beliefs in total benefits

"I think the charges have brought…"

Support for congestion charges

- Large benefits
- Some benefits
- No benefits
"Adapting" is easier than most believe

- "Have you decreased your number of car trips across the cordon?"
  - Stated effect: 5-10%
  - Measured effect: ~30%

- "Did you become more positive during the trial?"
  - 2006: 29% yes
  - 2007: 13% yes
People change from day to day

- Habitual (5 trips/week) 29%
- Seldom (< 1 trip/week) 25%
- Frequent (4 trips/week) 14%
- Occasional (1-3 trips/week) 32%

Private cars across cordon
Attitudes are (also) formed by "association"

- Unfamiliar questions tend to associate to existing attitudes towards similar questions
  - Beliefs, knowledge, experience => Stronger attitude
  - Linked to identity and emotions => Stronger attitude

Is CC "similar to" something to which people have strong attitudes?

- Efficient allocation in the transport sector? – probably not!
- Tax
- Public intervention
- Environmental measure
- (Price?)
Communication

- Communicating congestion charges is about associating it to the "right" issue – where people already have strong existing attitudes

- Opponents: taxes, restricting freedom, restricting mobility, government intervention, tolls…

- Proponents: environment, efficiency, rationality, market solution…

Institutional and political context
The institutional context

- Charges need to be part of integrated, comprehensive transport planning strategy
  - Charges, road infrastructure, public transport, land use planning
- Power over design and revenues key for political acceptability
- "Package" approach common recommendation
  - Not necessary though
- Consistency between design and stated purpose necessary
- Transparency, responsiveness – and boldness!
Summary

- It works – drivers are affected by costs
- There are many ways to adapt (not just public transport)
- Less than half of traffic is work trips
- People change all the time – so will adapt easier than most think
- Getting acceptance is about consistency and associating to ”right” existing attitudes
- Politicians care about the institutional setting – maybe even more than about public support
Success factors

- Design the system carefully
  - Use good transport models
  - "Too simple" is a more common error than "too complicated"
  - Consistency btw design and purpose
- Communicate the purpose and the effects
  - Independent scientific evaluation of effects
- Stable, transparent institutional arrangement necessary for political support
  - Part of integrated transport planning
  - Local/regional power over design and revenues (usually)
There’s nothing more practical than good theory
"Fields of rationality"

Techical/rational
Efficient?
Consequences
Experts important
Little political gains/risks
Few care (a lot)

Moral
Right? Just? Fair?
Emotions
Experts unimportant
Big political gains/risks
Potentially divisive
Founded in fundamental values
Phase 1: CC for efficiency

- CC advocated as efficiency measure 1960-1990
- Not successful: even IF people agree – no strong attitudes to that
- More "like" taxes etc.
Phase 2: CC as environmental measure

- Instead: link to environmental attitudes (mid-90’s)
- Strong attitude; strong similarity
- Moral and emotions necessary for political engagement
Phase 3: Polarization

- Moral and dramatic arguments link to identity
- Battle for moral high ground
  - "Car user"/"owner"
  - "Freedom"
  - "Democracy"

- More engagement => increasingly divisive issue
- Necessary price for political interest?
Phase 4: De-charging

- Referendum + govt. decision => democratic legitimacy
- Earmark to roads => "OK to be a car driver" (no moral identity attack)

- Technical fix, rather than moral commandment
- "Pricing" not so strange
Less emissions

• 10-14% less emissions in the inner city
  – positive long-term health effects
  – significant reduction of exposure

• 2-3% less CO2 emissions in the county
CBA results – overview

**million Euro per year**

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Investment cost 210 million Euros –

annualised cost 16 million Euros (assuming 20 years lifetime)
Social and financial surplus – if the system is run for more than 4 years

- The congestion charge gives a **financial** surplus of around 550 mSEK/year (net of running costs)
- … and a **social** surplus of around 700 mSEK per year (net of running costs)
- Investment+ first year running costs were 1900 mSEK
- Both financially and socially profitable in around 4 years
Literature

The referendum

- Small majority for the charges in Stockholm city
- Small majority against the charges in Stockholm county
- One third lived in municipalities without referendum
Lesson 1: It works!

- People really are cost-sensitive.
- Fairly small traffic reductions (may) give very large congestion reductions
- The effects seem to stay long-term – and seem to grow over time (more adaptation mechanisms get used)
- But freed-up road-space tends to get used up to some extent – if not by traffic then by bus lanes, roadwork…
- If the latter is done consciously – then good.
Lesson 2: People react in many ways

- Less than half of the trips are commuting trips
- Commuters typically change to transit (in the short term)
- Other trips change in *many* ways (almost untraceable)

- Some won’t even know they changed (1): many are “occasional car drivers” who change on the margin
- Some won’t even know they changed (2): people change for many other reasons – remember Herakleitos

- No measurable retail effects
Lesson 3: Getting high benefits

- Define the purpose(s)
  - Need to *have* problems – congestion or air quality, for example
- Keep politicians from the design details – force them to talk about purposes, goals, constraints
  - We’ll return to “fairness”
- Translate purposes into targets (percentage reduction e.g.)
- Design and forecast very carefully
  - Good models (a speech of its own – VoT classes for example…)
- Allow for several adaptation possibilities
- Keep design possibilities open so you can change the design “on the fly” (need to solve legal things here)
Effective or simple?

- A simple system may be nearly as good as a first-best one
- But not too simple – need to achieve benefits!
- Singapore and “value pricing” road are “complicated” designs – that work
- Tech. costs are not necessarily higher for “complex” designs
Lesson 5: Getting cost-efficient technology

• Choose cost-efficient technology
  • don’t design the tender so you exclude cost-efficient technologies

• Get a good negotiating position
  • Not your back against the wall
  • Stockholm a warning…

• Political risk => Administrative risk => Commercial risk => Insurance costs
  • Risk reduction by e.g. redundant components
  • Operator wants compensation for high risk
Lesson 6: Getting acceptability

- Idea is OK, but details scare people off.
  - Have short time between decision and introduction
  - Don’t have a referendum before right before start
- "Familiarity breeds acceptability”
  - it’s better than you thought (larger benefits)
  - it’s not as bad as you thought (less adaptation and monetary costs)
  - It’s the transition that bugs people.
- Need to have a clear purpose and deliver benefits
  - Purpose also serves as "branding”
  - Measure and market effects
  - Hypothecate revenues
What is "fairness"?

- “Before-after” perspective…
- …or “congester/polluter pays” perspective?

- Remember (1): most people (70% of private cars) are ”occasional car drivers” that can probably change on the margin
- Remember (2): people change for many other reasons. Who are the ”losers” after a few years?
Political acceptance

- Mistrust between cities, regions, national level
- Power over revenues and charge levels?
- What happens to national grants to regional infrastructure?
- Who gets the (real) power over money and charge levels?
- How does this affect negotiation between state/region on infrastructure money?