Equity effects of congestion charges
–
a Stockholm perspective

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The Stockholm congestion charges

- Trial period during spring 2006
- Referendum Sept 2006 – close "yes"
- Reintroduced Aug 2007
- Large positive majority now (~70%)

- 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

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<th>Time</th>
<th>Amount</th>
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<td>18.30-06.29</td>
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</table>
Stable traffic decrease ≈20% across cordon

Vehicles across cordon 6.00-19.00

2005 before charges
2006 with charges
2007 with charges
2008 with charges

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Parts of the traffic decrease remained after charges were abolished!

*dashed line – 2006-2007 ”between” charging*
30-50% less time in queues

Delay time, PM peak

- Inner main roads, inbound
- Inner main roads, outbound
- Inner streets
- Inner main roads, northbound
- Inner main roads, southbound
What happened to disappearing traffic?

![Pie chart showing different travel patterns.](chart.png)
Equity impacts
Problems with quantifying equity impacts of congestion charges (1)

- Differences in values of time
  - between travellers
  - between trips
- Self-selection – trips with the highest values of time stay on the road
- Travel time benefits are underestimated
Problems with quantifying equity impacts of congestion charges (2)

- **We don’t know the variation within a group** if we measure *one day’s travel*
- Difference between groups smaller than difference within groups
- Example: Assume average cost is 1 SEK/day. Do ”everybody” pay 50 SEK every 50th day, or do 2% pay 50 kr *every day*?
Problems with quantifying equity impacts of congestion charges (3)

- **Use of revenues is decisive**
- How the revenue is used will matter more than "direct impact" in terms of equity impacts
How many are affected?

- May pay sometimes – few pay often
  - During two weeks, half of the car owners pay the charge sometimes…
  - … but less than 5 percent of car owners pay more than 100 kr/week

- A small group pays a substantial part of the charges
  - 5 percent of the car owners pay a third of the charges

Almost half of the cars in the county

5% of the cars – 1/3 of revenues
Who pay the most?

- **Inner city residents** pay twice as much as the rest in the county
- "**Rich**" **households** pay three times as much as "**poor**" households
- **Employed** pay three times as much as the rest
- **Men** pay twice as much as women
- **Households with children or two adults** pay 50% more than the rest (per person)
High income segments pay more…

- High 29%
- Mid high 27%
- Middle 19%
- Mid low 17%
- Low 8%
...middle income segments change more

- Low -6%
- Mid low -25%
- Mid high -9%
- Middle -30%

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Rich lose more than poor – before revenue recycling

Direct effects

Net effect after revenue recycling

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Inner city residents supposedly the biggest losers – but are the most positive!

- Inner city residents lose twice as much as the rest
- Why are they the most positive?
- We neglect self-selection effect on values of time
- … and effects on perceived urban environment
Conclusions

• Equity really not a big issue in reality – only politically:
  – … at least in relatively affluent countries with decent transit shares
  – ”rich men” pay most and change the most – ”no problem” from a political equity perspective
  – total charge payments relatively small – most pay seldom
• Traditional equity analysis neglects the decisive effects:
  – variation within groups (frequent payers vs. occasional payers)
  – revenue use
  – self-selection effects on VoT’s
  – perceived urban environment
• Are they even meaningful?
  – considering that support and formal equity calculation point in opposite directions!
There’s nothing more practical than good theory.
30-50% less time in queues

Delay time, AM peak

- Inner main roads, inbound
- Inner main roads, outbound
- Inner streets
- Inner main roads, northbound
- Inner main roads, southbound

(Chart showing percentage change in delay times for different road types, comparing 2005 and 2006 data.)

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Public opinion

- Support for the charge lowest right before the start...
- ... but rapidly increased once effects became visible
- "U-curve" typical
- Inner city residents most positive – inner periphery most negative
- Women and young more positive
Men changed more than women

Car trips during charged hours starting or ending inside the cordon

Women -9%
Men -21%
Men lose more than women – before revenue recycling

Direct effects

Net effect after revenue recycling
As during the trial – but less cong. to begin with than in April

Small effects now and during the trial
As during the trial – but less cong. in April

Small effects now and during the trial
Forecasting traffic effects

-25%  -20%  -15%  -10%  -5%  0%  5%

forecasted effects

-25%  -13%  -6%  0%

-25%

Streets inside

Streets inside, large

Main roads inside

Veh. km. inside cordon

Across cordon

Main roads outside cordon

Main roads far from cordon

Streets outside

"Ring roads"
Forecasts – what worked and what didn’t

- Percentage effects for charged hours correct
  - Increase on Essinge bypass less than expected
- Wrong relation on relative effects morning/mid-day/afternoon
- Missed effect on night traffic
- Less effect on departure times than expected
- Effects on travel times larger than expected

- Static models underestimate ”junction blocking” effects of congestion – hence underestimating congestion reduction effects
- Too low values of time & larger travel time effects in the inner city => less increase on Essinge bypass
- Too simplified modeling of trips’ distribution across the day