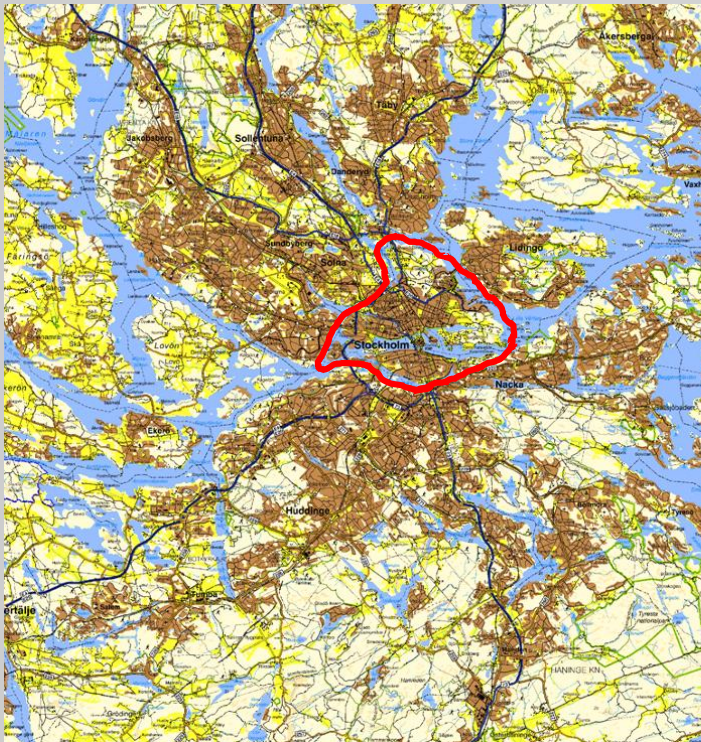


# Equity effects of congestion charges — a Stockholm perspective

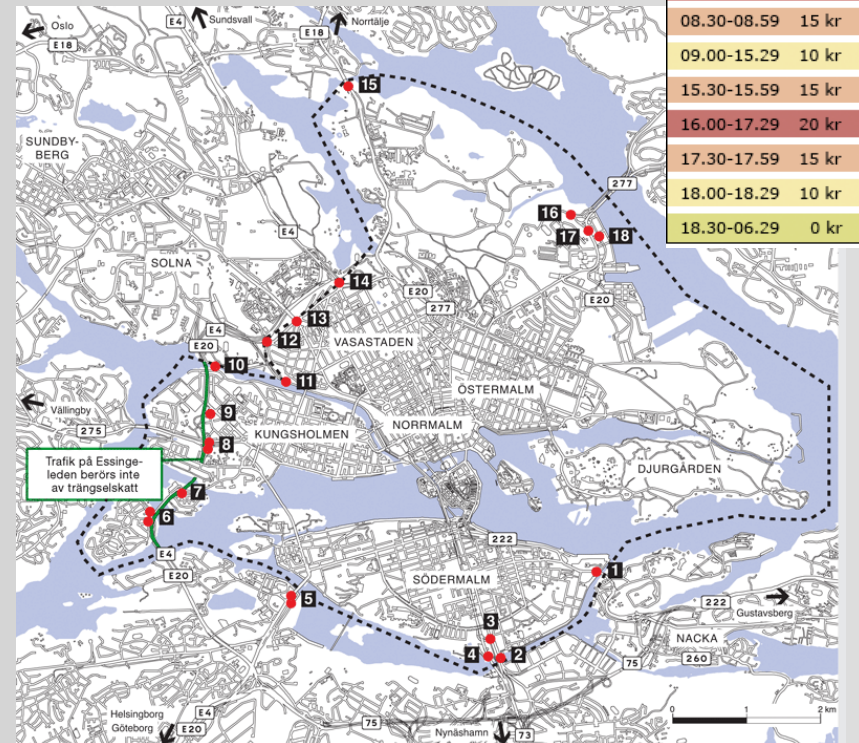
Jonas Eliasson

Professor Transport Systems Analysis,  
Centre for Transport Studies, KTH  
Chairman of the evaluation expert group

# The Stockholm congestion charges



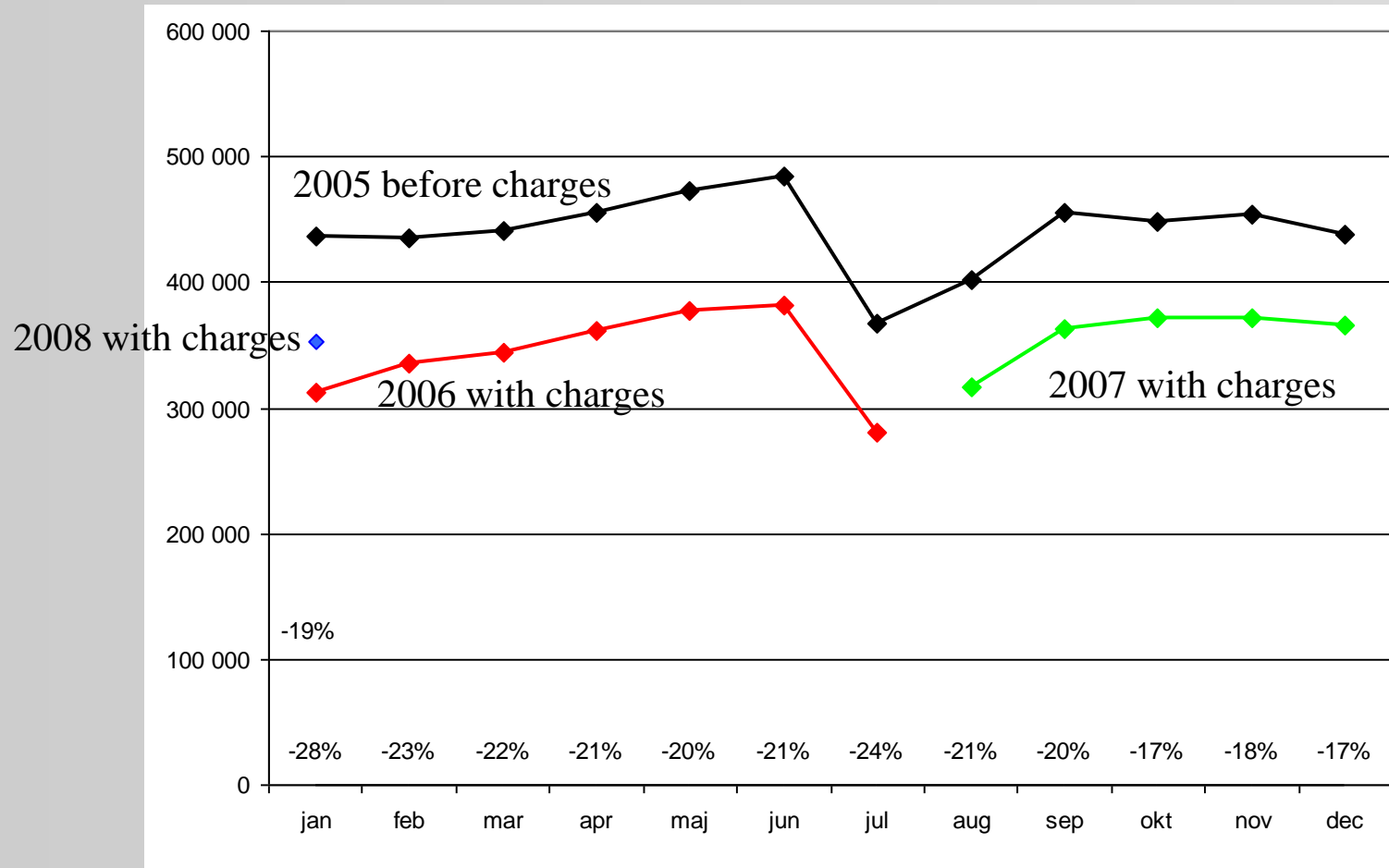
- Trial period during spring 2006
- Referendum Sept 2006 – close "yes"
- Reintroduced Aug 2007
- Large positive majority now (~70%)



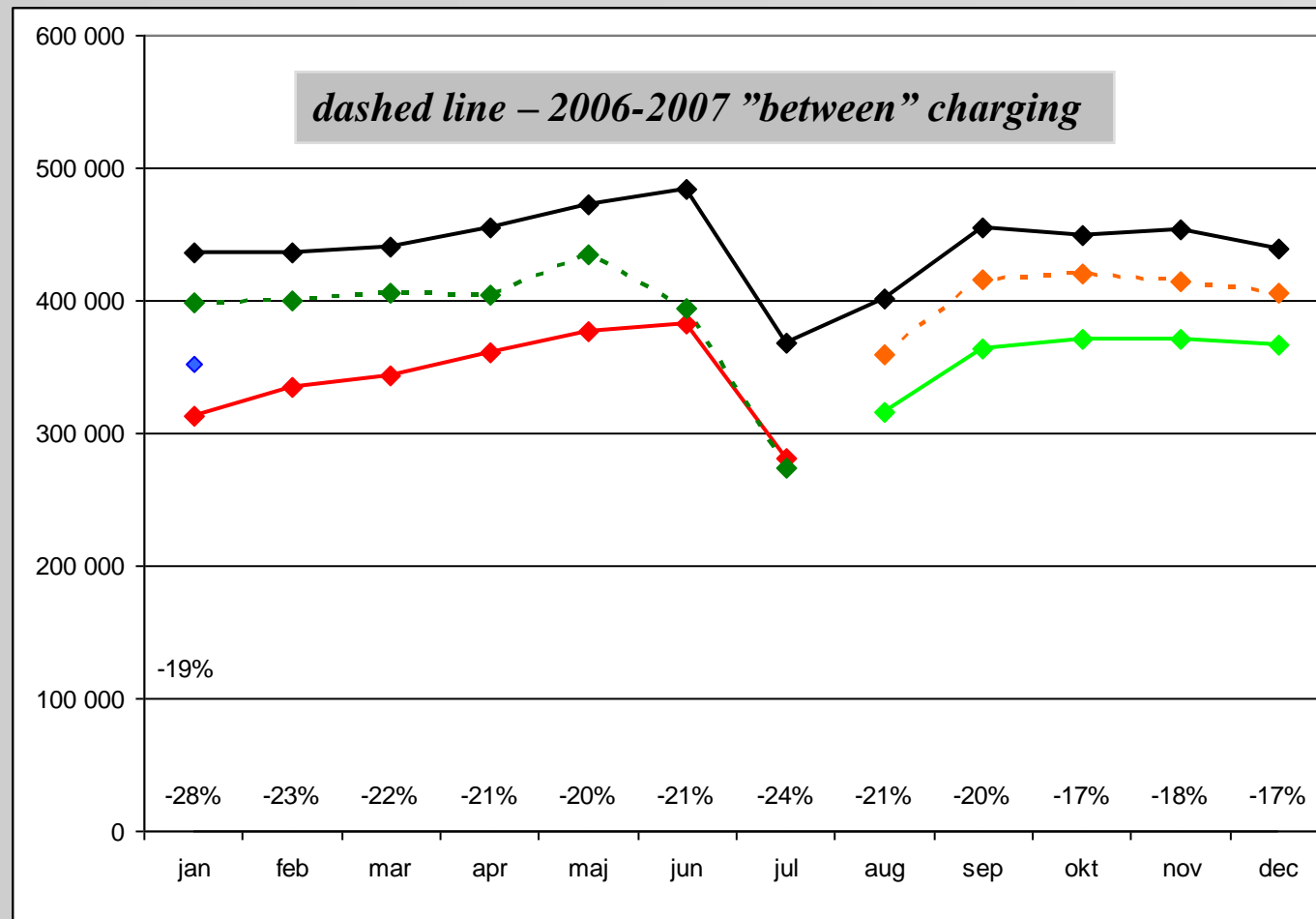
- 10-20 SEK (1-2 €) per cordon crossing, depending on time of day
- No charge evenings or weekends
- Alternative-fuel cars exempt
- Max 60 SEK/day

# Stable traffic decrease $\approx 20\%$ across cordon

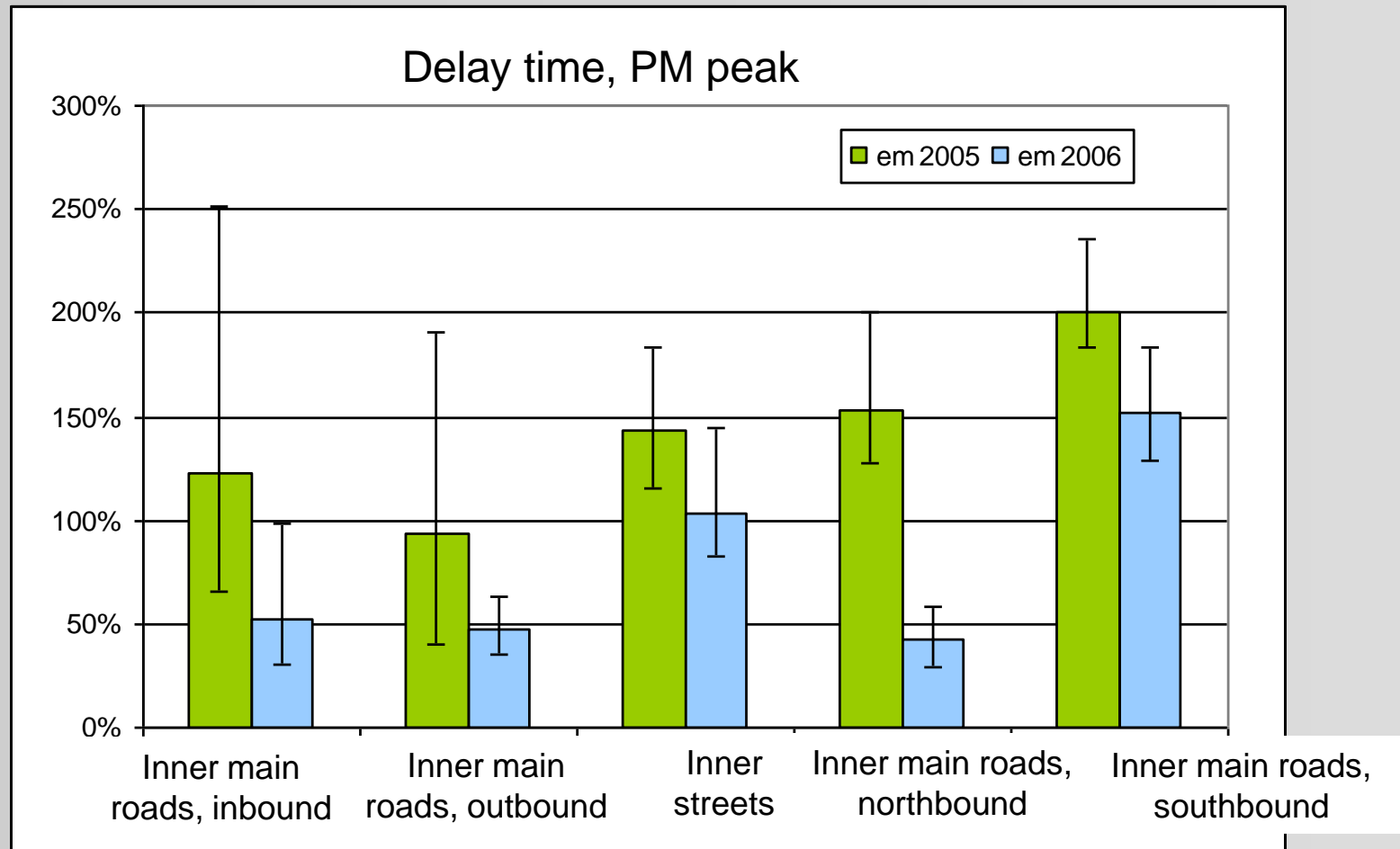
Vehicles across cordon 6.00-19.00



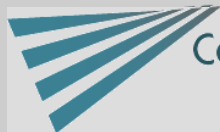
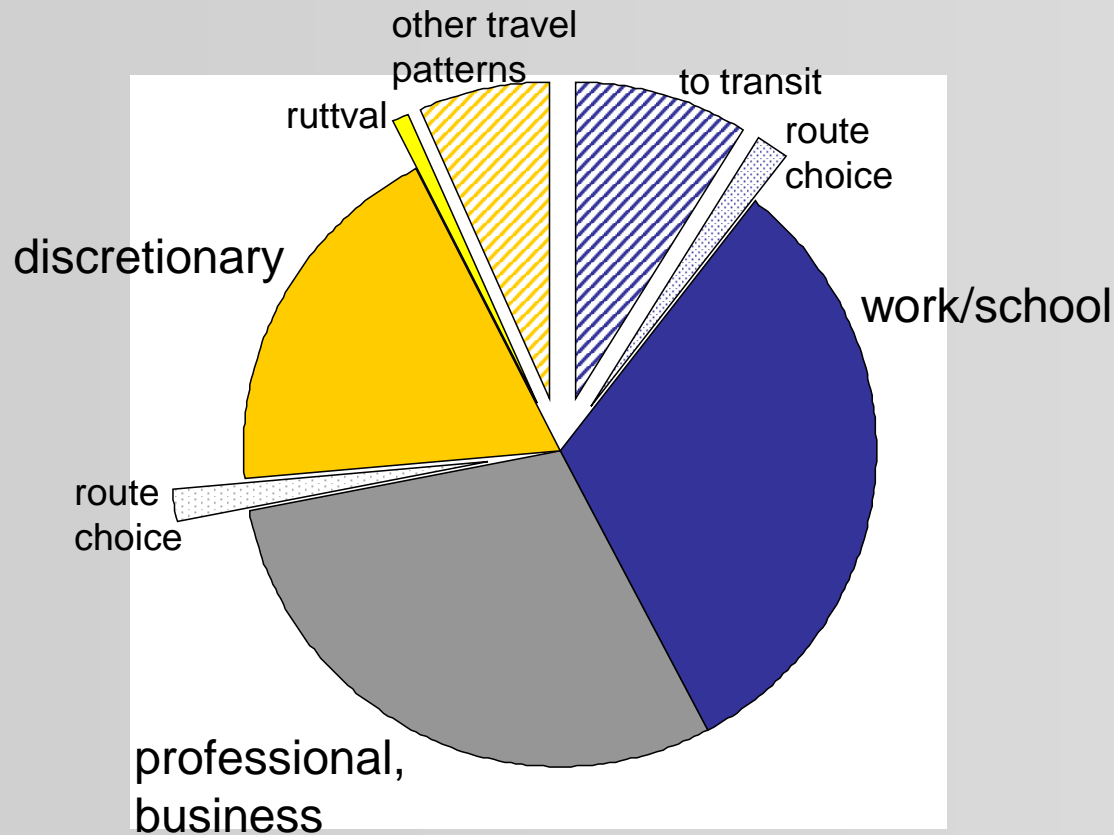
# Parts of the traffic decrease remained after charges were abolished!



# 30-50% less time in queues



# What happened to disappearing traffic?



# 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)

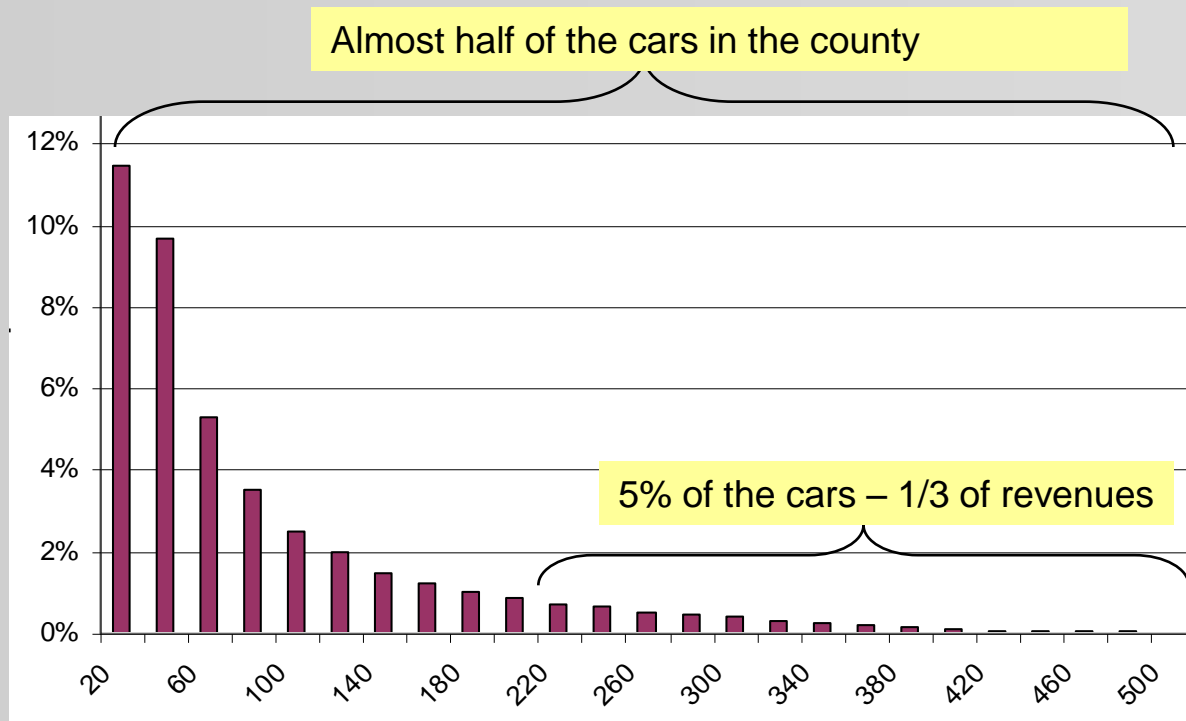
- **We don't know the variation within a group** if we measure *one day's travel*
- Difference between groups smaller than difference within groups
- Example: Assume average cost is 1 SEK/day. Do "everybody" pay 50 SEK every 50th day, or do 2% pay 50 kr *every day*?

# 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?

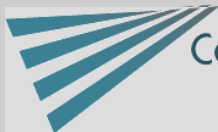
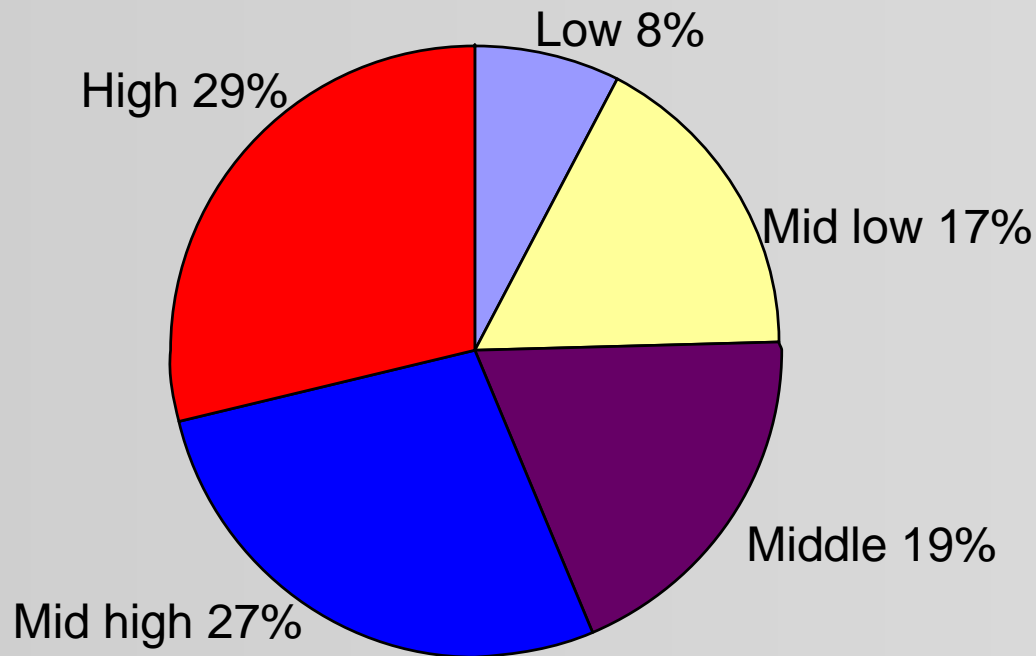
- May pay sometimes – few pay often
  - During two weeks, half of the car owners pay the charge sometimes...
  - ... but less than 5 percent of car owners pay more than 100 kr/week
- A small group pays a substantial part of the charges
  - 5 percent of the car owners pay a third of the charges



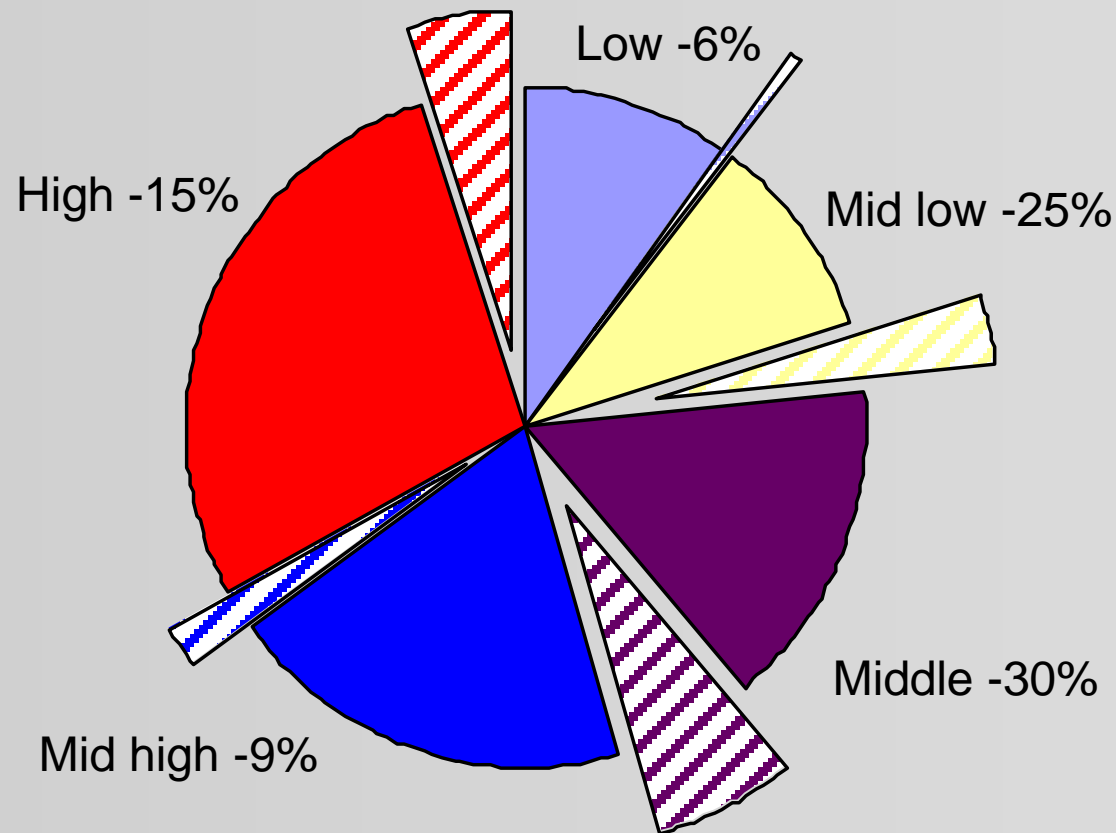
# Who pay the most?

- **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...

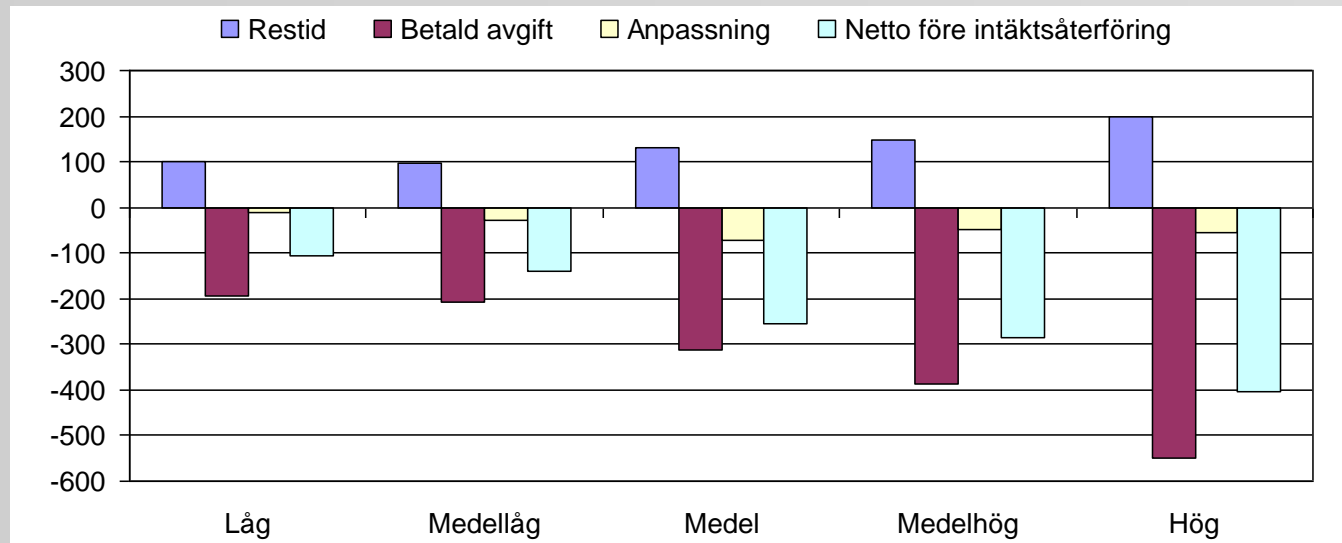


...middle income segments change more

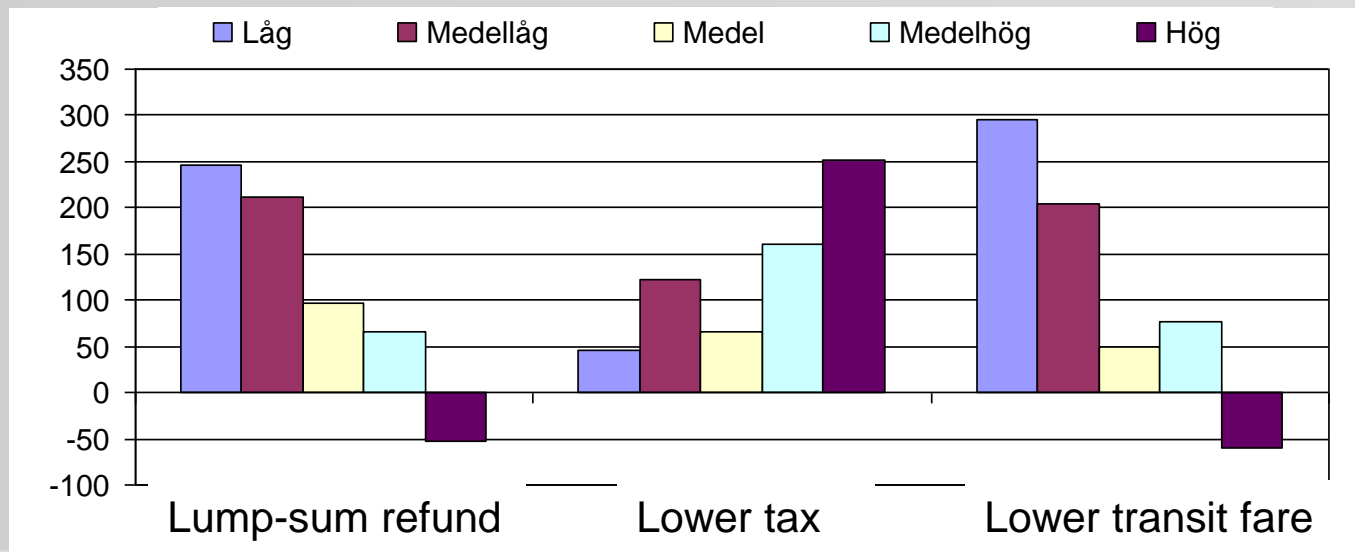


# Rich lose more than poor – before revenue recycling

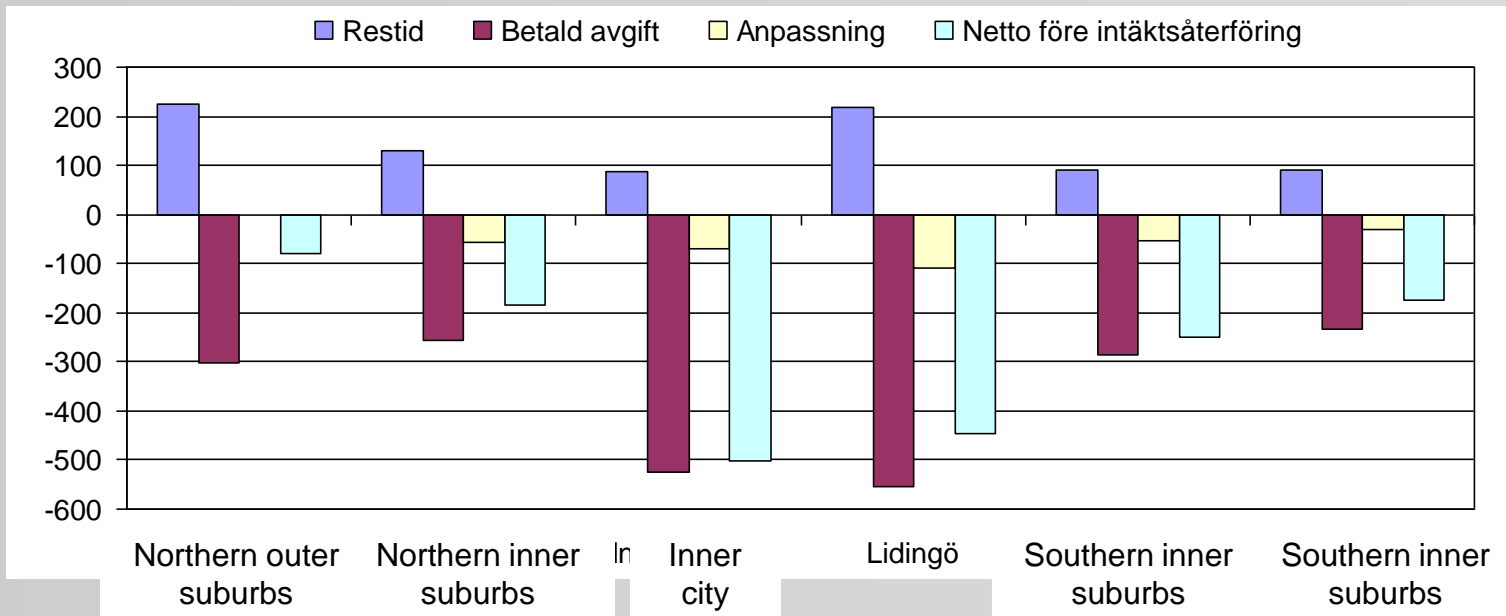
Direct effects



Net effect after revenue recycling



# 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

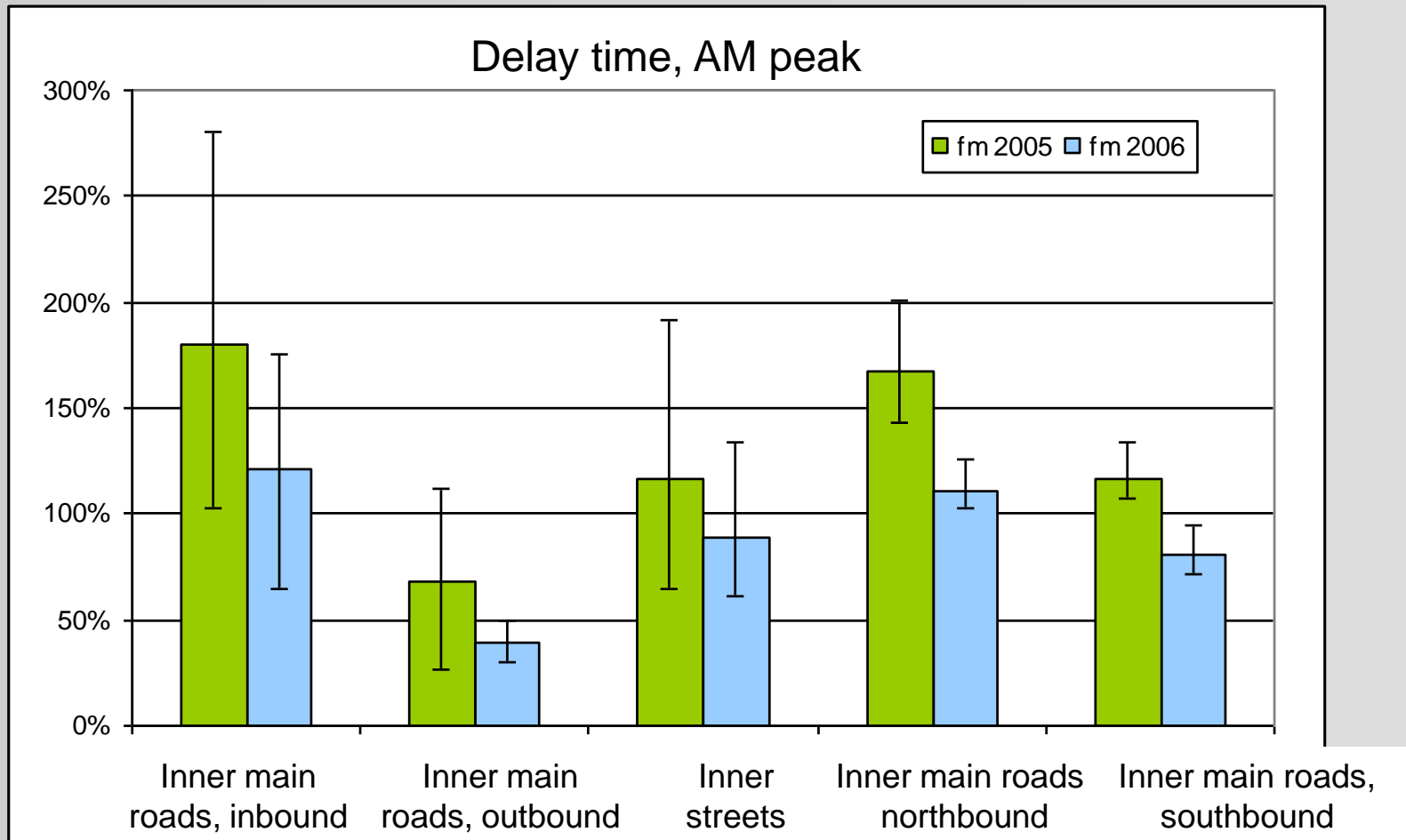


# Conclusions

- 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.

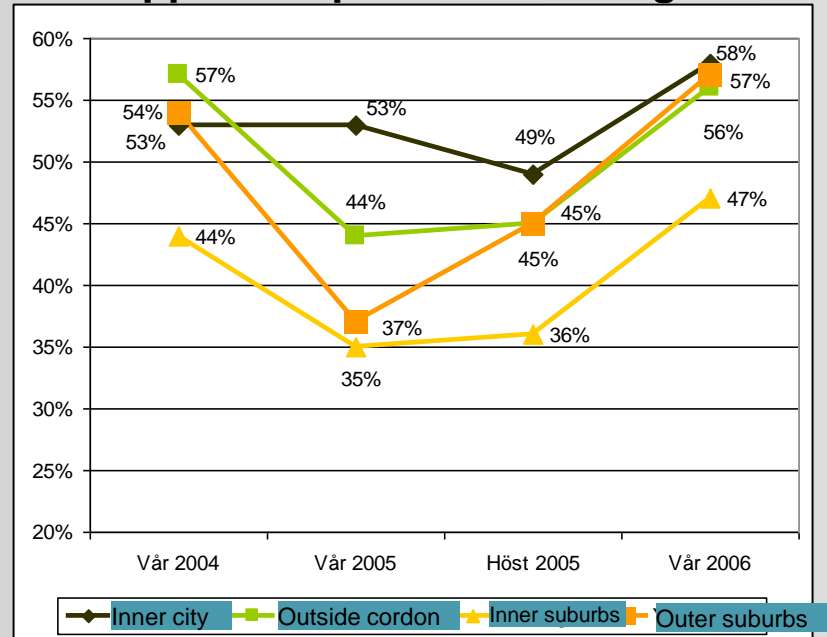
# 30-50% less time in queues



# Public opinion

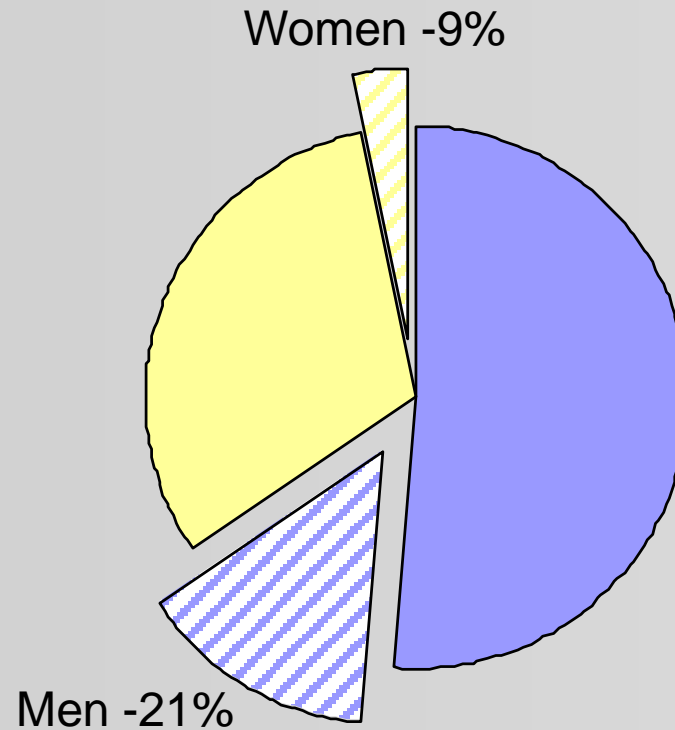
- Support for the charge lowest right before the start...
- ... but rapidly increased once effects became visible
- "U-curve" typical
- Inner city residents most positive – inner periphery most negative
- Women and young more positive

**Support for permanent charges**



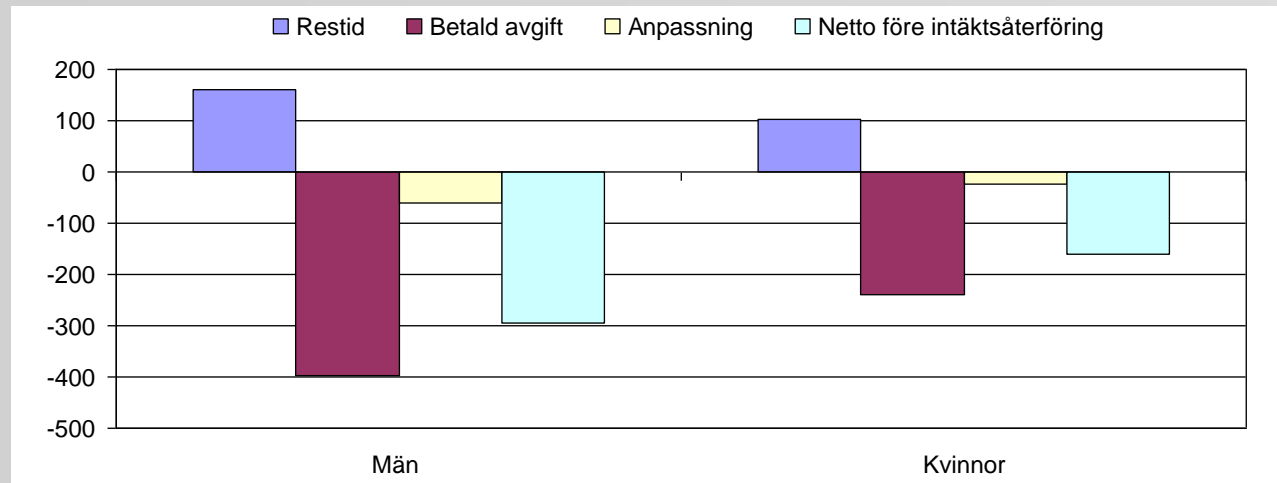
# Men changed more than women

*Car trips during charged hours starting or ending inside the cordon*

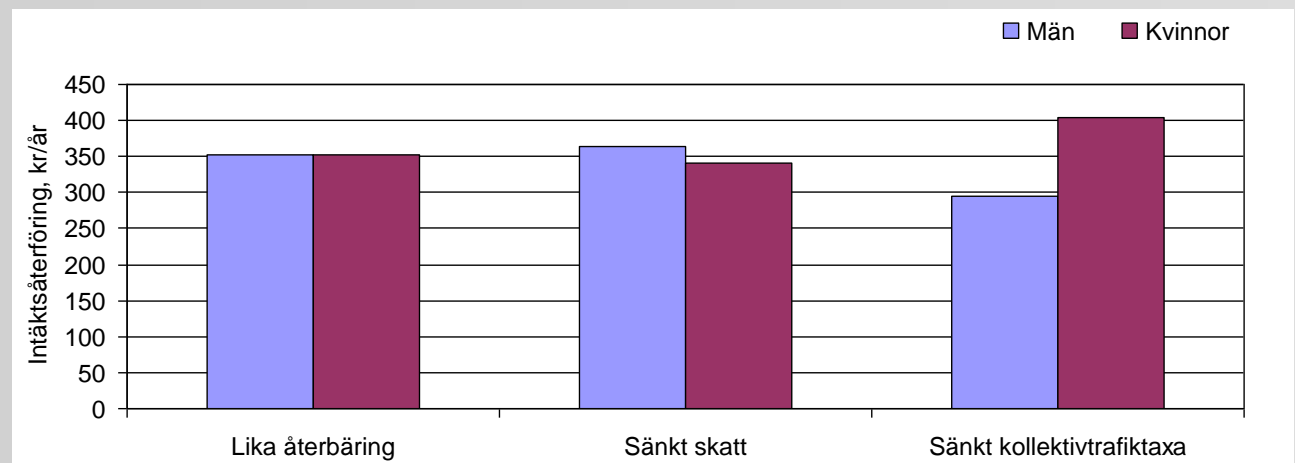


# Men lose more than women – before revenue recycling

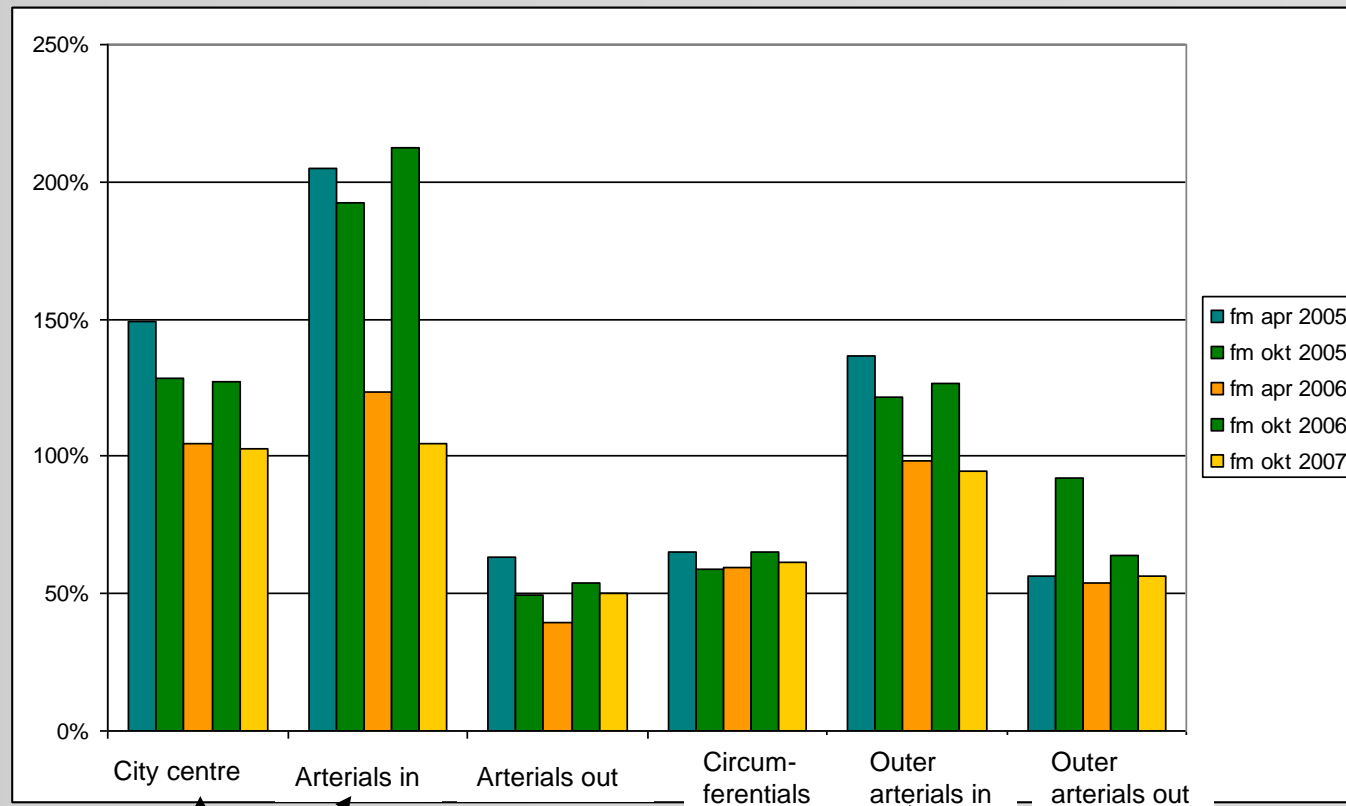
Direct effects



Net effect after  
revenue  
recycling



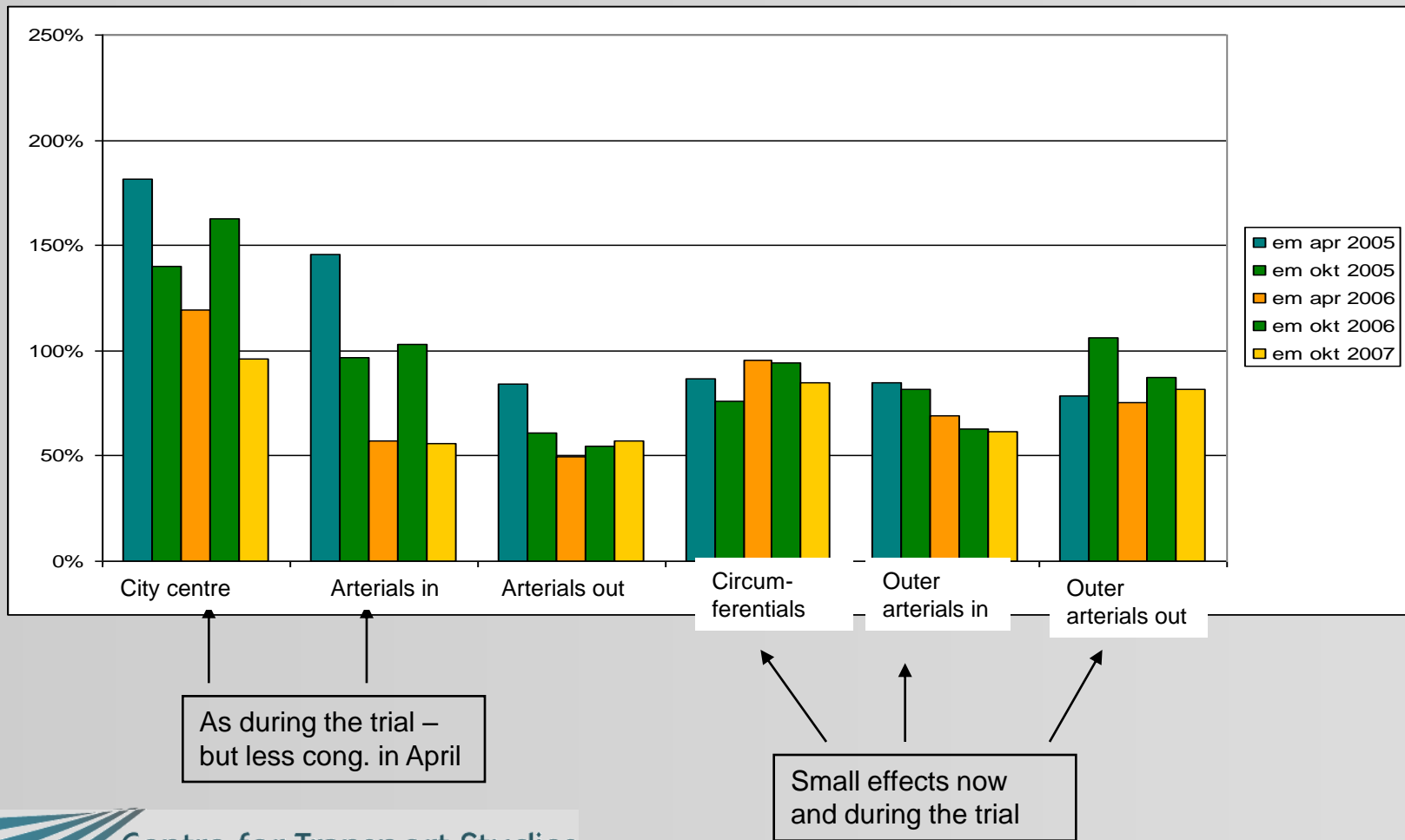
# Congestion, morning rush hours



As during the trial – but less cong. to begin with than in April

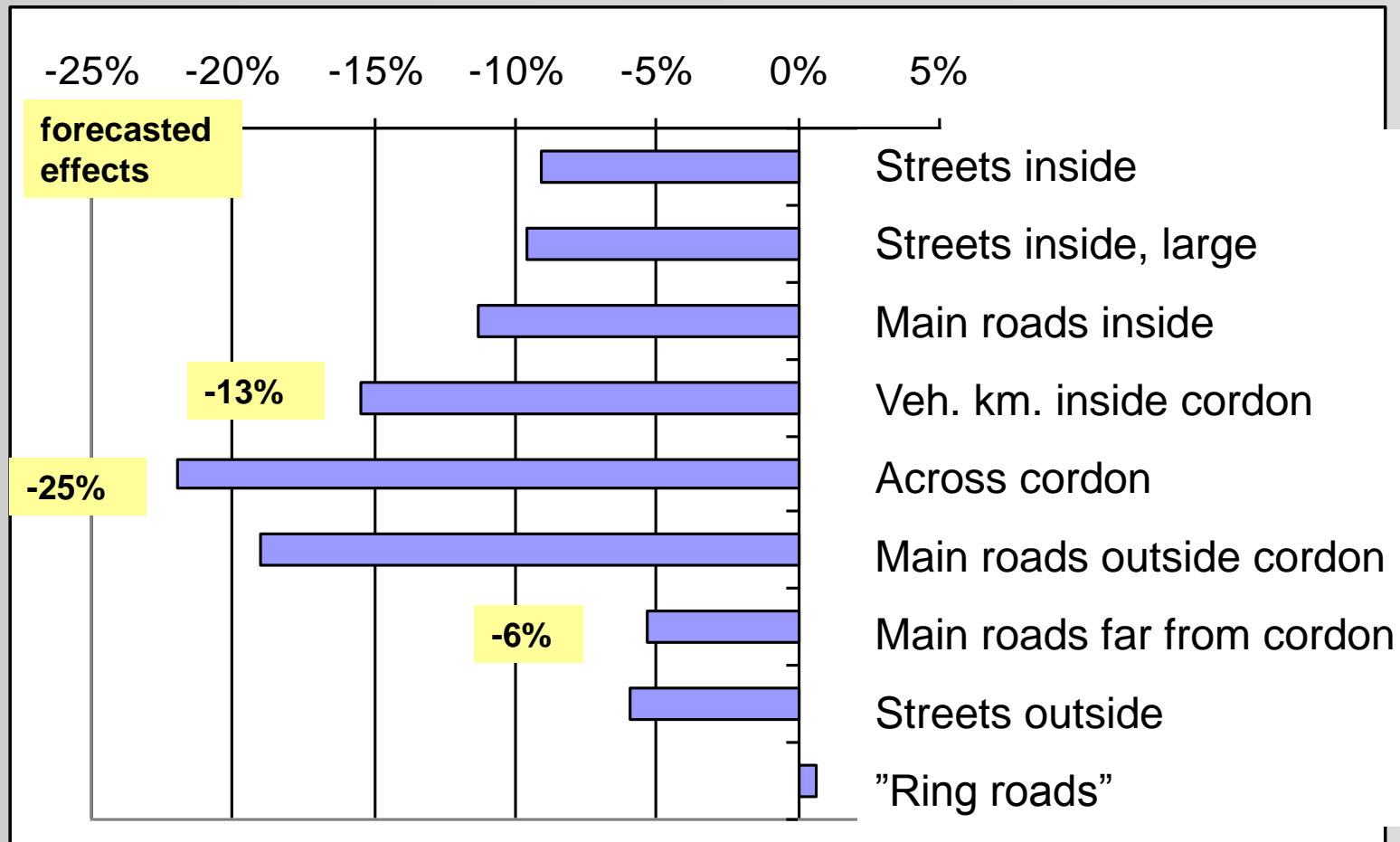
Small effects now and during the trial

# Congestion, afternoon rush hours





# Forecasting traffic effects



# 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