



# Centre for Transport Studies

STOCKHOLM

## Congestion Charges in Stockholm

Lessons learned and advice for other cities

Carl J. Hamilton



# Things I will talk about

Background  
Effects on the Road  
Environmental Effects  
Public Transit  
Commerce  
Reporting  
Public Acceptance  
Technical solution  
& cost



# Background

Discussed in back rooms since early 90's

Idea floated publicly before election 2002

Social Democrats promised "No Tolls"

Greens in balance of power, ultimatum:

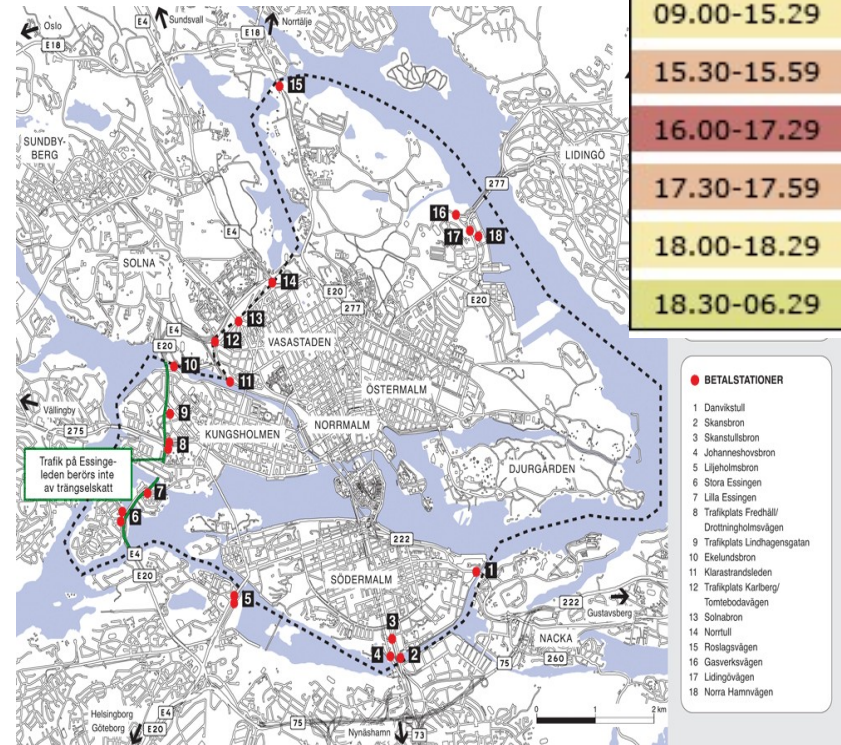
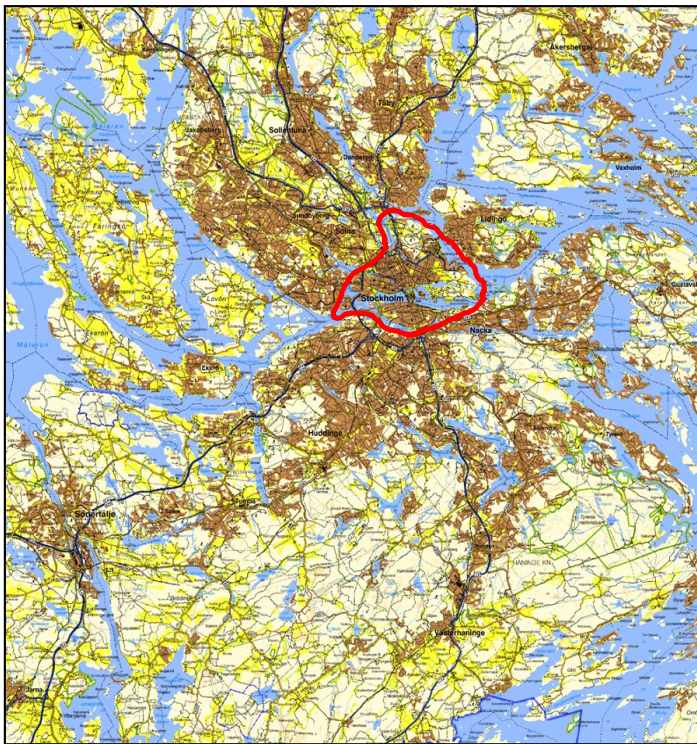
Support charges or we support the other team!

Introduced as a trial Jan-July 2006

Referendum September 2006

Public support swings from 20 to 52%, now 65%

# The Stockholm Congestion Charges



Time	(SEK) Amount
06.30-06.59	10 kr
07.00-07.29	15 kr
07.30-08.29	20 kr
08.30-08.59	15 kr
09.00-15.29	10 kr
15.30-15.59	15 kr
16.00-17.29	20 kr
17.30-17.59	15 kr
18.00-18.29	10 kr
18.30-06.29	0 kr

- 10-20 SEK (1-2 €) per cordon crossing, depending on time of day
- No charge evenings or weekends

- Low emission cars exempt
- Max 60 SEK/day

# Did it work?

# The shocking experience of Stockholm

TISDAG  
20 JANUARI 2006 • ÅRSÅG 11

Bröder  
som  
spelar  
bröder

NOJE, 5/24



Daniela  
slår ett  
slag för  
vårens  
mode

NYHETER, 5/03

KLARASTRANDSLEDEN 16.30  
MÅNDAG 2 JANUARI



KLARASTRANDSLEDEN 16.30  
TISDAG 3 JANUARI



KLARASTRANDSLEDEN 16.30  
MÅNDAG 9 JANUARI



LUGNT PÅ KLARASTRANDSLEDEN. Lugnt på Essingeleden. Lugnt i kollektivtrafiken. Ingen visste i går med säkerhet vart stockholmarna tagit vägen.

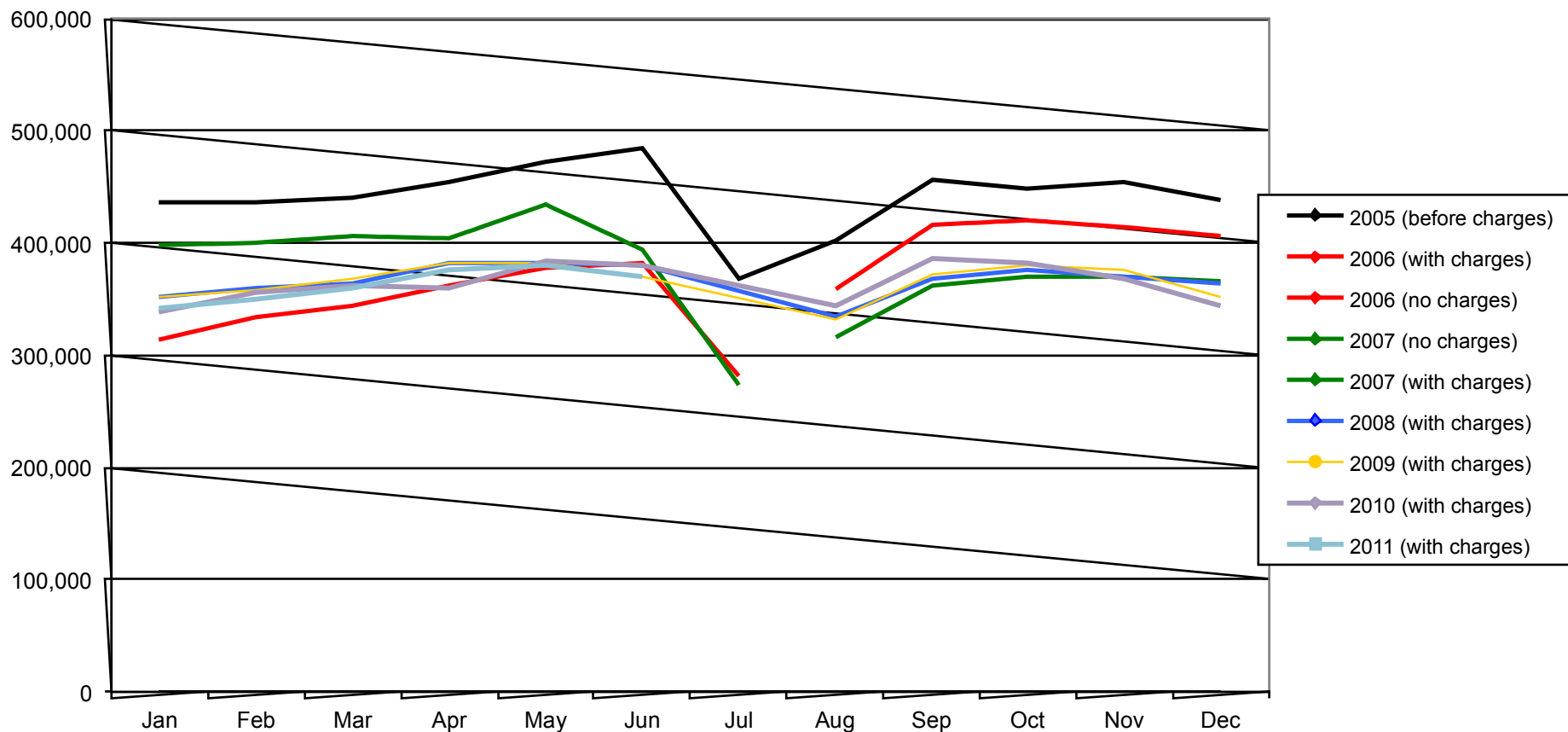
## Stockholmarna, vart tog ni vägen?

”Stockholmers – where did you go?”

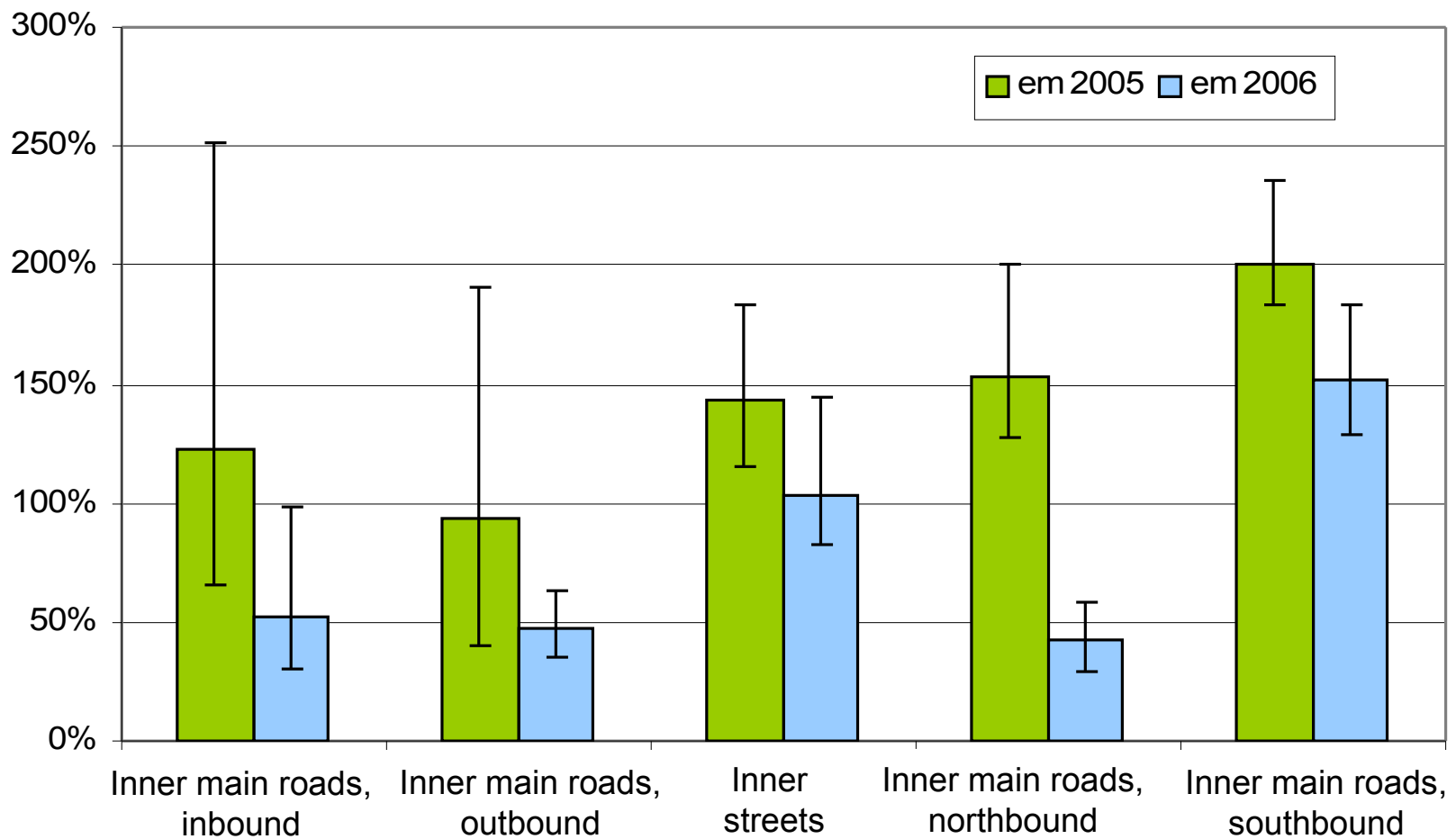
”Every fourth car disappeared”



# Traffic Volume Across Cordon

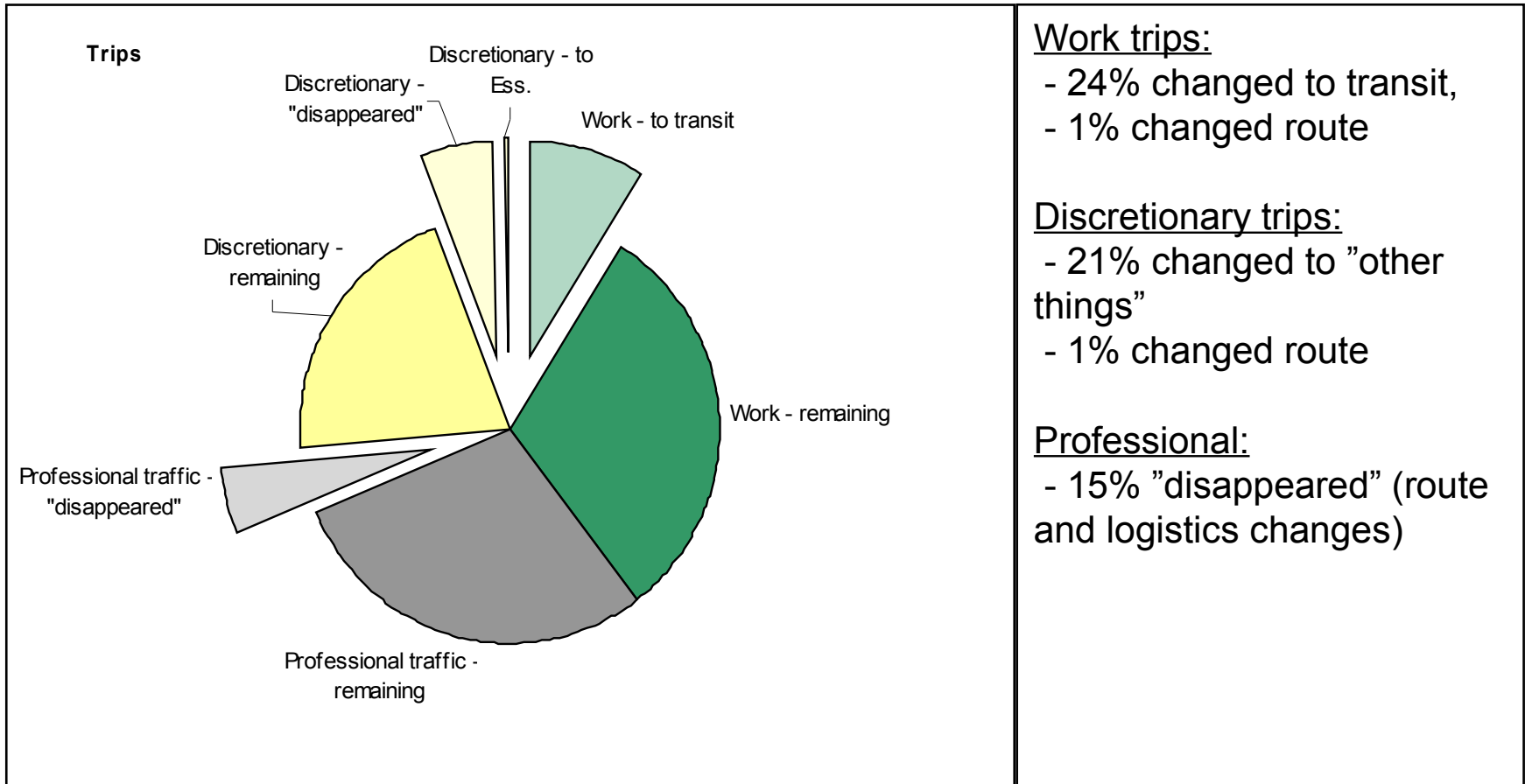


## Travel time & reliability, AM peak





# Where did they go?



Work trips:

- 24% changed to transit,
- 1% changed route

Discretionary trips:

- 21% changed to "other things"
- 1% changed route

Professional:

- 15% "disappeared" (route and logistics changes)

Lesson #1

# It works!

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People really are cost-sensitive.

Small traffic reductions can give very large congestion reductions.

Effects long-term and grow over time.

# People change from day to day

*Private cars  
across cordon*

## Lesson #2

# The question is about more than “car or transit”!

# The questions in people's heads

More than one way to adapt:

Car, transit, bicycle, or walk.

Travel now or some other time.

Where to go and what way to take.

To go in separate cars or share one.

To make one connected trip, or many separate.

To travel or not to travel at all.

Commuters ↘ Transit in the short term

But they are not even the majority of traffic!

Some changes untraceable, not even perceived

Lesson #3

# Scheme design is difficult

# Advice on Scheme Design

Scheme design is difficult - Leave it to experts, using good models

Politicians should define goals, constraints, and priorities

Allow for several adaptation possibilities, different value of time & traffic network effects

First, allow complexity to find a good design – then simplify (but not too much)

Remember: It does not have to be a circle!

Flexibility to change is desirable.

Exemptions = Problems



# Environmental Effects

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## Measure vs. Model

### Measured

Diluting effects

Weather influence

Change in PT fleet structure

### Modelled

VMT (-16%), fleet composition, driving pattern

CO2 down 14% (probably underestimated)

NOx down 8-9%

Other air borne pollutants down 10-14%

Approx. 30 less premature deaths/year

## Lesson #4

Environment will benefit,  
but it is difficult to measure.

# Public Transit

# Transit – The Challenge

Pre trial: 70/30 Transit/Car in rush hour

Expected 7% increase in Transit

Track capacity maxed out

Crowding would lead to

Existing PT riders unhappy

Fewer car drivers switching mode

# Transit – Added Capacity

New capacity added

4 months prior to CC trial

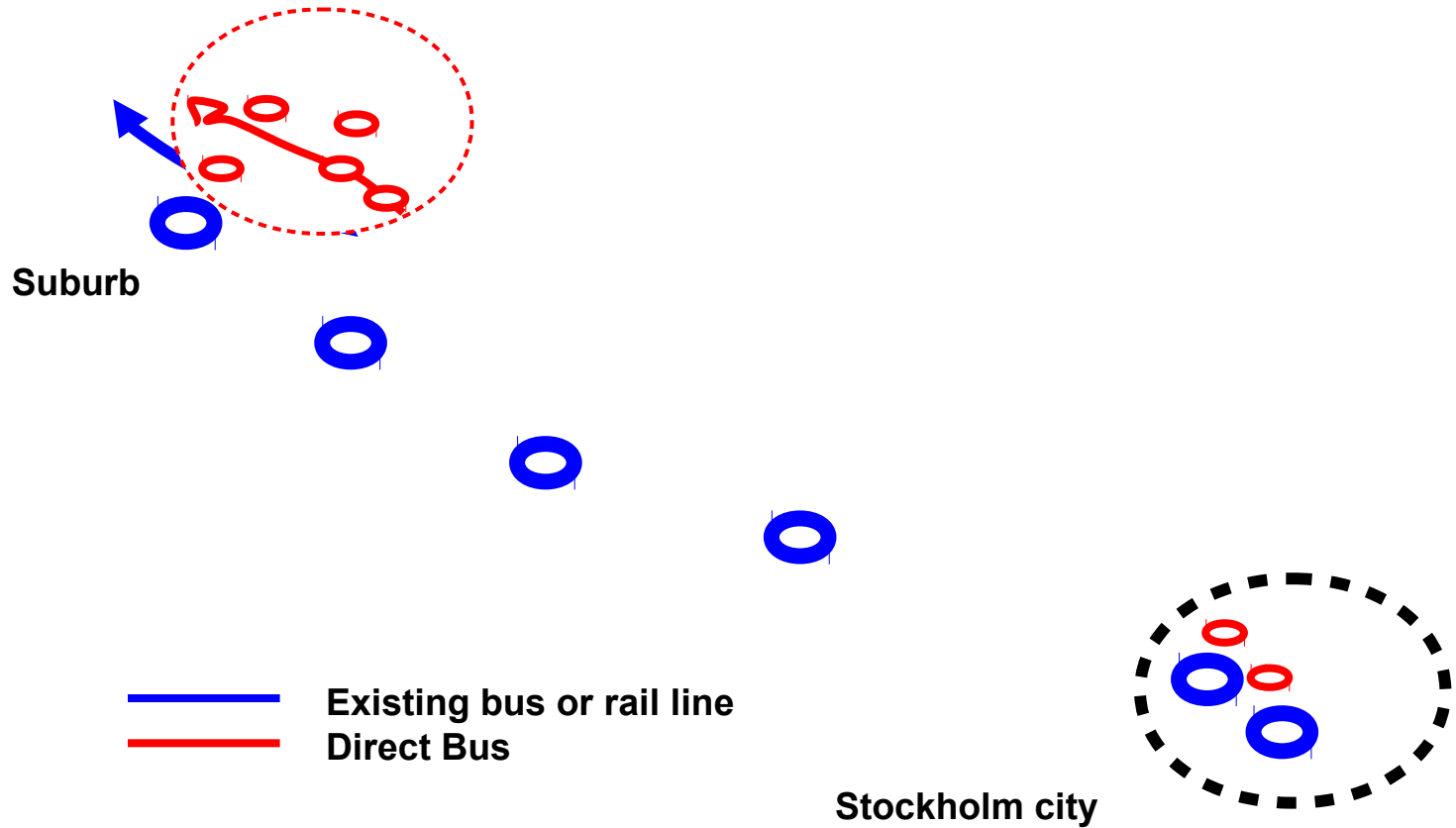
3 months after (partially)

Denser time tables (mainly buses)

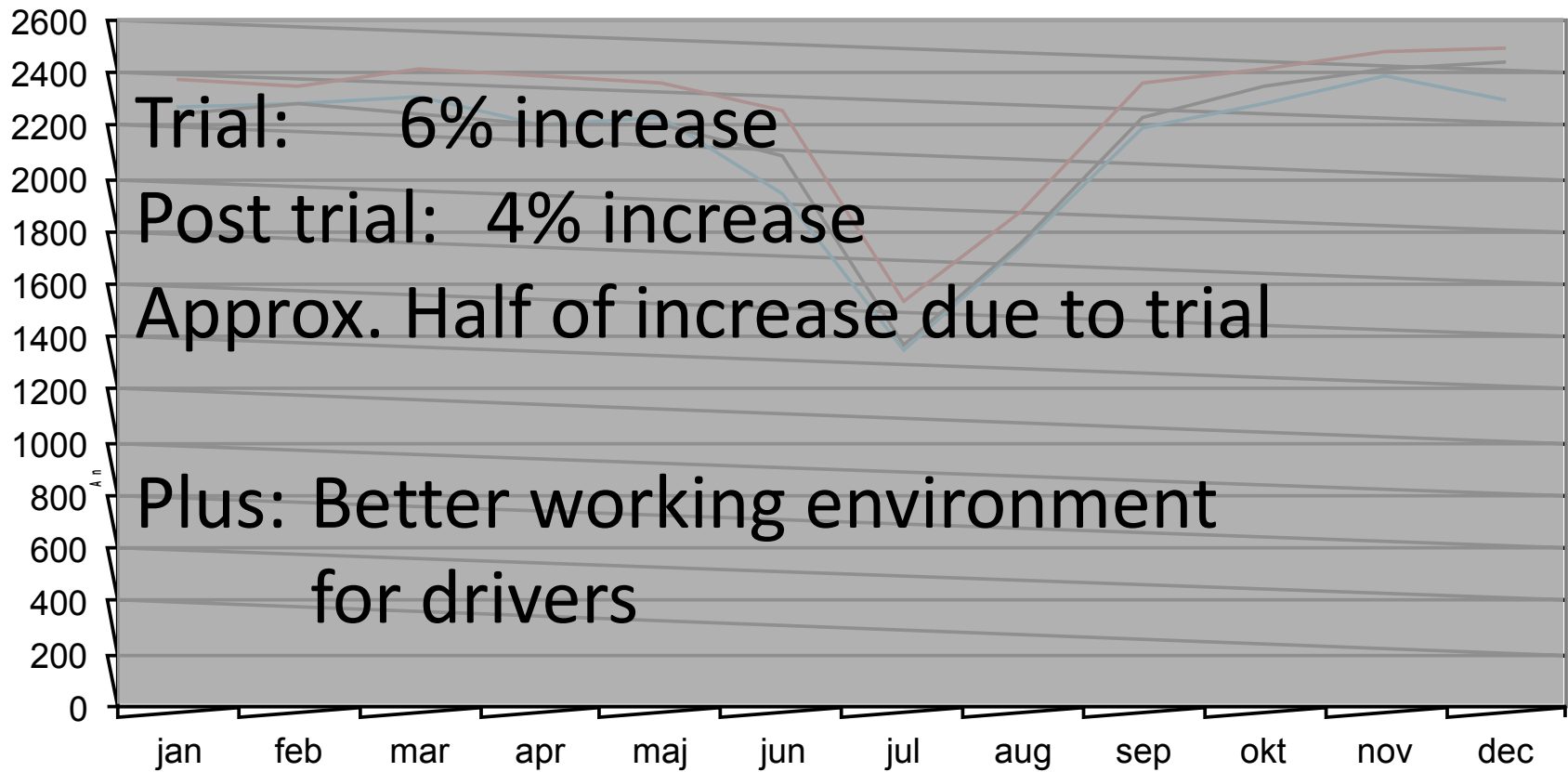
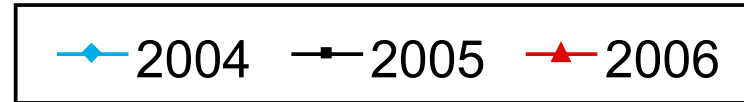
New direct bus routes

New Park & Ride facilities

# Direct Bus Line



## Results – Passengers





Lesson #5

# Transit helps, but cannot do it alone.

# Advice on Public Transit

Where initial PT share is high, expect  
higher acceptance

mode switch less painful

Increase in PT capacity to  
increases acceptance

makes car drivers more willing to switch

make PT riders less exposed to crowding

Does NOT attract (much) mode switch on its own

# Commerce in the City

# Effects on commerce

Separate effects from CC and business cycle effects

No measurable differences between *inside*, *close to*, and *far from* CC-area

Reasons:

- Few shopping trips by car and in rush hour

- Charge very small compared both to disposable income and shopping value

Individual winners and losers exist

Lesson #6

Commerce barely  
affected on average.

But fear and individual cases  
may affect public opinion.

# Advice on Commerce

Expect the debate & fear  
Measure well, and meet it with facts  
Accept the individual cases

# Measuring & Reporting

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Media requested reporting on day 1

Enough data was available to provide a constant feed of quality report.

But much was forgotten, or measured incorrectly



Lesson #7

Measure, and measure well.  
Or else, someone else will.

# Advice on Reporting

Measure the “before” situation, and publish it

Travel time & its variability is the most important, and the most difficult to measure

Floating car doesn't work

# Measure at least...

Traffic volume (loops etc)

Travel time (cameras or probes)

Travel time variability

Individual travel diaries, to learn who changed to what

PT ridership & crowding

Commerce turnover

Analysis of emissions, accidents, welfare, gender, equity etc. can be generated from this.

# Public Acceptance

# Experience breeds Acceptance

Place	Before	After
Stockholm	21%	74% (City only)
Bergen	19%	58%
Oslo	30%	41%
Trondheim	9%	47%
London	39%	54%

# Experience breeds Acceptance

But why?

Accepting the unavoidable (cognitive dissonance)

Value what you have more than what you might gain (loss aversion)

Wasn't as bad as feared

Benefits higher than expected

Paying for scarce resources isn't so weird after all

# Self Interest Matters

Acceptance goes down as

Car ownership goes up

Car usage goes up

Satisfaction with transit goes up

Availability of transit goes up

# Ideology Matters

Acceptance goes up as

Environmental concern goes up

Trust in government goes up

And down as

Dislike of taxes goes up

Dislike of authority goes up (e.g. speed cameras)



# Demography Matters Not

## Irrelevant:

Age, gender, income, family size  
(when controlling for other factors)

## Matters a little:

Education (higher education=more acceptance)

Lives inside the zone (less accepting)

## Lesson #8

Public acceptance comes from  
experience, self interest & ideology.

# Advice on Acceptance

Trust acceptance to go up once the system is in place and works.

Address self interest

- Ensure real travel time & reliability benefits

- Spend to avoid crowding in transit

- Don't over charge

Address ideological concerns

- Make objective evaluation

- Earmark revenues clearly

- Respect privacy

# Technical System & Cost

# System & Cost

Entire trial operation kept separate

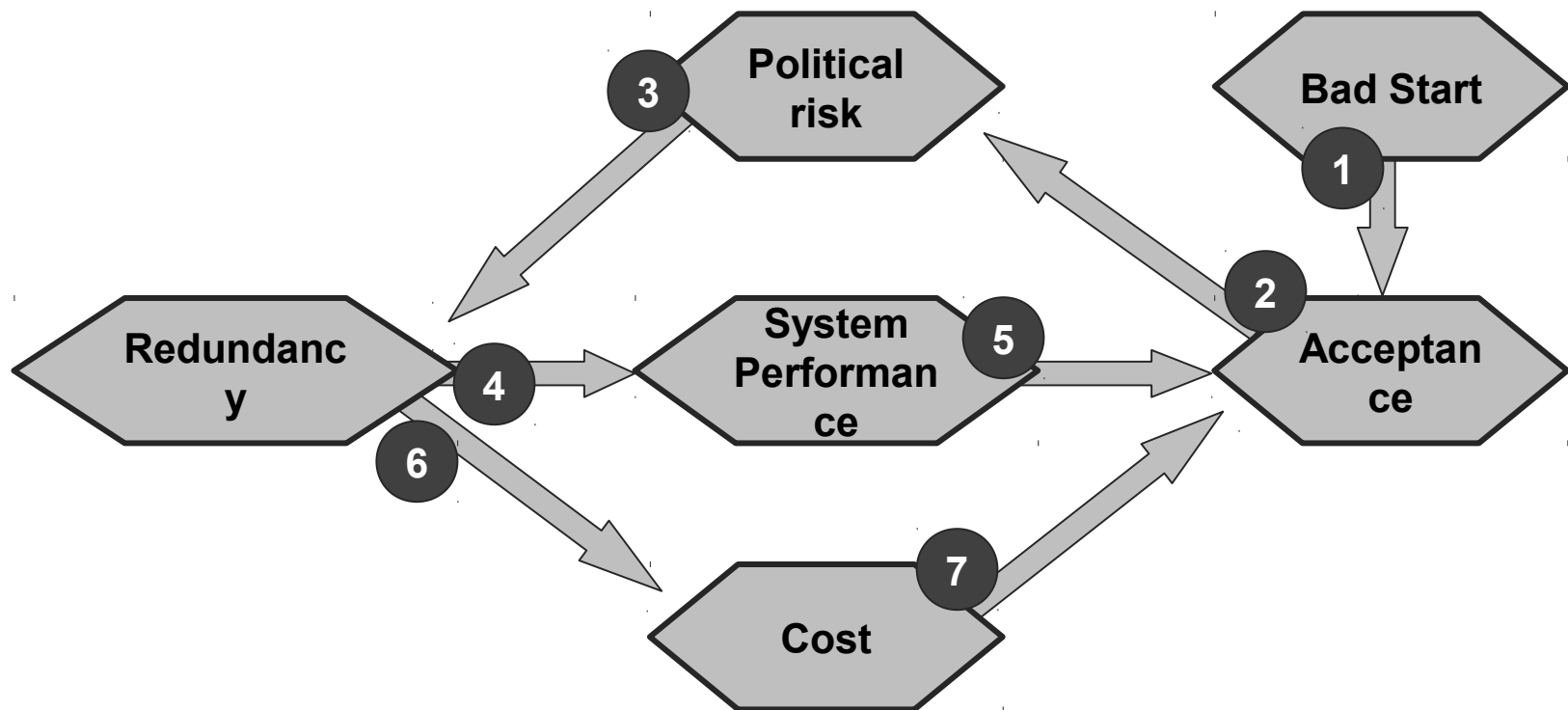
Expensive to build & operate

More than 1 bn SEK to build

Initially over 400 mSEK/year to run

Now down to 100 mSEK/year

# Risk, redundancy & cost



# Transponders now replaced by ANPR

- No driver action necessary
- Invoice each month – can pay either manually or automatically
- Transponder handling expensive
- Automatic number plate recognition very effective



Lessons #9 & 10

Political risk drives system cost.

It can be done without  
transponders.



Most important lesson:

Scheme design is difficult.  
Keep working until you get it right.

Thank you

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