IMPACTS OF DEMAND MANAGEMENT AND PRICING POLICIES ON URBAN TRAVEL DEMAND AND CO2 EMISSIONS

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DEMAND MANAGEMENT
Where mobility demand originates and how it can be influenced
DEMAND FOR MOBILITY OPTIONS

“CAN” … but lacking acceptance

“WANT“ … but lacking access or ability
CHANGE POTENTIAL

high willingness to change (~20%)

no willingness to change (~10%)

Population

„WANT“ … but lacking access or ability

„CAN“ … but lacking acceptance

[project „pro:motion“, representative survey in Austria]
CHANGE STRATEGIES

"CAN" … but lacking acceptance

"WANT“ … but lacking access or ability

Population

FACILITATE
improve access
strengthen ability

PERSUADE
motivate
incentivise

FORCE
coerce
penalise

You can
PRICING POLICIES
How to use monetary measures to steer demand
## ROAD PRICING SCHEMES

<table>
<thead>
<tr>
<th>Category</th>
<th>Primary goal</th>
<th>Financial benefits</th>
<th>Reduction congestion</th>
<th>Reduction pollution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Tolls</td>
<td>Increase revenues</td>
<td>***</td>
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<tr>
<td>Value pricing</td>
<td>Increase revenues and reduce congestion</td>
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<tr>
<td>High Occupancy Toll</td>
<td>Increase revenues</td>
<td>*</td>
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<td>Travel distance based charging</td>
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<td>Travel time based charging</td>
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<td>Road Space Rationing</td>
<td>Reduce congestion within the urban area</td>
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<tr>
<td>Cordon-based charging/Zonal Schemes/Satellite-based road pricing schemes</td>
<td>Reduce congestion within the urban area</td>
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[Gervasoni and Sartori, 2007]
CONGESTION CHARGING SINGAPORE

- Area Licensing Scheme (ALS) introduced 1975
- Paper system of daily licenses for vehicles entering the central zone during peak traffic periods
- Electronic Road Pricing (ERP) since 1998
- Peak fee (each entry) S$ 4 (€ 2,5)
- Aim: reduce traffic during peak hours

[DOT - FHWA, 2017]
CONGESTION CHARGING SINGAPORE - EFFECTS

• Traffic reduction:
  • ALS: reduction of entering cars: - 73% (vehicles: -44%)
  • Shift to public transit and shift in trip departure times
  • Speed in area increased by 20% or more during morning peak, speed on bypass route dropped by 20%

• Environment and emissions
  • Drop in CO levels during morning peak below previous noon level
  • NOx decreased in monthly average values
CONGESTION CHARGING LONDON

- Introduced 2003, extended 2007
- 170 camera-equipped access points
- Daily charge for driving or parking a vehicle on public roads in the zone (fee: £ 5, currently £ 11,50 - € 14,50)
- Between 07:00 and 18:00, Monday to Friday
- Only 50% of cars get fully charged
- Aim: to reduce traffic and to raise revenues for re-investment in transport

[Croci and Douvan, 2016]
CONGESTION CHARGING LONDON - EFFECTS

• Traffic reduction:
  • Reduction of vehicle movements (2002 – 2006: -21%, trend ongoing)
  • Reduction of congestion -30% after introduction, meanwhile back on pre-charging levels
  • Increase in public transport and bicycle usage
  • Bus speed increased only in the first year

• Environment and emissions
  • NOx emissions: -13%
  • PM10 emissions: -15%
  • CO2 emissions: -16%

[Croci and Douvan, 2016]
CONGESTION CHARGING STOCKHOLM

- Toll cordon around inner city
- 18 camera-equipped control points
- Introduced 2006 as trial period
- Cost of passing the cordon between SEK 10 and 20 (€ 1-2), daily maximum charge SEK 60
- Fees vary according to peak hours
- Aim: to reduce congestion in the inner city especially during the peak hours, and to improve the environment

[Croci and Douvan, 2016]
CONGESTION CHARGING STOCKHOLM - EFFECTS

• Traffic reduction:
  • Reduction of passages across cordon: -28% following introduction, now -20% on average
  • Car commuting trips: -24% (99% switched to transit)
  • Non-commuting trips: -22%
  • Commercial traffic: -15%

• Environment and emissions
  • PM10 emissions: -15%
  • CO2 emissions: -14%

[Croci and Douvan, 2016]
PARKING MANAGEMENT VIENNA

• Started 1993, 3 extension phases
• Entire districts or large connected parts thereof turned into short-term parking zones
• Permanent parking permits for residents (annual fee € 90)
• Aim: reduction of car traffic and environmental pollution, improvement of public transit and overall parking situation, more space, higher traffic safety
• Reduction in average parking spaces occupancy rates (morning: 109% to 71% at first extension phase)
• Reduction in unauthorized parking by 86% (morning) and 76% (evening)
• Reduction in non-residential parked cars by two thirds (morning)
• Spillover effects in adjacent districts
• Reduction in car traffic by 26%
• Modal shift to Public Transport (accompanied by other measures, e.g. introduction of annual public transit pass for € 365)
LEARNINGS
Which aspects improve or limit the effectiveness of pricing measures
SUPPORTIVE MEASURES

• Target „superusers“
  • San Francisco/Boston: only very few driver sources are main contributors to repeated congestion
  • Shifting about 25% from the 1.5 – 2% highest contributors can decrease congestion by 14 – 18%

• Improve alternatives
  • Singapore: incentivising off-peak public transit to compensate high shift in demand (gamification approach: lottery)
  • Vienna: improvement of qualitative and quantitative public transit plus cheap annual ticket
REBOUND EFFECTS AND COPING STRATEGIES

• Behavioural Economics
  • „Irrational“ reactions counteract desired effects
  • Fines become prices: setting a fine for an undesired behaviour may invite this behaviour (people „pay“ for it)

• Coping strategies
  • People become creative when avoiding barriers
  • Singapore: incentivising high occupancy vehicles has been ceased, as people hired passengers for their trips
THANK YOU!

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REFERENCES


