The Economics of Smart Mobility

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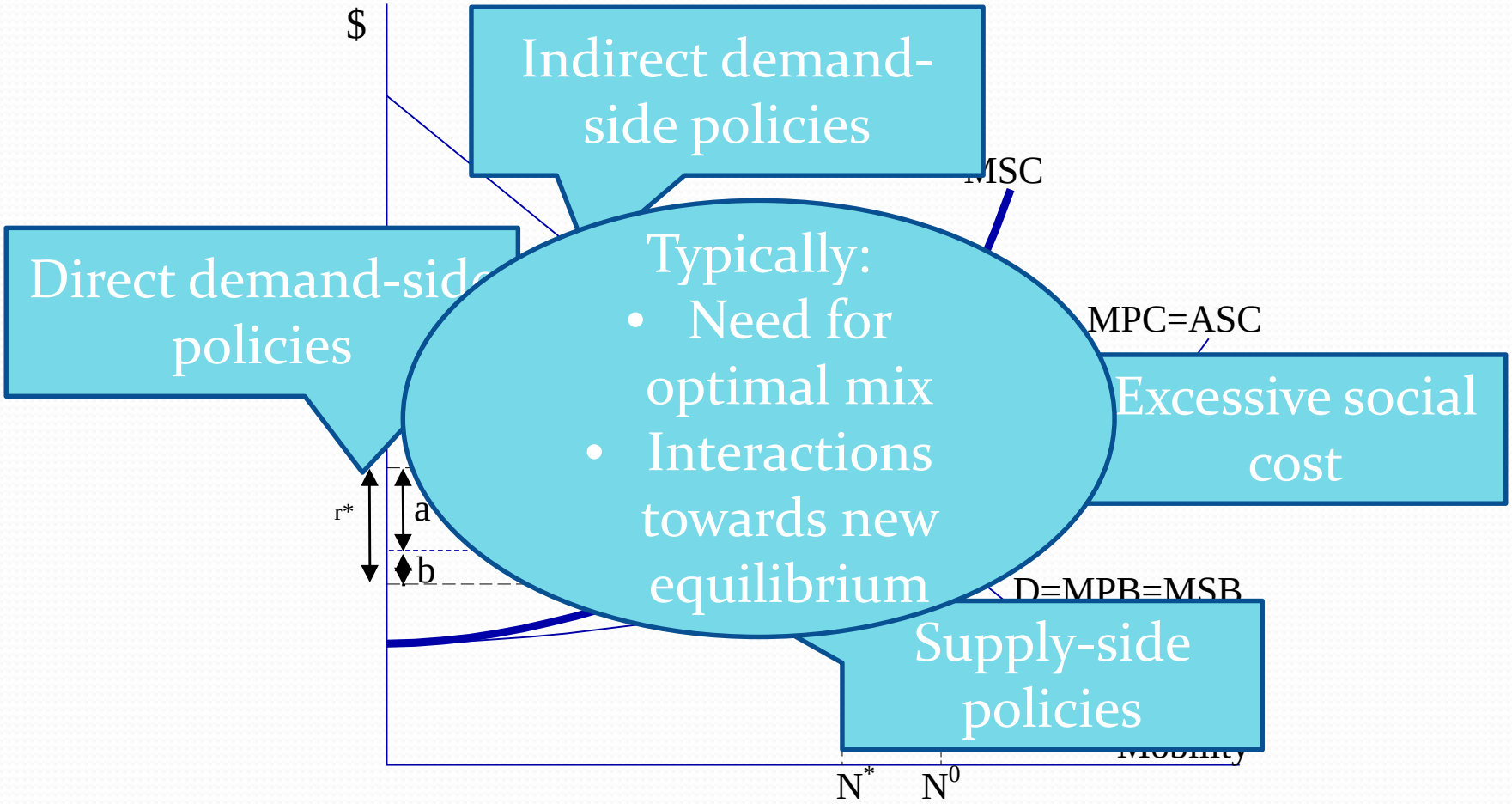
Dealing with unpriced scarcity…

- Many of the societal challenges in transport and the use of space boil down to the societal benefits and costs of using unpriced / not properly priced scarcity
  - Pollution
  - Accident risks
  - Time / congestion
  - Maintaining open space
  - Using public space in cities
  - Visual intrusion
- Economics: external costs
  - Markets fail to deliver societally optimal outcomes
  - Government intervention required

Typical urban road transport market



Smart interventions required

- Supply-side
  - Example: automated highways
- Indirect demand management
  - Example: tele-commuting
- Direct demand management
  - Example: traffic information

- Economies of scope
  - Synergies in technologies
  - Synergies in data collection and use

Smart demand management in action

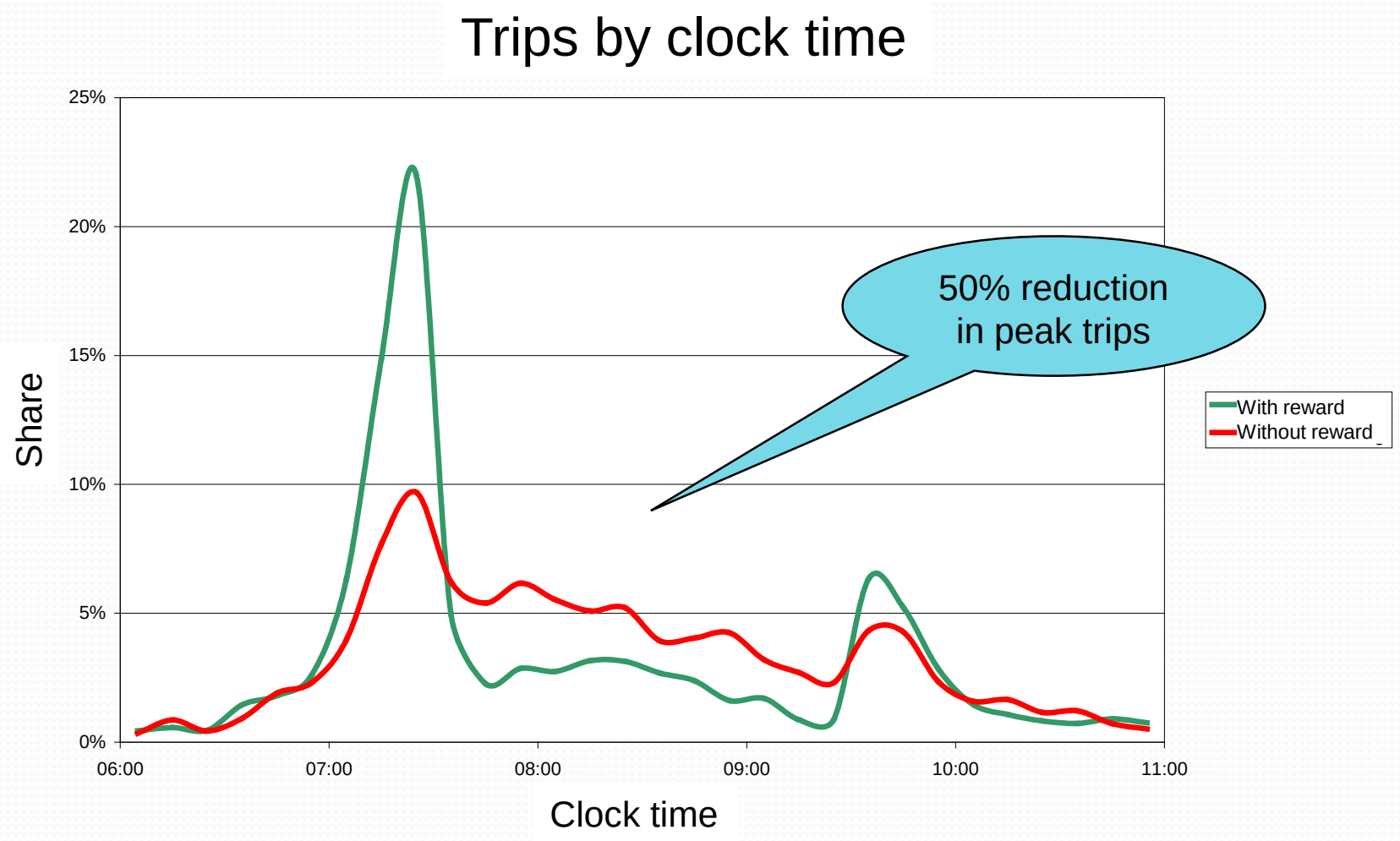
- Example for direct demand management
  - Pricing: efficient, effective, but low acceptability
  - Rewarding (as in “Spitsmijden”: “Peak Avoidance”)
    - Popular, effective
    - But (1): Financially unsustainable (rewards!)
    - But (2): Less efficient (induced or latent demand problem)
  - Hybrid solutions?
    - **Budget neutral: feebates, tradable permits**

“Spitsmijden” / “Peak Avoidance”

- Series of experiments
  - Road
  - Public transport
- “User paid” instead of “user pays”:
  - Rewards for avoiding peak travel
- Typical characteristics of experiments
  - Automated (GPS) detection of vehicles or individuals
  - Participants invited on the basis of observed peak behaviour
  - Financial incentive of around € 3,- to avoid peak travel

Effectiviness: SpitsMijden I

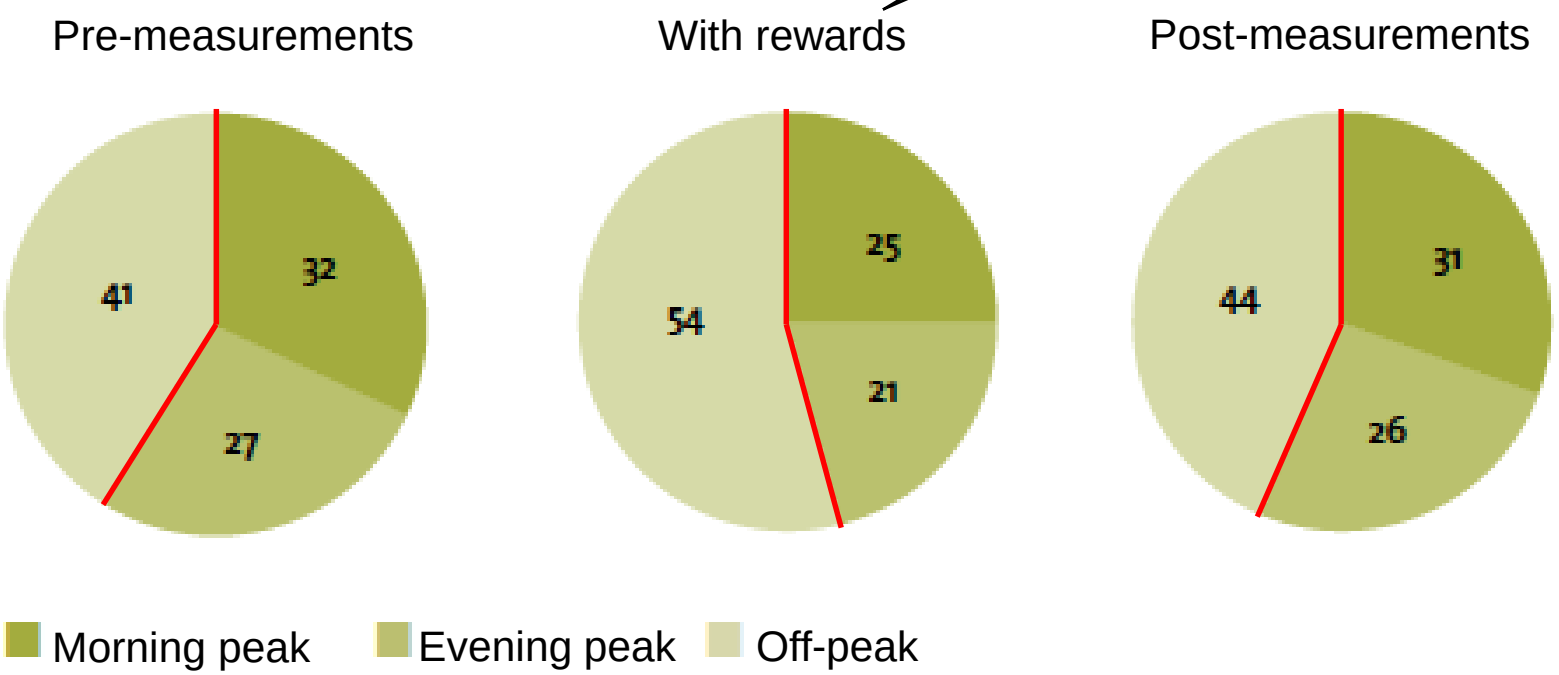
(Zoetermeer, 2006, 340 participants)



SpitsMijden in the Train

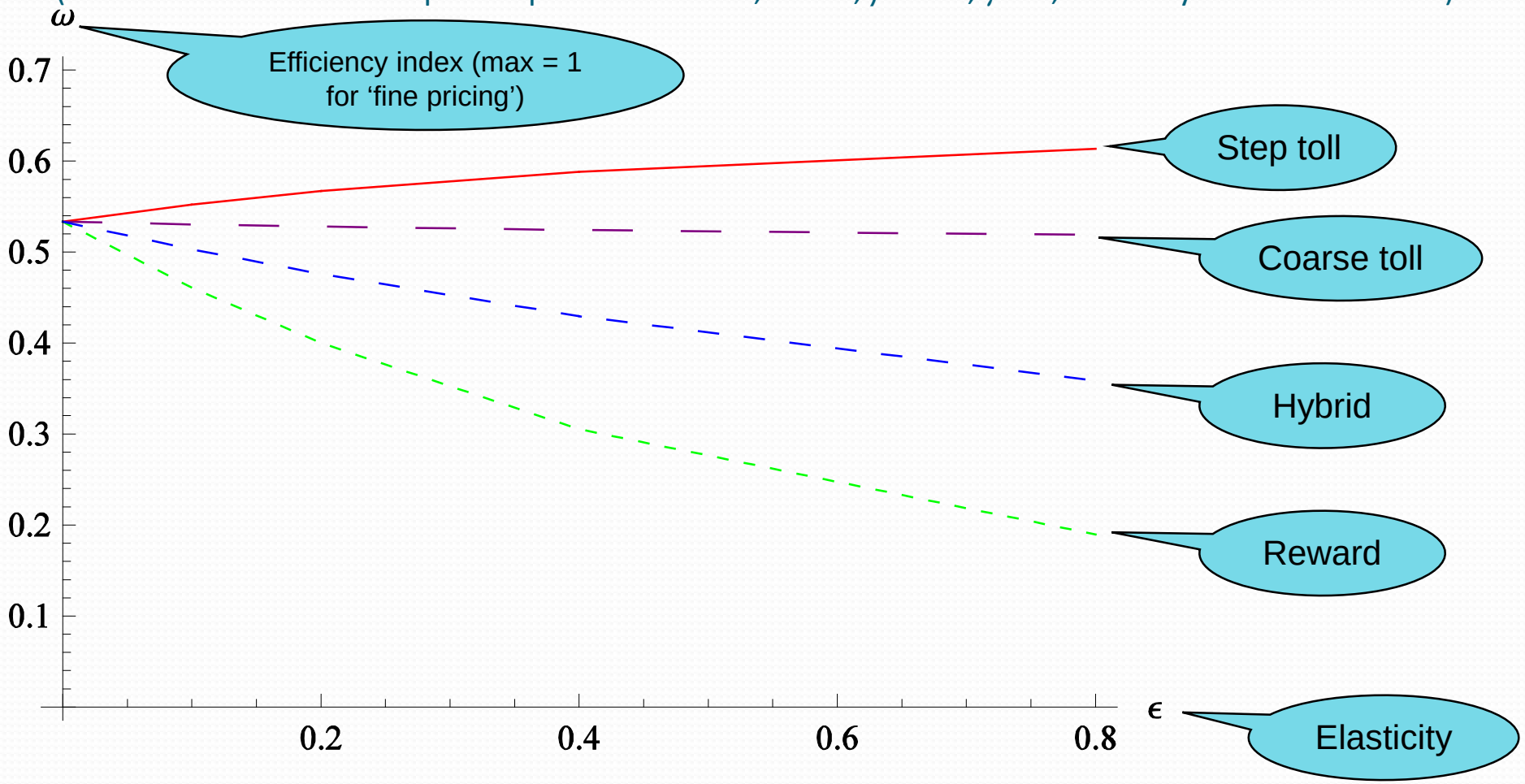
(Abonnements, 2012-2013, 467 participants)

22% reduction in peak trips



Second-best aspects

(Bottleneck model. Assumptions: peak of 2:30 hrs; α=7.5, β=3.75, γ=15; elasticity from –0.1 to –0.8)



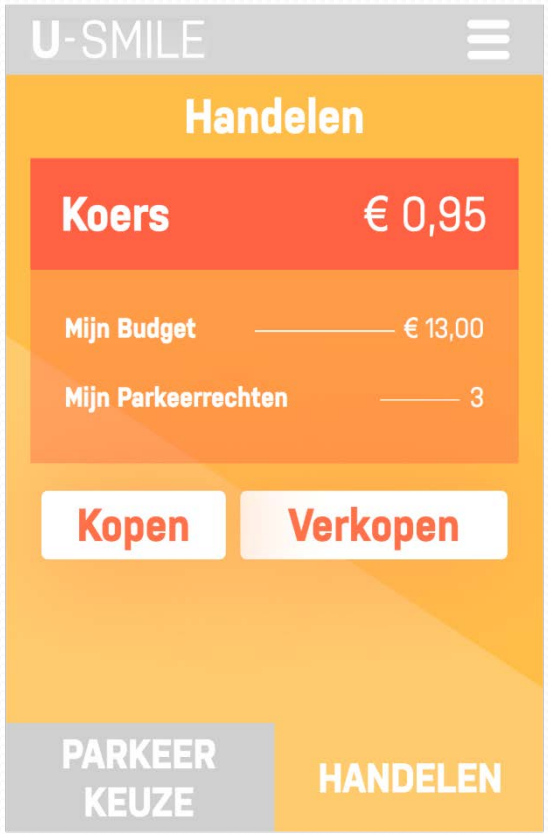
Design – an example

- Imagine a Spitsmijden experimental setting
  - Aggregate target of *Q* trips per period of 5 working days
    - Less than initial behaviour…
  - A total of *Q* tradable credits *(rit-coins)* is distributed over participants
    - Exact distribution can be chosen
    - One peak-coin is used up for each peak trip
      - Peak trip without peak-coin: penalty (> expected peak-coin price)
    - Peak-coins can be bought and sold
- Should in theory be equivalent to rewarding, but will it work?

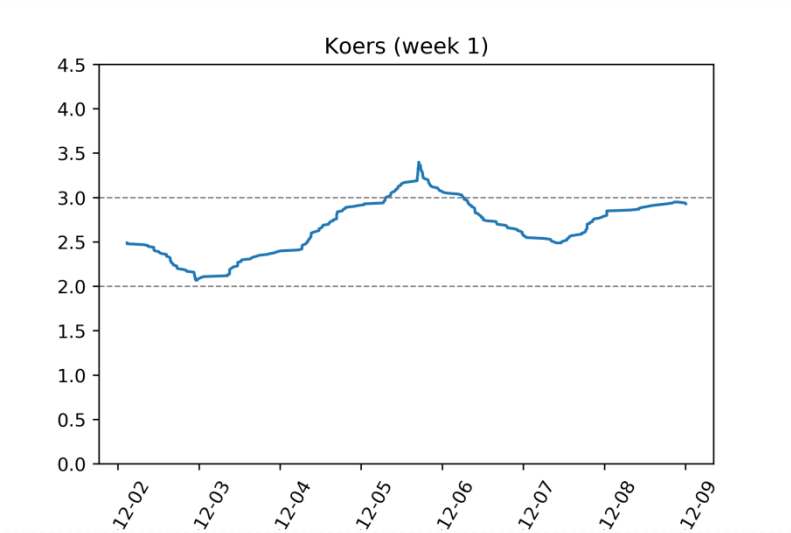
Lab-in-the-field (U-Smile)

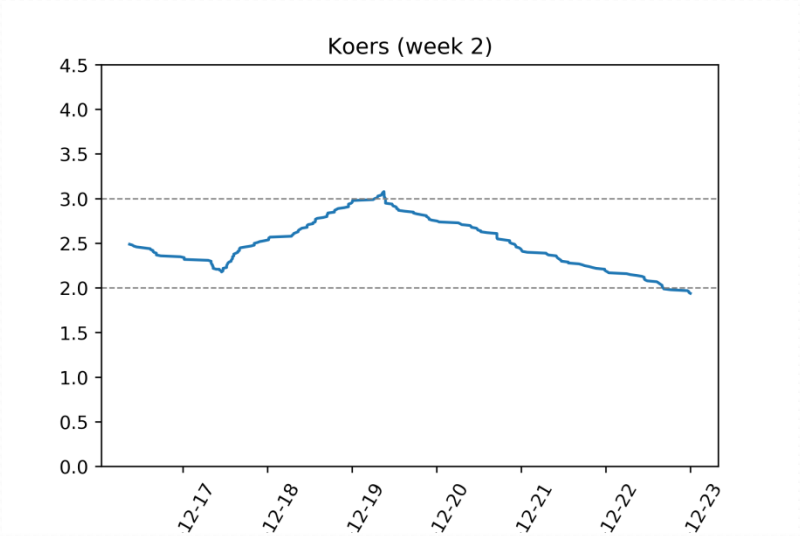
- Set-up replicates a permit scheme that is as close as possible to classical rewarding experiment
  - Unit of trade: a commuting trip attribute, for a “weekfull of mobility choices”
  - Virtual / serious gaming environment
    - No interference with actual mobility behaviour
    - Complete control of pay-offs / preferences
  - Parking experiment: parking charge vs parking permit
    - Desirability of use of permit varies between days through variation of parking charge
  - Permit-price dynamics require experiment to last for a week
    - Hence: Lab-in-the-field

Lab-in-the-field – the looks

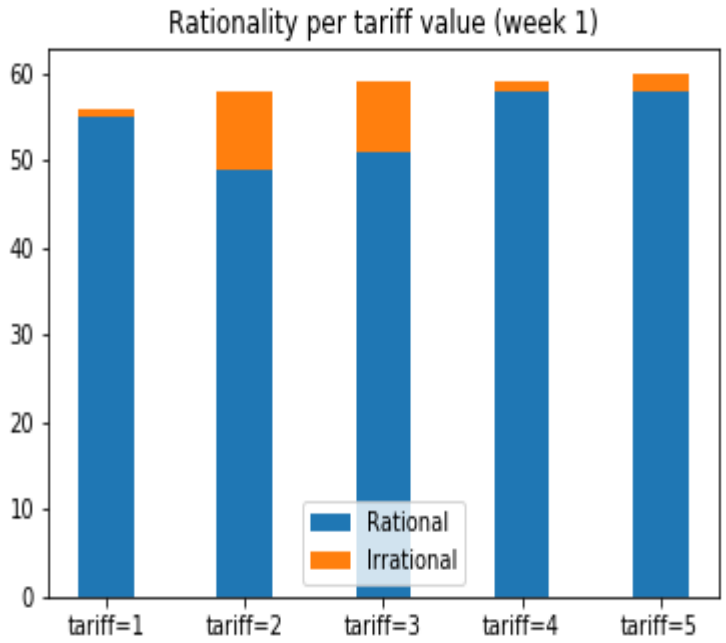


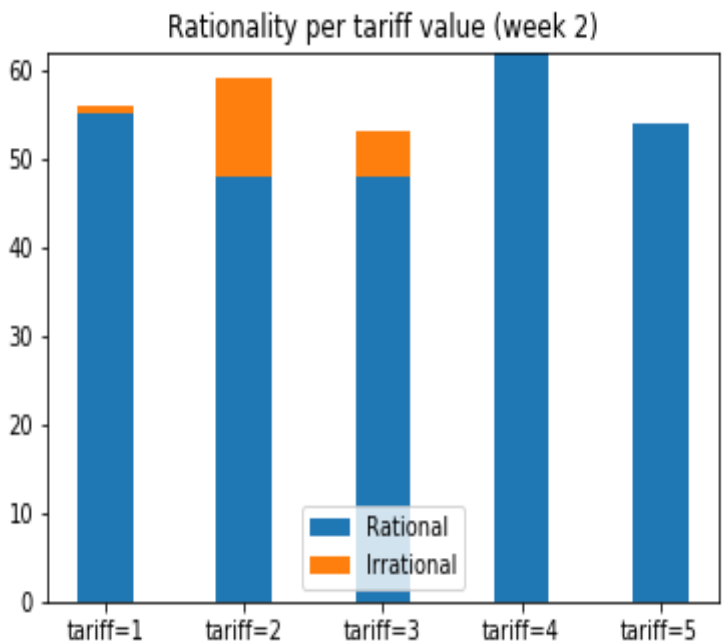
Market dynamics



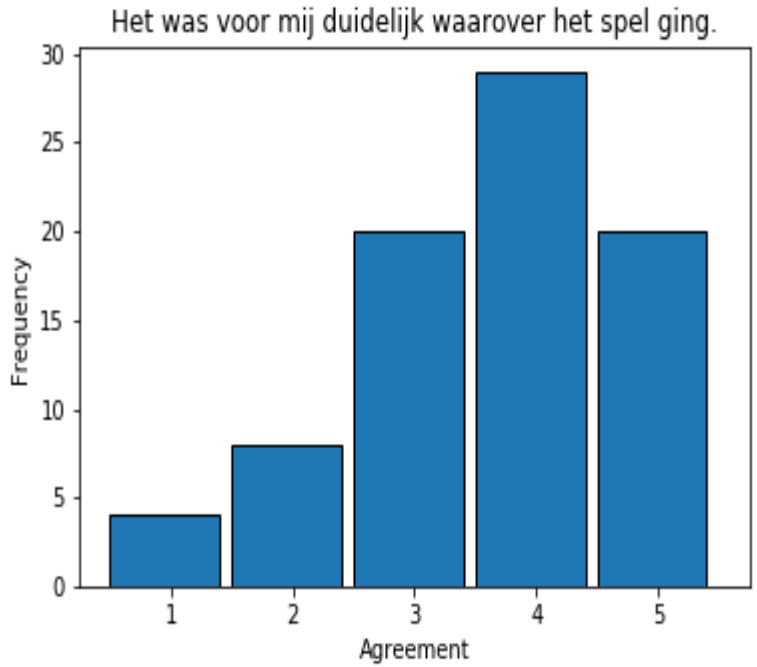


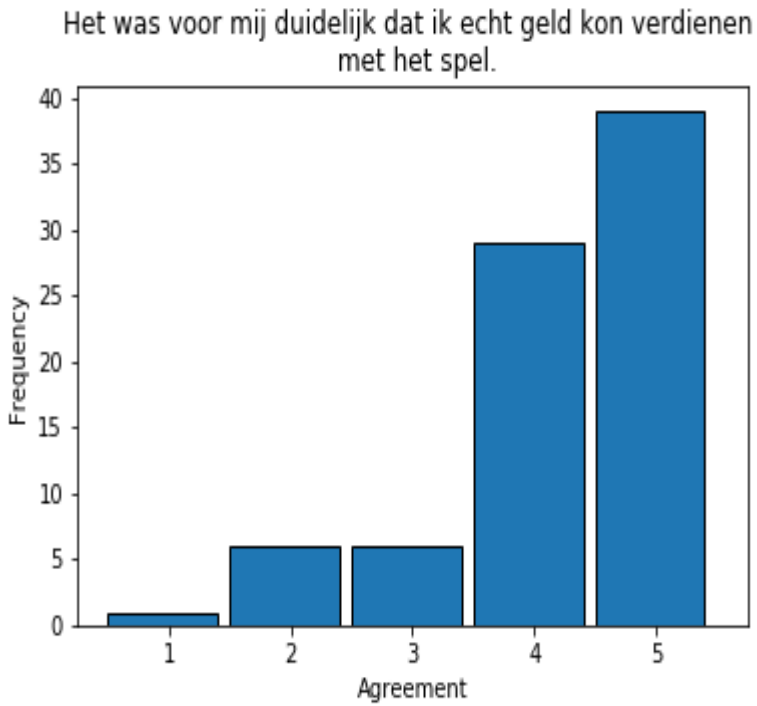
Instantaneous rationality





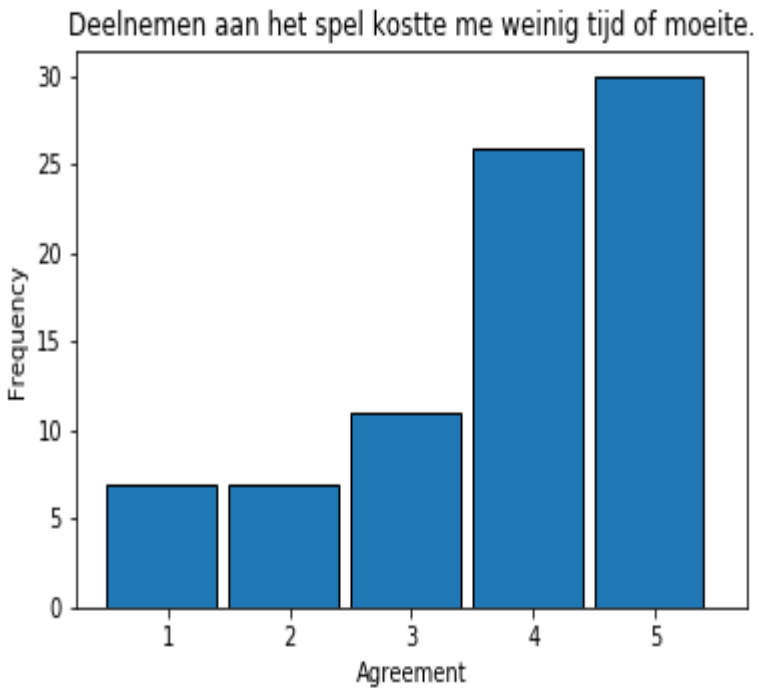
Responses

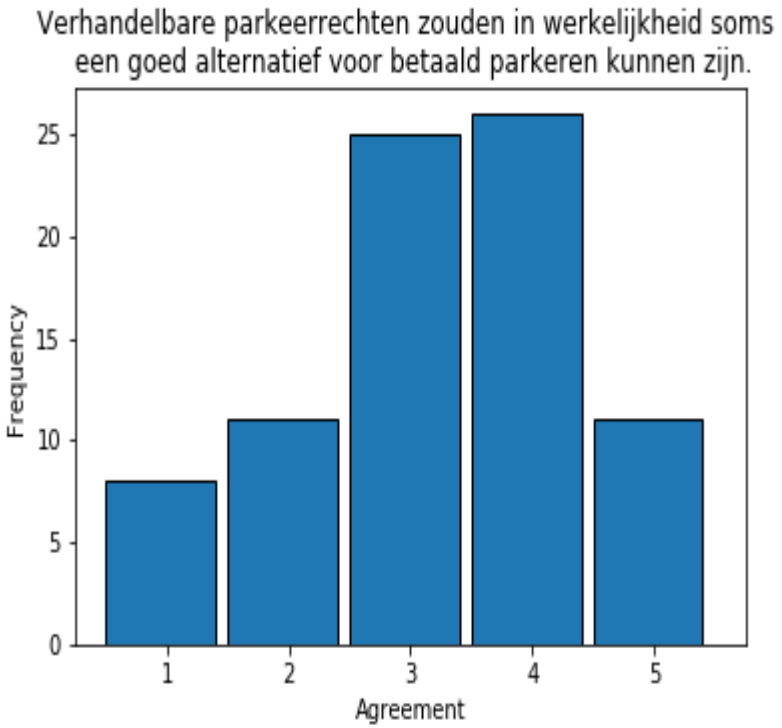




Schaal 1 (Helemaal oneens) t/m 5 (Helemaal eens)

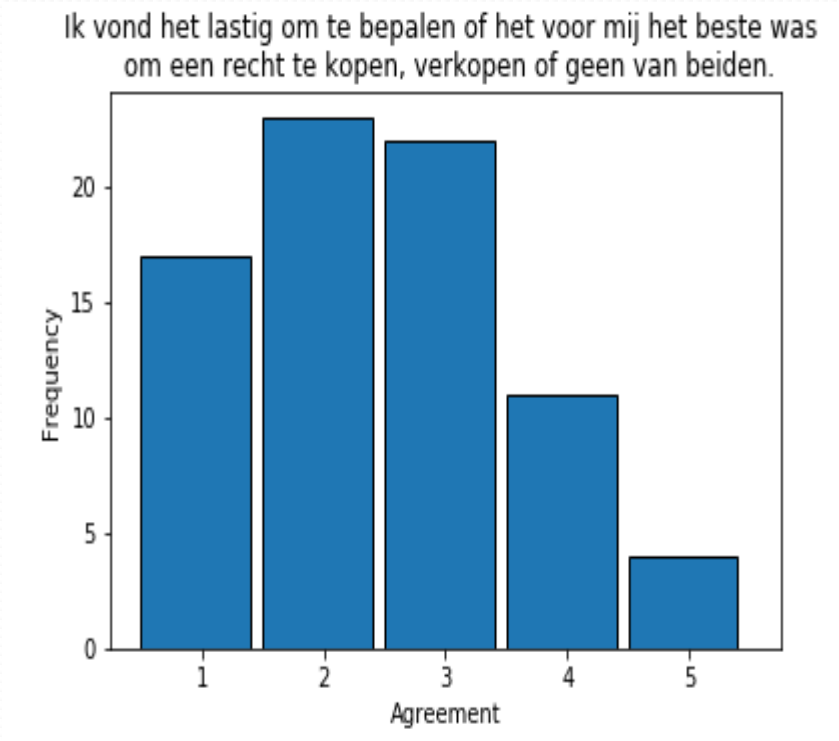
Responses (2)





Schaal 1 (Helemaal oneens) t/m 5 (Helemaal eens)

Responses (3)



Schaal 1 (Helemaal oneens) t/m 5 (Helemaal eens)

Lessons learned

- Most participants understand tradable mobility permits
  - Both their tradability as well as how to use them
  - From revealed performance and from questionnaire
- Instantaneous rationality
  - Large majority of choices indeed rational
  - Participants also indicate that making the choice was easy
- Participants find it somewhat more difficult to determine best trading behaviour (according to the survey)

Much wider applicability of principle

- Residential parking permits
  - Currently: scarcity -> waiting list
  - Tradability?
- Potential scheme
  - Suppose: 100 household, 25 parking places
  - Each year, every household gets 1 right
  - 4 rights are needed for 1 permit
    - Permit can even keep its current price!
  - Balances “rewards” (for sellers) and “charges” (parkers)
  - Efficient, effective, fair?

Much wider applicability of principle II

- Over-supply of business-parks
  - Likely result of policy competition
- Potential scheme
  - Suppose: municipalities receive tradable development rights, e.g. expressed in acres
    - Based on national desirable ceiling
    - Distribution based on population?
  - Rights can be bought and sold
  - Balances “rewards” (for sellers) and “charges” (developers)
  - Extensions including dismantling can be thought of
  - Efficient, effective, fair?

In conclusion

- Smart mobility initiatives
  - Great potential
  - Synergies in mixing
    - Supply-side
    - Direct demand management
    - Indirect demand management
  - Tradable permits as a promising application
    - Budget neutral
      - More efficient and financially sustainable than rewarding
      - More acceptable than pricing
    - First experiences seem promising

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