The effects of parking cash-out on individual mode choice behavior

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Agenda

- Employer paid parking: the problems
- Parking cash-out as an alternative?
- Modeling travel behavior for cash-out
  - Data
  - Models and estimation results
  - A model with only car users
  - Comparison: response measures linear and non-linear models
- Discussion and conclusions

- Distortion of relative prices
    - preferential treatment of private cars (Shoup 1997, Arnott et al. 1991, Small 1997, Wilson 1991)

- Welfare losses due to taxation

    - $ 36 Billions for USA (Shoup 1997)

    - € 5 Billions for EU/ $ 30 Billions for USA (Van Ommeren & Wentink 2011)

# Parking Cash-Out as an Alternative?

- A proposal by Shoup (1992)
  - Cash-Out: Commuters are monetary rewarded for loosing their right of a parking space at work
  - In case of traveling by car: parking charges

- Existing literature: change of travel behavior
  - Descriptive (Shoup 1997, Enoch 2002, Waters et al. 2006)
  - Analytic (De Borger & Wuyts 2009)

- However: No existence of "classical" mode-choice models

- Theoretically: The effect of cash-out programs will depend on individual preferences

All others

Private car
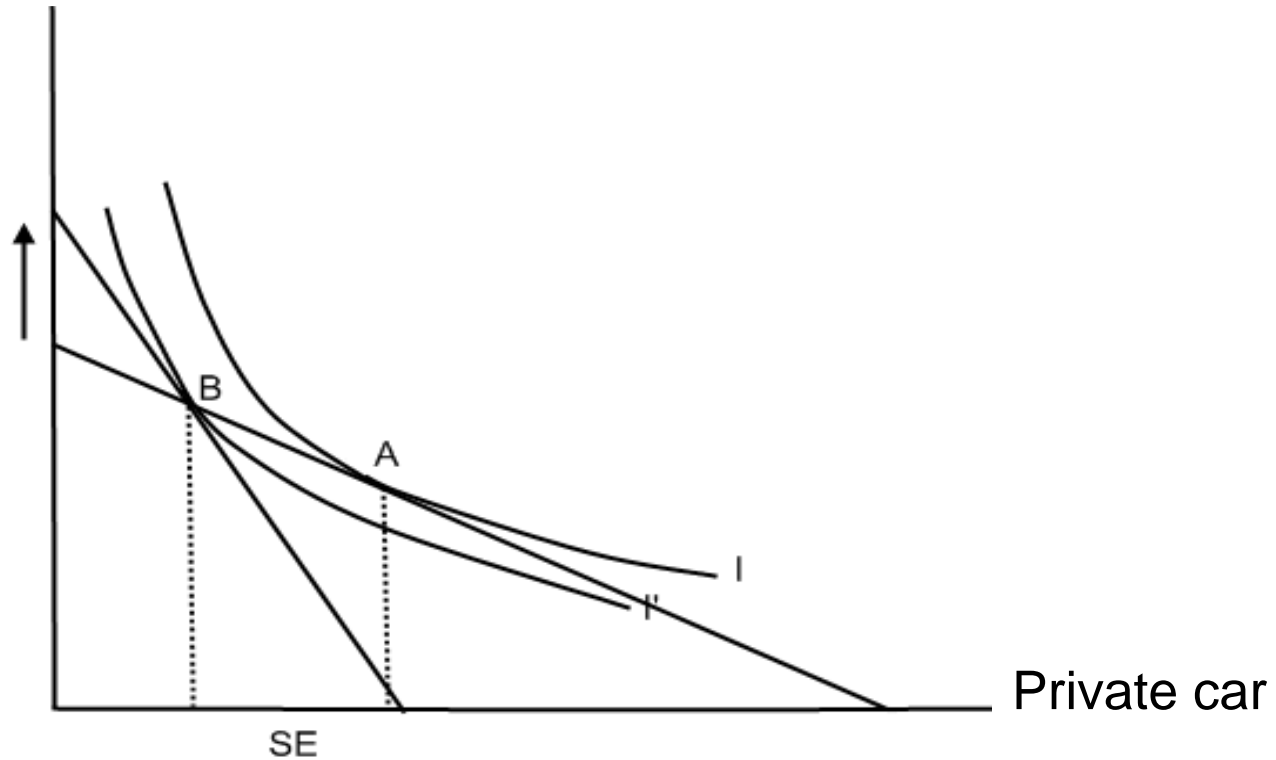
Modeling Parking Cash-Out

Modal choice if commuters are compensated

Implies utility maximization for individual t: $if \quad U_{it} > U_{jt} \Rightarrow i \succ j, \forall j \in J.$

Probabilistic model: $U_{it} = V_{it} + \varepsilon_{it}$

Assuming iid and extrem valued distributed ε_{it} derives the well known MNL choice probabilities

$$P(i) = \frac{e^{V_i}}{\sum_j e^{V_j}}$$

- Data
  - 681 commuters in an survey in Dresden – Germany → employer paid parking

  - First stage: revealed mode choice and general individual information

  - Second stage: Scenario on parking cash-out

  - Cash-out level randomized (between € 1 and € 5 per day in 10Ct steps) → new choice

Model specification:

$$V_{car,t} = 0 + \beta_{TT} \cdot TT_{car} + \beta_{TC} \cdot TC_{car} + \beta_{pc} \cdot PC + ...$$

$$V_{SR,t} = ASC_{SR-car} + \beta_{TT} \cdot TT_{SR} + \beta_{TC} \cdot TC_{SR} + ...$$

$$V_{PT,t} = ASC_{PT-car} + \beta_{TT} \cdot TT_{PT} + \beta_{TC} \cdot TC_{PT} + ...$$

$$V_{cycle,t} = ASC_{cycle-car} + \beta_{TT} \cdot TT_{cycle} + \beta_{TC} \cdot TC_{cycle} + ...$$

$$V_{foot,t} = ASC_{foot-car} + \beta_{TT} \cdot TT_{foot} + \beta_{TC} \cdot TC_{foot} + ...$$
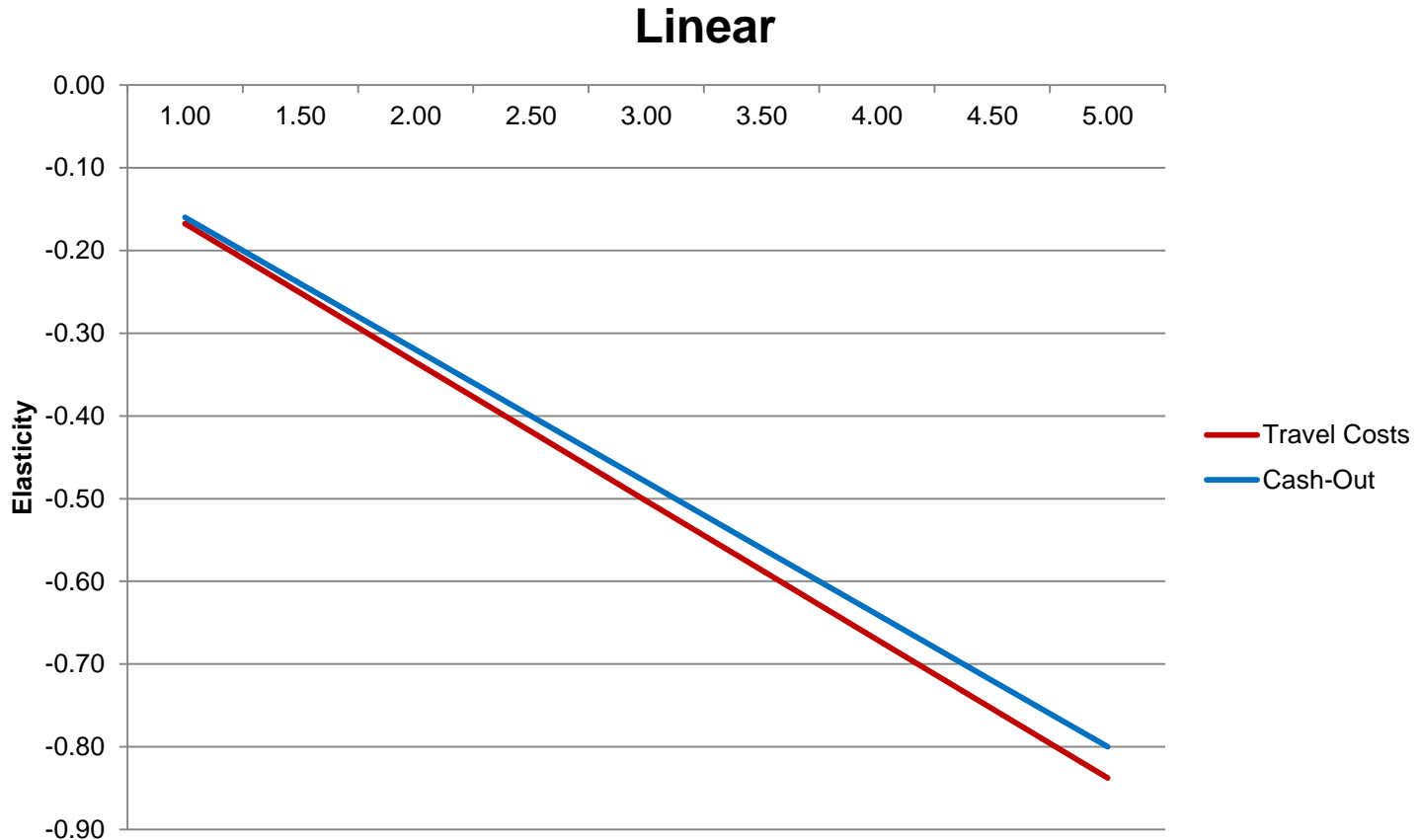
Modeling Parking Cash-Out: Results

Variable	Estimate M1	Estimate M2	Estimate M3	Estimate M4 (only car drivers)
Travel time				
In vehicle (motorized modes)	-0.0488***		-0.0449***	
(non-motorized modes)	-0.112***		-0.115***	
Private car		-0.055***		-0.037*
Share ride		-0.054***		-0.039
Public transit		-0.050***		-0.031**
Cycle		-0.113***		-0.100***
On foot		-0.164***		-0.097
Out of vehicle	-0.0313***	-0.034***	-0.032***	-0.025
Travel costs	-0.266***	-0.263***	-0.266***	-0.147*
Cash-out (private car)	-0.254***	-0.259***		-0.409***
Log (cash-out)			-0.705***	
Job Ticket (public transport)	0.673***	0.691***	0.670***	0.444
Adjusted R-square	0.218	0.207	0.217	0.379

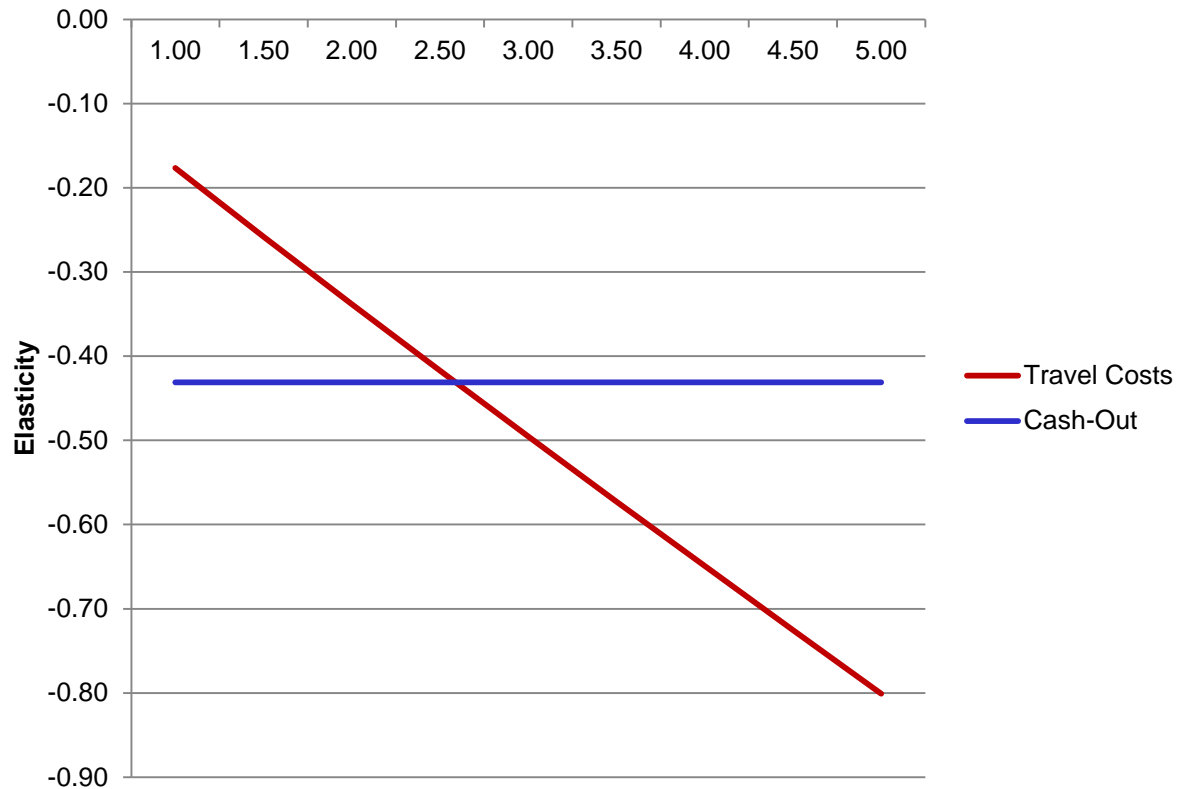## Compute Elasticities of car use: M1

Linear

Compute Elasticities: M3

Main results:

1. Elasticities between travel costs and cash-out are very similar → Cash-Out could possibly derive similar results to increasing travel costs (M1)

2. Elasticities differ at different charging levels: For lower charging levels parking cash-out performs better in terms of mode choice probabilities. For higher ones, increasing travel costs derive better results (M3).

Conclusions and Discussion

- **Possible advantages**
  - Acceptability: Insights from tolling literature suggest the need for a kind of „compensation"
  - Use of revenues out of road pricing (Marcucci et al., 2005; De Borger/Proost, 2011; Oberholzer-Gee/Weck-Hannemann, 2002)

- Recently: Removal of parking charges as a compensation for road pricing (Bonsall/Young, 2010)
  - But: political distortions may still exist

- Acceptability for parking charges seems to be higher than road pricing (e.g. Albrecht & Mahalel 2006)
  - In line with Zajac's (1995) principles of fairness

- In addition: Possibly even higher acceptability for parking cash-out. Political and psychological distortions may be even lower for cash-out.

Thank you for Attention