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Predicted response of Prague residents to regulation measures

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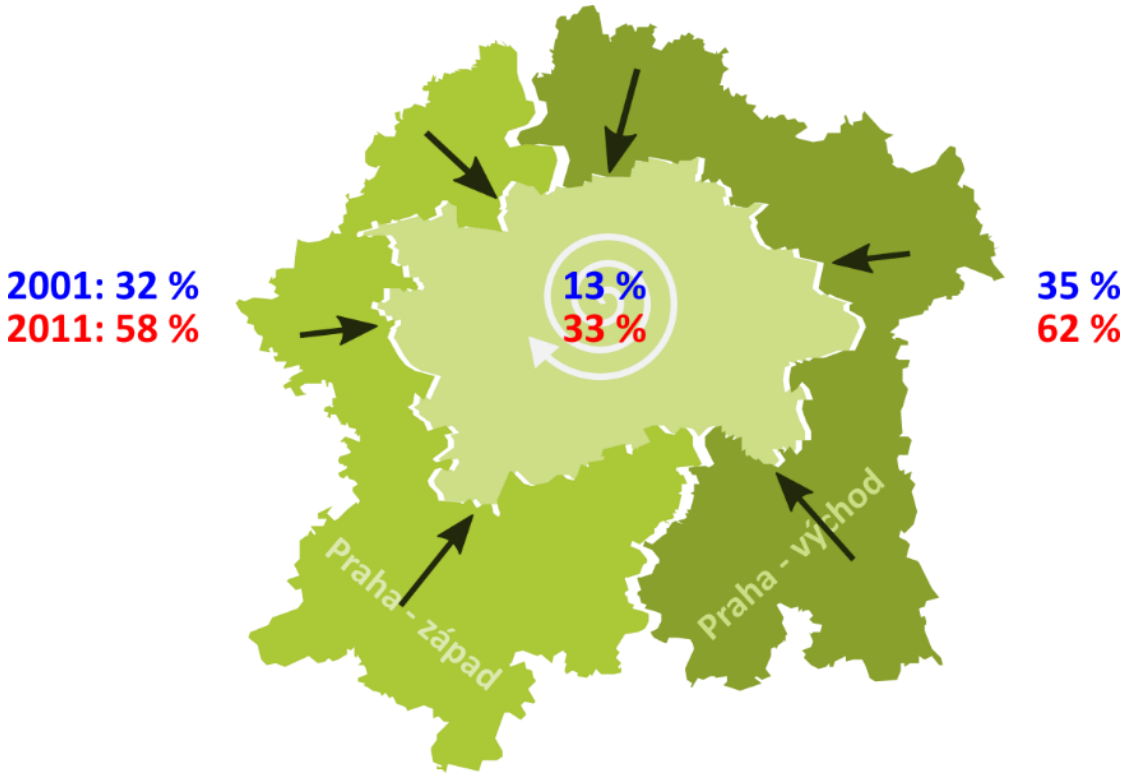
How would residents of the Prague agglomeration respond to regulation measures?

- Price based mesures
- Travel time based measures

What we know about travel behavior of residents of Prague agglomeration?

- Differences in travel patterns between urbanites and suburbanites
- Suburbanites travel more often by car
- The share of car on modal split continuously increases
- The share of bike is marginal (about 1 %)

Share of car in modal split
(commuting to and within Prague)



Data: Population and housing censuses 2001 & 2011

Why do suburbanites commute by car more than urbanites?

- their trip made by car compare to other travel modes may be
  - faster
  - cheaper
  - more reliable
  - more comfortable (*time with family members*)
  - barrier free / seamless
  - …
- their travel schedule may be more flexible

Why do people prefer one travel mode to another?

Why do people prefer one travel mode to another?

- It is for them more attractive than all other available travel modes

Random utility choice model

- helps to understand what attributes makes the relative attractivness of the travel modes

3 types of factors:

- attributes of travel alternatives (travel time, travel cost, reliability, …)
- Individual characteristics (age, gender, income, education, household structure, type of work, …)
- Characteristics of travel situation (commuting or leisure, weather, characteristics of urban structure, …)

Lucas et al. 2011

Prediction of the response to regulation

Based on:

- Survey data from residents of Prague agglomeration
- Real choices made on randomly selected working days (*revealed preferences*)
- Estimated parameters of the Random utility model (*nested logit*)

Baseline modal split:

Car - driver	Car pool	Public transport	Walk	Bike	Total
25.7%	4.9%	63.8%	5.3%	0.38%	100%

Model scenarios (# 8):

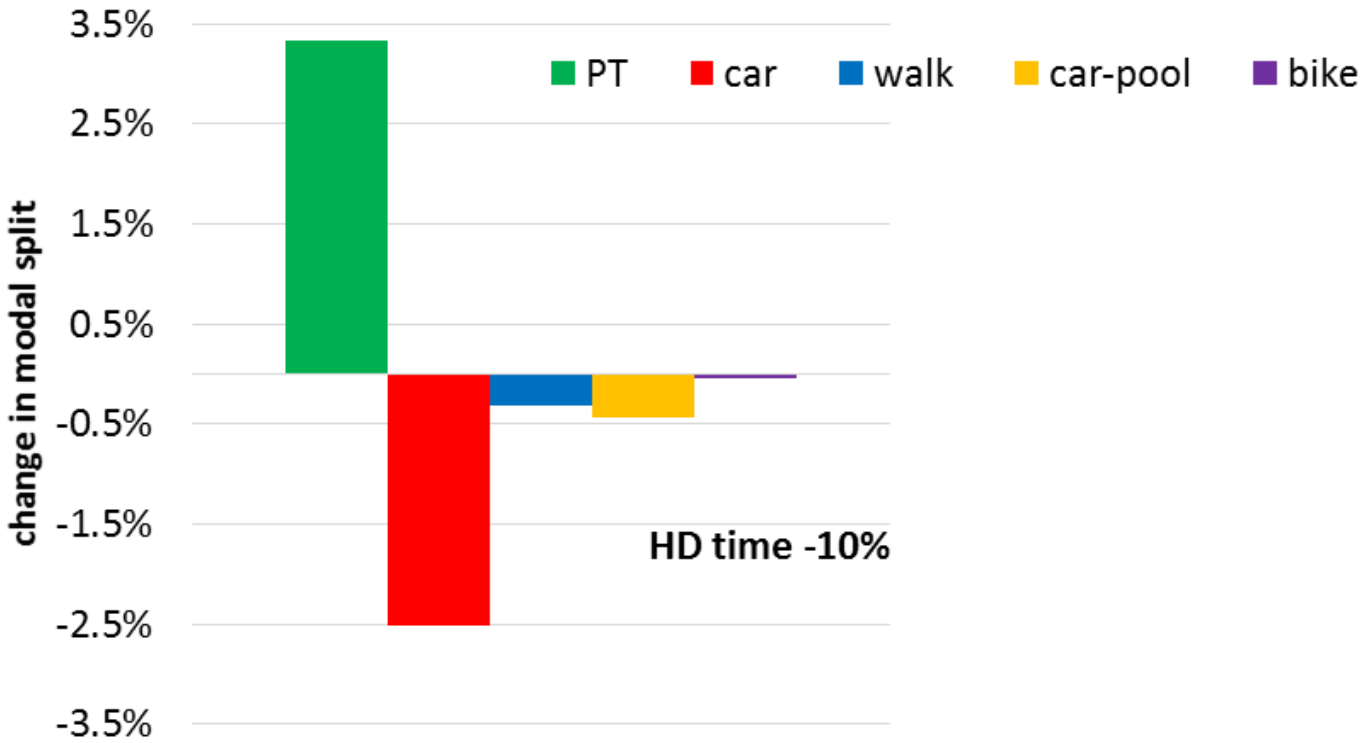
- ±10 % changes in travel costs – public transport
- ±10 % changes in travel costs – car

- ± 10 % changes in travel time - public transport
- ± 10 % changes in travel time - car

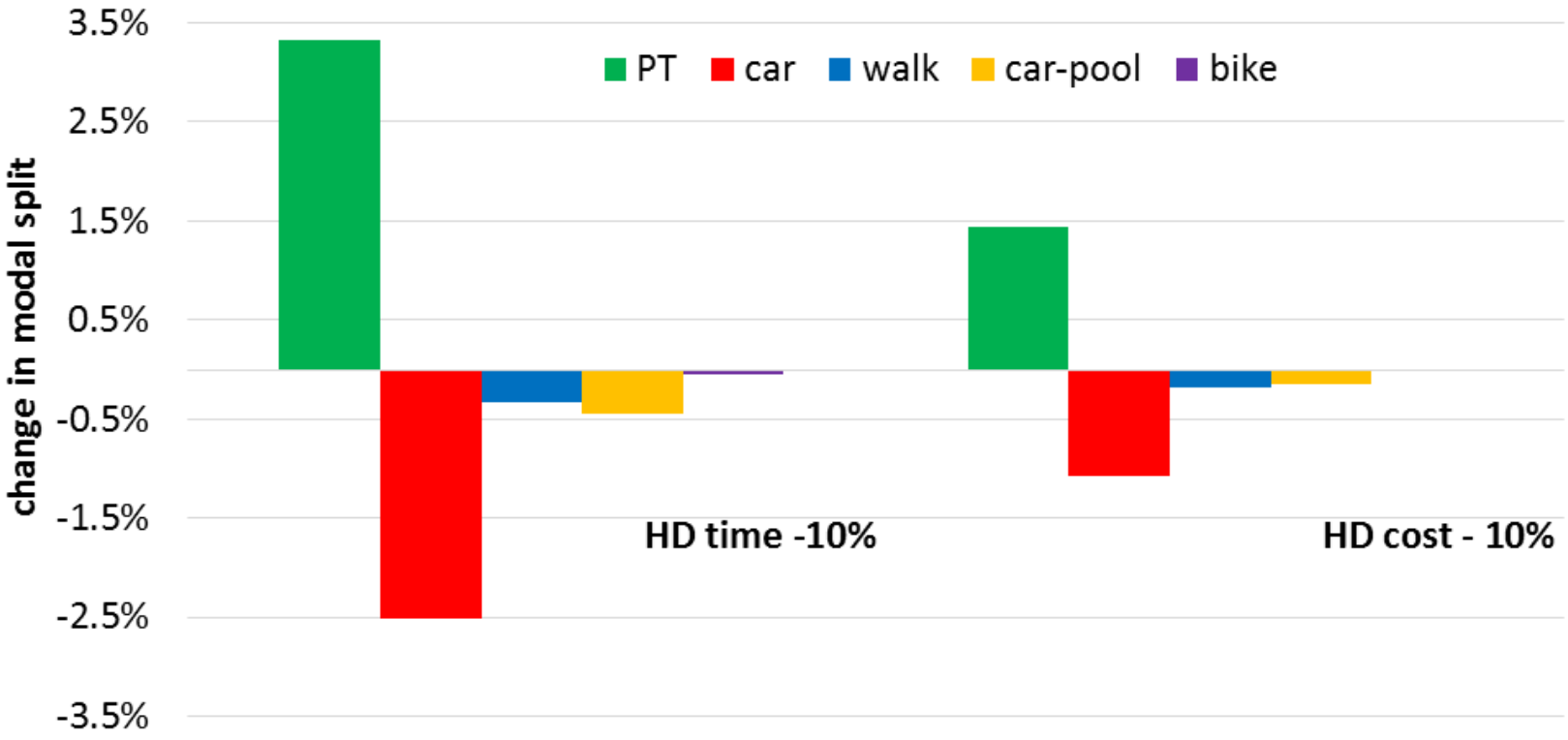
Dependent variable:

- change in modal split (for 5 modes)

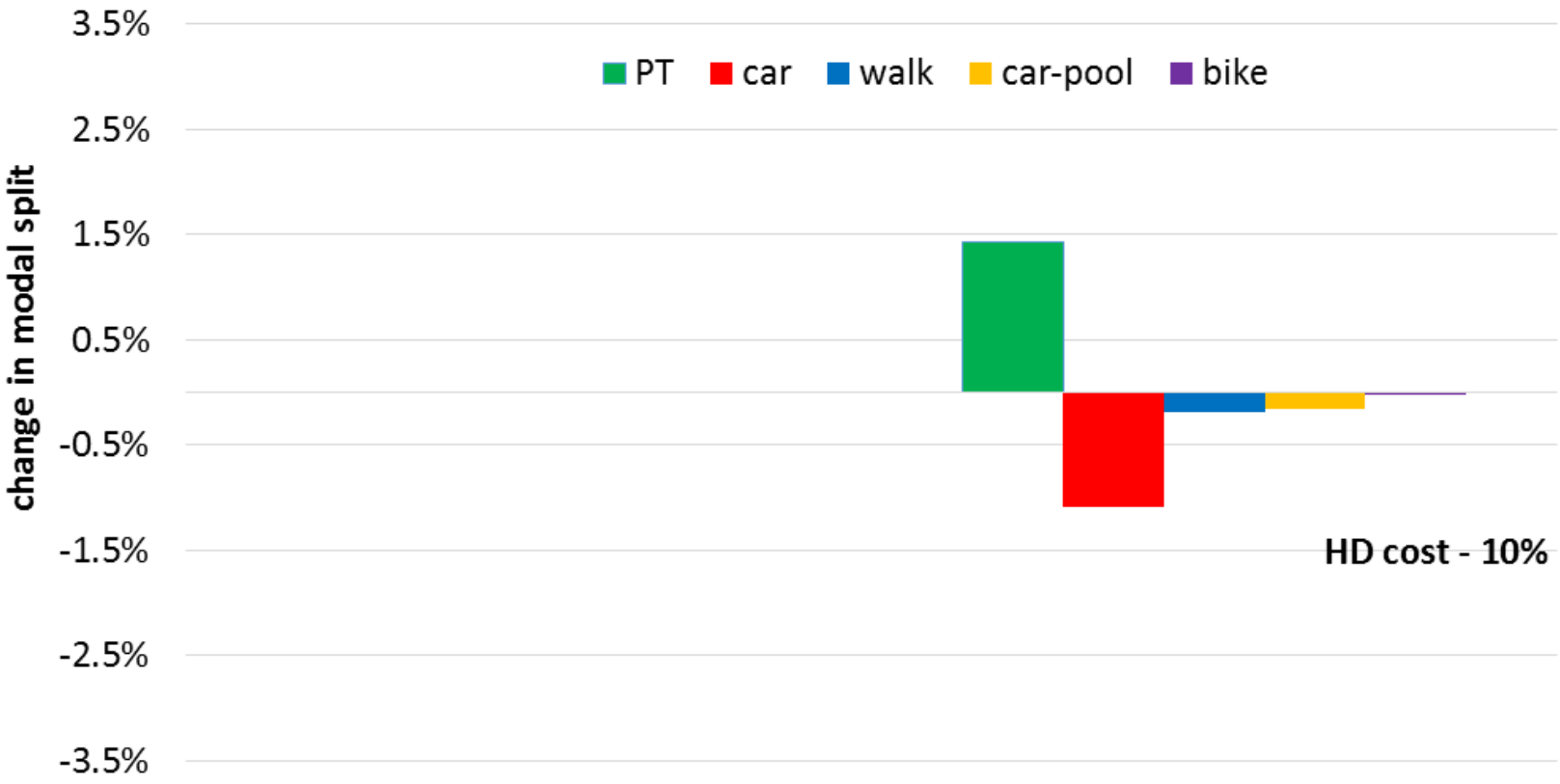
Scenario 6: change in modal split due to change in PT travel time (-10%)



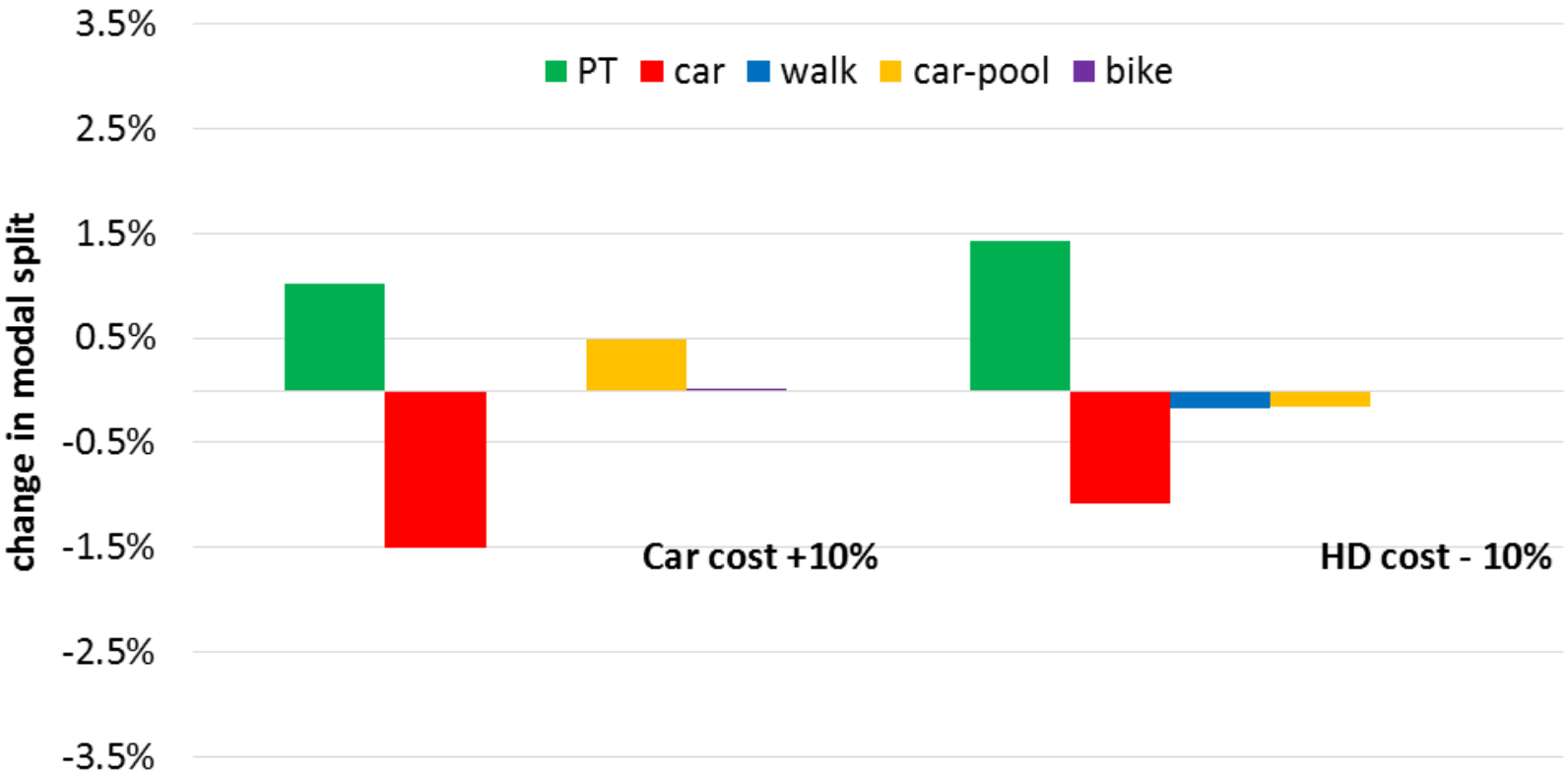
Scenarios 6 & 2: change in modal split due to change in time / cost



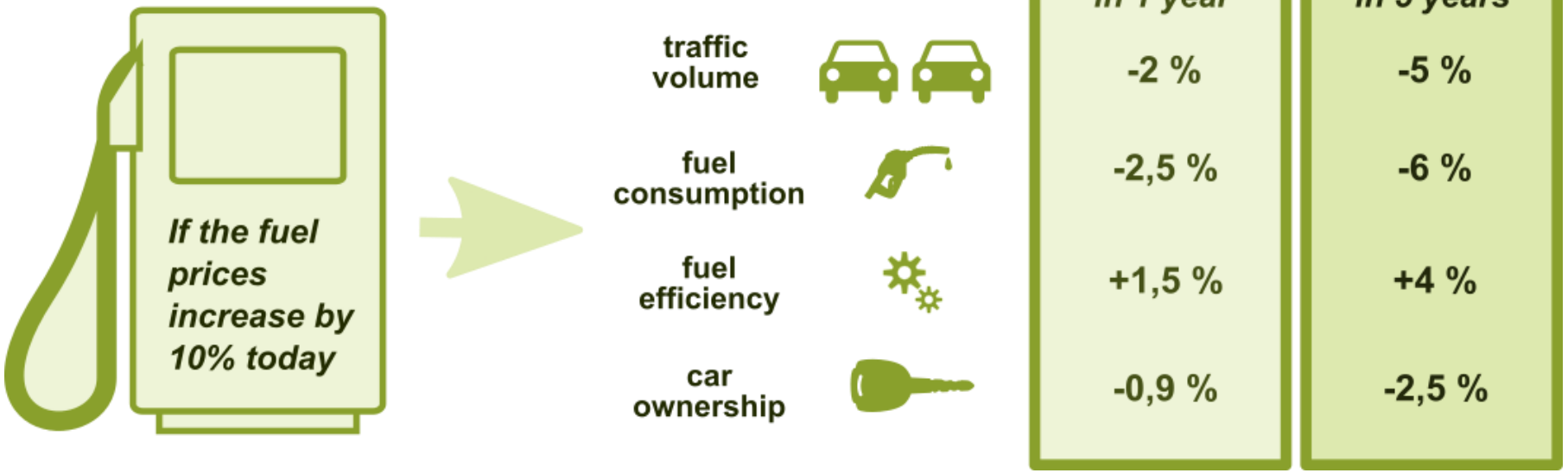
Scenarios 2: change in modal split due to change in cost



Scenarios 4 & 2: change in modal split due to change in costs

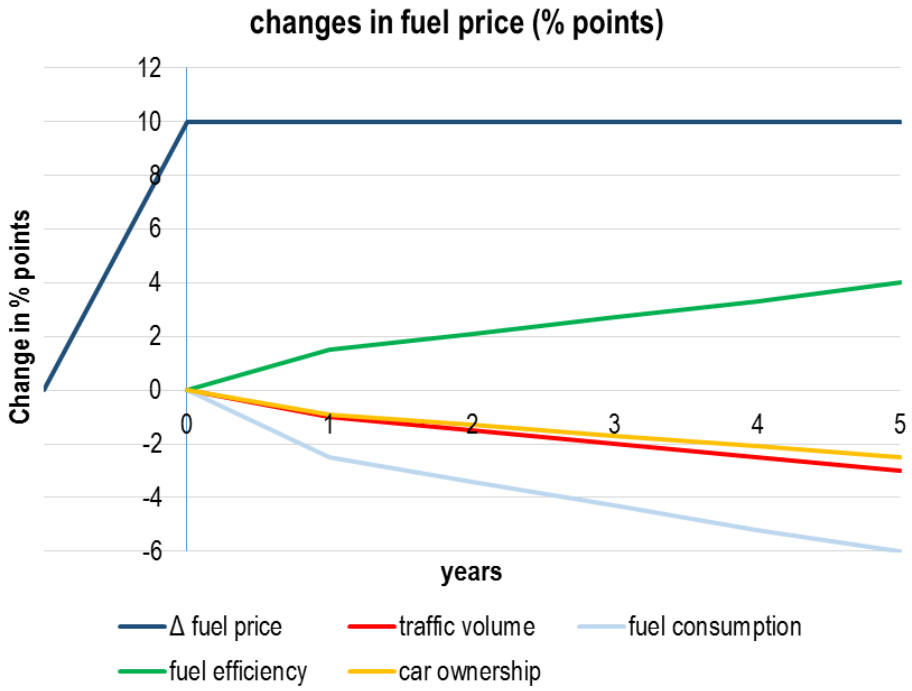


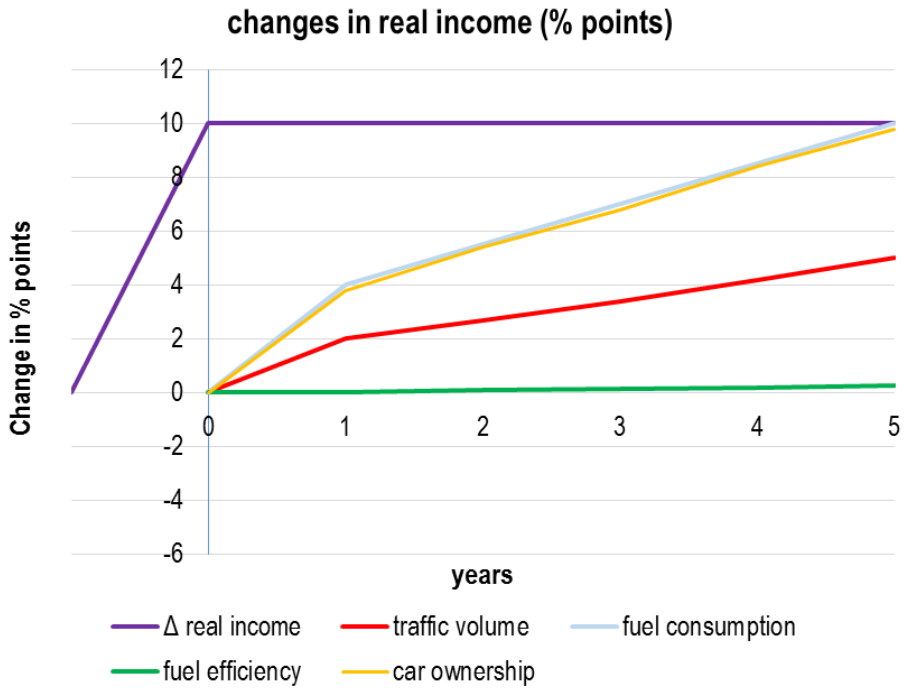
Change in demand in response to fuel price increase



Source: Goodwin-Dargay-Hanly. 2004. "Elasticities of Road Traffic and Fuel Consumption with Respect to Price and Income : A Review." Transport Reviews 24 (3): 275–92.

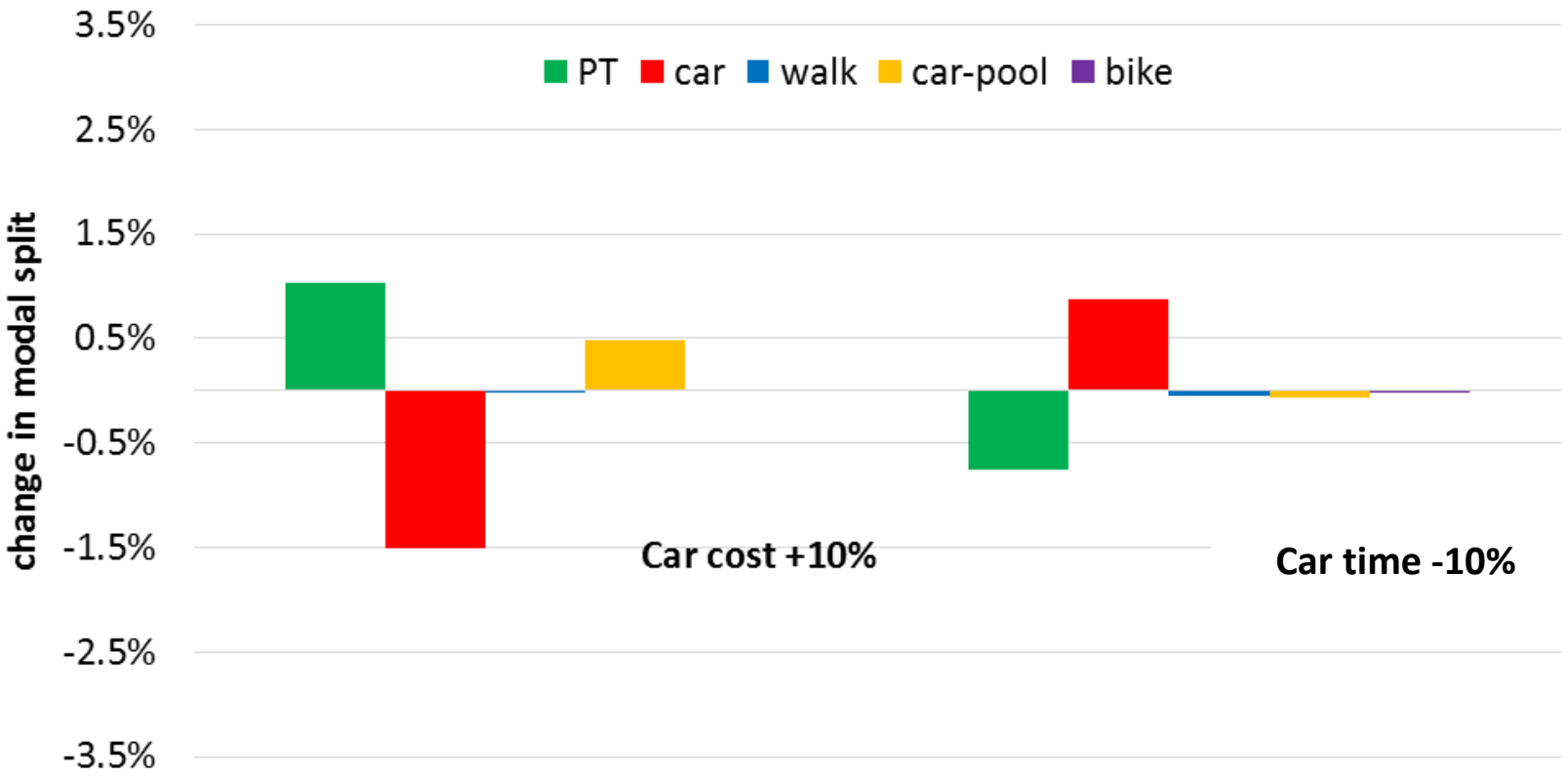
Change in demand in response to increase in fuel price and real income





Source: Goodwin-Dargay-Hanly (op. cit.)

Scenarios 4 & 7: change in modal split due to change in car cost and time



Summary:

- Travel time of public transport has the highest effect on car choice
- The effect of price regulation on car demand is lower than proportional *(middle time price elasticity for Prague -0.59)*
- Improvement of road infrastructure (to make car trips faster) leads to higher attractiveness of car compare to other travel modes *(e.g. 50% travel time reduction → ~17 % induced car demand)*
- Regulation measures based on pricing increase inequality (here we model average effects, in reality pricing affects more low income households)
- Short time effects (are proportionally higher) than long time effects

Discussion (1):

- Data 2008
- Sub-sample of Prague agglomeration residents (N=278)
- Simple model:
  - doesn‘t account for individual heterogeneity
  - doesn‘t include other individual characteristics
  - quality-related attributes of public transport (reliability, comfort, etc.) are not modelled (effect remains in the intercept)
- We estimate average effects
  - may differ for different groups (social class, residence area, etc.) and individuals (craftsmen, people with disabilities, etc.)
- Different effects in peak and non-peak periods and for different purposes (demand for leisure travel more elastic)

Discussion (2):

- Effects of price regulation differ according to pricing methods *(fuel prices, congestion charges, parking charges, etc.)*
- Other mode choice determinants:
  - structure of work *(flexible working time, home office, teleconferences)* – estimated effect 0.6 – 2.2 % (*Cairns et al. 2004*)
- Soft measures
  - mobility plans of companies and schools
  - personalized travel planning – estimated effect 0.4 – 1.9 % (*Cairns et al. 2004*)

Future challenges:

- New travel alternatives:
  - Car-sharing
  - Bike-sharing (e-bike sharing)
  - Light e-mobility (e-bikes, e-scooters)
- Travel services (*transport-as-a-service*)
  - On-demand transport
  - Uber-like services
  - Autonomous mobility
- Shifts in shopping patterns
  - Shopping delivery services

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Thank you!

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Results (1):

- Decrease in travel time of public transport (scenario 6)
    - Highest positive effect on the share of PT (3.3%)
    - highest negative effect on the share of car (2.6%)
    - Note that demand for public transport is affected more than demand for car
- Increase in travel time of PT (scenario 5)
    - Highest positive effect on the share of car (2.5%)
- Change in travel time of car has lower effect on car demand than change in travel time of public transport (- 0.9 and 0.8 vs. 2.5 and – 2.6%)
- Change in travel time of car has on car demand lower effect than the change in travel cost in car (- 0.9 % vs. - 1.6%)
- Increase in travel cost of car and travel time of PT has the highest positive effect on car pooling (0.5% and 0.6%)

Results (2):

- Effects of the increase in travel cost for car travel:

PT:	+ 1 %
Car - driver:	- 1.6 %
Car pool:	+ 0.5 %
Walk:	± 0 %
Bike:	± 0 %