Selection-bias in reward experiments: evidence from a real-life peak avoidance experiment among train commuters

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This study aims at investigating and quantifying self-selection effects in an experiment where train commuters were rewarded (financially) for traveling off-peak.

Setting

The peak avoidance experiment took place in the Netherlands between summer 2012 and spring 2013, and included more than 1000 active participants. Depending on the reward regime (high vs. low) and their distance class, participants could earn a reward of 1.5 to 4.5 Euro per off-peak trip along their participation link. The travel behavior of the participants was measured via a smartphone app, which continuously recorded their GPS coordinates, and hence provided a direct measurement of their travel behavior. Besides the reward period of 22–25 weeks, the travel behavior of the participants was also measured during a 3-week period of pre-measurement and a 4-week period of post-measurement.

Recruitment

Participants were recruited among existing clients (annual travel pass holders) of the Dutch train operators via email invitations and posters at the station. The response rate was rather low, amounting to only 1.2% of those invited via email.

Non-respondents

Additionally, we also collected data on non-respondents, hence on train commuters who were invited to participate in the experiment, but declined. A response rate of 13% (489 respondents) was achieved.

Dropouts

A significant share of the more than 1000 initial participants quitted before the end of their participation period of 22–25 weeks. Less than 50% of the initial participants filled in all obligatory surveys and logbooks.

Data

We can distinguish between three groups of persons: (1) full participants (those who participated throughout the entire experiment), (2) dropouts (participants who dropped out in the course of the experiment) and (3) non-respondents
(those who were invited to join the experiment, but declined). Depending on group membership, the following data are available:

- **Revealed preference (RP) data**

Travel data from the dedicated app are available for full participants and dropouts. They contain the registered train commute trips (arrival and departure time, origin and destination station). The data have a panel structure due to multiple trips being made by one person. Together with the travel information provided by an app that is made available by the Dutch National Railways (NS), the RP data render it feasible to estimate full-fledged scheduling choice models, including definitions of the following attributes of the departure time choice alternatives: rewards, travel time, schedule delays, number of transfers, crowdedness (as a proxy for comfort) and travel time variability. Due to the presence of the time-of-day-dependent reward, the monetary valuations associated with improvements in these attributes can be derived.

- **Stated preference (SP) data**

All full participants, most dropouts and all non-respondents filled in a stated preference survey involving departure time choices (10 choices with 2 alternatives each). The alternatives differed in terms of reward, travel time, schedule delays, number of transfers, crowdedness and travel time variability. Travel time and schedule delay attributes were personalized.

- **Data on socio-economic characteristics, scheduling preferences, etc.**

All full participants, most dropouts and all non-respondents filled in an extensive survey concerning their socio-economic characteristics and scheduling preferences/restrictions.

**Method**

1. The participation/dropout decision is explained, using an ordered logit model with the participation duration as dependent variable and socio-economic variables, distance class and scheduling restrictions as explanatory variables.

2. Scheduling choices are explained (based on SP and RP data), using multinominal logit and latent class models.

3. Based on (1) and (2), RP-based coefficients for non-respondents are inferred, and their scheduling decisions are predicted.

**Preliminary results**

Significant differences exist between full participants, dropouts and non-respondents:

- Full participants tend to have more flexible jobs.
- Full participants tend to travel close to or during off-peak periods also without financial reward for off-peak traveling. Moreover, their preferred arrival time is often outside or at the edges of the peak period.
- The marginal utility of income (i.e. the reward coefficient) is significantly higher for full participants than for the other groups, both in the RP as well as in the SP domain.