Rewarding for avoiding the peak period: a synthesis of three studies in the Netherlands

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Introduction

Pricing in transport has been embraced by several countries as a useful instrument for alleviating congestion problems. World-wide many studies, both model based and empirical, have been done on the effects of road pricing on travel behaviour and resulting traffic conditions. Instead of a negative incentive (pricing), a positive incentive (rewarding) could be given. Rewarding travellers for 'good behaviour' with money or other means is in itself an interesting concept and may trigger larger behavioural changes than pricing.

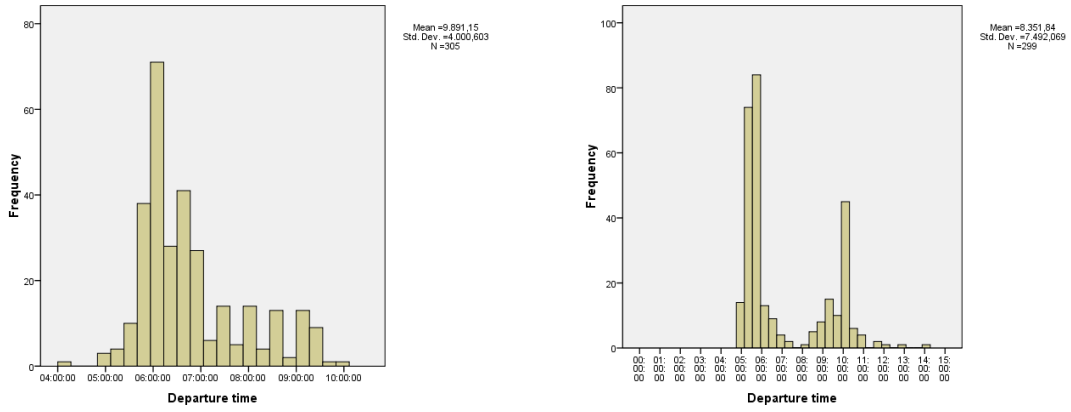
In the Netherlands, three rewarding studies have been done and implemented on the road. They all aimed to decrease congestion (or minimize the increase in congestion due to road works), but differ in implementations and rewards. In this paper we try to give a synthesis of these three studies on the effects of rewarding on travel behaviour and on the potential effects for traffic conditions.

Study 1: Peak avoidance region Amsterdam

In 2008 repairs on a bridge ('Hollandse Brug') on an important 3-lane motorway corridor between Almere and Amsterdam was executed. Lanes were narrowed and the maximum speed limit was lowered to 70 km/h. This would lead to a reduction in capacity and an increase in congestion on the already heavily congested corridor. The Dutch government implemented several measures to mitigate inconvenience for commuters that pass the bridge frequently. The measures that were offered included (1) a reward for avoiding the bridge during peak hours (6am-10am), (2) free access to public transport including bus and vanpool, (3) the use of a ferry for pedestrians, cyclists, heavy goods vehicles shorter than 12 meter and agricultural vehicles, and (4) provision of travel time information for alternative routes.

During the repairs on the bridge 760 commuters made use of the free access to public transport option, 2,700 commuters voluntarily participated in the peak avoidance option. They were rewarded with 4 euros for each weekday they avoided the bridge during peak hours (relative to their base level, registered before the project). Registration was done by means of cameras with licence plate recognition. Travellers on the corridor are therefore encouraged with a reward (a free public transport pass or money) to (i) change trip decision, (ii) change mode, (iii) change departure time, and (iv) change route.

Of the 2,700 participants, 500 to 800 avoided the peak hours each day. A survey was conducted to get insight into the travel behaviour of the participants. More than 70% of the participants indicated that they changed their travel behaviour in some way. Of the peak avoiding participants, 16% decided to work from home, 19% switched public transport, 44% travelled outside the peak period, and 26% change to another route. People that changed their departure time had a preference for departing earlier. Commuters departed earlier, with a peak just before 6am, or they departed later directly after the peak (10am), see Figure 1.



Before peak avoidance project During peak avoidance project

Figure 1: Departure time shifts due to rewarding in Amsterdam region

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Even though up to 800 vehicles avoided the peak period, the traffic intensity measured during peak hours increased by 8% and directly after peak hour the intensity increased by 10%. This increase is mainly due to the fact that trucks were prohibited to use the bridge during the repairs and therefore the traffic was more homogenous, increasing the capacity. The increase in intensity did not lead to longer queues. On the contrary, since the capacity increased due to absence of trucks, the queue length decreased.

Study 2: Peak avoidance region Rotterdam

Peak avoidance was also applied in 2008 during repairs of another bridge ('Moerdijk Brug') on a busy 3-lane motorway south of Rotterdam in the Netherlands, in which similar problems were expected as described for the Amsterdam region. During the reparations that lasted for almost a year measures were taken by the Dutch government to mitigate congestion during the repairs. These measures included (1) a reward of 4 euros each day for avoiding the bridge during evening peak hours (3pm-7pm), (2) provision of travel time information for alternative routes, and (3) extension of a Park and Ride facility to facilitate travelling by public transport.

Peak avoidance was applied during 3 months using the same conditions as peak avoidance in the Amsterdam region. In total 2,700 commuters took part in the peak avoidance project.

During the evening peak hour an average decrease of 920 vehicles (4.6%) was measured. Two questionnaires were developed. One for commuters that participated in the peak avoidance project and one for commuters that did not participate in the project. In total 66% of the participants changed their travel behaviour during the project. Alternatives for travelling during peak hours included: by car outside peak hours (30%), alternative route by car (43%), public transport (3%), tele-working (16%) and P+R (2%). Again, participants made combinations of these alternatives. During the project 19% of the commuters departed earlier from work, or they departed later (37%) directly after the peak hour, 44% sometimes departed earlier and sometimes later. Clearly, while travellers depart earlier to avoid the morning peak in the previous study, now travellers mostly depart later to avoid the evening peak. This indicates time constraints on the work side.

With respect to traffic conditions, the traffic intensity decreased. As a result, a decrease in travel time of 2.5 minutes (18%) during the peak hours was accomplished. Even more, between 5 pm and 6 pm an average decrease of 5 minutes (36%) in travel time was measured.

Study 3: Peak avoidance region The Hague

In 2006 an experiment with 340 participants was conducted on the corridor Zoetermeer – The Hague, where participants would receive a reward between 3 and 7 euros when they would avoid the morning peak period (7h30-9h30) by car (i.e., if they were not registered by cameras or detected using on-board units on the road). Instead of a monetary reward, participants could save up points for receiving a free smart phone with route information. All routes between the two cities were monitored, therefore changing route would not lead to a reward.

The results suggest that all types of incentives resulted in a considerable reduction of peak car trips. The initial percentage of about 45-50% could be reduced to about 20% of peak car travellers. The primary response to incentives is to retime the car commute to the periods before and after the morning peak. Mode switches only accounted for a relatively small share of the reduction in peak car traffic. In case of monetary incentives, the lowest incentive (3 euro) accounted for the largest part of the reduction, while raising the reward to 7 euro resulted in only an additional 7% reduction. In case of the smartphone incentive, a noteworthy finding is that without an incentive, but having access to traffic information, the share of in-peak car travellers decreases. This most likely signals that participants made arrangements to adjust their peak trips the full duration of the trial. Finally, it is found that participants are more likely to adjust their behaviour when they have flexible work hours, have public transport alternatives and regularly use traffic information. In addition, males, highly educated and high-income participants are more likely to avoid the peak in response to incentives.

Impact on traffic conditions were not expected from this experiment due to the low number of participants. Model results show that such a rewarding scheme can lead to significant reductions in congestion levels if the reward is introduced on a larger scale with the right participation level (up to 50%) and the right reward level (up to 3 or 4 euros). Higher participation and reward levels may be counter effective.

Synthesis

The final paper will present a synthesis of these three studies. In particular, conclusions will be drawn regarding the types and magnitude of the behavioural responses, depending on the design of each study. Elements such as the height of the reward, the allowed responses (e.g. route change or not) and the duration of the measure will be take into account. Additional issues will concern options on the side of the traveller, such as work time flexibility, household obligations but also length of the commute trip.