Does Feedback Make You Try Less Hard? A Study of Automotive Telematics

1. Introduction

In many industries ranging from healthcare (Song et al. 2017) to transportation (Toledo and Lotan 2006) technological advances allow us to provide immediate performance feedback to individuals which can be used to improve performance. Behavioral tendencies such as ahead-seeking and behind-aversion (Roels and Su 2014) can be used to nudge individuals in the right direction without extra cost.

In this paper we focus on insurance provided using automotive Telematics devices that track users' behavior while driving (known as Usage Based Insurance or UBI) which is currently the most disruptive technology in the auto insurance industry\(^1\). However, little is known about implications of this technology for drivers. Using a novel dataset obtained through a collaboration with a startup, we study behavioral implications of Telematics and we show that providing simple feedback to users based on their most recent driving behavior may have unexpected consequences.

Once the user opts in for a UBI, the insurer tracks the user's driving behavior using a device embedded in the user's car or a smartphone. The user is given two types of scores after each trip: a trip score (the score for the latest trip), and a to-date score (score based on all the trips taken in the past). The trip score is calculated based on a combination of three behavioral scores—speeding, acceleration and braking and it also includes two trip attributes- time of the day and miles driven. Based on the to-date score, the user may qualify for a discount on the next insurance premium. Users can see detailed feedback regarding their performance through a smartphone application.

One of the key underlying assumptions of UBI is that technology-generated performance feedback benefits everyone. On one hand, it provides real-time feedback to drivers to improve driving behavior, which is rewarded in the form of discounts on insurance premiums. On the other hand, the insurance company lowers its risk of insurance claims because of improved

\(^1\) http://www.insurancetech.com/telematics-reinventing-auto-insurance/d/d-id/1311877?
driving. Our results, however, demonstrate that not all feedback leads to improved driving performance.

Our dataset is comprised of trip-level data for nearly 400 users under UBI totaling ~80,000 trips. After every trip, users are notified about their trip score; and they are given an option to study detailed feedback via the app interface. Through the application, we track the length of time the users spend looking at their detailed feedback. Users who receive a to-date score of 70 or more out of 100 qualify for an insurance premium discount.

Using archival data, we answer four fundamental research questions: (1) Does seeking detailed feedback help users perform better in the short-term as well as long-term? (2) Do users respond to feedback differently contingent on their to-date score? (3) Does negative and positive feedback lead users to behave differently? (4) Does recent performance trend have an impact on the future performance?

2. Econometric model

To answer our research questions, we fit a linear econometric model. We use trip score as our dependent variable, and our treatment captures whether a user has looked at the detailed driving performance feedback in the app. Our identification strategy relies on the fact that, if we control for various parameters (including unobservables), we should be able to identify the impact of feedback, which happens when users review their dashboard via the smartphone app. We employ several controls in our model including hours of driving, miles driven and frequency of feedback. Therefore, any changes in the trip score reflect the changes in the three behaviours (speeding, acceleration and braking). Furthermore, we control for the date and individual fixed effects to account for unobservables pertaining to date of travel and individuals. To test the robustness of our results, we collect network outages in the relevant geography and, using them as an exogenous shock, we re-estimate the model. We find consistent results. Finally, our results remain consistent using matching method, when users are matched based on observed parameters.
3. Results

Counterintuitively, we find that feedback has unexpected impact on user performance. We find that overall feedback does not help users to drive any better; on the contrary - it impedes performance. Cumulative feedback also leads to performance deterioration. We find that, on an average, after taking 100 such feedbacks, users may perform worse by 1.3% in their next trip score, compared to the case when they had not taken any feedback. The three driving behaviours are positively correlated, which indicates that such reduction in score has a negative effect on all of them. Given that a speed increase of 1km/hr increases the risk of an accident by 3% (Finch et al. 1994), small fluctuations in the score could have significant impact on reduced road safety and increased risk of accidents.

Our results suggest that the impact of feedback depends on the user’s to-date score relative to the insurance discount threshold. The impact of feedback on the drivers who are below the threshold is positive, while on the drivers who are above the threshold is negative. This suggests that, to be effective, the feedback provided to users should be personalized based on the users’ past performance. In addition, we find that the positive impact of feedback on drivers is the highest for drivers whose to-date score is lower, but near the threshold: drivers closest to obtaining a financial incentive benefit the most from feedback. Lastly, we show that drivers who exhibit a positive score trend perform worse than the drivers whose performance trend is negative. These insights are essential for understanding and correcting the unintended consequences of UBI and for designing better feedback mechanisms.

4. References


