

Sensor Data and Behavioral Tracking: Does Usage-Based Auto Insurance Benefit Drivers?

Online Appendix

- **Appendix A**

In this section, we provide some further analyses that support the validity of our primary analysis and results. Three arguments are tested in this appendix to support our primary results.

A1: *Average UBI score and the week in which customers drop out of the UBI policy are significant determinants of the permanent discount.*

In this section, we want to check the assumption that the permanent discount is related to the average UBI score of customers and their decision about continuing in the UBI program during 6 months.

$$\text{permanent discount}_i = \beta_0 + \beta_1 \times \text{UBI score}_i + \beta_2 \times \text{Age}_i + \beta_3 \times \text{Gender}_i + \beta_4 \text{Cancellation week}_i + \varepsilon_i$$

In the above model, we consider the permanent discount (as a fraction of the premium that would otherwise be charged) that the UBI customers receive as the dependent variable and the average UBI score, age, gender and the week in which driver i drops out of the UBI policy as covariates.

Table A1: Regression analysis results for permanent discount.
('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size= 32478

| | Estimate(Std.Error) |
|--------------------------|--------------------------|
| <i>(Intercept)</i> | -0.13(0.00046) ** |
| <i>UBI score</i> | 0.0019(0.000006) ** |
| <i>Age</i> | 0.00007(0.00003) ** |
| <i>Gender (Female)</i> | 0.0032(0.002) |
| <i>Cancellation week</i> | 0.0061(0.00005) ** |
| Multiple R-squared: 0.67 | Adjusted R-squared: 0.66 |

We find that the model can explain about 66% of the variation in the permanent discount observations and average UBI score and cancelation week are both significant factors in determining permanent discount as we expected. The age coefficient is also significant which shows for a fixed value of UBI score, the senior drivers receive more permanent discount compared to younger drivers.

A2: *Daily hard brakes and mileage are significant determinants of daily UBI score.*

We explained in the data description section of the paper that although there are many elements that the insurance company uses to monitor and assess the actual driving performance, in our datasets we have 3 measures. The primary measure in our dataset is daily UBI score; and daily number of hard brakes and mileage driven are two factors that describe driving behavior of UBI customers. We need to test the assumption that both daily hard brakes and mileage have significant effect on UBI score and also these factors can explain high percentage of variation in daily UBI scores.

$$UBI\ score_{it} = \beta_0 + \beta_1 \times mileage_{it} + \beta_2 \times Hard\ brake_{it} + \varepsilon_{it}$$

For each UBI customer, we have daily observations for up to 180 days.

Table A2: Regression analysis results for daily UBI score.

([∗]): p-value < 0.1, (^{*}): p-value < 0.05, (^{**}): p-value < 0.01, sample size= 5,032,529

| | Estimate(Std.Error) |
|--------------------------|--------------------------|
| <i>(Intercept)</i> | 82.11(0.17) ** |
| <i>Mileage</i> | -0.18(0.01) ** |
| <i>Hard brake</i> | -3.79(0.02) ** |
| Multiple R-squared: 0.58 | Adjusted R-squared: 0.57 |

The results show that both mileage driven and hard brakes are significantly negatively correlated with daily UBI score. More importantly, just these two factors alone can explain about 57% of the variation in daily UBI score observations in our dataset which means mileage and number of the hard brakes are two key factors in determining the UBI score based on the company's policy.

A3: *Long term effect of UBI adoption on renewal insurance score improvement after one and two years.*

We model the changes in insurance score after one year (first renewal) and two years (second renewal) for customers who adopt UBI as compared to those who do not to estimate the effect of UBI adoption on long term improvement of insurance score.

$$\Delta IS_i = \alpha + state_i + \beta_1 \times age_i + \beta_2 \times male_i + \beta_3 \times UBI\ acceptance_i + \varepsilon_i$$

ΔIS_i : Changes in insurance score of customer i after 1 or 2 years.

$UBI\ acceptance_i$: Whether the customer i adopts the UBI policy or not.

Table A3: Regression analysis results for long term effect of UBI adoption.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01

| | Estimate(Std.Error) | |
|---------------------------|---------------------|----------------|
| | First renewal | Second renewal |
| <i>Intercept</i> | 5.08 (0.15)** | 8.59 (0.21)** |
| <i>Age</i> | -0.08 (0.01)** | -0.12 (0.01)** |
| <i>Gender(Male)</i> | -0.312 (0.11)** | -0.21 (0.1)* |
| <i>UBI acceptance</i> | 0.28 (0.08)** | 0.41 (0.11)** |
| <i>State dummies</i> | Included | Included |
| Multiple R-squared | 0.39 | 0.41 |
| Sample size | 61,358 | 20,435 |

The coefficient of $UBI\ acceptance$ is positive and significant at 0.05 level in both regressions. It shows that the UBI adoption may lead to long-term improvement in insurance score of customers at first and second insurance renewal time after controlling the demographic information.

A4: *First week UBI score regression analysis*

$$UBI\ score_{i1} = \alpha_0 + \alpha_1 \times age_i + \alpha_3 \times gender_i +$$

$$\alpha_5 \times newdriver_i + \alpha_6 \times insurancescore_i + \alpha_7 \times rural_i + State_i + \varepsilon_{it}.$$

Table A4: Cross sectional regression analysis results for first week UBI score

('): p-value < 0.1, (*):p-value < 0.05, (**): p-value < 0.01, Sample size = 38,459

| | Estimate(Std. Error) | Pr(> t) |
|----------------------------|---------------------------|-----------|
| <i>(Intercept)</i> | 58.07(0.12)** | |
| <i>Age</i> | 0.06(0.01)** | |
| <i>Gender (Female)</i> | 2.89(0.21)** | |
| <i>Newdriver</i> | -0.86(0.25)** | |
| <i>Insurance score</i> | 0.053(0.02)** | |
| <i>Rural</i> | 1.95 (0.23)** | |
| <i>State fixed effects</i> | Included | |
| Multiple R-squared: 0.398 | Adjusted R-squared: 0.395 | |

Based on the result, older drivers tend to have higher UBI score in the first week and females drive significantly better (in terms of UBI score) than males in the first week of monitoring. In addition, the customers who live in rural area have higher initial UBI scores compared with urban customers.

• **Appendix B**

In this part we add all tables of fixed effects regression results for heterogeneity section.

Table B1: Fixed effects regression analysis results for UBI score across age groups.

(¹): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | | | |
|---------------------|---------------------------|----------------------------|----------------------------|----------------------------|
| | age_group 1 | age_group2 * week _dummies | age_group3 * week _dummies | age_group4 * week _dummies |
| <i>Week_dummy2</i> | 3.58 (**) | -1.18 (**) | -1.61 (**) | -3.36 (**) |
| <i>Week_dummy3</i> | 5.93 (**) | -2.73 (**) | -3.72 (**) | -5.66 (**) |
| <i>Week_dummy4</i> | 7.07 (**) | -3.48 (**) | -4.53 (**) | -6.76 (**) |
| <i>Week_dummy5</i> | 7.17 (**) | -3.60 (**) | -4.67 (**) | -6.9 (**) |
| <i>Week_dummy6</i> | 7.48 (**) | -3.83 (**) | -5.00 (**) | -7.19 (**) |
| <i>Week_dummy7</i> | 7.6 (**) | -3.88 (**) | -5.09 (**) | -7.29 (**) |
| <i>Week_dummy8</i> | 7.71 (**) | -4.18 (**) | -5.16 (**) | -7.36 (**) |
| <i>Week_dummy9</i> | 7.80 (**) | -4.27 (**) | -5.30 (**) | -7.48 (**) |
| <i>Week_dummy10</i> | 7.84 (**) | -4.04 (**) | -5.12 (**) | -7.45 (**) |
| <i>Week_dummy11</i> | 8.05 (**) | -3.77 (**) | -5.05 (**) | -7.63 (**) |
| <i>Week_dummy12</i> | 7.86 (**) | -3.55 (**) | -4.66 (**) | -7.47 (**) |
| <i>Week_dummy13</i> | 8.07 (**) | -3.77 (**) | -4.87 (**) | -7.67 (**) |
| <i>Week_dummy14</i> | 8.06 (**) | -3.70 (**) | -4.85 (**) | -7.68 (**) |
| <i>Week_dummy15</i> | 8.21 (**) | -3.89 (**) | -5.01 (**) | -7.80 (**) |
| <i>Week_dummy16</i> | 8.20 (**) | -3.93 (**) | -4.98 (**) | -7.79 (**) |
| <i>Week_dummy17</i> | 8.17 (**) | -3.84 (**) | -4.98 (**) | -7.75 (**) |
| <i>Week_dummy18</i> | 8.11 (**) | -3.71 (**) | -4.86 (**) | -7.64 (**) |
| <i>Week_dummy19</i> | 8.28 (**) | -3.88 (**) | -5.02 (**) | -7.80 (**) |
| <i>Week_dummy20</i> | 8.26 (**) | -3.83 (**) | -4.97 (**) | -7.79 (**) |
| <i>Week_dummy21</i> | 8.25 (**) | -3.78 (**) | -4.96 (**) | -7.75 (**) |
| <i>Week_dummy22</i> | 8.27 (**) | -3.77 (**) | -4.96 (**) | -7.75 (**) |
| <i>Week_dummy23</i> | 8.48 (**) | -3.94 (**) | -5.19 (**) | -7.90 (**) |
| <i>Week_dummy24</i> | 8.54 (**) | -3.97 (**) | -5.22 (**) | -7.94 (**) |
| <i>Week_dummy25</i> | 8.58 (**) | -3.97 (**) | -5.25 (**) | -7.94 (**) |
| <i>Week_dummy26</i> | 8.56 (**) | -3.94 (**) | -5.23 (**) | -7.86 (**) |
| | Multiple R-squared: 0.536 | | Adjusted R-squared: 0.528 | |

Table B2: Fixed effects regression analysis results for hard brakes across age groups.

(:) p-value < 0.1, (*) p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | | | |
|---------------------|---------------------------|----------------------------|----------------------------|----------------------------|
| | age_group 1 | age_group2 * week _dummies | age_group3 * week _dummies | age_group4 * week _dummies |
| <i>Week_dummy2</i> | -0.32 (**) | 0.03 | 0.08 (*) | 0.20 (**) |
| <i>Week_dummy3</i> | -0.35 (**) | 0.03 | 0.07 (*) | 0.18 (**) |
| <i>Week_dummy4</i> | -0.42 (**) | 0.08 (*) | 0.13 (*) | 0.18 (**) |
| <i>Week_dummy5</i> | -0.51 (**) | 0.13 (*) | 0.22 (**) | 0.26 (**) |
| <i>Week_dummy6</i> | -0.55 (**) | 0.14 (*) | 0.24 (**) | 0.28 (**) |
| <i>Week_dummy7</i> | -0.56 (**) | 0.14 (*) | 0.26 (**) | 0.28 (**) |
| <i>Week_dummy8</i> | -0.53 (**) | 0.08 (*) | 0.21 (**) | 0.25 (**) |
| <i>Week_dummy9</i> | -0.57 (**) | 0.11 (*) | 0.23 (**) | 0.29 (**) |
| <i>Week_dummy10</i> | -0.58 (**) | 0.10 (*) | 0.21 (**) | 0.31 (**) |
| <i>Week_dummy11</i> | -0.56 (**) | 0.09 (*) | 0.2 (**) | 0.28 (**) |
| <i>Week_dummy12</i> | -0.56 (**) | 0.09 (*) | 0.21 (**) | 0.27 (**) |
| <i>Week_dummy13</i> | -0.58 (**) | 0.09 | 0.21 (**) | 0.3 (**) |
| <i>Week_dummy14</i> | -0.58 (**) | 0.08 | 0.18 (**) | 0.28 (**) |
| <i>Week_dummy15</i> | -0.60 (**) | 0.09 | 0.19 (**) | 0.31 (**) |
| <i>Week_dummy16</i> | -0.59 (**) | 0.08 | 0.17 (*) | 0.28 (**) |
| <i>Week_dummy17</i> | -0.61 (**) | 0.08 | 0.18 (*) | 0.29 (**) |
| <i>Week_dummy18</i> | -0.63 (**) | 0.11 (*) | 0.20 (**) | 0.32 (**) |
| <i>Week_dummy19</i> | -0.64 (**) | 0.10 | 0.19 (*) | 0.34 (**) |
| <i>Week_dummy20</i> | -0.66 (**) | 0.12 | 0.22 (**) | 0.37 (**) |
| <i>Week_dummy21</i> | -0.68 (**) | 0.13 (*) | 0.23 (**) | 0.37 (**) |
| <i>Week_dummy22</i> | -0.69 (**) | 0.13 (**) | 0.24 (**) | 0.39 (**) |
| <i>Week_dummy23</i> | -0.61 (**) | 0.04 | 0.15 (*) | 0.3 (**) |
| <i>Week_dummy24</i> | -0.72 (**) | 0.17 (*) | 0.27 (**) | 0.40 (**) |
| <i>Week_dummy25</i> | -0.73 (**) | 0.15 (*) | 0.27 (**) | 0.41 (**) |
| <i>Week_dummy26</i> | -0.75 (**) | 0.15 (*) | 0.28 (**) | 0.42 (**) |
| | Multiple R-squared: 0.487 | | Adjusted R-squared: 0.479 | |

Table B3: Fixed effects regression analysis results for mileage across age groups.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | | | |
|---------------------|---------------------------|----------------------------|----------------------------|----------------------------|
| | age_group 1 | age_group2 * week _dummies | age_group3 * week _dummies | age_group4 * week _dummies |
| <i>Week_dummy2</i> | 0.15 | -0.28 (*) | -0.21 (*) | -0.21 (*) |
| <i>Week_dummy3</i> | 0.36 (*) | -0.42 (**) | -0.23 (*) | -0.41 (**) |
| <i>Week_dummy4</i> | 0.47 (*) | -0.48 (**) | -0.37 (**) | -0.48 (**) |
| <i>Week_dummy5</i> | 0.51 (*) | -0.48 (**) | -0.25 (*) | -0.48 (**) |
| <i>Week_dummy6</i> | 0.50 (*) | -0.44 (**) | -0.31 (**) | -0.41 (**) |
| <i>Week_dummy7</i> | 0.54 (*) | -0.46 (**) | -0.38 (**) | -0.58 (**) |
| <i>Week_dummy8</i> | 0.52 (*) | -0.45 (**) | -0.45 (**) | -0.49 (**) |
| <i>Week_dummy9</i> | 0.46 (*) | -0.37 (**) | -0.36 (**) | -0.37 (*) |
| <i>Week_dummy10</i> | 0.50 (*) | -0.44 (**) | -0.44 (**) | -0.38 (**) |
| <i>Week_dummy11</i> | 0.53 (*) | -0.46 (**) | -0.49 (**) | -0.46 (**) |
| <i>Week_dummy12</i> | 0.58 (**) | -0.44 (**) | -0.56 (**) | -0.40 (**) |
| <i>Week_dummy13</i> | 0.71 (**) | -0.55 (**) | -0.56 (**) | -0.55 (**) |
| <i>Week_dummy14</i> | 0.73 (**) | -0.61 (**) | -0.38 (**) | -0.55 (**) |
| <i>Week_dummy15</i> | 0.76 (**) | -0.59 (**) | -0.3 (**) | -0.61 (**) |
| <i>Week_dummy16</i> | 0.70 (**) | -0.50 (**) | -0.25 (*) | -0.56 (**) |
| <i>Week_dummy17</i> | 0.74 (**) | -0.60 (**) | -0.26 (*) | -0.55 (**) |
| <i>Week_dummy18</i> | 0.85 (**) | -0.72 (**) | -0.31 (**) | -0.68 (**) |
| <i>Week_dummy19</i> | 0.8 (**) | -0.64 (**) | -0.27 (*) | -0.6 (**) |
| <i>Week_dummy20</i> | 0.89 (**) | -0.69 (**) | -0.36 (**) | -0.73 (**) |
| <i>Week_dummy21</i> | 1.01 (**) | -0.83 (**) | -0.46 (**) | -0.85 (**) |
| <i>Week_dummy22</i> | 0.99 (**) | -0.82 (**) | -0.42 (**) | -0.8 (**) |
| <i>Week_dummy23</i> | 0.98 (**) | -0.84 (**) | -0.38 (**) | -0.81 (**) |
| <i>Week_dummy24</i> | 0.94 (**) | -0.81 (**) | -0.33 (*) | -0.74 (**) |
| <i>Week_dummy25</i> | 0.96 (**) | -0.79 (**) | -0.36 (*) | -0.8 (**) |
| <i>Week_dummy26</i> | 0.92 (**) | -0.74 (**) | -0.33 (*) | -0.79 (**) |
| | Multiple R-squared: 0.445 | | Adjusted R-squared: 0.441 | |

Table B4: Fixed effects regression analysis results for UBI score across gender groups.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | |
|---------------------|-------------------------|---------------------------|
| | Male | Female* week _dummies |
| <i>Week_dummy2</i> | 2.75 (**) | -0.49 (*) |
| <i>Week_dummy3</i> | 3.02 (**) | -0.43 (*) |
| <i>Week_dummy4</i> | 3.17 (**) | -0.53 (*) |
| <i>Week_dummy5</i> | 3.22 (**) | -0.55 (*) |
| <i>Week_dummy6</i> | 3.34 (**) | -0.59 (**) |
| <i>Week_dummy7</i> | 3.41 (**) | -0.48 (*) |
| <i>Week_dummy8</i> | 3.41 (**) | -0.33 (*) |
| <i>Week_dummy9</i> | 3.51 (**) | -0.24 (*) |
| <i>Week_dummy10</i> | 3.77 (**) | -0.20 (*) |
| <i>Week_dummy11</i> | 4.44 (**) | -0.45 (**) |
| <i>Week_dummy12</i> | 4.43 (**) | -0.30 (**) |
| <i>Week_dummy13</i> | 4.29 (**) | -0.03 |
| <i>Week_dummy14</i> | 4.37 (**) | -0.04 |
| <i>Week_dummy15</i> | 4.32 (**) | 0.07 |
| <i>Week_dummy16</i> | 4.22 (**) | 0.25 (*) |
| <i>Week_dummy17</i> | 4.32 (**) | 0.07 |
| <i>Week_dummy18</i> | 4.39 (**) | 0.01 |
| <i>Week_dummy19</i> | 4.38 (**) | 0.09 |
| <i>Week_dummy20</i> | 4.41 (**) | 0.10 |
| <i>Week_dummy21</i> | 4.45 (**) | 0.12 |
| <i>Week_dummy22</i> | 4.49 (**) | 0.07 |
| <i>Week_dummy23</i> | 4.52 (**) | 0.25 (*) |
| <i>Week_dummy24</i> | 4.53 (**) | 0.27 (*) |
| <i>Week_dummy25</i> | 4.58 (**) | 0.29 (**) |
| <i>Week_dummy26</i> | 4.60 (**) | 0.34 (**) |
| Multiple R-squared: | 0.496 | Adjusted R-squared: 0.488 |

Table B5: Fixed effects regression analysis results for hard brakes across gender groups.
('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | |
|---------------------|-------------------------|---------------------------|
| | Male | Female* week _dummies |
| <i>Week_dummy2</i> | -0.17 (*) | 0.04 |
| <i>Week_dummy3</i> | -0.28 (**) | 0.07 |
| <i>Week_dummy4</i> | -0.17 (*) | -0.17 (*) |
| <i>Week_dummy5</i> | -0.30 (**) | -0.03 |
| <i>Week_dummy6</i> | -0.28 (**) | -0.03 |
| <i>Week_dummy7</i> | -0.34 (**) | -0.02 |
| <i>Week_dummy8</i> | -0.38 (**) | -0.09 (*) |
| <i>Week_dummy9</i> | -0.42 (**) | -0.20 (**) |
| <i>Week_dummy10</i> | -0.59 (**) | -0.14 (*) |
| <i>Week_dummy11</i> | -0.65 (**) | -0.29 (**) |
| <i>Week_dummy12</i> | -0.59 (**) | -0.51 (**) |
| <i>Week_dummy13</i> | -0.66 (**) | -0.39 (**) |
| <i>Week_dummy14</i> | -0.58 (**) | -0.45 (**) |
| <i>Week_dummy15</i> | -0.61 (**) | -0.49 (**) |
| <i>Week_dummy16</i> | -0.68 (**) | -0.55 (**) |
| <i>Week_dummy17</i> | -0.65 (**) | -0.55 (**) |
| <i>Week_dummy18</i> | -0.63 (**) | -0.57 (**) |
| <i>Week_dummy19</i> | -0.71 (**) | -0.55 (**) |
| <i>Week_dummy20</i> | -0.68 (**) | -0.69 (**) |
| <i>Week_dummy21</i> | -0.75 (**) | -0.77 (**) |
| <i>Week_dummy22</i> | -0.72 (**) | -0.82 (**) |
| <i>Week_dummy23</i> | -0.69 (**) | -0.93 (**) |
| <i>Week_dummy24</i> | -0.65 (**) | -0.97 (**) |
| <i>Week_dummy25</i> | -0.68 (**) | -0.91 (**) |
| <i>Week_dummy26</i> | -0.74 (**) | -0.88 (**) |
| Multiple R-squared: | 0.427 | Adjusted R-squared: 0.424 |

Experienced drivers versus new drivers

By comparing results for experienced (more than one year of driving experience) drivers to less experienced drivers, we show that the improvement after UBI adoption is due to more than natural improvement and maturation effect. We find that the improvement in driving behavior after UBI adoption is not just limited to new drivers, but also to the experienced drivers. We divide our sample of UBI enrollees into two sets: experienced drivers, those drivers who have had at least 1 year of driving experience before adopting the UBI policy, and new drivers, those who are the main policy holder for the first time or have less than one year of driving experience. The first column shows that the weekly UBI score is higher for all weeks as compared to the first week for experienced drivers and the second column shows that this effect is higher for new drivers. It may well be that newer drivers improve more quickly due to a maturation effect, but both groups (new and experienced) of drivers perform higher as compared to their first week performance.

The results are consistent if we run the fixed effects model by considering the average hard brakes as DV.

Heterogeneity across Urban/Rural areas

In our dataset we have ZIP codes of all customers, so it's possible for us to categorize the customers into rural and urban area customers based on their ZIP codes. We did this categorization based on census data available from Missouri Census Data Center¹. The table below compares some key variables between the rural and urban areas in our dataset.

We run a fixed effects model similar to equation 4 in our paper by adding the interaction of week dummies and rural area dummy variable. In this way we are able to capture the difference in changing driving behavior after week 1 between urban and rural area customers.

¹ <http://mcdc.missouri.edu/websas/geocorr2k.html>

Table B6: Fixed effects regression analysis results for comparing experienced and new drivers' UBI Score changes.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752
The average UBI score in first week: Experienced drivers: 62.37, New drivers: 60.89

| Coefficients estimation | | |
|---------------------------|---------------------|----------------------------|
| | Experienced drivers | New drivers* week _dummies |
| <i>Week_dummy2</i> | 1.43 (**) | 0.69 (**) |
| <i>Week_dummy3</i> | 2.16 (**) | 0.75 (**) |
| <i>Week_dummy4</i> | 2.91 (**) | 0.72 (**) |
| <i>Week_dummy5</i> | 3.19 (**) | 0.81 (**) |
| <i>Week_dummy6</i> | 3.28 (**) | 0.89 (**) |
| <i>Week_dummy7</i> | 3.32 (**) | 0.88 (**) |
| <i>Week_dummy8</i> | 3.38 (**) | 0.76 (**) |
| <i>Week_dummy9</i> | 3.41 (**) | 0.79 (**) |
| <i>Week_dummy10</i> | 3.59 (**) | 0.81 (**) |
| <i>Week_dummy11</i> | 3.78 (**) | 0.84 (**) |
| <i>Week_dummy12</i> | 3.94 (**) | 0.90 (**) |
| <i>Week_dummy13</i> | 4.09 (**) | 0.93 (**) |
| <i>Week_dummy14</i> | 4.27 (**) | 1.06 (**) |
| <i>Week_dummy15</i> | 4.22 (**) | 1.02 (**) |
| <i>Week_dummy16</i> | 4.28 (**) | 1.03 (**) |
| <i>Week_dummy17</i> | 4.32 (**) | 0.98 (**) |
| <i>Week_dummy18</i> | 4.29 (**) | 1.09 (**) |
| <i>Week_dummy19</i> | 4.28 (**) | 1.15 (**) |
| <i>Week_dummy20</i> | 4.32 (**) | 1.29 (**) |
| <i>Week_dummy21</i> | 4.36 (**) | 1.37 (**) |
| <i>Week_dummy22</i> | 4.38 (**) | 1.34 (**) |
| <i>Week_dummy23</i> | 4.42 (**) | 1.46 (**) |
| <i>Week_dummy24</i> | 4.41 (**) | 1.48 (**) |
| <i>Week_dummy25</i> | 4.45 (**) | 1.44 (**) |
| <i>Week_dummy26</i> | 4.51 (**) | 1.48 (**) |
| Multiple R-squared: 0.515 | | Adjusted R-squared: 0.508 |

Table B7: Fixed effects regression analysis results for comparing experienced and new drivers' hard brakes changes.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

The average Daily number of hard brakes in first week: Experienced drivers: 4.38, New drivers: 5.92

| | Coefficients estimation | |
|---------------------|-------------------------|----------------------------|
| | Experienced drivers | New drivers* week _dummies |
| <i>Week_dummy2</i> | -0.11(*) | -0.46(*) |
| <i>Week_dummy3</i> | -0.17(**) | -0.57(*) |
| <i>Week_dummy4</i> | -0.22(**) | -0.68(*) |
| <i>Week_dummy5</i> | -0.20(**) | -0.64(**) |
| <i>Week_dummy6</i> | -0.28(**) | -0.74(**) |
| <i>Week_dummy7</i> | -0.32(**) | -0.71(**) |
| <i>Week_dummy8</i> | -0.36(**) | -0.76(**) |
| <i>Week_dummy9</i> | -0.34(**) | -0.72(**) |
| <i>Week_dummy10</i> | -0.31(**) | -0.75(**) |
| <i>Week_dummy11</i> | -0.38(**) | -0.81(**) |
| <i>Week_dummy12</i> | -0.44(**) | -0.84(**) |
| <i>Week_dummy13</i> | -0.48(**) | -0.85(**) |
| <i>Week_dummy14</i> | -0.42(**) | -0.79(**) |
| <i>Week_dummy15</i> | -0.45(**) | -0.83(**) |
| <i>Week_dummy16</i> | -0.41(**) | -0.88(**) |
| <i>Week_dummy17</i> | -0.47(**) | -0.96(**) |
| <i>Week_dummy18</i> | -0.49(**) | -0.95(**) |
| <i>Week_dummy19</i> | -0.46(**) | -0.98(**) |
| <i>Week_dummy20</i> | -0.44(**) | -1.06(**) |
| <i>Week_dummy21</i> | -0.48(**) | -1.03(**) |
| <i>Week_dummy22</i> | -0.51(**) | -1.07(**) |
| <i>Week_dummy23</i> | -0.51(**) | -1.08(**) |
| <i>Week_dummy24</i> | -0.53(**) | -1.02(**) |
| <i>Week_dummy25</i> | -0.51(**) | -1.11(**) |
| <i>Week_dummy26</i> | -0.52(**) | -1.13(**) |
| Multiple R-squared: | 0.412 | Adjusted R-squared: 0.409 |

Table B8: Urban/Rural data summary.

| | Rural | Urban |
|--|-------|-------|
| <i>Percentage of customers</i> | 19.3% | 81.7% |
| <i>UBI acceptance rate</i> | 26.1% | 31.2% |
| <i>Average Initial Premium (£/month)</i> | 95.5 | 110.6 |
| <i>Average initial insurance score</i> | 56.57 | 50.59 |
| <i>Average initial UBI score (week1)</i> | 63.24 | 61.82 |
| <i>Average initial hard brakes</i> | 4.20 | 5.48 |
| <i>Average initial mileage</i> | 33.6 | 25.9 |

Table B9: Fixed effects regression analysis results for UBI score(Rural/Urban area).

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01,sample size=705,752

| | Coefficients estimation | |
|---------------------|-------------------------|---------------------------|
| | Urban | Rural* week_dummies |
| <i>Week_dummy2</i> | 2.90 (**) | -0.62 (**) |
| <i>Week_dummy3</i> | 3.25 (**) | -0.65 (**) |
| <i>Week_dummy4</i> | 3.33 (**) | -0.76 (**) |
| <i>Week_dummy5</i> | 3.48 (**) | -0.77 (**) |
| <i>Week_dummy6</i> | 3.58 (**) | -0.74 (**) |
| <i>Week_dummy7</i> | 3.65 (**) | -0.79 (**) |
| <i>Week_dummy8</i> | 3.67 (**) | -0.71 (**) |
| <i>Week_dummy9</i> | 3.74 (**) | -0.81 (**) |
| <i>Week_dummy10</i> | 3.89 (**) | -0.89 (**) |
| <i>Week_dummy11</i> | 4.44 (**) | -0.91 (**) |
| <i>Week_dummy12</i> | 4.53 (**) | -0.93 (**) |
| <i>Week_dummy13</i> | 4.59 (**) | -0.89 (**) |
| <i>Week_dummy14</i> | 4.64 (**) | -0.88 (**) |
| <i>Week_dummy15</i> | 4.67 (**) | -0.95 (**) |
| <i>Week_dummy16</i> | 4.71 (**) | -0.95 (**) |
| <i>Week_dummy17</i> | 4.83 (**) | -0.97 (**) |
| <i>Week_dummy18</i> | 4.77 (**) | -0.91 (**) |
| <i>Week_dummy19</i> | 4.86 (**) | -0.98 (**) |
| <i>Week_dummy20</i> | 4.76 (**) | -1.03 (**) |
| <i>Week_dummy21</i> | 4.80 (**) | -1.06 (**) |
| <i>Week_dummy22</i> | 4.85 (**) | -1.01 (**) |
| <i>Week_dummy23</i> | 4.90 (**) | -1.05 (**) |
| <i>Week_dummy24</i> | 4.94 (**) | -1.12 (**) |
| <i>Week_dummy25</i> | 4.89 (**) | -1.09 (**) |
| <i>Week_dummy26</i> | 4.97 (**) | -1.14 (**) |
| Multiple R-squared: | 0.491 | Adjusted R-squared: 0.484 |

Table B10: Fixed effects regression analysis results for hard brakes(Rural/Urban area).

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01,sample size=705,752

| | Coefficients estimation | |
|---------------------|-------------------------|---------------------------|
| | Urban | Rural* week _dummies |
| <i>Week_dummy2</i> | -0.47(**) | 0.16(*) |
| <i>Week_dummy3</i> | -0.53(**) | 0.21(*) |
| <i>Week_dummy4</i> | -0.57(**) | 0.24(*) |
| <i>Week_dummy5</i> | -0.55(**) | 0.28(**) |
| <i>Week_dummy6</i> | -0.58(**) | 0.32(**) |
| <i>Week_dummy7</i> | -0.59(**) | 0.31(**) |
| <i>Week_dummy8</i> | -0.56(**) | 0.35(**) |
| <i>Week_dummy9</i> | -0.61(**) | 0.38(**) |
| <i>Week_dummy10</i> | -0.67(**) | 0.41(**) |
| <i>Week_dummy11</i> | -0.74(**) | 0.44(**) |
| <i>Week_dummy12</i> | -0.78(**) | 0.54(**) |
| <i>Week_dummy13</i> | -0.85(**) | 0.55(**) |
| <i>Week_dummy14</i> | -0.88(**) | 0.52(**) |
| <i>Week_dummy15</i> | -0.85(**) | 0.54(**) |
| <i>Week_dummy16</i> | -0.89(**) | 0.52(**) |
| <i>Week_dummy17</i> | -0.91(**) | 0.56(**) |
| <i>Week_dummy18</i> | -0.97(**) | 0.59(**) |
| <i>Week_dummy19</i> | -0.95(**) | 0.6(**) |
| <i>Week_dummy20</i> | -0.98(**) | 0.61(**) |
| <i>Week_dummy21</i> | -0.99(**) | 0.63(**) |
| <i>Week_dummy22</i> | -1.05(**) | 0.61(**) |
| <i>Week_dummy23</i> | -1.08(**) | 0.64(**) |
| <i>Week_dummy24</i> | -1.07(**) | 0.67(**) |
| <i>Week_dummy25</i> | -1.11(**) | 0.65(**) |
| <i>Week_dummy26</i> | -1.09(**) | 0.66(**) |
| Multiple R-squared: | 0.423 | Adjusted R-squared: 0.420 |

UBI dropouts and loyal customers.

We divide the drivers who enroll in the UBI program into four groups: (1) loyals, who continue in the monitoring program for all 26 weeks, (2) early dropouts, who remove their devices within the first 10 weeks before obtaining an updated UBI discount, (3) informed dropouts, who remove their UBI device in weeks 11 and 12, just after being informed of their updated UBI discount, and (4) late dropouts, who drop out in weeks 13-25. The last two groups, despite dropping out early, receive a (revised) discount that applies to their automobile insurance premiums. Table B11 compares the 4 groups on a number of variables of interest.

Table B11: Loyal and dropouts.

| | Loyal | Early dropouts (<week11) | Informed dropouts(11&12) | Late dropouts (>week12) |
|---------------------------------|--------|--------------------------|--------------------------|-------------------------|
| <i>Number of Customers</i> | 18067 | 1159 | 4222 | 4876 |
| <i>Age</i> | 38.43 | 42.54 | 41.17 | 39.15 |
| <i>Fraction Male</i> | 0.51 | 0.52 | 0.53 | 0.51 |
| <i>Average Initial Discount</i> | 0.05 | 0.05 | 0.05 | 0.05 |
| <i>Insurance Score</i> | 49.19 | 51.43 | 50.37 | 49.43 |
| <i>Initial Premium</i> | 114.83 | 109.86 | 111.03 | 113.04 |
| <i>Updated Initial Discount</i> | 0.091 | 0 | 0.074 | 0.081 |
| <i>First Renewal Rate</i> | 0.9 | 0.44 | 0.73 | 0.77 |
| <i>Fraction of Enrolls</i> | 0.638 | 0.041 | 0.149 | 0.172 |

To model the heterogeneity between the informed dropouts' (weeks 11 and 12) and loyal customers' improvement in UBI score, we estimate a fixed effects model that allows for different behavior changes for loyals and informed dropouts.

$$S_{it} = \beta' \times week_dummies_{it} + \delta' \times Loyal_i \times week_dummies_{it} + driver_i + \varepsilon_{it}.$$

Where,

$$Loyal_{it} = \begin{cases} 1 & \text{UBI driver } i \text{ is loyal} \\ 0 & \text{driver } i \text{ cancel the UBI at week 11 or 12 (Informed dropouts)} \end{cases}$$

Table B12 shows the result of the fixed effects model for UBI score when we add the interactions of loyal customers and week variables. The results show that there is improvement in driving behavior of both groups after adopting the UBI policy, but the improvement in driving behavior of loyal customers is significantly higher than that of informed dropouts in the first 10 weeks of UBI usage.

In summary, we show that informed dropouts and loyals both improve their driving behavior while being monitored by the UBI telematics device that was installed in their automobiles. However, learning rates vary across groups. The results show that the loyal customers change

Table B12: Fixed effects regression analysis results for UBI score of informed dropouts and loyal customers.

(:) p-value < 0.1, (*) p-value < 0.05, (**): p-value < 0.01, sample size=157,380

| | Base_Estimation | Loyalty interaction | Loyalty Pr(> t) |
|---------------------------|-----------------|---------------------------|-------------------|
| <i>Week_dummy2</i> | 1.23 | 0.52 | ** |
| <i>Week_dummy3</i> | 1.72 | 0.65 | ** |
| <i>Week_dummy4</i> | 1.90 | 0.64 | ** |
| <i>Week_dummy5</i> | 2.29 | 0.51 | ** |
| <i>Week_dummy6</i> | 2.66 | 0.52 | ** |
| <i>Week_dummy7</i> | 2.89 | 0.40 | * |
| <i>Week_dummy8</i> | 2.93 | 0.42 | * |
| <i>Week_dummy9</i> | 3.08 | 0.41 | * |
| <i>Week_dummy10</i> | 3.14 | 0.43 | * |
| Multiple R-squared: 0.364 | | Adjusted R-squared: 0.360 | |

their driving behaviors more than informed dropouts in the first 10 weeks of UBI usage; that is, the improvement in driving behavior of loyal customers is faster than for informed dropouts. As a result of their faster improvement, customers in the loyal group received a higher average updated UBI discount (9.1%) than informed dropouts (7.4%).

Comparison of eight Fault and No-Fault states

Table B13: Data summary of Fault and No-Fault states (UBI customers)

| | No Fault | Fault | Significant difference at 0.05 level |
|------------------------------|--------------|-------------|--------------------------------------|
| States | Michigan | Connecticut | |
| | Minnesota | Maryland | |
| | New Jersey | Wisconsin | |
| | Pennsylvania | Virginia | |
| Average Monthly Premium | 130.7 | 107.59 | ** |
| Number of customers | 38487 | 32892 | |
| Average UBI score (26 weeks) | 65.74 | 64.12 | ** |
| Average age (Std.error) | 46.8(0.18) | 45.1(0.16) | ** |
| Fraction male | 0.53 | 0.52 | |
| UBI acceptance rate | 0.312 | 0.301 | ** |

Table B14: Fixed effects regression analysis results for UBI Score across all 15 states.
 ('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| | Coefficients estimation | |
|---------------------|-------------------------|--------------------------------|
| | Fault states | No-Fault states* week _dummies |
| <i>Week_dummy2</i> | 1.67 (**) | 0.6 (**) |
| <i>Week_dummy3</i> | 2.23 (**) | 0.34 (*) |
| <i>Week_dummy4</i> | 3.04 (**) | 0.34 (*) |
| <i>Week_dummy5</i> | 3.35 (**) | 0.26 (*) |
| <i>Week_dummy6</i> | 3.34 (**) | 0.47 (*) |
| <i>Week_dummy7</i> | 3.41 (**) | 0.5 (*) |
| <i>Week_dummy8</i> | 3.41 (**) | 0.53 (*) |
| <i>Week_dummy9</i> | 3.51 (**) | 0.69 (**) |
| <i>Week_dummy10</i> | 3.77 (**) | 0.61 (**) |
| <i>Week_dummy11</i> | 4.03 (**) | 0.85 (**) |
| <i>Week_dummy12</i> | 4.34 (**) | 0.62 (**) |
| <i>Week_dummy13</i> | 4.39 (**) | 0.61 (**) |
| <i>Week_dummy14</i> | 4.37 (**) | 0.6 (*) |
| <i>Week_dummy15</i> | 4.32 (**) | 0.69 (**) |
| <i>Week_dummy16</i> | 4.29 (**) | 0.79 (**) |
| <i>Week_dummy17</i> | 4.34 (**) | 0.78 (**) |
| <i>Week_dummy18</i> | 4.39 (**) | 0.79 (**) |
| <i>Week_dummy19</i> | 4.38 (**) | 0.86 (**) |
| <i>Week_dummy20</i> | 4.41 (**) | 0.87 (**) |
| <i>Week_dummy21</i> | 4.45 (**) | 0.82 (**) |
| <i>Week_dummy22</i> | 4.49 (**) | 0.92 (**) |
| <i>Week_dummy23</i> | 4.52 (**) | 0.97 (**) |
| <i>Week_dummy24</i> | 4.53 (**) | 1.05 (**) |
| <i>Week_dummy25</i> | 4.58 (**) | 1.09 (**) |
| <i>Week_dummy26</i> | 4.6 (**) | 1.06 (**) |
| Multiple R-squared: | 0.464 | Adjusted R-squared: 0.462 |

Comparison of Michigan (No-Fault) drivers versus Wisconsin (Fault) drivers

Table B15: Fixed effects regression analysis results for UBI Score for Wisconsin vs. Michigan.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=92,464

**The second column interaction effect shows the difference between the changes in UBI score of Wisconsin and Michigan drivers.

| | Coefficients estimation | |
|---------------------|-------------------------|-----------------------------------|
| | week_dummies(Wisconsin) | Michigan*week_dummies(Std. Error) |
| <i>Week_dummy2</i> | 0.78(0.14)** | 0.69 (0.22)** |
| <i>Week_dummy3</i> | 1.38(0.14)** | 0.72(0.22)** |
| <i>Week_dummy4</i> | 1.64(0.14)** | 0.76(0.22)** |
| <i>Week_dummy5</i> | 1.92(0.14)** | 0.78(0.23)** |
| <i>Week_dummy6</i> | 2.21(0.15)** | 0.83 (0.23)** |
| <i>Week_dummy7</i> | 2.36(0.15)** | 0.91(0.23)** |
| <i>Week_dummy8</i> | 2.32(0.15)** | 0.96(0.23)** |
| <i>Week_dummy9</i> | 2.37(0.15)** | 1.02(0.23)** |
| <i>Week_dummy10</i> | 2.41(0.16)** | 1.35 (0.24)** |
| <i>Week_dummy11</i> | 2.54(0.17)** | 1.47 (0.24)** |
| <i>Week_dummy12</i> | 2.49(0.17)** | 1.59 (0.24)** |
| <i>Week_dummy13</i> | 2.53(0.17)** | 1.55 (0.25)** |
| <i>Week_dummy14</i> | 2.50(0.17)** | 1.64 (0.25)** |
| <i>Week_dummy15</i> | 2.56(0.18)** | 1.68 (0.25)** |
| <i>Week_dummy16</i> | 2.63(0.18)** | 1.59 (0.25)** |
| <i>Week_dummy17</i> | 2.73(0.18)** | 1.67 (0.26)** |
| <i>Week_dummy18</i> | 2.71(0.19)** | 1.75 (0.26)** |
| <i>Week_dummy19</i> | 2.77(0.19)** | 1.79 (0.27)** |
| <i>Week_dummy20</i> | 2.86(0.19)** | 1.83(0.27)** |
| <i>Week_dummy21</i> | 2.79(0.20)** | 1.76(0.27)** |
| <i>Week_dummy22</i> | 2.84(0.21)** | 1.91(0.27)** |
| <i>Week_dummy23</i> | 2.95(0.21)** | 1.99(0.28)** |
| <i>Week_dummy24</i> | 2.89(0.22)** | 1.93(0.28)** |
| <i>Week_dummy25</i> | 2.91(0.22)** | 1.89(0.28)** |
| <i>Week_dummy26</i> | 3.08(0.22)** | 2.02(0.28)** |
| Multiple R-squared: | 0.535 | Adjusted R-squared: 0.529 |

Comparison of Minnesota (No-Fault) drivers versus Wisconsin (Fault) drivers

Table B16: Fixed effects regression analysis results for UBI Score for Wisconsin vs. Minnesota.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=85,826

| Coefficients estimation | | |
|---------------------------|-------------------------|------------------------------------|
| | week_dummies(Wisconsin) | Minnesota*week_dummies(Std. Error) |
| <i>Week_dummy2</i> | 0.84 (0.13)** | 0.22 (0.19) |
| <i>Week_dummy3</i> | 1.29(0.13)** | 0.27(0.19) |
| <i>Week_dummy4</i> | 1.58(0.13)** | 0.18(0.19) |
| <i>Week_dummy5</i> | 1.96(0.13)** | 0.29(0.19) |
| <i>Week_dummy6</i> | 2.15(0.14)** | 0.31 (0.20)' |
| <i>Week_dummy7</i> | 2.31(0.14)** | 0.25(0.20) |
| <i>Week_dummy8</i> | 2.39(0.14)** | 0.34(0.21)' |
| <i>Week_dummy9</i> | 2.30(0.14)** | 0.37(0.21)' |
| <i>Week_dummy10</i> | 2.48(0.16)** | 0.32 (0.21) |
| <i>Week_dummy11</i> | 2.61(0.16)** | 0.40 (0.23)' |
| <i>Week_dummy12</i> | 2.57(0.17)** | 0.49 (0.23)* |
| <i>Week_dummy13</i> | 2.49(0.17)** | 0.43 (0.23)' |
| <i>Week_dummy14</i> | 2.58(0.17)** | 0.52 (0.23)* |
| <i>Week_dummy15</i> | 2.69(0.17)** | 0.47 (0.25)' |
| <i>Week_dummy16</i> | 2.61(0.17)** | 0.57 (0.25)* |
| <i>Week_dummy17</i> | 2.77(0.18)** | 0.46 (0.25)' |
| <i>Week_dummy18</i> | 2.82(0.18)** | 0.60 (0.25)* |
| <i>Week_dummy19</i> | 2.70(0.18)** | 0.53 (0.25)* |
| <i>Week_dummy20</i> | 2.81(0.18)** | 0.56(0.25)* |
| <i>Week_dummy21</i> | 2.78(0.19)** | 0.49(0.26)' |
| <i>Week_dummy22</i> | 2.86(0.19)** | 0.57(0.26)* |
| <i>Week_dummy23</i> | 2.92(0.20)** | 0.63(0.26)* |
| <i>Week_dummy24</i> | 2.92(0.20)** | 0.59(0.27)* |
| <i>Week_dummy25</i> | 2.84(0.20)** | 0.52(0.27)' |
| <i>Week_dummy26</i> | 2.96(0.20)** | 0.60(0.27)* |
| Multiple R-squared: 0.502 | | Adjusted R-squared: 0.501 |

Table B17: Fixed effects regressions for each age group to compare the Fault versus No-Fault states.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| variables | (18-35) | | (36-50) | | (51-65) | | over 65 | |
|--------------|---------|----------------------|---------|----------------------|---------|----------------------|---------|----------------------|
| | Fault | No-Fault interaction | Fault | No-Fault interaction | Fault | No-Fault interaction | Fault | No-Fault interaction |
| Week_dummy2 | 2.91** | 0.75** | 1.97** | 0.46* | 2.09** | 0.31' | 0.19* | 0.08' |
| Week_dummy3 | 3.58** | 0.82** | 2.28** | 0.37' | 2.43** | 0.29 | 0.17* | 0.05 |
| Week_dummy4 | 3.77** | 0.89** | 2.39** | 0.41' | 2.49** | 0.33' | 0.13 | 0.08' |
| Week_dummy5 | 3.96** | 0.86** | 2.45** | 0.45' | 2.57** | 0.37' | 0.18* | 0.06 |
| Week_dummy6 | 4.20** | 0.96** | 2.49** | 0.43' | 2.54** | 0.42' | 0.21* | 0.07 |
| Week_dummy7 | 4.42** | 0.99** | 2.58** | 0.49* | 2.64** | 0.40' | 0.19* | 0.09' |
| Week_dummy8 | 4.68** | 1.06** | 2.63** | 0.54* | 2.67** | 0.45' | 0.22* | 0.08 |
| Week_dummy9 | 4.83** | 1.01** | 2.74** | 0.58* | 2.72** | 0.51' | 0.25** | 0.09' |
| Week_dummy10 | 4.96** | 1.09** | 2.81** | 0.61* | 2.78** | 0.54* | 0.23* | 0.10' |
| Week_dummy11 | 5.47** | 1.35** | 3.24** | 0.58* | 3.11** | 0.62* | 0.26* | 0.13* |
| Week_dummy12 | 5.48** | 1.29** | 3.28** | 0.62* | 3.21** | 0.59* | 0.22* | 0.11' |
| Week_dummy13 | 5.69** | 1.38** | 3.32** | 0.65* | 3.28** | 0.63* | 0.24* | 0.12' |
| Week_dummy14 | 5.83** | 1.44** | 3.30** | 0.71* | 3.36** | 0.61* | 0.27** | 0.12 |
| Week_dummy15 | 5.99** | 1.48** | 3.33** | 0.64* | 3.39** | 0.64* | 0.25* | 0.14* |
| Week_dummy16 | 6.19** | 1.49** | 3.41** | 0.73* | 3.47** | 0.61* | 0.24* | 0.13* |
| Week_dummy17 | 6.26** | 1.52** | 3.49** | 0.79** | 3.45** | 0.59 | 0.24* | 0.11 |
| Week_dummy18 | 6.33** | 1.57** | 3.55** | 0.77* | 3.54** | 0.64* | 0.26* | 0.09 |
| Week_dummy19 | 6.49** | 1.55** | 3.52** | 0.83** | 3.58** | 0.67* | 0.25* | 0.10 |
| Week_dummy20 | 6.57** | 1.59** | 3.62** | 0.85** | 3.55** | 0.68* | 0.27* | 0.12' |
| Week_dummy21 | 6.55** | 1.61** | 3.68** | 0.87** | 3.62** | 0.65* | 0.27* | 0.11 |
| Week_dummy22 | 6.69** | 1.58** | 3.66** | 0.82** | 3.60** | 0.68* | 0.28** | 0.10 |
| Week_dummy23 | 6.78** | 1.62** | 3.71** | 0.85** | 3.67** | 0.69* | 0.26* | 0.08 |
| Week_dummy24 | 6.87** | 1.64** | 3.76** | 0.89** | 3.65** | 0.72* | 0.29** | 0.11 |
| Week_dummy25 | 6.96** | 1.68** | 3.75** | 0.92** | 3.69** | 0.74* | 0.30* | 0.09 |
| Week_dummy26 | 7.09** | 1.63** | 3.83** | 0.87** | 3.64** | 0.71* | 0.32** | 0.12 |

Table B18: Fixed effects regressions for each gender to compare the Fault versus No-Fault states.

('): p-value < 0.1, (*): p-value < 0.05, (**): p-value < 0.01, sample size=705,752

| variables | Male | | Female | |
|--------------|--------|-----------------------|--------|-----------------------|
| | Fault | No-Fault interactions | Fault | No-Fault interactions |
| Week_dummy2 | 2.17** | 0.47* | 2.29** | 0.33' |
| Week_dummy3 | 2.36** | 0.41* | 2.54** | 0.29' |
| Week_dummy4 | 2.49** | 0.49* | 2.58** | 0.32' |
| Week_dummy5 | 2.56** | 0.53* | 2.66** | 0.28' |
| Week_dummy6 | 2.68** | 0.56* | 2.74** | 0.27' |
| Week_dummy7 | 2.82** | 0.52* | 2.85** | 0.31' |
| Week_dummy8 | 2.87** | 0.57* | 2.92** | 0.34' |
| Week_dummy9 | 2.97** | 0.61** | 2.99** | 0.41* |
| Week_dummy10 | 3.13** | 0.63** | 3.09** | 0.38' |
| Week_dummy11 | 3.38** | 0.82** | 3.34** | 0.49* |
| Week_dummy12 | 3.36** | 0.77** | 3.29** | 0.46* |
| Week_dummy13 | 3.48** | 0.74** | 3.41** | 0.47* |
| Week_dummy14 | 3.53** | 0.79** | 3.45** | 0.45* |
| Week_dummy15 | 3.59** | 0.75** | 3.49** | 0.49* |
| Week_dummy16 | 3.57** | 0.79** | 3.46** | 0.53* |
| Week_dummy17 | 3.66** | 0.82** | 3.55** | 0.50* |
| Week_dummy18 | 3.69** | 0.80** | 3.62** | 0.53* |
| Week_dummy19 | 3.74** | 0.81** | 3.69** | 0.49* |
| Week_dummy20 | 3.73** | 0.84** | 3.68** | 0.55* |
| Week_dummy21 | 3.77** | 0.80** | 3.73** | 0.52* |
| Week_dummy22 | 3.79** | 0.83** | 3.77** | 0.57* |
| Week_dummy23 | 3.84** | 0.89** | 3.83** | 0.51* |
| Week_dummy24 | 3.90** | 0.95** | 3.89** | 0.56* |
| Week_dummy25 | 3.85** | 0.88** | 3.95** | 0.51* |
| Week_dummy26 | 3.97** | 1.07** | 4.06** | 0.58* |

Poisson regression results for the effect of negative feedback on hard brakes reduction

Since the daily number of hard brakes is a count variable, we run a Poisson regression model to check the robustness of results reported in table 5 of the paper. Using “pglm” package in R, we ran the fixed effects model for our panel data by considering Poisson distribution for the number of daily hard brakes.

As shown in table B19, the negative feedback coefficient is negative and significant which shows that the results are consistent across estimation methods.

Table B19: Fixed effects Poisson regression results for number of daily hard brakes to capture the effect of negative signal on performance.

(^o): p -value < 0.1, (^{*}): p -value < 0.05, (^{**}): p -value < 0.01, Sample size=4,936,264

| | Estimate(Std. Error)Pr(> t) |
|-------------------------|-------------------------------|
| <i>Negativefeedback</i> | -0.056(0.008)** |
| <i>Monday</i> | 0.063 (0.02)** |
| <i>Tuesday</i> | 0.049 (0.02)** |
| <i>Wednesday</i> | 0.016 (0.01) |
| <i>Thursday</i> | -0.027 (0.02) |
| <i>Friday</i> | 0.052 (0.02)** |
| <i>Saturday</i> | 0.023 (0.02) |
| <i>Week_dummy2</i> | -0.046 (0.004)** |
| <i>Week_dummy3</i> | -0.049(0.004)** |
| <i>Week_dummy4</i> | -0.056(0.004)** |
| <i>Week_dummy5</i> | -0.053(0.004)** |
| <i>Week_dummy6</i> | -0.056(0.005)** |
| <i>Week_dummy7</i> | -0.058(0.005)** |
| <i>Week_dummy8</i> | -0.061(0.005)** |
| <i>Week_dummy9</i> | -0.060(0.005)** |
| <i>Week_dummy10</i> | -0.063(0.005)** |
| <i>Week_dummy11</i> | -0.067(0.006)** |
| <i>Week_dummy12</i> | -0.065(0.006)** |
| <i>Week_dummy13</i> | -0.063(0.006)** |
| <i>Week_dummy14</i> | -0.069(0.006)** |
| <i>Week_dummy15</i> | -0.067(0.006)** |
| <i>Week_dummy16</i> | -0.072(0.006)** |
| <i>Week_dummy17</i> | -0.069(0.006)** |
| <i>Week_dummy18</i> | -0.074(0.006)** |
| <i>Week_dummy19</i> | -0.078(0.006)** |
| <i>Week_dummy20</i> | -0.074(0.006)** |
| <i>Week_dummy21</i> | -0.072(0.006)** |
| <i>Week_dummy22</i> | -0.075(0.006)** |
| <i>Week_dummy23</i> | -0.071(0.007)** |
| <i>Week_dummy24</i> | -0.074(0.007)** |
| <i>Week_dummy25</i> | -0.079(0.007)** |
| <i>Week_dummy26</i> | -0.085(0.007)** |