Safer Transit Options for Passengers

Monitoring marshutka drivers might make them drive a bit safer

Complaints about minibus (*marshutka*) driving are common in Georgia. From excessive speeds, to erratic and distracted driving, minibus travel in Georgia is often less than safe and comfortable. But could a small change make an important difference in passenger safety and comfort? This brief reports the results of a randomized control trial which tested whether telling drivers that they are being and again would be monitored for safe driving is effective in decreasing dangerous driving behaviors.

Georgia has a severe problem with traffic accidents, which minibuses undoubtedly contribute to. In 2016, 6,939[1] accidents took place, resulting in 581 fatalities and 9,951 injuries. At a per capita rate, this amounts to approximately 156 fatalities per million citizens, roughly 2.5 times the EU average in 2014, the latest year in which data is available.[2]

While estimates do not exist for Georgia for how many accidents are caused by distracted and dangerous driving practices, they are very likely contribute to the high fatality rates on the roads in Georgia. Studies from other contexts suggest that distracted driving increases a driver's chances of being in an accident. One study suggests that drivers using cell phones are four times more likely to get into an accident.[3] Cell phone use is associated with increased incidence of accidents among both novice and experienced drivers.[4] Cell phones aside, other distractions such as smoking increase the risk of traffic accidents.[5] Importantly, commercial vehicle drivers are no exception, with increased risk of accident associated with distracted driving among commercial drivers as well.[6]

While we know that distracted and other dangerous driving practices are both common and likely to be leading to fatalities in Georgia, feasible, effective, and economically efficient policies are needed to stem distracted driving policies.

Anonymous monitoring of driver safety: A potentially safe and cheap solution

A potentially simple way of decreasing distracted driving among minibus drivers is to use anonymous monitoring combined with both rewards for safe driving and penalties for distracted or dangerous driving. Under such a policy, the government would hire a small number of monitors to ride on randomly selected minibuses throughout the country without informing the driver. After the ride, the monitor would report on any serious road violation as well as the number of distracted driving activities and safety violations carried out.

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[1] http://georgiatoday.ge/news/5647/Road-Accidents-Up-in-Georgia

[2] http://ec.europa.eu/eurostat/statistics-explained/index.php/File:Fig_3_Number_of_road_traffic_accident_fatalities_per_million_inhabitants,_2014.png

[3] https://trid.trb.org/view.aspx?id=868221

[4] http://www.nejm.org/doi/full/10.1056/NEJMsa1204142#t=article

[5]https://www.researchgate.net/profile/Sergio_Useche/publication/311932194_Smoking_while_Driving_Frequency_Motives_Perceived_Risk_and_Punishment/links/5863644d08ae329d620260e4.pdf

[6] http://www.fmcsa.dot.gov/facts-research/research-technology/report/FMCSA-RRR-09-042.pdf

If drivers performed without fault, the government could provide them with a reward such as a gas voucher to incentivize them to continue to be safe drivers. If the driver committed serious traffic violations, however, fines could be distributed. While the direct impact would be on the driver that would receive the award or fine, if the system were broadly publicized, it could have a general impact, with drivers being given dual incentives to drive safer – to avoid punishment and gain reward.

While in theory, this policy design is quite sound, practice and theory often diverge. Hence, in order to test whether the policy would in fact be effective, CRRC-Georgia carried out a randomized control trial, which tested whether the knowledge that for safe driving, a driver could receive an award might improve their driving in late 2016.

Starting on (dates), CRRC-Georgia interviewers observed over 300 mini bus trips in three waves. In the first wave, minibus routes which had been randomly selected were observed without telling the driver that they were being monitored. In the second wave, minibus drivers who drive along similar routes were informed that:

1. Their trip would be monitored for safety along a number of dimensions
2. A monitor would return in the coming weeks and monitor them again without telling them
3. If they were found to be among the safest drivers, they would be rewarded with a petrol voucher.

In the third wave of trips, the interviewers returned to monitor the minibus drivers, but without informing them that they were being monitored.

Over the course of the trip, monitors recorded how many times drivers:

1. Smoked
2. Engaged in text messaging
3. Engaged in telephone conversation
4. Number of times per half hour period they were not wearing a seat belt
5. Made passes in areas it was not legal to do so
6. Made other aggressive driving maneuvers
7. Were aggressive towards passengers
8. Were aggressive towards non-passengers

Monitors also recorded stop and travel time, and following the trip, the average speed of travel was recorded.

Through recording the above information, we have been able to test for three different types of effects of a potential monitoring system. First, by comparing drivers in the first and second wave, it is possible to find out whether drivers that are aware of being monitored drive safer. Second, by comparing the drivers that were directly informed about the monitoring in the second wave to the same drivers in the third wave, we can test whether being monitored had a lasting impact on their driving. Third, by comparing the uninformed drivers that were observed in the first wave of travel to uninformed drivers in the third wave of observation, we can test for a contagion effect

i.e. did drivers in general become safer from learning from their colleagues that they might be monitored for safe driving.

To test for the above types of effects, we used multivariate matching with genetic weights together and difference in difference calculations of average treatment effect. Using these methods, we calculate both the size of an effect and the probability that it emerged by chance alone.

Results

The results of the experiment suggest that there was a relatively large effect from drivers being aware of being monitored and some lasting effects on the drivers.

With direct knowledge of being monitored, the treatment effects are quite large. Drivers made 1.2 fewer calls per trip on average, smoked 1.6 fewer cigarettes, made 2.7 fewer illegal passes, and 2.4 fewer aggressive maneuvers. Overall, in the group that was directly aware that it was being monitored, there were 8.3 fewer incidents on average per trip. The chances that these differences are due to chance along vary between 0.03 for telephone calls and 0.000000092485 for the overall decline in number of incidences – that is to say the chances are unlikely to have been caused by chance alone. In Table 1 below, we present the average treatment effect on each indicator and the probability that the difference is due to chance.

Treatment effects by indicator		
Indicator	Treatment Effect	p-value
Number of incidents total	-8.3119	9.25E-08***
Speed (km/hour)	-3.3377	0.30797
Telephone calls	-1.2037	0.03081*
Text messages	-0.14035	0.54092
Smoking	-1.6491	4.58E-06***
Seatbelt unworn	-0.29006	0.14294
Illegal passes	-2.692	0.0027405***
Aggressive Maneuvers	-2.3717	8.21E-05***
Aggressive Towards Passengers	0.02924	0.68725
Aggressive Towards Non-passengers	0.005848	0.86357

Based on these statistics we can conclude that direct knowledge of being monitored lead to fewer distracted and other dangerous driving behaviors. However, did these effects last? To understand whether direct knowledge of being monitored and that one would again be monitored had a lasting effect, we compare the results of the drivers who knew they were being monitored to roughly two weeks later when they did not know they were being monitored. In this case, a lasting effect is present if there was a statistically significant decline in a behavior in the first round of monitoring, and no significant change in the second round of monitoring.

Data analysis suggests that drivers who knew they would be monitored maintained lower levels of smoking, illegal passing, and potentially[7] aggressive maneuvers. On other indicators, drivers returned to significantly higher levels of poor driving behavior. Table 2 below, presents the lasting effects.

Treatment effects by indicator		
Indicator	Treatment Effect	p-value
Number of incidents total	4.0344	0.014681*
Speed (km/hour)	-1.5649	0.55977
Telephone calls	0.83436	0.01104*
Text messages	0.01227	0.57263
Smoking	0.22086	0.37527
Seatbelt unworn	0.32699	0.2476
Illegal passes	1.5761	0.18701
Aggressive Maneuvers	1.1252	0.066438 .
Aggressive Towards Passengers	-0.030675	0.62364
Aggressive Towards Non-passengers	-0.030675	0.27686

The results of the tests for a contagion effect uniformly show no significant change except for in speed. Given that this is one in ten tests and that there was no significant effect from the first wave of monitoring, we suspect that this test may have been found to be significant based on chance.

The above results have a number of policy implications. First, if a driver is aware that someone is paying attention to their driving and wants them to drive safely, they will drive safer. This suggests that if citizens want drivers to drive safer, they should say so. As previous studies[8] have suggested that when citizens speak up and ask the driver to be safer is an effective means of encouraging safer public transit driving, Georgian citizens should speak up when they feel a driver is endangering them. Importantly, this may have a lasting effect on drivers. While the present study only measured the effects roughly two weeks after drivers were told they would be monitored, if enough citizens regularly speak up, a longer lasting effect may emerge.

Second, the proposal for a policy wherein drivers would be offered rewards and punishments for safe driving likely needs punishments. In the present experiment, we could only offer a reward rather than a punishment. However, numerous studies suggest that individuals are generally much more responsive to losses rather than potential gains.[9] Hence, if government were to offer both a carrot – a gas voucher or reward of some other sort – and a stick – fines – they would likely succeed. Importantly, the knowledge that the driver was being monitored dramatically

[7] The p-value in the present case is on the border of significance. Most social scientists would consider this a non-significant difference.

[8] https://gui2de.georgetown.edu/projects/zusha

[9] https://www.behavioraleconomics.com/mini-encyclopedia-of-be/loss-aversion/

lowered the number of times they engaged in dangerous driving behavior. If this knowledge was accompanied by stronger incentives and wider publicity, it would likely lead to lower levels of dangerous driving in Georgia. Ultimately, that would mean safer transit options for passengers.