Private Enterprise Development in Low-Income Countries

Mitigating Market Frictions by Monitoring Employees in SMEs: A Field Experiment in Kenya's Public Transport Sector

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This project develops and tests a fleet management system for Kenya's semi-formal public transport system. The pilot study shows that firms with this system are more easily able to track their employees' productivity and safety performance, which allows owners to incentivize better driving behavior.

Background

For millions of individuals in the developing world, commuting to work is a risky endeavor: with 1.24 million people dying in traffic accidents each year, they are the leading cause of death among individuals aged 15-29[1]. In Kenya, public transport makes up a majority of traffic, and public minibuses, called matatus, make up a large share of traffic accidents.

An important possible cause of the reckless driving responsible for many accidents is the contractual structure under which matatu drivers are hired. Each night, the drivers are required to give the matatu owner some target amount of cash. As a result, matatu drivers face a lot of pressure to earn a high daily revenue, and thus have a strong incentive to engage in risky driving.

Figure 1: A matatu after an accident.
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The matatu business is not only dangerous but also unproductive. Matatu owners have high costs for maintenance, repair and insurance, and their profit margins are low. In addition, keeping track of their matatu driver's income by calling or checking on him in person can be very time-consuming. These repair and monitoring costs increase as owners oversee more and more matatus, leading to inefficiently small firms in this industry.

Intervention – Introducing a Tracking Device for Matatus

Our project addresses these two problems – safety and productivity in small matatu firms – by developing and piloting a new monitoring technology. This technology consists of a sensor device that uses GPS and accelerometer technology to measure speed, location, mileage, sudden deceleration and acceleration. As a result, owners can receive reliable information on the productivity and safety of their driver, which opens up the possibility for them to use more subtle incentives to ensure effort and discourage risky driving.

Thus, our study is concerned with how the lack of information about employee behavior contributes to the low productivity and negative externalities often encountered in small firms in developing countries. In particular, we are interested in how the contractual arrangements and management strategies change once employers receive better information about their employees' behavior.

[1] World Health Organisation, 2013

Figure 2: The sensor device mounted on a dashboard.

To this end, we will run a randomized controlled trial (RCT) in the metropolitan area of Nairobi, Kenya. In both the treatment and control group, we fit matatus of small-scale owners with our sensor device. Then, in our treatment group, the owners will receive real-time information about their driver on their smartphone app or via SMS. The different treatment arms consist of receiving information (a) only productivity (b) only on safety (c) on both.

In preparation for the full RCT, we have engaged in extensive piloting of our technology and treatment arms. Ten owners participate in our pilot study, testing the tracking device and giving us feedback on the information coming out of the system and delivered to them via SMS. In addition, we interviewed more than a 100 owners and 160 drivers in both semi-structured and fully structured interviews. So far, our most important findings from the pilot and surveys are:

(a) Monitoring drivers in semi-formal transport is feasible using our newly developed system

(b) The information from our system is relevant to the decisions people are making; thus, we are confident that the information treatments in the RCT on the basis of the system will have an effect on driving behavior, and that we will be able to identify the channels through which these changes are mediated.

Different Effect of Safety and Productivity Information – The Management and Contract Channels

While both the productivity information treatment and the safety information treatment matter to owners, our interviews with them suggest that they have different effects. On one hand, owners value safety information because it is highly correlated with maintenance costs. As a result, they use the safety information from the system to give more specific instructions on optimal driving to their drivers – this change can be thought of as improved management process. The extent to which owners engage in micro-managing their driver using our device is surprising; for example, one owner frequently checks whether his driver goes over the speed limit in one curve he considers particularly dangerous.

Productivity information, on the other hand, factors into the owner-driver relationship by limiting the scope of renegotiation of payouts at the end of the day and thereby changing the de-facto contract. Not only does it become harder for drivers to pretend they didn't reach the target revenue amount on good days, but it also allows drivers to more credibly claim that they missed the target on bad days.

Based on these qualitative insights on both information treatments, we see potential to identifying both the management channel as well as the contract channel in the effect of the relaxing the information constraints of owners on the productivity and safety of matatus.

Cash Incentives for Drivers – Internalizing the Externality of Dangerous Driving

While the effect of providing information to owners allows us to gauge the value of aligning incentives between the drivers and the owners in the matatu industry, it tells us little about the value of internalizing externalities relative to public regulation and society at large. Indeed, the public may value safety more than productivity compared to both employers and employees in the matatu sector. Therefore, in addition to the information treatments for owners, we also treat drivers directly using cash incentives. It is interesting to see how much larger the advances in terms of safety are when we directly set incentives for drivers to drive more carefully. In fact, our main insight so far is that

drivers require substantial direct cash incentives as well as sufficient information about the system to shift behavior. Only after offering up to ½ of daily income, did we saw a substantial drop in the number of violations (from on average sixty a day to twenty a day) but this was still too much for them to receive any payout. We believe one important reason for the limited success of cash incentives so far is limited awareness of when violations occur, and so we are currently addressing the last issue by improving our real-time feedback system to alert drivers when violations occur.

Policy Impact – The Benefits of Improved Monitoring Systems

We see potential policy impact arising from the results of our study in two areas. First, given the prevalence of traffic accidents in Kenya and beyond, monitoring drivers may be an avenue to improve safety in semi-formal public transport systems in many parts of the developing world. For example, the National Transport and Safety Authority (NTSA) in Kenya has been introducing mandates for GPS tracking on long-distance and night buses. Our technology would make it possible to set forth much more specific driving style requirements using the richer data coming from our devices.

Second, monitoring systems may contribute to the further consolidation and formalization of the matatu industry, increasing the productivity of the entire sector. Our technology gives inexperienced and unskilled owners a powerful tool to help their matatu enterprise grow. Combined with legislation that offers additional incentives for SACCOs to take on a bigger role in monitoring and managing driving behavior, we believe our system can help to increase operational efficiency of the matatu industry as a whole and help matatu firms to consolidate into larger, more productive units.

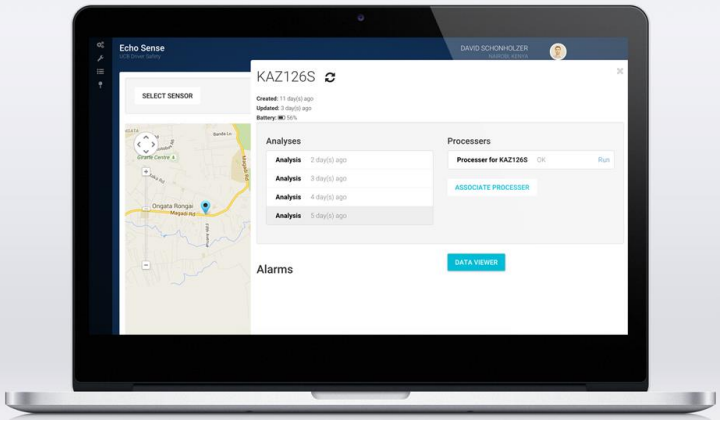

Figure 3: The Graphic User Interphase of our sensor device. The system shows real-time location and speed as well as any recent safety or productivity events.

Moving Forward…

We are on track to finalizing our pilot, with both system development as well as treatment arm testing still undergoing fine-tuning until we begin the RCT next year. The experiment will run for about six to twelve months and could include up to four hundred pairs of matatu owners and drivers.

Our experimental design will pin down parameters whose magnitudes are largely unknown so far: What is the productivity increase in response to relieving information frictions in SMEs in developing countries? How does information availability affect externalities produced in industries such as public transport? And are contractual arrangements or management techniques more important conduits for employers to act upon newly available information?

Looking ahead, we believe our project will open up new questions in the realms of applied principal-agent problems, SME management in developing countries, and the limits of internalizing externalities in a fragile and unreliable policy context. Ultimately, we suspect questions around improved governance – essentially, how to use and regulate new technology available in a welfare-enhancing way – will take a center stage in many parts of development economics research.