

The Impact of Monitoring Technologies on Contracts and Employee Behavior

Experimental Evidence from Kenya's Transit Industry

Erin Kelley

Gregory Lane

David Schönholzer

FIRM UP PERFORMANCE
ATHENS, GREECE
SEPTEMBER 9-12, 2019



Firm productivity and Growth

Motivation

- Firms success relies heavily on the performance of employees
 - Design contracts that incentivize effort
 - Difficult when firms cannot monitor their workers
- May partially explain low firm productivity
 - Unobservable output and effort → lower revenues
 - Unobservable riskiness → higher costs

The role of Monitoring

Motivation

- In theory, firms can invest in monitoring technologies
 - With the rise of monitoring tech: provide more precise signal at low cost
- In practice, monitoring technologies may be hard to use effectively
 - Poor managerial ability
 - Weak legal institutions
- Limited empirical evidence
 - Hard to obtain data on firm profits / employee behavior
 - Finding the right study environment can be a challenge

Monitoring RCT in Kenya's Transit Industry

Motivation

Our approach:

- 1 Randomize the introduction of new monitoring devices among firms
- 2 Collect high-frequency data from firms and workers

Kenya's Transit Industry:

- 1 Industry where firms struggle to observe worker behavior
 - Can't see effort, output, risk, and law breaking
- 2 Industry where monitoring could affect firm growth
 - Firms are typically small but can become more productive
 - Monitoring technologies make expanding firm size more feasible
- 3 Industry that is representative of the informal transportation system worldwide



ZETECH

Kenya Institute of Technology
Accredited by JUKUAT

DIRTY TRAIL

Wachatu

AGRESSO

GOD WITH US

KARIPO

KAY-513L

Operations

- Owners “rent” their minibuses to drivers who operate along designated routes
 - Owner specifies a “target” that the driver must deliver by EOD
 - Driver chooses how effort/risky driving to engage in
 - Driver chooses how much revenue (from passenger fares) to report
- No designated stops for picking up passengers

Prevalence

- Approximately 20,000 in Nairobi (120,000 in Kenya)
- Transport 70% of commuters

Safety

- Kenya: Matatus account for 11% of registered vehicles but 70.2% of casualties
- US: Buses account for 1% of registered vehicles and 0.4% of casualties

Research Questions

Firms, workers and society

1 **How do monitoring technologies affect firms?**

- Profits
- Growth

Research Questions

Firms, workers and society

1 **How do monitoring technologies affect firms?**

- Profits
- Growth

2 **How do these technologies affect workers?**

- Worker behavior: effort, revenue reporting and risk taking
- Workers: salary and working environment

Research Questions

Firms, workers and society

- 1 **How do monitoring technologies affect firms?**
 - Profits
 - Growth
- 2 **How do these technologies affect workers?**
 - Worker behavior: effort, revenue reporting and risk taking
 - Workers: salary and working environment
- 3 **How do these technologies affect compliance with regulation?**
 - Safety regulation: rules of the road

This Project: tracking devices

Randomized control trial

- Fit monitoring devices inside *all* 255 buses
- Run randomized control trial:
 - **Treatment 1:** Provide treatment owners with information
 - **Treatment 2:** Provide drivers with cash incentives for safe driving
- Collect data to measure high-frequency impact of monitoring technologies

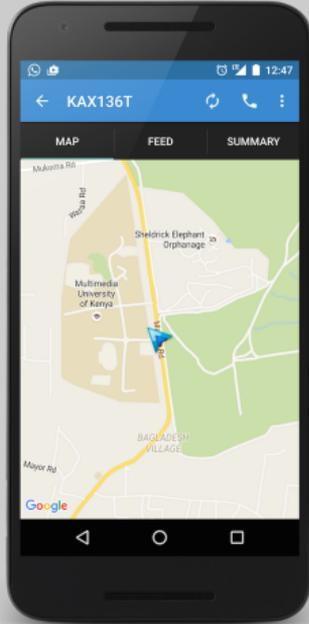
RCT

RCT: Info Treatment

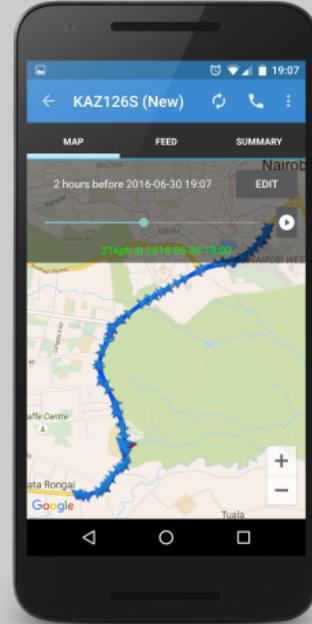
The Monitoring System



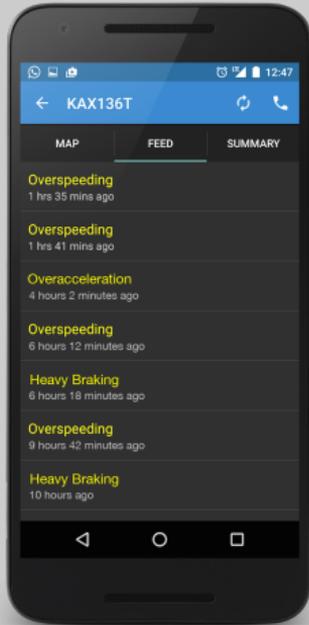




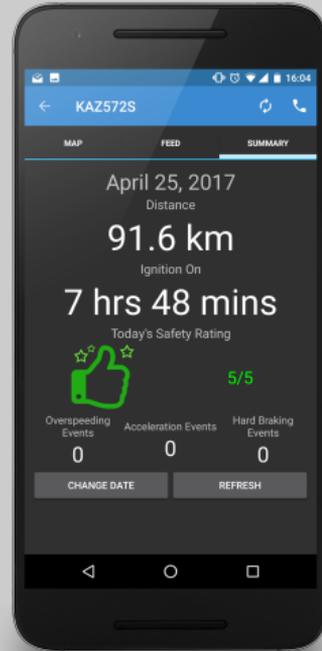
(a) Map Viewer



(b) Historical Map Viewer



(a) Safety Feed

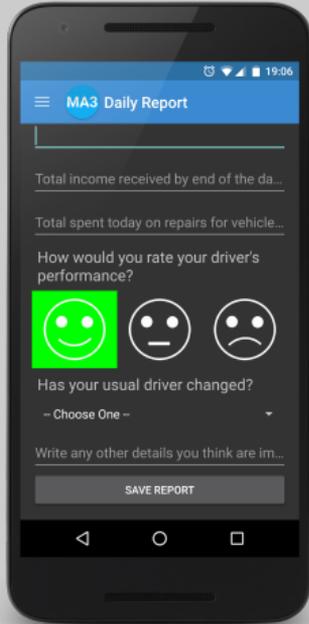


(b) Productivity Summary Viewer

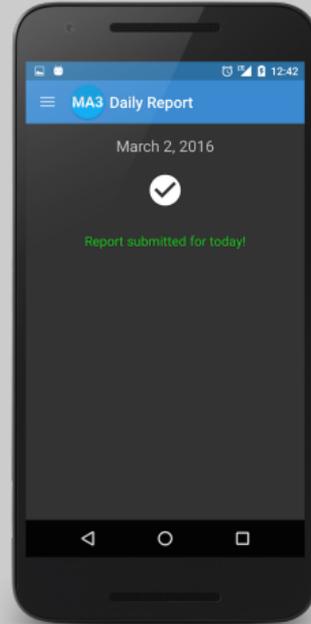
Datasets

Three sources of data

- Daily Surveys
 - Owner (Target, Income, Rating)
 - Driver (Revenue, Salary, Employment Status)
- Tracking Device (30s intervals)
 - Acceleration/jerk/speed/location and safety alerts
- Phone/In-person Surveys
 - Baseline/Endline in person
 - Weekly/Monthly check-in's



(a) Report



(b) Report Complete

Datasets

Challenges

- Developing a system to track response rates, and follow up to keep our response rates high
- Designing a survey questionnaire that was not too long
- Capturing things like revenue
- Ensure similar reporting across treatment and control

Results

What happens to firms?

- Treatment firm profits increases by 13% (\approx 600 USD over 6 months)
 - Gains more than offset the cost of the device (125 USD)
 - Suggests that a tracking device would be a worthwhile investment for the employer if it were available on the market.
- Treatment firm fleet size increases by 11%

What happens to workers?

Worker Behavior

- Drivers' incentive to lie to owners about revenue they collect in fares ↓
 - Under-reported revenue falls by approximately 1 USD per day (16%).
- Drivers' incentivize to increase effort ↑
 - The number of hours drivers work increases by 1.4 hours per day (9.9%).
- Drivers' incentive to reduce instances of damaging driving ↑
 - Proxy damaging driving by the amount of repair costs the owner incurs
 - Repair costs decrease by 2 USD per day (46%).
 - Fewer instances of off-route driving on bumpy, damaging roads.

What happens to workers?

Work and Trust

- **Con:** Engage in fewer behaviors they once chose to do
 - Working more hours, though salary per hour stays the same
- **Pro:** Owners trust their drivers more
 - Behavioral trust game
 - Conducted a small survey 6 months out to elicit driver feedback
 - 96% said they preferred driving with the tracker
 - 65% said it made their job easier (26 % said nothing changed)

And Safety?

- Monitoring Device on it's own
 - **Safety Alerts:** unchanged
 - **Accidents:** unchanged
- Monitoring Device with cash incentives
 - **Safety Alerts:** Sharp braking and sharp speeding ↓ in short run
 - **Accidents:** unchanged

Conclusion and Policy Take-Aways

- 1 Introducing cost-effective monitoring technologies can be a worthwhile investment for companies looking to increase profits and grow their asset base.
- 2 Gains to the firms do not necessarily come at the expense of workers *in this setting*.
- 3 Remote tracking solutions on their own may not have the desired impacts on road safety. More targeted interventions may be necessary if these devices are to induce safer driving.