The Impact of Monitoring Technologies on Contracts and Employee Behavior

Experimental Evidence from Kenya’s Transit Industry

Erin Kelley  Gregory Lane  David Schönholzer
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
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
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% (≈ 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 its own
  - **Safety Alerts**: unchanged
  - **Accidents**: unchanged

- Monitoring Device with cash incentives
  - **Safety Alerts**: Sharp braking and sharp speeding ↓ in short run
  - **Accidents**: unchanged
Introducing cost-effective monitoring technologies can be a worthwhile investment for companies looking to increase profits and grow their asset base.

Gains to the firms do not necessarily come at the expense of workers in this setting.

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.