On The Institutional Foundations of Corrupt Exchange: Social Relationships and Joint Profit in Kinshasa*

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ABSTRACT: This article presents evidence from the Congo showing that private actors and state compliance officers strategically create mutual social ties between themselves to safeguard their shared profit from corruption's transaction costs. The study focuses on public transport, where a more efficient toll fee system has replaced costly bribe negotiations among mutually connected drivers and officers. A field experiment reroutes drivers in random days to lines where they do not have ties with the officers. Rerouting reduces the proportion of officers on the route who have ties with the driver. It also decreases driving revenue, net of operating costs (joint profit). The analysis of two cross-randomizations allows us to attribute this reduction in joint profit to the driver-officer social ties, and to establish that they allow the driver to increase passenger demand and prices. When interaction with unfamiliar officers is expected to be recurrent, drivers create in new ties with them through a costly process known as "buying the land" and profit recovers within days. The findings introduce the notion of the fundamental problem of exchange to corruption, the role of social ties in mitigating it, and imply that corruption profit opportunities shape the social structure. **Keywords**: Corruption, transaction costs, relational contracts. **JEL Codes:** D23, D73, D74

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1. Introduction

Motivated by the notion that state failure impedes the functioning of markets, a huge literature in economics has been concerned with the economic causes and consequences of corruption by state officials (Shleifer and Vishny, 1993, Rose-Ackerman, 1999). Much of the literature has focused on the properties of corrupt exchange, taking as given that, as long as it is mutually beneficial, state officials and citizens are able to exchange the promise of a corrupt action and the promise of a bribe without frictions. This would be reasonable if individuals are generally able to agree on the terms of this exchange without costly negotiations and to credibly commit their respective promises. Stated differently, this presumes that there is no fundamental problem of exchange (Greif, 2000) that needs to be mitigated in the first place to enter in a mutually beneficial corrupt transaction.

However, corruption is typically illegal; thus, the way that society structures the corrupt exchange relationship could have important ramifications for the mitigation of this problem and for the spread of corruption. Complementing this omission, sociologists have suggested that corrupt exchange is "embedded" in social institutions such as social relationships (Polanyi, 1944, Granovetter, 1985). In simple words, this suggests that social relationships and relational contracts (Macchiavello and Morjaria, 2020) may be crucial to sustain corruption. A corollary of this possibility is that, if social relationships help increase the profits from corruption, opportunities for corruption could in turn lead individuals to invest in creating new relationships, shaping the structure of social ties. A challenge to study this question is that social relationships that sustain corrupt exchange are difficult to observe and form endogenously; thus, they have been hard to study and, to date, we have little evidence of how they operate in corruption.

In this paper, to address this challenge, we leverage three years of qualitative research to gain access inside the Kinshasa driver association. We use this access to document the type of corrupt transactions between public transport drivers and police officials, to induce randomness in whether public transport drivers have social relationships with traffic police officers on the line on which they drive, and to induce randomness in the expected horizon over which there are profitable opportunities for corruption. This allows us to answer the following questions. What is the cost of corrupt exchange? How do social ties between citizens and officials influence such cost? How do these ties form?

This setting was well-suited to examine the role of social relationships in corruption. First, public transport was privately provided through homogeneous old Mercedes minibuses, commonly called the *Spirit of Death* ("*Esprit de Mort*" in French), due to their poor safety (they were almost always in violation of the law). Second, drivers had large leeway to negotiate the ride price with the passengers, and could provide effort to attract new passengers, shouting the direction of the minibus and waiting at key intersections. Third, at each intersection, a team of police officers regularly sought shakedown or bribes. Officers had the power to stop drivers, which could lead to lengthy negotiations and large bribes. Thus, time negotiating with the passengers for the price or trying to attract passengers exposed the drivers to the risk of detection, potentially leading to significant revenue loss. Fourth, against the backdrop of this risk, an unofficial toll called the *Kola Nut Greeting* ("*Mbote ya Likasu*" in Lingala) had developed. To take part in it, drivers had to "buy the land" ("*acheter la terre*," in French), through a large payment after a lengthy negotiation, marking the start of a relationship. The toll consisted in 500 Congolese francs (53 cents in US dollars of 2015) once per day to each team of officers.

The first key input into our analysis is a dataset we gathered prior to the experiment, relying on relationships built over three years in the minibus sector. Our data collectors gained the trust of ten minibus drivers and travelled every day in the minibuses. This produced a unique dataset of bribes paid to the officers and the time spent negotiating for a bribe, containing 15,426 occurrences of driving through the city intersections in which police officers are posted, of which 2,423 involved interaction with the officers.

Using these data, we first document several facts of minibus bribe payments on the lines where drivers regularly drive and have ties with the police (henceforth, *the home lines*). Negotiating a bribe can cause significant time waste—in some cases up to one hour—and can result in large payments—with up to 27 USD for a single bribe. However, of all interactions with the police, 84.1% are the *mbote ya likasu* toll fee, while only 2.7% are bribes that involve negotiation (henceforth, *negotiation bribes*); the remaining are amicable talks without payments. The toll fee (500 Congolese francs) involved on average less than 40 seconds of interaction with the officer versus 7 minutes for negotiation bribes.

The second key input into our analysis is a randomized experiment covering the ten minibus lines of the distribution network of East Kinshasa. Drawing on relationships we had built with ten minibus drivers spanning the ten lines and with the national association of drivers (*Association des Chauffeurs du Congo*, henceforth, *ACCO*), we provided a randomized encouragement in some days and not others for drivers to drive on lines where they did not have relationships with the officers on the street (henceforth, *foreign lines*). Our experimental design allocates 270 driver-days over a period of 27 days as follows: for each driver, days were re-grouped into 13 *driving blocks* of one to three contiguous days, totalling 130 driving blocks in the study; within driver randomization strata, seven driving blocks were randomly assigned to driving in a foreign line and the remaining six to driving on their home lines. To mitigate any financial harm to the drivers and satisfy their participation constraint, at the end of the study, drivers received previously negotiated compensation for participating in the experiment. This design allows us to make three contributions. First, we analyze the effect of foreign-line driving on the driving revenue, net of operating costs (henceforth, *joint profit*). Second, we separately identify whether this effect arises from the driver's expected interaction with the officers on the street. To do so, we borrow from a practice commonly used by private drivers, in which high-ranking officers intervene in negotiations with officers on the street, which were believed to ensure that the driver could be left alone. Assistance from ACCO allowed us to leverage connections with high-ranking officers and consequently to extend their protection to drivers on randomly selected days. Third, we decompose the effect of not having a relationship with the police into: a. not having a relationship, and not aiming to create one; b. not having a relationship, but investing in a new relationship. To do so, we experimentally varied the duration of the rerouted driving blocks. In some blocks, the driver was rerouted for 3 consecutive days; in others, for 1 day. None of the study participants was ever informed that they were part of an experiment.

The analysis of our randomized experiment yields three results. First, rerouting significantly decreases the prevalence of relationships from 56 to 30% and the joint profit from 18.6 to 9.5 USD per day. Second, the negative effect of rerouting on joint profit is muted when the driver was assigned third-party protection. This suggests that the reduction of the joint profit induced by rerouting is *explained by* the properties of the interaction the driver can expect to have with the police officers on the street, and not by confounders related to rerouting. Third, relationships with the officers increase the effciency of driving and enable the driver to induce passenger demand, and drivers invest in new when the horizon of rerouting is long. We reach this conclusion with the help of a simple two-period decision-theoretic model. In the model, a driver can choose to provide effort, which increases revenue per unit of time driving. However, effort also increases the risk of being detained by the police officer, causing time waste from negotiating for a bribe and eventually a bribe payment. Turning to the experiment, we find that: a. short-term rerouting decreases joint profit by reducing the number of passengers and passenger prices, while it keeps bribes the same; b. long-term rerouting decreases the joint profit by decreasing the trips per day, but increases bribe costs by 72%. This suggests that drivers in short-term rerouting are less patient when attracting passengers and negotiating ride prices, reducing joint profit, and that they spend resources to create new ties when the rerouting horizon is long. Indeed, within three days, relationships, trips per day and profits catch up.

We combine these results to quantify the value of these social ties for producer and consumer surplus. We consider the economic activity of drivers and officers, the producers, offering transportation to the consumers, and the analyze the producer, consumer, and total economic surplus from this activity. We find that short-term rerouting in which the driver was *not* assigned third-party protection decreases joint profit per day, the daily producer surplus, to zero. Analyzing the effect of unprotected as well as protected short-term rerouting on the number of trips per day, the number of passengers per trip, trip duration, passenger prices, and the operating costs, we further provide suggestive evidence that this increase in producer surplus reflects an increase in total surplus, arising from a reduction of marginal costs of transporting passengers and an increase in demand. The intuition, consistent with our qualitative interviews, is that when the driver does not have ties with officers on the line, calling and waiting for passengers to fill the bus, as well as negotiating with them for a price, exposes the driver to detection and shakedown by police officers, discouraging the driver to take those actions; with driver-officer ties, the driver can take such actions without the risk of shakedown.

The value of these relationships for the joint profit prompts the question of whether creating a relationship is a profitable investment for the driver-officer pair. The dynamic analysis showed that, on average, for at least one day, creating new relationships reduces the joint profit by 9.7 USD from 22.2 USD and costs 5 USD in bribes. This possibly one-off 15 USD reduction in profit is small compared to the return of 30 USD each day. Our qualitative interviews suggest two reasons why most drivers have a large number of unexplored lines: a. they are liquidity constrained, and typically start the day with close to zero savings; the 24 USD of daily joint profit is then allocated into bribes, payments to the assistant who calls for passengers, rental fees for the owner, and the residual is a small profit for the driver; b. drivers are risk averse and, while the benefit of new relationships may often exceed the expected cost, the downside, such as if the vehicle is taken to the station where it is sometimes sold in the black market, can be very large.

Our experimental estimates take the prevailing equilibrium as given. Three theoretical questions are central for their external validity. First, it is possible that the cost of not having a relationship is jointly generated by the equilibrium strategy profile. This could be the (out of the equilibrium path) threat by the police that ensures the drivers do not forego paying the toll fee. Indeed, there is evidence to suggest this. One of the drivers we interviewed said: "He who doesn't give will be shaken. If you do not give, you really don't want to return with your *mbote* [toll fee]," suggesting that curbing driver moral hazard could be a rationale for lengthy negotiations. However, even in this context, lengthy negotiations leading to a large bribe are simply the only way for an officer to make money unless there is some other type of agreement. They are the benchmark costs that the cooperative toll fee systems emerge to manage. Second, one may worry that in certain settings where new relationships may form, less costly equilibria with no initial fixed costs might emerge. However, our finding about "buying the land" is a prediction shared by a large class of models of repeated interaction in which there is uncertainty about new relationships forming. For example, Kranton (1996) shows that, in that case, the (constrained) optimal level of cooperation can be achieved by simple strategies involving a "bond" in the form of reduced utility at the beginning of the relationship—such as "buying the land." Theoretically, many factors could explain the emergence and the size of such bond, including the driver and officers' discount factors, information asymmetry over different driver types, networks of relationships, and outside options that feed into the drivers' reservation value. But the existence of this initial dis-utility we document is unlikely to be a peculiar feature of the context.

Third, the speed of relationship formation is influenced by the fact that drivers in the study are less financially constrained than in reality, due to the expectations of receiving compensation at the end of the study. However, it is nonetheless a meaningful estimand: it indicates how fast relationships may form if drivers were financially unconstrained.

Our study presents evidence that the social structure shapes corruption and that the social structure responds to opportunities from corruption. This finding complements the literature on corruption in economics. While the role of repeated interaction was proposed theoretically (Rose-Ackerman, 1999, Dixit, 2004) the literature has tended to take the governance of corrupt exchange as given (Olken and Barron, 2009, Shleifer and Vishny, 1993, Bertrand, Djankov, Hanna, and Mullainathan, 2007, Banerjee, Mullainathan, and Hanna, 2012). Our study is the first to empirically establish that social relationships are critical for mitigating the fundamental problem of corrupt exchange.

This finding also complements a body of research emphasizing that connections with state officials can be profitable (Fisman, 2001, Fisman and Wang, 2015). A challenge with the literature is that "political connections are not exogenously assigned," and that connections are hard to measure, hence existing evidence relies on proxies for relationships and hinges on credible but not experimental identifying assumptions. Our study documents the nature of these ties by measuring them directly and quantifies their effect using a randomized experiment. Furthermore, if social ties are profitable, then profit opportunities should shape the structure of social ties. Drawing on the insights of an emerging empirical literature on relational contracts (Macchiavello and Morjaria, 2020) and randomizing the expected horizon of corruption opportunities, our study is the first to document how ties form in response to such opportunities.

Our results suggest that repeated interaction between citizens and state officials in the context of corruption, usually deemed to be undesirable because it promotes collusion, can also significantly reduce the cost of corrupt exchange—even as this comes in part at the expense of consumer surplus, and would be a second-best solution compared to a system in which drivers would pay a centralized fee to use the roads, and then optimize their routes. Furthermore, our result suggest that relationships could form surprisingly fast, and faster than is generally assumed by governments designing rotation systems for bureaucrats aiming to minimize opportunities for collusion (Greif, 2008).

2. Background: The Passenger Transportation Sector in Kinshasa

The public transportation system of Kinshasa in 2015 was privately operated by minibuses. The minibuses, most of which were Mercedes 207 and could theoretically transport 12 passengers, were commonly called the *Spirit of Death* ("*Esprit de Mort*" in French).[1] The minibuses owed their ironic name to the dangers of travelling in them. At the time of this study, most minibuses were known to fail to comply with various technical or safety regulations (Titeca and Malukisa, 2019). The vehicles were typically bought in poor condition, were on average between 15 and 20 years old, and frequently loaded more than 20 passengers.[2] Low cost repairs predominated. Although many vehicles in Kinshasa had technical problems, this was especially true for *Esprits de Mort*.

Property rights structure and the generation of profit

The driver was residual claimant and rented the minibus for a fee.[3] The main source of revenue to the driver was the number of passengers and the price they paid for the ride. *Esprit de Mort* lines of East Kinshasa are depicted in Figure 1. Minibuses followed preestablished lines, although the driver was free to choose which lines to drive on. In each trip, drivers passed through many intersections containing teams of police officers.

Revenue hinged on attracting passengers and negotiating with them for a price of the ride. First, to attract passengers, the driver usually relied on a conductor to shout the direction of the minibus through the window, and waited for passengers to respond to the call at key buys intersections—or shouted the direction himself. Second, the price per passenger was determined as follows: there was a standard ride price—considered by most to be fair—but drivers had a lot of latitude to negotiate that rate, depending on their relative patience. The driver would stop for discussions about those prices.

The risk inherent to profit generation

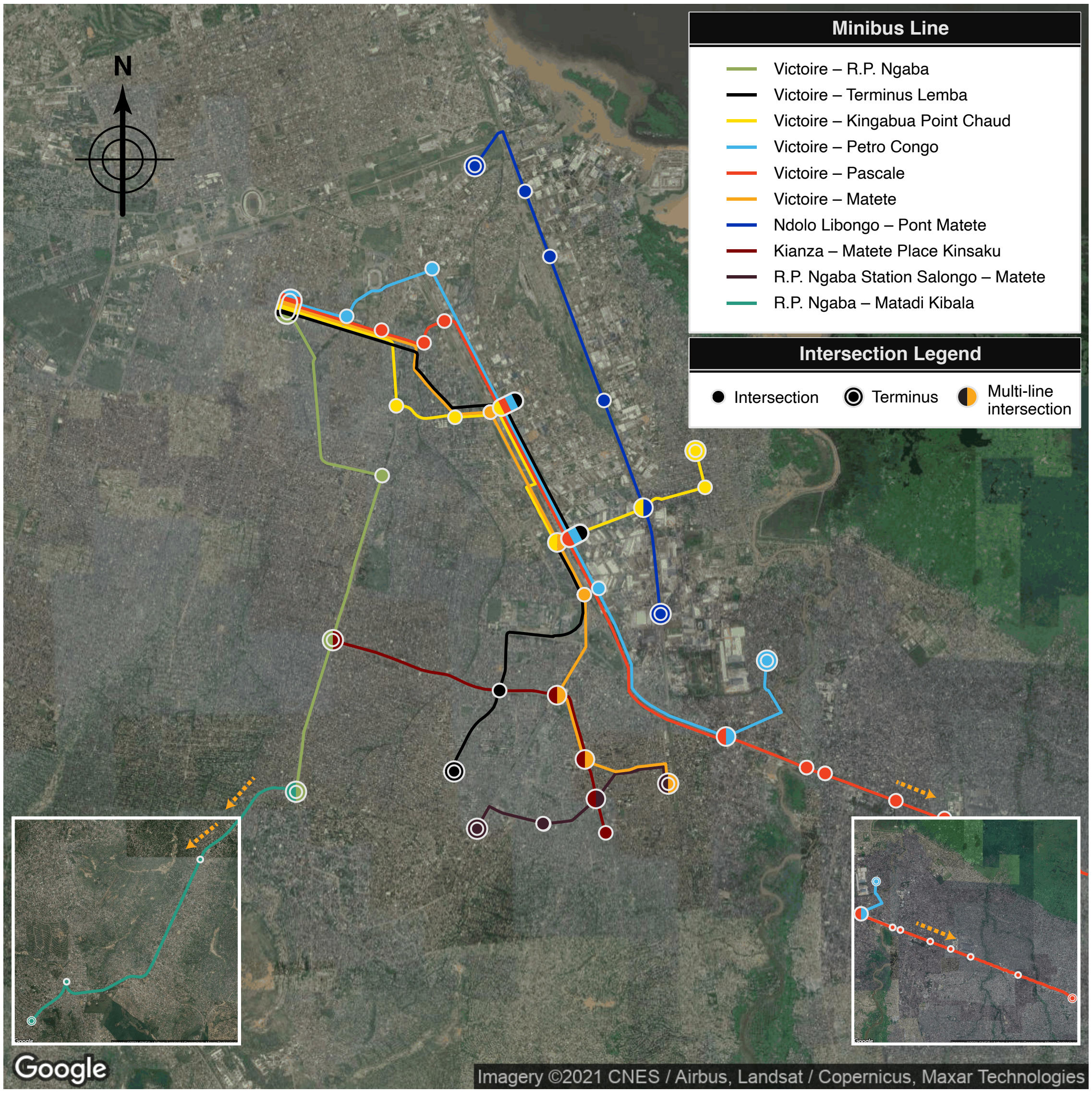
However, spending time negotiating for a price, or making oneself visible to the passengers through shouting, increased the revenue, but exposed the driver to significant

[1] Figure A1 depicts an *Esprit de Mort* minibus.

[2] This made them among the oldest in sub-Saharan Africa (Tchanche, 2019).

[3] Some arrangements also included ways of sharing risk between the driver and the owner.

Figure 1: The Public Transportation Network in East Kinshasa: *Esprit de Mort* Lines



Notes: This figure shows the universe of intersections and lines that *Esprit de Mort* minibuses drive through in East Kinshasa. Circles denote intersections, and lines denote bus lines. Circles with double border indicate termini (starting or end stations); circles with multiple colors indicate intersections crossed through by multiple lines. The two squares represent termini that are too far to fit on the current scale and are artificially closer. They are the termini of the lines the Rond Point Ngaba – Matadi Kibala (lower left quadrant), and the Victoire – Pascal line (lower right quadrant).

risk. Indeed, various traffic police officers posted along the lines at strategic locations where there were many such passengers, such as busy street intersections. If one of these officers detected a minibus at an intersection, he could stop the driver, triggering a lengthy negotiation in which he could threaten to seize the minibus to the police station, leading to time waste and high bribes. In some cases, it might even lead to the definitive loss of the vehicle: we were told of vehicles that had been sold on the black market by the police station staff upon failing to reach an agreement with the driver.

To avoid seizure once a negotiation had started, the driver could pay a bribe to the officer (henceforth, *negotiation bribe*). These negotiations were lengthy and in the worst cases could be violent.[4] In addition to the risk of having to pay a large bribe, the time negotiating with the officers was very costly in terms of lost revenue. Because of their inherently bad state, which made them in violation of various regulations, *Esprits de Mort* were particularly vulnerable to being detained for a negotiation. This implied that time spent at an intersection negotiating with the passengers or trying to attract passengers increased the risk of detection by police officers stationed there, inducing a significant loss of revenue. Thus, driving and passing through intersections *quickly*, while losing potential passengers and forgoing high negotiated passenger prices, allowed them to avoid detainment with more ease.

The social institution: relationships and the unofficial toll fee

Against the backdrop of these risks, minibus drivers and police officers had developed an unofficial toll fee called the *Kola Nut Greeting* ("*Mbote ya Likasu*" in Lingala). The system consisted of drivers paying only 500 Congolese francs (53 cents in US dollars of 2015) once per day to each team of officers at the intersection on the driving line. To take part in this system, drivers needed to be known to the officers on a line *and* to have social relationships with them.[5] In some lines, the drivers had relationships, allowing them to drive and make profits (henceforth, *home lines*). In others, they did not (henceforth, *foreign lines*), in which case, they were vulnerable to detainment and lengthy negotiations:

> The *Mbote ya Likasu* is money that the driver gives the officer as the officer's right. (Project notes of July 18$^{\text{th}}$ 2015)

Relationships were acquired through a process known as *buying the land* ("*acheter la terre*" in French). It consisted of taking part in lengthy discussions and ending with a large payment. For example, members of the study's implementation team told us:

> Another will tell you that, on this line, he already "bought the land." This means that between him and the officers on the line, it is hard for him to get

[4] Figure A2, Panel A, illustrates a typical instance of a negotiation bribe.

[5] Figure A2, Panel B, illustrates the *Kola Nut Greeting* ("*Mbote ya Likasu*") through a handshake.

> arrested because he is known. Here I am new. It is easy for me to get arrested. (Project meeting notes of July 10th 2015)[6]

> The way to familiarize oneself with the officer is to let oneself be arrested and endure long discussions, and through these discussions, we become friends! When we drive again, we are no longer new on this intersection. He "buys the land" like this . . . The driver therefore wanted to have good relations with this officer who helped him "buy the land" with the street-level officer: he gave him 5,000 Congolese francs. . . if *Esprits de Mort* get detained, they could be escorted very, very far! (Project meeting notes of September 4th 2015)

Empirically, thus, payments to buy the land were observationally equivalent from any other negotiation bribes: not only because the distinction depends on the intention of the driver, which is subject to interpretation, but also because even in cases of involuntary large payment, a friendship/relationship is automatically made.

Another solution: seeking third party "protectors"

At all levels of the hierarchy, police officers offered their "protection," often for money. When detained by a traffic police officer, the driver can call his protector and communicate this protection in the negotiations with officers. Our research observed failure of attempts to detain and seize minibuses (or other vehicles) by street-level police officers, after an "intervention" by high-level state officials. The following description illustrates the value of third-party protectors in the negotiation with the officers:

> The officer on the street did not want to take the phone offered by the driver. Only when another officer who sat with him was there and the driver mentioned the name of the major several times did the arresting officer take the phone. After answering the phone, the minibus was released. The driver

[6] Project meeting notes are records that we kept on a daily basis recording everything that was said in the project meetings by the research project members, to coordinate and monitor implementation, as well as to gather information about the system we studied. Typically, there were two such meetings each day. Ten data collectors, three data collection and treatment assignment supervisors, a scientific data coordinator, an operations coordinator, and the PI's took place of that meeting. The field staff having close interaction with the drivers and observing their work each day, these meetings were an opportunity to absorb and immortalize rich qualitative data that the project was being exposed to while it was under way.

> realized it was this one officer who knew the major who pushed his colleague to release the minibus. (Project implementation notes of September 4^{th} 2015)

Monthly fees for unconnected drivers to acquire high-ranking protection sold privately range from 100 to 500 USD. At the bottom of the hierarchy, street-level police officers also sold their protection, typically to wealthy drivers, by sitting in the car in the day, often for 30 USD a day. The power of these officers stems from their own relationships with their own "protectors" in the hierarchy. We now present stylized facts about corruption.

3. Corruption, Embedded in Social Relationships: The Home Lines

We now present stylized facts about the system of corruption in the minibuses "natural" environment: the home lines. The data were collected from ten minibuses between June 19_{th} and July 20_{th} 2015 in the ten lines of the East Kinshasa network.[7] The data contains information on 15,426 events in which a driver drives through one of the intersections of the network, which are observed from driving through 49 unique intersections.

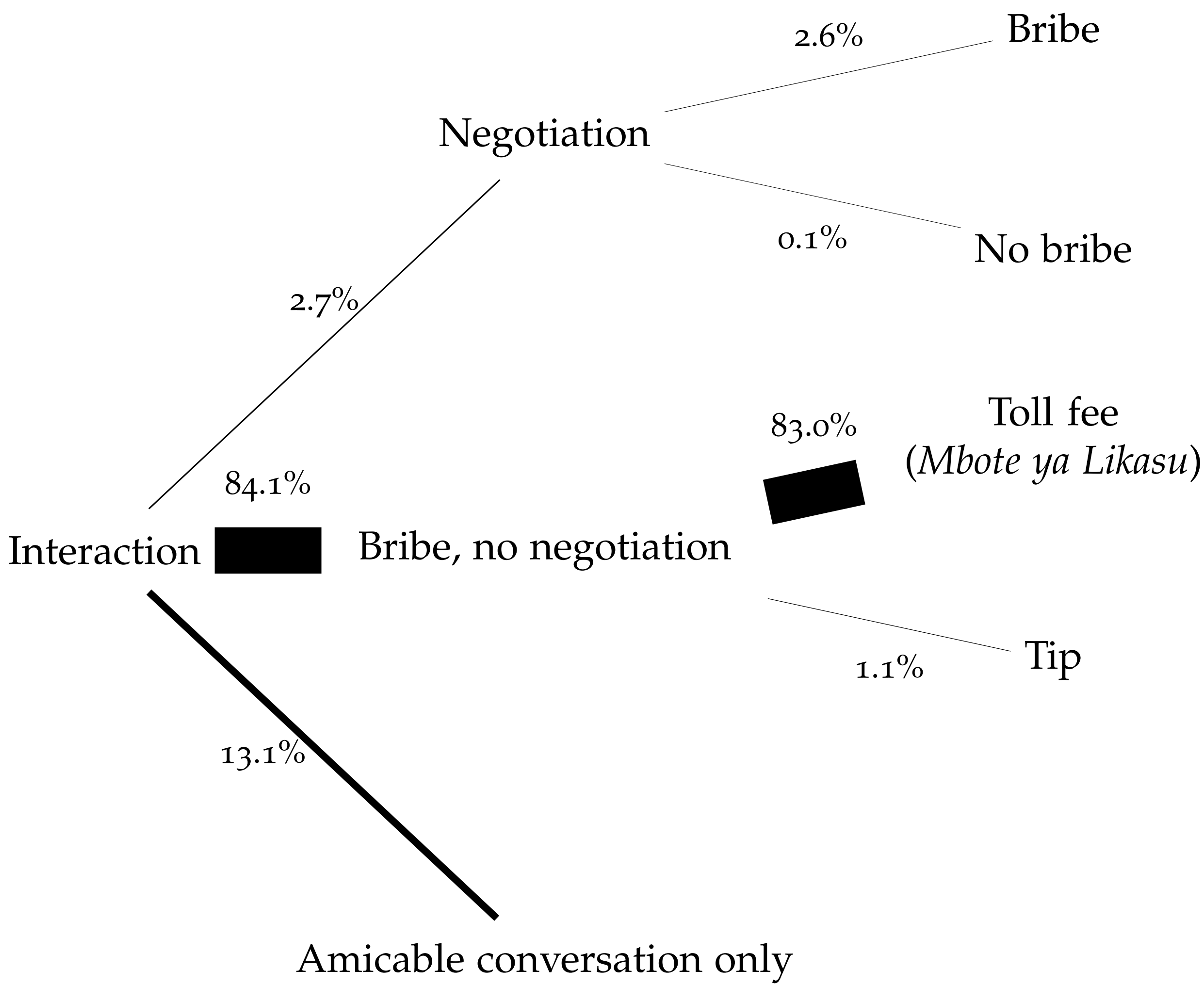
Figure 2 presents the type of interactions between the drivers and the police officers.[8] The vast majority of interactions are events in which the driver pays a bribe without negotiation (84.1%), which are predominantly toll fee payments (83.0%). The remainder comprises amicable conversations with no payment (13.1%) and negotiations (2.7%).

Table I, Panel (a), presents basic facts about the toll fee level vs. other types of bribes in these interactions. The toll fee is the smallest of all bribe payments, amounting to .53 USD on average. In contrast, the mean negotiation bribe payment is 9.79 USD. The toll fee is also extremely stable: while the toll fee standard deviation is .32, that of negotiation bribes is 7.05, suggesting enormous heterogeneity given that per capita income is around

[7]The collection of these data is the outcome of three years of qualitative work, six months of preparatory work for the quantitative data collection in which we field-tested various approaches to collect data on the minibuses. To collect the data for this section, every day, each of ten data collectors was dispatched to one of ten minibuses under the supervision of a data collector supervisor. Each data collector gathered the details of every interaction with the police officers for every intersection crossing for their corresponding minibus. We programmed a survey on SurveyCTO and the surveyor carried a smartphone, prompting each intersection on the minibus line to answer the following questions: *1. "Did the driver pass through the intersection?" 2. "Details of the interaction with the police if any and bribe payments if any."* Time and place marker was also embedded. Thus, the measurement of enumerators was also not blind nor double-blind and follows the practice introduced in Olken and Barron (2009).

[8]Figure A3 shows that most of these interactions are with street-level traffic police.

Figure 2: Classification of Driver-Police Officer Interactions in Pre-Experimental Data



Notes: This figure classifies the interactions observed between drivers and police officers at the intersections in the pre-experimental data between June 19_{th} and July 20_{th}, 2015, in a tree diagram. The data were collected from ten minibuses between June 19_{th} and July 20_{th} 2015 in the ten lines of the East Kinshasa network. The figure includes the percentage breakdown of 2,423 interactions that we observed between police officers and minibus drivers in their home lines. The branch thickness is drawn to be proportional to the *incidence* of each class of interactions. Enumerators coded "*negotiation*" for interactions between a driver and the police officers in which drivers negotiate for bribes. Negotiation events include negotiations that take place only on the street with the police officers (the majority) and negotiations that end in the driver being escorted to the police station for further negotiation with higher authorities (the minority). This class of interactions can only end in two types: a. payment ("bribe"); b. no payment ("no bribe"). No payment interactions are negotiations that result in the driver escaping, or the driving promising to pay in the future, or the driver and the officer agreeing that no payment is necessary because the driver announces to have a higher-level "protector" to avoid paying a bribe. Amicable conversation only is an interaction where drivers have conversation with police officers, either directly coded by enumerator or analyzed to be separated from negotiations, and results in no payment. Data collectors distinguish tip from "*mbote ya likasu*" by taking records of conversation and to further verify sometimes asking drivers.

Table I: Characteristics of The Three Types of Bribes in Pre-Experimental Data

A. Bribe Costs Decomposition—Payments per Transaction (USD), by Type of Bribe

Variable	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Average per transaction made	0.82	2.03	0.04	27.14	2,103
Toll fee (*mbote ya likasu*)	0.53	0.32	0.04	5.43	2,012
Negotiation bribe (incl. police station)	9.79	7.05	2.17	27.14	64
Tip	1.19	0.62	0.43	2.71	27

B. Time Waste per Transaction by Type of Bribe

Variable	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Fraction of intersection crossings in which time interacting with police is strictly positive	0.16	0.36	0	1	15,426
Time wasted in interaction with police, per transaction conditional on interaction time strictly positive (duration of negotiation in minutes)	0.83	2.13	0.1	55	2,103
Toll fee (*mbote ya likasu*)	0.64	0.78	0.1	20	2,012
Negotiation bribe (incl. police station)	7.04	9.59	0.5	55	64
Tip	0.72	0.35	0.5	2	27

C. Frequency of Payment by Type of Bribe

Variable	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Number of trips per day	5.92	2.56	1	15	261
Number of times per day in which a payment is made at the average intersection (any payment)	1.24	2.09	0	12	1,700
Toll fee (*mbote ya likasu*)	1.18	2.07	0	12	1,700
Negotiation bribe (incl. police station)	0.04	0.19	0	2	1,700
Tip	0.02	0.13	0	2	1,700

Notes: This table presents the summary statistics on the three types of bribes in the pre-experimental data between June 19_{th} and July 20_{th} 2015, observed in the drivers' home lines. The data were collected from ten minibuses between June 19_{th} and July 20_{th} 2015 in the ten lines of the East Kinshasa network. Panels A, B, and C present the bribe costs, the duration of the negotiation for each bribe, and the frequency of each bribe respectively. The statistics presented are computed from 15,426 events in which a driver drives through an intersection, from 49 unique intersections. Of these events, 2,103 resulted in the payment of a bribe.

1 USD per day.[9] Panel (b) presents basic facts about the time wasted negotiating. Overall, the driver interacts with an agent only in 16% of intersection crossings. On average, each interaction with the police lasts 50 seconds. However, this average masks substantial heterogeneity by type of bribe: the toll fee interaction lasts only 38 seconds, and a tip 43 seconds. This contrasts the time spent negotiating for a negotiation bribe, which is, on average, 7 minutes and can take up to 55 minutes.

In terms of prices and number of passengers, we did not collect such information in the pre-experimental data, which we used to develop the research questions. However, using the data that we collected in the experiment that we present in what follows, the average price of a trip is 47 cents USD, in USD of 2015. This price is variable (standard deviation of 7 cents), and ranges from 22 cents to 53 cents. In terms of passengers, the average number of passengers in a trip is 18.02, and is also variable (standard deviation of 3.66 passengers), ranging from 0 to 32 passengers for a trip in that sample.[10]

4. The Experiment

In this section, we present our experimental design of the rerouting treatment, the assignment procedure, its implementation, and the measurement of minibus outcomes, as well as cross-randomization. We conducted the experiment *in August and September 2015*, after the original data collection. We randomly rerouted minibus-days within each of ten minibuses to drive in foreign lines in some days and not in others.

[9]Table A1, Panel (a), presents the per-trip equivalent. The large share of the toll fee in total bribe costs arises from the frequency with which it is paid.

[10]In the Appendix, we provide various extensions of this analysis that provide reassurance in the validity of these conclusions and in the external validity of the samples used in the paper. First, Figure A4 presents histograms of time waste by bribes, confirming that the toll fee payments are very stable compared to negotiation bribes. Second, Table A1, Panel (b), presents the per-trip equivalent. Due to the fact that negotiaton bribes are infrequent in the home lines, they account for only 25% of time negotiating despite the fact that one negotiation bribe takes 11 times longer to negotiate than the toll fee. Third, Figure A5 presents the hourly time series of average bribe cost and time waste across all days in the pre-experimental data. The figure provides reassurance that these descriptive statistics of negotiation incidence, bribe level, and negotiation length are not explained by differential variation in the day. Fourth, Table A2 presents the same analysis as Table I using, instead, the data from the experiment, for the observations on home lines. It shows that the experimental sample is comparable to the pre-experiment benchmark, providing reassurance about the external validity of the experiment that follows.

A. ***Rerouting to Foreign Lines***

Identifying foreign lines

Drivers had a set of lines they considered feasible, in the sense that they had enough relationships with police officers at the intersections (*home lines*). The rest of lines are henceforth labeled *foreign lines*. The rerouting treatment consisted of an encouragement for drivers to drive through lines considered "foreign lines" for a block of contiguous days. There are also 10 drivers each with one main home line, for 27 days. To determine which lines were home and foreign for each of the drivers, we organized meetings with the drivers. Those meetings were organized prior to revealing the details of the experiment to reduce concerns for misreporting. On average, drivers had 1.3 lines that they considered home, and 8.1 foreign lines.

Randomization procedure: First and Second Wave

The randomization procedure selects driver-days to a given treatment assignment as follows. The sample for randomization consists of ten drivers spanning ten days, resulting in 270 minibus-days. The experiment time window was subdivided into a first wave of 23 days (the month of August, and part of September) and a second immediately after, of four days (a subsequent part of September).[11]

- **Step 1:** We randomly partitioned the 23 days of the first randomization wave into nine blocks of contiguous days (henceforth, "*driving blocks*"). In that window, each driver had *seven* three-day driving blocks and *two* one-day driving blocks.

- **Step 2:** the driving blocks were randomly assigned to home or foreign as follows. For each driver, three of the seven three-day driving blocks were randomly assigned to home line. The remaining four of the seven three-day driving blocks for each

[11]Due to initial uncertainty over the extent of funding, the experiment is divided into two periods, within which randomization occurs. The number of minibus used in the analysis reflects funding limitations. As described in this section, however, the experiment's inference is based on 270 minibus-days treatment clusters and, overall, the experiment sample is constituted of 13,092 events of crossing an intersection produced by 1,935 trips (compared to 304 trips in Olken and Barron (2009)). The experiment was implemented prior to pre-analysis plans becoming a norm, in 2015. The original hypothesis was that rerouting destroyed the surplus due to bribe negotiations and the expectations of negotations. Theoretically, the level of the bribes in home or foreign lines was not clear a priori given the lower rate of interactions in foreign lines and the possibility that the toll fee is priced to extract the value of the relationship.

driver were assigned to rerouting toward a foreign line (the identity of what specific foreign line is to be determined in the following step). All the days within each three-day block had the same home vs. rerouting assignment. Furthermore, for each driver, of the two one-day driving blocks, one was randomly selected to be a home line and the other to be a rerouting line.

- **Step 3:** We pinned down what specific line to drive, conditional on this assignment: a. In driving blocks assigned to home, drivers were asked to drive on their main line—some minibuses had multiple home lines, in which case we excluded the remaining home lines from the pool of foreign lines from which to select foreign rerouting; b. For each driver, in each driving block assigned to rerouting, we selected the unique foreign line to drive for all days of that driving block as follows. From the pool of lines that are considered foreign for that driver, we randomly selected one, *without replacement*. As a result of sampling *without* replacement, it follows that a foreign line could never be the selected line for a driving block in more than one driving block for a given driver.

- **Step 4:** Having implemented this randomization procedure to the first wave, we added four days to the study, the second randomization wave. Randomization for the four days of the second wave was implemented as follows: for each driver, the remaining four days were subdivided into four one-day driving blocks; then, for each driver, half (two) of these four days was assigned to home line driving (randomly selected) and the remaining half (two randomly selected days within driver) was assigned to rerouting. Among rerouting days, for each driver, foreign lines were randomly selected as in the first wave, among the pool of foreign lines that had not been previously selected, in any wave, for the corresponding driver.

Table A3 provides a *stylized* summary of this randomization procedure for a typical driver, *prior* to randomizing the sequence of driving-blocks, for presentation purposes. In reality, the sequences presented are randomized within each of the two waves, separately for each driver. The experiment of foreign line rerouting was thus a stratified, clustered randomization design, where we stratified the randomization by minibus driver-wave, ensuring balance between foreign and home driving blocks within driver-wave strata.

Because the assignment to home vs. foreign was made at the level of the driver's driving block, each minibus driving block is a randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, randomly assigned within each of 20 randomization strata. Thus in what follows, we henceforth refer to the driver-wave as *randomization strata*.

Drivers' incentives to participate and to comply to the randomization assignment

Compensation of drivers was tied to *participating* in the experiment, and was orthogonal to treatment status. This compensation was decided ex-ante per weeks-long conversations with the drivers. The amount of the compensation was calculated based on the expected losses from driving on foreign lines on some days and not on other days.[12] At the end of the study, drivers withdrew the remaining funds.

If a driver failed to comply with the randomization schedule, the research team would exclude the driver from the experiment. Given the value to the drivers of the funds kept by the experimenters for the end of the study, drivers had no incentive to violate the encouragement to reroute. Monitoring was tight to verify where each driver was driving in real time, using a supervisor. We detail data collection in Appendices A1-A3. We recorded no violation of the assignment thorough the experiment.

B. *Cross-Randomization: Third-Party Driver Protection*

To isolate the effect of foreign driving stemming only from the interaction between the driver and the police officers, we cross-randomized third-party protection.

We provided to each driver on randomly selected days a portfolio of actors representing various types of third-party protection. To extend third-party protection to the drivers, the Congolese members of our team identified the set of high-ranking police officers who regularly offered their protection, and a set of street-level police officers with whom we had established relationships in a previous study.[13] We also worked with

[12]The compensation was 500 USD for each driver and withheld until the experiment's completion. Drivers kept the right to request from the account sporadically if there were severe needs of cash. This happened few times—for example, after a few drivers were detained and escorted to the police station.

[13]Involvement of the non-Congolese members would have triggered expectations of high payment and extortion.

ACCO to produce a sticker to be visibly fixed on the minibus' windshield that could easily be removed at the end of the day. Figure A6 presents one example.[14]

After having randomized the sequence of thirteen driving blocks within each driver, and having randomly assigned the home vs. foreign treatment across these blocks, assignment to each type of police third-party protection (high-ranking officers or street-level police officers) and to ACCO third-party protection was randomized as follows.

First, stratifying by the set of three-day blocks within each minibus, we randomly assigned third-party police protection in either one or two days in the block. Stratifying by the set of one-day driving blocks within each minibus, we randomly assigned the day to either receive the police third-party protection or not. This ensures random assignment and balance of blocks of third-party protection for all minibus driving blocks.

Second, among driver-days assigned to third-party protection, we randomly assigned to the type of police protection. In a first step, we randomly assigned either high-ranking or street-level police to those protected days. Street-level police third-party protection are the police officers who sat with the driver in the minibus (henceforth "*police escort*"). high-ranking police third-party protection are the colonels or majors who can intervene upon a call from the driver. In a second step, we randomly assigned either colonel or major to those high-ranking-protected days, within minibus driving blocks.

Third, we randomly allocated days of ACCO sticker protection stratifying by minibus-driving block-protection status as follows. Each of two days in the three-day driving blocks that had the same police protection status has a 0.5 probability of being assigned an ACCO sticker. In contrast, the remaining day within the three-day driving block or the one-day driving block has a 0.43 chance of getting a sticker. Qualitative notes from the project indicate that drivers were eager to carry the sticker because of the protection

[14]The third-party protection we provided included, only in the days in which it was provided: a. Police escort that would travel through the day next to the driver; b. Third-party protection by colonels and majors; c. A sticker on the windshield with the official logo of the association of drivers of the Congo (ACCO), intended to signal to the police officers on the street that the driver was affiliated to the ACCO.

it provided, and they asked to keep the sticker at the end of the study.[15]

To plan the third-party protection treatment schedule, we developed one calendar for drivers, one calendar for each of the protectors, and one calendar for each of the project implementers who accompanied the minibus drivers. Each of our project implementers also doubled as a data collector. They collected driver outcome data and were supervised by a project coordinator, and a data collection monitor. The calendar for drivers indicated, for each day, whether and from whom they had third-party protection. The calendar also indicated the phone number of high-ranking protector to be used in case of need. Drivers were trained that they would not be protected outside of their assignment. The calendar for the police protectors calendar indicated, for each day, which drivers to protect. The total number of driver-days in their calendar was equal to the value of the protection purchased by the researchers. Police third-party protectors were trained so that, if they received a call by a driver in our study, they would first inspect if they were supposed to protect the driver on that day. If the driver was protected that day, they implemented the "intervention" over the phone. Otherwise, they were trained to ignore it.

To ensure compliance with the treatments, each of driver's project implementer had the following tasks. First, between 5 and 6 a.m., the implementers met with the police officers who worked as police escorts. Second, each implementer met each driver at their termini before the first trip. For drivers assigned to third-party protection by police escort, the implementer arrived with the police escort, and seated him before the passengers on the front seat, which is the usual seat for police escorts in this setting. Third, prior to the start of driving on each day, the project implementers verified the

[15]We also overlaid another type of protection that we did not previously pilot: protection by one of three captains. Protection by a captain was a priori the weakest, because: a. the captains had the lowest level on the hierarchy among the protectors not present in the minibus; b. unlike other third-party protectors, captain treatment was expected to only be effective in a small subset of intersections; c. we did not pilot the captain protection. As a result of these weak priors, assignment to captain protection is the only treatment that is overlaid after the number of units in treatment cells defined by the previous treatments was exhausted. To do so, every day of the study, we randomly drew half of the minibus drivers to receive protection by a captain. In addition to having weak priors about the meaningfulness of this layer of protection, during the implementation, we discovered that the effectiveness of captain protection was limited due to the fact that: a. they often did not respond to phone calls; b. it was often time consuming to find them and drivers found it preferable to ignore this protection; c. they had indeed very limited jurisdictions over which they had power; d. they even requested additional payments from the driver per each intervention requested; d. the tracking of events shows that the intervention of a captain assigned by this treatment was only requested 5 times; in one of these cases, the captain never responded. As a result from these priors and learning during implementation, in what follows, we exclude this third-party protection from the analysis. The results are identical if we include captain protection as a control.

calendar of assignments, provided reminders to the drivers, otherwise enforced the calendar. Each day drivers assigned to not carrying the sticker were monitored to remove it before the first round. Drivers were reminded of the protectors they had that day.

Table A4 presents the randomization balance of assignment to foreign treatment across days of week, and month. The characteristics summarized in Table A4 appear balanced.

C. *Cross-Randomization: Time Horizon of Rerouting*

We designed the randomization into driving blocks tp also generate experimental variation in the time-horizon of the rerouting. This variation allows us to examine whether longer-horizon of rerouting causes investment of a new relationship. As previously indicated, nine of each driver's thirteen driving blocks comprised three days; the remaining four driving blocks comprised one day. Since we randomize the sequence of driving blocks within the driver, the time at which he drives in a three-day vs. a one-day block is random. Randomizing foreign vs. home line for these driving blocks within each driver generates a random assignment to driving in a three-day or a one-day driving block. To ensure that foreign and home line driving were balanced for each of the three-day and one-day driving blocks, the randomization procedure for foreign vs. home line was also done blocking by three-day set of blocks, and by one-day set of blocks.[16] The effect of rerouting should be heterogeneous by whether their time horizon is over 1 or 3 days.

Table A5 presents the randomization balance for all treatment assignments. By design, assignment to foreign line rerouting is balanced, while assignment to any type of third-party protection is almost perfectly balanced. For this reason, the appropriate specification will include randomization stratas (minibus) fixed effects.

D. *Artificiality of the Research Design and Participants' Beliefs*

Design: To What Extent is it Artificial, and Where Does it Matter?

The research team spent many months of preparation tailoring the design to the practices that are common in this community. First, it is common to have a third-part protector of various types. The nature of these arrangements is also sufficiently varied in this

[16] Including this additional randomization strata as fixed effects is inconsequential for the estimation.

ecosystem that our contract did not generate feeling of it being artificial. The following quote, provided by the research manager in an exit interview after the study, articulates the extent to which the experiment design fit existing practice:

> We have a friend Z., he bought a RAV4 vehicle, but he never even registered the license plate. He often uses his car on Sundays, as the police are not very strict on Sundays. If he has a trip to make during the week, the Regiment Commander, his friend, provides him with one of his bodyguards. Throughout the day, Z. runs errands while the military officer sits in the front seat of the car. He is never stopped by the police. On days when he doesn't have any errands, the guard stays at home and never wonders why or how he wasn't called to accompany Z. Similarly, during our project in Kinshasa, when the police officer was not called, he was certain that we didn't need him that day. Remember that sometimes we would take a lieutenant, other times a captain, which allowed us to change the police officers. They were very sure that we only needed protection to avoid getting stopped by the police.

Second, it is also common for drivers to explore new routes. The research manager noted in the project's qualitative exit interview:

> But that doesn't mean he can't go on other routes, such as if his friend tells him that the route he is currently on is more profitable.

Thus, the situations created by the study fit naturally in an ecosystem of situations that emerge endogenously as various actors are trying to get by.

Finally, one aspect of the study is obviously artificial by construction: the drivers had access to an envelope at the end of the study. We take into account this feature when interpreting the speed of relationship formation.

Beliefs Held by the Drivers

First, drivers were made aware that they were part of a study but they did not know the hypothesis being tested nor that the interventions were part of an experiment. In training, drivers were informed that a Congo-based research team, led by a Congolese researcher from Kinshasa and by a Congolese research center from the east, sought funding to study minibus operations while also support the drivers' living conditions. The following quote, from the research manager in an exit interview, describes this:

> For the drivers, they were aware that it was a project because we invited them to the office, especially during the second phase [the experiment], to inform and explain how the variations would be made (changing routes, etc.) ... In short, they knew it was a project, and their motivation to participate was mainly for the money they earned ... It was predictable that they would think about certain things, especially on days when the routes changed, but the truth is that sometimes routes are changed without any form of intervention. Therefore, they cannot claim it's to measure the impact of the protection when they know very well that they are not under our protection on that day.

Second, for each driver, a calendar showed what unique line to drive each day and what type of recourse they had in case of problem. Thus, drivers knew *in advance* their driving and protection status. Our preparatory work suggest that this knowledge had no impact on their behavior vis-à-vis the police, such as how they relate with the police at the moment of interaction, other than influencing how they interact with the police.

Third, drivers were instructed to keep this information confidential, and we found no evidence that they shared this information with the officers on the street (we had observers sitting next to these interactions) nor officials about future assignments.

Fourth, we noted that project coordinators warned drivers that they would not be protected outside their randomly assigned protection days. This makes perfect sense within the context of the experimental design, but a natural concern is that these instructions might have primed the drivers on what they are supposed to do in those days. We ensured that this type of priming did not occur. In training, drivers were notified that they could do whatever they would normally do in those days, and that we just could not guarantee their protection in those days even if they tried.

Finally, the presence of the data collector in the minibus was not double-blind. This follows the practice introduced in Olken and Barron (2009). Furthermore, in our context, all of the interactions we observed between the driver and the officers were considered normal practice. The presence of the data collector in the minibus thus played no role in the drivers' behavior, except for its role to enforce compliance of the driver with the experimental variations. Furthermore, in exit interviews, we found that the regular presence of the observer was positive in the sense that it created a relationship of trust whereby the driver did not feel the need to conceal interactions.[17] Drivers furthermore knew that no future opportunity was held conditional on how they interacted.

Beliefs Held by the Third-Party Protectors

Third-party protectors include captains, colonels, majors, and street-level police agents who travelled in the minibuses. They were told that as part of their collaboration with the ACCO, they were asked to share some of their relationship capital with a subset of the drivers and only in a subset of days to be determined. The following quote, from the research manager in an exit interview, describes what was communicated:

> With regards to the police officers, we conducted the project in a highly confidential manner. Each officer involved in the protection system was aware that it was their job with us but they were not aware that it was part of a study. This system already exists, wherein police or military personnel earn money through collaboration with vehicle owners. They intervene when you get stopped by traffic officers either through a phone call or by coming directly to the place of arrest. This system was not new; it already existed.

Thus, protectors perceived this to be normal practice. As a result, it is unlikely that the fact that their protection was requested as part of the experiment influenced the way they interacted with officers in the street when they were called to intervene.

Beliefs Held by the Police Officers in the Street

When officers encountered a driver with protection, they were never made aware that the driver only had protection because they were part of the experiment (and not, say, because they had strong political connections prior to the study). This made no difference

[17]For example, in a study exit interview we conducted in August 2018, the driver was asked about the benefits of the project, to which he answered: "First, there are good contacts with you and your observer. We often call each other now." Source: Exit interview with study driver, August 2018.

between the home and foreign routes. The following quotes from the research manager describe how this was achieved. First, they did not know the driver was part of a study:

> I can confirm that the police officers on the road never altered their behavior because they were not aware of the project; otherwise, we wouldn't have observed the interactions we did. [Given the connections of the study, if they knew] they would have tried to pretend they act as good individuals ...

Second, street officers did not find protection by an officer travelling inside the vehicle artificial, nor knew that was part of a study:

> In Kinshasa, there are many vehicles used for public transportation, and the military personnel often lack means of transport. This leads to the military requesting service, and when they do so, the driver providing the service to the military or police is automatically exempt from paying road harassment fees. This means that when the traffic police (PCR) see a vehicle with a police officer or a military personnel in it, out of solidarity with their colleagues, they let the vehicle pass without any hassle. As a result, the PCR is not aware that this protection comes from us; they only know that they let the vehicle pass out of solidarity with their colleague.

Third, street officers did not find protection by majors, captains, etc. artificial, nor were they made aware by the driver nor the protectors that this was part of a study:

> Usually, when someone is already stopped, they try to use various influences to get released without having to pay a lot of money, often through phone calls made by the police or military personnel. This method is often successful because many military personnel have vehicles used for public transportation to earn money and support their households. Thus, within the scope of our study, when we receive protection from someone who will make a phone call, the reason they explain to the traffic police (PCR) is that the vehicle belongs to them. PCR officers are accustomed to these types of interventions, and sometimes they readily accept without raising doubts, especially if it is an authority they know well. However, there are times when the PCR officer

> initially doubts the explanation, and in such cases, they may not immediately accept the intervention. Sometimes, the person providing protection is obligated to go to the location to intervene. In short, this situation was a normal occurrence because the police officers were familiar with this practice.

Fourth, finding drivers in foreign routes was not artificial, nor were the officers made aware that drivers on foreign lines was part of a study:

> Even if the driver gets stopped on a route that is not his own, he cannot claim that he wasn't on his route because he is part of the study. During our meeting with the drivers, this was one of the elements on which we insisted, and our investigator was in the vehicle, so there was no way for the driver to disregard this rule ... However, there is police harassment; when the police see a vehicle that is not familiar with the route, they stop the vehicle and demand a given amount of payment from the driver. Sometimes, this leads to significant discussions, and eventually, the driver is released. As a result, the driver feels that they have already paid the "land" (Kosomba mabele), and the police are accustomed to these kinds of situations. They do not question why the driver went on a different route. Some drivers even change routes frequently, sometimes every week, and adapt to each situation.

Finally, street officers were not made aware that the driver had access to an envelope (the compensation for participating) that was provided by a study:

> The police officer was not informed about the amount we paid to the driver; we did our best to maintain confidentiality at every stage of the project.

In sum, we can quite confidently say that the officers in the street acted without perceiving anything out of the ordinary as a result of our study.

Learning by the Participants

Drivers did not learn anything, they simply benefitted from the creation of lasting relationships that would follow them after the study. First, the creation of new relationships, buying the land, the value of protection by known police individuals, are all normal practice. Second, the rigid experimental protocol was rigorously adhered to, thus noncompliance could not induce correlation between driver blocks. Third, foreign lines were sampled without replacement, reducing correlation across driving blocks.

The strict adherence to protocol raises questions about interpretation and how drivers were recruited and incentivized to comply. We have already described the compensation package received by the drivers for accepting to participate. To monitor their compliance, an observer was always in the minibus, and the observers were themselves anonymously monitored by three rotating supervisors who were regularly acting as "mystery" passenger observing the data collector and the driver. The strict incentives to comply to the assignment were communicated to the drivers prior to the experiment and the drivers we recruited is a selected set of drivers who were willing to go through with this condition.

Officers, too, had limited scope for learning. In general, a driver in a home line does not need protection. In a foreign line, officers might learn that a driver has protection and this might change their behavior if the driver is seen at a later day. However, this was impossible due to the fact that drivers either drove just one day in a foreign intersection for the entire duration of the study, or in a three-day block, in which case they tended to build ties from the first day. The following quote exemplifies the scope for such learning:

> There haven't been many troubles. It was only once on 7$^{\text{th}}$ Street [after the study] where an officer stopped me and asked me if the officer that had been given to me as a protection in the vehicle previously could be reached out so that I could be released. (Interview with study driver, August 2018)

In sum, meticulous attention to the system at the design stage ensured that participants took actions that were *not* out of equilibrium, that we simply incentivized variations of choices within normal practice in compliance with the community's norms. This provides reassurance that the behaviors do not reflect artificiality, Hawthorne effects, or hard to predict beliefs about situations that they never encounter.

E. *Ethics*

The Ethics Appendix discusses the ethics of the study at length. In this section, we focus on the important issue of (directly or indirectly) paying bribes. First, the project did not pay bribes. Second, drivers regularly paid bribes, and those were considered legitimate. There is a large literature discussing the legality and morality of bribes in the DRC: in a context in which many civil servants do not receive a state salary, or a very low state salary, certain bribes are considered legitimate by many actors, including drivers, police officers, and the citizens themselves (De Herdt and Titeca, 2019). To the extent that drivers had access to a large envelope at the end of the study to compensate them for participating, and that they received a daily compensation for the seat of the data collector, this implies that, indirectly, drivers might have used some of our compensation to pay these bribes. Potentially important, the existence of this compensation might have incentivized them to pay bribes where they would otherwise have chosen not to. For example, in reality a driver might not have chosen to drive in a particular foreign line when instructed by the study, because it exposed them to the need to pay a bribe.

Three important features mitigate these valid concerns: a. The project did not incentivize illegal behavior (whether the drivers complied to the law was determined prior to the study, and driving in a foreign line is as legal as driving in a home line); b. The third-party enforcers were called leveraging pre-existing relationships with the ACCO, who had their own agreements with them, hence the project did not pay bribes to these individuals; c. Extending third-party protection did not promote or help conceal illegal behavior; instead, it reduced the extent of corruption taking place between drivers and officers (the alternative was to pay a bribe); d. The short-lived nature of our interventions limited opportunities for the participants to make investments that would have amounted to encouraging illegal behavior. If anything, the qualitative evidence we gathered in the exit interviews is rather consistent with the long-term effect of the income shock of our compensation package (which was always never fully used in its entirety during the project itself) might have in fact contributed to increasing compliance with the law:

> The biggest impact is that I used to work without a driver's license, and I was often stopped as a result. However, thanks to the project, I was able to obtain one. (Interview with study driver, August 2018)

F. ***Sample Characteristics***

The experiment sample contains 13,092 events in which a driver crosses an intersection, obtained from 1,935 trips made by the ten drivers over 27 days. Of these 13,092 events, there are 1,682 payments from drivers to officers, 1,514 of which are toll fees, 62 are tips, 97 are negotiation bribes resolved in the street and 9 are negotiation bribes resolved as a of bribe in the police station. Overall, there are 38 events of escorts to the police station, of which 9 are those bribes and the remaining 29 ended without payment of any bribe. The number of unique officers interacting with the drivers is 344, of which 296 are street-level traffic police officers, 26 are ACCO agents, and 22 are other state officials. The drivers performed 8 trips on average per day, amounting to 4 round-trips, returning to their starting termini. On average, a trip has 6.5 intersections and lasts 50.9 minutes.[18] Overall, there are 120 driver-days in which the driver drives in their corresponding home line and the remaining 149 are driver-days on foreign lines.

5. Effect of Rerouting on Social Ties on the Line and On Joint Profit

We now analyze how rerouting to foreign lines affects the joint profit. We do so in two steps: first, we confirm that rerouting reduces the fraction of officers on the driven line with which the driver has a tie; second, we analyze the effect of rerouting on joint profit.

A. ***Sample for Estimation***

To isolate the role of social ties, we exclude, from the sample of rerouting the observations, those which constitute the second or the third day of the rerouting block. Indeed, in those observations, the driver can have already endogenously created new social ties with the officers on the rerouted line, taunting our analysis of the effect of having a relationship. Thus, our sample for estimation in this section includes: a. all observations in which the driver is on a home line; b. those in which the driver is on the first day of a rerouting driving block. The latter includes the first day of a three-day rerouting driving block, as well as the unique day of a one-day block.

[18] Table A6 presents these basic characteristics. Figure A7 shows a schematic map with key statistics.

B. ***Estimation***

Let i index the intersection, r index the round (trip) number, d index the driver, and t index the day-of-study. Let S_{irdt} be an indicator taking value 1 if the driver has a social tie with the police agent with whom he interacts and $\mathbb{1}_1(\text{Foreign}_{irdt}) \in \{0,1\}$ be an indicator variable taking value 1 if an observation indexed $irdt$ is assigned to the first day of a foreign line rerouting, and zero otherwise. Using the driver-day-trip-intersection sample, we estimate the effect of rerouting on the fraction of officers on the driven line in which the driver has a social tie by estimating following equation using OLS:

$$S_{irdt} = \beta^F \mathbb{1}_1(\text{Foreign}_{dt}) + \alpha_{dt} + \epsilon_{irdt}, \tag{1}$$

where α_{dt} denotes the foreign/home line *randomization strata* (i.e., driver-wave) fixed effects. There are 10 drivers and two waves, totalling 20 driver-wave randomization strata fixed effects. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization. There are 13 *driving blocks* for each of ten drivers, totalling 130 driver *driving blocks*. We account for the probability, implied by our randomization procedure, that a given day, a given driver is assigned to home vs. foreign driving.[19] We thus include inverse propensity weights using these probabilities in weighted OLS (henceforth "*rerouting weights*").[20] We henceforth refer to this as the baseline specification, and refer to β^F in that specification as the average treatment effect (henceforth, *ATE*), the average effect of "driving on a foreign line, given the pool of foreign lines available."

To estimate the effect of rerouting on joint profit, we aggregate the sample at the level of the driver-day-trip, since joint profit is a driver-day-trip property, that is, it is not measured separately for each intersection crossing but at the end of each trip driven. In that case, the dependent variable is J_{rdt}, which is the joint profit in US dollars, computed as total revenue on the trip driven minus gas and repair costs; total revenue on the trip driven is computed as the total number of passengers on the trip times the typical price, as reported by the observer. In that case, we estimate:

[19] To recover the probability of assignment to foreign or home lines, we conducted 10,000 simulations of the above-described randomization procedure, and computed the probabilities of assignment to foreign and home lines as the fraction of said randomization simulations, which produced a random assignment to foreign vs. home lines. We do so accounting for the randomization of the driving blocks sequence.

[20] Since the driving blocks sequence was randomized prior to the assignment to foreign, and since the fraction of home vs. foreign days was also balanced, inclusion of these weights, while producing the correct estimator, has no significance on the estimated coefficients.

$$J_{rdt} = \beta^F \mathbb{1}_1(\text{Foreign}_{dt}) + \alpha_{dt} + \epsilon_{rdt}. \tag{2}$$

Where appropriate, Equation 2 is $J_{dt} = \beta^F \mathbb{1}_1(\text{Foreign}_{dt}) + \alpha_{dt} + \epsilon_{dt}$, where Jdt is the daily joint profit, in US dollars.

In robustness analysis, we also estimate the following specifications. First, we exclude from the baseline specification the randomization weights and the randomization strata fixed effects; we refer to this as the sample average treatment effect raw (*SATE*^{raw}). Second, we exclude from the baseline specification the randomization weights, but include the randomization strata fixed effects; we refer to this as the sample average treatment effect (*SATE*). Third, to account for the fact that the pool of lines available for foreign driving may be systematically different to the set of home lines, we add line fixed effects to the baseline specification; we refer to this as the average treatment effect controlling for line fixed effects (ATE^C). Fourth, to alternatively account for the possible imbalance in foreign and home lines, re-weighting observations by the inverse probability that a line appears as a foreign or home line for a given driver (henceforth, "*composition weights*"); we refer to this as the population average treatment effect (PATE)—where population refers to the population of lines. Fifth, when the dependent variable is continuous, we estimate the baseline specification using various ways to handle extreme values.

C. *Effect of Rerouting on the Fraction of Officers on the Line with a Social Tie*

Interaction with street-level traffic police officers make up the vast majority of interactions (881 out of 1,097).[21] The remainder are with the "police of the police" (78)—an agency purportedly in charge of auditing police behavior—with police officers at parking station (71), with the leader of a team of traffic police officers (15), with the biker police (21), and with non-police officers (31). Of these 881 interactions, 43.8% are without relationship, while in 23.4% the driver and the agent are acquaintances, in 23.4% they are friends, and in 8.9% they are kin.

[21]Source: Figure A8. The subsample are observations for which the driver is not assigned to any treatment hence represents the system in its baseline state of home lines. Of the 13,092 number of times a driver crosses through an intersection in the sample, 6,774 are in a home line. Of those, there are 1,097 occurrences in which the driver directly engages with a state official at the intersection.

Figure 3 shows that while 56.2% of interactions with officers at the intersection are characterized as having a relationship on home lines, this fraction decreases to 29.9% on foreign lines.[22] The effect arises from a decrease in relationships described as friendships, for which the fraction decreases from 23.4 to 8.3%.[23] Given that this large number of interactions is generated by a small number of drivers, it is important to note to interpret this figure that the unit of the observation is the tie. These ties are induced by 344 unique officers interacting with the drivers in the experiment's sample.

D. *Effect of Rerouting on Joint Profit*

We construct the joint profit as the revenue from passenger payments, net of gas expenses and repairs. The joint profit is then allocated between the police officers through bribes, and the driver through profits. On average, on home lines, drivers make 3 USD of joint profit per trip.[24] This is generated from 8.79 USD in revenue from passengers, net of 5.79 USD operating costs per trip.[25] The 8.79 USD in revenue is produced by 18.36 passengers on average, who pay 48 cents of USD on average.[26]

Table II presents Equation 2 estimates for daily joint profit (Column 1), decomposed in number of trips per day (Column 2) and joint profit per trip (Column 3). Rerouting decreases daily joint profit: in Column (1), the coefficient on rerouting is negative and statistically significant at conventional levels. Column (2) shows that this effect comes, in part, through a reduction in the number of trips per day. Again, the coefficient is negative and statistically significant. This is consistent with the driver wasting more time negotiating with the police and providing less productive effort of the type that would allow him to do more trips. Column (3) shows that the joint profit per trip also decreases, consistent with the driver not making productive effort in anticipation of being more vulnerable to stops by police officers on foreign lines.[27]

[22]Figure A9 shows the result holds equivalently per intersection. Figure A10 compares the baseline coefficient estimate to alternative robustness specifications that account for this imbalance. The results are preserved across specifications.

[23]The effects on relationship are largely underestimated if all "*mbote ya likasu*" payments were coded as having relationship with police officers of at least acquaintance if not friendship, as qualitative experiences dictate. However, we rely on enumerators' raw coding of relationship to avoid data manipulation.

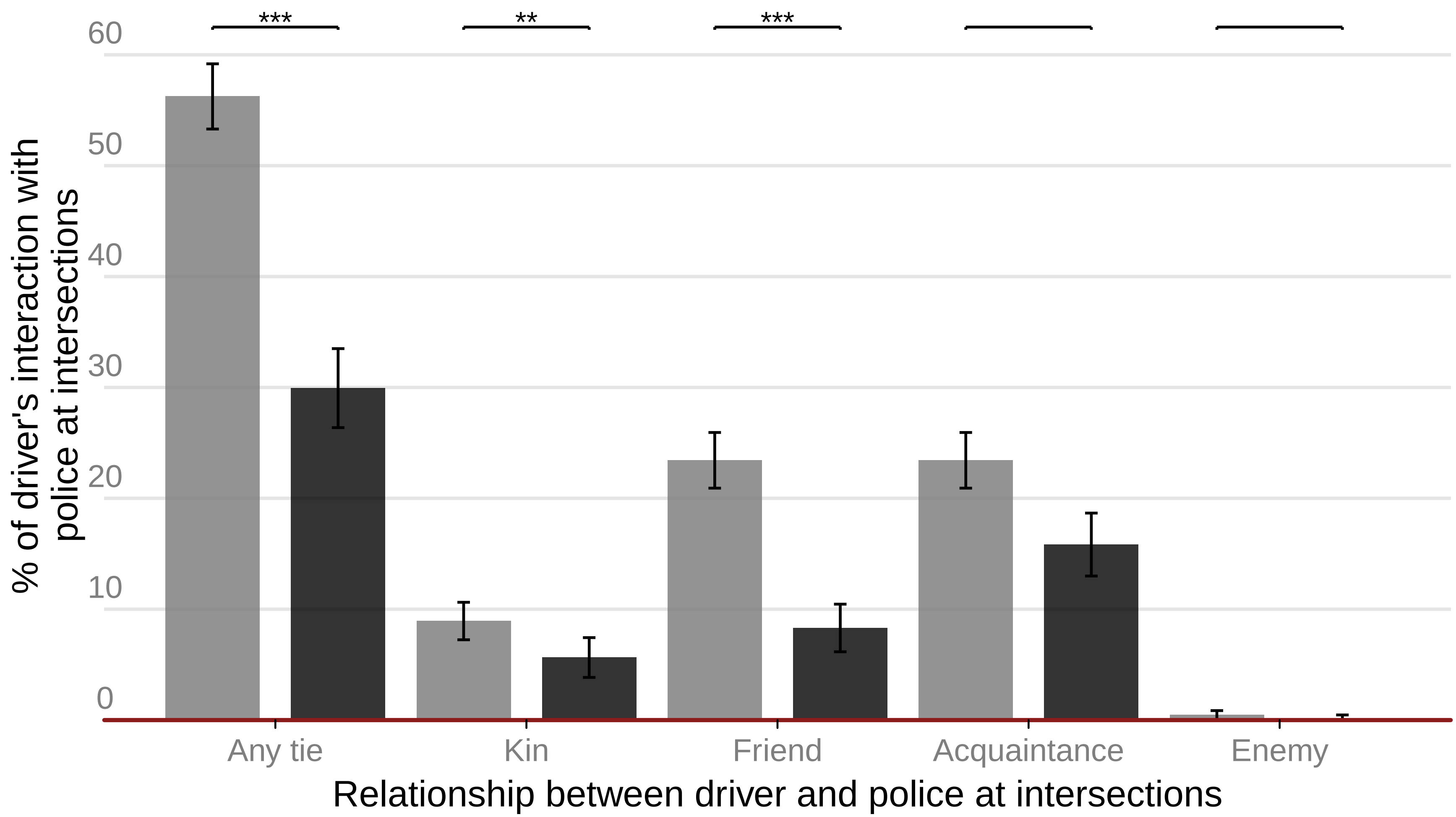
[24]This description is based on Table A8.

[25]Some costs, such as gas, are not incurred per trip. We impute the per trip average in this table.

[26]A complementary graphical representation of the joint profit decomposition is in Figure A11.

[27]Table A9 present the estimates in alternative specifications to account for misspecificaiton and outliers.

Figure 3: Effect of Rerouting on Fraction of Interaction with Police Officers in Which Driver and Officers Have a Social Tie



Notes: This figure presents the prevalence of social relationships between drivers and police officers at the intersections, expressed as the percentage of drivers' 1,097 interactions on their usual "home line" and 638 interactions on the "foreign line" on their first day of rerouting. The line segments represent 95% confidence intervals around the reported means. The asterisks report the segments of the p-value of the test for whether the fraction in the home line is different than that on the foreign line, for each relationship category: *** indicates that the p-value is equal or lower to .01, ** indicates that it is larger than .01 but lower than .05, and * indicates that it is larger than .05 but lower than .1. This test is implemented through OLS, by estimating β^F of Equation 1, with standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster; since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. Kin includes both nuclear and extended family relationships. Acquaintance category is different from friend category (*ami* in French) in two ways. First, in some cases, the drivers' directly reported acquaintance (*connaissance* in French). Second, we analyzed the content of the conversation between the driver and the officer, and were able to deduce whether the drivers and the officers were acquainted.

Table II: Effect of Rerouting to Foreign Lines on the Joint Profit

	Joint Profit (per day)	Number of trips (per day)	Joint Profit (per trip)
	(1)	(2)	(3)
Foreign	-9.142^{**}	-0.967^{***}	-0.874^{*}
	(4.013)	(0.360)	(0.456)
Mean Dep. Var.	18.6	7.86	2.62
Observations	167	176	1,395
R^2	0.337	0.328	0.204
Rand. Strata FE	YES	YES	YES
Foreign IPW	YES	YES	YES
Composition IPW	YES	YES	YES

Notes: This table presents the OLS estimates of β^F from Equation 2. In Column (1), the dependent variable is the daily joint profit in USD. Columns (2) and (3) decompose the joint profit per day into the number of trips per day (Column 2) and the joint profit per trip in USD (Column 3). Joint profit per trip (Column 3) is revenue in USD minus operating cost per trip in USD, where revenue is derived from number of passengers per trip times the average price in USD each passenger pays per trip, and operating cost per trip is repair and gas cost per day divided by the number of trips per day. As the table notes indicate, all regressions include randomization strata fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure (*rerouting weights*) and to adjust for imbalance on foreign line composition (*composition weights*). Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. In subsequent tables, we no longer indicate inclusion of these fixed effects and weights in the table notes due to redundancy—it is the same specification, except in robustness where indicated. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the sample of home line driving.

In sum, rerouting reduces the prevalence of relationships between the drivers and the officers with whom they interact and the joint profit. To isolate the role of these relationships on the effect of rerouting on the joint profit, in the analysis that follows, we follow two strategies. In Section 6, we decompose the effect of rerouting by whether the driver is assigned to third-party protection. We it as a placebo to separately identify the role of the driver-officer interaction from this effect. In Section 7, we separately estimate the effect of rerouting on various components of joint profit by whether the driver has a long- vs. a short-time horizon. This allows us to examine whether rerouting affects the outcomes which which should differentially be affected in short- vs. long-term rerouting if rerouting altered the relationships with officers on the line.

6. Separately Identifying Social Ties: The Third-Party Protector Placebo

In this section, we test for the mediating role of relationships in explaining the effect of rerouting on the joint profit, by exploiting the randomly induced variation in the presence of third-party protection on the side of the driver. As in Section 5, we analyze the effect of rerouting using the first day of a rerouting episode.

As described in Section 4, the third-party protection treatment is a bundle of various forms of protection, so that the third-party protection is representative of the type of third-party protections used normally. In what follows, we report the results using this bundle to classify observations, and use the more fine grained classification that distinguishes between types of protection in the Appendix as indicated.

In Table III, Panel A, we present the coefficient estimates of Equation 2, if the driver was randomly assigned to third-party police protection vs. not. Column (1) shows the effect of rerouting on the joint profit per day, for minibus-day observations in which the driver has not been assigned to third-party protection. In that case, the joint profit drops from 22.02 USD per day on home lines by 18.67 USD, and the drop is statistically significant. Column (2), in contrast, shows that rerouting decreases joint profit by -4.49 USD and this coefficient is insignificant. This suggests that rerouting reduces the joint profit through its effect on the driver's anticipation of the officers' behavior. Columns (3)-(6) replicate this analysis for the number of trips per day and the joint profit per trip. Rerouting reduces the number of trips per day, but only when the driver is unprotected. This is consistent with it not being optimal for drivers to create new relationships if they already have third-party protection for at least one day in the three, but it could also indicate that the investment in new relationships is less costly if the driver can leverage the third-party protection. Likewise, rerouting only decreases trips per day or joint profit per trip if the driver does not have third-party protection.

To identify whether the effect of rerouting is significantly smaller when the driver is protected, we estimate the following equation:

$$J_{rdt} = \beta^{FNP}\mathbb{1}_1(\text{Foreign}_{dt}) + \beta^{FP}\mathbb{1}_1(\text{Foreign}_{dt}) \times \mathbb{1}_1(\text{Protection}_{dt}) + \alpha_{dt} + \epsilon_{rdt}, \quad (3)$$

where $\mathbb{1}_1(\text{Protection}_{dt})$ is an indicator variable taking value 1 if the observation dt is assigned to third-party protection, and thus the coefficient β^{FNP} estimates the effect

Table III: Effect of Rerouting to Foreign Lines on Joint Profit, *by Third Party Protection*

A. Baseline Coefficient, With and Without Third-Party Protection

	Joint Profit (per day)		Number of trips (per day)		Joint Profit (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-18.67^{**}	-4.49	-1.48^{**}	-0.66	-1.66^{*}	-0.56
	(7.14)	(4.61)	(0.61)	(0.48)	(0.87)	(0.49)
Mean Dep. Var.	22.02	22.24	8.21	8.27	2.95	3.01
Observations	47	120	50	126	388	1,007
R^2	0.65	0.40	0.55	0.31	0.47	0.24
Protection, Any	NO	YES	NO	YES	NO	YES

B. Baseline Coefficient, Decomposed by Third-Party Protection

	Joint Profit (per day)	Number of trips (per day)	Joint Profit (per trip)
	(1)	(2)	(3)
Foreign	-19.83^{**}	-1.55^{**}	-1.78^{*}
	(8.02)	(0.60)	(1.01)
Foreign * Protection, Any	16.33^{*}	0.91	1.41
	(9.31)	(0.70)	(1.21)
Mean Dep. Var.	22.24	8.27	3.01
Observations	167	176	1,395
R^2	0.34	0.27	0.21

Notes: Panel A presents the OLS estimates of β^F from Equation 2, decomposed by whether the driver-day was assigned to not having any third-party protection (odd columns) and to having third-party protection (even columns). In Columns (1) and (2), the dependent variable is the driver's joint profit per day in USD. Columns (3), (4) and (5), (6) decompose the joint profit per day into the number of trips per day (Columns 3 and 4) and the joint profit per trip in USD (Columns 5 and 6). Joint profit per trip (columns 5 and 6) is revenue minus operating cost per trip, where revenue is derived from number of passengers per trip times the average price each passenger pays per trip, and operating cost per trip is repair and gas cost per day divided by the number of trips per day. Panel B presents the OLS estimates of β^{FNP} and β^{FP} from Equation 3. In Column (1), the dependent variable is the daily joint profit in USD. Columns (2), (3) decompose the joint profit per day as dependent variables into the number of trips per day and the average joint profit in USD along each trip, respectively. Third-party protection is assigned in the form of police escort on the minibus, access to higher-level police, or Association of Drivers (ACCO) sticker on the minibus. All regressions include randomization strata fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure (*rerouting weights*) and to adjust for imbalance on foreign line composition (*composition weights*). Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

of rerouting when unprotected, and β^{FP} estimates how much larger than the latter is the effect of rerouting if the driver is protected. We report these estimates in Panel B. Across columns, β^{FNP} is negative, large, and statistically significant, indicating that, when unprotected, rerouting significantly decreases the joint profit per day, arising both from a reduction in the number of trips and the joint profit per day; the coefficient β^{FP} is of similar magnitude and of the opposite sign, and is statistically significant in Column (1). This shows that the effect of rerouted is not only muted when the driver is protected, but it is also statistically distinguishable from the effect when the driver is unprotected.

Tables A10 and A11 replicate the above analysis, decomposing third-party protection into the two main types: whether the driver was assigned to wear the ACCO drivers' association sticker, and whether it was assigned to police protection. The results are the same for each type of protection, which provides reassurance in the main analysis.

Another way to measure the value of protection to isolate the mechanism of rerouting could have been to measure the willingness to pay for such protection under different experimental circumstances. We can use the data from the qualitative interviews to paint a picture about this important parameter of the study:

> Protection by officer in the minibus remains the absolute protection. It puts everyone at ease. This protection allowed the driver to save the money they had for *mbote ya likasu*; drivers loved it. Of all protections, the most powerful was the officer on the minibus. No arrest, no harassment, no *mbote ya likasu*. The vehicle is respected, officers let pass as if it were an ambulance. (Project implementation meeting notes of September 4th 2015)

> I still use the sticker until today because it always helps me. The police believe it's an ACCO vehicle. Once, I committed a parking violation, and the riders hesitated to approach me when they saw the sticker. (Exit interview with study driver, August 2018)

This section has shown that the effect of rerouting is *muted* if the driver has third-party protection. This suggests that unprotected rerouting identifies the effect of the relationships between drivers and officers on the efficiency of corruption. We analyze the mechanisms for this result in the next section, by exploiting the random assignment to short- and long-run rerouting.

7. Mechanisms: How Absence of Social Ties Destroys Joint Profit

To determine the channels by which relationships increase joint profit, in this section, we examine the randomized variation in rerouting horizon. Before analyzing its effects, we present a simple framework to guide which outcomes should be altered by this variation.

A. *A Simple Model of Relationship Horizon and Corruption*

We compare the joint profit by a driver on a line where he has relationships with police officers, to that on a line where he does not, as a function of the time horizon.

There are two periods, denoted $t = \{0,1\}$. There is one driver. In each period, the driver can generate driving yield $y(e) \in \mathbb{R}^+$, an increasing function, by choosing to provide (costless) productive effort $e \in \{0, 1\}$.[28] Let $y(1) = y^1$ and $y(0) = y^0$. If the driver does not have protection, in any given period the driver realizes the driving yield with probability $p(e)$, where $p(0) = p^0$, $p(1) = p^1$, and otherwise is detained and negotiates the whole period bribe $B > 0$, making no yield and paying B. If the driver has protection, the driving yield is realized with probability 1 in each period. In period 0, the driver chooses whether to purchase protection from an officer, $\eta \in \{0, 1\}$. Protection costs $F + f$ in period 0 and f in period 1 and is valid both periods, but also takes negotiation time to acquire. The opportunity cost of buying protection is $(1 - k(\eta))y(e)$, where $k(\eta) \in [0,1]$ and $k(0) = 1$.[29] $\delta < 1$ is the time preference parameter. In each period, the joint profit is $S = k(\eta)p(e)y(e)$ and the driver's profit is $\pi = S - (1 - \eta)(1 - p(e))B - \eta((1 - t)F + f)$.

Assumption A $y^1 > y^0$

Assumption B $p^1 < p^0$

Assumption C $\frac{y^1}{y^0} < \frac{p^0}{p^1}$

Assumption D $y^1 - p^0y^0 + (1 - p^0)B < F + f$

Assumptions A and B say that effort increases joint profit and the probability that the driver gets detained, respectively.[30] Assumption C says that effort increases joint

[28] Think of e as time negotiating with passengers to get larger price. We endogenize the yield under a bargaining context between the driver and the passenger in Appendix, Section A5.

[29] Parameter k captures the opportunity cost of time negotiating for the purchase of protection: both parties have private information so the purchase requires time. We assume protection is sold as a two-part tariff, consistent with the setting. We assume there is no commitment problem on the side of the officer.

[30] For example, effort or time spent negotiating exposes the driver to risk.

profit less so than it increases the risk of being detained. Assumption D ensures it is not optimal to buy protection in one period. Proofs in Appendix, Section A5.

Proposition 1 *If* $1+\delta < \frac{F+y^1(1-k)}{y^1-p^0y^0-f+B(1-p^0)}$ *[short time horizon], in period* 0*, the driver does not buy protection nor provide effort; joint profit and profit are* $S = p^0y^0$*,* $\pi = p^0y^0 - (1-p^0)B(1-p^0)$*. Otherwise [long time horizon]: in period* 0*, the driver buys protection (negotiates), provides effort and joint profit and profit are* $S = ky^1$*,* $\pi = ky^1 - f$*; in period 1, the driver has protection (does not negotiate) and provides effort, joint profit and profit are* $S = y^1$ $\pi = y^1 - f$*.*

Proposition 1 says that, in period 0, the driver buys protection, and provides effort, if and only if the time horizon is large. This has the following implications. Consider a driver driving in a "home" line in our setting. By definition, the driver is in period 1 of a long horizon, hence has purchased protection and provides effort.

Rerouting to a foreign line has an unambiguous effect on joint profit. If rerouting is long horizon, the joint profit decreases from y^1 to ky^1. If rerouting is short horizon, the joint profit decreases from y^1 to p^0y^1. Hence, irrespective of the time horizon, rerouting decreases joint profit. The effect of rerouting on effort, detainments and time waste depends on the time horizon of the rerouting. There are two cases.

[*rerouting with Short Time Horizon*] Buying new protection is not profitable. Without protection, the driver does not provide effort to reduce the risk of being detained, which would reduce joint profit and lead to a bribe payment. This reduces the joint profit. The fraction of detainments increases from zero to $1-p^0$. The effect on total bribe cost is ambiguous: if $1-p^0$ is sufficiently low, total bribe cost decreases, otherwise it increases.

[*rerouting with Long Time Horizon*] Buying new protection is profitable. With protection, the driver provides effort, hence probability of detainment remains at zero. However, buying protection costs $F+f$ in period 0 and f in period 1, and reduces the joint profit by $(1-k)y^1$ in period 0: time is wasted negotiating for protection. Empirically, we cannot distinguish B from F, but we can distinguish those from f.

B. *Effect of Rerouting on Joint Profit, by Time Horizon of Rerouting*

We just showed that, if relationships drive the effect of rerouting, short-term rerouting should decrease the joint profit per trip, while long-term rerouting should decrease the number of trips due to time waste. We now examine how the short-term vs. long-term rerouting affects the joint profit per trip and the number of trips per day.

Table IV presents the estimates from Equation 2 for joint profit per day (Panel A), as well as for number of trips and proxies of time waste (Panel B) and of joint profit per trip (Panel C). Panel A shows that rerouting reduces joint profit per day in both cases, although the effect is only significant in long-term rerouting, and the estimate is larger. This is consistent with rerouted drivers taking additional actions that reduce the joint profit if they expect that the interaction will be repeated, as an investment.

The analysis in Panel B paints a picture of long-run rerouting inducing the drivers to make additional costly investments that they do not do in short-run rerouting. It suggests that that rerouting to a foreign line decreases the number of trips per day (Columns 1 and 2) if the driver has a long-term driving horizon but does not when the driver has a short-term driving horizon. This is consistent with the driver in long-run rerouting taking actions that sacrifice the number of trips in order to invest in new relationships. While the estimates for number of negotiations per trip are of similar magnitude with short- and long-run rerouting, the estimate for time waste is three times larger in long-run rerouting (Columns 5 and 6). Consistent with the driver making more costly investments in new relationships (e.g., "buying the land"), Columns (7) and (8) show that, if and only if rerouting is long-run, the bribe costs significantly increase. The effect amounts to an 72% increase in bribe costs compared to home.

The analysis in Panel C shows that short- and long-run rerouting decrease the joint profit per trip (Columns 1 and 2), but through different channels (Columns 3-10). Columns (3), (4) show that rerouting decreases the number of passengers per trip in both, although the estimate is 40% larger in long-run rerouting; Columns (5), (6) show that short-run rerouting significantly reduces the passenger price, while long-run rerouting does not, consistent with drivers in short-run rerouting negotiating with the passengers in a rush as they fear being detained by officers; Columns (7)-(10) show that short- and long-run rerouting both fail to significantly affect operating costs and trip duration.

Taken together, these results show that rerouting reduces the joint profit in two distinct ways consistent with the role of social ties in the destruction of the joint profit. Its effect depends on whether the driver invests in new ties when he does not have ties on the line:

Table IV: Effect of Rerouting on Components of Joint Profit, by Time Horizon

A. Main Effect: Daily Joint Profit (Number of Trips per day × Joint Profit per Trip

	Joint Profit (per day)	
	(1)	(2)
Foreign	-7.47	-9.69^{*}
	(5.39)	(5.68)
Mean Dep. Var.	22.19	22.19
Observations	137	139
R^2	0.34	0.32
Time Horizon	Short	Long

B. Component 1: Number of trips (and actions that affect it)

	# Trip (per day)		# Negotiation (per trip)		Time waste (per trip)		Bribe costs (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign	-0.40	-1.28^{**}	0.07^{**}	0.05	0.31	1.08	0.11	0.62^{*}
	(0.55)	(0.51)	(0.04)	(0.05)	(0.29)	(0.88)	(0.19)	(0.34)
Mean Dep. Var.	8.25	8.25	0.11	0.11	1.16	1.16	0.86	0.86
Observations	143	148	1,165	1,187	1,165	1,187	1,165	1,187
R^2	0.31	0.29	0.12	0.10	0.10	0.04	0.07	0.04
Time Horizon	Short	Long	Short	Long	Short	Long	Short	Long

C. Component 2: Joint profit per trip (and actions that affect it)

	Joint Profit (per trip)		# Passenger (per trip)		Price (per trip)		Operating cost (per trip)		Duration (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Foreign	-1.10^{*}	-0.70	-0.39^{*}	-0.54^{**}	-0.04^{**}	-0.02	0.31	0.03	0.78	1.17
	(0.57)	(0.63)	(0.23)	(0.25)	(0.02)	(0.02)	(0.61)	(0.56)	(2.28)	(3.31)
Mean Dep. Var.	3	3	18.36	18.36	0.48	0.48	5.81	5.81	31.83	31.83
Observations	1,159	1,181	1,161	1,183	1,160	1,182	1,165	1,187	1,162	1,184
R^2	0.21	0.20	0.76	0.79	0.70	0.48	0.14	0.13	0.27	0.15
Time Horizon	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long

Notes: This table presents the estimates from Equation 2 for joint profit per day in USD (Panel A), for number of trips and proxies of time waste (Panel B) and of joint profit per trip (Panel C), decomposed by whether the driver-day was assigned to the first day of long-term rerouting (driving blocks of 3 contiguous days) or short-term rerouting (driving blocks of only 1 day). We present the estimates of β^F separately for the sample in short-term rerouting (odd columns) and long-term rerouting (even columns). *Dependent variables*: In Panel B, the dependent variables are the number of trips per day (columns 1 and 2), in which case the sample is at the driver-day level. The dependent variables in the remaining columns, which are from the sample at the driver-trip level, are as follows: the number of events in which the driver engages in a negotiation with a police officer (Columns 3 and 4), the duration of interaction between driver and police along a minibus trip in minutes (Columns 5 and 6), and the total bribe costs for the trip in USD (Columns 5 and 6). In Panel C, the dependent variables are all at the driver-trip level, and are the joint profit per trip in USD, computed as the revenue from passenger tickets minus gas and repair costs (Columns 1 and 2); gas and repair costs in USD (operating costs) are observed at the daily level and imputed at the trip level. The dependent variables in the remaining columns, which are also in sample at the driver-trip level, are as follows: the number of passengers that purchase a ticket for a ride (Columns 3 and 4), the average price paid by passengers on a trip in USD (Columns 5 and 6), the operating costs in USD, which are composed of the gas costs and repair costs observed at the driver-day level and imputed at the driver-trip level (Columns 7 and 8), and the duration of a trip in minutes (Columns 9 and 10). All regressions include randomization strata fixed effects, and observations are weighted by rerouting and composition weights. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

a. If the driver does not have an incentive in creating new ties, as in the case of short-run rerouting, the number of trips is unchanged and there is no significant time loss nor increase in bribes; however, short-run rerouting decreases the joint profit per trip because it harms the drivers' ability to attract passengers, and to negotiate prices with the passengers. This is consistent with our qualitative evidence. For example, in an exit interview with the project manager, he reported:

> The risk of getting stopped is linked to the lack of connections, as the majority of buses providing public transportation in Kinshasa do not meet transportation requirements ... These conditions make the drivers of these vehicles vulnerable (liable to be stopped frequently) ... It's possible and normal, a driver who operates a route that isn't their own is initially obstructed by those in charge of the route and runs the risk of being stopped at the loading (boarding) point. As a result, they desperately want to leave the point as quickly as possible before getting caught. The only thing that can motivate customers to get into their car quickly is a price reduction. I believe this is why several drivers were reducing the price ... If there are less passengers, it would be related to the fact that they don't have much time at the parking to charge their vehicle.

b. if the driver has an incentive to create new ties, the reduction in joint profit at the start of a long-run rerouting arises from a reduction in the number of trips per day, as the driver spends more time negotiating with the officers on the line, and paying large bribes, presumably creating new social ties; this also reduces the number of passengers per trip, but does not reduce the price, consistent with it being in the drivers' interest to be detected by the police, so he can start a bribe negotiation and build a new tie. In an exit interview with the project manager, he provides an explanation for this response:

> Aware of their vulnerability, when these drivers start a new route where they will be working in the upcoming days, they provide extra money (more than the Mbote ya Likasu fee). This is to establish relationships with traffic police officers assigned to that route (this was referred to in Lingala as "Kosomba Mabelé," which can be translated literally to "buying the land" in French).

> Thus, once the relationship is established, the traffic police officer for that route, knowing that they have received money from the driver, will only ask for the Mbote ya Likasu from the driver in the future. If the driver changes routes and encounters traffic police officers with whom they haven't established such relationships, they are aware of their vulnerability and therefore reluctant to operate on that route.

Overall, this suggests driver-officers social ties reduce the risk to the driver to be shaken down, enabling them to attract more passengers and negotiate a higher price without incurring such risk; while creating new relationships comes at an additional reduction in the joint profit, from where a larger bribe cost is also netted.

8. "Through these [Arrested] Discussions, We Become Friends!" Social and Economic Returns on Investment in New Social Ties

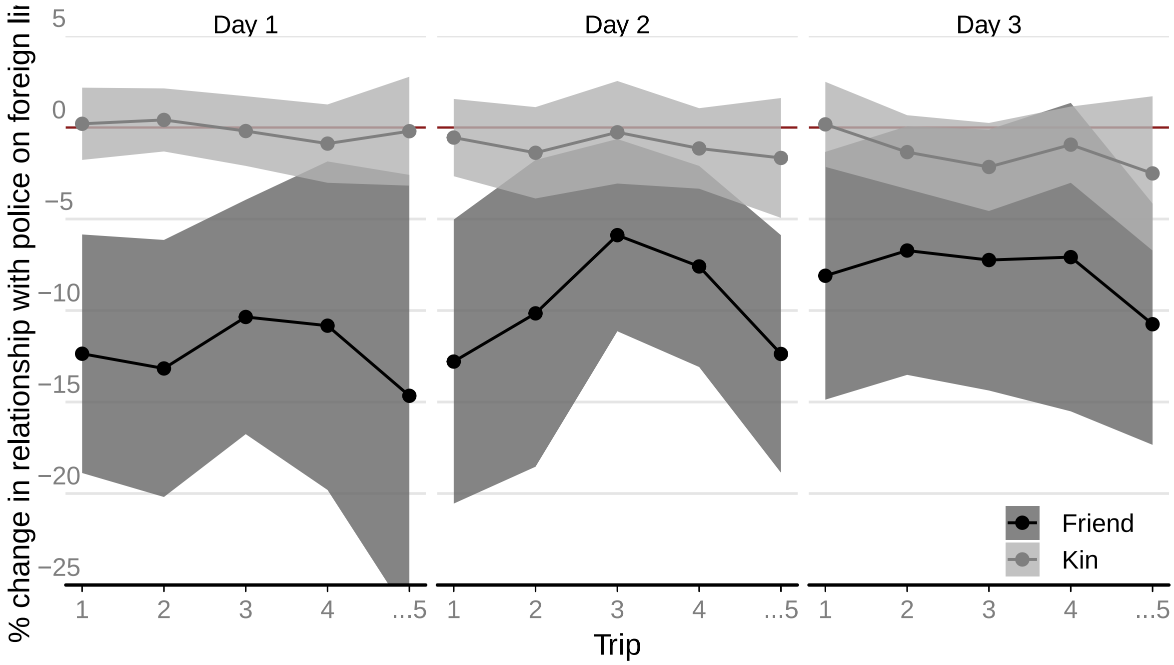
The previous section has shown that rerouting reduces joint profit and that this reduction can be attributed to the fact that, when rerouted, the driver has less officers with whom he has ties on the line. Moreover, in the first day of long-term rerouting, the reduction in joint profit came about from a reduction in the number of trips and number of passengers, accompanied by negotiations and time waste. We conjectured that this is due to the fact that the driver spends time negotiating with the officers for payments that create new relationships. If this is true, then we should see new relationships forming on subsequent days. We examine this implication in this section.

To analyze the dynamics of the interaction with the police, we separately estimate the following equation for each day of the three-day rerouting blocks:

$$S_{irdt} = \beta^F \mathbb{1}_1(\text{Foreign}_{dt}) + \nu_r + \beta_r^F \mathbb{1}_1(\text{Foreign}_{irdt}) \times \mathbb{1}_r(Round_{irdt}) + \alpha_{dt} + \epsilon_{irdt}, \tag{4}$$

where the dependent variable S_{irdt} is an indicator taking value 1 if the driver has a social relationship the police agent with whom he interacts, $\mathbb{1}_1(\text{Foreign}_{irdt})$ and $\mathbb{1}_r(Round_{irdt})$ are indicator variables taking value 1 if observation indexed $irdt$ is assigned to a Foreign rerouting, or if the round rank in the day is r, respectively. α_{dt} is the randomization strata fixed effect. In addition, ν_r captures the round number fixed effect. Thus $\beta^F + \beta_r^F$

Figure 4: Social Return: "Through these [arrested] discussions, we become friends!"

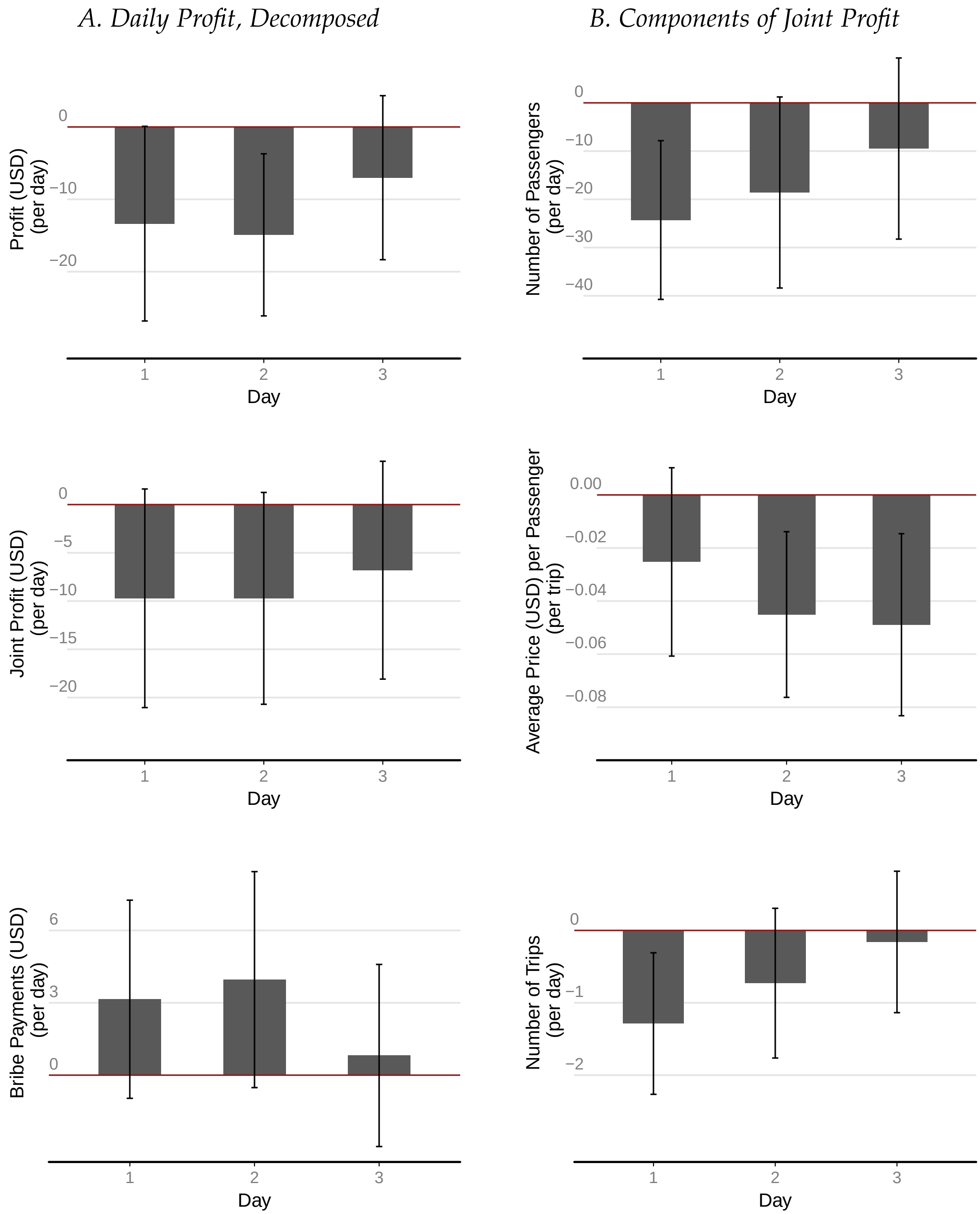


Notes: This figure presents the sizes and their 95% confidence intervals of the estimates of $\beta^F + \beta^F_r$, for each round (trip) r within each of the three days of the home and foreign long-run rerouting driving blocks of Equation 4. The coefficients and confidence intervals presented in light gray are the estimates when the dependent variable is an indicator for whether the driver and the officer are kin; those in dark gray are the estimates when the dependent variable is an indicator for whether the driver and the officer are friends. The figure presents estimates from three separate regressions, one for each day of the long-term rerouting, from left to right: day 1, day 2, and day 3. The control sample includes all observations on the home line. All regressions include randomization strata fixed effects, and observations are weighted by rerouting and composition weights. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction 13, clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. Trip is defined as a return trip between two termini. The number of trips is winsorized at 5 per day. The number of observation above 5 is extremely small.

captures the treatment effect of rerouting on the prevalence of kinship/friendship on trip r on each day of the three-day driving blocks.

In Figure 4, we present the estimates of $\beta^F + \beta^F_r$ from Equation 4, where the dependent variable is an indicator for whether the driver and the officer are connected. The coefficients in day 1 and 2 are negative and their confidence intervals do not overlap with zero. This means that, in days 1 and 2 of a foreign long-term rerouting driving block, the driver and the officers are much less likely to be friends in any round, compared to the rounds driven in an average day in home line. However, the coefficients get closer to zero by day 2, and, by day 3, they are already indistinguishable from zero in most rounds of the day. This suggests that the driver and the officers are becoming friends as day pass in a long-term rerouting, consistent with the interpretation that the driver makes a costly investment in the first day, which results in the creation of new relationships (he buys

Figure 5: Economic Return: Profits Recover, Driven by Bribes and Number of Trips



Notes: This figure presents the coefficient estimates of β^F of Equation 2, separately estimated in the following three samples: the sample of home line driving and of first day rerouting in a long-run (3-day) driving block (left bars); the sample of home line driving and of second day rerouting in a long-run (3-day) driving block (middle bars); the sample of home line driving and of third day rerouting in a long-run (3-day) driving block (right bars). The magnitude of the coefficients estimated in these three samples is represented as the height of the bars, respectively from left to right. The bars also include the corresponding 95% confidence intervals represented as brackets. The interpretation of the bar's height as the coefficient magnitude therefore implies that the bar's height is the estimate of how much larger is the corresponding dependent variable in the corresponding day of long-term (3-day) rerouting, compared to the average day on a home line; if the confidence interval overlaps with zero, the difference is not significant at the 5 % level. In Panel A, we present this analysis for *profit per day* (joint profit per day, net of bribe costs) and its decomposition, that is, for the following three dependent variables: profit from driving per day (joint profit minus bribes); joint profit per day (revenues from passenger rides minus gas and repairs per day); bribe payments in USD per day. In Panel B, we present this analysis for the following three components of joint profit per day: number of trips; number of passengers per trip; average price per passenger for the average trip in USD. All regressions include randomization strata fixed effects, and observations are weighted by rerouting and composition weights. Trip is defined as a return trip between two termini. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata.

the land). In contrast to friendship, we find no effect of rerouting on kinship on any day. This provides reassurance that the increase in the fraction of interactions on the foreign line where the driver and the officers are friends is not driven by spurious correlations.

The initial investment of on day 1 of long-term rerouting is followed by the formation of new social ties in the following days. If this investment has an economic benefit for the driver, we should also see that the profit of the driver improves in the days that follow, in the same foreign line. Figure 5 presents the estimates for the effect of long-horizon rerouting, separately for each of the three days of rerouting, for the driver's profit and its components (Panel A), and for the components of the joint profit (Panel B). Since most of these outcomes are recorded per day, we present the analysis per day.

Panel A shows that rerouting to foreign lines for three days significantly decreases driver profits in days 1 and 2, but profits have already recovered their average home line level by day 3. This effect comes from a reduction, and partial recovery of the joint profit (revenue minus gas and repairs), and by an initial increase in bribe payments, which then recover its home line level by day 3 as well. This suggests that the costs incurred in day 1, in terms of large bribe payments and actions by the driver that reduce the joint profit, translate not only into new social ties with the officers, also in higher profit.

The initial reduction, and recovery, of the driver profit comes in part from the initial bribe costs, but also, in part, from the dip in the joint profit from driving. Panel B replicates the analysis separately for the various components of the joint profit. The first and last exhibit confirm that the initial dip in the joint profit arises from a reduction in the number of trips per day and as a result, the number of passengers per trip, and then those catch-up. This is consistent with our interpretation that drivers in the first day of long-run rerouted are willing to lose driving rounds above and beyond the losses incurred in short-term rerouting, while they negotiate with the officers to buy the land. It also underscores the importance of excluding days 2 and 3 from the main analysis of rerouting as, by day 2, the number of trips is already catching up just like the prevalence of social ties. The catch-up is consistent with the interpretation that the initial bribe and time investments made by the driver, anticipating a long-run rerouting, allow the driver to recover the normal number of trips and of passengers once the social tie with the officers has been created.

The second exhibit of Panel B allows to check of the interpretation of the results so far. It shows that the price charged to the passengers does not initially dip (as the driver might be interested in negotiating with the officers and thus unconcerned and potentially interested in being detected); after the first day, the price remains significantly lower than in the home line. This pattern is consistent with the finding reported in Figure 5 that friendships do not fully catch-up, this suggests that, after three days, the driver has created productive social ties with officers on the line and is less involved in creating new ones, but new ties have not formed with many of the new officers, hence that the driver is still somewhat vulnerable to shake down. This is also consistent with our analysis of short-term rerouting in the previous section, showing that, when drivers have no incentive to create new ties in a foreign lines, they extract a lower ride price.

To provide additional evidence about the significance of these new social ties, we conducted three exit surveys with the research staff and with the drivers in the following years (in 2016 and 2017) as well as in 2023. The qualitative interviews confirm that drivers built lasting relationships in new lines. First, as reported by project implementers:

> In the beginning, the drivers discovered the new lines. They wanted to go back there after the research. It's really an advantage for them. That's why they considered that creating good relations with the police was the most important (Project meeting notes of September 4^{th} 2015)

Second, the drivers, too, suggested these relationships were a lasting investment:

> The project opened up horizons, I made friends among the officers.
>
> Yes, I have definitively changed my line to a new one, but also with a different boss. Because this line is more profitable than the one I was in. My new boss asked me among the lines I know, which one was profitable, and I suggested one of your diversion lines. Currently, I am driving through VP. [study rerouting line].
>
> I use the rerouting lines, but not every day, only for a few hours when there is a lack of passengers on my regular route due to low demand.

> Currently, I use two routes - my former line and one of the rerouting lines. In the mornings, I use the VM. route because there are customers during those hours. (Interviews with study drivers, August 2018)

In summary, in this section, we have provided evidence that rerouting reduces joint profit in ways that are consistent with its explanation through the absence of relationships. We conjectured, and then validated, that these time and money investments are associated with the creation of new relationships, which allow the drivers to attain the same level of profits as that on home lines by the third day.

9. Implications for Consumer vs. Producer Surplus

In this section, we analyze whether these relationships benefit not just the joint profit, but also the economic surplus. We consider the economic activity of driving, offered by the drivers (henceforth, *the producers*), to the passengers (henceforth, *the consumers*). We analyze the producer, consumer, and total economic surplus from this activity. With constant marginal cost (the gas and repairs per trip are constant within a reasonable time frame), these are the sum of the price minus marginal cost (the joint profit) across rides, the consumer's willingness to pay minus the price across rides, and the sum of these.

The market is structured with various drivers and many passengers, although competition between drivers might not be perfect, allowing drivers some leeway in bargaining over the price rather than setting it at marginal cost, depending on the driver's and passengers' bargaining power in each negotiation while charging the minibus. The intuition is that charging a bus is a localized transaction, where passengers often do not have many outside options: the time between minibuses of the same line is often long. Driver-police relationships could increase producer surplus by reducing the marginal cost, by increasing demand, or by influencing the driver and passengers' bargaining power and hence the allocation of the total economic surplus between the consumers and the producers. If relationships only affect the first two, driver-officer relationships would increase the total surplus, while if it affects only the latter, they would imply a reallocation of total surplus to producer surplus at the expense of consumer surplus.

In Table V, we analyze the effect of short-term unprotected rerouting to isolate and quantify the effect of relationships, allowing us to exclude from the rerouted observations the interference arising from the investment in new relationships. We analyze various outcomes to discuss how social ties increase producer and consumer surplus. In Panel A, we first examine whether social ties increase the producer surplus, the joint profit per day, aiming to quantify the role of these ties on producer surplus without interfering factors, and the examine their effect on its components as number of trips per day and joint profit per day. In Panel B, we analyze various outcomes to test various hypotheses about the effect of relationships on the joint profit per day.

In Panel A, the outcome is joint profit, the producer surplus. Unprotected short-term rerouting leads joint profit per day to fall from 22.02 USD to below zero (Column 1), a more than 100% reduction. Columns (3) and (5) show that this reduction arises both from a reduction in the number of trips per day, and in in the joint profit per trip. None of these effects are present when the driver is protected (Columns 2, 4, 6), hence this effect comes through varying the relationship between the driver and the officers on the line, rather than other idiosyncratic features of rerouting. The decrease in the number of trips, if mild, suggests that these relationships also increase consumer surplus, by increasing the quantity of trips. In what follows, we decompose the increase in producer surplus per trip driven to examine whether it arises at the expense of the consumers.

In Panel B, we test various hypotheses for the effect of social ties on the producer surplus per trip. First, we examine supply shifters. In Column (1), we test whether social ties decrease the marginal cost of a trip. This could arise, for example, if a driver spends more time without driving but wasting fuel or taking more physical risks when driving, as a result of re-optimizing pickup strategies when he does not have social ties with officers on the line. When assigned to short-term unprotected rerouting, operating costs increase from 5.8 USD by 3.3 USD per trip. Column (2) finds no such effect of rerouting when the driver is protected. Thus, driver-officer social ties have a productive benefit by decreasing the operating costs per trip.

Second, we examine demand shifters. In Column (3), we test whether social ties increase passenger demand. This might happen, for example, if passengers are *both* able to identify whether drivers have many social ties *and* to internalize it; in that case,

Table V: Short-Term Unprotected Rerouting and Producer vs. Consumer Surplus

A. Producer Surplus and Its Components, With and Without Protection

	Joint Profit (per day)		Number of trips (per day)		Joint Profit (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-29.819^{***}	-0.523	-1.506^{*}	-0.210	-4.656^{***}	-0.105
	(10.328)	(6.152)	(0.748)	(0.742)	(1.358)	(0.555)
Mean Dep. Var.	22.02	22.24	8.21	8.27	2.95	3.01
Observations	37	100	38	105	299	860
R^2	0.716	0.418	0.731	0.346	0.616	0.244
Protection, Any	NO	YES	NO	YES	NO	YES

B. Sources of Joint Profit Per Trip Change: Marginal Cost, Consumer Surplus, or Bargaining?

	Operating Costs		# Passengers		Trip duration		Price	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Foreign	3.242^{**}	-0.209	-0.549^{**}	-0.183	-3.249	2.856	-0.062^{***}	-0.019
	(1.559)	(0.596)	(0.256)	(0.271)	(2.035)	(3.097)	(0.022)	(0.014)
Mean Dep. Var.	5.82	5.8	18.61	18.27	31.7	31.87	0.47	0.48
Observations	302	863	300	861	300	862	299	861
R^2	0.604	0.136	0.801	0.756	0.346	0.294	0.745	0.783
Protection, Any	NO	YES	NO	YES	NO	YES	NO	YES

Notes: This table presents the OLS estimates of β^F from Equation 2 in the sample of driver-days assigned to either home driving or to short-term (foreign line) rerouting (driving blocks of only 1 day), decomposing this sample into two separate regressions: the subset of driver-days assigned to not having third-party police protection (odd columns), and the sample of driver-days assigned to having third-party police protection. *Dependent variables*: in Panel A, joint profit per day (columns 1 and 2), number of trips per day (Columns 3 and 4), and joint profit per trip (columns 5 and 6). Joint profit is the revenue from passenger tickets in USD minus operating costs in USD; operating costs are gas and repair costs. In Panel B, the sample is at the driver-trip level, and the variables are: the operating costs in USD (Columns 1 and 2), the number of passengers that purchase a ticket for a ride (Columns 3 and 4), the duration of a trip in minutes (Columns 5 and 6), and the average price paid by passengers on a trip in USD (Columns 7 and 8). operating costs are gas and repair costs, and are observed at the driver-day level and imputed at the driver-trip level using the number of trips. All regressions include randomization strata fixed effects, and observations are weighted by rerouting and composition weights. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

demand for drivers with social ties might be larger than for other drivers. Column (3) shows that the number of passengers is significantly reduced by short-term unprotected rerouting. Thus, it is possible that social ties allow the driver to induce larger demand. This would be the case if they give the driver the safety to take actions that increase passenger demand, such as making himself more visible at key strategic intersections—which he would forego without such social ties. Column (4) examines the effect of short-term protected rerouting as a placebo. In that case, there is no significant reduction in the number of passengers; thus, the effect of short-term unprotected rerouting on the number of sales cannot be explained by other features of rerouting, other than the social ties between the driver and the officers on the line. To further examine whether properties of the trip cause a shift in passenger demand, Column (5) examines the effect of short-term rerouting on trip duration. Trip duration is a good proxy for the passengers' valuation of a trip.[31] We find that short-term unprotected rerouting has no statistically significant effect on trip duration, and that this effect is comparable whether the driver is unprotected (Column 5) or protected (Column 6). That is, driver-officer social ties have no bearing on the objective features of the value of a single trip for the passengers; thus, unprotected rerouting decreases sales for reasons related to the social ties between the driver and the police and unrelated to the ability of the driver to deliver a fast trip to the passengers. Finally, Column (7) analyzes the effect of short-term unprotected rerouting on the average price paid by passengers. We find that the average passenger price falls from .47 to less than .41 cents, a 13% statistically significant reduction. One concern with this analysis is that this effect might reflect other features of rerouting than social ties with the police officers. To test for this possibility, Column (8) analyzes the effect of short-term protected rerouting. We find that there is no effect on the price in that case, and the p-value of the difference in these two effects is 0. Thus, this suggests that drivers who have ties with the officers on the line are better able to to induce demand.

[31] Another dimension might be safety. This might matter in our case if, for example, drivers with connections are perceived to drive more safely. It is unlikely that these connections have anything to do with safety, however, as our qualitative interviews suggest that these connections are all about the driver taking the time to negotiate and to call passengers at the terminii. Furthermore, safety does not appear a major concern on the side of drivers either. In the years before the study, the government introduced another type of buses, the *Esprits de Vie* (spirit of life, in French), which were safer. The trip on these buses was slightly costlier. The project was a failure because passengers still preferred the *Esprits de Mort* which, even if they were significantly less safe, were known to be faster.

Taken together, we have provided evidence that social ties with the officers on the line allows the driver to reduce the marginal cost of driving and, more importantly, to generate a larger demand, as seen in lower prices and lower sales. We found stark evidence in the qualitative interviews for how this happens: in practice, drivers who have social ties with the officers on the line feel safe to stop and call for passengers, and to wait to fill the bus, without the fear of being stopped by the police for long shake downs. Our qualitative evidence also supports these empirical facts. When asked how drivers behave differently in foreign lines, the project manager, who had been in contact with the drivers for two months, responds the following:

> A driver who is not on his designated route, due to being in a hurry, tends to accept even from those who don't have the full fare required for the route. For example, on a route where the fare is 500 Congolese Francs (FC), if a passenger offers the driver 400 FC, the driver on his designated route would likely refuse, as he knows he's not in a rush. However, the driver who is not on his designated route and needs to avoid getting caught will do everything possible to leave the intersection, so he is more likely to accept the lower fare.
>
> But in reality, there are customers (passengers) who come with an amount lower than the fare of the route. They start by negotiating the price, which makes it easier for a driver who is not on his designated route to accept such passengers, compared to a driver who is on his designated route and isn't concerned about getting stopped.
>
> In this matter, in reality, when a minibus operates on a route that it doesn't normally work on, there's a risk of being stopped by various individuals (sometimes the police, sometimes inspectors from ACCO) who are stationed at loading points, which are often intersections with police presence. This is why when a driver is not on his designated route, he is afraid to stop at any random stop to pick up passengers, out of fear of being stopped. If he does stop, it's only for a few minutes to monitor the police and ACCO agents. In doing so, he accepts passengers at whatever fare to avoid spending a lot of time discussing with passengers.

Two important theoretical considerations are in order to interpret these tests. First, the decrease in demand might just capture that rerouting worsens other dimensions of a trip that passengers value, such as safety, and that that passengers internalize that. However, if this were true, rerouting should decrease the price whether or not the driver has protection, since protection is unrelated to driving safely (often it is a sticker, sometimes the availability of a phone call, and otherwise it is an agent that has no better knowledge of the road than the driver). Second, the decrease in prices alone could also reflect that, in addition to reduced passenger demand, unprotected rerouting reduces the ability of the drivers to extract consumer surplus through harder bargaining conditions. This would be entirely consistent with the explanation we have provided for why social ties enable the driver to generate more demand. The intuition is also supported by our qualitative evidence: because drivers who do not have social ties with the officers negotiate for the price in a rush, this leads to a reduction in their bargaining power over the passengers, resulting in a lower equilibrium price, consistent with standard bargaining theory.

In sum, this analysis suggests that relationships between drivers and police officers increase the producer surplus, as well as the sum of the producer and the consumer surplus. The increase in total surplus arises from a reduction in the marginal cost of driving, and an increase in demand. Whether consumer surplus increases depends on whether social ties empower drivers to extract a larger share of total surplus from the consumer. We have no way of ruling out this possibility. Our findings thus allow us to give empirical content to the transaction costs inherent in the corrupt transaction in our context: the immediate transaction costs are the opportunity cost of revenue lost in negotiations and the reduction of number of trips per day (and if the vehicle is permanently apprehended); accounting for the drivers' response to avoid these costs, in equilibrium, the transaction costs arise from lower passenger demand and potentially lower ability to extract consumer surplus through bargaining. This finding is important, as it implies that private actors and officers might create social relationships to jointly maximize the total consumer and producer surplus; these relationships would facilitate the spread of corruption by making corrupt exchange more effective. Perhaps surprisingly, they also increase total economic surplus; thus they risk creating a broader coalition that includes the passengers, to support the creation of relationships between drivers and officers that increases the total surplus from driving—making it more likely that social ties for corruption, and corruption, spread.

10. Conclusion

Leveraging relationships that we had built over three years of qualitative research inside the public transport sector in Kinshasa, DRC's capital, we analyze the role of relationships between private operators and state official enforcers on the governance of corrupt transactions. We empirically document the prevalence of a nonmarket social institution, bilateral relationships, to govern the corrupt transaction and, using an experiment, we quantify its effect on the (shared) cost of corrupt exchange. We found that the transaction costs arising from negotiating corrupt transactions can be huge, and that, when drivers have the cash, relationships form relatively quickly to mitigate these costs.

Our findings document that, in the absence of social relationships between the driver and the police, corruption's transaction costs arise from the fact that drivers, anticipating lengthy and costly negotiations with the police, refrain from taking productive actions so as to avoid being detected by the officers, hence they can attract less passengers and negotiate a smaller price. Our qualitative evidence suggested that these actions might have included spending enough time searching for and calling passengers or negotiating with passengers for the price of their ride. The absence of relationships trickles down to harm the generation of the joint profit, and even as low as the ability of passengers to find a bus. This deep effect of officer-driver ties is the result of the fact that there are otherwise no institutions to govern the corrupt transaction between the officers and the drivers. With relationships, both are able to achieve a larger joint profit, and share it through transfers such as bribes. While the driver-officer relationships increase the total economic surplus, these relationships are almost certainly a second-best solution, in that a system whereby drivers pay a centralized licensing fee to use the roads, then optimize their routes, and officers can commit, would be more efficient if it could be implemented.

It is impossible to know how representative the particular scheme we observe is. Given the challenges we had to overcome for the study to be feasible while ensuring the safety of all participants, the study has somewhat low statistical power, driven by a low number of drivers (ten), allowing us to keep a tight monitoring structure and mitigating risks reasonably. Obtaining parallel data for other organizations, such as large-N longitudinal data, remains an important challenge. However, there are three encouraging features of our study that suggest our conclusions might be quite general. First, having made this ethical choice when designing the study, we have followed the experimental design to reduce noise in the analysis, such as including randomization strata fixed effects, and we have assessed the robustness of the specification with encouraging conclusions. Second, to the extent that we were able to gain access into the system, how homogeneous the minibuses are in this context, and given how open its participants spoke about the arrangements, our setting is particularly well-suited for studying the role of governance of corrupt exchange, as it is unlikely that the need to conceal played a role in these arrangements. Third, and most importantly, we have provided a discussion on how costs we document emerge under quite general conditions, rather than being an artifact of our setting: even if the costly negotiation is also what induces compliance among drivers to pay the toll fee once they are in that arrangement, it is also the benchmark default behavior for officers to generate income, and is therefore self-enforcing; and the seemingly peculiar "buying the land" procedure to enter the cooperative relationship can be rationalized, and has been theoretically already (Kranton, 1996), in settings of bilateral repeated interaction in which new relationships may form in the equilibrium path. It is a quite general feature of problems with similar features as the ones we study.

Our study has omitted from the explanation two fundamental aspects of this context of relevance for economics and social science generally. First, the interactions between the various actors are governed by established norms of behaviour. Thus, the seemingly bilateral relationship that we describe draws on a collective equilibrium, and thus belief system, that obviously informs the selection of the types of relational contracts that emerge between two parties—mixing economic and sociologist terminology, a "portfolio" of culturally acceptable or expected actions available for bilateral relationships, endogenously determined in a multi-lateral equilibrium. Indeed, provided each actor sticks to the known rule of the game, little bilateral trust needs to be built for such contracts to be sustained. Our omission is exemplified in the simple model, where we impose by assumption that there is no commitment to be solved on the side of the officer, so that we focus on studying how drivers behave strategically in this environment.

Yet, it is precisely how society has enabled the police officers to credibly commit to their side of the deal, through the emergence of norms and expected heuristics, which is inherent in the notion of "social embededness" (Polanyi, 2018) that we allude to at the opening of this paper, and which constitutes, in our view, a more interesting question for social science emerging from this setting. These bilateral interactions might produce different patterns of behavior depending on the social context on which they are "embedded." Answering this question would require observing social equilibria in a longer time period, or ingenious experimental study designs within the equilibrium to isolate the role of these norms. Second, and relatedly, while our study has taken an economic approach to explain the emergence of such arrangements in equilibrium and their economic benefits and costs, future research would greatly benefit from branching outside of economics into other disciplines, such as anthropology, where the rationale for these arrangements is often described as motivated by much richer factors: a meaning of social identity shared by the participants; separate spheres of economic exchange; the psychological significance of friendship and social relationships beyond their cynical reduction to their material consequences. These remain promising areas of research in economics of corruption—and are inhererent in the notion of "social embededdness."

References

Banerjee, A., S. Mullainathan, and R. Hanna (2012). Corruption. In *The Handbook of Organizational Economics*, pp. 1109–1147. Princeton University Press.

Bertrand, M., S. Djankov, R. Hanna, and S. Mullainathan (2007). Obtaining a driver's license in india: an experimental approach to studying corruption. *The Quarterly Journal of Economics 122*(4), 1639–1676.

De Herdt, T. and K. Titeca (2019). *Negotiating public services in the Congo: State, society and governance*. Bloomsbury Publishing.

Dixit, A. (2004). *Lawlessness and Economics: Alternative Modes of Governance*. Princeton, New Jersey: Princeton University Press.

Fisman, R. (2001). Estimating the value of political connections. *The American Economic Review 91*(4), 1095–1102.

Fisman, R. and Y. Wang (2015, 05). The Mortality Cost of Political Connections. *The Review of Economic Studies 82*(4), 1346–1382.

Granovetter, M. (1985). Economic action and social structure: The problem of embeddedness. *American Journal of Sociology 91*(3), 481–510.

Greif, A. (2000). The fundamental problem of exchange: A research agenda in historical institutional analysis. *European Review of Economic History 4*(3), 251–284.

Greif, A. (2008). Towards a political economy of implementation. In E. Helpman (Ed.), *Institutions and economic performance*, pp. 17–63. Harvard Univ. Press.

Kranton, R. E. (1996). The formation of cooperative relationships. *Journal of Law, Economics, Organization 12*(1), 214–233.

Macchiavello, R. and A. Morjaria (2020, 12). Competition and Relational Contracts in the Rwanda Coffee Chain*. *The Quarterly Journal of Economics 136*(2), 1089–1143.

Olken, B. A. and P. Barron (2009). The simple economics of extortion: Evidence from trucking in aceh. *Journal of Political Economy 117*(3), 417–452.

Polanyi, K. (1944). *The Great Transformation: The Political and Economic Origins of Our Time*. Boston: Beacon Press.

Polanyi, K. (2018). The economy as instituted process. In *The sociology of economic life*, pp. 3–21. Routledge.

Rose-Ackerman, S. (1999). *Corruption and Government: Causes, Consequences, and Reform.* Cambridge: CUP.

Shleifer, A. and R. W. Vishny (1993). Corruption. *Quarterly Journal of Economics 108*(3), 599–617.

Tchanche, B. (2019). A view of road transport in africa. *African Journal of Environmental Science and Technology 13*, 296–302.

Titeca, K. and A. Malukisa (2019). Real taxation practices among the traffic police. *unpublished paper*.

Appendix: Measurement and Experimental Procedure

We now describe the data collection, outcomes, and basic characteristics of the sample.

A1. Data collection

To collect our data, we hired one data collector for each minibus driver. Every day, data collectors were dispatched to the minibuses under the supervision of a data collector monitor. In each minibus, we purchased a ticket for the whole day close to the driver, which enabled the data collector to observe closely and listen in to the conversations of the driver with the police. A crucial aspect of this design is that the collectors had developed good relations with the minibus drivers, which ensured that the driver did not have incentives to act in a different way than usual in the presence of the observer.

We bought smartphones, installed SurveyCTO, and programmed, for each route, and for each trip direction, a survey that prompted the data collector to each intersection in the route. A minibus line is composed of a sequence of intersections.[32] The data collectors entered information for each expected intersection prompted by the app, and completed a full survey with information about the trip at the end of each round, in addition to the information collected per intersection.

In addition to the lump-sum compensation for the risk, drivers were compensated at a rate of 15 USD per day for assisting the data collectors who travelled with them in the minibus and for answering questions during their idle time at the termini.

A2. Outcome Data

The data collector recorded detailed operation data of the minibus. At the end of each trip, once at the terminus, the data collector obtained the number of passengers who purchased a ticket in the trip, as well as the price for the ticket. This information was directly obtained from the receiver in the minibus, who is in charge of accounting the tickets. This is the total revenue for the trip (the lowest level at which we could obtain

[32]The data collectors were the same individuals as the implementers ensuring compliance to the calendar. Overall, we hired one data collector for each minibus, four monitors of data collectors, one data coordinator whose role was to track the quality of the data in real time from a secure location in Kinshasa, and one operations' coordinator whose role was to ensure the safety of all participants.

revenue data). In addition, each day, the data collector obtained detailed information on gas expenses and on repair costs, which constituted the day-level operating costs. The data collector also obtained the number of trips made per day. This allows computing the daily revenue in case the data collector was absent for some of those.

The data collector also gathered data about the interaction with the police for intersection crossing as well as on each terminus. At each intersection that belongs to the route, the data collector recorded: whether an interaction with the police took place; whether a payment was made, the type and amount of the payment; the time spent interacting with the police; the records of the conversation, which we then use to separate conversations that are simple greetings from negotiation attempts that resulted in no bribe payments; the time spent in traffic; details of the interaction at the police station in case the minibus is seized and escorted to the police station; as well as the type of relationship that the driver had with the police officer he interacts with in that moment.

Most of the data was obtained through direct observation and, in some cases, such as the relationship, the data collector would simply ask the driver. According to the drivers, this activity was not an encumbrance to their operations and they enjoyed building a relationship with someone who was interested in their activity. To reduce room for shirking, we also employed a supervisor, who spent the day as a ghost auditor, following the data collectors.[33] Observers knew they were being monitored each day.[34]

A3. Probabilities of Treatment Assignment, For all Treatments

Our experimental design comprised one treatment arm (rerouting to foreign line), and additional treatment arms of third-party protection to isolate the role of relationships.

[33]We recorded only one event in which the data collector was detained for interrogation related to their activity. In that instance, the data collector was drunk, and had caused trouble with secret service agents travelling in the minibus. He was released within minutes without payment of any bribe.

[34]In addition to this data, we tracked the events of seizing of a minibus as follows. Drivers were instructed to call the study data coordinator every time that a minibus was seized. That call was sometimes placed from the driver's own phone, sometimes from the data collector's phone. In that call, the data coordinator asked the following questions: month, day, name of driver, code of minibus, home line of the driver, route on which the seizing took place, exact hour of seizing, a series of questions verifying the treatment assignment, whether the seizing resulted in escorting to the police station, initial money requested by the police, whether a bribe was paid and how much, details on the interaction, duration of the whole seizing process. The data coordinator filled a tracking document in Excel with the answers to each of these questions for each seizing event. Overall, the tracking of seizing events recorded 38 seizing events in the study period. We link the two sources of data for this variable.

The experiment was implemented on 27 days, split into episodes of 23 and 4 days due to funding increase for the second period. Ten minibus drivers participated in the experiment. The following subsections outline each randomization strategy in detail, and compute the probability of treatment assignment for the purposes of OLS regression weights to recover the unbiased estimator for the effect of rerouting.

A. ***rerouting***

We randomly assigned all participating minibus drivers to drive on their usual lines ("home lines") and the lines they reported to not have relationships with police officers and had never driven before ("foreign lines"). In the first episode of 23 days, each minibus driver was assigned to 10 days of his home line and 13 days of foreign lines; in the second episode of 4 days, each minibus driver was assigned to a maximum of 2 out of 4 days on his home line. For each minibus, we randomly allocated a sequence of driving blocks that was associated with home or foreign lines, as well as with the type of protection (Section B).

We sampled these blocks without replacement, totaling the number of experimental days. Table A3 enumerates the line allocation. For example, if a minibus driver was randomly assigned the sequence of driving blocks {5, 6, 7, 8, 9, 1, 2, 3, 4} in the 23-day period, he would drive on his first foreign line on days 1-3, on a different second one on days 4-6, on a different third one on days 7-9, on a different fourth one on days 10-12, on another different fifth one on day 13, and finally on his home line on days 14-23. Bus drivers who had multiple home lines are assigned *only one, unique,* home line.

Such a randomization scheme implies that the probability of being assigned a foreign line varies by day. We compute the probability of foreign line treatment for each minibus d and day t with the following formula:

$$\mathbb{P}_{dt}(\text{Foreign} = 1) = \mathbb{P}_t(\text{Foreign} = 1) = \sum_{j \in J} \mathbb{P}_t(\text{Block} = j) \times \mathbb{1}(\text{Foreign} = 1 | \text{Block} = j),$$

where $J = \{1,2,\ldots,9\}$ or $J = \{1,2,3,4\}$ depending on experimental period of 23 or 4 days. The second part of each sum is an indicator function dictated by experimental design. The first part of each sum is challenging to derive theoretically. We could and did resort to computational enumeration to calculate it, first listing all 362,880 possible combinations of block sequence given sampling without replacement in the 23-day episode[35] (or 14 in the 4-day episode), then calculating the probability that a given day takes on a driving block schedule. To minimize human error, we obtained the probability of treatment assignment through simulating the randomization procedure with 10,000 different seeds and took the average probability of treatment assignment.

B. *Police protection*

We studied the role of police protection in mediating the role of relationships by experimentally varying protection at the minibus-line level according to the block sequence as outlined in Table A3. Similarly to the computational procedure of the probability of rerouting, we obtained the probability of each type of police protection (colonel, major, police escort) by simulating 10,000 seeds of the randomization procedure and obtaining the average of treatment assignment.

C. *ACCO sticker*

We studied the role of ACCO sticker as another type of third-party protection in mediating the role of relationships by experimentally varying ACCO sticker. The sticker associates minibus drivers with a powerful trade union of minibus drivers. The ACCO sticker treatment was randomized by day, at the minibus-line reallocation block-protection level. We used the same simulation procedure to compute the probability of sticker assignment. The rule for sticker assignment within line reallocation block in the 23-day period (Table A3) is as follows: (1) Each of the two days that have the same police protection status takes a 0.5 probability of being assigned an ACCO sticker. (2) The remaining day within the three-day line-reallocation block, or the day where a block only contains one day (line reallocation blocks (4) and (9)), has a 0.43 chance of getting a sticker.

[35]For example, the probability of driving on any of the 9 blocks in the *first* day is 1/9 because each block has an equal probability of being sampled. To derive the probability on the *second* day, note that once a three-day block is sampled, a driver continues on the assigned route for the next two days. This implies that the probabilities are 1/9 in the 3-day blocks, and 1/72 in each of the 1-day blocks.

A4. Accounting for Line Imbalance in Foreign vs. Home Sets

In this section, we first demonstrate that in failing to account for the composition of foreign and home lines in the inverse propensity weights, a composition bias is created. We then show, for each route, the probability that the route is part of a home or a foreign treatment observation, as well as the conditional probability that an observation is foreign, conditional on being a given route.

Consider a minibus d on day t that was randomly assigned to reroute to a line $L_{dt}(D_{dt} = 1) \in \{0,1\}$, where importantly a foreign line $L_{dt} = 1$ is a function of randomized rerouting $D_{dt} = 1$ for minibus d on day t. Let $Y_{dt}(D_{dt})$ denote the corresponding potential outcome under randomized assignment. Route randomization introduces an assignment bias because a route has differential probability of being foreign to different minibuses and thus minibus-days. In the bias derivation below, we omit subscripts dt and write $L(1)$ as foreign line randomized rerouting assignment for brevity.

$$
\begin{aligned}
\widehat{\beta}_{\text{OLS}} = \quad & [Y|L(1),D=1] - [Y|L(0),D=0] && (1)\\
= \quad & \frac{[Y|D=1]}{\P[L(1)|D=1]} - \frac{[Y|D=0]}{\P[L(0)|D=0]} && (2)\\
= \quad & \frac{[Y|D=1]}{\P[D=1|L(1)]}\frac{\P[D=1]}{\P[L(1)]} - \frac{[Y|D=0]}{\P[D=0|L(0)]}\frac{\P[D=0]}{\P[L(0)]} && (3)\\
= \quad & [Y(1)|D=1]\frac{\P[D=1]}{\P[L(1)]} - [Y(0)|D=0]\frac{\P[D=0]}{\P[L(0)]} && (4)\\
= \quad & [Y(1)|D=1]\frac{\P[D=1]}{\P[L(1)]} - [Y(0)|D=0]\frac{\P[D=0]}{\P[L(0)]} && (5)\\
& \underbrace{- [Y(0)|D=1]\frac{\P[D=1]}{\P[L(1)]} + [Y(0)|D=1]\frac{\P[D=1]}{\P[L(1)]}}_{=0} \\
= \quad & \frac{1}{\P[L(1)|D=1]}\left([Y(1)-Y(0)|D=1]\right) && (6)\\
& - \left(\frac{1}{\P[L(0)|D=0]} - \frac{1}{\P[L(1)|D=1]}\right)[Y(0)|D=0] \\
= \quad & \underbrace{\frac{1}{\P[L_{it}(1)|D_{it}=1]}}_{\equiv w_{it}} \left(\underbrace{[Y_{it}(1)-Y_{it}(0)]}_{\equiv \text{ATE}}\right) && (7)\\
& \underbrace{+\left(\frac{1}{\P[L_{it}(1)|D_{it}=1]} - \frac{1}{\P[L_{it}(0)|D_{it}=0]}\right)[Y_{it}(0)]}_{\equiv c}
\end{aligned}
$$

where the first line is what OLS estimator identifies; the second line uses the partition theorem; the third line uses Bayes' theorem; the fourth line recognizes that the probability of foreign/home assignment is unity under foreign/home lines due to randomized controlled experiment; the fifth line adds zero akin to selection bias decomposition of ATE; the sixth line factorizes common ATT term, changes the conditional on the average untreated outcome by independence between treatment and potential outcomes due to random assignment, and uses Bayes theorem $\P[L(1)] = \P[L(1)|D = 1]\P[D = 1]$[36] to cancel the probability of foreign/home. Final line uses random assignment to switch ATT into ATE. The resulting equation appears similarly to the selection bias of observational studies but weighting the ATE by the inverse probability of foreign route. Weighted least square solves the selection bias.

To obtain these probabilities, we relied on driver's reporting of their foreign lines before revealing the detail of the experiments. Table A7 decomposes the probability that a given line is assigned to foreign for each of the minibuses in the sample. Lines that are *home* for a given minibus can never appear as foreign for that minibus and hence has probability zero. Importantly, the pool of foreign lines varies by minibus and all lines are equally represented as home or foreign line.

A5. Proofs

Proof of Proposition 1 We proceed by backward induction. We omit the role of k for simplicity but it is straightforward to see that it can be added back to produce the result of Proposition 1. If the driver buys protection, his payoff is $y(e) - F - f + \delta(y(e) - f)$. In that case, by assumption A: $e_1 = 1$, $e_2 = 1$. Thus expected utility with protection is $(1+\delta)(y^1 - f) - F$. If the driver does not buy protection, his payoff is $p(e)y(e) - B(1 - p(e)0) + \delta(p(e)y(e) - B(1 - p(e)))$. By assumption C, $e_1 = 0$, $e_2 = 0$. Hence, the driver buys protection in period 1 iff.:

$$(1+\delta)(y^1 - f) - F > (1+\delta)(p^0y^0 - B(1-p^0))$$

This is equivalent to:

$$(1+\delta) > \frac{F}{y^1 - p^0y^0 - f + B(1-p^0)}.$$

[36]Note that $\P[D = 1|L(1)] = \P[D = 0|L(0)] = 1$

□

Proposition 2 *[One period] a. If $y^1 - p^0y^0 + (1-p^0)B < F + f$ the driver does not buy protection and provides low effort, and gets utility $p^0y^0 - (1-p^0)B$; b. If $Y^1 - p^0y^0 + (1-p^0)B > F + f$, the driver buys protection and provides high effort, and gets utility $y^1 - F - f$. Willingness to pay for protection is $y^1 - p^0y^0$>0.*

Proof of Proposition 2 We proceed by backward induction.

If the driver buys protection, his payoff is $y(e) - F - f$. In that case, chooses to provide productive effort iff.: $y^1 > y^0$. This holds true by Assumption A, hence if the driver buys protection, he provides productive effort. Thus, his utility with protection is $y^1 - F - f$.

If the driver does not buy protection, his payoff is $p(e)y(e) - (1 - p(e))B$. In that case, he provides effort iff. $p^1y^1 - B(1-p^1) > p^0y^0 - B(1-p^0)$, that is, iff:

$$B < \frac{p^1y^1 - p^0y^0}{p^0 - p^1}$$

This is always false by Assumption C. Hence, the driver does not provide effort if unprotected. Thus, utility if unprotected is $p^0y^0 - B(1-p^0)$. Hence, the driver buys protection in period 1 iff.:

$$y^1 - F - f > p^0y^0 - B(1-p^0) \Leftrightarrow y^1 - p^0y^0 + B(1-p^0) > F + f$$

□

We now analyze the Rubinstein alternating-offer bargaining model to demonstrate how driver's bargaining power decreases with time pressure when negotiating fees with the passenger. At time 0, driver makes an offer y to the passenger. If the passenger accepts the offer, then partition of c is achieved. Else passenger makes a counter-offer z to the driver at time $\Omega > 0$. If accepted, then partition of c is achieved, else driver again makes a counter-counter-offer at 2Ω, ad infinitum until an agreement is reached. Each player's payoff is $U(x_i) = x_i \exp(-r_i t\Omega)$ where $i \in \{A,B\}$ indexes driver A or passenger B. We define discount factor $\delta_i \equiv \exp(-r_i\Omega)$. We assume that driver is less patient than the passenger due to risks of police harassment, so $\delta_A < \delta_B$—i.e. $r_A > r_B$. SPE will characterize the equilibrium partition. Furthermore, the SPE satisfies two conditions:

- **Condition 1** (No Delay) *Whenever a player has to make an offer, his equilibrium offer is accepted by the other player.*

- **Condition 2** (Stationarity) *A player makes the same offer whenever he has to make one.*

Proposition 3 *[Bargaining under time pressure] In the limit as $\Omega \to 0$, the share obtained by the driver is smaller than the passenger—i.e. driver accepts a lower price. Formally, the unique allocation SPE converge to $y^* = \mu_A c$ and $z^* = \mu_B c$, where*

$$\mu_A = \frac{r_B}{r_A + r_B} < \frac{r_A}{r_A + r_B} = \mu_B. \tag{8}$$

Proof of Proposition 3 First, by condition 2, let y^* and z^* denote the equilibrium offer that player A (driver) and player B (passenger) make when making an offer. Consider an arbitrary point in time at which the driver has to make an offer to the passenger. It follows from conditions 1 and 2 that B's equilibrium payoff from rejecting any offer is $\delta_B z^*$. Subgame perfection requires that player B reject any offer y such that $c - y < \delta_B z^*$. Because the driver's offer is accepted by the passenger, $c - y^* \geq \delta_B y^*$. In fact, $c - y^* = \delta_B z^*$ because otherwise the driver could increase his payoff by offering y' such that $c - y^* > c - y' > \delta_B z^*$. Symmetrically, $c - z^* = \delta_A y^*$. The SPE that satisfy these two equations are unique where the equilibrium offers are

$$y^* = \eta_A c \text{ and } z^* = \eta_B c, \text{ where}$$

$$\eta_i \equiv \frac{1 - \delta_{-i}}{1 - \delta_A \delta_B} = \frac{1 - \exp(-r_{-i}\Omega)}{1 - \exp(-(r_A + r_B)\Omega)} \to \frac{1 - (1 - r_i\Omega)}{1 - (1 - (r_A + r_B)\Omega)} = \frac{r_{-i}}{r_A + r_B} \equiv \mu_i \text{ as } \Omega \to 0.$$

$\square$

Appendix Tables and Figures

Table A1: Characteristics of the Bribe Costs and Time Waste in Pre-Experimental Data—Per Trip Equivalent

A. Bribe Costs Decomposition—Payments per Trip (USD) by Type of Bribe

Variable	Mean (1)	S.D. (2)	Min (3)	Max (4)	N (5)
Value of payments made (USD per trip)	1.12	2.70	0	30	1,544
Toll fee (*mbote ya likasu*)	0.69	0.83	0	7	1,544
Negotiation bribe (incl. police station)	0.41	2.43	0	27	1,544
Tips	0.02	0.18	0	3	1,544

B. Time Waste per Trip by Type of Bribe

Variable	Mean (1)	S.D. (2)	Min (3)	Max (4)	N (5)
Time wasted interacting with police (minutes per trip)	1.13	2.86	0	55	1,544
Toll fee (*mbote ya likasu*)	0.83	1.36	0	22	1,544
Negotiation bribe (incl. police station)	0.29	2.39	0	55	1,544
Tip	0.01	0.11	0	2	1,544

C. Frequency of Payment by Type of Bribe

Variable	Mean (1)	S.D. (2)	Min (3)	Max (4)	N (5)
Number of times payments made per trip	1.36	1.32	0	7	1,544
Toll fee (*mbote ya likasu*)	1.30	1.26	0	7	1,544
Negotiation bribe (incl. police station)	0.04	0.21	0	2	1,544
Tip	0.02	0.14	0	2	1,544

Notes: This table presents the summary statistics on the three types of bribes that are paid per trip in the pre-experimental data between June 19_{th} and July 20_{th}, 2015 observed in the drivers usual lines (their home lines). Panels A, B, and C present the bribe costs, the duration of the negotiation for each bribe, and the frequency of each bribe respectively. The statistics presented are computed from 1,544 trips which composed 15,426 events in which a driver drives through an intersection, from 49 unique intersections. The data were collected from ten minibuses between June 19_{th} and July 20_{th} 2015 in the ten lines of the East Kinshasa network.

Table A2: Characteristics of the Three Types of Bribes in Experimental Data

A. Bribe Costs Decomposition—Payments per Transaction (USD) by Type of Bribe

Variable	*Statistic*				
	Mean (1)	*S.D.* (2)	*Min* (3)	*Max* (4)	*N* (5)
Average per transaction made	1.06	2.24	0.22	24.96	767
Toll fee (*mbote ya likasu*)	0.67	0.33	0.22	2.17	693
Negotiation bribe (incl. police station)	6.82	6.74	0.22	24.96	47
Tip	1.17	0.62	0.54	3.26	27

B. Time Waste per Transaction by Type of Bribe

Variable	*Statistic*				
	Mean (1)	*S.D.* (2)	*Min* (3)	*Max* (4)	*N* (5)
Fraction of intersection crossings in which time interacting with police is strictly positive	0.16	0.37	0	1	6,774
Time wasted in interaction with police, per transaction conditional on interaction time strictly positive (duration of negotiation in minutes)	0.95	1.65	0.10	40	767
Toll fee (*mbote ya likasu*)	0.84	0.63	0.10	5	693
Negotiation bribe (incl. police station)	2.50	6.03	0.10	40	47
Tip	0.87	0.61	0.10	3	27

C. Frequency of Payment by Type of Bribe

Variable	*Statistic*				
	Mean (1)	*S.D.* (2)	*Min* (3)	*Max* (4)	*N* (5)
Number of trips per day	8.25	2.21	4	13	115
Number of times per day in which a payment is made at the average intersection (any payment)	0.52	0.96	0	6	1,462
Toll fee (*mbote ya likasu*)	0.47	0.93	0	6	1,462
Negotiation bribe (incl. police station)	0.03	0.18	0	2	1,462
Tip	0.02	0.15	0	2	1,462

Notes: This table presents the summary statistics on the three types of bribes in the experimental data observed in the drivers usual lines (their home lines). Panels A, B, C present the bribe costs, the duration of the negotiation for each bribe, and the frequency of each. The statistics presented are computed from 6,774 events in which a driver drives through an intersection, from 45 unique intersections. The data were collected from ten minibuses between June 19_{th} and July 20_{th} 2015 in the ten lines of the East Kinshasa network.

Table A3: Driving Block for Random Reallocation of Lines

First Wave: 23-day period	Second Wave: 4-day period
(1) Home line: 3 days (1 protected, 2 not)	(1) Home line: 1 day (unprotected)
(2) Home line: 3 days (2 protected, 1 not)	(2) Home line: 1 day (protected)
(3) Home line: 3 day (2 protected, 1 not)	(3) Foreign line 1: 1 day (unprotected)
(4) Home line: 1 day (protected or not)	(4) Foreign line 2: 1 day (protected)
(5) Foreign line 1: 3 days (1 protected, 2 not)	
(6) Foreign line 2: 3 days (2 protected, 1 not)	
(7) Foreign line 3: 3 days (1 protected, 2 not)	
(8) Foreign line 4: 3 days (2 protected, 1 not)	
(9) Foreign line 5: 1 day (protected or not)	

Notes: This table presents the design of experimental driving blocks of home vs. foreign lines and of third-party protection assignment. Each of the 9 driving blocks in the first wave (Aug 10-Sep 4, excluding Sundays) was sampled without replacement to construct a 23-consecutive-day calendar of driving with assigned lines/protections. The driving blocks in the second wave (Sep 7-10) were also sampled without replacement up to 4 days had been sampled from the block. The second wave was a result of unanticipated budget availability at the end of the first wave, which allowed the experiment to continue for 4 days before the budget was exhausted.

Table A4: Randomization Balance of the Treatment of Rerouting to Foreign Lines

Dependent Variable	All	Home line	Foreign line
Proportion of driving on/in	(1)	(2)	(3)
Monday	0.186	0.175	0.195
Tuesday	0.186	0.192	0.181
Wednesday	0.186	0.208	0.168
Thursday	0.186	0.200	0.174
Friday	0.145	0.125	0.161
Saturday	0.112	0.100	0.121
August	0.706	0.692	0.718
September	0.294	0.308	0.282
N. Bus-Day Obs.	269	120	149

Notes: This table presents the randomization balance of the proportion of driving weekdays and months on the home line vs. foreign line. The statistics presented are computed from 269 minibus-days during the experimental period, 120 and 149 of which were assigned to home and foreign lines.

Table A5: Balance Table, by Minibus

A. Treatment Assignment

Minibus	Foreign	Third-Party Protection	Police Escort	High-level Police	ACCO Sticker
(1)	(2)	(3)	(4)	(5)	(6)
1	0.5385	0.7308	0.1538	0.3846	0.4615
2	0.5556	0.7037	0.2593	0.2593	0.5185
3	0.5556	0.7037	0.0741	0.4444	0.4074
4	0.5556	0.7407	0.1481	0.3704	0.5185
5	0.5556	0.7037	0.0370	0.4444	0.4815
6	0.5556	0.7037	0.1852	0.3333	0.4074
7	0.5556	0.7407	0.1852	0.2963	0.5185
8	0.5556	0.6667	0.1852	0.3704	0.3704
9	0.5556	0.7037	0.1481	0.3333	0.4444
10	0.5556	0.8148	0.2222	0.3333	0.6296

B. Treatment Administration

Minibus	Foreign	Third-Party Protection	Police Escort	High-level Police	ACCO Sticker
(1)	(2)	(3)	(4)	(5)	(6)
1	0.5385	0.6538	0.1154	0.3462	0.4615
2	0.5556	0.5556	0.1852	0.1852	0.5185
3	0.5556	0.5926	0.0370	0.3704	0.3704
4	0.5556	0.5926	0.0741	0.3333	0.4815
5	0.5556	0.7037	0.0370	0.4444	0.4815
6	0.5556	0.7037	0.1852	0.3333	0.4074
7	0.5556	0.6667	0.1481	0.2593	0.5185
8	0.5185	0.5556	0.1111	0.3333	0.3704
9	0.5185	0.5926	0.1111	0.2593	0.4074
10	0.5185	0.7037	0.1481	0.2963	0.6296

Notes: This table presents the randomization balance of the proportion of driving weekdays and months on the home line vs. foreign line. The statistics presented are computed from 269 minibus-days during the experimental period, 120 and 149 of which were assigned to home and foreign lines. Panel A shows the fraction of days each minibus is assigned to a given treatment. Panel B shows the fraction of days each minibus received the administration of a given treatment, hence accounts for noncompliance.

Table A6: Sample Characteristics

	N
A. Sample size	
Number of times a sample driver crosses an intersection	13,092
Number of trips	1,935
Number of unique driver-officer matches (id-id)	344
B. Characteristics of events in which a driver crosses an intersection	
Number of times a sample driver crosses an intersection, in which	
... a payment is made	1,682
... a toll fee (*mbote ya likasu*) is paid	1,514
... a negotiation bribe is paid at intersection	97
... a negotiation bribe is paid at police station	9
... a tip is paid	62
... driver interacted with the police officer (including talk)	2,367
... money is demanded (including negotiation that resulted in no bribe)	1,839
C. Trip characteristics	
Number of trips per day	8
Number of intersections per trip	6.5
Duration of a trip in minutes	50.9

Notes: This table presents the sample characteristics of the minibus operations in our experiment, using data from home and foreign lines. The number of unique driver-officer matches computes the unique intersection crossings in which driver interacted with officers at the intersections.

Table A7: Empirical Probabilities of Appearing on Minibus Foreign Line Pool

	Minibus d									
Line l	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1	0	0	0.1112	0.1432	0.1111	0.1112	0.1250	0.1112	0.1117	0.1110
2	0	0.1252	0.1113	0.1427	0.1111	0.1110	0.1248	0.1113	0.1112	0
3	0.2499	0	0	0.1426	0.1110	0.1108	0.1255	0.1109	0.1108	0.1116
4	0	0.1250	0.1113	0	0.1109	0.1115	0.1252	0.1113	0.1106	0.1110
5	0.2495	0.1246	0.1108	0.1430	0	0.1107	0.1247	0.1108	0.1107	0.1108
6	0	0.1251	0.1113	0	0.1107	0.1110	0.1243	0.1113	0.1113	0.1111
7	0	0.1253	0.1110	0.1430	0.1116	0.1109	0	0.1110	0.1113	0.1112
8	0	0.1253	0.1110	0.1427	0.1114	0	0	0.1109	0.1114	0.1112
9	0.2499	0.1248	0.1113	0	0.1107	0.1114	0.1251	0.1112	0	0.1111
10	0.2507	0.1248	0.1108	0.1428	0.1114	0.1114	0.1252	0	0.1112	0.1110

Notes: This table presents the conditional probability $\P_d[\text{Foreign}|\text{Line}= l]$, calculated based on the empirical realities of each minibus d's set of available foreign lines. Probability of zero means driver is banned from a line due to risks of hefty harassment or safety.

Table A8: Joint Profit Decomposition

Variable	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Profit per day (USD$\cdot$day^{-1})	15.18	30.90	−88.57	75.00	109
Profit per trip (USD$\cdot$trip^{-1})	2.13	4.43	−29.85	11.10	945
Joint Profit per trip (USD$\cdot$trip^{-1})	3.00	3.73	−20.46	12.18	945
Revenue (USD$\cdot$trip^{-1})	8.79	1.80	0.43	15.20	945
Number of passengers	18.36	3.60	1	29	945
Price (USD $\cdot$person$^{-1}\cdot$trip^{-1})	0.48	0.05	0.22	0.54	945
Operating costs (USD$\cdot$trip^{-1})	5.79	3.53	0	31.75	945
Number of trips per day	8.32	2.21	4	13	109
Bribe costs (USD$\cdot$day^{-1})	7.00	7.70	0	44.62	109
of which paid to *receveur* (USD$\cdot$day^{-1})	6.62	4.67	0	19	109

Notes: This table presents the descriptive statistics of minibus profit and its operational decomposition. Indentation on variable indicates a decomposition of the parent variable. The statistics are computed from 109 days of home line observations in the experiment, encompassing 945 trips.

Table A9: Effect of Rerouting to Foreign on Joint Profit—Robustness

A. Joint Profit per Day

	SATE$_r$ (1)	SATE (2)	ATE (3)	ATEc (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-6.805	-8.632^{**}	-8.892^{**}	-8.953^{**}	-9.142^{**}	-7.975^{*}	-7.670^{*}	-7.433^{*}
	(4.884)	(3.811)	(3.786)	(3.887)	(4.013)	(4.045)	(4.028)	(3.987)
Mean Dep. Var.	18.6	18.6	18.6	18.6	18.6	19.81	19.61	19.36
Observations	167	167	167	167	167	167	167	167
R^2	0.012	0.318	0.322	0.370	0.337	0.290	0.284	0.277
Rand. Strata FE	NO	YES	YES	YES	YES	YES	YES	YES
Foreign IPW	NO	NO	YES	YES	YES	YES	YES	YES
Line FE	NO	NO	NO	YES	YES	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	NO	NO	NO

B. Number of Trips per Day

	SATE$_r$ (1)	SATE (2)	ATE (3)	ATEc (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-0.810^{**}	-0.890^{**}	-0.917^{**}	-0.920^{***}	-0.967^{***}	-0.885^{**}	-0.885^{**}	-0.823^{**}
	(0.384)	(0.357)	(0.356)	(0.324)	(0.360)	(0.347)	(0.347)	(0.326)
Mean Dep. Var.	7.86	7.86	7.86	7.86	7.86	7.97	7.97	7.88
Observations	176	176	176	176	176	176	176	176
R^2	0.028	0.258	0.262	0.375	0.328	0.244	0.244	0.236
Rand. Strata FE	NO	YES	YES	YES	YES	YES	YES	YES
Foreign IPW	NO	NO	YES	YES	YES	YES	YES	YES
Line FE	NO	NO	NO	YES	YES	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	NO	NO	NO

C. Joint Profit per Trip

	SATE$_r$ (1)	SATE (2)	ATE (3)	ATEc (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-0.681	-0.877^{**}	-0.900^{**}	-0.866^{*}	-0.874^{*}	-0.915^{**}	-0.912^{**}	-0.868^{**}
	(0.561)	(0.443)	(0.439)	(0.461)	(0.456)	(0.463)	(0.443)	(0.433)
Mean Dep. Var.	2.62	2.62	2.62	2.62	2.62	2.77	2.69	2.63
Observations	1,395	1,395	1,395	1,395	1,395	1,395	1,395	1,395
R^2	0.007	0.187	0.192	0.226	0.204	0.176	0.184	0.180
Rand. Strata FE	NO	YES	YES	YES	YES	YES	YES	YES
Foreign IPW	NO	NO	YES	YES	YES	YES	YES	YES
Line FE	NO	NO	NO	YES	YES	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	NO	NO	NO

Notes: This table presents the OLS estimates of β^F from Equation 2. In Panel A, the dependent variable is the joint profit per day in USD. Panels B and C decompose the joint profit per day as dependent variables into the number of trips per day and the joint profit per trip. Joint profit per trip (Panel C) is revenue minus operating cost per trip, where revenue is derived from number of passengers per trip times the average price each passenger pays per trip, and operating cost per trip is repair and gas cost per day divided by the number of trips per day. Each column modifies Equation 2 to account for biases in the estimation of average treatment effect of foreign line driving on the joint profit variables. Column (1) presents the coefficients from β^F estimator in Equation 2 without randomization stratas fixed effects, identifying the raw sample average treatment effect of rerouting (SATE^{raw}). Column (2) presents the coefficients from β^F estimator identifying the sample average treatment effect with randomization stratas (SATE). Column (3) presents the coefficients from β^F estimator which include randomization stratas fixed effects and weights for the inverse propensity of treatment assignment, identifying the average treatment effect of rerouting (ATE). Columns (4) and (5) account for potential line composition imbalances in the assignment of home vs. foreign treatments. Column (4) presents the coefficients from β^F estimator, which additionally include line fixed effects (ATE^C). Column (5) presents the coefficients from β^F estimator, which additionally include the weights for the inverse propensity that a given line is in the set of foreign or home lines (PATE). Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. To re-weight the observations when estimating PATE, for each observation, we include the inverse of the probability that an observation is foreign or home, conditional on the specific line, and multiply it with the inverse of the probability that the randomly selected line appears as a home or a foreign line, given the sample of drivers and of lines in the experiment. This obtains propensity weights for home vs. foreign that produce the average treatment effect of driving home vs. foreign that is representative of all lines in the sample with equal weight. Appendix A4 provides a comprehensive discussion of the bias that would arise failing to include this probability, and how weighted OLS allows to produce unbiased estimates. Table A7 catalogs these empirical probabilities of lines appearing on the foreign line pools. Lines that are *home* for a given minibus can never appear as foreign for that minibus hence has probability zero. Importantly, the pool of foreign lines varies by minibus and that all lines are equally represented as home or as foreign line.

Table A10: Effect of Rerouting on Joint Profit, With and Without Each Type of Protection

A. by ACCO Third-Party Protection

	Joint Profit (per day)		Number of trips (per day)		Joint Profit (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-13.95^{***}	-3.26	-1.35^{***}	-0.62	-1.23^{**}	-0.65
	(4.81)	(5.91)	(0.47)	(0.60)	(0.61)	(0.63)
Mean Dep. Var.	21.66	22.76	8.02	8.49	2.88	3.1
Observations	88	79	91	85	697	698
R^2	0.53	0.47	0.40	0.41	0.40	0.27
Protection, ACCO Sticker	NO	YES	NO	YES	NO	YES

B. by Police Third-Party Protection

	Joint Profit (per day)		Number of trips (per day)		Joint Profit (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-12.82^{**}	-5.29	-1.28^{**}	-0.73	-1.22^{*}	-0.65
	(5.89)	(5.48)	(0.55)	(0.51)	(0.71)	(0.54)
Mean Dep. Var.	24.22	20.46	8.4	8.13	3.25	2.77
Observations	79	88	85	91	675	720
R^2	0.58	0.39	0.38	0.39	0.40	0.24
Protection, Police	NO	YES	NO	YES	NO	YES

Notes: This table presents the OLS estimates of β^{FNP} and β^{FP} from Equation 3, decomposed by: in Panel A, whether the driver-day was not assigned to third-party protection of type ACCO Driver's Association sticker (odd columns), or instead assigned to third-party protection of type ACCO Driver's Association sticker (even columns); in Panel B, whether the driver-day was not assigned to third-party police protection (odd columns), or instead assigned to third-party protection by the police (even columns). In both panels, the dependent variables are the joint profit per day in USD in Columns (1) and (2), the number of trips per day in Columns (3) and (4) and the joint profit per trip in Columns (5) and (6), respectively. Joint profit per trip is revenue minus operating cost per trip, where revenue is derived from number of passengers per trip times the average price each passenger pays per trip, and operating cost per trip is repair and gas cost per day divided by the number of trips per day. Police third-party protection combines police escort on the minibus and access to higher-level police. All regressions include controls for each non listed type of third-party protection, randomization strata fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure and to adjust for imbalance on foreign line composition. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

Table A11: Effect of Rerouting on Joint Profit, Decomposed by Type of Protection

A. by ACCO Third-Party Protection

	Joint Profit (per day)	Number of trips (per day)	Joint Profit (per trip)
	(1)	(2)	(3)
Foreign	-15.35^{***}	-1.46^{***}	-1.41^{**}
	(5.60)	(0.45)	(0.70)
Foreign * Protection, ACCO Sticker	14.87^{*}	1.18^{*}	1.25
	(7.72)	(0.65)	(1.01)
Mean Dep. Var.	22.76	8.49	3.1
Observations	167	176	1,395
R^2	0.34	0.28	0.21

B. by Police Third-Party Protection

	Joint Profit (per day)	Number of trips (per day)	Joint Profit (per trip)
	(1)	(2)	(3)
Foreign	-13.50^{**}	-1.24^{**}	-1.22
	(6.36)	(0.52)	(0.77)
Foreign * Protection, Police	9.49	0.64	0.80
	(8.18)	(0.64)	(1.04)
Mean Dep. Var.	20.46	8.13	2.77
Observations	167	176	1,395
R^2	0.33	0.26	0.21

Notes: This table presents the OLS estimates of β^{FNP} and β^{FP} from Equation 3, separately for whether the driver-day was assigned to third-party protection of type ACCO Driver's Association sticker (Panel A), whether the driver-day was assigned to third-party police protection (Panel B). In Column (1), the dependent variable is the joint profit per day in USD. The dependent variables in Columns (2), (3) are the number of trips per day and the joint profit per trip, respectively. Joint profit per trip is revenue minus operating cost per trip, where revenue is derived from number of passengers per trip times the average price each passenger pays per trip, and operating cost per trip is repair and gas cost per day divided by the number of trips per day. Police third-party protection combines police escort on the minibus and access to higher-level police. All regressions include controls for each non listed type of third-party protection, randomization strata fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure and to adjust for imbalance on foreign line composition. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

Figure A1: An *Esprit de Mort* Minibus

Notes: This image depicts an *Esprit de Mort* minibus in Kinshasa. **Source**: Emilio Noorani

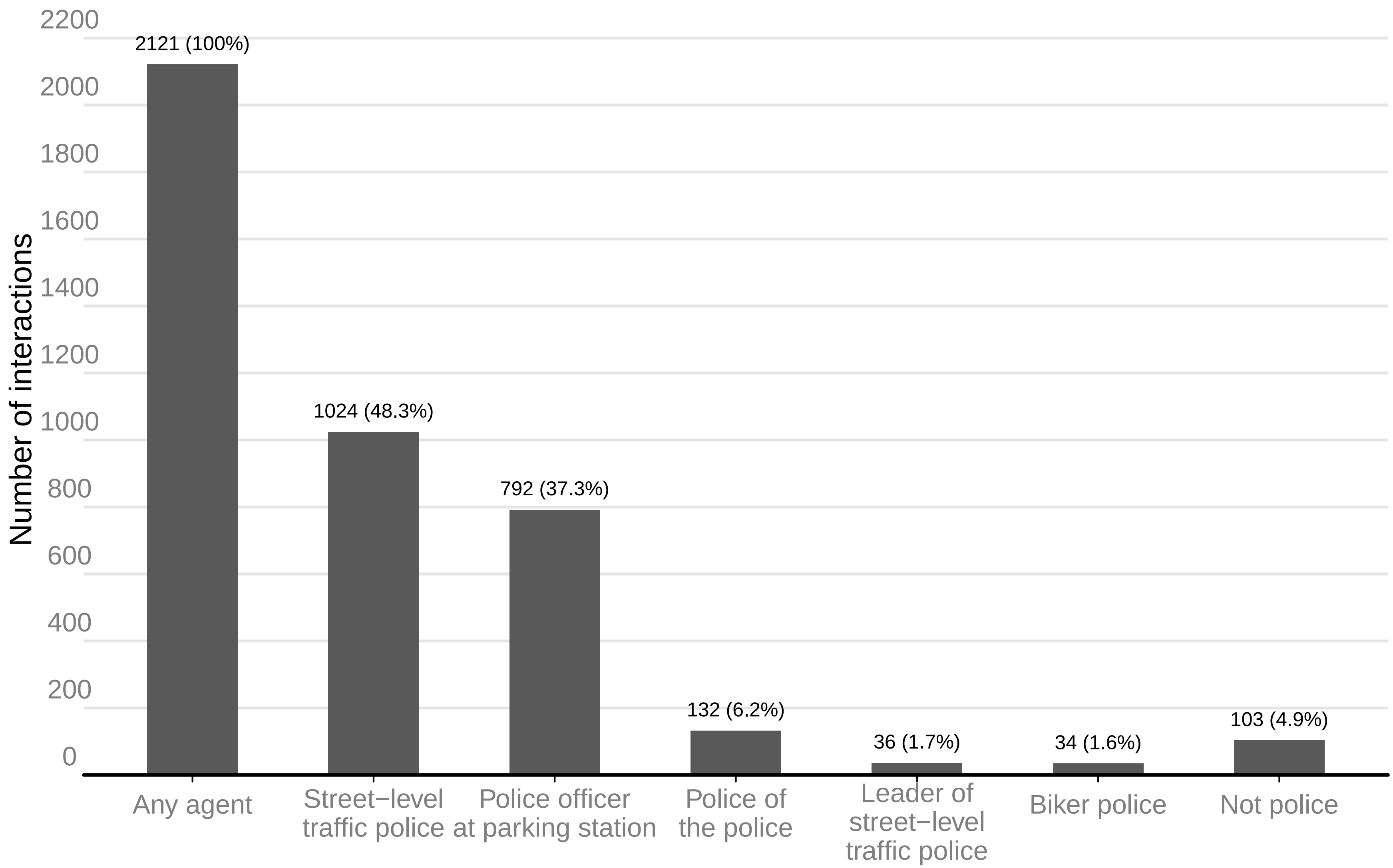
Figure A2: Negotiation bribes vs. *"Mbote ya Likasu"*

A. Negotiation bribes

B. Mbote ya Likasu (the toll fee)

Notes: Panel A depicts a common instance of a negotiation bribe. Source: Youtube Congo Avenir. Panel B depicts the *"Mbote ya Likasu"* handshake greeting between a driver and an intersection police officer, indicating a toll fee payment and signaling ongoing relationship. Source: Congo Durable

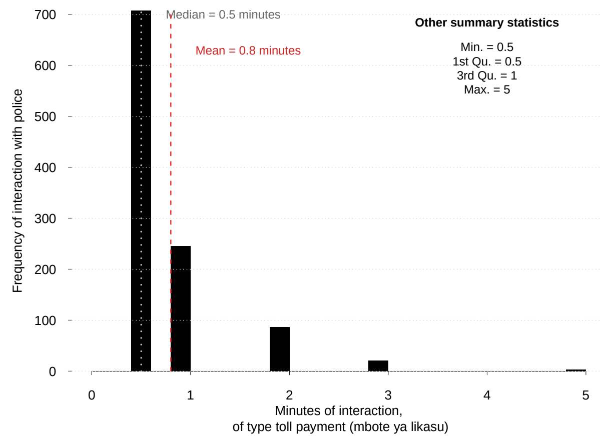
Figure A3: Interactions Between Drivers and State Officials in the Street, in Pre-Experimental Data



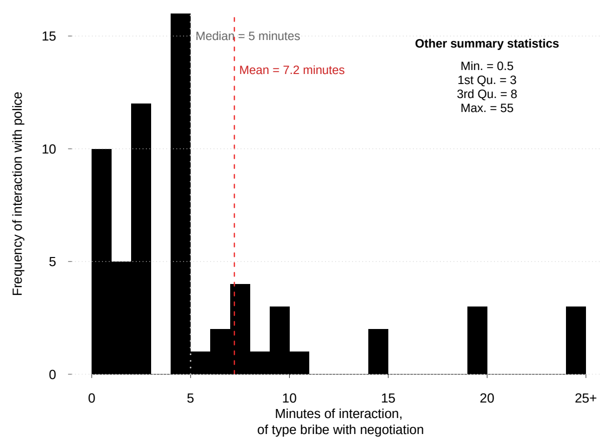
Notes: This figure presents the number (and corresponding fraction) of interactions between the driver and different types of agents when crossing an intersection on the home line. The figure is obtained from 15,426 crossings of an intersection from the pre-experimental data between June 19_{th} and July 20_{th} in the ten lines of the East Kinshasa network.. Not police includes City Transportation Agency, National Intelligence Agency, Congolese Army, and Congolese Army Elite Units. The different officers identified reflect the local knowledge of minibus drivers and data collectors based on the officers' badges and uniforms, which is entered as multiple choice survey questions on the SurveyCTO by the observer in the bus.

Figure A4: Time Waste per Bribe Transaction with Police, by Type of Interaction

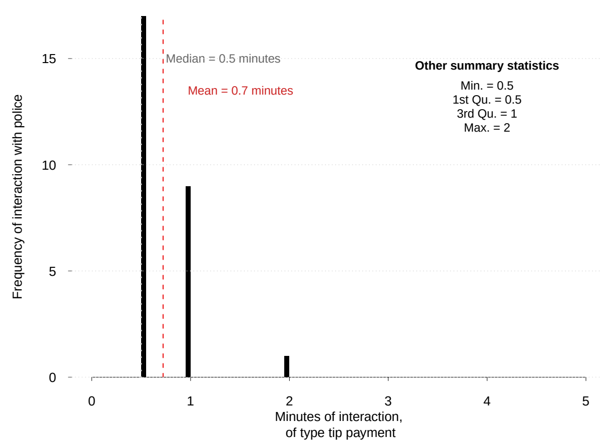
A. Toll Fee (Mbote ya Likasu)



B. Negotiation Bribe (incl. Police Station)

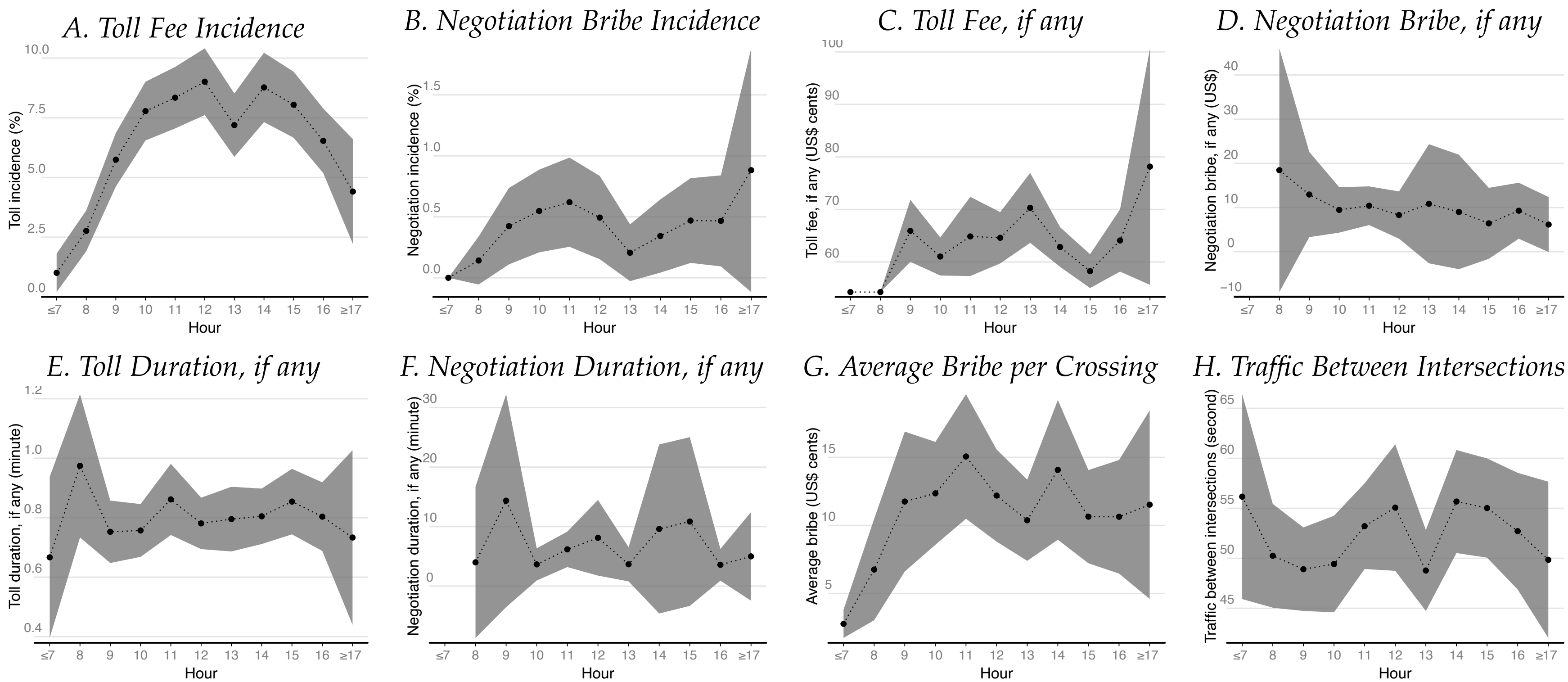


C. Tip



Notes: This figure presents the duration of time spent when drivers interact and pay bribes to the police officers on the home line from the pre-experimental data. These bribes are toll fee ("*mbote ya likasu*"), negotiation bribes (which include those paid at the intersection or at the police station), and tip. The classification is made by the observers in the buses, based on their local knowledge and on the strong cues associated with each different type of transaction.

Figure A5: Time Series of Bribe Costs and Time Waste per Crossing of an Intersection, by Hour

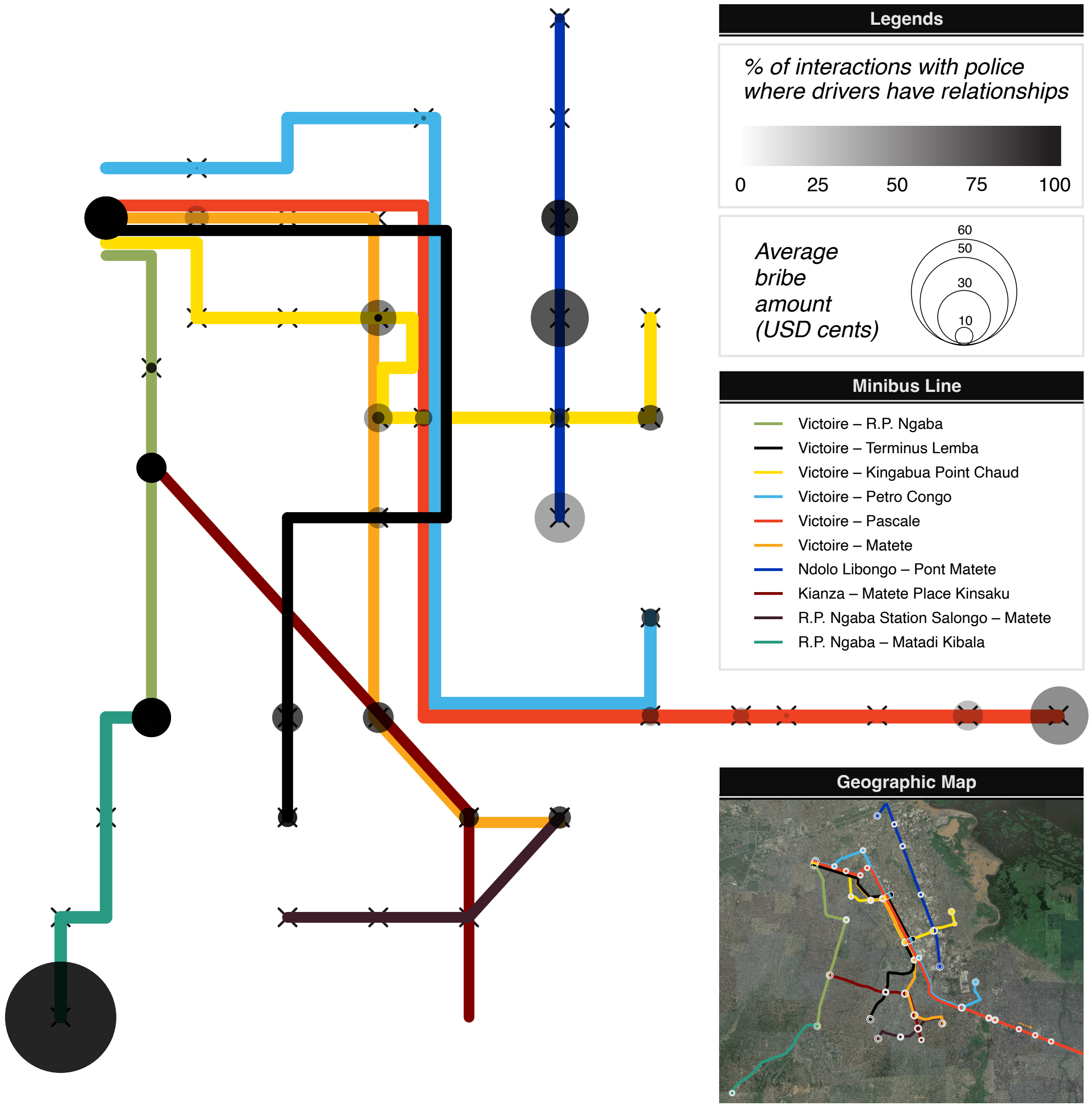


Notes: These time series plot the hourly average characteristics of the bribe costs of type toll fee ("*mbote ya likasu*") and negotiation bribe, and their associated time waste, per crossing an intersection, as well as their 95% confidence intervals. Panels A and B show the average incidence, panels C and D show the amount in USD conditional on paying, panels E and F show the duration in minutes conditional on paying, panel G shows the hourly average bribe amount per crossing an intersection, and finally panel H shows the hourly average duration of traffic between intersections. Data are obtained from the pre-experimental observations on the home lines.

Figure A6: The ACCO Sticker

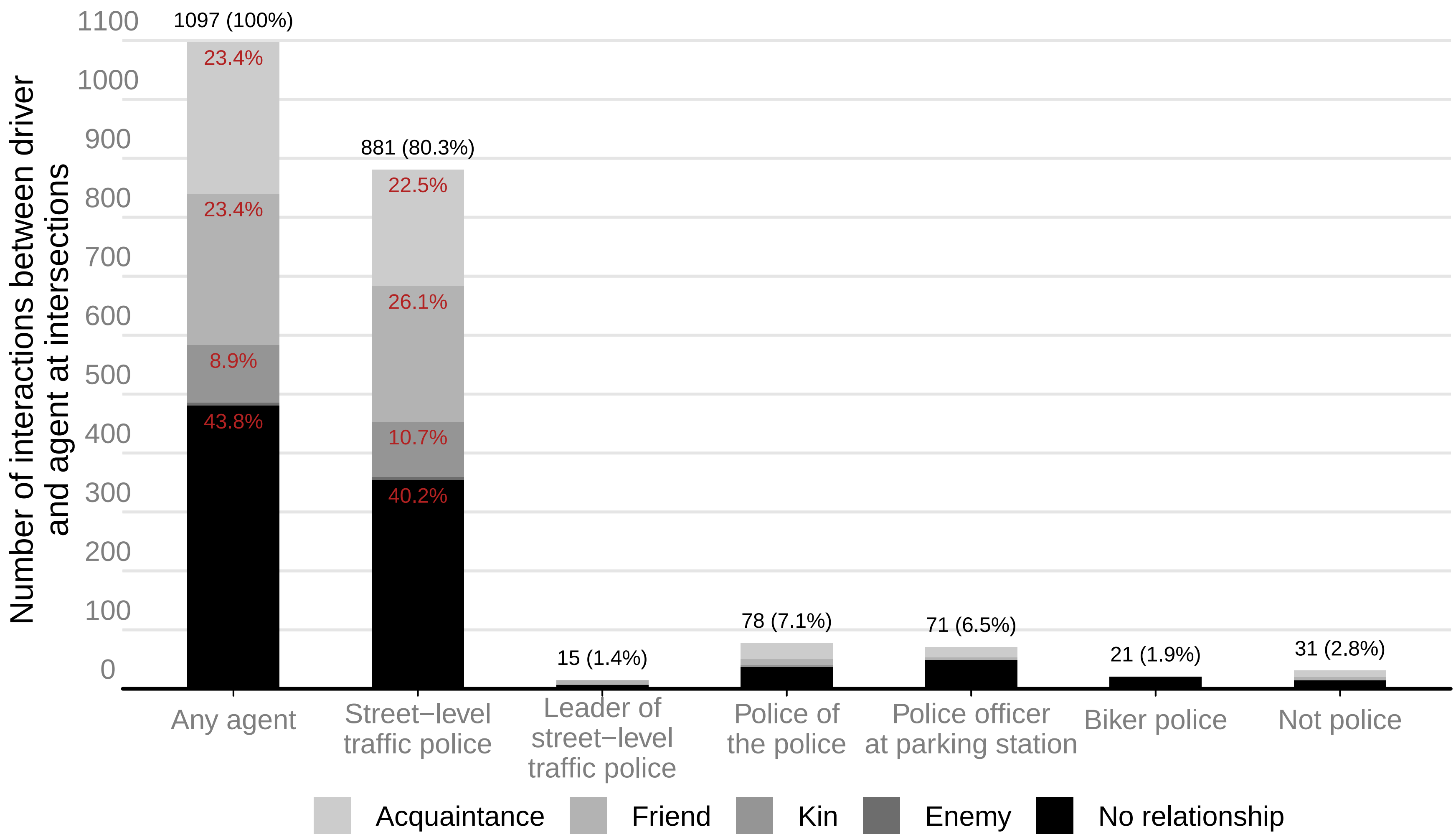
Notes: This figure presents an example of the sticker of the association of drivers of the Congo (ACCO). **Source**: Research team.

Figure A7: Schematic Map of the Minibus Network of Lines in Kinshasa



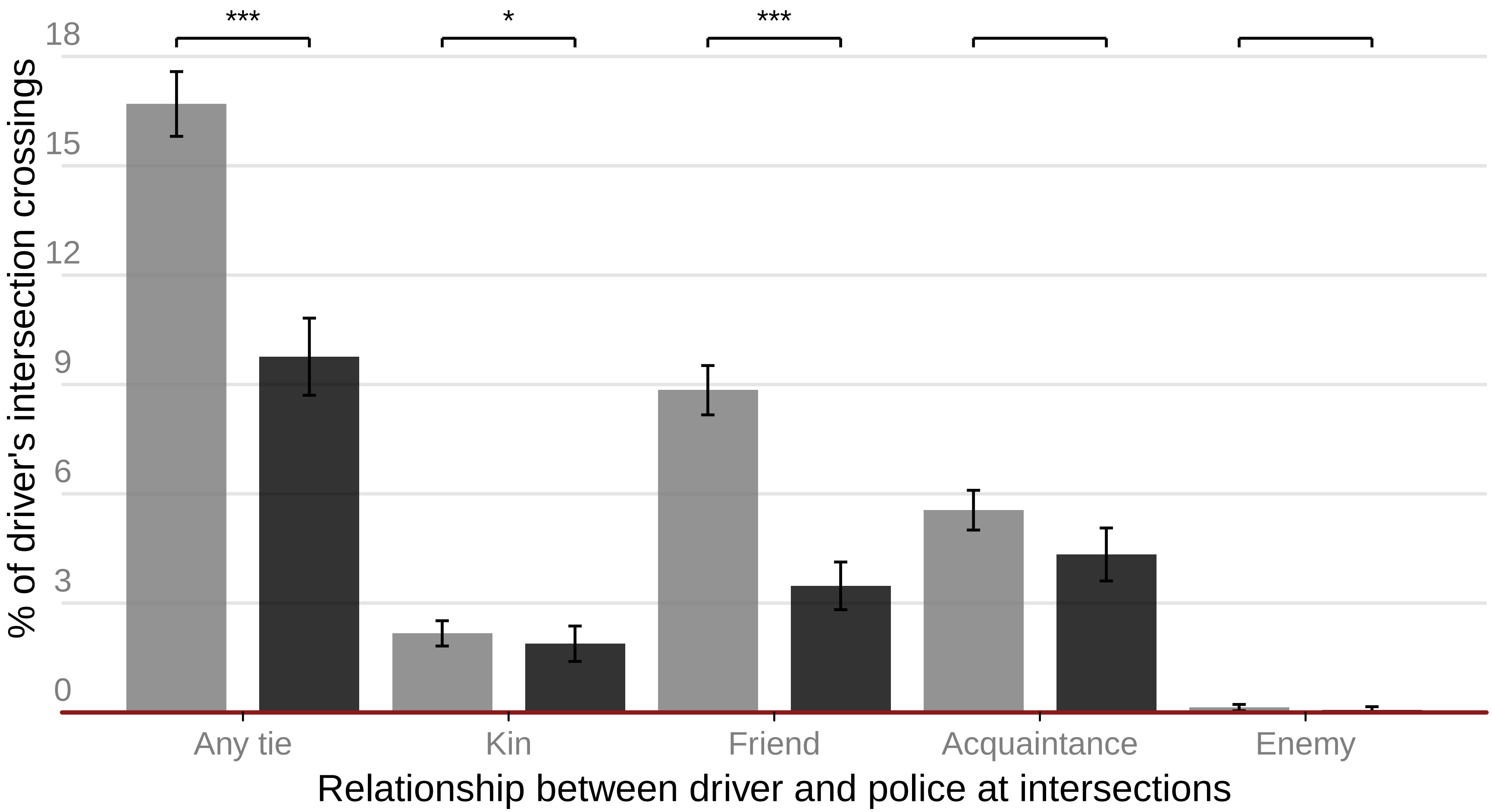
Notes: This figure represents, schematically, the lines through which "*Esprit de Mort*" minibuses pass, as well as: the percentage of interactions at which home line drivers reported having relationships with police, depicted as a gray scale with darkness proportional to the fraction of reported ties; the average amount of bribe that is paid by home line drivers in each intersection, depicted as circles with diameter proportional to the amount. Geographic proximity is preserved as much as possible in the schematic map.

Figure A8: Relationships Between Drivers and State Officials in the Street



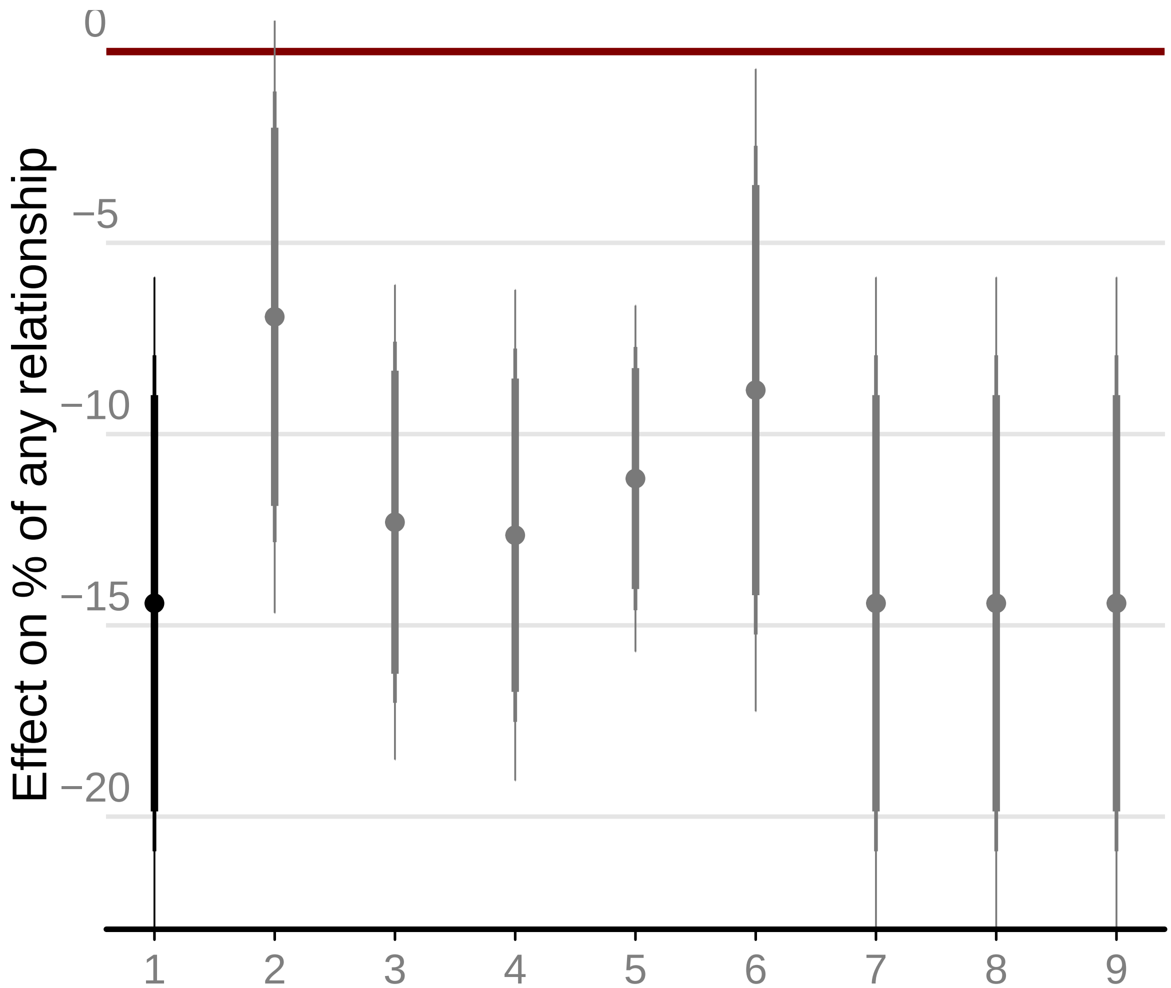
Notes: This figure presents the number (and corresponding fraction) of interactions between drivers and officers in which drivers have relationships with officers, obtained from interactions in driver's home lines in the experimental data. Each bar is decomposed into the type of relationship, stacked into the bar. The percentages reflect the proportion of interaction between driver and officers at the intersection for which the type of officers are described on the horizontal axis. The digits inside each bar segment describe the percentages of interactions with each agent for which drivers and officers have relationship described by the color in the legend. The figure is obtained from 1,097 interactions with officers in the experimental data. Not police includes City Transportation Agency, National Intelligence Agency, Congolese Army, and Congolese Army Elite Units. The different officers identified reflect the local knowledge of minibus drivers and data collectors based on badges and uniforms, which is then codified as multiple choice survey questions on the SurveyCTO.

Figure A9: Effect of Foreign Line rerouting on Relationship with Agents at Intersections, by Intersection Crossing



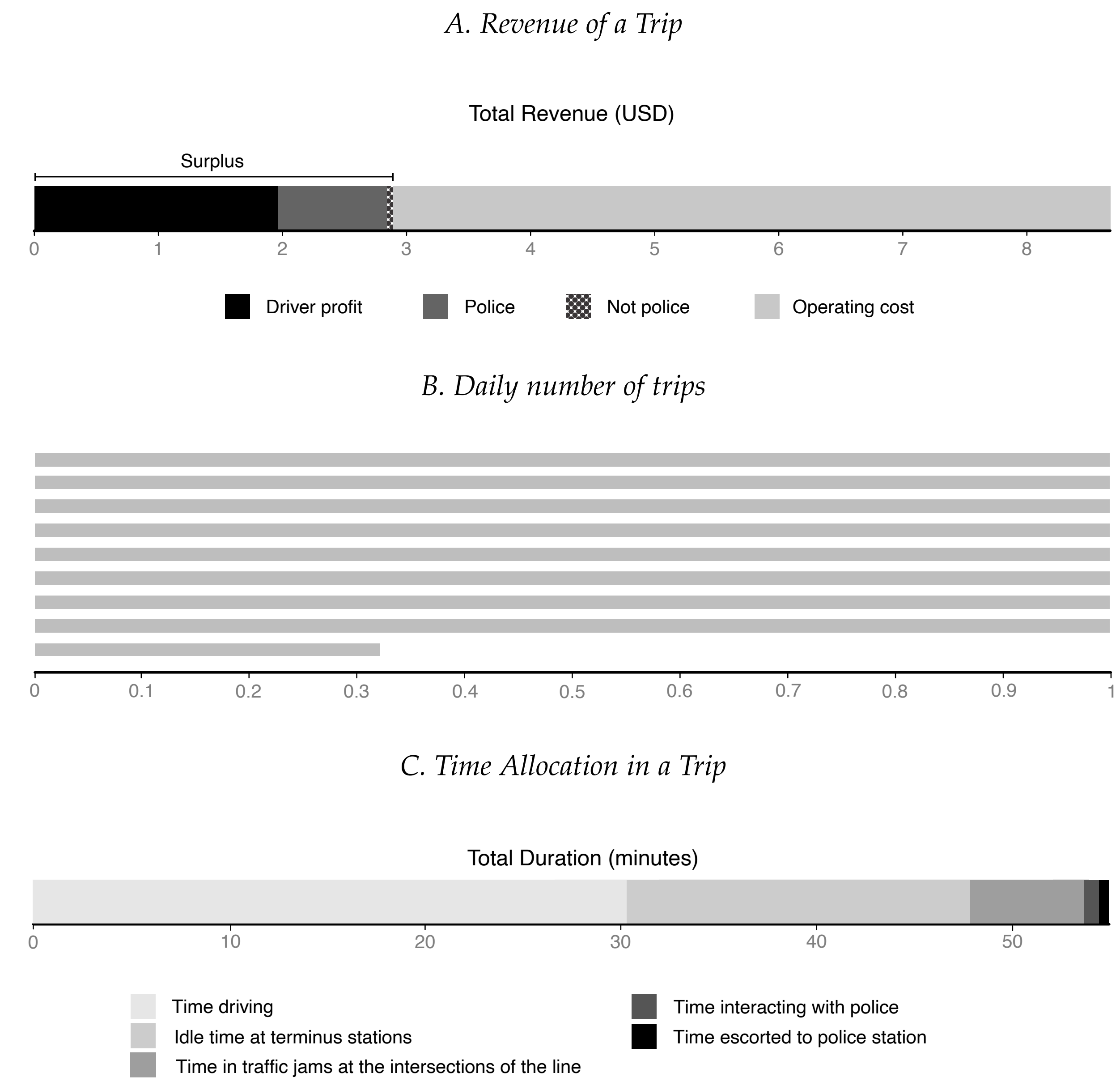
Notes: This figure presents the mean prevalence of social relationships between drivers and police officers at the intersections, expressed as the percentage of drivers' 6,774 crossings of an intersection on their usual "home line," and 3,022 intersection crossings on the "foreign line" on their first day of rerouting. The line segments represent 95% confidence intervals around the reported means. The asterisks report the segments of the p-value of the test for whether the fraction in the home line is different than that on the foreign line, for each relationship category: *** indicates that the p-value is equal or lower to .01, ** indicates that it is larger than .01 but lower than .05, and * indicates that it is larger than .05 but lower than .1. This test is implemented through OLS, by estimating β^F of Equation 1, with standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster; since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. Kin includes both nuclear and extended family relationships. Acquaintance category is different from friend category (*ami* in French) in two ways. First, in some cases, the drivers' directly reported acquaintance (*connaissance* in French). Second, we analyzed the content of the conversation between the driver and the officer, and were able to deduce whether the drivers and the officers were acquainted.

Figure A10: Effect of Rerouting to Foreign on Prevalence of Relationships—Robustness



Notes: This figure presents the plotted estimates of the estimates of β^F from Equation 1. The dependent variable is relationship (any tie) under various specifications of regression weights and controls. The line segments depict the 95% and 90% confidence intervals for the coefficient estimates. Specification key on the x-axis: (1) PATE, our main specification, which is the population average treatment effect, (2) Sample average treatment effect without randomization strata fixed effects, SATE^{raw}, (3) Sample average treatment effect, SATE, (4) Assignment probability adjusted sample average treatment effect, ATE, (5) Assignment probability adjusted sample average treatment effect with line fixed effects, ATE^C, (6) Assignment probability adjusted sample average treatment effect, ATE, without randomization strata fixed effects, (7) PATE for whose outliers in dependent variables are winsorized at 1%, (8) Specification 7, except at 5%, (9) Specification 7, except at 10%. Standard errors are clustered at the level of the *drivers' driving blocks*, which is the level of randomization into foreign vs. home driving, the randomization cluster. Since there are, by construction, 13 clusters for each minibus, the experiment randomizes 130 clusters, stratified by 10 randomization strata. To re-weight the observations when estimating PATE, for each observation, we include the inverse of the probability that an observation is foreign or home, conditional on the specific line, and multiply it with the inverse of the probability that the randomly selected line appears as a home or a foreign line, given the sample of drivers and of lines in the experiment. This obtains propensity weights for home vs. foreign that produce the average treatment effect of driving home vs. foreign that is representative of all lines in the sample with equal weight. Appendix A4 provides a comprehensive discussion of the bias that would arise failing to include this probability, and how weighted OLS allows to produce unbiased estimates. Table A7 catalogs these empirical probabilities of lines appearing on the foreign line pools. Lines that are *home* for a given minibus can never appear as foreign for that minibus hence has probability zero. Importantly, the pool of foreign lines varies by minibus and that all lines are equally represented as home or as foreign line.

Figure A11: Trip Characteristics



Notes: This figure presents the allocation of joint profit and time from an average trip from drivers on the home line of the experimental data. Panel A breaks down the driver's revenue from passenger's payment of minibus tickets into joint profit and operating cost. Panel B depicts a progress bar of the number of round trips conducted in a day. Panel C breaks down the duration of each trip into 30.8 minutes driving, 5.9 minutes waiting in traffic jams at intersections, and 17.8 minutes idle at parking terminus, 1.7 minutes of interaction with police, and 0.5 minutes on average of total driver-trips on the home line being escorted to police station.