ON THE GOVERNANCE OF CORRUPT EXCHANGE: HOW CITIZENS AND OFFICIALS BUILD SOCIAL TIES TO REDUCE CORRUPTION'S TRANSACTION COSTS*

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ABSTRACT: This article provides evidence from the Congo that social relationships with state officials can decrease one social cost of corruption, in the context of public transport. We first document that police stops can lead to long bribe negotiations. In response, some drivers and officers have built relationships, allowing the drivers to take actions to attract passengers and negotiate passenger prices without the risk of being stopped, simply paying an unofficial set toll fee to the officers. We then examine a field experiment that re-routes drivers in randomly selected days to lines on which they do not have such ties. Re-routing *decreases* the surplus from driving (revenue minus repairs and gas). We cross-randomize third-party protection of the driver against police stops using existing common practices. The reduction of the surplus from re-routing is entirely driven by re-routing days in which the driver does not have such protection, thus the effect of re-routing is explained by driver-police interactions. We cross-randomize the time horizon of re-routing. When they expect to be re-routed only one day, drivers accept lower passenger prices and obtain less passengers, which leads to lower surplus, consistent with them trying to avoid detection by the officers. When they expect to be re-routed various days, drivers spend time negotiating with the officers and pay large bribes, destroying the surplus further, but yielding new relationships and higher revenue within three days. The findings suggest that relationships with state officials can form fast to reduce the transaction costs of the corrupt transaction and that these can amount to a very large social cost. **Keywords**: Corruption, transaction costs, relational contracts. **JEL Codes:** D23, D73, D74

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1. Introduction

Aiming to improve the capacity of the government to control its bureaucracy, governments have regularly resorted to rotating state officials (Greif, 2008). The purported rationale for rotating state officials is that, in the absence of rotation, repeated interaction between state officials and citizens might enable the formation of relational contracts between the citizen and the state official (Baker, Gibbons, and Murphy, 2002), where they collude against the government (Tirole, 1986). The social costs of these relations could be large in situations in which official-citizen collusion might induce mis-allocation of government resources (Banerjee, Mullainathan, and Hanna, 2012).

However, the existence of repeated interaction, and relationships, between state officials and citizens can also be productive—even in the context of corruption. For example, relationships could reduce the *transaction costs* inherent in the corrupt transaction. If these costs are large, relationships could potentially even increase the efficiency of corruption, if the social costs arising from the mis-allocation they induce are not too large in comparison. This could be the case if corruption is inelastic to the costs of transacting with state officials, or when corruption induces relatively low mis-allocation. The possibility that relationships in corruption can be productive was first proposed by sociologists and anthropologists, who suggest that corruption, like any other transactions, is "*embedded*" in social relationships (Polanyi, 1944, Granovetter, 1985). A challenge to examine the benefits of relationships with state officials is that relationships form endogenously and are difficult to observe without insiders. As a result, we have little evidence today.

In this paper, we induced randomness in whether public transport drivers have social relationships with traffic police officers on the line on which they drive, in the Democratic Republic of the Congo (DRC)'s capital, Kinshasa, to answer the following questions. What is the effect of relationships between citizens and enforcers on the *feasibility* and *surplus* from corruption? *How* and *how quickly* do these relationships form?

This setting was well-suited to examine the role of social relationships in corruption. First, public transport was privately provided through 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 shake-down 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 of 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 (67 cents in Dollars of 2015) once per day to each team of officers through a handshake. Not being in the system meant also corruption, but with the usual costs from lengthy negotiation.

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 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 13.1% are amicable conversations without payments. The toll fee was a set amount equal to 53 cents in Dollars of 2015 (500 Congolese Francs), involving less than 40 seconds of interaction with the officer on average, against 7 minutes for negotiation bribes.

The second key input into our analysis is a randomized experiment covering the minibus lines of the entire distribution network of East Kinshasa. Drawing on relationships we had built with minibus drivers and the national association of drivers (*Association des Chauffeurs du Congo*, henceforth, *ACCO*), we provided a randomized encouragement 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 *minibus-days* to their corresponding home or foreign lines within minibus strata across days. In randomly selected blocks of contiguous days (henceforth, *driving blocks*), minibuses were re-routed away from their home lines to randomly selected lines on which they did not have relationships. In the rest of driving blocks, they drove on their home lines. 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, *surplus*). Second, we separately identify what share of this effect arises from the driver's expected interaction with the officers on the street. To do so, we take inspiration from the practice commonly used by private drivers, in which third-parties (high-ranked officers) intervene in negotiations with officers on the street. Interventions by well-connected third-parties were believed to ensure that the driver could be left alone. Assistance from ACCO allowed us to leverage connections with high-ranked officers and consequently to extend protection by third-parties 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 re-routed driving blocks. In some blocks, the driver was rerouted for 3 consecutive days; in others, for 1 day. This allows us to separately estimate, on the first day of a driving block, the effect of re-routing when the time horizon of the re-routing is short vs. long.

The analysis of our randomized experiment yields three results. First, re-routing is associated with lower prevalence of relationships between the drivers and the officers, especially friendship, and lower surplus. While the drivers and the police officers with whom they interact have social ties in 56.2% of interactions on home lines, they only do in 29.9% of interactions when re-routed. Surplus is 43.3% lower. For both outcomes, the difference is statistically significant at conventional levels. Second, the effect of re-routing on driving surplus is driven by days on which the driver was *not* assigned third-party protection. This suggests that the effect of re-routing on the surplus 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 re-routing. Third, when they do *not* have relationships with the officers on the street, drivers have weaker bargaining power over passengers, and invest in new relationships when the horizon is long. To guide the empirical results from the randomization into long- and short-term driving, we present a simple two-period decision-theoretic model. In the model, a driver can choose to provide productive 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. The driver chooses whether to enter into a contractual agreement with the police officer at some down-payment and time cost to acquire a relationship which allows the driver to drive every period without risking being detained, nor wasting time negotiating for a bribe. In any period without a relationship, if driving with a short horizon, the driver provides low effort to reduce the risk of being detected by the police; if time horizon is long, the driver spends time and bribes, negotiating to acquire a new relationship. With a relationship, the driving surplus is larger than without. Consistent with this simple model, we find that:

a. short-term re-routing decreases surplus by decreasing the surplus per trip through passenger prices, and halves bribe costs. These results corroborate the interpretation that drivers in short-term re-routing are less patient when negotiating prices with passengers because time negotiating exposes them to the risk of being detained by the police.

b. long-term re-routing decreases the surplus by decreasing the trips per day, but increases bribe costs by 60%. This suggests that, while they can choose to cut effort and raise surplus, drivers on foreign lines invest in creating new ties when the horizon is long. Indeed, within three days of a long re-routing, drivers have built new ties at rates comparable to those on home lines, and the number of trips per day and profits catch up. This confirms the formation of new profitable relationships with the officers.

We combine these results to quantify the value of relationships. Short-term re-routing decreases the surplus (from 24 to 9 USD), only if the driver was *not* assigned third-party protection. Conversely, third-party protection in long-term re-routing is less relevant because the driver's choice of whether to incur a productive effort and how to negotiate is guided by the potential of forming new relationships with the officers. The value of this destruction of surplus is an investment in relationship. Our estimates imply that relationships with the officers increase the surplus by 280% from \$9 to \$24 per day.

Our study complements the literature on bureaucratic corruption in economics by suggesting that the governance of corrupt transactions matters. While the literature has taken their governance as given in order to focus on their implications for society (Olken and Barron, 2009, Shleifer and Vishny, 1993, Bertrand, Djankov, Hanna, and Mullainathan, 2007, Banerjee et al., 2012), this study shows that relationships increase the surplus shared by the parties who take part in the corrupt transaction and reduce its transaction costs. Focusing on a context of extortion where corruption can happen with or without relationships, this study shows that social institutions, and not impersonal market institutions alone, are critical for determining the social cost of corruption.

Our findings emphasize that corrupt transactions are embedded in social institutions. An established literature in anthropology has argued that economic practices in general, and corrupt transactions in particular, are embedded in social institutions (Granovetter, 1985, Olivier de Sardan, 1999). While related ideas were proposed in economics theoretically (Rose-Ackerman, 1999, Dixit, 2004), our study is the first to empirically isolate and quantify the role of social relationships in factors relevant to the spread of corruption.

These findings further emphasize that informal relationships between the agents of the state and the citizens are important to determine how policy is implemented (Sánchez de la Sierra, 2021, Pepinsky, Pierskalla, and Sacks, 2017). In our context, social relationships form the basis of a "*real governance*" that has, at least, some productive functions (Titeca and de Herdt, 2011). The role of relationships in the very operation of the state challenge applications of "Weberian" conceptions of the state as an autonomous and professionalized bureaucracy.

Our discovery also has new implications for policy. Governments across the world and in history have tried to design rotation systems to make collusion between the state officials who are supposed to implement their policy and the people harder (Greif, 2008). The speed of relationship formation is an important parameter. Because relationships that govern corruption can form quickly, our results imply that the optimal speed of rotation could be much higher than that traditionally assumed by governments attempting to design a bureaucracy. Over and above that, given the large transaction costs we have documented, attempting to delay the creation of relationships between corrupt enforcers and citizens not only could be hopeless, but also socially costly.

2. Background: The Passenger Transportation Sector in Kinshasa

The transportation system of Kinshasa in 2015 was privately operated by minibuses. The minibuses, most of which were of make *Mercedes 207* and which could transport 12 passengers in theory, were commonly called the *Spirit of Death* ("*Esprit de Mort*", in French).[1] The minibuses owed their ironic name to the dangers of traveling 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 loaded more than 20 passengers.[2] Low cost repairs predominated. Although many vehicles in Kinshasa had technical problems, this is especially true for the *Esprit de Mort* minibuses.

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 pre-established 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 crucially on attracting and negotiating with the passengers, and on the interaction with the police. First, to attract passengers, the driver usually shouted the direction and waited for passengers at key intersections. While there existed ride prices considered fair, there was a wide leeway for drivers to negotiate the level, depending on their respective patience. Second, if an officer 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. 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 sometimes 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. As a result of being in violation of various regulations, *Esprits de Mort* were particularly vulnerable to being detained for a negotiation.

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

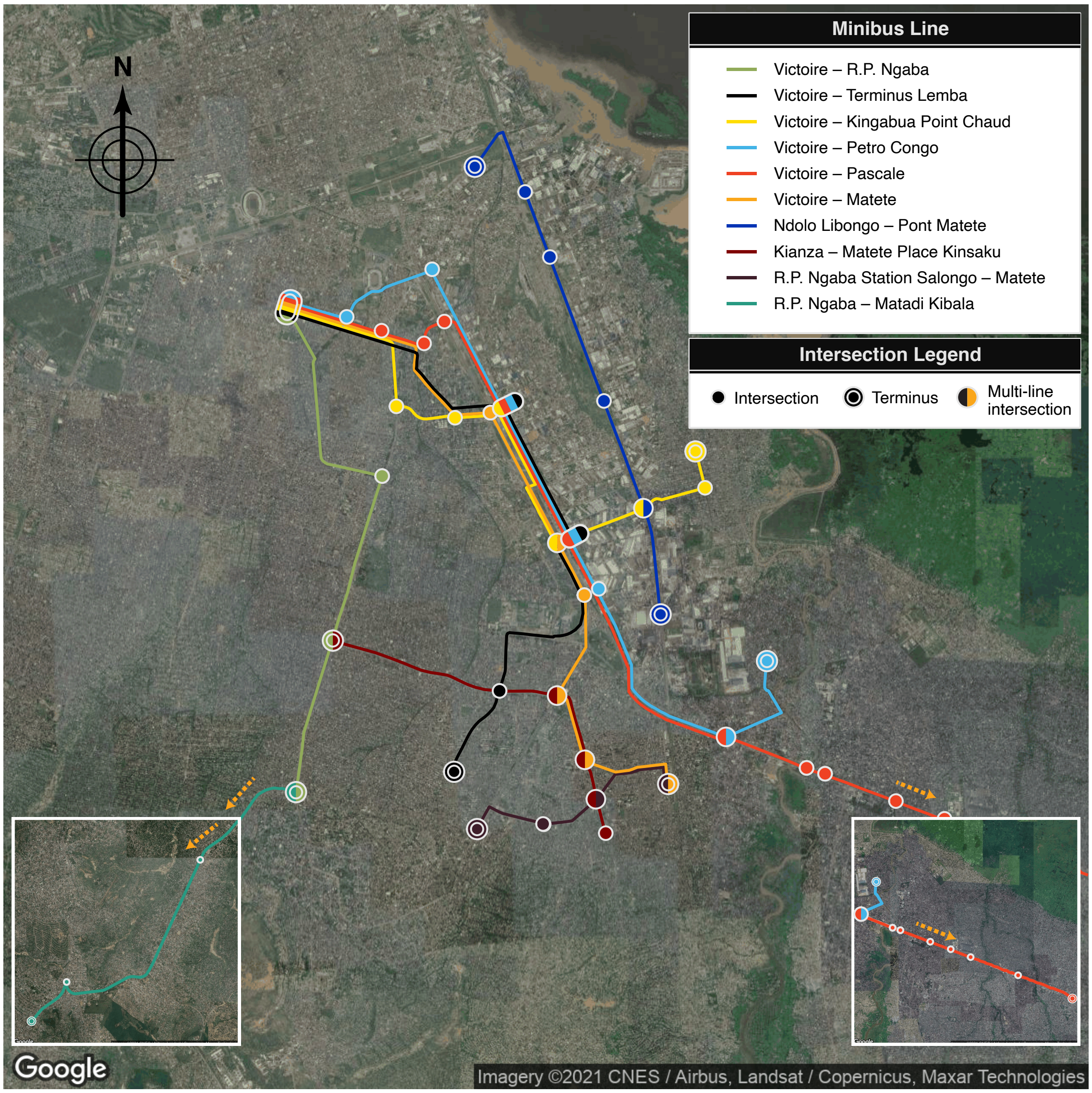
[2] This made them among the oldest in sub-Saharan Africa (Tchanche, 2019).

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

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

This implied that time spent at an intersection negotiating with the passengers for the price of a ride or trying to attract passengers exposed the drivers to the risk of being detected by police officers stationed there, and losing significant 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.

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).

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 (67 US cents in Francs 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. *Mbote ya Likasu* was paid through a quick handshake:

> "*The Mbote ya Likasu is money that the driver gives the officer as the officer's right. He who doesn't give will be shaken. If you do not give, you really don't want to return with your mbote.*" **Source**: Project meeting notes of July 18th 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 driver 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 arrested because he is known. Here I am new. It is easy for me to get arrested.*"
> **Source**: Project meeting notes of July 10th 2015.

> "*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 particular officer who helped him buy the land with the street-level officer: he gave him 5,000 Congolese Francs... if Esprit de Mort go to battalion when arrested, they go to Kin West, a place very, very far!* " **Source**: 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.

We now present stylized facts about bribery in the system.

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

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 between June 19th and July 20th in the ten lines of the East Kinshasa network.[6] 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 repeatedly driving through 49 unique intersections.

Figure 2 presents the type of interactions between the drivers and the police officers.[7] 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%).

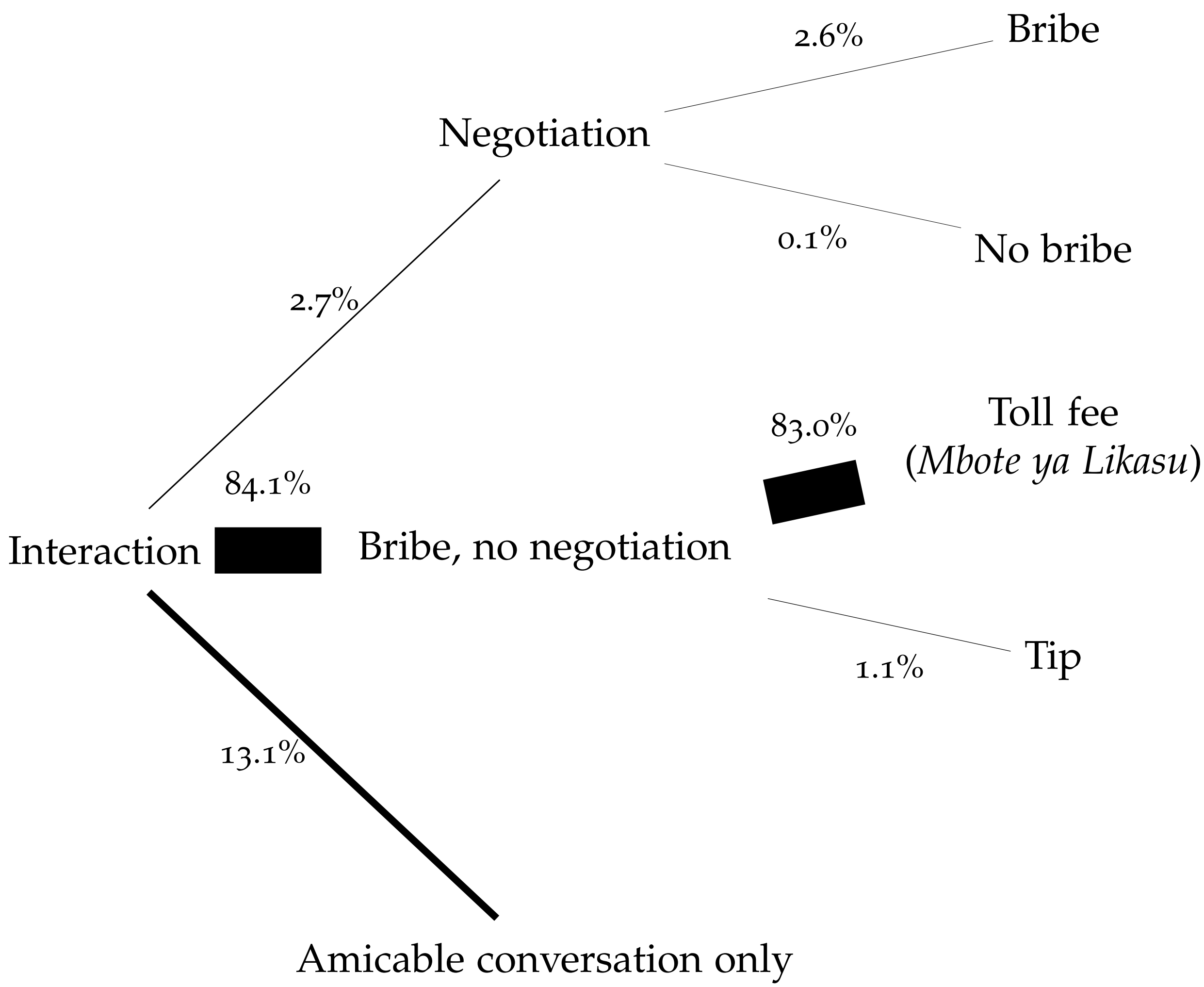
Table I, Panel (a), presents basic facts about the toll fee level vs. other types of bribes in these interactions. The toll fee is the smallest of all bribe payments, amounting to .53 USD on average. In contrast, the mean negotiation bribe payment is 9.79 USD. The toll fee is also extremely stable: while the toll fee standard deviation is .32, that of negotiation bribes is 7.05, suggesting enormous heterogeneity given that per capita income is around 1 USD per day.[8] 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

[6]To collect the data for this section, every day, data collectors were dispatched to the 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. 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.

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

[8]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.

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 19th and July 20th, 2015, in a tree diagram. 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 (1)	*S.D.* (2)	*Min* (3)	*Max* (4)	*N* (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 (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	0.36	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 (1)	*S.D.* (2)	*Min* (3)	*Max* (4)	*N* (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 19th and July 20th, 2015 observed in the drivers' 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 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.

average, 7 minutes and can take up to 55 minutes.[9]

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 54 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. These simple numbers suggest that the drivers have significant leeway to take actions that can result in different prices and number of passengers (such as negotiating, or shouting and waiting at an intersection for passengers to join). As Section 2 has suggested based on qualitative interviews. Yet, the risk of being stopped by the police may be an important determinant in those choices, and hence in the surplus generated from driving. We examine this possibility in the subsequent sections.[10]

4. The Experiment

In this section, we present our experimental design of the re-routing treatment, the assignment procedure, its implementation, and the measurement of minibus outcomes. We also present a cross-randomizing treatment which isolates the role of relationships

[9]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.

[10]The collection of these pre-experimental data was done in order to investigate the economic and social rationale of the home line and toll fee system, prior to developing the hypotheses for the experiment that follows (which was conducted one month after). These data do not contain information on relationships, nor on price and passengers, because the hypothesis for the experiment, which was conducted after this data collection, was formulated as a result of the qualitative interviews of the team during the collection of these pre-experimental data as well as the analysis of this pre-experimental data. Upon formulating the hypothesis, the experiment that we describe in what follows was designed so that we collect data on relationships, passengers, and prices.

in the effect of re-routing. We conducted the experiment in August and September 2015, over 27 days. We randomly re-routed the minibuses within minibus driver across days.

A. *Re-Routing to Foreign Lines*

Drivers had a set of lines they feasibly drove through because on these lines, they typically had relationships with police officers at the intersections, which allow them to drive without making negative profit (*home lines*). In the rest of lines, drivers do not have relationships, and it was very rare at the start of the experiment that any driver would venture into these lines (*foreign lines*).

The re-routing treatment consisted of an encouragement for drivers to drive through lines considered "foreign lines" for a block of contiguous days. To determine which lines were home and foreign for each driver, we organized meetings with the drivers. Those meetings were organized prior to revealing the details of the experiment, so as to ensure that the drivers were not given an incentive to mis-report what lines are foreign for each. On average, drivers had 1.3 lines which they considered home, and 8.1 lines, foreign.

The randomization procedure was within minibus as follows.

First, we randomly partitioned each driver's 27 days into a sequence of thirteen blocks of contiguous days (henceforth, "*driving blocks*"). Driving blocks varied in duration, with some blocks consisting of three contiguous days, and other consisting only in one day. Each driver had the same menu of nine three-day driving blocks and four one-day driving block (Table A3).

Second, we randomly assigned six blocks to driving on a home line, and the remaining seven to driving on a foreign line. The assignment to home vs. foreign was at the level of the driving block, hence all the contiguous days in each block had the same status.

Third, we randomly selected which specific foreign lines drivers were to re-route, so that within each driving block, drivers only drove the contiguous days in one foreign line. For each driving block assigned to foreign, we randomly selected a separate line among the set of foreign lines available to the driver. In driving blocks assigned to home, drivers were asked to drive on the their main lines.[11]

The experiment of foreign line re-routing was thus of a stratified clustered randomization design. We stratified the randomization by minibus driver, ensuring perfect balance between foreign and home driving blocks. Because the assignment to home vs. foreign was made at the level of the driver's driving block, minibus drivers are the randomization blocks, and their driving blocks are the randomization clusters.

We negotiated the level of a compensation if and only if drivers *take part* in the experiment. 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. The compensation was identical 500 USD for each driver and withheld until the experiment's completion.[12] At the end of the study, drivers withdrew the remaining funds.[13]

To ensure compliance with the treatment schedule, we created a driving plan for each driver, printed in the form of calendars. For each driver, the plan showed what unique home or foreign line to drive each day. All the project staff had the driving plans and verified daily whether the drivers were in their allocated lines.

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

To expel other effects of driving on a foreign line and therefore isolate the effect of foreign driving stemming only from the interaction between the driver and the police officers, we randomly cross-randomized and assigned third-party protection to the drivers.

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[11]The number of lines for foreign treatment was 10, and the number of lines used for home treatment was the same 10. That is, there was perfect overlap. For each minibus driver, the number of foreign lines available to him was 6 to 7. All drivers had a main line even if they were able to drive in some other home lines. Each minibus drove a different home line.

[12]Reflecting time inconsistent preferences or re-distribution, the drivers requested the research team to keep the 500 USD in a driver-specific savings account that the drivers could not access. Drivers kept the right to request from the account sporadically if there were severe needs of cash. This happened a minimal number of times, for example after a few drivers were detained and escorted to the police station.

[13]The prior negotiation of the compensation prevented violation of drivers' participation constraint. All drivers expressed enthusiasm for the study, reflecting their making gains on net. As researchers kept the funds, and as each driver was accompanied with a data collector, drivers had no incentive to violate the encouragement to re-route, lest them lose the compensation. We detail data collection in Appendix §1-3.

Background to the Third-Party Protection Treatment

Since the 1970s, resources for African civil servants declined; civil servants had to "*fend for themselves*" by using their state position to secure other sources of revenue ("*informal privatization*") leading to personalization strategies all over Africa (Blundo (2006)).[14] True particularly in the DRC, state positions were "privatized" for the drawing of "*personal benefits ... from the appropriation of public office*" (Lemarchand, 1988). The state continued to hire civil servants but assumed they would (in the words of President Mobutu) "*steal cleverly*" (Titeca and de Herdt, 2011).[15] This also applies to the traffic police agency.

At all levels of the hierarchy, police officers offer their protection for money. The driver calls his protector and communicates this protection in the negotiations with street-level 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.[16] Colonels, captains, majors, agents, provided protection for a known fee.[17]

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. The power of these officers stems from their own relationships with their own "protectors" in the hierarchy.

Treatment Definition, Assignment, and Implementation

Against the backdrop of this market for third-party protection did we provide to each driver on randomly selected days, a portfolio of actors representing various types of protection. To extend third-party protection to the drivers, the Congolese members of our team identified the set of high-ranked police officers who regularly offered their protection, and a set of street-level police officers with whom we had previously established

[14] See also Schatzberg (1991), Boyle (1995), Lemarchand (2001).

[15] "*All the state's usual attributes have been influenced by informal privatisation ... public officials have taken over the customary functions and prerogatives of the state, selling their services to their 'customers'* " (Petit and Mutambwa, 2005): 467.

[16] The following description illustrates the role of social relationships with powerful individuals, third-party protection relationships, to influence the allocation of the surplus: *"The police stopped a motorbike yesterday. The agent and a soldier who owned a motorbike quarreled over the motorbike. The soldier said 'tomorrow you'll see what I do, I will come back!' The soldier came today with a jeep, heavily armed. They arrested the agent in front of everyone. They threw him in the jeep in front of everyone! The other agent wanted to intervene. The soldiers said: if you intervene, we will shoot; they were almost going to shoot! The agent fled. The soldiers left with the agent, and they are going to beat him up."*

[17] Monthly fees for high-ranked protection sold privately range from 100 to 500 USD.

relationships in a previous study.[18] We also worked with 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 of the ACCO stickers we printed for the study.[19]

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-ranked officers or street-level police officers) as well as 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, we randomly assigned the type of police protection, within the set of minibus days that were assigned to police third-party protection. In a first step, we randomly assigned either high-ranked 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-ranked 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-ranked-protected days, always within minibus driving blocks.

Third, we randomly allocated days of ACCO sticker protection stratifying by minibus-driving block-protection status as follows. Each of the two days in the three-day driving blocks which 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

[18]Involvement of the non-Congolese members would have triggered expectations of high payment and extortion. Our design thus uses existing fees in an already existing market for protection.

[19]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 all asked to keep the sticker at the end of the study.[20]

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 data collector. They collected driver outcome data and were supervised by a project coordinator, and audited by an auditor.

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-ranked protector to be used in case of need. Project coordinator warned drivers that they would not be protected outside their randomly assigned protection days.

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 appeared as protected that day, they implemented the "intervention" over the phone with the officer negotiating with the driver. If they received a phone call by a driver who was not protected that day, project coordinator instructed them to ignore it.

To ensure compliance with the treatments, each of driver's project implementer had the following tasks. First, between 4 and 5 am, the implementers met with the police officers who worked as police escorts. Second, each implementer met each driver at

[20]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 mini-bus; b. unlike other third-party protectors, captain treatment was expected to only be effective in a small sub-set 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 intervntion 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 assignment to captain protection as a control.

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

We use the (inverse of the) corresponding treatment assignment probabilities implied by the randomization procedure as observation weights in each specification when estimating each treatment, and include indicators for each treatment as controls.[21]

C. *Cross-Randomization: Time Horizon of Re-Routing*

The design of driving blocks also generates experimental variation in the time-horizon of the re-routing. We do so to examine whether longer-horizon of re-routing 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 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 was also done blocking by three-day set of blocks, and by one-day set of blocks.[22] If three days were a sufficiently long horizon for drivers to deem creating a new relationship worthwhile, the effect of re-routing should be heterogeneous by whether their relationship time horizon is over 1 or 3 days.

[21] Table A5 presents the randomization balance for the foreign line re-routing and the various types of protection. By design, assignment to foreign line re-routing is balanced, while assignment to any type of third-party protection is almost balanced. For this reason, the appropriate specification will include randomization blocks (minibus) fixed effects. While the foreign line re-routing is balanced across minibus by design, it may not be across days. Table A4 presents the randomization balance of this treatment across days. These are indicator variables for the day of week, and indicator variables for whether the observation is in August, and whether it is in September. The characteristics summarized in Table A4 appear balanced across the treatment groups.

[22] Including this additional randomization block as fixed effects is inconsequential for the estimation.

D. *Sample Characteristics*

The data we gathered contain information of 13,092 events in which a driver crosses an intersection. These events are obtained from 1,935 trips, which drivers took in the study. Of the 13,092 events of crossing an intersection, we observe 1,682 payments from drivers to the police officers, 1,514 of which are toll fee payments, 62 are tips, and 97 are negotiation bribes resolved as a payment of a bribe on the street. There were 9 are negotiation bribes resolved as a payment of a bribe in the police station, which made up the observed 38 events of escorts to the police station, and the remaining 29 of which ended without the payment of a bribe. The number of unique officers interacting with the drivers that underpins this total is 344, of which 296 are street level traffic police officers, 26 are ACCO agents, and 22 are other state officials. The drivers perform 8 trips on average per day, amounting to 4 round-trips returning to their starting termini. On average, a trip has on average 6.5 intersections and lasts 50.9 minutes.[23] 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 Re-Routing on Relationships and on Driving Surplus

We now analyze how re-routing to foreign lines affects relationship and surplus.

A. *Estimation*

To identify the effect of driving on a foreign line, our analysis includes all observations in which the driver is on a home line and those in which he is on his first day of re-routing (the first day of a three-day block or the only day of a one-day block).

Let i index the intersection, r index the round (trip) number, d index the driver, and t index the day-of-study. Let $\mathbb{1}^1_{irdt}(\text{Foreign}) \in \{0,1\}$ be an indicator variable taking value 1 if an observation indexed $irdt$ is assigned to the first day of a foreign line re-routing, and zero otherwise. We estimate the following equation using ordinary least squares (OLS):

$$Y_{irdt} = \beta^F \mathbb{1}^1_{irdt}(\text{Foreign}) + \alpha_d + \epsilon_{irdt} \tag{1}$$

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

where the dependent variable Y_{irdt} is an indicator taking value 1 if the driver has a social tie with the police agent with whom he interacts; in some parts of the analysis, Equation 1 omits subscripts ir to indicate the driver's daily surplus from driving.[24] Parameter α_d denotes the Foreign/Home treatment assignment randomization blocks (i.e., the driver). Standard errors are clustered at the level of the driver-day, which is the level of randomization.

To produce unbiased estimates for the effect of driving on a foreign line, we account for the probability of assignment to home vs. foreign driving as implied by our randomization procedure. 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. Having computed treatment assignment probabilities, we estimate coefficient β^F by including them as inverse propensity weights in a standard weighted OLS estimation (henceforth "*re-routing weights*"), with minibus driver (the randomization block) as fixed effects, and with the standard errors clustered at the level of the minibus-driving block, as informed by the experimental design.[25]

This estimation strategy produces an unbiased estimator for the effect of re-routing, conditional on the sample of foreign and home lines of the drivers. However, if the set of lines that the drivers hold as foreign is systematically different from the set of drivers that they hold as home, then comparing driver outcomes between foreign and home lines in this sample may simply capture the heterogeneity between the existing set of lines that are foreign and are home. Even if inverse propensity re-routing weights were included, the composition of foreign and home lines may differ across home and foreign days. To tackle this potential bias generated by the imbalance in the foreign line composition, we take precaution and address the fact that the pool of lines available for foreign driving

[24]In this case, Equation 1 is $Y_{dt} = \beta^F \mathbb{1}^1_{dt}(\text{Foreign}) + \alpha_d + \epsilon_{dt}$, where Y_{dt} is the daily surplus from driving, in USD, in $\mathbb{R}^+$. Recall that the surplus is daily revenue minus operating costs such as gas and repairs, whereas any bribes paid will be deducted from the surplus so that surplus net of bribes is profit.

[25]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, the probabilities we obtain have little significance on the estimated coefficients. All the results that follow are identical with and without these *re-routing weights*.

or for home driving may be systematically different. We compute the probability that a given line appears on the foreign lines' pool vs. the home line pool, and supplemented the OLS weights with the inverse probability of a line appears as a foreign or home line for the driver (henceforth, "*composition weights*").[26] For robustness, where indicated, we also present results including fixed effects for each individual line.

B. *Effect of Re-Routing on Relationships*

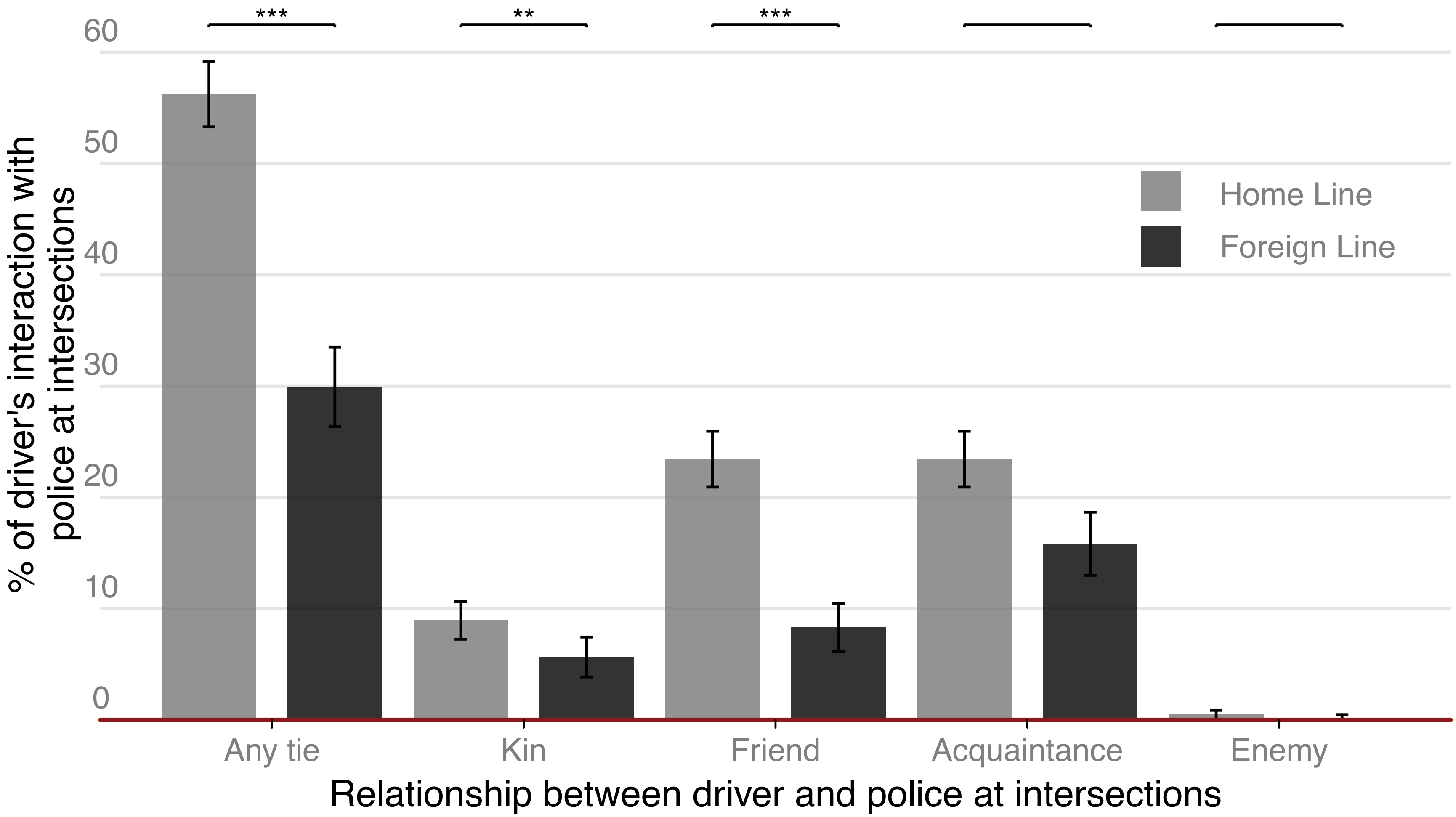
Interaction with street-level traffic police officers make up the vast majority of interactions (881 out of 1,097).[27] The remainder are with the police of the police (78), with police officers at parking station (71), with the leader of a team of traffic police officers (15), with the biker police (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 kins.

Figure 3 shows that, while 56.2% of interactions with officers at the intersection are characterized with having a relationship on home lines, this fraction decreases to 29.9%

[26]Specifically, 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, Section 4 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 which 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.

[27]Source: Figure A8. The sub-sample 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: Effect of Re-Routing to Foreign Lines on Prevalence of Social Relationships with Police Officers



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 re-routing. The asterisks represent the statistical significance of the test for whether the fraction on the home line is statistically significantly different than that on the foreign line, for each relationship category. Statistical significance is obtained from estimating β^F of Equation 1. Social relationships include those of kin, friend, acquaintance, and enemy. Kin includes both nuclear and extended family relationship. 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.

on foreign lines.[28] The effect is driven by a decrease in relationships described as friendships, for which the fraction decreases from 23.4 to 8.3%.[29]

C. *Effect of Re-Routing on Driving Surplus*

We refer to the surplus as the revenue from passenger payments, net of gas expenses and repairs (henceforth, *operating costs*). The surplus is then allocated between the police officers through bribes, and the driver through profits. On average, on home lines, drivers make 3 USD of surplus per trip.[30] This is generated from 8.79 USD in revenue from passengers, net of 5.79 USD operating costs per trip.[31] The 8.79 USD of revenue are produced by 18.36 passengers on average, who pay 48 cents of USD on average.[32]

Table II presents the estimates from Equation 1 for daily surplus (Column 1) and its decomposition in number of trips per day (Column 2) and surplus per trip (Column 3).

Re-routing decreases daily surplus from driving: in Column (1), the coefficient on re-routing 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

[28] Figure A9 shows the result holds equivalently per intersection. Figure A10 shows that the result is robust mis-specification. Since the set of a driver's lines from which we can select as his foreign line may not be random, our measured effect of re-routing may capture that the composition of lines that are available for foreign tends to be similar across drivers, and different than the set of home lines. Imbalance here could bias the interpretation that driving on a foreign line affects the surplus if the set of lines available for foreign have different surplus potential on average. We thus take additional precautions for robustness. Thus, in Figure A10, we compare the baseline coefficient estimate to: 1. unweighted OLS with no randomization block fixed effects; 2. unweighted OLS with randomization block fixed effects; 3. weighted OLS with randomization block fixed effects; 4. weighted OLS with randomization block and line fixed effects; 5. weighted OLS with randomization block fixed effects and inverse propensity weights adjustment for foreign line composition (baseline estimate); 6. baseline estimate, winsodirzing the dependent variable at 99%; 6. baseline estimate, winsodirzing the dependent variable at 95%; 7. baseline estimate, winsodirzing the dependent variable at 90%. The coefficient estimator β^F in 1,2,3,4 is the raw sample average treatment effect (SATE raw), the sample average treatment effect (SATE), the assignment probability adjusted sample average treatment effect (ATE), the assignment probability adjusted sample average treatment effect accounting for line composition imbalances (ATE^C), and the population average treatment effect (PATE), respectively. The results are preserved across specifications.

[29] 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.

[30] The description in this paragraph is based on Table A8, which presents the decomposition of the minibus surplus on the home line.

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

[32] A complementary graphical representation of the surplus decomposition is provided in in Figure A11.

type that would allow him to do more trips. Column (3) shows that the surplus 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.[33]

In sum, this analysis confirms that re-routing is associated with a decrease in the prevalence of relationships between the drivers and the officers with whom they interact, as well as a destruction of the surplus. This is consistent with drivers having created surplus enhancing relationships on lines that become their home lines. However, the reduction in relationships and in the surplus is not conclusive evidence that the effect on the surplus arises through the effect on relationships: a mediation problem.

Therefore, to isolate the mechanisms through which re-routing destroys the surplus, in the analysis that follows, we follow two strategies. In Section 6, we decompose the main effect of re-routing by whether the driver is assigned to third-party protection, to purge the effects of re-routing arising through other channels than those related to the interaction between drivers and the officers. In Section 7, we isolate the effect on surplus by whether the driver has a long vs. a short-time horizon, and examine the outcomes for which theory predicts should only be affected in short vs. long-term re-routing if the effect on surplus indeed arises from relationships.

6. Isolating the Effect of Relationships: Third-Party Protector Mediation

In this section, we test for the mediating role of relationships in explaining the effect of re-routing on the surplus, 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 re-routing using the first day of a re-routing episode to prevent any newly created relationships from confounding the analysis.

[33] In Table A9, we present the coefficient estimates in: 1. unweighted OLS with no randomization block fixed effects; 2. unweighted OLS with randomization block fixed effects; 3. weighted OLS with randomization block fixed effects; 4. weighted OLS with randomization block and line fixed effects; 5. weighted OLS with randomization block fixed effects and inverse propensity weights adjustment for foreign line composition (baseline estimate); 6. baseline estimate, winsodirzing the dependent variable at 99%; 6. baseline estimate, winsodirzing the dependent variable at 95%; 7. baseline estimate, winsodirzing the dependent variable at 90%. The coefficient estimator β^F in 1,2,3,4 is the raw sample average treatment effect (SATE raw), the sample average treatment effect (SATE), the assignment probability adjusted sample average treatment effect (ATE), the assignment probability adjusted sample average treatment effect accounting for line composition imbalances (ATE^C), and the population average treatment effect (PATE), respectively. The results are preserved across specifications.

Table II: Effect of Re-Routing to Foreign Lines on the Surplus from Driving

	Surplus (per day) (1)	Number of trips per day (2)	Surplus (per trip) (3)
Foreign	-8.071^{*}	-0.982^{***}	-0.855^{*}
	(4.297)	(0.363)	(0.483)
Mean Dep. Var.	18.60	7.86	2.62
Observations	167	176	1,395
R^2	0.324	0.318	0.194
Rand. Block 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 1. In Column (1), the dependent variable is the daily surplus in USD·day^{-1}. The daily surplus is the sum of surplus generated through each trip driven in the day. Hence, Columns (2) and (3) also decompose the surplus per day as dependent variable into the number of trips per day (Column 2) and the average surplus from driving along each trip (Column 3). Surplus per trip (column 3) 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. All regressions include randomization block fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure (*re-routing weights*) and to adjust for imbalance on foreign line composition (*composition weights*). Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the sample of home line driving.

In Table III, we present the coefficient estimates of Equation 1, separately by whether the driver was randomly assigned to third-party police protection on that day.[34]

Column (1) shows the effect of re-routing on the surplus per day, for minibus-day observations in which the driver has not been assigned to third-party protection. In that case, the surplus drops from 22.02 USD per day on home lines by 23.78 USD, and the drop is statistically significant. Recall that the main effect of re-routing independently of whether the driver had third party protection was only a reduction of 8.07 USD. As such, this suggests that re-routing has a huge destructive effect on surplus, driven by days on which drivers do not have third-party protection. This conjecture is confirmed by Column (2), where re-routing has insignificant effect. The magnitude is -3.29, and the coefficient is not statistically significant. This is consistent with the interpretation that re-routing destroys the surplus through its effect on the interaction between the driver and the officers. This effect is muted in re-routed observations in which the driver enjoys

[34]Tables A10 and A11 show the same for whether the driver was assigned to wear the ACCO drivers' association sticker, or to police protection. The results are the same.

Table III: Effect of Re-Routing to Foreign Lines on Surplus, *by Third Party protection*

	Surplus (per day)		Number of trips per day		Surplus (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-23.78^{**}	-3.29	-1.66^{**}	-0.63	-2.30^{*}	-0.52
	(11.00)	(4.95)	(0.67)	(0.44)	(1.36)	(0.50)
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	0.38	0.37	0.37	0.32	0.21	0.24
Protection	NO	YES	NO	YES	NO	YES
H_0 p-val.		0.079		0.142		0.217

Notes: This table presents the OLS estimates of β^F from Equation 1, decomposed by whether the driver-day was assigned to third-party protection. We present the estimates of β^F separately for the sample without third-party protection (odd columns) and with third-party protection (even columns). In Columns (1) and (2), the dependent variable is the daily surplus in USD$\cdot$day^{-1}. The daily surplus is the sum of surplus generated through each trip driven in the day. Hence, Columns (3), (4) and (5), (6) also decompose the surplus per day as dependent variable into the number of trips per day (Columns 3 and 4) and the average surplus from driving along each trip in (Columns 5 and 6). Surplus 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. 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 block fixed effects, and observations are weighted by inverse propensity scores to account for the randomized assignment procedure (*re-routing weights*) and to adjust for imbalance on foreign line composition (*composition weights*). Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. Table notes denoted "H_0 p-val." present the p-value from the interaction term in the regression of outcome variables on foreign line and third party protection assignments.

third-party protection, where he is protected from police harassment.

Columns (3)-(6) replicate this analysis for the number of trips per day and the surplus per trip. Similarly, re-routing destroys 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, the effect of re-routing on the surplus per trip is driven by the observations in which the driver does not have third-party protection, consistent with re-routing causing the driver to negotiate under pressure only when the driver does not have third-party protection against the police.

This section has shown that the effect of re-routing is entirely muted if the driver has third-party protection. This provides conclusive evidence that re-routing, when not having third-party protection, 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 different re-routing horizons.

7. Testing for Relationships' Mechanisms: Re-Routing Time Horizon

To determine the channels by which relationships increase surplus, in this section, we examine the randomized variation in re-routing 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 driving surplus 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 $e \in \{0,1\}$.[35] 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 $k(0) = 1$.[36] $\delta < 1$ is the time preference parameter. In each period, the surplus 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 $y^1 - p^0y^0 + (1-p^0)B < F + f$

[35]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 5.

[36]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.

Assumptions A and B say that effort increases surplus from driving and the probability that the driver gets detained, respectively.[37] Assumption C says that effort increases surplus from driving 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 5.

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

Re-routing to a foreign line has an unambiguous effect on driving surplus. If re-routing is long horizon, the surplus decreases from y^1 to ky^1. If re-routing is short horizon, the surplus decreases from y^1 to $p^0 y^1$. Hence, irrespective of the time horizon, re-routing decreases surplus. The effect of re-routing on effort, detainments and time waste depends on the time horizon of the re-routing. There are two cases.

[*Re-routing With Short Time Horizon*] Buying new protection is not profitable. Without protection, the driver also does not provide effort to reduce the risk of being detained, which would destroy surplus and lead to a bribe payment. This reduces the surplus. 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.

[*Re-routing 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 destroys the surplus 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.

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

B. *Effect of Re-Routing on Surplus, by Time Horizon of Re-Routing*

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

Table IV presents the estimates from Equation 1 for time waste and number of trips (Panel A), and surplus per trip decomposition (Panel B). Panel A shows that the reduction of number of trips per day induced by re-routing is entirely driven by re-routing in which the driver has a long-time horizon on the foreign line. Indeed, the number of trips per day decreases from 8.3 by more than one (Columns 1 and 2). This effect is driven by significant time waste arising from negotiations. Columns (3) and (4) show that re-routing increases the number of negotiations per trip by almost one time, but again only in the long time-horizon. Columns (5) and (6) reveal a significant increase in the duration of time waste from negotiations: while time waste is reduced for short-term re-routing, it increases significantly for long-term re-routing. These results indicate that the driver takes time-costly actions on the first day of a long-term re-routing block in order to create new ties with and have protection from the police officers in the new route.[38] Columns (9) and (10) show that, while re-routing in the short-term causes a significant decrease in bribe costs (arising from avoiding interaction to lower exposure to police officers, even when the model already predicts a low probability of detection). In contrast, when drivers have a sufficiently long horizon, bribe costs significantly increase, consistent with the drivers negotiating, and making, a payment to build a relationship.

Panel B shows that the surplus per trip decreases both in long- and short-term re-routing. The effect is of similar magnitude, although it is only statistically significant for long-term re-routing (Columns 1 and 2). The channels of this increase, however, are telling of the role of relationships in the effect of re-routing. While long-term re-routing causes drivers to lose passengers, short-term re-routing does not. These results reveal

[38]The effect in short-term re-routing is driven by the time spent in amicable conversations and in negotiation bribes, for which the effect is large and significant, although it is also large among the toll fee payments (see Figure A12, Panel A). It is consistent with drivers strategically avoiding interaction with the police in order to avoid paying a bribe and wasting time due to the absence of relationships with the police. The effect in long-term re-routing is driven by an increase in time negotiating for negotiated bribes (see Figure A12, Panel B).

Table IV: Effect of Re-Routing to Foreign Lines on Surplus and its Components, Decomposed by Time Horizon of Re-Routing

A. Number of trips and actions that decrease the trips

	# Trips per day		# Negotiation		Time waste		# No negotiation		Bribe costs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Foreign	−0.271	−1.038***	0.001	0.075**	−0.377	1.053*	−0.034	0.176**	−0.448**	0.549**
	(1.056)	(0.366)	(0.058)	(0.032)	(0.244)	(0.537)	(0.098)	(0.072)	(0.223)	(0.217)
Mean Dep. Var.	8.3	8.3	0.1	0.1	1.2	1.2	0.8	0.8	0.9	0.9
Observations	124	167	1,018	1,334	1,018	1,334	1,018	1,334	1,018	1,334
R^2	0.326	0.246	0.123	0.090	0.111	0.037	0.393	0.388	0.069	0.037
Time Horizon	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
H_0 p-val.		0.571		0.232		0.011		0.055		0.001

B. Surplus per trip and actions that decrease the surplus per trip

	Surplus		# Passenger		Price		Operating cost		Trip duration	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Foreign	−1.052	−0.970*	0.264	−0.722***	−0.062**	−0.021*	0.001	0.299	−0.315	1.705
	(1.028)	(0.520)	(0.260)	(0.252)	(0.029)	(0.012)	(1.079)	(0.509)	(4.745)	(2.126)
Mean Dep. Var.	3.0	3.0	18.4	18.4	0.5	0.5	5.8	5.8	31.8	31.8
Observations	1,014	1,326	1,014	1,330	1,015	1,327	1,018	1,334	1,015	1,331
R^2	0.210	0.168	0.806	0.735	0.796	0.408	0.142	0.094	0.268	0.146
Time Horizon	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
H_0 p-val.		0.942		0.004		0.167		0.819		0.809

Notes: This table presents the OLS estimates of β^F from Equation 1, decomposed by whether the driver-day was assigned to the first day of long-term re-routing (driving blocks of 3 contiguous days) or short-term re-routing (driving blocks of only 1 day). We present the estimates of β^F separately for the sample in short-term re-routing (odd columns) and long-term re-routing (even columns). *Dependent variables*: In Panel A, 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 include 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), the number of events in which the driver makes a bribe payment without any negotiation, which are composed of the "Mbote ya Likasu" and tip (Columns 7 and 8), and the total bribe costs for the trip (Columns 9 and 10). In Panel B, the dependent variables are the total surplus per trip, computed as the revenue from passenger tickets minus gas and repair costs (columns 1 and 2). Gas and repair costs (operating costs) are observed at the daily level and imputed at the trip level. The dependent variables in the remaining columns, which also include the 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 (Columns 5 and 6), the the operating costs, 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 (Columns 9 and 10). All regressions include randomization block fixed effects, and observations are weighted by re-routing and composition weights. Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. Table notes denoted "H_0 p-val." present the p-value from the interaction term in the regression of outcome variables on foreign line and time horizon assignments.

passsengers' unwillingness to partake in drivers' wasteful actions in building relationships with the police. Even more revealing of the passenger-driver interaction is the driver's bargaining power in price negotiations when he is in a rush. Indeed, Columns (5) and (6) show that short-term re-routing causes a significant decrease in the price per passenger, while the effect in long-term re-routing is three times smaller and marginally significant. Taken together, our results are consistent with the interpretation that the absence of relationships with the police and the reluctance to create a new one weaken driver's bargaining position with passengers when negotiating prices, decreasing agreed prices to the detriment of the surplus per trip.

Overall, having a long-time horizon causes the driver to invest in new relationships, using his productive time to negotiate with the police. The analysis on time horizon also suggests that the main effect of re-routing on surplus can be substantiated through two different mechanisms. Although driver-police relationships reliably explain the patterns we observe on the efficiency of corruption, on the first day of foreign line driving when the driver had a short-time horizon, the driver fails to take productive actions in order to avoid the increasing risk of being noticed and detained. Furthermore, this risk-avoidance causes the driver to spend less time negotiating with passengers, leading to weaker bargaining power, lower prices, and hence lower surplus. On the contrary, on the first day of foreign line driving when the driver had a long-time horizon, due to the experimental manipulation into the three-day driving blocks, the destruction of surplus is instead driven by time waste in negotiating with police, causing a reduction in the number of trips per day. This is consistent with the driver investing in a relationship, and where creating new relationships takes time away from driving, to negotiating with the police.

C. *Returns on Investment: Formation of Relationships After First Day*

The previous section has demonstrably indicated the harmful effect of re-routing, which reduces the prevalence of relationships and surplus. Moreover, in long-term re-routing, the destruction of surplus came about through an increase in time waste. We conjectured that this time waste accrues from the driver spending 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.

In this section, we verify such an interpretation for the long-term re-routing surplus destruction. To analyze the dynamics of the interaction with the police, we separately estimate the following equation for each day of the three-day re-routing blocks:

$$Y_{irdt} = \beta^F \mathbb{1}^1_{irdt}(\text{Foreign}) + \sum_{r=1}^{5} (\nu_r * \beta^F \mathbb{1}^1_{irdt}(\text{Foreign})) + \alpha_d + \epsilon_{irdt} \tag{2}$$

where the dependent variable Y_{irdt} is an indicator taking value 1 if the driver has a social relationship the police agent with whom he interacts, and the independent variable $\mathbb{1}^1_{irdt}(\text{Foreign})$ is an indicator variable taking value 1 if observation indexed $irdt$ is assigned to a Foreign re-routing, and zero otherwise. α_d is the randomization block fixed effects. In addition, ν_r captures the trip fixed effects, so the sum with the interaction term $\beta^F + \nu_r + \nu_r\beta^F$ captures the population average treatment effect on kinship/friendship from re-routing to a foreign line on trip r on each day of the three-day driving blocks.

Figure 4 presents the estimates for the effect on the indicator for whether the driver has a relationship with the officers. It presents the analysis per day. In day one, the driver and the officers are much less likely to be friends. In day 2, the effect is preserved, although the difference is smaller in the middle of the day. By day 3, the difference is smaller. There is no upward trend within the day, suggesting that the relationships are formed from a day to the next rather than as quickly as within a day.

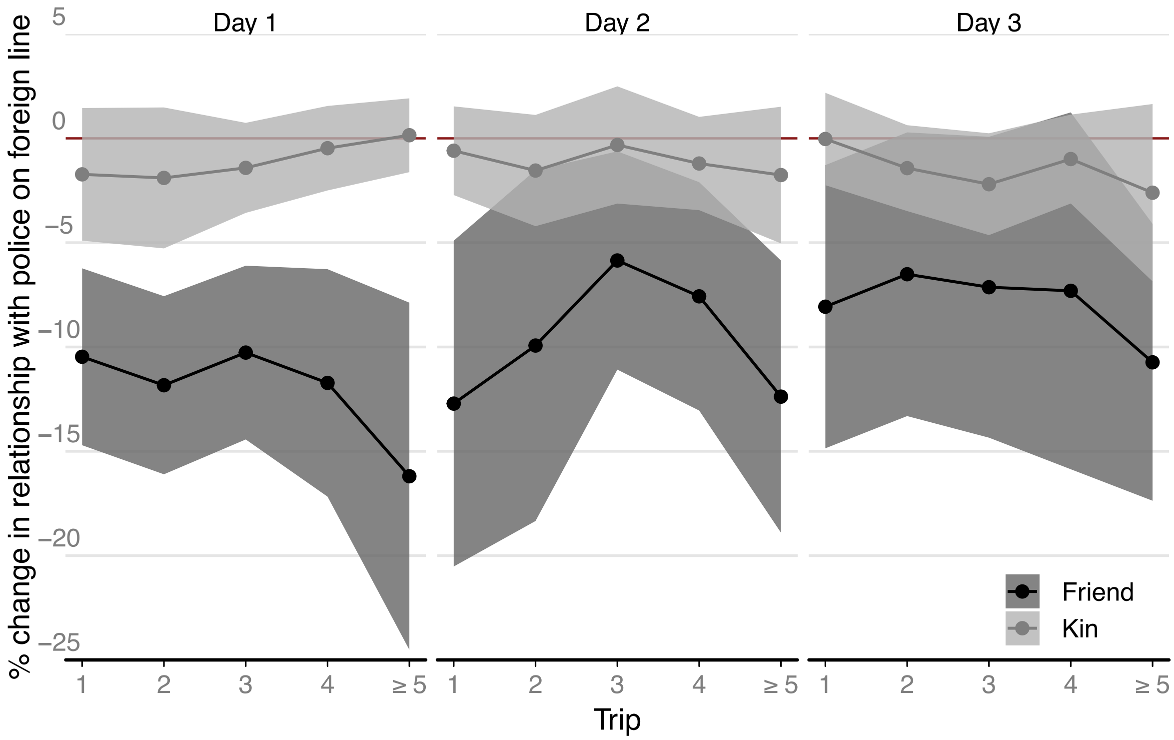
It is possible that the increase in friendship captures compositional changes in the police teams rather than a change in the nature of the relationship between them and the driver. Therefore, as a placebo, we also included the existence of kinship as a dependent variable because unlike friendship, kinship cannot be newly created. In contrast to friendship, we find no effect of re-routing on kinship.[39]

We have shown that the costly time waste negotiating bribes on the first day of a long-term re-routing is associated with the subsequent creation of new relationships. We then jointly analyze the evolution of the number of trips per day and the bribe negotiations per day, marks of the conjectured investment in relationships, to see if driver profits increase across the days.

Figure 5 presents the estimates for the effect of long-horizon re-routing on the number of trips per day (Panel A), bribe negotiations per day (Panel B), and driver profits per day

[39] Figure A14 presents the analysis per day. The conclusion is identical.

Figure 4: Long-Term Horizon: Investment in New Relationships?



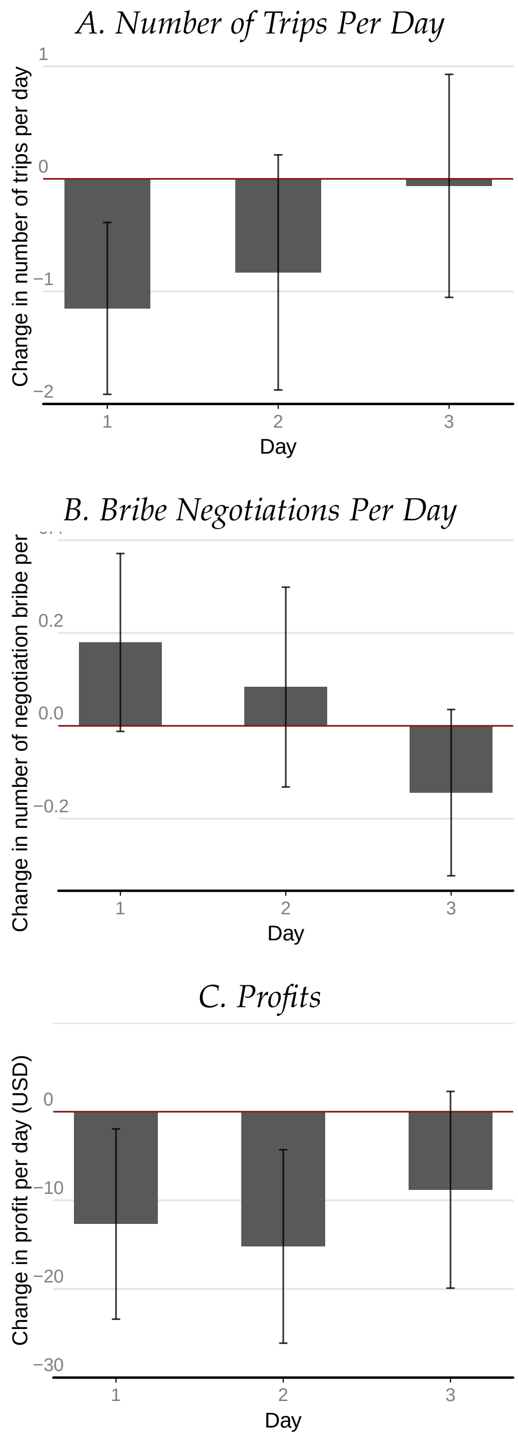
Notes: This figure presents the coefficient sizes and their 95% confidence intervals of the estimates, for each round (trip) r within each of the three days of the driving blocks, of $\beta^F + \nu_r + \nu_r \beta^F$ of Equation 2. The coefficients and confidence intervals presented in light gray are the estimates when the dependent variable is an indicator for whether the driver and the officer are kins; 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 re-routing, 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 block fixed effects, and observations are weighted by re-routing and composition weights. 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.

(Panel C). On day 1, the driver makes a significantly lower number of trips than on home lines. On day 2, however, the effect is smaller, and it is no longer statistically significant. By day 3, the numbers of trips on home and foreign lines are indistinguishable, and the coefficient is virtually zero. This is consistent with the cost of the investment in new relationships being incurred predominantly on the first and second days, enabling the protection required to make as many trips as on home by the third day.

In addition, we see a larger fraction of bribes negotiations on the first day. The difference is marginally significant. By day 2, this difference, still positive, is not significant and halved. By day 3, the difference is negative, and not statistically significant. The number of negotiations converge to that on home lines, consistent with the interpretation that initial negotiations have created new relationships.

Finally, the profit of the drivers is significantly lower on day 1. It is also significantly lower on day 2. However, by day 3, the reduction in the profits compared to home lines

Figure 5: Long-Term Re-Routing: Returns From Relationship Investment



Notes: This figure presents the coefficient estimates of β^F of Equation 1, separately for each day of re-routing for long-term re-routing to foreign lines (re-routing to drive in 3 contiguous days on lines in which the driver does not have sufficient pre-existing relationships with the officers to drive through). The coefficients, represented as the length of the bars, thus are interpreted as how much larger is a given variable in long-term re-routing than on home lines for that specific day of long-term re-routing. The bars also include the corresponding 95% confidence intervals represented as brackets. In Panel A, the dependent variable is the number of trips per day. It is obtained in the sample of driver-days as the number of times a driver completes a return trip per day. In Panel B, the dependent variable is the total number of negotiation bribes (excludes the events in which the driver pays a bribe without any negotiation, which are Mbote ya Likasu and tips). In Panel C, the dependent variable is the profits from driving per day. Profits in USD$\cdot$day^{-1} are computed as the surplus per day minus the bribe costs per day. Bribe costs per day is the sum of all the payments from a driver to the police across all intersections in all trips in a day. Surplus per day is the sum of all the revenue from passenger tickets along a trip minus operating cost in a day. All regressions include randomization block fixed effects, and observations are weighted by re-routing and composition weights. Trip is defined as a return trip between two termini.

has been halved, and the difference is not statistically significant. Again, profits converge to the home line levels by day three, consistent with the interpretation that drivers incur the main cost of relationship creation on the first two days.

In summary, in this section, re-routing destroys surplus in ways that are consistent with its explanation through the absence of relationships. In short-term re-routing, driving with neither a relationship nor the incentives to incur costs to create new relationships increases the risk of being detained if detected by the police, weakening the drivers' bargaining power with passengers and decreasing surplus from driving. In long-term re-routing, i.e. driving without relationship but with the incentives to incur costs to create new relationships, the drivers waste significant time negotiating with the police. 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.

The following quote from one project implementer corroborates the interpretation that drivers were actively building valuable relationships in new lines:

> *"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 "*
>
> **Source**: Project meeting notes of September 4th 2015.

8. Quantifying the Revenue-Equivalent of Ties with Officers in the Line

In this section, we decompose the main effect of short-term re-routing (through its effect on price), and the main effect of long-term re-routing (through its effect on time waste and number of trips per day), by whether the driver has third-party protection. This allows identification of the pure benefits of relationship, which rids other effects irrelevant to the driver-police interaction and the incentives for relationship formation.

Table V presents this analysis. In Panel A, we analyze the effect of short-term re-routing on surplus per day, number of passengers, price, operating costs, and trip duration, decomposed by whether the driver has third party protection.

Panel A shows that re-routing destroys the surplus per day only if the driver does not have third-party protection. When he does, the effect is positive and not statistically significant. When he does not, surplus per trip is sharply decreased. This effect is entirely driven by the reduction in the price. Short-term re-routing without third-party protection decreases the average price from 48 to 37 cents of a dollar, and the decrease is statistically significant at the 1% level, implying a 23% reduction in the price. In contrast, short-term re-routing with third-party protection has no effect in the price. The coefficient is even positive, and not statistically significant. The effects of re-routing with and without protection on the number of passengers, the operating cost and the trip duration act as a placebo: there is no significant effect for any of them, suggesting the effect of re-routing is driven by its effect on the drivers' ability to bargain with passenger for prices.

Thus, the destruction in the surplus per day from 24.22 USD to 9.5 USD documented in Column (1) from short-term re-routing without third-party protection is the measure of the value of relationships for the efficiency of corruption. With relationships with police officers, driving generates 24.22 USD. Without, it generates only 9.5 USD, a destruction of more than 60% of the surplus from driving, driven by the effects that absence of driver-police relationship causes on the economic operation that governs the surplus.

Panel B shows that the long-term re-routing effects are murkier. Re-routing significantly decreases the number of trips per day, although the increase in time waste is only significant if the driver has third party protection. Similarly, re-routing increases the payment of no negotiation bribe, and bribe costs overall, if the driver has third-party protection, but the coefficients with and without third-party protection are comparable. Again we demonstrate that third-party protection is less relevant than the driver's anticipated return on subsequent days on new investments in relationship. However, the presence of mediating effects provides suggestive evidence that the efficiency of negotiation is partly improved by the presence of third-party protectors. Our qualitative interviews validate this conjecture: drivers often leverage having a third-party protector to create new ties, with third party protector as an intermediary between the driver and the agent. The following quotes from the project meetings support the interpretation that: a. third-party protection was effective, and b. how third-party protection by police officers reduces the transaction costs in the negotiations:

Table V: The Effect of Short and Long-Term Re-Routing on Surplus, by Third-Party Protection

A. Isolating the Role of Relationships in the Short Term Driving Effect using Randomly Assigned Police Protection

	Surplus per day		Surplus per trip		# Passenger		Price		Operating cost		Trip duration	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Foreign	-14.970^{*}	8.905	-2.377^{**}	0.640	0.058	0.570	-0.105^{***}	0.015	0.391	-0.021	-2.841	6.415
	(8.154)	(18.918)	(0.965)	(1.922)	(0.222)	(0.451)	(0.027)	(0.013)	(1.111)	(2.142)	(6.127)	(5.471)
Mean Dep. Var.	24.22	20.46	3.25	2.77	18.2	18.5	0.48	0.48	5.52	6.06	30.99	32.56
Observations	55	63	485	529	485	529	485	530	487	531	484	531
R^2	0.561	0.405	0.402	0.240	0.824	0.794	0.849	0.891	0.402	0.134	0.229	0.330
Protection	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
H_0 p-val.		0.303		0.418		0.574		0.000		0.691		0.251

B. Isolating the Role of Relationships in the Long Term Driving Effect using Randomly Assigned Police Protection

	Surplus per day		Trips per day		Negotiation		Time waste		# no negotiation bribe		Bribe costs	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Foreign	-17.519^{**}	-3.093	-1.601^{***}	-0.551	0.115^{**}	0.053	1.010	0.991^{***}	0.114	0.233^{**}	0.472	0.536^{**}
	(8.473)	(6.191)	(0.562)	(0.486)	(0.049)	(0.041)	(1.013)	(0.324)	(0.096)	(0.101)	(0.361)	(0.233)
Mean Dep. Var.	24.22	20.46	8.4	8.13	0.1	0.11	1.4	0.94	0.79	0.73	0.9	0.83
Observations	74	84	80	87	637	697	637	697	637	697	637	697
R^2	0.376	0.319	0.308	0.369	0.112	0.096	0.030	0.093	0.357	0.441	0.035	0.059
Protection	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES
H_0 p-val		0.434		0.161		0.309		0.888		0.218		0.625

Notes: This table presents the OLS estimates of β^F from Equation 1, decomposed by whether the driver-day was assigned to long-term re-routing (driving blocks of 3 contiguous days of driving on the same line) or short-term re-routing (driving blocks of only 1 day), and by whether the driver-day was assigned to benefit from third-party police protection. We present the estimates of β^F separately for the sample in short-term re-routing (Panel A) and long-term re-routing (Panel B). *Dependent variables*: In Panel A, the dependent variables are the total surplus per day (columns 1 and 2), the surplus per trip (columns 3 and 4), computed as the revenue from passenger tickets minus gas and repair costs at the driver-trip level. The dependent variables in the remaining columns, which also include the sample at the driver-trip level, are as follows: the number of passengers that purchase a ticket for a ride (Columns 5 and 6), the average price paid by passengers on a trip (Columns 7 and 8), the the operating costs, which are composed of the gas costs and repair costs observed at the driver-day level and imputed at the driver-trip level (Columns 9 and 10), and the duration of a trip (Columns 11 and 12). In Panel B, the dependent variables are the surplus from driving per day (Columns 1 and 2) number of trips per day (columns 3 and 4), in which case the sample is at the driver-day level. The dependent variables in the remaining columns, which include 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 5 and 6), the duration of interaction between driver and police along a minibus trip in minutes (Columns 7 and 8), the number of events in which the driver makes a bribe payment without any negotiation, which are composed of the "Mbote ya Likasu" and tip (Columns 9 and 10), and the total bribe costs for the trip (Columns 11 and 12). All regressions include randomization block fixed effects, and observations are weighted by re-routing and composition weights. Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. Table notes denoted "H_0 p-val." present the p-value from the interaction term in the regression of outcome variables on foreign line and third party protection assignments.

a. *"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 saved for Mbote ya Likasu even; 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."*
Source: Project implementation meeting notes of September 4^{th} 2015.

b. *"First reaction : 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 on-call several times did the arresting officer take the phone. After answering the phone, the minibus was released. The driver realized it was this one officer who knew the major who pushed his colleague to release the minibus. The officer continued to intimidate the driver though. "*
Source: Project implementation meeting notes of September 4^{th} 2015.

To conclude, analyzing the effect of short-term re-routing, when driving in a foreign line is not confounded by the driver's investing in new relationships, and when the driver does not have third-party protection, where the effect on surplus is not confounded by other channels, we found that the surplus from driving decreases from 24.22 USD per day to 9.50 USD per day if the driver does not have a relationship with the police officers on the street. In both cases, the driver operates in an environment of illegality and corruption. But on foreign lines, significant surplus from driving is destroyed by poor contracting between the driver and the agent, who destroy the surplus they could instead share through bribe payments.

Our findings suggest that the role of police officers-drivers' relationships stems from the ability of drivers and police officers to collude, not just against the government by ignoring the law, but against the passengers, by enabling the driver to have higher bargaining power in his negotiation with the passengers. This increase is driven by the reduction in the risk of being detained, paying a bribe, and wasting time.

9. Conclusion

We conducted an experiment in Kinshasa, DRC's capital, to analyze the role of relationships between private operators and state official enforcers on the governance of corrupt transactions. We found that the transaction costs arising from negotiating corrupt transactions can be huge, and that relationships form relatively quickly to sustain arrangements that mitigate these costs.

In our context, the public transport sector, these transaction costs arise from the fact that drivers, anticipating lengthy and costly negotiations with the police officers on the line, take actions to avoid being detected by the officers. These actions, such as reducing the time searching for and calling passengers, or negotiating with passengers for the price of their ride with impatience, diminish the number of passengers they can attract as well as the price they are able to negotiate with the passengers. This reduces the surplus from driving significantly as a direct result of the fact that there are no formal institutions to govern the corrupt transaction between the officers and the drivers. In the presence of such institutions, both would be able to achieve a larger surplus from driving, and share the surplus through transfers such as bribes. Yet, we showed that this is exactly what relationships between drivers and officers are able to solve: when the drivers have relationships with the officers, the driver can take such surplus-enhancing actions, and shares the surplus through a set unofficial toll fee involving no destruction of the surplus. Furthermore, these relationships form relatively fast to reduce these transaction costs.

One implication of our analysis is that the architecture of the state-society relationships can explain why illegal markets spread. This complements classical analysis of rule-bending by state officials (Becker and Stigler, 1974), which focuses on penalties to state officials to reduce illegal markets, but assumes that the corrupt transaction can emerge free of transaction costs in the first place. Our results also provide an empirical foundation for policies in the design of bureaucracies, such as rotation, which have been documented as motivated by the desire of rulers reduce opportunities for collusion by the lower-level state officials (Greif, 2008). Furthermore, when payments to state officials are "grease-in-the wheels," as with endogenous red tape and sub-optimally burdensome regulations, our findings also suggest that promoting relationships between private actors and officials could be socially optimal, by decreasing transaction costs.

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Appendix: Measurement and Experimental Procedure

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

1. 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 supervisor. 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 which prompted the data collector to each intersection in the route. A minibus line is composed of a sequence of intersections.[40] 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 rate of 15 USD per day for assisting the data collectors who travelled with them in the minibus and for them answering the questions during their idle time at the termini.

2. 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

[40]The data collectors were the same individuals as the implementers ensuring compliance to the calendar. Overall, we hired one data collector for each minibus, one supervisor/monitor of data collector activity, 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.[41] Observers knew they were being monitored each day.[42]

3. Probabilities of Treatment Assignment, For all Treatments

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

[41]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.

[42]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 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 took a total of 27 days, split into episodes of 23 and 4 days due to funding increase for the second period. 10 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 re-routing.

A. *Re-routing*

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 $J = \{1,2,...,9\}$ or $J = \{1,2,3,4\}$ depending on experimental period of 23 or 4 days. The second part of each sum 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[43] (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 re-routing, 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 which 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.

[43]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.

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

In this section, we first demonstrate that, 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 re-route to a line $L_{dt}(D_{dt} = 1) \in \{0,1\}$, where importantly a foreign line $L_{dt} = 1$ is a function of randomized re-routing $D_{dt} = 1$ for minibus d on day t. Let $Y_{dt}(D_{dt})$ denotes 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 re-routing assignment for brevity.

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

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 $\mathbb{P}[L(1)] = \mathbb{P}[L(1)|D = 1]\mathbb{P}[D = 1]$[44] 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 which 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.

5. 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.:

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

This is equivalent to:

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

[44] Note that $\mathbb{P}[D = 1|L(1)] = \mathbb{P}[D = 0|L(0)] = 1$

$\square$

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.:

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

$\square$

We now analyze the Rubinstein alternating-offer bargaining model to demonstrate how driver's bargaining power decreases with time pressure when negotiating fee with the passenger.[45] 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:

[45] The following subsection is derived from Muthoo (2002).

- **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 less 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 which 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	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(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	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Time wasted interacted 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	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(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 which are paid per trip in the pre-experimental data between June 19th and July 20th, 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.

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.

Table A3: Driving Block for Random Reallocation of Lines

23-day period	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: 3 days (unprotected)
(4) Home line: 1 day (protected or not)	(4) Foreign line 2: 3 days (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 days (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 23-day period (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 4-day period (Sep 7-10) was also sampled without replacement up to 4 days had been sampled from the block. The 4-day period was a result of unanticipated budget availability at the end of the 23 days, which allowed the experiment to continue for 4 days before the budget was exhausted.

Table A4: Randomization Balance of the Treatment of Re-Routing 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 non-compliance.

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 which 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 $\mathbb{P}_d[\text{Foreign}|\text{Line}= l]$, 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: Minibus Surplus Decomposition

Variable	*Statistic*				
	Mean	*S.D.*	*Min*	*Max*	*N*
	(1)	(2)	(3)	(4)	(5)
Profit per day (USD·day^{-1})	15.18	30.90	−88.57	75.00	109
Profit per trip (USD·trip^{-1})	2.13	4.43	−29.85	11.10	945
Surplus per trip (USD·trip^{-1})	3.00	3.73	−20.46	12.18	945
Revenue (USD·trip^{-1})	8.79	1.80	0.43	15.20	945
Number of passengers	18.36	3.60	1	29	945
Price (USD ·person^{-1}·trip^{-1})	0.48	0.05	0.22	0.54	945
Operating costs (USD·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·day^{-1})	7.00	7.70	0	44.62	109
of which paid to *receveur* (USD·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 Re-routing to Foreign on Driving Surplus—Robustness

A. Surplus (per day)

	SATE^{raw} (1)	SATE (2)	ATE (3)	ATE^{c} (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-6.805	-7.844^{*}	-8.002^{**}	-8.053^{*}	-8.071^{*}	-8.011^{*}	-7.919^{**}	-7.567^{**}
	(4.884)	(4.065)	(4.046)	(4.388)	(4.297)	(4.284)	(3.919)	(3.741)
Mean Dep. Var.	18.60	18.60	18.60	18.60	18.60	18.67	19.05	19.76
Observations	167	167	167	167	167	167	167	167
R^2	0.012	0.284	0.291	0.327	0.324	0.323	0.388	0.401
Rand. Block 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	NO	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	YES	YES	YES

B. Number of trips per day

	SATE^{raw} (1)	SATE (2)	ATE (3)	ATE^{c} (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-0.810^{**}	-0.869^{**}	-0.894^{**}	-0.911^{***}	-0.982^{***}	-0.959^{***}	-0.956^{***}	-0.956^{***}
	(0.384)	(0.348)	(0.347)	(0.321)	(0.363)	(0.359)	(0.358)	(0.358)
Mean Dep. Var.	7.86	7.86	7.86	7.86	7.86	7.86	7.86	7.86
Observations	176	176	176	176	176	176	176	176
R^2	0.028	0.241	0.246	0.363	0.318	0.315	0.315	0.315
Rand. Block 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	NO	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	YES	YES	YES

C. Surplus (per trip)

	SATE^{raw} (1)	SATE (2)	ATE (3)	ATE^{c} (4)	PATE (5)	Winsor 99 (6)	Winsor 95 (7)	Winsor 90 (8)
Foreign	-0.681	-0.867^{*}	-0.898^{*}	-0.804	-0.855^{*}	-0.846^{*}	-0.809^{*}	-0.759^{**}
	(0.561)	(0.471)	(0.466)	(0.494)	(0.483)	(0.472)	(0.418)	(0.353)
Mean Dep. Var.	2.62	2.62	2.62	2.62	2.62	2.62	2.74	2.82
Observations	1,395	1,395	1,395	1,395	1,395	1,395	1,395	1,395
R^2	0.007	0.167	0.175	0.201	0.194	0.197	0.262	0.344
Rand. Block 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	NO	NO	NO	NO
Composition IPW	NO	NO	NO	NO	YES	YES	YES	YES

Notes: This table presents the OLS estimates of β^F from Equation 1. In Panel A, the dependent variable is the daily surplus in USD·day^{-1}. The daily surplus is the sum of surplus generated through each trip driven in the day. Hence, Panels B and C also decompose the surplus per day as dependent variable into the number of trips per day and the average surplus from driving along each trip. Surplus 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 1 to account for biases in the estimation of average treatment effect of foreign line driving on the surplus variables. Column (1) presents the coefficients from β^F estimator in Equation 1 without randomization blocks fixed effects, identifying the raw sample average treatment effect of re-routing (SATE^{raw}). Column (2) presents the coefficients from β^F estimator identifying the sample average treatment effect with randomization blocks (SATE). Column (3) presents the coefficients from β^F estimator which include randomization blocks fixed effects and weights for the inverse propensity of treatment assignment, identifying the average treatment effect of re-routing (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^{FE}). 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). Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving.

Table A10: Effect of Re-Routing to Foreign Lines on Driving Surplus, by ACCO Third-Party Protection

	Surplus (per day)		Number of trips per day		Surplus (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-15.05^{**}	-3.13	-1.34^{***}	-0.71	-1.43^{*}	-0.61
	(6.10)	(6.04)	(0.47)	(0.53)	(0.78)	(0.66)
Mean Dep. Var.	21.66	22.76	8.02	8.49	2.88	3.1
Observations	88	79	91	85	697	698
R^2	0.34	0.41	0.30	0.38	0.20	0.24
ACCO Protection	NO	YES	NO	YES	NO	YES
H_0 p-val.		0.080		0.213		0.534

Notes: This table presents the OLS estimates of β^F from Equation 1, decomposed by whether the driver-day was assigned to third-party protection of type ACCO Driver's Association sticker. We present the estimates of β^F separately for the sample without third-party ACCO protection (odd columns) and with third-party ACCO protection (even columns). In Columns (1) and (2), the dependent variable is the daily surplus in USD$\cdot$day^{-1}. The daily surplus is the sum of surplus generated through each trip driven in the day. Hence, Columns (3), (4) and (5), (6) also decompose the surplus per day as dependent variable into the number of trips per day (Columns 3 and 4) and the average surplus from driving along each trip in (Columns 5 and 6). Surplus 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. All regressions include randomization block 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. Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. Table notes denoted "H_0 p-val." present the p-value from the interaction term in the regression of outcome variables on foreign line and third party protection assignments.

Table A11: Effect of Re-Routing on Surplus from Driving, by Police Third-Party Protection

	Surplus (per day)		Number of trips per day		Surplus (per trip)	
	(1)	(2)	(3)	(4)	(5)	(6)
Foreign	-17.04^{**}	-2.52	-1.43^{***}	-0.62	-1.68^{*}	-0.39
	(7.62)	(6.12)	(0.53)	(0.48)	(0.94)	(0.61)
Mean Dep. Var.	24.22	20.46	8.4	8.13	3.25	2.77
Observations	79	88	85	91	675	720
R^2	0.41	0.32	0.31	0.35	0.24	0.20
Police Protection	NO	YES	NO	YES	NO	YES
H_0 p-val.		0.365		0.293		0.717

Notes: This table presents the OLS estimates of β^F from Equation 1, decomposed by whether the driver-day was assigned to third-party police protection. We present the estimates of β^F separately for the sample without third-party police protection (odd columns) and with third-party police protection (even columns). In Columns (1) and (2), the dependent variable is the daily surplus in USD$\cdot$day^{-1}. The daily surplus is the sum of surplus generated through each trip driven in the day. Hence, Columns (3), (4) and (5), (6) also decompose the surplus per day as dependent variable into the number of trips per day (Columns 3 and 4) and the average surplus from driving along each trip in (Columns 5 and 6). Surplus 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. Police third-party protection combines police escort on the minibus and access to higher-level police. All regressions include randomization block 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. Table notes "Mean Dep. Var." provides the mean of the dependent variable in the corresponding column computed in the full sample of home line driving. Table notes denoted "H_0 p-val." present the p-value from the interaction term in the regression of outcome variables on foreign line and third party protection assignments.

Figure A1: An *Esprit de Mort* Minibus

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

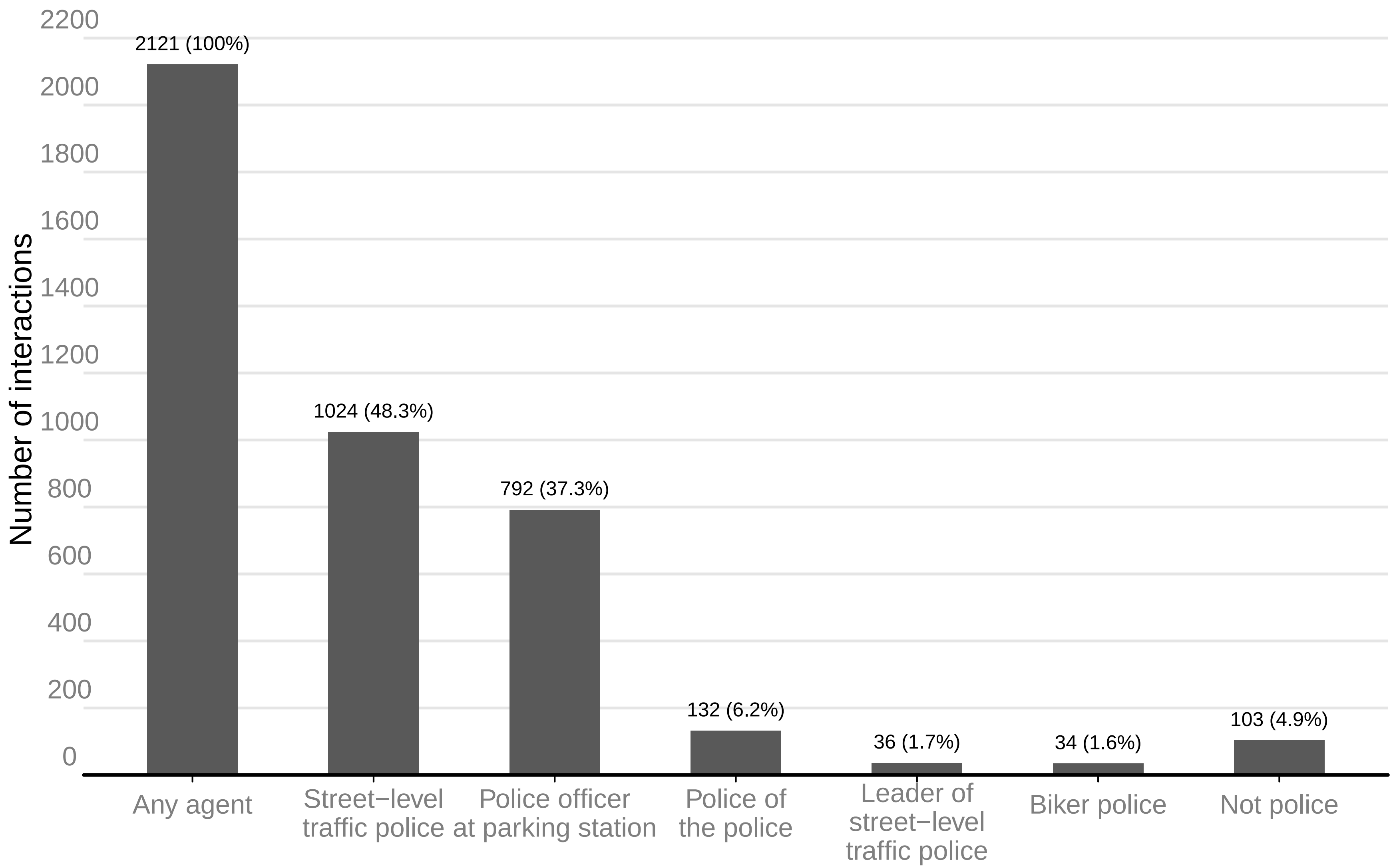
Figure A2: Negotiation bribes vs. *"Mbote ya Likasu"*

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

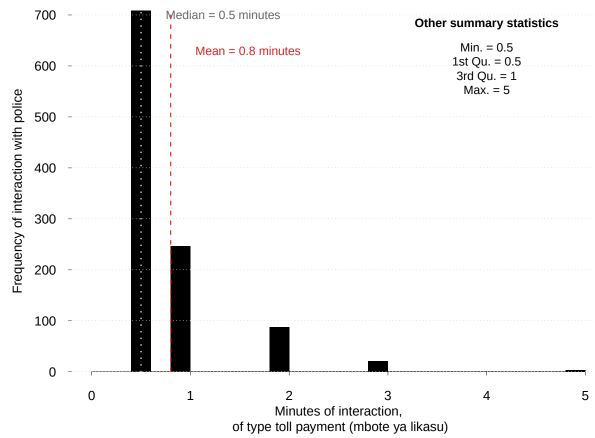
Figure A3: Interactions Between Drivers and State Officials in the Street, in Pre-Experimental Data



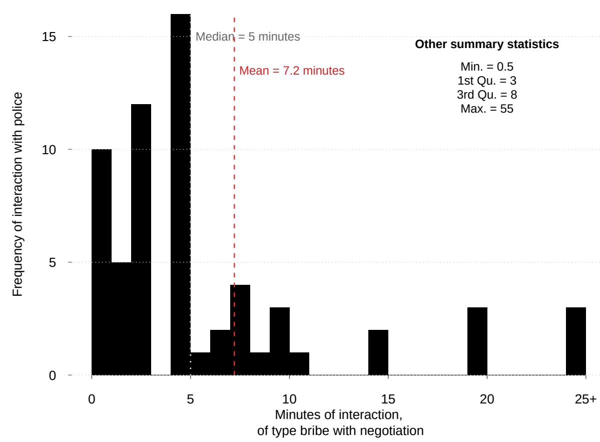
Notes: This bar chart displays the number and fraction of interactions between the driver and different types of agent when crossing an intersection on the home line. The figure is obtained from 15,426 crossings of an intersection from the pre-experimental data between June 19th and July 20th in the 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 unique identifiers such as badges and uniforms in the qualitative work in the years preceding the re-routing experiment, which is then codified into multiple choice survey questions on the SurveyCTO used by the data collector when reporting with whom the drivers interact.

Figure A4: Histogram of Time Waste per Bribe Interaction with Police, Decomposed by Type of Interactions

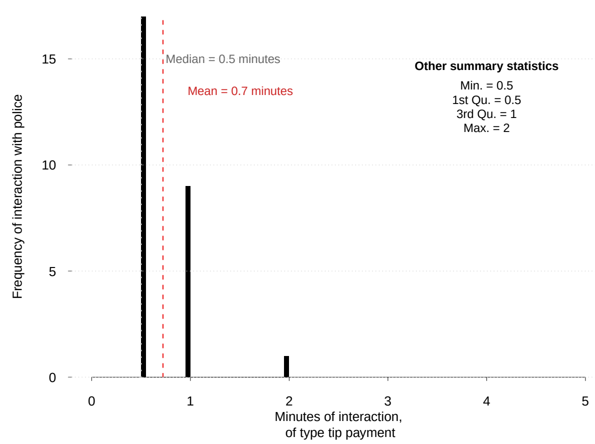
A. Toll Fee (Mbote ya Likasu)



B. Negotiation Bribe (incl. Police Station)

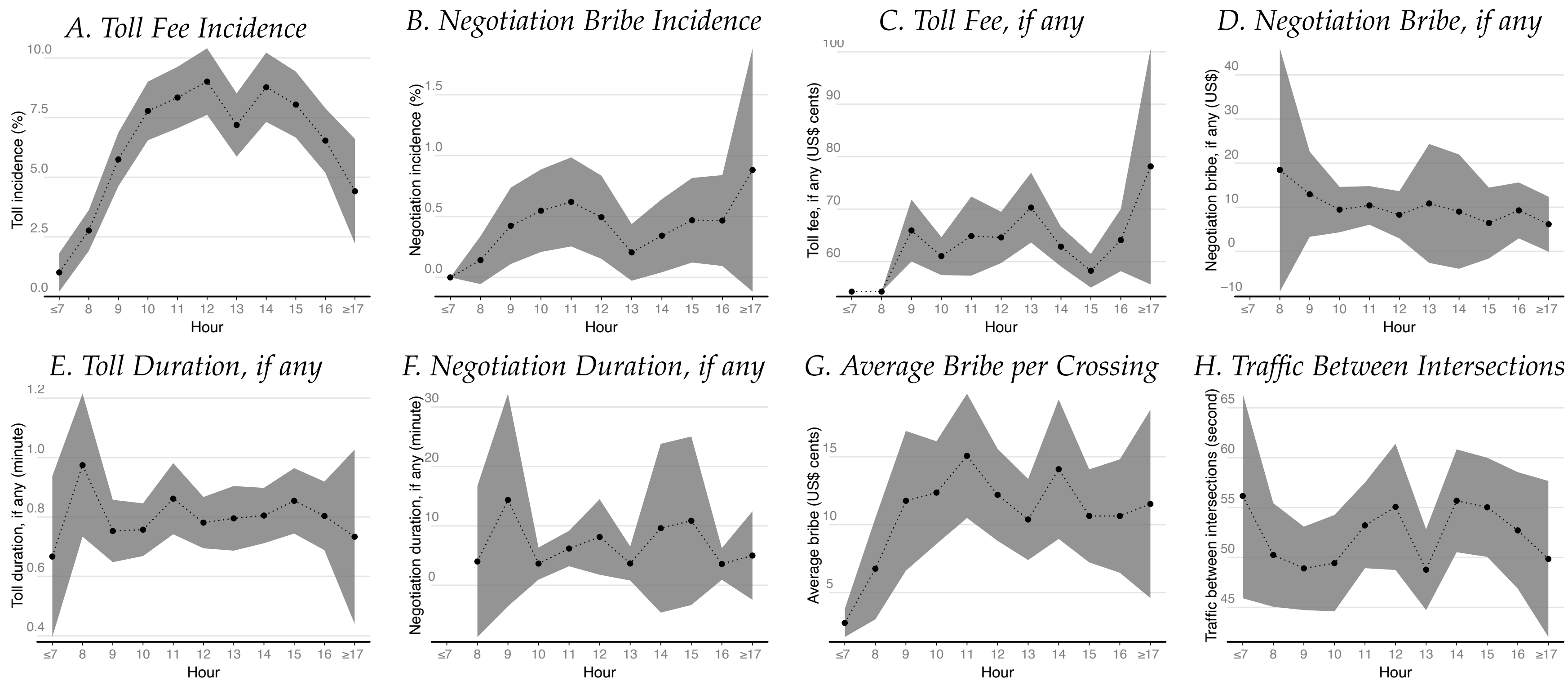


C. Tip



Notes: This histogram depicts 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.

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

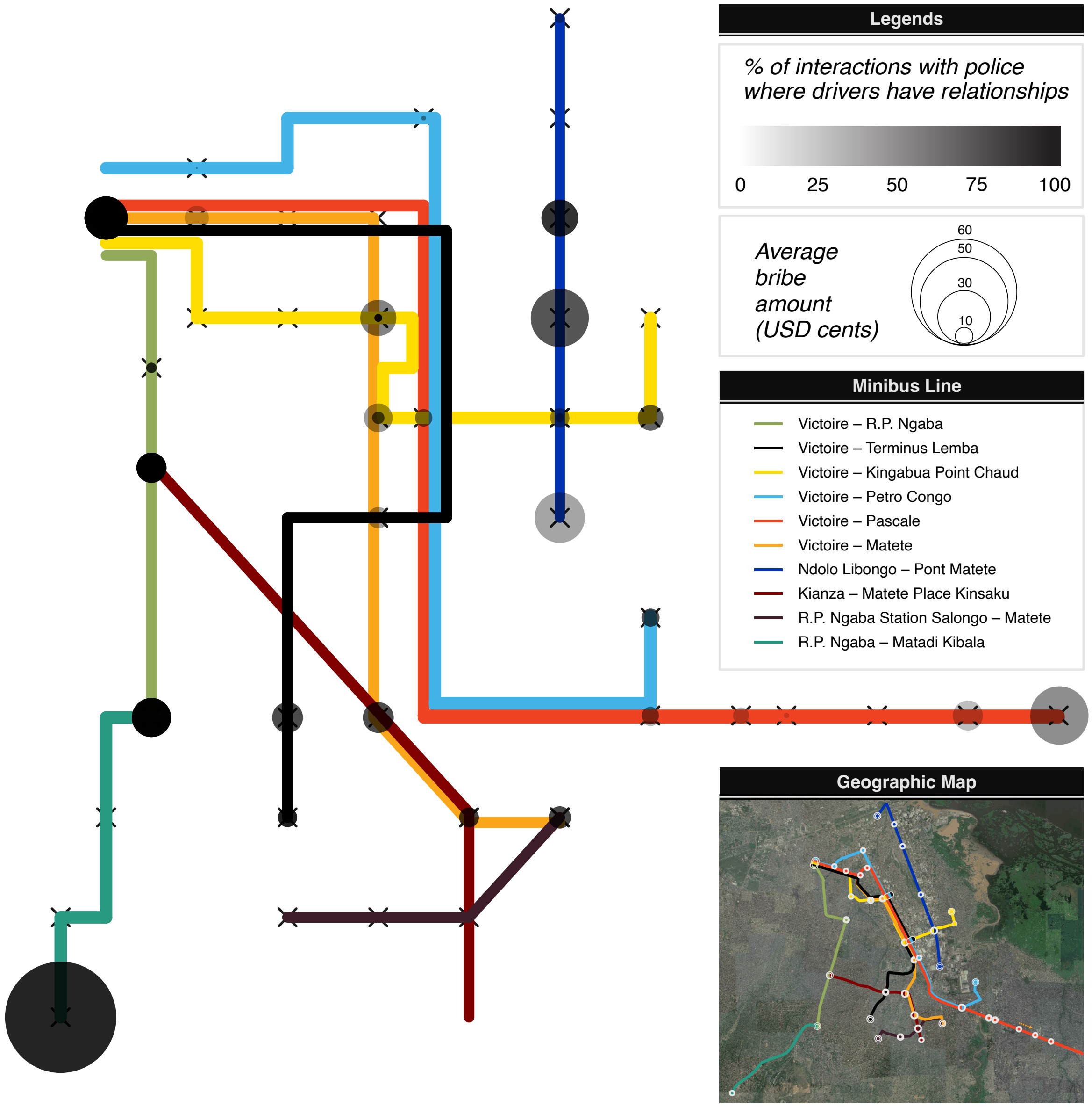


Notes: These time series plot the hourly average characteristics of the bribe costs of type toll fee ("mbote ya likasu") and negotiation bribe, and their associated time waste, per crossing an intersection, as well as their 95% confidence intervals. Panels A and B show the average incidence, panels C 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 sticker of the association of drivers of the Congo

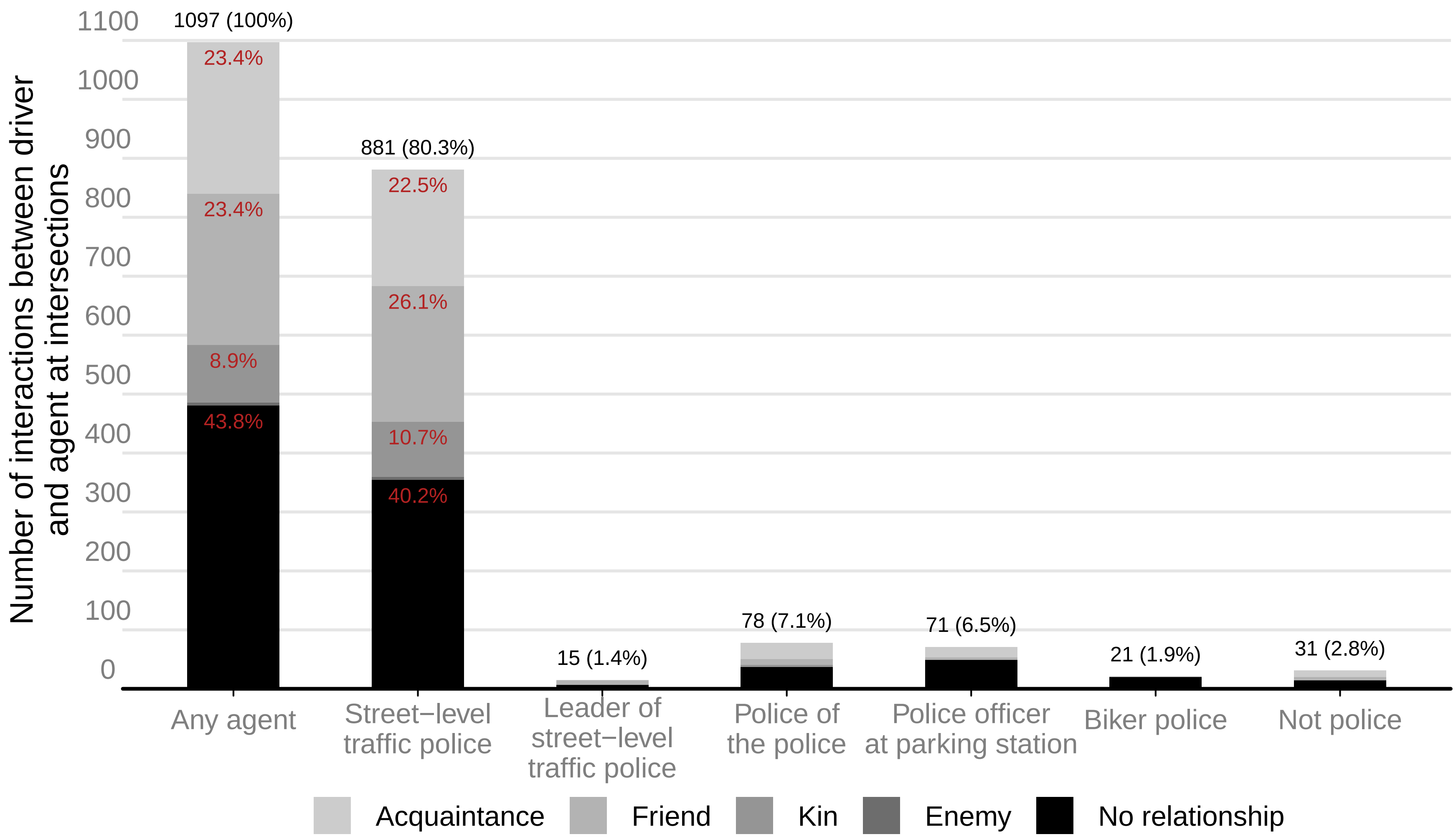
Notes: This figure presents the sticker of the association of drivers of the Congo, pasted on the body of the Mercedes 270 minibuses known as *Spirit of Death* ("*Esprit de Mort*"). **Source**: Research team.

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



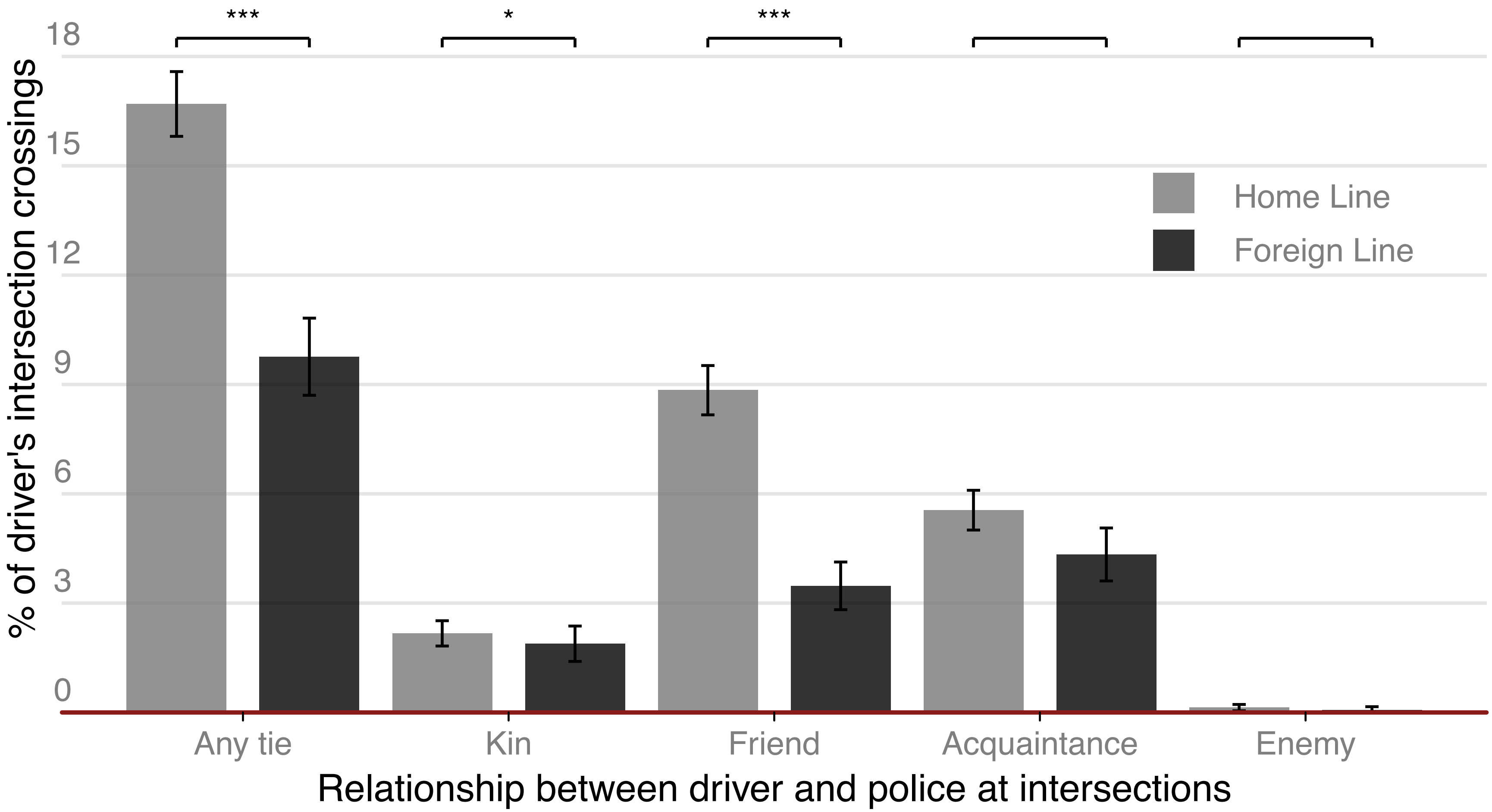
Notes: This figure schematically represents the lines through which "*Esprit de Mort*" minibuses pass and two key statistics for each intersection (×). The first statistics is the percentage of interactions at which home line drivers reported having relationships with police, depicted as greyscale in increasing blackness. The second statistic is the average amount of bribe that is paid by home line drivers in each intersection, depicted as circles with increasing diameter. Geographic proximity is preserved as much as possible in the schematic map.

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



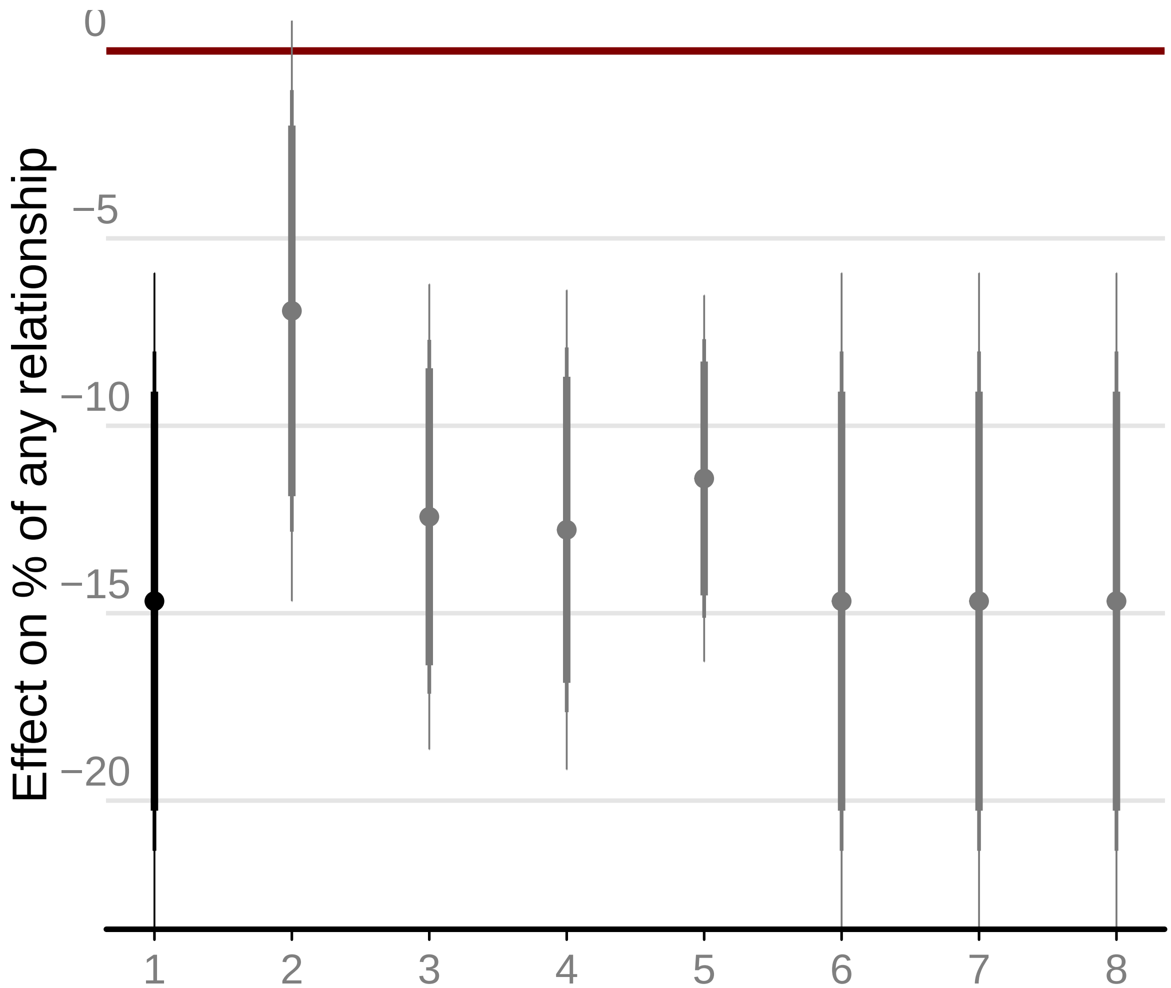
Notes: This bar chart displays the number and fraction of interactions in which drivers have relationships with police officers, obtained from interactions in driver's home lines in the experimental data. Each bar is further decomposed into the extent of relationship. The percentages reflect the proportion of interaction between driver and officers at the intersection for which the type of officers are described on the horizontal axis. The red labels 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 unique identifiers such as badges and uniforms in the qualitative work in the years preceding the re-routing experiment, which is then codified into multiple choice survey questions on the SurveyCTO used by the data collector when reporting with whom the drivers interact.

Figure A9: Effect of Foreign Line Re-Routing on Relationship with Agents at Intersections, per intersection crossings



Notes: This figure presents the 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 re-routing. The asterisks represent the statistical significance of the test for whether the fraction on the home line is statistically significantly different than that on the foreign line, for each relationship category. Statistical significance is obtained from estimating β^F of Equation 1. Social relationships include those of kin, friend, acquaintance, and enemy. Kin includes both nuclear and extended family relationship. 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.

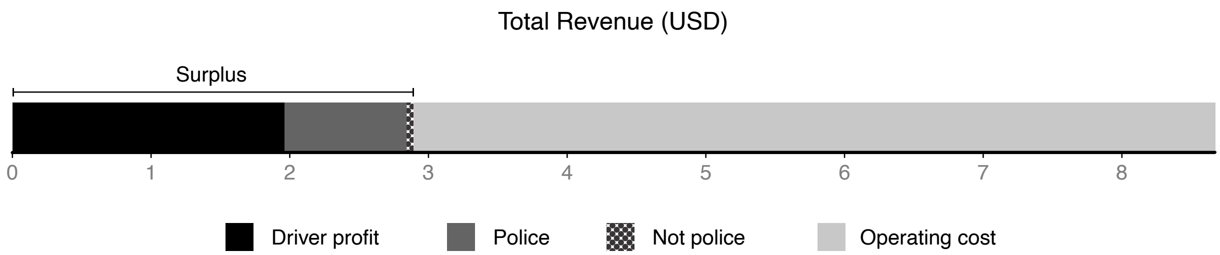
Figure A10: Effect of Re-routing to Foreign on Prevalence of Relationships—Robustness



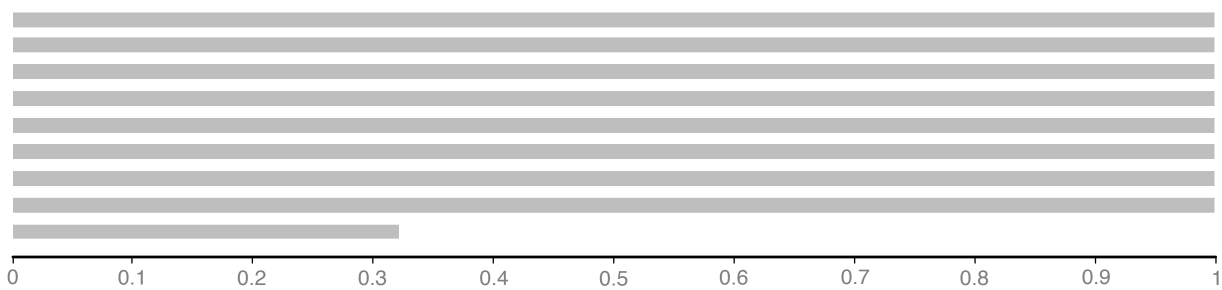
Notes: This figure plots the estimates of β^F coefficient from Equation 1 for relationship (any tie) under various specifications of regression weights and controls. The brackets depict the confidence intervals for the coefficient estimates at 1%, 5%, and 10% significance. Specification key on the x-axis: (1) PATE, our main specification, which is the population average treatment effect, (2) Sample average treatment effect without randomization block fixed effects, SATE$^{\text{raw}}$, (3) Sample average treatment effect, SATE, (4) Assignment probability adjusted sample average treatment effect, ATE, (5) Assignment probability adjusted sample average treatment effect accounting for line composition imbalances, ATE^C, (6) PATE for whose outliers in dependent variables are winsorized at 1%, (7) Specification 6, except at 5%, (8) Specification 6, except at 10%.

Figure A11: Trip Characteristics

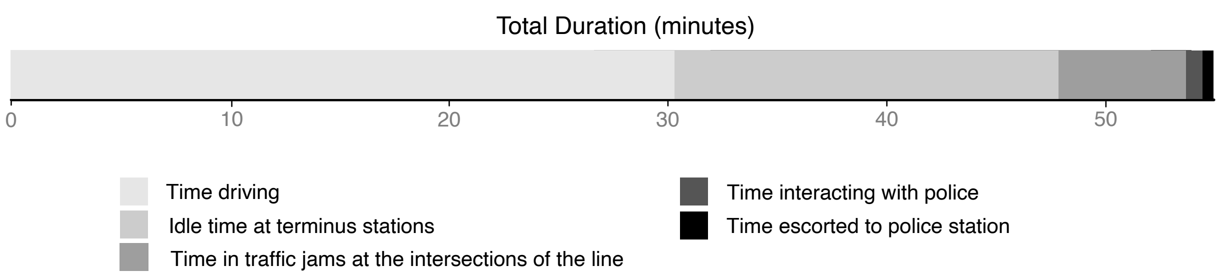
A. Revenue of a Trip



B. Daily number of trips



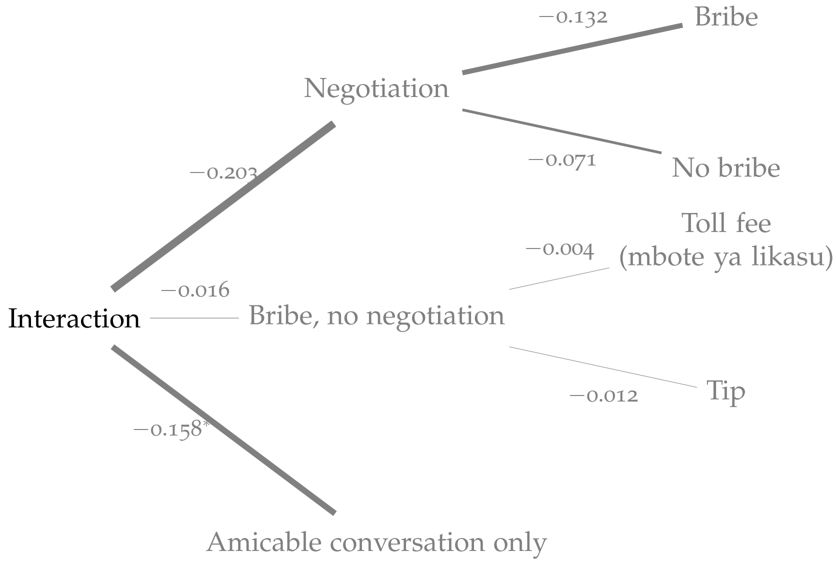
C. Time Allocation in a Trip



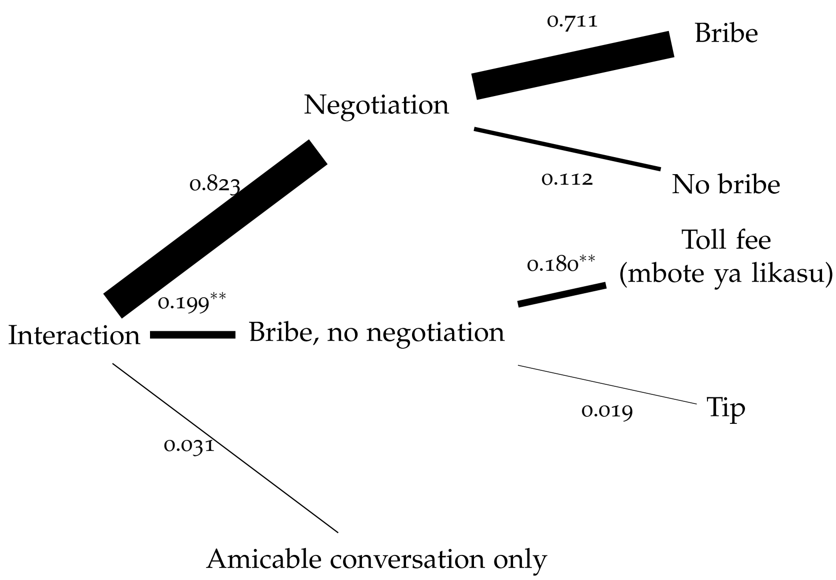
Notes: This figure presents the allocation of surplus and time from an average trip from drivers on the home line of the experimental data. Panel A breaks down the driver's revenue from passenger's payment of minibus tickets into surplus and operating cost. Panel B depicts a progress bar of the number 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.

Figure A12: Effects of Re-Routing on Duration of interaction with the Police

A. Effect of Short-Term Re-Routing

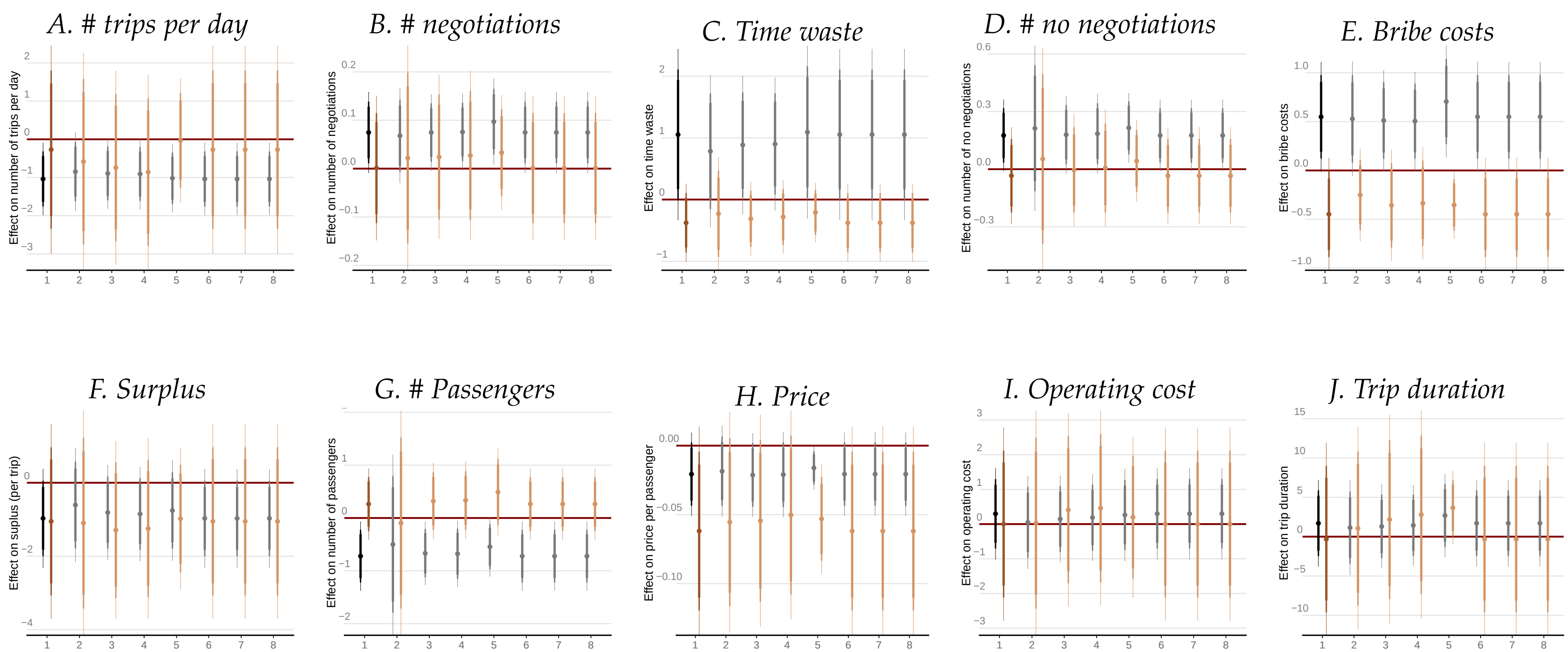


B. Effect of Long-Term Re-Routing, Day 1



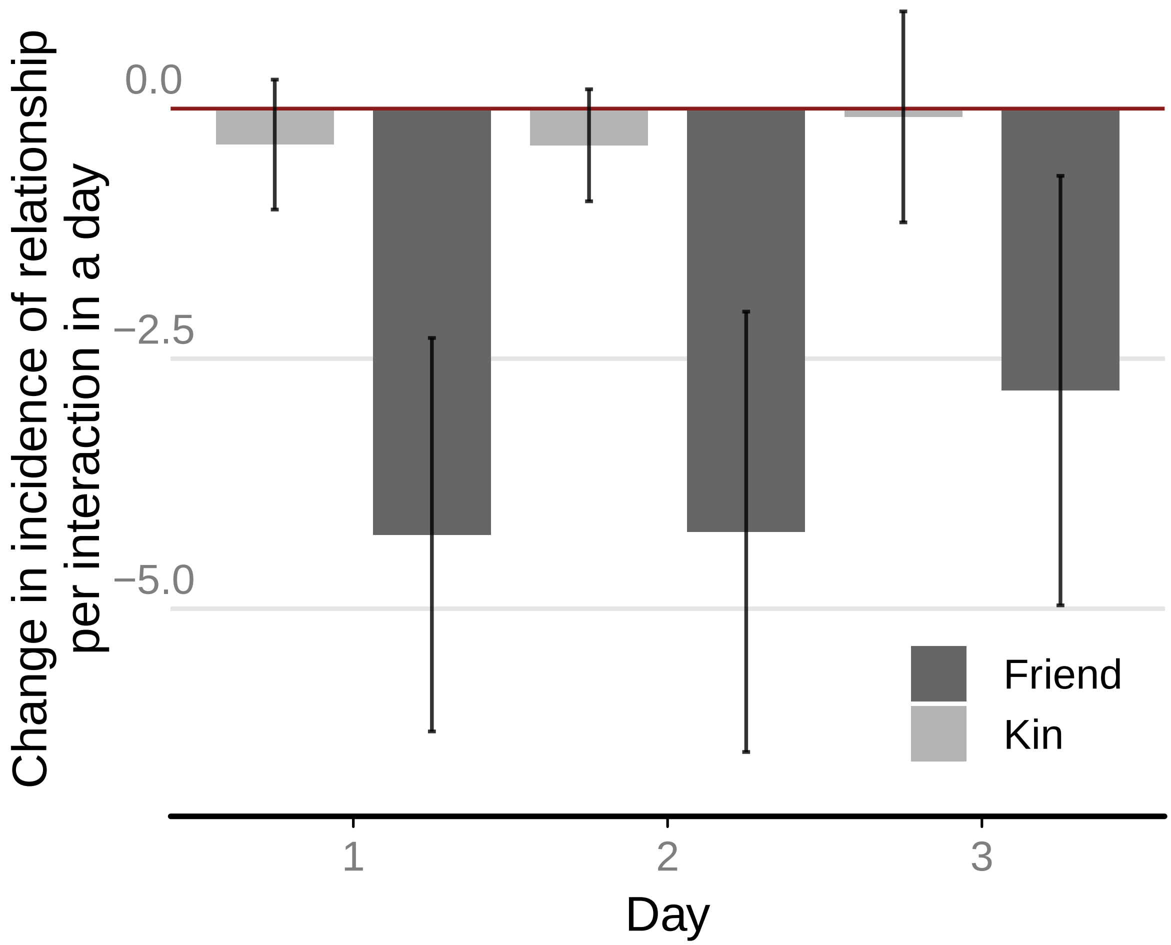
Notes: This tree diagram separates the effects of re-routing on the duration of interactions by the length of the time horizon of this re-routing, using the replica of Figure 2 as a baseline template for the type of interactions which occur when drivers interact with police officers on the driving lines. As the experimental design suggests, we partition the days of experiment and drivers into driving blocks of contiguous days (three days or one day, in order to allow the analysis of the impact of various time horizon.) Panel A presents the effect of short-term re-routing, that is re-routing which occurs on one-day driving block. Panel B presents the effect of long-term re-routing, that is re-routing which occurs on the three-day driving block. The effect of foreign re-routing is based on observations only on the first day of these driving blocks on the foreign line to remove the effects associated with having interacted with the police officers on the first day, as compared to observations which pool the driving blocks on the home line. The line thickness of each branch in the tree diagram is proportional to the coefficients from β^F population average treatment effect estimator in Equation 1, on the duration of each type of interaction. Each coefficient size of the estimate of this PATE estimator and the statistical significance of the coefficient are labeled on each branch. Negative coefficient identifying lower time waste is colored in grey, while positive coefficient identifying higher time waste is colored in black. Negotiation with bribe is coded by the enumerator as driver having negotiated payments with police and resulting with payments, whereas negotiation with no bribe is coded as having negotiated payments with police but ending up with zero payment (either due to protection, escape, promise of future payment, etc.)

Figure A13: Effect of Re-routing to Foreign Lines on Surplus and its Components—Robustness



Notes: These figures plot the estimates of coefficient β^F from Equation 1 under various specifications of regression weights and controls (Panels A-E), as well as those for which dependent variables are lead and lagged for 1, 2, and 3 days (Panels F-J), separately for subsamples of observations which were assigned to long and short time horizons. 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 block fixed effects, SATE$^{\text{raw}}$, (3) Sample average treatment effect, SATE, (4) Assignment probability adjusted sample average treatment effect, ATE, (5) Assignment probability adjusted sample average treatment effect accounting for line composition imbalances, ATE^{C}, (6) PATE for whose outliers in dependent variables are winsorized at 1%, (7) Specification 6, except at 5%, (8) Specification 6, except at 10%.

Figure A14: Long-Term Horizon: Investment in New Relationships?



Notes: This figure presents the population average treatment effects of re-routing on the incidence of kinship and friendship, separated by observations on the first, second, and third day of the long time-horizon, i.e. experimental driving blocks which contain three contiguous days. The figure plots the coefficient size and the 95% confidence interval of the β_1 estimate of the PATE estimator from Equation 2, which identifies the population average treatment effect of foreign line driving on the incidence of relationship within each trip and days of driving. Incidence of kinship is shown on lighter grey, while incidence of friendship is shown on darker grey. Trip is defined as a return trip between two termini. Trips are winsorized at 5 per day because of the low number of observation above it.