Competition and Corruption: Highway Corruption in West Africa

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Introduction

In West Africa, long-haul truck drivers frequently encounters checkpoints where they are required to pay petty bribes in order to proceed. In this study, we explore how competition among corrupted officials affects the corruption equilibrium by exploiting the spatial allocation of checkpoints along a dual road system.
We exploit an exogenous road construction project to study how change in the market structure affects bribe levels. The Malian government launched a road construction project that completely rebuilt one of two roads, severely impacting road conditions on that route during construction. We hypothesize that the extra cost to pass through one route will push more drivers to choose the alternative road. As a result, officials on the other road will extort more from drivers. We find that both bribes and minutes delayed on the unaffected non-shared segment increased during the period of road construction, relative to those on the affected non-shared segment. Moreover, we find checkpoints on the unaffected road segment gain even more bargaining power against drivers in the rainy season compared to the dry season. It validates our results because rainfall intensifies the cost differential between two roads during the period of construction.

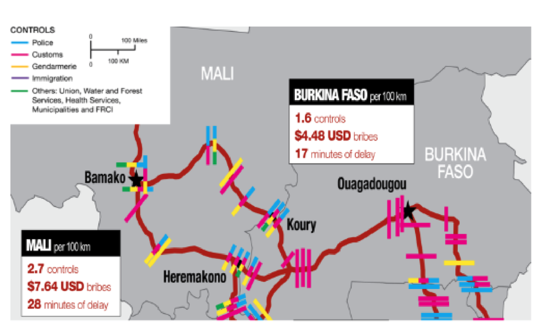


Figure 1. *The figure illustrates the dual road system. From now on, we will call the road affected by the construction project Héré, and the unaffected road Koury.*

Aim

The main purpose of the study is to explore how spatial competition affects corruption outcomes on a dual road system. For this purpose, we build a theoretical model that deduces the Nash Equilibrium of a system where delayed offers are endogenized. The model predicts a a redistribution of corruption benefits towards checkpoints unaffected by the road construction.
We confirm the model hypotheses empirically via difference-in-differences. Our results point out the importance of market structure to corruption outcomes, and an unintended spillover effect of local anti-corruption interventions.

Method

The data on bribes and enforced delays comes from the Improved Road Transport Governance (IRTG) project sponsored by USIAID's West Africa Trade Hub. That project surveyed over 10,000 truck drivers along six main inter-state corridors that connect major cities in West Africa. In each trip, bribes and enforced delays were recorded. We use the records on the two corridors: *Koury* and *Héré*.
We compare the two non-shared road segments by estimating the following difference-in-differences model:

$$Y_{ict} = \beta \mathbb{1}\{Construction\} \times \mathbb{1}\{Koury\} + X_t'\gamma + \theta_c \times \delta_d + \eta_m + \sigma_r \times m + \epsilon_{ict}.$$

where

- Y_{ict}: bribes (or minutes delayed) for a stop i at checkpoint c during a trip t.
- $\mathbb{1}\{Construction\}$: road construction dummy.
- $\mathbb{1}\{Koury\}$: dummy of the unaffected road Koury.
- X_t: trip-level characteristics.
- $\theta_c \times \delta_d$: checkpoint-direction fixed effects.
- η_m and $\sigma_r \times m$: month fixed effects and route-specific monthly trends.

The coefficient β identifies identifies the change in stop-level bribes (or delayed minutes) on the *Koury* corridor during road construction compared to the change in bribes (or delayed minutes) on the *Héré* corridor.
To further validate our results from DID, we use rainfall as a proxy for actual road conditions and run a triple-difference model to identify the heterogeneous effects of road construction during the rainy vs. dry seasons.
In addition, we test the parallel trends assumption via a event study. The event studies is as follows:

$$Y_{ict} = \sum_{q=-4}^{2} \beta_q \mathbb{1}\{quarter\ q\} \times \mathbb{1}\{Koury\} + X_t'\gamma + \theta_c \times \delta_d + \eta_m + \sigma_r \times m + \epsilon_{ict},$$

where $\mathbb{1}\{quarter\ q\}$ refers to quarter dummies. Since our data is from January 2011 to September 2012, while the road construction is from November 2009 to March 2012, there is no "pre-trend" for us to test the parallel trend assumption. We instead use the post trend (the second and third quarter in 2012) to test the assumption. We find evidence consistent with parallel trends post road construction (Figure

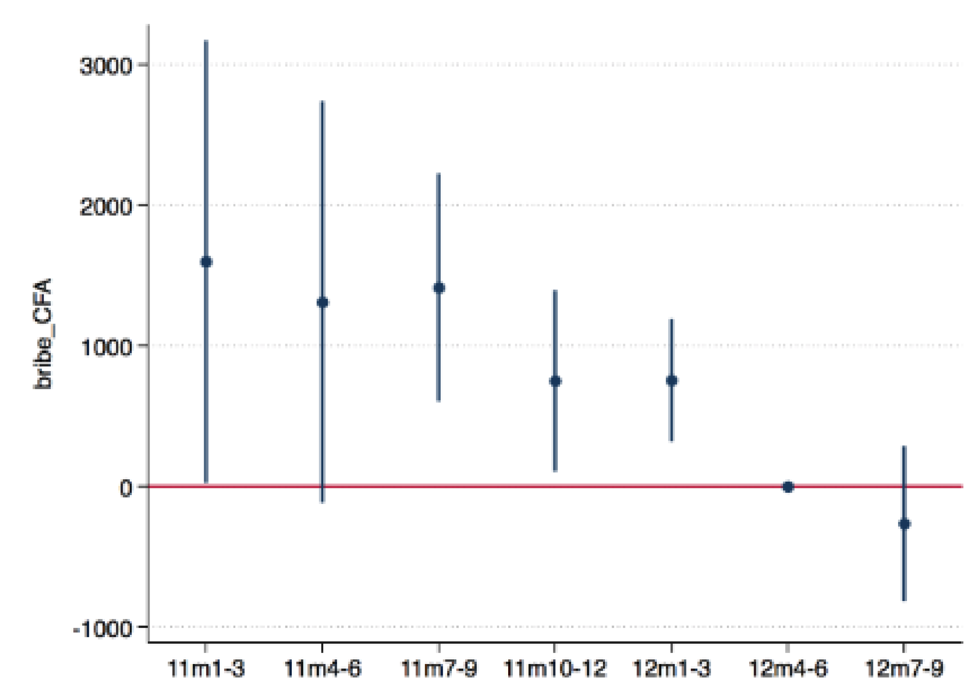
Results

Table 1 presents the DID results. We find that the road construction significantly increases both bribes (560 CFA, or about $1 per stop) and enforced delay (2 min per stop) on the *Koury* segment, relative to the *Héré* segment. Figure 2 shows the event study results on bribes. The DID passed the parallel trend assumption as the coefficient of the third quarter in 2012 is insignificant. Moreover, it shows a convergence of difference in bribes towards 0 as the end date of the road construction approaches. Table 2 presents results of the triple-difference estimations, showing that drivers pay more as the precipitation level increases.

	Bribes (CFA)		Enforced Delay (min)	
	(1)	(2)	(3)	(4)
Road Construction × Koury	540.800***	560.727***	1.917***	2.092***
	(166.014)	(170.143)	(0.449)	(0.469)
Truck & merchandise types		×		×
Driver Characteristics		×		×
Holiday		×		×
Checkpoint-Direction FE	×	×	×	×
Month FE	×	×	×	×
Corridor-specific Time Trends	×	×	×	×
N	18973	18805	18973	18805
R^2	0.556	0.565	0.634	0.639
Outcome Mean	1856.839	1857.474	7.859	7.886

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 1. Difference in Difference Estimates of Bribes and Delays *Table shows significant increases in bribes and delays for drivers on the Koury corridor when there is construction on the other Héré corridor. Standard errors are clustered at the checkpoint-authority level and shown in parentheses.*



(a) Effects on bribes

Figure 2.Event study on bribe outcome

	Bribes (CFA)		Enforced Delay (min)	
	(1)	(2)	(3)	(4)
Road Construction × Koury	560.727***	648.364***	2.092***	1.652***
	(170.143)	(180.402)	(0.469)	(0.495)
Road Construction × Koury × Precipitation		4.721*		-0.007
		(2.803)		(0.010)
Koury × Precipitation		2.787		-0.011
		(2.434)		(0.011)
Precipitation		-0.481		0.003
		(0.383)		(0.003)
Truck & merchandise types	×	×	×	×
Driver Characteristics	×	×	×	×
Holiday	×	×	×	×
Checkpoint-Direction FE	×	×	×	×
Month FE	×	×	×	×
Corridor-specific Time Trends	×	×	×	×
N	18805	15361	18805	15361
R^2	0.565	0.556	0.639	0.598
Outcome Mean	1857.474	1808.977	7.886	7.115

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2.Triple Difference estimates with Rainfall *Precipitation is the rainfall level (unit mm) of the commune where a driver was stopped on that date. We assume that checkpoint officials and drivers on the Koury corridor infer the rainfall level on the Héré corridor based on rain they experience on their own road. Precipitation in Mali ranges from 0mm/day in the dry season up to 50-100 mm/day in the rainy season, bribes per stop during a trip in July could be 235-470 CFA higher than during a trip in January, increasing the average bribe per stop between 10-20%.*

Conclusion & Policy Implications

In this paper, we argue that effective anti-corruption interventions require an improved understanding of the market structure that shapes corruption behavior. We demonstrate how market structure shapes corrupt behavior by showing both theoretically and empirically a spillover effect of a road construction project on checkpoints unaffected by the project. Specifically, we find that when one road is harder to pass due to road construction, corrupted officials on the other competing road gain more bargaining power against drivers. As a result, they can extort more from drivers.
Our paper shows that a reduction in competition caused by a local construction project leads to a redistribution of corruption benefits towards checkpoints unaffected by the road construction. Such a spillover effect should be taken into account by policy-makers considering anti-corruption interventions, since their effectiveness may be offset by corrupted officials beyond the scope of the intervention.
In general, a national anti-corruption policy with strong enforcement can avoid such spillover effects. When such a policy is not available, it is important to carefully evaluate possible spillovers caused by localized anti-corruption interventions.