On the Waterfront: An Empirical Study of Corruption in Ports*

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Abstract

This paper investigates how bureaucrats set bribes and whether these payments impose significant economic costs. We generate an original dataset on bribe payments at ports in Southern Africa that allows us to take an unusually close look into the black-box of corruption. We find that bribes are product-specific, frequent and substantial. Bribes can represent up to a 14% increase in total shipping costs for a standard 20ft container and a 600% increase in the monthly salary of a port official. Bribes are paid primarily to evade tariffs, protect cargo on the docks and avoid costly storage. We identify three systemic effects associated with this type of corruption: a "diversion effect" where firms go the long way around to avoid the most corrupt port; a "revenue effect" as bribes reduce overall tariff revenue; and a "congestion effect" as the re-routing of firms increases congestion and transport costs in the region by generating imbalanced flows of cargo in the transport network. The evidence supports the theory that bribe payments at ports represent a significant distortionary tax on trade, as opposed to just a transfer between shippers and port officials that greases slow-moving clearing queues.

Keywords: Corruption; Transport; Ports; Trade Costs

JEL Classification Numbers: D21, D61, D73, K42, L91, O12, O55, R41.

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I Introduction

Recent research suggests that corruption at ports raises the cost of trade (Yang, 2008; Clark et. al, 2004), but the absence of data on actual bribe payments has made it difficult to understand how corruption emerges and how it affects the economy more broadly. And yet ports provide fertile ground to analyze corrupt behavior since opportunities for rent-seeking abound. A port represents an administrative monopoly over an essential public service with broad discretionary powers and scant institutional accountability.

From a theoretical perspective, how bribes are set and the mechanisms through which corruption affects the economy are ambiguous. For instance, the "corruption as grease" theory argues that if bribes are set according to the time-preferences of private agents, corruption can be efficiency-enhancing by reducing delays in slow-moving queues for public services (Leff, 1964; Huntington, 1968; Lui, 1985). An alternative view suggests that bribes are set according to the strategic preferences of bureaucrats, representing a "distortionary transaction tax" that leads to an inefficient allocation of public and private resources (Krueger, 1974; Klitgaard, 1991; Shleifer and Vishny, 1992; Shleifer and Vishny, 1993; Rose-Ackerman, 1999). Other theories emphasize that bribe setting is shaped by different combinations of wage incentives and administrative sanctions (Becker, 1968; Becker and Stigler, 1974; Lindauer, 1988; Besley and Mclaren, 1993; Das-Gupta and Mookherjee, 1998). Different theories persist in the literature in part due to the challenge of obtaining micro-data on the dynamics of corrupt behavior, and to the difficulty of measuring the impact of corruption on economic outcomes.

To investigate corruption we generate an original dataset on directly observed bribe payments to port officials for a random sample of 1,300 shipments going through two competing ports in Southern Africa. To the best of our knowledge, this is the first study to document the magnitude, the determinants and the impact of corruption in ports, with actual data on bribe payments. Our empirical setup and the level of detail of our data enable us to take an unusually close look inside the blackbox of corruption. On the one hand, we observe how

corruption levels vary among different types of port officials with more or less bureaucratic discretion to extract bribes, and across different types of shipments. On the other hand, because we observe the entire chain between bribe setting and port users' shipping decisions, we are able to more accurately estimate the systemic impact of this type of corruption on the economy.

Our empirical strategy consists of first identifying how port officials adopt different rules of thumb when determining the incidence, the distribution and the magnitude of bribes. We then examine the broader economic implications of corruption by analyzing how firms respond to these bribe schedules when they have a choice between two ports offering similar quality of service, but with different levels of expected corruption. Specifically, we study how firms located in the hub of economic activity in South Africa choose between the equidistant ports of Maputo and Durban, which differ significantly in their level of corruption. The expected bribe in Maputo is four times higher than the expected bribe in Durban.

We present three main findings on the importance, the nature and the impact of corruption. First, we find that bribes are high, frequent and that they vary significantly across ports due to organizational differences in port bureaucracies. The incidence of bribe payments can be as high as 53% of a random sample of 650 shipments, increasing total port costs by up to 130% and total shipping costs - including costs of overland transport, port clearance and ocean shipping - by up to 14% for a standard 20 ft container traveling between South Africa's economic hub and Eastern Africa or the Far East.[1]

Second, we provide quantitative and qualitative evidence on how bribes are set. Port officials practice third-degree price discrimination, charging higher bribes to shipments with characteristics that suggest a higher willingness for a shipper to pay a bribe. Bribes are increasing in the level of tariffs due, in the extractive capacity of the port official, in storage costs and in the size of the shipment, but decreasing in the elasticity of import demand for the good shipped. Our results also suggest that the incidence and the magnitude of bribes

[1]Total port costs include cargo dues as well as handling, security and document fees.

depend more on the extractive capacity of each port official than on their wage levels, lending credence to the old adage that the "opportunity makes the thief". Though wages and sanctioning systems are similar across ports for customs officials in Maputo and port operators in Durban, the former have far greater discretion than the latter to extract bribes. As a result, bribes can represent up to a 600% increase in the average monthly salary of a customs official compared to a 144% increase in the average monthly salary of a port operator.

During the period we study, the phasing in of a regional trade agreement led to the reduction in tariff levels of a select group of products in Mozambique. We take advantage of this natural experiment to identify the impact of a change in policy -tariffs- on bribe levels. We observe bribe payments before and after the tariff change took place, which we then compare to goods that remained in the high tariff group throughout the entire period. We find that goods that experience the tariff reduction are associated with a 34% decline in the size of the bribe paid.

Third, we observe that firms respond to different bribe schedules at ports. In what we label the "diversion effect" of corruption, we find that a firm shipping goods vulnerable to corruption will travel on average an additional 322 kms to avoid paying a bribe at the most corrupt port. Though not as clearly identified, our results suggest two additional effects that increase the cost of corruption. In what we label the "revenue effect", we find that when bribes are paid to evade tariffs the impact on tariff revenue is equivalent to a 5 percentage point reduction in the average tariff rate. The median bribe paid corresponds to only 6% of the tariff liability evaded, suggesting a small transfer between shippers and bureaucrats relative to the size of the private rent captured by evading the tariff. This result adds to the growing evidence on what has been termed the "Tullock Paradox", which refers to the small size of bribe payments relative to the size of the corresponding rent. Finally, in what we label the "congestion effect" of corruption, we observe that the re-routing of firms due to corruption increases congestion and transport costs in the region by generating imbalanced flows of cargo along the transport network.

Our findings are consistent with an emerging literature that argues that bureaucrats price discriminate when setting bribes and that corruption can have significant economic consequences. Svensson (2002) and Fisman and Svensson (2002) find evidence that corrupt bureaucrats act as price discriminators in determining access to public services and that a 1 percentage point increase in bribery rates reduces firm growth by 3 percentage points. However, both studies rely primarily on self-reported measures of bribe payments to public officials by surveyed firms, which bear a high risk of perception and reporting bias. Olken (2007) conducts an empirical test of the Shleifer and Vishny (1993) corruption model with field data on bribe payments by truckers to road post officials in Indonesia and also finds evidence that corrupt bureaucrats behave like price-discriminating profit-maximizing firms. The paper shows that corruption is determined by the organizational structure of the "market" for bribes, the elasticity of demand for the official's services and the degree to which corrupt officials can coordinate with one another in setting bribe prices. Bertrand et al. (2007) provides experimental evidence on how bureaucrats undercut existing regulations on obtaining a driving license in India, responding to the needs of private agents but at a high social cost. While these papers suggest large social losses due to bribe payments, neither has the data to quantify the impact of corruption on economic activity.

The rest of the paper proceeds as follows. Section II describes the empirical setting in more detail. Section III introduces our theoretical framework describing how port officials set bribes and laying out our main predictions. Section IV describes the primary data collection. Section V presents the descriptive statistics and the empirical analysis on the determinants of bribe payments. Section VI examines the different costs imposed by corruption in ports, section VII discusses robustness checks and section VIII provides some concluding remarks with suggestions for future research.

II Setting

II.1 Transport and Ports in Southern Africa

In 2007, shipping a container from a firm located in the main city of the average country in Sub-Saharan Africa was twice as expensive as shipping it from the US, Brazil or India (World Bank, 2007). Even in a middle income country like South Africa, expenditures on transport are equivalent to 15-20% of GDP (CSIR, 2005) and transport costs weigh heavily on the cost structure of firms, constraining decisions on the location of production, the sourcing of inputs and participation in international trade.[2] But not only is exporting from Sub-Saharan Africa more expensive, it is also more time-consuming. In 2007, it took an average of 35 days for a firm to get a standard 20ft container from its warehouse through the closest port and on a ship. This was twice as long as in Brazil and six times longer than in the US. Djankov, Freund and Phan (forthcoming) in turn find that each day cargo is delayed reduces a country's trade by 1% and distorts the ratio of trade in time-sensitive to time-insensitive goods by 6% and a growing literature suggests that transport costs currently impose a higher effective rate of protection than tariffs (Hummels et al, 2008).

In this study we focus on two competing transport corridors connecting South Africa's mining, agricultural and industrial heartland to the ports of Durban in South Africa and Maputo in Mozambique, as shown in Figures 3 and 4. Given its strategic location, the port of Maputo has historically been considered a critical part of South Africa's transport network and together with Durban serves as the primary transportation route to the sea for the booming South African provinces of Mpumalanga, Gauteng and Kwazulu-Natal.[3] The

[2] An enterprise survey we conducted in the region in 2007 found that transport costs accounted for 34% of a medium-sized firm's total cost structure. In comparison, labor costs accounted for on average 30%.

[3] There is a third port in the region, the port of Richards Bay, which is located approximately halfway between Durban and Maputo along South Africa's eastern seaboard. This port was developed in the late 70s to serve a select group of private shareholders and is primarily used by large mining conglomerates to ship bulk cargo. Given the restricted nature of access to this port, we do not consider it to be a substitute for either Durban or Maputo for the type of firms we cover in this study. In fact, the enterprise survey we conducted in South Africa in 2007 covered a random sample of over 1,700 firms. None of these firms used Richards Bay as an import or export port.

choice of which port to use is not trivial since cargo travels long distances - an average of 588 kms - between centers of production or consumption and ports, primarily by road given the high cost and low efficiency of railroad services in the region.[4]Since 2004, the barriers for freight transit along the transnational corridor connecting to the port of Maputo have been significantly reduced.[5] A clearly defined group of South African firms therefore faces the choice of using two different ports - Maputo or Durban - with similar overland transport costs, similar handling technologies at the ports and similar logistics services for standard cargo, but facing different levels of expected corruption. Furthermore, the effects that we find on the impact of corruption on firms' choice of port are likely to be magnified across the region given that the South African and Mozambican transport networks also serve six landlocked and neighboring countries in Southern Africa - Malawi, Lesotho, Swaziland, Botswana, Zambia and Zimbabwe.

II.1.1 The Ports of Maputo and Durban: Bureaucratic Variation and Opportunities for Corrupt Behavior

An important feature of this empirical setup is that neither port dominates the other in overall speed and quality of cargo handling (see Table 1 for a summary of the main characteristics of each port and Appendix I for a more comprehensive description of the different ports).

Though each port official sells a differentiated product with monopoly power over a specific sequence in the clearing chain, officials differ in their authority and discretion to stop cargo and create opportunities for bribe payments. In principle, customs officials have greater discretionary power to extract bribes than regular port operators given their broader mandate and the fact that they can access full information on each shipment and each shipper

[4]Our enterprise survey revealed that less than 4% of the 2,700 firms covered in both South Africa and Mozambique used railroad services in 2007.

[5]For one, there are no visa requirements for truck drivers from either country to operate along the transnational Maputo corridor.

at all times. Regular port operators on the other hand have a narrower mandate to move or protect cargo on the docks, while facing binding informational constraints on non-observable characteristics of the shipment.[6]

The port bureaucracies of Maputo and Durban differ in two important dimensions: the type of terminal management and the level of technology in customs. Together, these organizational features determine which of the two types of port officials have more opportunities for bribe extraction: customs or port operators. The port of Maputo outsourced the management of all terminals and port operators to the private sector, while the Port of Durban remains under public control. Private management in Maputo has succeeded in keeping any side payments to regular port operators in check while in Durban, the strength of dock workers' unions have prevented more far-reaching monitoring and punishment for corrupt behavior among port operators. As for customs, the submission of all documentation for cargo clearance can be done online in Durban while in Maputo this process requires the presence of a clearing agent. Close interaction between clearing agents and customs officials creates increased opportunities for corrupt behavior in Maputo. Both ports have similar passive sanctioning systems, whereby action to punish an official for engaging in corrupt behavior is only taken upon a user's report of a bribe solicitation.[7]

[6]Customs officials possess discretionary power to single-handedly decide which cargo to stop and whether to reassess the classification of goods or import prices for tariff purposes. They can also threaten to conduct a physical inspection of the shipment, which can delay clearance for up to 4 days, or request additional documentation from the shipper. Beyond customs, corrupt behavior can emerge in the contracting of access to terminals and privileged port services but also in the form of outright extortion from a long and complex chain of frontline port operators. Bribes are frequently paid to agents in charge of adjusting reefer temperatures for refrigerated cargo stationed at the port; to port gate officials who determine the acceptance of late cargo arrivals; to stevedores who auction off forklifts and equipment on the docks; to document clerks who stamp import, export and transit documentation for submission to customs; to port security who oversee high-value cargo vulnerable to theft; to shipping planners who auction off priority slots in shipping vessels and to scanner agents who move cargo through non-intrusive scanning technology.

[7]According to Customs Agencies in South Africa and Mozambique, both ports averaged less than 6 reports of bribe payments in 2007-2008, which is a low reporting rate given the number of payments we observed in our random sample of shipments during the same period. In the period of time covered in our sample, no customs official was punished with removal from his or her post.

II.1.2 The Shipping Decision: the Role of the Clearing Agent

Most firms will engage in ad hoc, shipment-based contracts with truckers and clearing agents to satisfy their transport and clearance needs. Alternatively, firms can outsource the entire transport chain of transport and clearing to a larger freight forwarder. These intermediaries will then engage in contracts with clearing agents who specialize in port or border clearance. By law, no firm is allowed to interact directly with customs or port operators. Firms have instead to resort to clearing agents who specialize in clearing cargo through the port on behalf of their clients. The market for clearing agents is moderately competitive following the de-regulation of the trade in the 80s in South Africa and in the 90s in Mozambique. However, cumbersome clearance procedures and complicated tariff schedules in both countries together with the need to establish relationships with a web of agents involved in getting cargo in and out of the port raise significant barriers for new entrants in the market. In the sample of firms we track in this paper, 80% engaged in direct contracts with clearing agents, 65% of which were for a one-time shipment.

Bribes are paid primarily by clearing agents, with all costs imputed to client firms.[8]The decision to pay a bribe is often made by the firm, which is then put into practice by the clearing agent.

In this paper we make several simplifying assumptions. For one, we assume that there is no strategic sorting between clearing agents and different port officials. In the case of imports, there is significant uncertainty as to when the vessels can dock at the port due to wind patterns or congestion levels and for exports there is uncertainty as to when trucks enter the port. Given that customs officials operate for 6 to 8 hour shifts and that no cargo can stay idle inside the port without the documentation being submitted to port officials, we consider that clearing agents are randomly matched with port officials. We also abstract from several bargaining dynamics namely the possibility of collusion between different port

[8]Truckers may also pay bribes at roadposts along both corridors. We do not include these bribes in our study given that trucking surveys in the region indicated that the probability of paying a bribe in either corridor was identical and that these bribes were on average 50% lower than the bribes that were paid at the port or border post by clearing agents.

officials at each port or across ports; agency problems between firms and clearing agents as well as intertemporal bargaining dynamics. We choose to abstract from these dynamics given that we do not find any evidence of collusion between port officials and we find that bribes vary significantly between clearing agents and across shipments handled by the same clearing agent. Moreover, the small sample of clearing agents participating in this study due to the nature of the data collection effort rendered it impossible to test these hypotheses any further with the current data.

III Theoretical Framework

In this section we adapt two models of price discrimination in transport and bribe setting developed in Hummels (2008) and Olken (2007) to guide our empirical testing of the conditions under which bribes will occur, and the manner in which bribe levels are set. In this modified theoretical framework, port officials set an optimal bribe as a function of the (1)extractive capacity of their position in the clearing chain, of (2) product characteristics such as the tariff code the product belongs to and its price, and of (3) shipment characteristics such as its size and total transportation costs. Alternative hypotheses are that shippers pay a flat bribe for each shipment, that all port officials price discriminate the same way irrespective of their position in the clearing chain, or that port officials discriminate based on the time-preferences or the location of different shippers.

III.1 Assumptions

Suppose that port officials are allocated to different phases of the clearance chain, each with monopoly power over different stages of the clearing process, but that their capacity to extract bribes varies according to the organizational structure of the port. Examples of important organizational characteristics are whether terminals are privately or publicly managed or whether shipping documents are submitted online or in-person, thus changing the

nature of the interaction between port officials and clearing agents, and consequently the opportunity for bribery to take place. This model considers $i = 1, 2, ...M$ symmetric consumers in a given country, with quasilinear preferences defined over a homogeneous numeraire good and over different varieties of traded goods with a price elasticity of import demand σ. We assume that firms substitute between domestic and international goods conditional on cost and consumers' preferences. The average consumer has a utility function:

$$U_{ij} = q_{i0} + \Sigma q_{ij}^{\frac{\sigma - 1}{\sigma}} \tag{1}$$

where q_{i0} is consumer i's consumption of the numeraire and q_{ij} is consumer i's consumption of internationally traded goods j. The price of the numeraire is generalized to 1 and can be traded at zero cost. Internationally traded goods are sold at price p_j, which port officials take as given. The final price of traded goods includes a per-unit transportation cost, f_j, the cost of all bribes paid at the port B_j and the ad-valorem tariff rate applicable to the good τ_j with $\tau_j \geq 1$:

$$P_j = p_j \tau_j + f_j + B_j \tag{2}$$

Bribes are set by customs officials, tariffs are established by policy in both countries and transportation costs are set by the transport industry. All are taken as given by firms.[9]

III.2 Bribe Setting Behavior

We begin by solving for the import demand of imported goods j.[10] Consumers, and consequently firms will purchase quantities of goods that set the ratio of marginal utilities equal to

[9] As noted in Hummels et al. (2008), this particular formulation encompasses the standard iceberg assumption of transportation costs if per unit transportation price is unit elastic with respect to product prices.

[10] This formulation can also nest the case of exports. We focus on imports in this model since they are more vulnerable to extortion by port officials. In our sample, only 10% of exports paid a bribe compared to 45% of imports. This is in part related to the fact that exports are rarely inspected or stopped by customs since no tariff duties are due.

the ratio of delivered prices. Relative to the numeraire, the consumption of internationally traded goods j satisfies the following:[11]

$$\frac{\sigma}{\sigma - 1} q_j^{\frac{1}{\sigma}} = \frac{P_{i0}}{P_j} \tag{3}$$

which gives us the demand for goods j:

$$q_j = [\frac{\sigma}{\sigma - 1}(p_j \tau_j + f_j + B_j)]^{-\sigma} \tag{4}$$

where q_j is a decreasing function of the total amount of bribe payments that must be made to clear the goods through the port. We can then calculate the price elasticity of demand for internationally traded goods, with respect to bribe costs:

$$\frac{\partial q_j}{\partial B_{ij}} \frac{B_j}{q_j} = -\sigma s_j \tag{5}$$

The price elasticity of demand for clearance services at the port equals the elasticity of import demand for the goods with respect to a change in total import prices, σ, multiplied by the share of bribe costs in the total delivered price of goods j, $s_j = \frac{B_j}{p_j \tau_j + f_j + B_j}$. This means that a 1% increase in the bribe cost of clearing goods raises delivered prices by s_j percent. An s_j percent change in delivered prices then leads to a $-\sigma_j$ reduction in imports of good j, and therefore in the demand for clearance services for that good at the port.

Given this demand function, each port official maximizes:

$$\pi_i = Q_i(B_i - c(\gamma)) \tag{6}$$

[11] Following Hummels et al. (2008), we deviate from the standard CES demand function given that we calculate demand for a good relative to the numeraire instead of relative to a basket of other goods. In our empirical tests we control for import fixed effects, which can be understood as the price of the numeraire for out function, or, alternatively, as the level of the CES price index for the standard formulation in the absence of a numeraire.

where $c(\gamma)$ is a function increasing in γ, which represents an exogenously determined measure of the extractive capacity of a given port official, defined as $0<\gamma<1$. Q_i represents the demand by shipper i. We assume that bureaucrats face a finite risk of detection of the illicit transaction that can lead to administrative sanctions, which depends on the volume of cargo that is stopped and requested to pay a bribe.

The first order condition can be represented as:

$$\frac{\partial \pi_i}{\partial Q_i} = B_i + Q_i \frac{B_i}{\partial B_i} \partial Q_i - c(\gamma) = 0 \tag{7}$$

The total amount of goods shipped through the port is given by the sum of shipments cleared by all port officials:

$$Q_{ij}^1 + Q_{ij}^2 + Q_{ij}^3 ... Q_{ij}^n = q_{ij} \tag{8}$$

We consider n to be the number of other port officials with similar extractive capacity at the port. In the case of Durban, n is high since there is a chain of port operators potentially competing for bribes by causing delays at different stages of clearance. In the case of Maputo, n is small given that bribe extraction is concentrated in customs. From equation (5) we can replace the elasticity of import demand with respect to a change in bribe payments into equation (7) to obtain the optimal bribe that maximizes a port official's total bribe revenue, as a function of exogenous variables:

$$Q_j^l = \frac{1}{n_j} \left[(\frac{\sigma}{\sigma - 1}) \frac{c(\gamma) + p_j \tau_j + f_{ij}}{1 - \frac{1}{\sigma n_j}} \right]^{-\sigma} \tag{9}$$

$$b = c(\gamma) + \frac{c(\gamma) + p_j \tau_j + f_{ij}}{n_j \sigma - 1} \tag{10}$$

The model suggests that the optimal bribe is a function of the extractive capacity of port officials as well as of shipment and product specific characteristics. Specifically, bribes are decreasing in the final product's price elasticity of demand σ; increasing in the capacity of

extraction of the port official γ; increasing in the price of the good and the ad-valorem tariff rate $p_j\tau_j$ and on transportation costs f_{ij}; and decreasing in the number of port officials with the power to stop cargo at the port. This simple model can therefore generate substantial variation in the level and in the incidence of bribes across products, shipments and port officials. These hypotheses will be tested in our empirical work in section V.

IV Data

We generate three main datasets in this study: (1) we measure actual transport costs on both the Maputo and Durban corridors with an original survey of trucking companies; (2) we measure corruption costs with direct observational data from cargo movements inside each port and (3) we identify firm's choice of port through an original enterprise survey. All data were collected between October 2006 and July 2008 by the IFC and the World Bank.

IV.1 Transport Costs

To identify actual overland transport costs in the region we implemented a trucking survey covering a random sample of 220 trucking companies operating in both the Maputo and Durban corridors. These included both large and medium-sized licensed transport companies, but also smaller owner-drivers who were randomly sampled in the field in locations with high concentration of trucks, such as lorry parks and the entrance of ports. This survey elicited detailed information on vehicle operating costs including maintenance and fuel costs, average transit times and transport rates charged to firms.[12] To guarantee that we obtained accurate survey data on transport rates charged to firms, we conducted an additional "mystery client" exercise by which we contacted 75 transport firms and requested specific rates for a standard shipment of goods to and from each port. We use these data to calculate transport costs to each port for all firms in our sample.

[12]This micro-data allows us to identify transport rates charged to users by private transport companies but also to calculate actual operating costs of firms that organize their own transport services in-house.

To account for additional transport fees that firms need to pay to ship cargo, we collected information on port charges from the administration of each port as well as on toll charges and border clearance fees from National Roads Agencies in both countries.[13]

IV.2 Bribe Payments

The second source of primary data is a tracking study designed and implemented by the IFC in the Ports of Maputo and Durban and the border post between South Africa and Mozambique. The IFC hired well-established clearing agents to track all bribe payments to officials in a random sample of 1,300 shipments between March 2007 and July 2008.[14] The clearing agents recorded detailed information at the level of each shipment on arrival and clearance times and dates, expected storage costs at the port, the size of the client firm and a wide range of cargo characteristics such as its size, value and product type. They also noted the primary recipients of bribes, the bribe amounts requested and the main reason for a bribe payment, ranging from the need to jump a long queue of trucks to get into the port to evading tariffs or missing important clearance documentation. For a random subset of shipments, locally recruited observers accompanied clearing agents throughout the clearing process to verify the accuracy of the data. These observers began shadowing clearing agents several weeks before the tracking study took place in order to become familiarized with all clearing procedures. To avoid any suspicion, the observers were similar in age and appearance to any other clerk who normally assists clearing agents in their interactions with customs.

[13]We also collect administrative information on traffic levels on the Durban and Mozambican routes and by approximating the traffic count stops to the location of each firm we calculated firm-level congestion costs, accounting for both inner city congestion and highway traffic. Given that we do not find significant differences between congestion levels on each transport route we do not make use of these data in the final regressions.

[14]The illicit nature of the bribe payments and the IFC's concern with ensuring discretion in the data collection to maximize its accuracy restricted the sample to eight clearing agents. However, each clearing agent worked with an average of 20 to 25 clients. The selection of clearing agents to participate in this study was stratified by "reputation" and length of establishment. The "reputation" of each agent was assessed through a small survey of freight forwarders operating with clearing agents at both ports in the two months preceding the actual tracking study. We also collected information on whether the container contained smuggled goods. Given the small number of shipments that fell under this category, we removed them from the analysis.

We found no differences between the data reported with and without our observer present. Data from this tracking study enable us to measure expected bribes at each port.

IV.3 Firms' Shipping Decisions

We also conducted an enterprise survey in 2007, covering 250 firms located in the overlapping hinterland of the ports of Durban and Maputo and over 1,400 firms in other regions of South Africa. The survey elicits information on shipping choices, perceptions of the quality of each port and on characteristics of firms' average shipments such as their frequency, size and degree of urgency proxied by firm-level inventories. The sample was stratified by firm size and industry, covering a range of both transport intensive and non-transport intensive firms. We use these data to identify firms' choice of transport corridor and port given their location, the urgency of their shipments and the characteristics of their cargo.

IV.4 Complementary Data Sources

We collected additional secondary data on variables that could be associated with higher bribe payments at each port. To begin with, perishable products carry a higher probability of spoilage in warm temperatures. This suggests that the weather can be an important determinant of variation in shippers' time preferences, and implicitly, in the level of bribes paid to speed clearance through the port. To test this hypothesis, we collected daily temperature data from the National Weather Institutes.

In this setting, tariff levels may also affect the probability of paying a bribe through two different channels. First, shippers and bureaucrats may disagree on the amount of tariffs due, with either side attempting to misclassify goods or misrepresent import prices. A second way in which tariff levels may affect bribe payments is through the transit bonds placed on transit cargo. For South African cargo shipped through the port of Maputo, the amount of tariffs due is set by the South African tariff code alone. However, while in transit through Mozambique, South African firms will have to pay a refundable bond on transit

cargo. This bond is equivalent to the Mozambican tariffs the cargo would have to pay, were it to be diverted and stay in Mozambique. All clearing agents confirmed that transit bond procedures were straightforward and easy to implement, although customs in Maputo would often seek to re-classify shipments or claim the misrepresentation of import prices in order to negotiate a bribe against the threat of an arbitrary increase in the transit bond. To test this hypothesis on the importance of tariffs, we collected tariff data from customs in South Africa and Mozambique for all products in our tracking sample.[15]

To further test the mechanism through which tariffs can affect bribe levels and distinguish between the misclassification of goods and the misrepresentation of import prices, we turned to Rauch's (1999) typology on the valuation of internationally traded commodities. Rauch distinguishes between goods with a reference price quoted in organized markets such as sugar or wheat; goods with a reference price quoted only in trade publications such as certain metals and minerals, and differentiated goods for which "average" prices are more difficult to assess, such as clothing or vehicles. In theory, the greater the difficulty of assessing the correct import price of a good, the higher the probability that corrupt behavior will emerge given that shippers have a strong incentive to underreport the value of the goods, while customs agents have an incentive to overvalue them. Following this typology, we categorize all products shipped by firms in our sample as being differentiated, part of an organized exchange or having a reference price. We then test whether differentiated products are associated with higher bribe levels due to the increased difficulty in assessing reported import prices.[16]

[15]The Mozambican tariff structure can be summarized as follows: (0%) for medicines and raw materials originating from SADC countries; between 2.5-5% for non-SADC raw materials, equipment goods and oil products; 7.5% for sugar, rice and certain intermediate goods and 20-25% for consumer goods. There is a VAT tax of 17% as well as excise taxes but for the purpose of this study, we focus only on taxes that can affect transit cargo. South Africa's tariff schedule is more complex but similar in coverage, with high tariffs applied to agricultural goods, textiles, vehicles and other manufactured goods

[16]Javorcik and Narciso (2008) suggest that trade in products without set international prices is correlated with higher tariff evasion due to the misrepresentation of import prices, while Fisman and Wei (2004) sustain that higher tariffs result in higher evasion both through the misclassification of product categories and the underreporting of the value of imports. Fisman, Moustakerski and Wei (2006) demonstrate that tariff evasion can be an important driver of indirect trade through entrepot ports.

V The Determinants of Bribe Payments at Each Port

V.1 Descriptive Statistics

We present basic descriptive statistics of bribe payments at each port in Table 2. Not only is the probability of paying a bribe much higher in Maputo - nearly 53% compared to 36% in Durban -, but the amount of bribes paid is also almost 3 times higher than in Durban.[17] In Maputo, the average bribe represents a 130% increase in total port costs for a standard 20 ft container, and is equivalent to a 14% increase in total shipping costs - including overland transport, port clearance costs and sea shipping - for the same container shipped between South Africa's economic hub and a destination in Eastern Africa or in the Far East. In Durban, the incidence of bribe payments is lower, but still high at 36% out of a random sample of 650 cargo movements. The average bribe corresponds to a 32% increase in total port costs for a standard 20 ft container and are equivalent to a 4% increase in total shipping costs on the same routes to Eastern Africa or the Far East.

In Tables 2 and 3 we present descriptive statistics of the random sample of cargo we tracked at each port. First, we check for the importance of distance in determining bribe payments. Ideally, we would incorporate in our regression analysis a variable measuring the distance each shipment traveled to reach the port. Due to logistical constraints, we only captured this indicator for a randomly selected subset of 60 shipments. However, as shown in Table 2, we find no evidence that distance affects bribe amounts. Firms located more than 500 km away from the port pay as much in expectation as firms located in the vicinity of the port.[18] An additional concern is that in a dynamic model of corridor choice, assortative

[17] See Figure 5 for the distribution of bribes across each port. We find no evidence that clearing agents pay flat rates to customs officials since the probability of paying a bribe and the level of bribes paid vary significantly across all clearing agents in our sample, and for each clearing agent, across shipments. We also collect information on any in-kind gifts to port officials in return for faster handling of cargo on the docks or clearance from customs. In both countries, we only observed 4 instances out of 1,300 shipments in which a gift was exchanged in the form of a couple of bottles of whiskey. These gifts were primarily made to stevedores in Durban to guarantee the availability of handling equipment for certain shipments.

[18] To confirm these results, we presented four clearing agents in both ports with two hypothetical bribery scenarios, where the only distinguishing factor was that the cargo originated either in the port city or farther

matching could take place between firms' cargo or shipment characteristics and unobservable characteristics of each port. If bribe payments are also correlated with these unobservables, we would mistakenly identify corruption as the main driver of corridor choice. In Table 3 we present a test of differences in means for some of the key variables. We provide further evidence against this possibility in section V.3. Finally, given that Durban is marginally closer to the Western routes leading to South and North America, we also check if Durban tends to attract more cargo heading to the West. Instead, we find that from our random sample of shipments from each port, the proportion of cargo originating or going to the West is higher in Maputo than in Durban.

The recipients of bribes and the reasons for bribe payments in our sample vary significantly across ports as indicated in Table 4. In Maputo, the primary recipients of bribe payments are customs officials (80%), followed by stevedores (15.81%), scanner agents (3%) and finally the port police (1.03%). In Durban, the primary recipients of bribes are clerks at the document department (38.5%), security agents (24.34%) overseeing idle cargo and shipping planners (10.18%) auctioning off priority slots in outgoing vessels. In Table 5 we show the reported reasons for the bribe payments in our sample. In Maputo, we find that bribes are paid primarily to customs to evade tariffs (40.86%) or to solve problems with documentation for clearance (17.03%), followed by congestion at the port (20.39%). In Durban, bribes are paid to port security (38.5%) and document clerks (24.34%).

This first look at the data provides some insights into how different technology and management structures at each port play a role in determining the type and prevalence of corruption observed. The port of Durban is equipped with a system that automates the submission of all clearing documentation, thus reducing the number of in-person interactions between private clearing agents and customs officials. It is also a larger and more congested port, where space is at a premium and most cargo handling operations are still managed by a

inland. None of the clearing agents identified distance as a determinant of the probability of paying a bribe or of the bribe amount to be paid.

public entity.[19] These two features: the automation of document submission to customs and the public management of terminals appear to translate into higher bribes for public port operators such as stevedores, document officers, depot workers and port security in publicly-managed container terminals, but lower bribes for customs' officials and private operators in privately-managed bulk terminals.

We conducted an informal survey among a select group of clearing agents and freight forwarders that have been operating in Durban for over 10 years to identify possible reasons for these differences. The results of the survey suggested that an over-reliance on casual labor in public terminals and the historical strength of the nation's dock workers' unions placed checks on any attempt to monitor and punish corrupt activity.[20] Maputo, on the other hand, is managed by a multinational private consortium that places strong checks on bribe payments, yet clearing agents are still in close contact with customs agents given that all clearance documentation must be filed in person. This results in infrequent and smaller payments to private security or private stevedores but higher bribes paid to customs, as illustrated in Table 4.

We also find a stark difference in the levels of bribes paid to port operators and to customs officials at the different ports, even when measured as a percentage of the monthly salary of the port official. The median bribe in Maputo is equivalent to approximately 24% of the monthly salary of a customs official, while in Durban, the median bribe is equivalent to 4% of the monthly salary of a regular port operator. A back of the envelope calculation suggests that if we assume that any given customs official in Maputo extracts a bribe out of 53% of the approximately 50 shipments he clears a month, his monthly salary can grow by more than 600% just due to corruption. If we assume that due to higher volumes the

[19]The port of Durban is surrounded by the city of Durban itself, placing a check on the port's physical expansion.

[20]The South African Transport and Allied Workers Union (SATAWU) boasts 82,000 members and is affiliated with the Congress of South African Trade Unions (COSATU). COSATU's strength in turn is deeply rooted in the historical struggle against apartheid, which resulted in COSATU's participation in the tripartite political alliance that gave birth to the first post-apartheid government in South Africa. In a clear display of its strength in May of 2008, SATAWU members in Durban refused to unload a ship from China bearing a large amount of Chinese-manufactured weapons that were bound for Zimbabwe.

regular port operator in Durban processes double the number of shipments per month than a customs official in Maputo, this would still correspond to a lower salary increase of 144% per month due to corruption. The salary of a customs official in Maputo is one of the highest in public administration in the country and is equivalent to that of a port operator in South Africa when adjusted for each country's CPI index. These findings are not consistent with a well-developed literature (Becker and Stigler, 1974; Besley and McLaren, 1990) that stresses the role of wage incentives in reducing corruption when in the presence of a non-zero probability of detection. Our results suggest instead the importance of opportunities for bribe extraction as an important motivation for bribery to take place.

In fact, the most likely reason for this difference in the relative magnitude of the bribe captured by each type of port official is that the extractive power of port operators is considerably lower than that of a customs' agent. For one, information asymmetries are more pronounced for general port operators when negotiating a bribe with a clearing agent since they lack access to the cargo's documentation specifying the value of the cargo, the client firm and its origin/destination among others. Second, the extractive capacity of these agents is checked by factors that are observable to both parties in the bargaining for bribes such as the level of congestion at the port and the availability of storage space on the docks.

Customs' officials on the other hand have significantly more discretion and a broader toolkit to draw from in order to extract bribes, such as the power to stop and delay cargo irrespective of the levels of congestion experienced at the port; to proceed to an arbitrary reevaluation of the shipment or to a cumbersome physical inspection; or to simply request additional documentation. The lower level of bribes paid per transaction in Durban may therefore be explained by the reduced contact between customs officials and clearing agents and the limited extractive capacity of other port operators.

V.2 Estimation Strategy

We begin by identifying the determinants of the probability of paying a bribe at each port. We estimate the following equation, which includes variables and interactions that capture the hypotheses derived in the theoretical model:

$$Pr(B_{ij}|X_i, HT, \sigma) = \alpha_{1j} + \beta_{1j} HT_{ij} + \beta_{2j} HT_{ij} * YEAR08 + \beta_{3j} YEAR08 + \beta_{4j} \sigma_j + \beta_{5j} DP_i + \beta_{6j} + u_{ij} \tag{11}$$

where B_{ij} equals 0 if no bribe was paid and 1 if a bribe was paid for the j^{th} shipment. This equation is estimated separately for each port with $i = 1$ for Maputo and $i = 2$ for Durban. We test for the differential effect of the tariff level on the probability of paying a bribe by introducing a dummy variable HT that equals 1 to indicate a product subject to a 20-25% tariff rate, and 0 for products subject to 0-7.5% rates. The dummy YEAR 08 captures whether the shipment was observed in 2007 or 2008, given that there was a change in the tariff schedule for certain goods in 2008. However, in this equation, we only capture the level effect of being a high tariff good in both years on the probability of paying a bribe. σ_j represents the import price elasticity of demand for the product in shipment j, which we proxy with an indicator of whether the good is containerized or bulk. On this we follow Broda and Weinstein (2006) and Hummels et al (2008), which show that bulk products have higher import demand elasticities. DP is a dummy variable indicating if the shipment corresponds to a differentiated product as categorized by Rauch (1999). The coefficient on DP tests the hypothesis that the absence of a fixed price in international markets provides customs' officials with more room to claim or detect the misrepresentation of import prices. X_i represents a vector of shipment-level controls, which vary across specifications but always include a dummy variable indicating large firms; a variable calculating the deviation of temperature the day the shipment arrives at the port from the average monthly temperature; whether the shipment represents an export or an import; the natural log of the value of the shipment; its size measured in tons as a proxy for transport costs and a dummy for perishable

cargo.[21]

In our data, we do not observe any shipment where a clearing agent was asked for a bribe and the bribe was not paid. Any negotiation that ensues is presumably to attempt to reduce the level of bribe paid. As such, we can also estimate the determinants of the amount of bribes paid at each port, independent of the probability of paying a bribe:

$$LBA_{ij} = \alpha_{2j} + \beta_{7j}\, HT_{ij} + \beta_{8j}\, HT_{ij} * YEAR08 + \beta_{9j}\, YEAR08 + \beta_{10j}\sigma_j + \beta_{11j}\, X_i + v_{it} \quad (12)$$

where LBA represents the natural log of the bribe amount paid, and all other variables are identical to the variables included in the previous equation. We also exploit a natural experiment to more clearly identify the impact of tariff levels on bribes. In January 2008, the phasing in of an additional chapter of a trade agreement reduced tariff levels by 20 percentage points for select categories of goods in Mozambique. This change affected cargo going through Maputo that stayed in Mozambique but also cargo in transit to South Africa, due to its effect on the size of the transit bond. If the tariff group to which the product belongs to is correlated with bribes as suggested in our summary statistics, we expect this reduction in tariffs to affect the probability of paying a bribe at the port of Maputo for cargo that transitioned from a high to a low tariff group. To test for this effect we adopt a difference-in-differences approach by including a time-shock dummy YEAR 08 interacted with a dummy variable that we label TRED, which is equal to 1 if the good experienced a tariff reduction in 2008 and 0 if the good remained in the high tariff group. This change affected 53% of the shipments in our sample.

The difference-in-differences (DD) estimator calculates the difference in the probability of paying a bribe and on the amount of bribe paid, between goods that experienced a tariff reduction and those that did not, before and after the reduction took place in Mozambique.

[21] We consider a large firm to have more than 100 employees. We do not include a variable on the location of the shipper since this information was not captured consistently in our data. We examined bribe payments for a smaller subset of a random sample of 60 shipments for which we had location data, comparing cargo originating in cities 500 kms away from the port, to those located in the city surrounding the port. We found no differences on average bribe amounts or in the probability of paying a bribe.

The DD is estimated by the following equations:

$$Pr(B_{ij}|X_i, HT, TRED) = \alpha_{3j} + \sigma\, TRED_i + \rho\, TRED_i * YEAR08 + \omega\, YEAR08 + \psi\, X_i + \epsilon_{it} \quad (13)$$

$$LBA_{ij} = \alpha_{4j} + \delta\, TRED_i + \gamma\, TRED * YEAR08_i + \phi\, YEAR08 + \lambda\, X_i + v_{it} \quad (14)$$

where $TRED_i$ represents the dummy indicating the change in tariffs in $YEAR\,08$. γ is the coefficient of interest reporting the difference between goods that experienced a reduction in tariffs and those that did not, before and after the tariff reduction took place.

V.3 Discussion of Results

In Table 7, we present the estimation results for equations (9) and (10) for the ports of Maputo and Durban, respectively. Column (1) presents the results for a linear probability estimation of the probability of paying a bribe in Maputo, column (2) presents the same estimation for Durban and columns (3) and (4) present the OLS estimates of the determinants of the amount of bribe paid in Maputo and Durban.[22] We find that in Maputo high-tariff goods are 13% more likely to pay bribes, bulk cargo is 13% less likely to pay a bribe and differentiated products are 7% more likely to pay a bribe though this effect is not statistically significant. Imports are also more likely to pay higher bribes given that customs officials have more power to stop imports out of concerns for smuggling, for the verification of import prices, for the classification of goods or for the absence of phytosanitary documentation. Transit bonds for cargo en route to South Africa are also only paid for import cargo. These results are consistent with our initial findings that bribes are paid primarily to customs.

In Durban on the other hand, we find that high tariffs do not affect the probability of paying a bribe and differentiated products have a 4% lower probability of paying a bribe. This is consistent with our preliminary findings that bribes in Durban are not paid to customs officials. The probability of paying a bribe in Durban is determined instead by the size of

[22]We do not include storage costs in the estimation of bribes in Maputo given that Maputo offers 21 days of free storage to shippers, which represented a non-binding constraint for all shipments in our sample.

the shipment, the price elasticity of import demand for the good and by the storage costs it would pay to move from the docks to the depot at the port. The mean shipment in our sample contains only one container. Adding one more to the shipment increases the amount of bribe paid by 92% even though it does not have a strong effect on the probability of paying a bribe. Bulk cargo is 53% less likely to pay a bribe, which is consistent with the fact that bribes are smaller for goods with a high elasticity of import demand. Finally, a one standard deviation in the cost of storage in Durban, which corresponds to adding 5USD to the total storage bill per container, increases the probability of paying a bribe by 19% and the amount of bribe paid by almost 70%. Storage costs are product specific.

In Table 8 we present the results for our difference-in-differences estimator under a linear probability model, which estimates the effect of the reduction in tariffs on the probability of paying a bribe. Though these results are not statistically significant, the coefficients have the expected sign, indicating a 5% decline in the probability of paying a bribe and a 34% reduction in the amount of bribe paid.

Consistent with our model, our results show that bribes are determined primarily by product characteristics and that they differ across ports, depending on the extractive power and the opportunities for bribery presented to different port officials. In Maputo, bribes are paid primarily to customs. The extractive power of customs officials is high given that they have full access to all the information on the shipment and that they manage a broader toolkit of authority on which to draw from to extract a bribe. Bribes are also higher for products subject to higher tariffs.[23] In Durban, bribes are paid to document clerks, cargo

[23]Associating the bribe to tariff evasion combines the desirable features of reducing both the informational costs of bargaining and the risk associated with the illicit transaction. From the perspective of the customs official, whether the good falls into a high tariff category or not encapsulates all necessary information on the willingness-to-pay of a bribing clearing agent. Customs officials assume all firms would be better off by evading a tariff and the higher the tariff the higher the price a firm would be willing to pay to evade it. All other shipment characteristics carry only coarse information on the firm's willingness-to-pay a bribe, requiring that the customs' official infer each firm's cost of delays. For example, high value cargo carries a variable level of risk of theft by standing idle on the docks or in the depots, and the size of the shipment is also an imperfect indicator of urgency: large shipments may signal a firm carrying higher than average levels of inventory with a lower willingness to pay to expedite clearance or a large firm with a higher *ability* to pay for speed of clearance. A lengthy process of discovering commitment to an illicit transaction and the reservation costs of a clearing agent increases both the risk and the cost of the bargaining game for

handlers and port security, all of which have low extractive power due to limited access to information on the shipment and limited authority to stop and delay cargo. As predicted in the theoretical model, the probability of paying a bribe and the amount of bribe paid is increasing in the extractive capacity of the port official; increasing in the tariff level of the good, increasing on transport costs (in our estimation proxied by the size of the shipment and by storage costs) but decreasing in the elasticity of import demand for the good (captured by the bulk dummy).

We conduct an additional exercise to test that the differences in corruption between Maputo and Durban are driven primarily by the characteristics of each port and their level of corruption, as opposed to the distribution of shipments each port handles. To this end we pool our data for both ports and estimate equations (11) and (12) adding a dummy variable for whether the shipment went through Maputo or not. We then decompose the differences in fitted values of both the probability of paying a bribe and the amount of bribe paid between ports into a "port effect" and the effect of other significant explanatory variables. As shown in Table 9, we find that the main driver of our results is the Maputo intercept, lending further support to our institutional argument that it is the port, and not the distribution of shipments that drives differences in bribe patterns.

VI The Costs of Corruption

In this section we examine the broader implications of corruption in ports. The goal is to test if corruption distorts a firm's choice of port. We begin with a straightforward assumption: absent corruption, firms will choose the port that minimizes overland transport and port

both parties. A transaction based on tariff evasion also lowers the risk of detection of the illicit transaction through a second channel: since both parties are implicated in the illicit deal, self-damage due to an *ex post* defection from it is well-defined and understood. When a bribe is paid for tariff evasion, it is clear that both parties benefitted from the transaction and that they were fully informed and aware of the illicit transaction. This results in a more credible commitment to the bargaining deal and a stronger deterrent for either party to defect from it. Tariff evasion is also less visible and easier to conceal from other customs officials and clearing agents when compared to an observable action such as jumping a queue or avoiding a physical inspection.

costs. On the one hand, if for instance port officials discriminate based on the location of shippers, firms that are closer to each port pay a higher bribe and those farther away pay less due to their credible threat of shipping through an alternative port. In this case, corruption does not distort a firm's choice of port and we would expect factors like overland shipping costs, distance or the urgency of the cargo to be the strongest predictors of each firm's choice. If on the other hand port officials price discriminate according to shipment or product characteristics, and if their extractive capacity differs across ports, the choice of corridor is a function not only of distance but also of the level of bribes a firm expects to pay at each port.

We test these two hypotheses by estimating a firm's choice of port given its location, the urgency of its shipments and the characteristics of its cargo; and by identifying the location of the firm that is indifferent between both ports. For simplicity, if we assume that the distance between ports is a one dimensional line segment, according to the first hypothesis, the indifferent firm should still be located at the point of transport cost equidistance (halfway), while in the alternative hypothesis, the indifferent firm is located closer to the more corrupt port (see Appendix II for a graphical illustration of these hypotheses).

VI.1 Estimation Strategy

We begin by calculating the overland costs for each firm located in South Africa to reach the ports of Durban and Maputo, including all port charges, tolls and border fees. We specify a binomial probability model to estimate the probability of each firm choosing Maputo or Durban, given its location and the type of cargo it ships:

$$Pr(P_{2i}|X_{4i}) = \alpha_3 + \sigma_2 \, HTD_i + \theta \, HTM_i + \phi \, LRTC_i + \lambda \, LF_i + \gamma \, LDI_i + \beta_{12} \, X_{4i} + z_i \quad (15)$$

in which $P_{2i} = 0$ if firm i selects Durban and $P_{2i} = 1$ if firm i selects Maputo; z_i represents a stochastic error term; X_{4i} consists of a vector containing firm-level controls that differ across specifications but always include the frequency of shipments; a dummy variable indicating

whether the firm ships perishable cargo; dummy variables indicating whether the firm is an importer or an exporter; dummy variables for the type of industry the firm belongs to and a dummy variable that equals 1 if the firm ships a differentiated product. HTM and HTD are dummy variables indicating whether the cargo falls into a high tariff category in respectively Mozambique and South Africa. In this case, we are restricting the analysis to swing firms located in South Africa, i.e. those outside of the immediate hinterland of each port. These South African firms will always have to pay the South African tariffs, irrespective of whether the port of entry is Maputo or Durban. The Mozambican tariff code will only affect the level of the transit bond the cargo has to pay if it ships through Maputo. $LRTC$ represents the natural log of the ratio of total transport costs to Maputo over transport costs to Durban for each firm in the sample. These transport costs include all overland transport costs, border fees and port charges; LF represents a dummy variable indicating a large firm and LDI corresponds to a dummy variable indicating whether a firm has an inventory level below the average for its size and industry grouping, as a proxy for the urgency of its shipment. We hold constant the size of the shipment the firm intends to ship through either port and we further include several interaction terms to account for the differential effect of inventories and distance for exporters and importers. Through this equation, we can test the relative importance of distance, the urgency of shipments and the level of expected bribes on a firm's choice of port.

VI.2 Discussion of Results

Table 10 presents the results of a linear probability model fitted to equation (15). The dependent variable assumes value 1 if the firm chooses Maputo and 0 if it chooses Durban. Column (1) presents results for the base model, without any additional interactions. In column (2) we augment the model to investigate whether there is a differential effect of distance on urgent cargo by including interactions between distance and perishable cargo and distance and firms carrying low inventories. In column (3) we test if there is a differential

effect of distance for exporters and importers with low and high inventories by including triple and double interactions between exporters, distance and inventories. We also expect import transit cargo arriving through Maputo to be more vulnerable to bribe payments, given that there is a positive chance of this cargo being diverted into Mozambique without paying the required duties, instead of continuing to South Africa. To test this hypothesis, in column (4) we include an interaction between distance, importers and high tariff shipments. This tests whether importers that are closer to Maputo importing high tariff goods have a lower probability of choosing Maputo than an importer of low tariff goods due to corruption.

We find that if a firm ships goods that are subject to a high tariff classification in Mozambique, the probability of choosing Maputo declines by approximately 22%. The only channel through which Mozambican tariffs can affect the choice of port by South African firms is through its effect on the transit bonds. In the absence of corruption, the transit bond could be paid and recouped the same day. Since corruption at the port of Maputo targets high tariff goods, the uncertainty in the amount a shipment will have to pay and in when that amount will be defined creates a strong deterrent for South African firms shipping this type of cargo to go through Maputo. As expected, the coefficient on distance is negative across most specifications indicating that the higher the transport costs to Maputo, the less likely a firm is to choose this port. We also find that firms with less frequent shipments are less likely to use Maputo though the magnitude of this effect renders it economically insignificant. We observe that firms that import are less likely to choose the Port of Maputo, which may again be driven by the higher probability of this type of cargo having to pay a bribe.

These results suggest that even when accounting for distance, perishability and the urgency of the shipment, the "tariff effect" of corruption is the strongest predictor of the choice of port. As an example, 46% of South African firms in our sample located in regions in which overland costs to the port of Maputo are 57% lower, are going the long way around to Durban in order to avoid higher bribe payments. Of these, 75% are shipping perishable cargo

and 73.8% are shipping urgent cargo.[24]

In Figures 6 and 7 we present non-parametric regressions of the probability of a firm choosing Maputo as a shipping port on the relative transport costs to Maputo. In the absence of corruption, we would expect the indifferent firm to be located at the point that equates transport costs to either port, which in both Figures corresponds to 0. If corruption distorts firms' choice of corridor, we expect the indifferent firm, i.e. the inflection point, to be located closer to the most corrupt port. After this point, firms start switching to the alternative port to avoid corruption. In both Figures 6 and 7, we observe that the firm which is most likely to ship through Maputo is located at approximately $L = \frac{1}{3}$, considerably closer to the most corrupt port of Maputo than the point of transport cost equidistance at $L = \frac{1}{2}$. [25] These results further contradict the hypothesis of non-distortionary price discrimination, whereby the indifferent firm would still be located at the point that equates transport and port costs to alternative ports, even in the presence of corruption.

The distortions created by this "diversion effect" are magnified when we move to a general equilibrium framework. Every time a firm re-routes away from the most corrupt port, it imposes a negative externality on other firms. We label this negative externality as the "congestion effect" of corruption. The re-routing of firms adds to congestion at the least corrupt port and contributes to fewer and more imbalanced cargo flows to the more corrupt one, resulting in higher transport costs. In our trucking survey, we observe that though the actual costs of operating either corridor are almost identical for all trucking companies, the absence of a regular flow of backloads along the Maputo corridor leads to a 71% increase in transport rates charged to firms on that route.[26] A regular service to Durban is charged at 0.07 c/ per ton-km compared to 0.12 c/ per ton-km to Maputo. Though this difference can-

[24] A firm's choice of port was captured in 2007, prior to the tariff regime change in 2008 so we are unable to observe whether the choice of port has changed in line with changes in the probability of paying bribes for high tariff goods. This will be captured in a subsequent round of our enterprise survey, scheduled for 2009.

[25] South African firms cannot evade tariffs by shipping through Maputo.

[26] This difference persists even though the quality of the roads is comparable. The Maputo-bound toll highway was built in 2002 and is privately managed. The Durban bound road is part of the South African national highway system. For evidence on the difference between actual trucking costs and transport rates charged to firms see Raballand and Macchi (2008).

not be solely attributed to the "congestion and diversion effects" of corruption, the pattern of bribe payments in Maputo and their effect on firm's demand for the port is likely to play an important role in driving this result.

We also find suggestive evidence of what we label the "revenue effect" of corruption at ports. The impact of corruption on tariff revenue in our random sample of shipments is equivalent to a 5% point reduction in the average tariff rate. Specifically, it is equivalent to a 9% point reduction for high tariff goods from an average of 22.5%, and a 1% decrease for low tariff goods from an average tariff of 3.75%. The median bribe paid corresponds to only 6% of the tariff liability evaded, suggesting a small transfer between shippers and bureaucrats relative to the size of the rent associated with evading tariffs through a bribe payment. We therefore argue that bribe payments at ports are not just a transfer of surplus between a private agent and a bureaucrat. Instead, bribes distort firm's shipping choices, which both generates deadweight loss in the economy and reduces tariff revenue for the government.

VII Robustness Checks

In this section we discuss three robustness checks to our results. Evidence collected in the field prior to our tracking study suggested that there was a demand-driven increase in bribes around the holiday period in December. Customs officials in Maputo may also have attempted to increase the level and frequency of bribes extracted from shippers in anticipation of the tariff decline due in January of 2008. Since a spike in bribe payments in the month of December could be driving our main results, we conduct two types of robustness checks: we introduce a month trend and remove the month of December from our analysis. In both cases we find no significant changes in our main coefficients of interest. This suggests that there is no "December" or "month effect" on corruption levels.

When we analyze firms' choice of corridor, we face yet another endogeneity challenge: the pattern of bribe payments at each port could have already influenced a firm's location or its type of business. To address this we restrict our sample to firms that were already

established when the Maputo port re-opened in 2004, but find no significant differences in the main coefficients of interest.

We also attempt to address the issue of the "border effect" and how it could dissuade firms from shipping through a port located in a different country. Since 2004, several South African companies have established offices in Maputo and at the border post to facilitate the clearance of transit cargo to and from South Africa. In our survey of 270 trucking companies in the region, all companies operating internationally between Maputo and South Africa were South African. This mitigates our concern about differences in the quality of trucking companies serving the ports of Maputo and Durban.

In our tracking study, we also generated a parallel dataset from the border post between South Africa and Mozambique to measure the potential for an independent "border effect" on firms' choice of transport corridor and port. We tracked a random sample of 50 shipments through the South African - Mozambican border post, using the same methodology for data collection that we used at the ports. We hired local observers with previous experience in the shipping business, who then shadowed clearing agents for 4 months. Given that customs are the only bureaucracy stationed at the border, it is likely that the dynamics found at the port extend to the border post. To investigate this possibility we estimate equations (12) and (14), now applied to our random sample of shipments from the border post. In Tables 11 and 12 we present the results, with bootstrapped standard errors clustered at the product level. Consistent with our findings at the port, high tariff products are associated with a 97% increase in the amount of bribe paid at the border post. In the difference-in-difference framework we validate these results by showing that goods that moved from being high tariff to low tariff due to the phasing in of the trade agreement are associated with a 76% decline in the amount of bribe paid. Our findings therefore suggest that the border reinforces the disincentive to choose the port of Maputo, primarily through the same channel of corruption.

VIII Conclusion

In this paper we take an unusually close look into the blackbox of corrupt behavior to document the magnitude, the determinants and the consequences of corruption in ports. Our empirical setup and the level of detail in our data allow us to observe the entire chain of agents involved in bribery, to understand the incentives faced by different port officials and to identify the impact of bribery on firms' shipping decisions. We test a simple model in which port officials set bribes as a function of the extractive capacity of their position in the clearing chain and product characteristics such as the tariff code the product belongs to, its price, its price elasticity of import demand and its transport costs.

We test this model with data from 1,300 shipments through competing ports in Southern Africa. We show that bribes are high, frequent, different across ports and quantitatively significant for port officials. At the most corrupt port, bribes are paid in more than half of the shipments going through the port, the average bribes increases total shipping costs for a standard 20 ft container by 14% and can represent up to a 600% increase in the monthly salary of a port official.

We then estimate the impact of this type of bribe setting behavior by showing how firms choose between alternative ports given their location, the characteristics of their shipments and the bribes they expect to pay at each port. We identify 3 effects that can amplify the cost of corruption in ports. First, we identify a "diversion effect" of corruption, as firms shipping cargo that is vulnerable to bribe payments take the long way around to avoid the most corrupt port. Second, we provide suggestive evidence on a "revenue effect" of corruption as bribes reduce overall tariff revenue. Third, we identify a "congestion effect" of corruption as the re-routing of firms increases congestion and transport costs in the region by generating imbalanced flows of cargo along the transport network. Our trucking surveys indicate that though the cost of serving each corridor is the same, overland transport rates charged to firms shipping to the most corrupt port are 71% higher than rates charged to the least corrupt port due to an imbalance in cargo flows.

Several important implications emerge from our analysis for the study of corruption and the design of anti-corruption policies. First, we find that incentives for corrupt behavior are shaped by the organizational structure of different bureaucracies, in which the *opportunity* to extract a bribe plays an important role in the motivation for corrupt behavior. Policies that reduce in-person contact between clearing agents and customs officials or that reduce the number of steps in the clearing process such as the introduction of online submission of documentation or pre-clearance programs, may reduce opportunities for corruption. Second, we find that port officials employ different yet sophisticated rules of thumb to discriminate between high and low-bribe shipments. Understanding these patterns may assist in concentrating monitoring efforts in certain categories of products. Third, our findings suggest that the impact of corruption goes beyond just the transfer of resources between private agents and bureaucrats. Instead, by distorting behavior, bribe payments can impose negative externalities on the economy and lead to a significant drain on revenue for the government.

This paper is primarily concerned with the static inefficiency of corruption and its costs. How this distortionary trade cost can in the long run affect trade by shaping the number of exporters and the volume of exports in the economy remains an important area for future research.

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X Appendix I: The Ports of Durban and Maputo

We collect both administrative and survey data to support our assumption of the overall comparability between services provided by the port of Durban and the port of Maputo. To begin with, though Durban achieves significant economies of scale in operations as the largest container port in Sub-Saharan Africa, most port services are still publicly owned, with frequent labor strikes and long turnaround vessel times. The port of Maputo was privatized in 2004, which brought significant investments in its physical infrastructure. Though Maputo is a smaller port and is still expanding its capacity to handle all types of cargo, berth occupancy rates are much lower at 30%, compared to 100% in Durban.[27]

As an important indicator of service quality, crane moves per hour on the docks are similar in both ports (15 TEU/hour), reflecting the higher productivity of the Mozambican private stevedores against the higher capital intensity of operations in Durban. Finally, though storage capacity is larger in Durban, space is at a premium due to the large volume of cargo flows going through the port. Durban offers 3 days of free storage to shippers while Maputo is able to offer 21 days, after which storage costs in Maputo are still half of what is charged in Durban. The overall quality of road freight services to both ports are similar given that transport and logistics services to Maputo are primarily provided by the same South African freight forwarding companies that serve Durban. The port of Maputo is also managed by a consortium of British and South African capital, including as shareholders some of South Africa's main transport companies. Most documentation can therefore be processed in English, greatly reducing the logistical cost for a South African firm to ship through Maputo.

Beyond these administrative indicators of the quality of each port, we also obtain users' perspectives on Maputo and Durban as viable shipping alternatives. In our firm survey conducted in 2007, a sub-sample of 250 South African firms located in the hinterland of

[27] A lower berth occupancy rate means that a freight forwarder is able to bring a ship in and out of Maputo faster than if it queues in Durban.

both ports ranked Maputo and Durban at respectively 3.4 and 3.7 out of a total score of 5 in terms of overall quality of port services.[28]

Despite the comparability of Maputo versus Durban, it is still possible that firms' choice of shipping corridor is based instead on the relative cost of ocean shipping from each port. Recent work by Hummels et al (2008) suggests that shipping lines price discriminate across routes, depending on the prices of the products transported and the number of competitors faced on any given route. Durban is a larger port, attracting a wider variety of cargo and a higher number of shipping lines.[29] There is however a frequent feeder service between Maputo and Durban, which increases the flexibility of firms to ship through either port. In Table 2 we also find that even though Durban is 24 hours closer to the Western transport routes, a higher proportion of cargo shipped through Maputo is either originating or is destined to the West, when compared to the sample we obtained from Durban. Though we are unable to rule out the importance of having fewer container lines calling at Maputo, the results from our survey suggest that this is not a binding constraint, and that Maputo is regarded as competitive for shipments originating in and destined to different parts of the world.

In addition to the actual cost of shipping and handling, a firm's shipping choice may also be influenced by the time it takes to clear cargo at each port. In this paper, though we account for port costs, we abstract from transit times given that they do not vary significantly across ports. The median of the distribution of the average number of days reported by firms

[28]This corresponds to an unweighted average of the score assigned to each port in a scale of 1 (Very Poor) to 5 (Very Good), along the following dimensions: a) Facilities for large and abnormal cargo and flexibility in meeting special handling requirements, b) Frequency of cargo loss and damage, c) Convenient pick up and delivery times, d) Availability of information concerning shipments and port facilities, e) Speed of on the dock handling of containers, f) Availability of intermodal arrangements (rail, road and port) and g) Port Cost.

[29]In fact, there is a significant difference in the number of shipping lines calling at each port, particularly for container cargo. Non-containerized cargo is carried primarily by tankers, which operate under a taxi model across ports, whenever there is demand for the service. Containerized cargo on the other hand is transported by conference lines with scheduled service at specific ports. Durban is the main container port in the region and as such attracts the largest shipping lines on a regular basis. The port of Durban averages 2 container vessels a day, which is what Maputo receives in a week. Despite these differences, almost no firms covered in our enterprise survey highlighted this fact as a binding constraint. In mid 2006, one of the largest freight forwarding companies in South Africa acquired a 28% stake at the port of Maputo. This company owns several container liners that have started to call more frequently at the port of Maputo.

to clear customs was similar for both ports (4 days) and the median of the distribution of the longest number of days reported to clear customs was only slightly higher in Durban (8 days) than in Maputo (7 days).

Finally, an important assumption in our analysis is that firms are capable of switching between corridors at low cost. In our enterprise survey, we find that from the 450 firms surveyed in all of South Africa, nearly 65% outsourced transport services to freight forwarders and clearing agents, primarily through spot contracts with high turnover rates. Furthermore, less than 4% of these firms have ever made a long-term investment in either port. When asked about an alternative transport route, more than 50% of firms using either corridor identify Maputo or Durban as a real alternative and when asked to rank both ports on several quality indicators, Maputo and Durban are ranked very similarly. Finally, an informal survey conducted among a select group of freight forwarders further suggested that the choice of corridor is primarily guided by cost considerations as well as by the request of the client firm. These findings allay our concern that firms could be locked into using a particular route, a particular clearing agent or a particular port.

XI Appendix II: Choice of Port (graphical illustration)

We illustrate the effects of corruption by comparing two types of bribe setting behavior.For simplicity, let's assume that the distance between both ports is a one-dimensional line segment. First, if bureaucrats can perfectly discriminate between firms according to their location and the bargaining for bribes is costless, the Coase Theorem predicts an efficient allocation of clearance slots among firms located at different distances from the port. Bureaucrats would auction off clearance slots capturing "spatial rents" without distorting a firm's choice of shipping route. In this case, the indifferent firm will still be located halfway in the line segment between both ports, just as in the case without corruption. Bribe payments are equivalent to an increase in overland transport costs along each corridor, proportional to the distance the cargo has to travel to reach the closest port. This would therefore correspond

to a non-distortionary pattern of bribe setting.

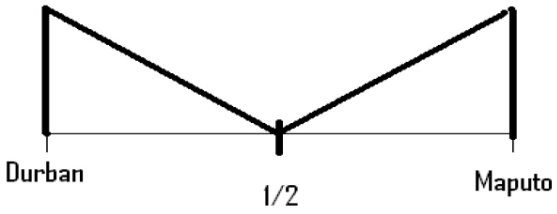

Figure 1: Model A of price discrimination based on location. The indifferent firm would still be located at $L = 1/2$ as in the case of a model without corruption

Now suppose that bribes are set according to other shipment characteristics and that bribe schedules vary across ports. Port officials can still practice some form of price discrimination between firms but their bribe schedule is based on other observable characteristics such as the size of the shipment, its value or the tariff group the products belong to. If bribes differ across ports, the indifferent firm will be located closer to the port charging higher bribes as illustrated below.

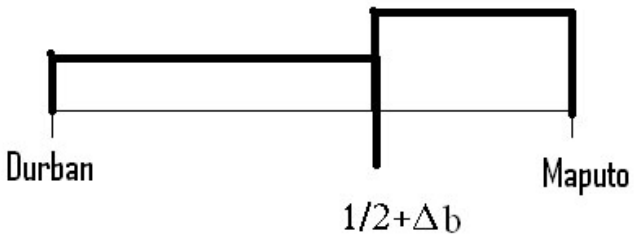

Figure 2: Model B of price discrimination based on cargo characteristics or the strategic considerations of bureaucrats. The indifferent point is located at $L = 1/2 + \frac{\Delta B}{2t}$. Note: In this figure, Maputo represents the more corrupt port

XI.1 Figures

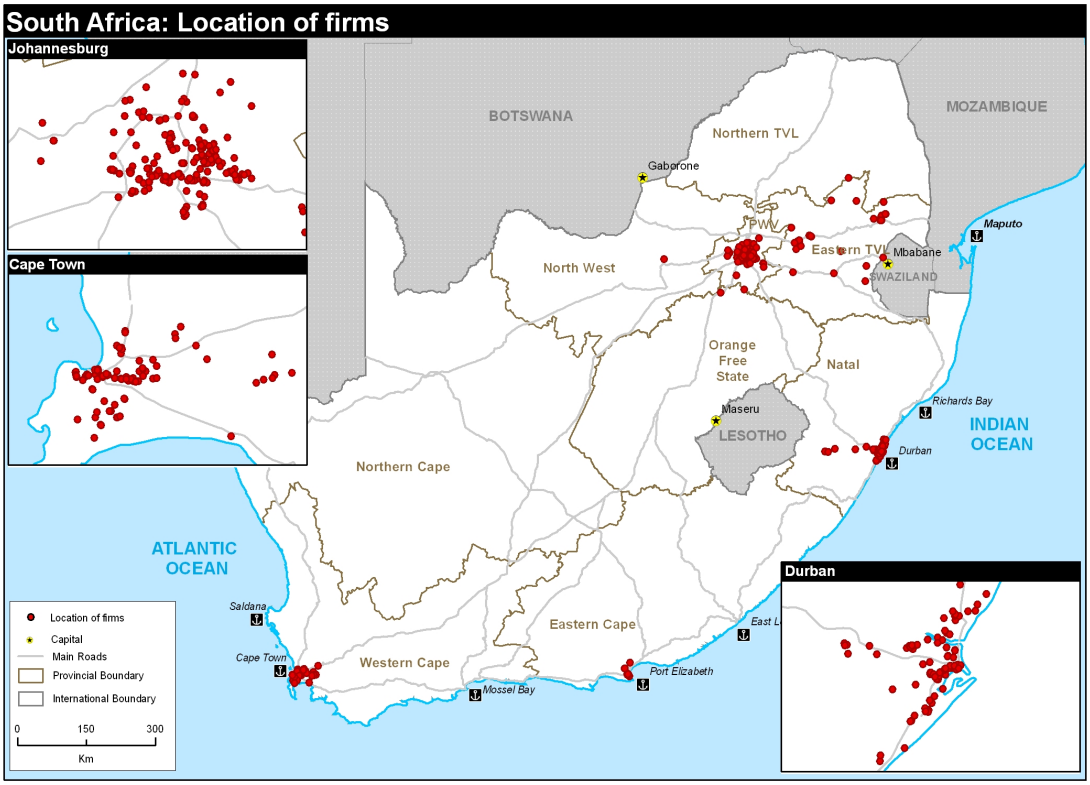

Figure 3: Map of Southern Africa identifying the Ports of Maputo and Durban. The dots correspond to the firms that were covered in our firm survey for which we observe a shipping decision.

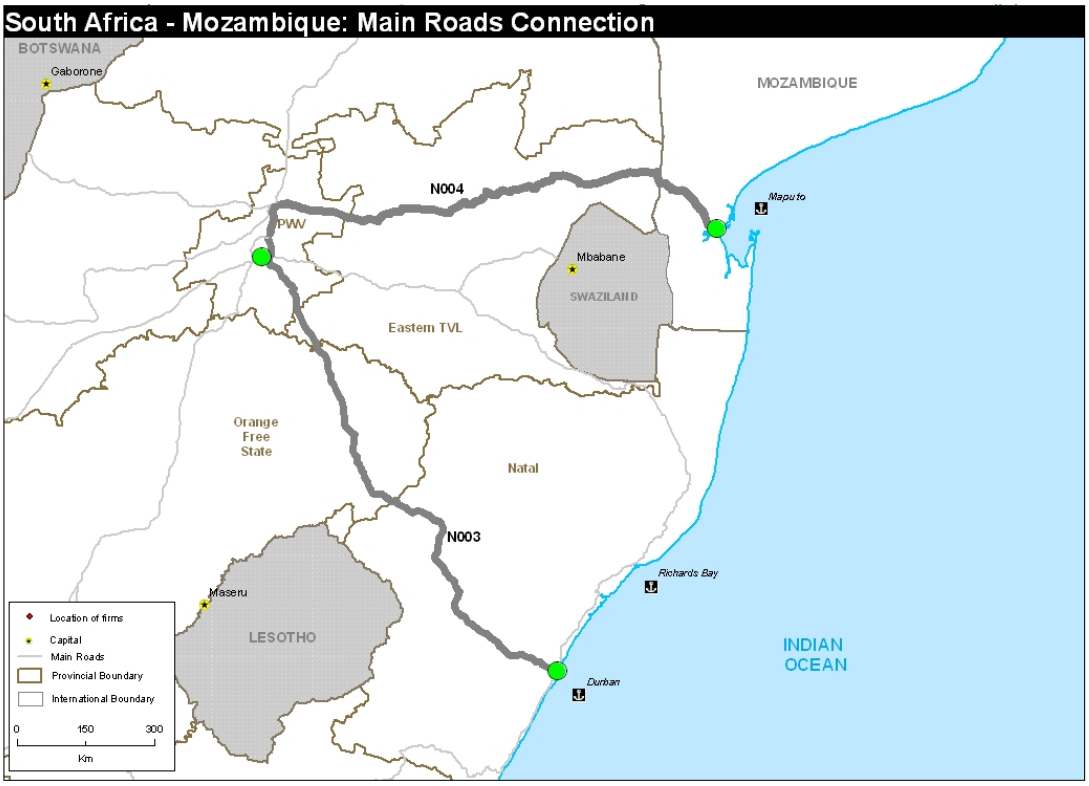

Figure 4: Road Network connecting the hub of economic activity in South Africa to the Ports of Maputo and Durban. The thick lines correspond to the main highways

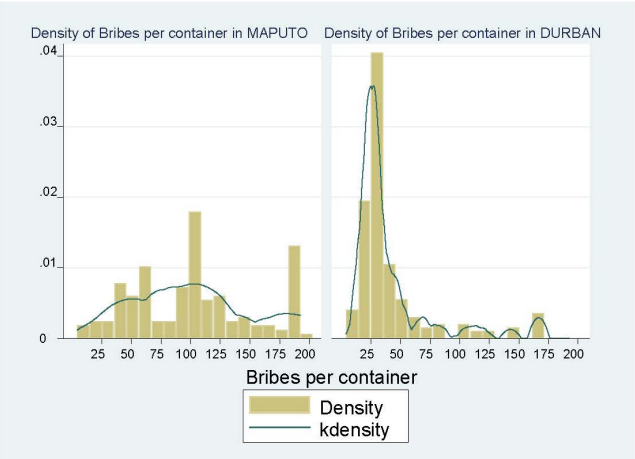

Figure 5: Distribution of Bribes per Container at the Ports of Durban and Maputo

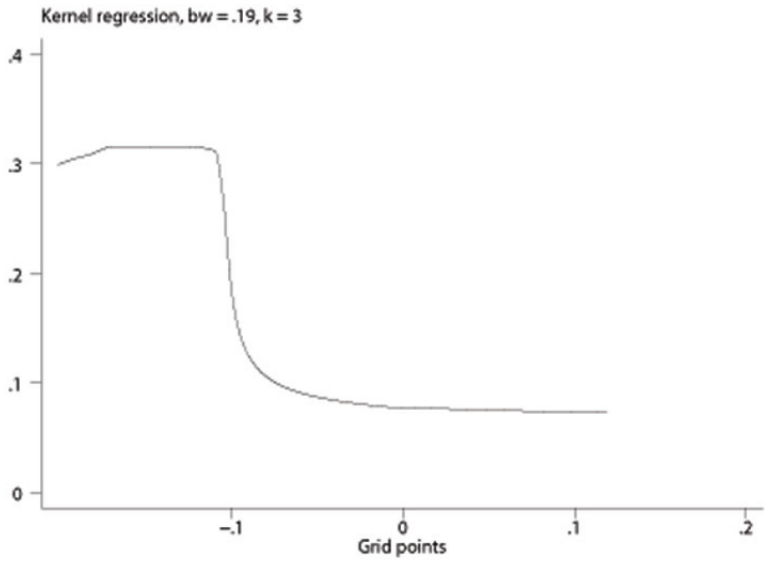

Figure 6: Non-Parametric Kernel Regression of the Probability of Choosing Maputo (y-axis) on the Log of Relative Transport Cost to Maputo (x-axis). At the point at which transport costs to Maputo and to Durban are equalized, the probability of choosing Maputo is under 10%.

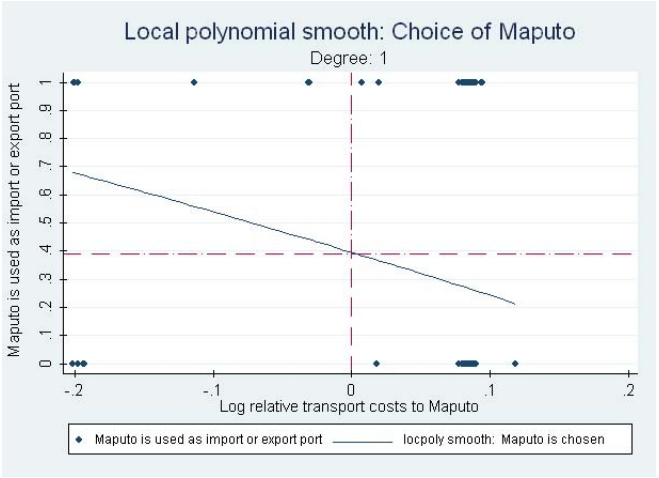

Figure 7: Kernel-weighted Local Polynomial Smoothing Regression of Degree 1 of the Probability of Choosing Maputo (y-axis) on the Log of Relative Transport Cost to Maputo (x-axis). At the point at which transport costs to Maputo and to Durban are equalized, the probability of choosing Maputo is 39%.

XI.2 Tables

Table 1: **Comparing the Ports of Durban and Maputo**

PORT CHARACTERISTICS:	MAPUTO	DURBAN
Average Quay Length (m)	238.4	225.9
Average Alongside Depth (m)	10.8	10.54
Maximum Alongside Depth (m)	11.5	12.8
Minimum Alongside Depth (m)	9.5	6.1
Berth Occupancy Rates (%)	30	100
Crane Movements per hour (TEU)	15	15
Days of free storage	21	3
Average number of days to clear customs *(median of the distribution)*	4	4
Longest number of days to clear customs *(median of the distribution)*	7	8
Average distance to Johannesburg (km)	586	578
Port Performance Ranking (out of 5)	3.4	3.7
Safety	ISPS certified	ISPS certified
Document submission	In-person	Online
Management of Terminals	Private	Public

[a] Sources: Port of Maputo (MPDC), South Africa Freight Database, Enterprise Survey 2007 (IFC).

[b] NOTES: The port performance ranking was obtained through the IFC's survey of 250 firms in South Africa and corresponds to an unweighted average of the score assigned to each port in a scale of 1 (Very Poor) to 5 (Very Good), along the following dimensions: a) Facilities for large and abnormal cargo and flexibility in meeting special handling requirements, b) Frequency of cargo loss and damage, c) Convenient pick up and delivery times, d) Availability of information concerning shipments and port facilities, e) Speed of on the dock handling of containers, f) Availability of intermodal arrangements (rail, road and port) and g) Port Cost. ISPS code stands for the International Ship and Port Facility Security Code. It corresponds to a comprehensive set of measures to enhance the security of ships and port facilities developed in response to the perceived threats in the wake of the 9/11 attacks in the United States. All countries that are members of the SOLAS convention are required to be ISPS certified. SOLAS is the most important of all international treaties concerning the safety of merchant ships. TEU (Twenty-foot Equivalent Unit) is a unit of cargo capacity often used to describe the capacity of container ships and container terminals, based on the volume of a 20ft container.

Table 2: **Summary Statistics of Bribes and Cargo at Each Port**

VARIABLE	Maputo (1)	Durban (2)
Probability of Paying a Bribe	52.75%	36.09%
Mean Bribe Amount (USD)	275.3	95
Mean Bribe as a % of port costs	129%	32%
Mean Bribe as a % of overland costs	25%	9%
Mean Bribe as a % of ocean shipping to East Africa	37%	13%
Mean Bribe as a % of ocean shipping to Far East	46%	37%
Mean Bribe as a % of total shipping costs (overland, port and ocean shipping)	14%	4%
Median Bribe (USD) if firm > than 500 km from port	192	35
Median Bribe (USD) if firm < than 5 km from port	190	32
Monthly salary increase of port official	600%	144%
Real monthly wage of port official in USD (CPI adjusted)	692	699
Distribution of Cargo across Ports		
Percent of High Tariff Goods	53.33	52.54
Percent of High Tariff Goods in 2007	61.2	64.12
Percent of High Tariff Goods in 2008	44.41	37
Percent of Perishable Cargo	20.19	32.4
Percent of Cargo with Origin/Destination in the West	35.38	13.16

Table 3: **Shipment summary characteristics at each port**

VARIABLE	Mean		(Std. Dev.)		Median		P-value
	Maputo	Durban	Maputo	Durban	Maputo	Durban	
Tons	123.9	129.3	(977.8)	(216.7)	8	26.5	0.0861
Number of Containers	1.9	1.3	(5.17)	(0.85)	1	1	0.0033
Value of Shipment in (USD)	85,336.6	263,539	(51,5034.59)	(265,846.7)	17,000	188,888	0.00

Table 4: **TOTAL BRIBE PAYMENTS: Who receives bribes?**

RECIPIENTS of BRIBES	MAP (%)	DURB (%)	Amounts MAP Mean	Amounts DURB Mean
Customs	**80.07**	10.18	344	35.45
			(529.9)	(24.39)
Stevedores	15.81		42.3	
			(4.44)	
Port Police	1.03		300	
			(.)	
Gate Officials		7.96		102.8
				(110.76)
Port Security		24.34		54.98
				(69.79)
Document Department		**38.5**		60.2
				(70.67)
Shipping Planners		10.18		294.2
				(254.96)
Depot Workers		6.19		138.10
				(142.79)
Weighbridge Officials		1.33		480.11
				(393.86)
Temperature Reefer Agents		0.44		66
				(.)
Scanner Agents	6		163	
			(344.7)	

Sources: Tracking Study.

NOTES: Standard errors in parenthesis. The Document Department releases a document for each container to allow cargo handling and customs clearance among others. All values calculated as a percentage of total bribe payments in our sample.

Table 5: **TOTAL BRIBE PAYMENTS: Why are bribes paid?**

REASONS FOR BRIBES	MAP (%)	DURB (%)	Amounts MAP Mean	Amounts DURB Mean
Jump queue of trucks at Port Gate	18.10	**33.33**	172.77	69.87
			(138)	(81.72)
Problems with Documentation	17.03	11.95	250.96	43.72
			(128.94)	(33.25)
Jump Tariffs	**40.86**	0.88	300	32.14
			(493.85)	(5.05)
Late arrival	2.37	14.60	230.26	230.67
			(.)	(238.97))
Avoid overnight stay		1.33		94.55
				(127.76)
Avoid Storage Costs		**29.65**		62.28
				(78.2)
Avoid Late Container Return Fee		2.65		151.54
				(200.864)
Urgent Consignment		3.10		39.3
				(48.99)
Change Reefer Temperature		0.44		66.66
				(.)
Congestion at the Port	20.39	0.88		42.3
				(4.43)
Avoid the Scanner	6.47	0.88	417.2	678.5
			(515.9)	(2.72)
Other Reasons	0.65		258.97	
			(217.61)	

Sources: Tracking Study. Standard errors in parenthesis. All values calculated as a percentage of total bribe payments in our sample.

Table 6: **Variable Descriptions**

Variables	**Description**
HIGH TARIFF MAPUTO	Coded 1 if product falls into high tariff category according to the Mozambican Tariff Code High tariffs are considered to be subjected to 20-25% rates. Source: Mozambican Customs
HIGH TARIFF DURBAN	Coded 1 if product falls into high tariff category according to the South African Tariff Code. High tariffs are considered to be subjected to 20-25% rates. Source: South African customs
YEAR 2008	Coded 1 if shipment took place after the tariff reduction and 0 otherwise. Source: Tracking study
LARGE FIRM	Coded 1 if firm has more than 100 employees and 0 otherwise. Source: Enterprise Survey, IFC 2007 and tracking study
LOG VALUE SHIPMENT	Natural log of value of shipment in USD. Source: Tracking Study
LOG TONS	Natural log of tonnage of shipment. Source: Tracking Study
PERISHABLE	Coded 1 if products belongs to any of the following categories:prepared food, beverages,wheat, vegetables, tobacco, medicine, meat, fish, dairy, nuts and 0 otherwise. Source: Enterprise Survey IFC 2007 and tracking study
DIFFERENTIATED PRODUCT	Coded 1 if product does not have a set price in international markets as defined by Rauch (1999) and 0 otherwise. Source: Enterprise Survey, IFC 2007 and tracking study
BULK	Coded 1 if cargo is non-containerized and 0 if it is containerized. Source: Tracking Study
LOG STORAGE COSTS	Natural log of expected storage costs, as calculated by the clearing agent prior to the arrival of the cargo on the docks. Storage costs are based on the type of product shipped.
EXPORTER	Coded 1 if firm exports and 0 otherwise. Source: Enterprise Survey, IFC 2007
IMPORTER	Coded 1 if firm imports and 0 otherwise. Source: Enterprise Survey, IFC 2007
DAYS BETWEEN SHIPMENTS	Average number of days between each firm's shipments. Source: Enterprise Survey, IFC 2007
LOG DAYS OF INVENTORY	Number of days of inventory of the main input that a firm has on average by the time the next shipment arrives. Source: Enterprise Survey, IFC 2007
LOG RELATIVE DISTANCE TO DURBAN	$\frac{DM*RM+PM}{(DD*RD+PD)}$
TRED	Tariff reduction due to trade agreement. Equals 1 if good experienced a tariff reduction, 0 if it remained high tariff. Source: Tracking study
DD	Distance to Durban
RD	Transport Rate to Durban
PD	Port and toll costs to Durban
DM	Distance to Maputo
RM	Rate to Maputo
PM	Port, toll and border fees to Maputo

Table 7: **Determinants of Bribe Payments in Maputo and Durban**

	MAPUTO	MAPUTO	DURBAN	DURBAN		MAPUTO	MAPUTO	DURBAN	DURBAN
VARIABLES	Prob Bribe LPM (1)	Prob Bribe LPM (2)	Prob Bribe LPM (3)	Prob Bribe LPM (4)		Bribe Amount OLS (5)	Bribe Amount OLS (6)	Bribe Amount OLS (7)	Bribe Amount OLS (8)
HIGH TARIFF	0.130**	0.35***	-0.120	-0.03	HIGH TARIFF	0.58	0.30***	-0.54*	-0.054
	(0.0600)	(0.03)	(0.0821)	(0.05)		(0.431)	(0.09)	(0.312)	(0.14)
LOG TONS	0.013		0.01		LOG TONS	0.11		0.08	
	(0.02)		(0.061)			(0.103)		(0.27)	
BULK	-0.135**		-0.53***		BULK	-0.84***		-3.027***	
	(0.06)		(0.12)			(0.32)		(0.838)	
DIFFERENTIATED PRODUCT	0.074		-0.045		DIFFERENTIATED PRODUCT	0.026		-0.3	
	(0.089)		(0.09)			(0.45)		(0.33)	
LOG STORAGE COSTS			0.114***	0.07***	LOG STORAGE COSTS			0.6***	0.65***
			(0.04)	(0.03)				(0.208)	(0.11)
Temperature controls	Yes	No	Yes	No		Yes	No	Yes	No
Value of shipment	Yes	No	Yes	No		Yes	No	Yes	No
Observations	149	759	319	406		112	350	120	170
R-squared	0.46	0.13	0.31	0.23		0.19	0.03	0.535	0.34

[a] Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Standard errors are clustered at the product level.

[b] High tariff equals 1 if high tariff product and 0 otherwise. Tariffs calculated according to the Mozambican and South African tariff codes. Temperature controls correspond to the deviation of temperature the day the cargo arrives at the port from the monthly temperature average. Temperature controls are interacted with a perishable dummy. Additional controls include the log of the value of the shipment, whether the shipment is an import or an export; whether the shippers is large or small. Differentiated Product Dummy equals 1 if product does not have a referenced price in international markets, as categorized by Rauch (1999) and 0 otherwise. Columns (1) and (2) represent a linear probability model and columns (3) and (4) ordinary least squares. These results are robust to the inclusion of clearing agents fixed effects.

Table 8: **Did a Change in Tariffs Lead to a Change in Bribes? Difference-in-Differences**

Dependent Variable	**Prob Bribe**
VARIABLES	LPM (1)
TRED	-0.026
	(0.017)
TRED * YEAR 08	**-0.056**
	(0.088)
YEAR 08	-0.64***
	(0.066)
Log Value of Shipment	Yes
Log Tons	Yes
Temperature	Yes
Perishable	Yes
Differentiated Product	Yes
Bulk	Yes
Observations	284
R-squared	0.57

[a] Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0. Standard errors are clustered at the product level.

[b] Linear probability model fitted to the sub-sample of cargo shipped through the Maputo Port. TRED Dummy equals 1 if the product experienced a tariff reduction between 2007 and 2008 and 0 if it remained as a high tariff product. High tariff equals 1 if tariff rate is above 20% and 0 if the tariff rate is between 0-7.5%. Tariffs calculated according to the Mozambican tariff code. All regressions include controls for the value and size of the shipment, the deviation of temperature the day the cargo arrives at the port from the monthly temperature average and an interaction with a perishable dummy,as well as whether the cargo is containerized or not. Differentiated Product Dummy equals 1 if product does not have a referenced price in international markets, as categorized by Rauch (1999) and 0 otherwise. Large firm dummy equals 1 if firms has more than 100 employees.Includes clearing agents fixed effect

Table 9: **Decomposing Differences in the Probability of Paying a Bribe and on Bribe Amounts by Port**

	Prob of Paying a Bribe	Maputo Intercept	High Tariff	Log Tons	Bulk	Storage Costs
$\frac{\overline{X}_{Mp}}{\overline{X}_{Db}}$	1.46		1.009	0.96	0.446	0.531
Contribution to fitted values	1.63	0.40	-0.04	0.0002	-0.37	-0.02
$\frac{\hat{B_{Mp}}}{\hat{B_{Db}}}$	(100%)	**(24.37%)**	(-2.71%)	(0.013%)	**(-22.46%)**	(-1.103%)
	Bribe Amount	Maputo Intercept	High Tariff	Log Tons	Bulk	Storage Costs
$\frac{\overline{B}_{Mp}}{\overline{B}_{Db}}$	2.90		1.009	0.96	0.446	0.531
Contribution to fitted values	1.05	1.89	-0.24	-0.002	-0.860	-0.078
$Ln\,\hat{\beta_{Mp}} - Ln\,\hat{\beta_{Db}}$	(100%)	**(180%)**	**(-22.74%)**	(-0.21%)	**(-81.8%)**	(-7.37%)

NOTE: These results are robust to a pooled conditional logit regression of the probability of paying a bribe, over shipments matched by their harmonization code.

Table 10: **Which Firms Choose Maputo?**

	Model 1	**Model 2**	**Model 3**	**Model 4**
VARIABLES	(1)	(2)	(3)	(4)
HIGH TARIFF MAPUTO	-0.23**	-0.22*	-0.23*	-0.15***
	(0.11)	(0.11)	(0.12)	(0.07)
HIGH TARIFF DURBAN	-0.076	-0.096	-0.071	
	(0.092)	(0.096)	(0.098)	
LOG REL. TRANSP. COST TO DB	-1.1	-1.03	0.91	-0.5
	(0.77)	(1.48)	(5.88)	(1.56)
LARGE FIRM DUMMY	-0.074	-0.090	-0.066	
	(0.085)	(0.088)	(0.093)	
PERISHABLE	0.14	-8.72*	0.15	
	(0.29)	(4.98)	(0.30)	
DAYS BETWEEN SHIPMENTS	-0.00071**	-0.00076***	-0.00073*	
	(0.00027)	(0.00026)	(0.00037)	
EXPORTER	0.11	0.087	0.14	
	(0.15)	(0.15)	(0.25)	
IMPORTER	-0.27**	-0.25**	-0.33	-0.25***
	(0.12)	(0.12)	(0.21)	(0.11)
LOW INVENTORY DUMMY	-0.15	-0.16	-0.15	
	(0.11)	(0.15)	(0.19)	
DIFFERENTIATED PRODUCT	0.040	0.011	0.028	
	(0.096)	(0.093)	(0.10)	
Dist*Perishable	No	Yes	No	No
Dist*Inventory	No	Yes	Yes	No
Dist*Exporter	No	No	Yes	No
Dist*Importer	No	No	Yes	No
Dist*Imp*Inventory	No	No	Yes	No
Imp*Inventory	No	No	Yes	No
Imp*Dist*HTM	No	No	No	No
Clearing Agents Fixed Effect	Yes	Yes	Yes	Yes
Observations	89	89	89	148
R-squared	0.194	0.216	0.210	0.09

[a] Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Standard errors clustered by city.

[b] High-Tariff Dummies calculated according to the Mozambican and South African Tariff Codes, equal 1 if high tariff products. Log Relative Transport Costs to Durban is calculated as $\frac{(Distance\ Maputo * Rate\ Maputo + Port\ toll\ and\ border\ fees\ to\ Maputo)}{(Distance\ Durban * Rate\ Durban + Port\ and\ toll\ costs\ to\ Durban)}$. Differentiated product dummy equals 1 if product does not have a referenced price in international markets, as categorized by Rauch (1999). Large firm dummy equals 1 if firm has more than 100 employees. Column (1) corresponds to the base model. Column (2) includes interactions between distance and perishable cargo and distance and firms carrying low inventories. Column (3) includes triple and double interactions between exporters, distance and inventories. Column (4) corresponds to the full sample, without controls. All results are robust to the inclusion of industry dummies. We also consider different measures of urgency: actual log of each firm's average inventory levels; a measure of by how much each firm's inventory levels deviate from the average inventory levels in their respective industry category; and a dummy variable indicating if the firm's inventory levels are below the average inventory levels for a firm of similar size and industry category. The results are not sensitive to any of these specifications.

Table 11: **Is there a BORDER EFFECT?**

DV: LOG BRIBE AMOUNT

VARIABLES	OLS (1)	OLS (2)
HIGH TARIFF	**0.722**	**0.970***
	(0.466)	**(0.576)**
HIGH TARIFF* YEAR 08	**-0.954***	**-1.128**
	(0.509)	**(0.701)**
YEAR 08	0.309	0.360
	(0.435)	(0.545)
PERISHABLE	0.0279	0.198
	(0.361)	(0.623)
LOG VALUE SHIPMENT		0.0182
		(0.179)
DIFFERENTIATED PRODUCT		0.392
		(0.407)
Constant	5.153***	4.596**
	(0.374)	(1.823)
Observations	40	38
R-squared	0.086	0.125

[a] Bootstrapped standard errors in parentheses, clustered at the product level. *** p<0.01, ** p<0.05, * p<0.10. High-Tariff Dummies calculated according to the Mozambican and South African Tariff Codes, equal 1 if high tariff products.

Table 12: **Is there a BORDER EFFECT? Difference in Differences**

DV: LOG BRIBE AMOUNT

VARIABLES	OLS (1)	OLS (2)
TRED	0.638*	0.352
	(0.365)	(0.435)
TRED * YEAR 08	**-0.942*** **	**-0.760** **
	(0.294)	**(0.387)**
YEAR 08	0.309	0.36
	(0.435)	(0.545)
PERISHABLE		0.496
		(0.483)
LOG VALUE OF SHIPMENT		-0.213
		(0.212)
DIFFERENTIATED PRODUCT		-0.225
		(0.484)
Constant	5.244***	7.435***
	(0.227)	(2.328)
Observations	31	31
R-squared	0.171	0.242

[a] Bootstrapped standard errors in parentheses clustered at the product level *** p<0.01, ** p<0.05, * p<0.10.

[b] TREAD Dummy equals 1 if the product experienced a tariff reduction between 2007 and 2008 and 0 if it remained as a high tariff product. High tariff equals 1 if tariff rate is above 20% and 0 if the tariff rate is between 0-7.5%. Tariffs calculated according to the Mozambican tariff code..