CORRUPTION AND FIRM BEHAVIOR: Evidence from African Ports*

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Abstract

This paper investigates how different types of corruption affect firm behavior. Firms can face two types of corruption when seeking a public service: cost-reducing "collusive" corruption and cost-increasing "coercive" corruption. Using an original and unusually rich dataset on bribe payments at ports matched to firm-level data, we observe how firms respond to each type of corruption by adjusting their shipping and sourcing strategies. Cost-reducing "collusive" corruption is associated with higher usage of the corrupt port, while cost-increasing "coercive" corruption is associated with reduced demand for port services. Our results suggest that firms respond to the opportunities and challenges created by different types of corruption, organizing production in a way that increases or decreases demand for the public service. This can have important implications for how we identify and measure the overall impact of corruption on economic activity. Our data further allow us to understand the bribe setting behavior of different types of public officials with implications for the design of anti-corruption strategies.

Keywords: Corruption; Firm Behavior; Transport; Ports; Trade Costs
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I Introduction

An extensive literature argues that reducing trade costs can substantially increase income and improve welfare in trading countries, particularly in the developing world where these costs are highest (Frankel and Romer 1999; Rodriguez and Rodrik 2001; Limao and Venables 2001; Obstfeld and Rogoff 2001). In 2007, shipping a container from a firm located in the main city of the average country in Sub-Saharan Africa was still twice as expensive, and six times more time-consuming, than shipping it from the US. It was also twice as expensive and just as time-consuming as shipping a similar container from India or Brazil (World Bank 2007).[1] As a result, a significant portion of aid efforts has in recent years been channeled to reducing trade costs and improving trade logistics in the developing world, particularly through investments in transport infrastructure.[2]

Some categories of trade costs have however proven to be considerably more difficult to identify and reduce than others. Evidence is growing on how corruption in transport networks can significantly increase the cost of moving goods across borders. Clark et al (2004) rely on indirect measures of bribes to document that corruption is an important source of port inefficiency, Sequeira (2011a) shows a positive correlation between trade costs and standard indices of corruption in a cross-section of countries and Yang (2008) provides evidence on how corruption in ports is pervasive and hard to displace. Maachi and Sequeira (2009) suggest that by distorting demand for transport services, corruption could even dampen the returns to the investments in physical transport infrastructure that are currently underway in the developing world.

How corruption affects economic activity in the context of public service delivery has been heavily debated in the theoretical literature. One line of argument is that bribes are set to allow private agents to overcome cumbersome regulations, and that they create direct incentives for bureaucrats to perform, resulting in an improvement in the overall allocative efficiency of public resources (Leff 1964; Huntington 1968; Lui 1985). Others contend that bribes are mostly set according to the strategic preferences of bureaucrats and that they distort private agents' decisions, increasing the overall efficiency costs of corruption (Krueger 1974; Klitgaard 1991; Shleifer and Vishny 1992; Shleifer and Vishny 1993; Rose-Ackerman 1999). The key empirical challenge that follows from this debate resides in understanding how bribes are set, and whether private agents adjust demand for the public service in response to corruption. Limited progress has however been made on both fronts mostly due to the absence of

[1] In 2007 it took an average of 35 days for a firm in Sub-Saharan Africa to get a standard 20ft container from its warehouse through the closest port and on a ship, which may have important implications for the structure of trade in the region. Djankov, Freund and Phan (2010) 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%.

[2] In 2008, the World Bank allocated over 20% of its budget to "aid for trade", targeting in particular transport infrastructure in over 35 countries worldwide.

data on actual bribe payments, and on how users of public services respond to corruption. This paper attempts to bring new empirical evidence to bear on these questions. Motivated by standard industrial organization theories of bureaucratic organization and price setting, we first analyze the structure of public bureaucracies and how it determines the bribe-setting behavior of frontline public officials. The main goal of the paper is then to identify how users adjust their demand for the public service in response to different types of bribe-setting behavior. In particular, we observe how firms adapt their shipping and input sourcing strategies to the type of corruption they face at each port. These results have direct implications for the measurement of the overall efficiency costs of corruption in the economy, and, by providing a better understanding of the distribution of costs and benefits among those involved in bribery deals, for the design of anti-corruption policies.

To investigate how bribes are set we generate a unique dataset of directly observed bribe payments to port bureaucracies for a random sample of 1,300 shipments going through two competing ports in Southern Africa.[3] The level of detail in our data enable us to investigate the link between the structure of each bureaucracy and the bribe-setting behavior of frontline officials. We observe how bribe levels vary across different types of bureaucracies, different types of bureaucrats within each bureaucracy, and different types of firm-level shipments.

In our setup, firms have the choice to ship through two ports: Maputo in Mozambique, and Durban in South Africa. The majority of firms in our sample are equidistant to both ports while a subset of firms will be significantly closer to the more corrupt port of Maputo. Survey data revealed that the choice of port is driven primarily by the interaction between transport and corruption costs at each port. Transport costs are linear to the distance between each firm and the ports, while corruption costs are determined by the type of product the firm ships. Our main measure of the distortion caused by corruption is how firms shipping products that are more vulnerable to corruption will opt to go the long way around to avoid a closer, but more corrupt port. We also find suggestive correlations between the level and type of corruption firms face at each port, which directly affects the cost of using port services, and firms' decision to source inputs from domestic or international markets.

Because we observe the entire chain between competing port bureaucracies, frontline bureaucrats setting bribes and potential port users making shipping and sourcing decisions, we are able to more accurately trace both the determinants and the systemic impact of corruption on the economy. To the best of our knowledge, this is the first study to use primary data on bribe payments and firm behavior to document the magnitude, the determinants and the efficiency costs of corruption in an essential public bureaucracy.

[3] Port bureaucracies provide fertile ground to analyze corrupt behavior since opportunities for rent-seeking abound. A port represents an administrative monopoly over an important public service, with broad discretionary powers and scant institutional accountability.

Our analysis generates three main findings on the determinants of bribe payments and on the efficiency costs of corruption. First, we find that public officials engage in two main types of corruption. "Collusive" corruption emerges when public officials and private agents collude to share rents generated by the illicit transaction. "Coercive" corruption takes place when a public bureaucrat coerces a private agent into paying an additional fee just to gain access to the public service, above and beyond the official price. Bureaucrats will engage in "collusive" or "coercive" corruption depending on the opportunities and constraints created by the bureaucratic structure under which they operate.

Second, we find that "collusive" and "coercive" types of corruption can impose costs on the economy, but through different mechanisms. Our preferred estimate of the distortion caused by "coercive" corruption is what we label the "diversion effect": firms travel on average an additional 319 kms - in some cases almost doubling their transport costs-, just to avoid "coercive" corruption at a port. This effect is only observed for firms facing a higher probability of being coerced into a bribe due to the type of product they ship. In the most extreme case in our sample, the cost for a firm to re-route could be three times higher than the cost of the actual bribe requested at the most corrupt port. Survey data revealed that firms were willing to incur in higher transport costs to avoid (less costly) corruption due to an extreme aversion to the uncertainty surrounding bribe payments at the most corrupt port. Consistent with this observation, conditional on being a targeted firm, the coefficient of variation of the distribution of bribes is higher at the more corrupt port of Maputo (139%) relative to the port of Durban (131%). These results are robust to a variety of controls for unobserved heterogeneity of shipments and shippers.

Corruption can also affect the relative cost of imports by determining the total cost of using port services and clearing goods through customs.[4] We provide suggestive evidence on how firms respond to different types of corruption by adjusting their decisions on whether to source inputs in domestic or international markets. Cost-reducing "collusive" corruption is associated with a higher proportion of imported inputs, whereas cost-increasing "coercive" corruption is associated with a higher proportion of domestic inputs. Taken together, these findings suggest that firms respond to different types of corruption by organizing production in ways that increase or decrease demand for the public service.

Third, we also provide some suggestive evidence on how both types of corruption can affect economic activity beyond the immediate cost of the bribe to the user of the public service. The "diversion effect" caused by "coercive" corruption increases congestion and transport costs in the region by generating imbalanced flows

[4] We focus on imports since most countries have expedited port clearance for exports, with no tariff payments or mandatory screening procedures. Export shipments represented only 10% of our random sample of shipments reported by clearing agents.

of cargo along the transport network. Even though the actual cost of physical transport is identical across the corridors under study, transport services on the transport corridor leading to the most corrupt port carry a 70% price premium for users, lending further evidence to the fact that "coercive" corruption can introduce both direct and indirect distortions in the market. "Collusive" corruption is on the other hand associated with significant tariff revenue loss for the government, equivalent to a 5 percentage point reduction in the average nominal tariff rate.[5] Our results were confirmed by the clearing agents participating in this study: bribes are higher and more frequent under "collusive" types of corruption, while "coercive" corruption appears to be more distortionary.

An important question is why we observe such an extreme aversion to the uncertainty surrounding bribe payments at the most corrupt port, to the point that a firm would prefer to incur in a higher cost to go the long way around to an alternative port. One likely explanation is that in an environment of higher and more unpredictable bribes, the asymmetry of information between firms, the clearing agents working on their behalf and port officials, becomes more salient, making firms more reluctant, and less able, to guarantee the necessary liquidity for clearing agents to make bribe payments. This is consistent with an extensive literature arguing that the uncertainty associated with corruption deals can cripple business (Shleifer and Vishny 1993; Bardhan 1997; Campos, Lien and Pradhan 1999; Dierdimer and Pritchett 2010).

The validity of our strategy relies on two key identifying assumptions. For our comparison of bribe schedules across ports, we assume that the overall type of cargo handled in Maputo does not differ significantly from the cargo handled in Durban along important dimensions that may be correlated with firms' shipping and sourcing strategies, or with unobservable characteristics of each port. We provide evidence that the type of cargo handled in Durban and Maputo is indeed very similar, based on important observable characteristics such as the average size of the shipments or the average tariff grouping the products fall under. A second identifying assumption in our analysis of firms' choice of port and sourcing behavior is that the level of bribes at each port is exogenous both to the location and to the type of input sourced by the firms in our sample. The port of Maputo only became a viable shipping option to our firms when it re-opened to international traffic in 2004, following decades of civil war in Mozambique.[6] To mitigate the problem of endogenous firm location and input choice, we restrict our analysis to firms established in a given sector before 2002. Our results are robust to restricting the analysis even further to firms established as far back as 10 years earlier (1992), prior to the end of the civil war in Mozambique. We also

[5]This calculation is based on the tariff loss associated with the 650 shipments observed in our sample for the port of Maputo where this type of corruption takes place.

[6]As discussed in section III.1.2, the re-opening of the port was driven by funding from the IFIs and a desire to achieve political stability in the region through economic integration, with limited initial engagement from business.

observe shipping and sourcing strategies both from firms that are equidistant to the ports and from firms that are closer to each port. These firms do not differ in important characteristics such as volume of sales, number of employees, export capacity and size of inventories (see sections V and VII for a more detailed discussion of selection concerns) and we find no evidence that bribes are set according to the distance each firm has to travel to reach either port.

A concern that may emerge is that the choice of port is driven by other factors beyond what we account for in our analysis. While our design does not allow us to completely dismiss this possibility, we provide important evidence of the contrary. First, our survey data indicates that the choice of transport corridor and port is driven primarily by trucking and corruption costs. Second, the firms in our sample ranked the two ports similarly across a host of important indicators.[7] Third, we observe that only a subset of firms that ship goods at risk of paying a higher bribe in Maputo decide to re-route to Durban. This result holds when controlling for the value, size and perishability of the product, the urgency of the shipment as well as for the number of documents required to clear it. These findings are therefore inconsistent with a model in which all firms simply prefer one port over the other for reasons other than distance or transport and corruption costs.

While our data suggest that corruption can affect firms' decisions, our study was not designed to fully estimate to what extent the constraints or opportunities created by different types of corruption matter for trade, investment and growth in the long-run. This would require specific assumptions about existing tariff structures and how "collusive" corruption could for instance contribute to firm growth by allowing firms to circumvent them. Our results do however suggest that eliminating corruption can have heterogeneous effects on firms depending on whether they are engaging in cost-increasing "coercive" or cost-reducing "collusive" corruption. Understanding the distribution of rents among the different players engaged in bribery deals can have significant implications for how we measure the real costs imposed by corruption on economic activity and on how we design effective anti-corruption strategies in the future.

Our findings fit into an emerging literature arguing that bureaucrats price discriminate when setting bribes and that corruption can impose significant costs on the economy. Svensson (2003) and Fisman and Svensson (2007) find evidence that corrupt bureaucrats price discriminate in determining access to public services and that a 1 percentage point increase in bribery rates reduces firm growth by 3 percentage points, though no direct mechanism for these effects is specified. Dutt and Traca (2010) investigate the dual impact of corruption as a trade-reducing extortionary tool or as a trade-enhancing means to evade tariffs. These studies rely primarily on self-reported

[7] Surveys included questions about the speed, safety, capacity and reliability of port services in Maputo and Durban.

measures of bribe payments to public officials by surveyed firms or on perception based indices of corruption, both of which bear a high risk of perception and reporting bias (Olken 2009). 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 at a high social cost. Olken (2009) also traces the level of bribes paid by truckers at road posts in Indonesia to the structure of localized markets for corruption. While both studies suggest large social losses due to bribe payments, they lack the necessary data to identify how users respond to each type of bribe, and consequently to identify the real costs and opportunities generated by corruption.

The rest of the paper proceeds as follows. Section II introduces a simple conceptual framework to guide the empirical analysis and section III discusses the empirical setting. Section IV describes the data collection, section V analyzes the characteristics and determinants of bribe payments, section VI identifies the efficiency costs of corruption, section VII discusses endogeneity concerns and conducts further robustness checks. Section VIII concludes.

II Conceptual Framework

II.1 Competition Between Port Bureaucracies, Bribe-setting Behaviour of Frontline Officials and the Economic Costs of Corruption

Motivated by standard theories of industrial organization and price setting behavior, this section discusses how the structure of the market for port services and the organization of port bureaucracies can affect the way bureaucrats set bribes, with important implications for the efficiency costs of corruption.

The structure of the market for the provision of the public service can first and foremost affect the level of corruption each bureaucracy engages in. If the market for the provision of port services is characterized by perfect competition, even with just two ports, the only Nash equilibrium would equalize the price of the bribe in each port to the marginal cost of providing the service for the bureaucrat, which we assume to be zero. Bribes would be competed to zero and there would be no efficiency cost associated to corruption(Shleifer and Vishny 1993). Alternatively, bribes can be positive if bureaucrats are able to perfectly collude to jointly maximize bribe revenue across ports. In this case, bureaucrats would set bribe prices acting as a joint monopolist, internalizing cross elasticities of demand across ports and setting marginal revenue equal to marginal cost. If the game were repeated infinitely, the monopoly price would become a Nash equilibrium. Sustaining this strategy in equilibrium would require low coordination costs between bureaucrats; a credible threat of punishment for deviations from the monopoly price; low and equalized discount rates across bureaucrats, and that the costs of deviating from the agreement be borne by the individual bureaucrats setting the bribes. The efficiency costs of corruption would be low in the case of perfect competition or perfect collusion in bribe setting across ports, but high otherwise (Shleifer and Vishny, 1993). Whether the conditions for perfect competition or perfect collusion in bribe setting hold depends on the way bureaucracies are organized and on the structure of the market in which they operate.

The structure of each bureaucracy in turn determines the opportunities provided for bureaucrats to engage in different types of corruption. "Collusive" corruption emerges when public officials and private agents collude to share rents generated by the illicit transaction. A clear example of "collusive corruption" is when private agents collude with customs officials to evade tariffs. "Coercive" corruption takes place when a public bureaucrat coerces a private agent to pay a fee just to gain access to the public service. In this case, the private agent does not benefit from any rent from the illicit transaction, as the bribe is extortionary in nature.[8] If demand for the public service is decreasing in the price of the bribe and increasing in the rent accrued to the private agent, "collusive" corruption should always increase demand for the service, while "coercive" corruption would be cost-increasing, reducing demand for the service.

The efficiency costs of both "collusive" and "coercive" forms of corruption also depend on how bureaucrats engage in price discrimination when setting bribes. If bureaucrats engage in efficient price discrimination that maximizes joint welfare with the shipper, corruption does not necessarily distort firm behaviour. Examples of efficient price discrimination would be setting bribes according to the time preferences of users, according to their ability to pay bribes or according to the distance each firm needs to travel to reach the port. While still costly to firms, corruption with this type of price discrimination would represent just a transfer from private agents to bureaucrats that would not, in the short run, distort allocative efficiency (Leff 1964; Huntington 1968; Lui 1994). But this type of efficient discrimination strategy is costly to the bureaucrat as it requires eliciting non-verifiable information from the shipper during the bargaining process. Bureaucrats will therefore only have an incentive to obtain this information when the elasticity of demand for their service is high or their time horizons long, since they would otherwise fully internalize the costs of engaging in an inefficient type of price discrimination (Niehaus and Sukhantkar 2010).

This simple conceptual framework provides three types of predictions that we will explore in the empirical analysis that follows. The first prediction is that the efficiency costs of corruption will be low either in the case of

[8] This typology of corruption differs from Shleifer and Vishny's (1993) distinction between corruption *with* and *without* theft. Our main focus is on the effect of corruption on the user of the public service. Paying a bribe to evade tariffs and paying a bribe to speed clearance through the port represent forms of "collusive" corruption given that in both cases a rent is shared between the public official and the private agent, but while the former is a clear example of corruption with theft, the latter represents a case of corruption without theft.

perfect competition or perfect collusion between port bureaucracies, but high otherwise. The ability of bureaucrats to collude in bribe-setting depends on their discount rates and on coordination costs across ports. The second prediction is that "collusive" corruption is overall cost-reducing, leading to an increase in the demand for the public service, while "coercive" corruption is cost-increasing, reducing demand for the public service. The third prediction is that the informational costs involved in bargaining for bribes and the time horizons of the different bureaucrats will determine the choice of a bureaucrat's bribe setting behaviour.

III Empirical Setting

III.1 Transport and Port Bureaucracies in Southern Africa

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 1 and 2. Given its strategic location, the port of Maputo has historically been considered a critical part of South Africa's transport network. However, the port suffered great losses during the Mozambican civil war in the 80s and 90s, and reopened to international traffic only in 2004 under private management. Today, and together with Durban, the port of Maputo serves as the primary transportation route to the sea for the booming South African provinces of Mpumalanga and Gauteng.[9]

Since 2004, the barriers for freight transit along the transnational corridor connecting South Africa to the port of Maputo have been significantly reduced and a set of comparable South African trucking companies have begun to serve both ports.[10] An important feature of this empirical setup is that neither port dominates the other in terms of 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 ports). As a result, a clearly defined group of South African firms faces the choice of using two different ports - Maputo or Durban - with similar overland transport costs, similar cargo-handling technologies and similar logistics services for standard cargo, but with different levels of expected corruption.

[9]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 access to this port, we do not consider it to be a substitute for either Durban or Maputo for the type of firms covered in this study. In fact, the enterprise survey we conducted in South Africa covering a random sample of over 1,700 firms revealed that none of these firms used Richards Bay as an import or export port in 2007.

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

III.1.1 The Shipping Decision: the Role of the Clearing Agent and the Transit Bond

The choice of port is far from trivial in an environment in which cargo travels long distances - an average of 588 kms - between centers of production or consumption and ports, at very high prices of overland transport.[11] By law, no firm is allowed to interact directly with customs or port operators in Mozambique or in South Africa. Firms have instead to resort to clearing agents who specialize in clearing cargo through the port or border post, mostly through *ad hoc*, shipment-based contracts.[12] Bribes are paid primarily by clearing agents, with all costs imputed to their client firms.

We make several simplifying assumptions in our analysis. 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 due to wind patterns and congestion levels at the port, and for exports there is uncertainty as to when trucks can offload their cargo given road traffic and queuing at the entrance to the ports. Since port officials operate for 6 to 8 hour shifts and no cargo can stay idle inside the port without the respective documentation being submitted, we consider that clearing agents are randomly assigned to different port officials.[13] We also abstract from several bargaining dynamics namely the possibility of collusion between different port officials within each port; agency problems between firms and clearing agents, as well as intertemporal bargaining dynamics. We choose to abstract from these dynamics given that we found no qualitative evidence of collusion between port officials. Bribes also vary significantly both across clearing agents, across shipments handled by the same clearing agent and across time. Moreover, the small sample of clearing agents participating in this study due to the secretive nature of the data collection effort rendered it impossible to test these hypotheses any further with the current data. These simplifying assumptions on the relationship between the clearing agent and the port official do not however affect our main results on the efficiency costs of corruption: our study was primarily designed to capture the total costs of corruption that are passed on to firms.

South African firms in our sample have the choice to ship through the ports of Maputo or Durban. A critical feature of the empirical setup is that in both cases, these firms pay import tariffs only when the cargo enters South Africa, in accordance with the South African tariff code. Even when the cargo comes to South Africa via

[11] According to CSIR (2005, 2006), expenditures on transport and logistics in South Africa are equivalent to 15-20% of GDP, double the figure for comparable middle income countries like India or Brazil.

[12] 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. In the sample we track in this paper, 80% of firms engaged in direct contracts with clearing agents, 65% of which were for a one-time shipment.

[13] For a random sample of 94 shipments in the port of Maputo, we asked clearing agents to identify the last time they had interacted with the port official dealing with their shipment. Less than 20% of this sample reported interacting frequently with the same port official.

the port of Maputo, no tariff payments are made in Mozambique. Instead, while the shipment is in transit for approximately 83 kms through Mozambican territory, South African firms have to pay a refundable transit bond. The amount of this transit bond is in principle determined by the tariff the cargo would have to pay according to the Mozambican tariff code. This is a standard precautionary measure in case the cargo gets diverted from its course and remains in Mozambique. All the clearing agents who participated in this study confirmed that while transit bond procedures are in principle straightforward and easy to implement, customs in Maputo would often seek to re-classify shipments or change shipment values in order to negotiate a bribe against the threat of an arbitrary increase in the amount of the transit bond due. We explore the consequences of this behavior in section V. Whether a firm has in principle to pay a high or low transit bond depends on the tariff category its main imported input falls under according to the Mozambican tariff code. The transit bond is important in our setup insofar as it creates an exogenous variation in South African firms' exposure to "coercive" corruption at the port of Maputo, and is therefore critical for our identification of the distortionary effect of this type of corruption on firms.[14]

III.1.2 The Ports of Maputo and Durban: Official Types, Bureaucratic Variation and Opportunities for Corrupt Behavior

Though each port official sells a differentiated product with monopoly power over a specific sequence in the clearing chain, we define two broad categories of officials that differ in their administrative authority and in their discretion to stop cargo and generate opportunities for bribe payments: customs officials and port operators. In principle, customs officials have greater discretionary power to extract bribes than regular port operators given their broader bureaucratic mandate and the fact that they can access full information on each shipment, and each shipper, at all times.[15] Regular port operators on the other hand have a narrower mandate to move or protect cargo on the docks, and they lack access to the cargo's documentation specifying the value of the cargo, the client firm and its origin/destination, among others.[16]

[14]Our analysis is restricted to firms that chose their geographic location and the products they ship before the Port of Maputo reopened to international traffic in 2004. As a result, their choice of main input is orthogonal to whether it falls under a high or low tariff category according to the tariff codebook of neighboring Mozambique.

[15]Customs officials possess discretionary power to single-handedly decide which cargo to stop and whether to reassess the classification of goods for tariff purposes or validate reported prices of goods. 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.

[16]Bribes can be paid to different types of port officials: agents in charge of adjusting reefer temperatures for refrigerated cargo stationed at the port; port gate officials who determine the acceptance of late cargo arrivals; stevedores who auction off forklifts and equipment on the docks; document clerks who stamp import, export and transit documentation for submission to customs; port security who oversee high-value cargo vulnerable to theft; shipping planners who auction off priority slots in shipping vessels, and scanner agents who move cargo through non-intrusive scanning technology. It is also possible that truckers have to pay bribes at roadposts along both corridors. We do not include these bribes in our study given that our trucking surveys indicated that the probability of paying a bribe

To investigate if the structure of bureaucracies affects the level and type of corruption observed, we take a closer look at how each port bureaucracy is organized. The port bureaucracies of Maputo and Durban differ in three important organizational features that determine which of the two types of port officials described above have more opportunities to extract a bribe: the high extractive types -customs agents- or the low extractive types -port operators-. These differences reside in the level of interaction that takes place between clearing agents and customs officials, the type of management overseeing port operations, and the time horizons of each type of bureaucrat.

In Durban, direct interaction between clearing agents and customs' agents is kept to a minimum since all clearance documentation is processed online. In contrast, the level of interaction in Maputo is high since all clearance documentation must be submitted in-person by the clearing agent.[17] The close interaction between clearing agents and customs officials in Maputo creates more opportunities for corrupt behavior to emerge in customs relative to Durban.

There are also significant differences regarding the type of management overseeing port operations. In Maputo, port operators are privately managed but in Durban, all terminals are under public control. Private management in Maputo is associated with fewer opportunities for bribe payments due to better monitoring and stricter punishment for misconduct [18]. These organizational features therefore determine that the high extractive types in customs have more opportunities to extract bribes in Maputo, while the low extractive types in port operations have more opportunities to extract bribes in Durban.

A third significant difference between the two port bureaucracies is that officials with opportunities to extract bribes differ in their time horizons. As part of a comprehensive reform program triggered by the merging between the Mozambican Customs' Agency and the Tax Authority in 2006, customs in Maputo adopted a policy of frequently rotating agents across different terminals and ports.[19] While customs officials in Maputo can be in a post for as little as 6 weeks, port operators in Durban have extended time horizons given the stable support they receive from dock workers' unions.[20] We therefore expect the high extractive types with the shortest time horizons - customs' officials in Maputo - to extract higher and more frequent bribes relative to the low extractive

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.

[17]The level of red tape is however similar in both countries. South Africa and Mozambique require the same number of documents to process the clearing of goods through their ports (Doing Business, 2007).

[18]Interviews with SAPO in charge of port operations in Durban and MPDC, responsible for port operations in Maputo, 2008

[19]As shown in section IV.5, bribes vary significantly by the type of product being shipped, and consequently by the type of terminal at the port. Customs agents can therefore at any given moment be assigned to terminals with different levels of extractive potential.

[20]Interviews with the Customs Agency in Maputo and SATAWU, the transport union in Durban.

types with long time horizons that we found in Durban (Campante, Chor and Do, 2009).

An important part of this setup is that these differences in organizational structure were not determined by the level of corruption at each port. In Mozambique, the privatization of port operations was a necessary condition for the government to receive funding from international financial institutions (IFIs) for the rehabilitation of the port.[21] In South Africa, dock workers' unions spearheaded a long and successful fight against the privatization of port operations, particularly for container terminals. The political strength of the organization is deeply rooted in the historical role it played in the struggle against Apartheid, which culminated in the active participation of labor unions in the tripartite political alliance that gave birth to the first post-apartheid government in South Africa.[22]

IV Data

We rely on three main sources of primary data: (1) we measure overland transport costs on both the Maputo and Durban corridors using data from an original survey of trucking companies; (2) we measure the level and frequency of bribes payments by tracking shipments going through each port and (3) we identify firms' shipping and sourcing strategies through an original enterprise survey. All data were collected by the IFC and the World Bank.

IV.1 Transport Costs

To accurately measure overland transport costs in the region, we conducted a trucking survey covering a random sample of 220 trucking companies operating in both the Maputo and Durban corridors. We 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 on each corridor, and the transport prices charged to client firms.[23] To ensure that we obtained accurate information on

[21] The derelict state of the port of Maputo in the late 1990s resulted from decades of civil conflict, economic isolation and under-investment in transport infrastructure. The capital requirements to rehabilitate and re-open the port to international traffic in the early 2000s could only be met by resorting to concessional lending.

[22] The South African Transport and Allied Workers Union (SATAWU) enlists 82,000 members and is affiliated with the Congress of South African Trade Unions (COSATU). COSATU is an active member in the tripartite political alliance with the ANC and the Communist party that is currently in power. 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.

[23] This micro-data allows us to identify not only the rates transport companies charge to firms, but also the actual transport costs they incur in.

transport rates charged to firms, we conducted an additional "mystery client" exercise that involved contacting approximately 100 transport firms and requesting rates for a standard shipment of goods to and from each port. 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.We use these data to calculate precise transport costs to each port for all firms in our sample.[24]

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 in the border post between South Africa and Mozambique. The IFC hired well-established clearing agents to track all bribe payments made to port officials for a randomly selected sample of 1,300 shipments.[25] Clearing agents provided the listing of shipments received per week and were instructed to track every third shipment to record detailed information on the date and time of arrival and clearance; on expected storage costs at the port; on the size of the client firm and on 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 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.[26] During this data collection exercise, emphasis was placed on capturing all formal and informal costs of importing and exporting goods through the ports. The goal was to minimize the possibility of clearing agents strategically misreporting data on bribe payments. In this particular setting, there was limited stigma attached to the payment of bribes to port or border officials, since clearing agents saw a bribe as a necessary payment made at the request of their clients. Acting as mere intermediaries, clearing agents felt limited moral responsibility for their actions.

To cross-check the accuracy and reliability of the data collected we trained locally-hired observers to shadow clearing agents and report on all legal and illegal payments made to port and border officials. The observers

[24] We concentrate on road transport costs since our enterprise survey revealed that less than 4% of the 1,700 randomly selected firms covered in both South Africa and Mozambique used railroad services.

[25] The sample size was restricted to eight clearing agents given the illicit nature of the bribe payments and the IFC's concern with ensuring discretion in the data collection to maximize its accuracy. However, each clearing agent worked with an average of 20 to 25 clients. 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. A list of formally registered clearing agents was first stratified by the "reputation" of each agent and by their length of establishment. A random sample of agents was then selected from within each stratum.

[26] Clearing agents also documented whether the container had smuggled goods. Given the small number of shipments that fell under this category, we removed them from our analysis.

had experience in the shipping industry and were therefore familiar with all clearance procedures. To avoid any suspicion, the observers were also similar in age and appearance to any other clerk who normally assists clearing agents in their interactions with port officials. Clearing agents were randomly assigned to monitored and non-monitored sequences of data collection for a total of 800 shipments. Sequeira (2011b) discusses the preliminary results of this experiment, finding suggestive evidence that the presence of the observer was associated with a lower probability of reporting a bribe payment, even when controlling for the characteristics of the cargo, the client firm and clearing agent fixed effects.[27] This evidence is consistent with an extensive literature in psychology showing that self-administered questionnaires increase the willingness of respondents to report sensitive behaviour in a variety of settings (Barnett, 1998; Bradburn and Sudman 1979; Groves 1989; Turner et al 1995; Waterton and Duffy 1984; Weinrott and Saylor 1991). Given that clearing agents knew from the onset that they would be monitored at some point, it is unlikely that they would try to strategically misreport information on bribe payments while they were not being monitored. We therefore restrict our analysis to the data reported directly by the clearing agent, which enable us to measure expected bribes at each port for different types of shippers and different types of shipments.

IV.3 Firms' Shipping and Sourcing Decisions

To identify firms' choice of port and sourcing decisions we conducted an enterprise survey that covered 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 and Mozambique. The survey elicits information on firms' perceptions of the quality of each port, their shipping strategies, and on the characteristics of their 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 Secondary Data Sources

We also collected secondary data on variables that could be associated with higher bribe payments at each port. For instance, perishable products carry a higher probability of spoilage in warm temperatures. This suggests that

[27] This experiment is still ongoing so the sample size is preliminary.

the weather could 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 each country. Another important determinant of bribe payments may be the import price elasticity of demand of the products shipped through our ports. To test this possibility, we match the estimates of price elasticities of import demand from Broda and Weinstein (2006) to our shipments and directly test if products with higher elasticity of import demand are more or less vulnerable to different types of corruption.

In this setting, tariff levels may affect the probability of paying a bribe through two different channels. First, shippers and bureaucrats at each port 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 traveling between the port of Maputo and South Africa. To test this hypothesis on the importance of tariffs and the transit bond, we collected tariff data from customs in South Africa and Mozambique for all products in our tracked sample.

To identify the mechanism through which tariffs can affect bribe levels 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. It is possible that the difficulty of assessing the correct import price of a good increases the probability of corrupt behavior given that shippers have strong incentives to underreport the value of 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. This will test if the main mechanism through which tariffs affects corruption levels is through the misrepresentation of import prices or through the misclassification of goods.[28]

V The Characteristics and Determinants of Bribe Payments

In Table 2 we present basic descriptive statistics of bribe payments at each port. We find that bribes are high, frequent and different across ports. Not only is the probability of paying a bribe much higher in Maputo - nearly

[28] Javorcik and Narciso (2008) suggest that trade in differentiated products is correlated with higher tariff evasion due to the misrepresentation of import prices while Fismand and Wei (2004) find evidence of pervasive misclassification of tariff categories.

53% compared to 36% in Durban -, but the amount of bribes paid in Maputo is also 3 times higher than in Durban.[29] In Maputo, the median bribe represents a 129% 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 - on any route connecting Southern Africa to the Far East. In Durban, the incidence of bribe payments is lower, but the median bribe is still equivalent to a 32% increase in total port costs for a standard 20 ft container, which is also equivalent to a 4% increase in total shipping costs on similar routes.

Bribes are also high and significant when measured as a percentage of each bureaucrat's salary. 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 (CPI adjusted). 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% due to corruption. If we assume that because of higher volumes a 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 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.[30]

The recipients of bribes and the reasons for bribe payments in our sample also vary significantly across ports. In Maputo, the primary recipients of bribe payments are customs officials (80%) and the primary reason for bribe payments is to evade tariffs (41%). In Durban, the primary recipients of bribes are clerks in the document department (38.5%) and security agents (24.34%) overseeing idle cargo on the docks, to prevent cargo from being arbitrarily moved from the general docks to expensive depots while waiting for clearance.

The data do not therefore seem to support the hypothesis that bribes are competed to zero across ports, or that there is any type of collusion between frontline bureaucrats when setting bribes across ports. This non-cooperative outcome in bribe setting across bureaucracies is likely to result from high coordination and communication costs between different levels of bureaucrats in different countries; from the fact that price-cutting and any deviation from "joint monopolist" prices is not easily observed and that the threat of punishment for this deviation is not credible given that due to capacity constraints, neither port is capable of reducing bribes to zero and serve the entire market. More importantly, the public officials involved in corruption at each port differ in their discount

[29] See Figure 3 for the distribution of bribes per container and per ton 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 and across time. 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.

[30] In these calculations we are assuming that officials will capture the entire bribe to themselves as opposed to sharing it with other officials in the same shift or higher up in the bureaucratic hierarchy. In our current dataset, we found no examples in which clearing agents perceived the bribe to be shared between port officials. In an extension of this study, Sequeira (2011b) analyzes this possibility in more detail.

rates. Customs officials in Maputo have high discount rates while port operators in Durban have longer time horizons, implying that deviations from the "joint monopolist" bribe level would not be internalized in the same way by the different bureaucrats. Bribe levels at each port appear to be determined primarily by the way each bureaucracy is organized and how it determines the extractive capacity of the different bureaucrats who are able to engage in corruption. Bureaucrats act as independent monopolists when setting bribes, maximizing their own individual bribe revenue as opposed to that of the bureaucracy they belong to.

To further investigate how bureaucrats set bribes, we begin by estimating the probability of a shipment paying a bribe given the characteristics of the cargo, the timing of the arrival of the shipment at each port and the characteristics of the client firm. In the main econometric specification, our dependent variable is denoted by $Bribe_{ij}$ 0, equalling 0 if no bribe was paid and 1 if a bribe was paid for the j^{th} shipment at port i. The vector of independent variables is

$$\beta_{1i}Tariff_{ij} + \beta_{2i}\,Diff_{ij} + \beta_{3i}\,LargeFirm_{ij} + \beta_{4i}\,LStorage_{ij} + \beta_{5i}\,ImpElasticity_{ij} + \beta_{6i}X_{ij} \quad (1)$$

where $Tariff_{ij}$ represents the tariff level a given shipment falls under; $Diff_{ij}$ is a dummy variable indicating whether the shipment corresponds to a differentiated product as categorized by Rauch (1999); $LargeFirm_{ij}$ is a dummy variable indicating that the shipment belongs to a large firm; $LStorage_{ij}$ represents the natural log of the storage costs the shipment has to pay when held back at the port and $ImpElasticity_{ij}$ indicates the estimated price elasticity of import demand for the product shipped according to Broda and Weintein (2006). The coefficient on $Diff_{ij}$ tests the hypothesis that the absence of a fixed price in international markets provides customs' officials and shippers with more room to claim or detect the misrepresentation of import prices. We consider a large firm to have more than 100 employees. X_{ij} represents a vector of shipment and firm-level controls, which vary across specifications including, among others, the frequency of each firm's shipments; a variable calculating the deviation between the actual temperature the day the shipment arrives at the port and the average monthly temperature at the port; the natural log of the value of the shipment; the size of the shipment measured in tons; a dummy variable indicating whether the shipment carried perishable cargo; the terminal that processed the cargo; whether the cargo was subjected to pre-shipment inspection at origin; whether the shipment includes agricultural or consumer goods and whether the shipment is containerized or bulk.[31] This equation is estimated separately for each port, with $i = 1$ representing shipments going through Maputo, and $i = 2$ shipments going through Durban. Standard errors are clustered at the 4-digit harmonization code level for each shipment.

[31] Ideally, we would include in our specification a variable measuring the distance each shipment traveled to reach the port. Due to constraints related to the disclosure of the identity of the firm, we only captured this indicator for a randomly selected subset of 60 shipments. As shown in Table 2, we find no evidence in this sub-sample that distance is correlated with bribes.

To investigate the determinants of the amount of bribe paid, a count model analysis is more appropriate given the nature of the dependent variable. We focus on the negative binomial model since a Poisson model can be rejected at high levels of confidence due to overdispersion of the bribe amount outcome variable (results not shown). The dependent variable is now the natural log of the bribe amount paid, and the independent variables are identical to the main econometric specification used to explore the determinants of the probability of a bribe payment. Disturbances are also allowed to be correlated across similar products belonging to the same 4-digit harmonization code grouping.

V.1 Determinants of Bribe Payments: Discussion of Results

In Tables 3 and 4, we present the determinants of bribe payments at the ports of Maputo and Durban. In Table 3, columns (1) through (5) present the estimates for a linear probability model on the probability of paying a bribe in Maputo. To minimize any measurement error, in column (4) we replace the continuous variable denoting the tariff level the shipment falls under with a dummy variable indicating whether this tariff category is high (above 20%) or low (between 0-10%) reflecting the bi-modal distribution of the tariff schedules.[32]

We find that in Maputo moving from a low tariff rate of 2.5% to a high tariff rate of 20% increases the probability of a bribe payment by 18%, and increases the amount of bribe paid by 65%. These results are robust to a specification in which we replace the continuous tariff level variable with the dummy variable indicating a high tariff good (columns 4 and 11).[33] Larger firms are also associated with a 17% increase in the probability of paying a bribe. We find no statistically significant effects on the probability of paying a bribe for differentiated products, for products with a higher elasticity of import demand, for perishable products in a particularly warm day, for shipments inspected at origin, or for agricultural and consumer goods. These results are consistent with our preliminary findings that bribes in Maputo are paid primarily to customs officials who are in charge of receiving all tariff payments, and who have full information on the client firm and on the product being shipped at all times. It also suggests that customs officials in Maputo engage both in "collusive" corruption when dealing with domestic cargo, and in "coercive" corruption when dealing with South African cargo in transit through the port. While

[32]The sample is reduced once we introduce the full set of controls, particularly from column 3 onward. This is primarily due to the fact that variables like the size of the shipment were reported in different units (eg: tons, units or number of containers) and to the absence of information on some variables like whether the shipment was subjected to pre-shipment inspections. We have every reason to believe that observations are dropped at random from the main sample given that any differences in the characteristics of the shipments remaining in the sample relative to those that are dropped are statistically insignificant. Storage costs are not included in the specifications reported in Table 3 given that Maputo offers 21 days of free storage to shippers as opposed to the 3 days that a shipper can get in Durban. This represented a non-binding constraint for all shipments in our sample.

[33]The results are robust to several functional forms including a standard ordinary least squares (OLS) regression in which the dependent variable consists of non-zero bribe payments (columns 6 through 8), and a Tobit model (results not shown).

domestic cargo appears to be paying a bribe to evade tariffs, transit cargo is paying a bribe just to avoid an arbitrary increase in the transit bond of products that fall under a high tariff category since no tariff evasion is possible for these shipments in Maputo.

In Table 4 we present the estimation results for shipments going through the port of Durban. The main determinant of the probability of a bribe payment at the port of Maputo appear to be the storage costs that the shipment incurs in if its clearance is delayed. Doubling a shipment's expected storage costs from the mean increases the probability of a bribe payment by 30% and the amount of bribe paid by over 400%. The relationship between bribes and storage costs appears however to be non-linear: as storage costs increase, the probability of paying a bribe and the amount of bribe paid decrease. Storage costs are product specific and while most cargo would have up to 3 free days to remain in the general docks, port operators will often claim that due to congestion in the port (non-verifiable information for the clearing agent or the client firm), cargo has to be moved to more expensive depots. Just like in Maputo, we do not find any evidence that differentiated products or products with a lower elasticity of import demand are targeted for bribes in Durban. These results confirm our initial descriptive statistics revealing that bribe payments in Durban are concentrated in port operations, and that port operators are engaged primarily in a "coercive" form of corruption. In the following section we discuss the implications of each of these types of corruption on firm behaviour.

One concern with these results is that differences in corruption levels between the ports of Maputo and Durban are driven by the distribution of shipments handled by each port. The problem arises if in a dynamic model of transport corridor choice, assortative matching takes place between firms' cargo or shipment characteristics and the unobservable characteristics of each port. If bribe payments are also correlated with these unobservables, we would mistakenly identify certain cargo characteristics as the drivers of corruption patterns. In Table 2 we present the distribution of important shipment characteristics going through each port. Table 2 displays the p-values from a two sample t-test and a two sample chi-square test for important variables such as the value, size and expected storage costs of shipments, as well as the percentage of consumer and high tariff goods going through each port. With the exception of the value of the shipments, variable means are close and none of the p-values indicate significant differences at conventional levels. Given the statistically significant difference in average value of the shipments going through Durban and Maputo (mostly due to the higher variance of shipment values in Maputo), we conduct further tests of the sorting hypothesis. First, we pool our data for both ports and estimate the determinants of bribe payments 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 of the amount of bribe paid between ports, into a “port effect”, and the effect of other significant explanatory variables. The port effect clearly dominates the effect of other variables (results not shown). Following Crump et al (2009), we also estimate the propensity score of a shipment in our pooled sample going through Maputo through full covariate matching. We then select (conservatively) the subset of shipments that have propensity scores between 0.2 and 0.8 to ensure common support, before we re-estimate the determinants of bribe payments at the port of Maputo (Table 3, columns 5 and 12). Our main results are robust to restricting the sample to comparable shipments, lending further support to our institutional argument that it is the port, and not the distribution of shipments that drives differences in bribe patterns.

Our results show that bribes are determined primarily by product characteristics and that they differ across ports, depending on the opportunities for corrupt behavior presented to different types of port officials. In Maputo, bribes are paid primarily to customs by shippers of high tariff goods, in a “collusive” arrangement with Mozambican firms and a “coercive” deal with South African firms shipping through Mozambique. Associating the bribe with the tariff level of the good 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 carries all the necessary information on the willingness-to-pay of a potentially bribing shipper. Customs officials assume that all firms would be better off by evading a tariff, or by reducing the level of the transit bond, so the higher the tariff, the higher the bribe a firm would be willing to pay. All other shipment characteristics carry coarse information on the firm’s willingness-to-pay a bribe, requiring that the customs’ official engage in a costly and time-consuming exercise to elicit information on each firm’s time sensitivity, or its ability to pay. For example, the size of the shipment is an imperfect indicator of willingness to pay a bribe: large shipments may signal a firm carrying higher than average inventories with a lower willingness to pay to expedite clearance, or a large firm with a higher ability to pay for a faster service. A lengthy process of discovering both commitment to an illicit transaction and the reservation costs of a shipper increases both the risk and the cost of the bargaining game for 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 the deal is both well-defined and well-understood (Schelling, 1956). 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 of a container.

In Durban, bribes are paid to document clerks, cargo 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. Bribes are set according to the storage costs the cargo would have to pay if it were moved from the general docks into private depots. Associating the bribe with potential storage costs also combines the desirable features of reducing the informational cost of bargaining and the risk associated with the illicit transaction. Storage costs are easy to calculate based on the volume of the shipment and on the type of product to be stored. Port operators assume that this is a cost firms will always want to avoid. The timing of when the cargo has to move to the depot also depends on the congestion levels at the port, a variable that is not directly observed by the client firm. This allows a port operator to exploit an important informational asymmetry to extract a higher bribe, with low probability of detection. These payments fall under the category of "coercive" corruption since they represent a cost, above and beyond what shippers would normally have to pay in the absence of corruption. In most instances, we observed that the payment of a bribe took place before the cargo had remained in the general docks for the full three days it is entitled to stay for free.

Our findings therefore suggest that public officials are not price discriminating efficiently to maximize joint welfare with the shipper but are instead responding to their strategic concerns about how to minimize both the informational costs of bargaining over bribes, and the probability of detection of the illicit transaction.

VI The Efficiency Costs of Corruption

In this section we examine the implications of different patterns of bribe payments on the efficiency costs of corruption. We measure the efficiency costs of corruption by observing how "collusive" or "coercive" types of corruption distort a firm's choice of port and its sourcing decisions.

VI.1 Corruption and Shipping Decisions

To identify the impact of "coercive" corruption on firm behaviour, we restrict our sample to South African firms and their choice of which port to use.[34] Our assumption is that in the absence of corruption, firms minimize overall transport costs, which are a linear function of geographic distance. With corruption, firms minimize both transport costs and expected bribes when deciding which port to use.[35]

[34]We restrict our analysis of port choice to South African firms that have a real choice between both ports. Given the layout of the road network, it is unviable for any Mozambican firm to use the port of Durban as its main port of entry or exit. See Figures I and II for more evidence.

[35]Table 1 shows that cargo dwelling time is comparable across ports so we do not include clearance time in our analysis.

We test whether corruption affects a firm's choice of port given its location, the level of urgency of its shipments and the characteristics of the cargo that render it more or less vulnerable to paying a bribe in Maputo or in Durban. Our main dependent variable is denoted by $Maputo_k$, which equals 1 if firm k chooses to ship through the port of Maputo and 0 otherwise. Our vector of independent variables is

$$\sigma\, Tariff\, Moz_k + \theta\, Tariff\, South\, Africa_k + \phi\, LRTC_k + \lambda\, Large\, Firm_k + \gamma\, Low\, Inventories_k + \rho\, X_k + z_k \quad (2)$$

where $Tariff\, Moz_k$ represents the tariff level category that the main product shipped by the firm would fall under according to the Mozambican tariff code if it uses the Maputo port, which determines the amount of the transit bond the firm will have to place. $Tariff\, South\, Africa_k$ represents the level of tariffs due once the cargo enters South Africa, irrespective of whether the point of entry is the port of Maputo or the port of Durban. $LRTC_k$ denotes the natural log of the ratio of total transport costs to Maputo over transport costs to Durban for each firm in the sample (transportation costs include the cost of road transport, all port charges, tolls and border fees); $Large\, Firm_k$ is a dummy variable indicating a large firm and $Low\, Inventories_k$ corresponds to a dummy variable indicating whether the client firm has a below average inventory level given its size and industry grouping, as a proxy for the urgency of its shipments. X_k consists of a vector containing firm-level controls that differ across specifications including the frequency of a firm's shipments; dummy variables indicating whether the firm ships perishable cargo; if the firm is an importer or an exporter; the industry the firm belongs to; the average value of the product shipped; the value of the product interacted with the distance the shipment has to travel to the port of Maputo and whether the product represents a differentiated good according to Rauch's (1999) classification. Standard errors are allowed to be correlated at the level of the 4-digit harmonization code of the product being shipped.

VI.2 Shipping Decisions: Discussion of Results

Table 5 presents the results of a linear probability model, with column (1) representing the base model, while in column (2) we augment the model to investigate whether there is a differential effect of distance on the choice of port when a firm is transporting valuable cargo.

We find that the tariff level a product falls under in Mozambique is negatively associated with the probability of a firm choosing the port of Maputo. The coefficient implies that moving from shipping a product with a 2,5% tariff rate to shipping a product with a 20% tariff rate, the probability of choosing Maputo declines by approximately 13% (column 2). These results are robust to the inclusion of all controls (including higher polynomials for shipment value and distance) and interactions between distance, importer status and product value. In column 3 we capture the tariff category through a dummy variable equalling 1 when the product falls under a tariff category above 20% and 0 if the tariff is between 0-10%. The only channel through which Mozambican tariffs can affect South African firms' choice of port is through its effect on the transit bond. In the absence of corruption in customs in Maputo, the tariff code of neighboring Mozambique should not play a role in determining South African firms' choice of port. South African firms reported however that there is significant uncertainty as to the exact level of transit bonds that need to be paid since this value is not revealed by Mozambican customs until the cargo reaches the port or the border post. Given that corrupt officials at the port of Maputo and at the border post target high tariff goods to attempt to extract a bribe, regardless of whether cargo is in transit or not, South African firms shipping goods that happen to fall under a high tariff classification in Mozambique will avoid the "coercive" corruption they face in Mozambique and ship through the port of Durban instead.[36]

These results suggest that even when accounting for distance, perishability and the urgency or value of the shipment, the expected bribe is a strong predictor of the choice of port. For 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 still going the long way around to Durban in order to avoid higher bribe payments. Of these, 75% are shipping perishable cargo and 74% are shipping urgent cargo. To illustrate the impact of corruption, take a firm located in the town of Nelspruit, the capital of the booming Mpumalanga province in northeastern South Africa. This firm is 171 kms from the port of Maputo and 992 kms from the port of Durban. If the firm happens to import a high tariff good, this firm is 13-21% more likely to incur in a 210% increase in overall costs to ship through Durban instead of Maputo.[37] For firms that re-route to the least corrupt port, this cost adds up to an 8% overall increase in yearly transport costs relative to a firm that ships cargo that is less vulnerable to corruption.[38] The "diversion costs" of corruption for each individual firm are on average three to four times higher than the actual bribe collected

[36]Despite clear differences in the elasticity of demand for port services, there are two possible reasons for why customs officials in Mozambique do not discriminate between transit and local cargo when setting bribes. First, customs officials in Mozambique have very short time horizons and consequently high discount rates given that they may not stay in their posts for longer than 6 weeks (Interview with Mozambican Customs Authority). Officials do not fully internalize the cost of requesting high bribes from firms with a high elasticity of demand since it is felt mostly in the future. Furthermore, at the time the study was conducted, transit cargo only represented about 15% of the total number of shipments moving through Maputo. Second, adopting more sophisticated bribe-setting strategies that discriminate between transit and local cargo could potentially increase the probability of detection of the illegal transaction due to the perceived unfairness of charging different bribes to South African and Mozambican shippers. This hypothesis was suggested by the clearing agents participating in our study though we were unable to test it further with our data.

[37]This accounts for road tolls, trucking charges, port costs and expected bribes in Durban.

[38]This calculation is based on the average number of shipments a firm in this region ships a year, the average size of the shipments and the average prices paid for trucking services along each corridor.

by the customs' official in Maputo. This also suggests that firms exhibit considerable aversion to the uncertainty associated with bribe payments in Maputo.[39] This aversion was confirmed by survey data and a likely explanation is that in an environment of higher and more unpredictable bribes, the asymmetry of information that exists between firms, clearing agents and port officials with respect to bribe payments becomes more salient, making firms more reluctant, and less able, to guarantee the necessary liquidity of clearing agents to make all required payments (Shleifer and Vishny, 1993; Bardhan, 1997; Campos, Lien and Pradhan, 1999; Dierdimer and Pritchett, 2010).

Our main result on the choice of port is robust to different functional forms. Figures 4 and 5 show non-parametric regressions of the probability of a South African firm choosing Maputo as a shipping port on the relative transport costs to Durban. In the absence of corruption, we would expect the indifferent firm to be located at the point that equates transport costs to either port. In Figure 4, this would correspond to zero since relative transport costs are in log form. 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 Figure 4 we observe that the firm which is most likely to ship through Maputo is located at approximately $L = \frac{1}{3}$, which is considerably closer to Maputo than the point of transport cost equivalence at $L = \frac{1}{2}$. 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. In Figure 5, it is clear that at the point of transport cost equivalence around 1, South African goods that are less vulnerable to corruption have a higher probability of being shipped through the port of Maputo. In this figure, low and high bribe goods are those that fall under a low and high tariff category in Mozambique, respectively. This pattern of port choice driven by high and low tariff products argues strongly against an alternative explanation suggesting that firms are avoiding the port of Maputo altogether due to any quality or capacity concerns, to the fact that the port is located in a neighboring country requiring the payment of a transit bond or to any differential in transport costs.

The distortions created by this "diversion" effect are magnified when we move to a general equilibrium framework. Every time a firm re-routes its imports away from the most corrupt port, it imposes a negative externality on other firms. We label this negative externality the "congestion effect" of corruption. The re-routing of firms adds to congestion in the least corrupt port and contributes to fewer and more imbalanced cargo flows to the more corrupt one, resulting in higher overall transport costs through both corridors. Given that imports are

[39] As observed in Figure 3, the coefficient of variation of the distribution of bribes is higher in Maputo (139%) than in Durban (131%).

more vulnerable to paying higher bribes than exports on the Maputo corridor as shown in Table 6, there is more outbound than inbound cargo. Our trucking survey revealed that even though the actual costs of operating in either corridor are almost identical for all trucking companies, the absence of a regular flow of backloads along the Maputo corridor leads to a 70% increase in transport rates charged to firms on that route. A regular transport service to Durban is priced at 0.07 c/ per ton-km compared to 0.12 c/ per ton-km to Maputo.[40] Though this difference cannot be solely attributed to the "congestion and diversion" effects of corruption, the pattern of bribe payments in Maputo and its effect on South African firms' demand for the port and corridor are likely to play an important role in this result.[41] In the absence of any corruption, if transport rates were equalized across corridors, the overall transport costs for the average firm located closer to Maputo would be halved. This is yet another clear example of the distortionary nature of "coercive" corruption as it induces users to reduce demand for the public service.

VI.3 Corruption and Sourcing Decisions

We now turn to how different types of corruption can affect another important margin of firm behaviour: the decision to source inputs domestically or in international markets. Decisions on the sourcing of inputs matter not only because they affect the productivity of the firm itself, but also because they have significant spillover effects in the economy as a whole, by affecting the nature and the extent of backward and forward linkages between firms. We assume that all else equal, if corruption increases the cost of clearing imported goods through a port, firms should have an incentive to decrease demand for imported inputs, while the opposite would happen if corruption decreases these costs.

To measure the impact of different types of corruption on sourcing decisions we construct an expected bribe probability measure for each product shipped by firms in our sample, based on the predicted values estimated through equation (1) (Tables 3 and 4, column 3). One concern is that omitted firm-level characteristics are correlated both with import behaviour and corruption. It is also possible that causality is reversed, running from sourcing decisions to the probability of paying a bribe. In particular, the proportion of inputs a firm decides to import affects the number of interactions it has with the port, which could ultimately affect the level of bribes

[40]The distances and the quality of of the roads are comparable in both corridors. The Maputo-bound toll highway was built in 2002 and is privately managed by a South African and Mozambican consortium. The Durban bound road is part of the South African highway system.

[41]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.

paid. While we are unable to completely eliminate this possibility, the results in section IV.6 provide little evidence to support it. Our results strongly suggested that the level of bribes at each port is product-specific and that it does not depend on the frequency of each firm's shipments and interactions with the port. To further minimize these endogeneity concerns we replace the firm-level measure with an industry-level measure of the expected probability of paying a bribe based on 2-digit harmonization codes. Given that the indicator is now measured at a more aggregate level it is less likely to be correlated with unobserved firm-level characteristics. To analyze the impact of different probabilities of bribe payments on the different margins of a firm's sourcing decisions, we estimate a reduced-form model with the following independent variables

$$\tau_i \, Expected\, Bribes_{ki} + \theta_{2i}\, X_{ki} + \nu_{ki} \tag{3}$$

To measure the effect of corruption on the extensive margin of the sourcing decision we place as our dependent variable $Import_{ki}$, which equals 1 if firm k decides to import its inputs and 0 otherwise in Mozambique ($i = 1$) and in South Africa ($i = 2$). To identify the effect of corruption on the intensive margin of the sourcing decision we change the dependent variable to $Proportion\, Imported\, Inputs$ to capture the proportion of the firm's inputs that are sourced internationally (in log-form). X_{ki} represents a vector of firm and product-level characteristics that control for firm size; distance from the nearest port; the average value of the input; whether the firm already exports and is therefore more familiar with operating in international markets; the age of the firm and the tariff level of the input according to each country's tariff code. ν_{ki} represents a stochastic error term that is allowed to be correlated at the industry level.

Each specification is estimated independently for firms facing only "coercive" corruption (South African firms in Durban and in Maputo) and for firms facing "collusive" corruption (Mozambican firms in Maputo).

We find that corruption has the opposite effect on firms' sourcing decisions depending on the type of corruption the firms face. A 50% increase in the probability of paying a "collusive" bribe is associated with a 30% higher probability of a firm importing any inputs and by almost 400% the proportion of inputs sourced internationally (Table 6). Firms respond differently to "coercive" corruption. While we find no statistically significant effect of "coercive" corruption on the decision to import, we find suggestive evidence that firms adjust the intensive margin of their sourcing decision to this type of corruption. A 10% increase in the probability of paying a "coercive" bribe decreases the proportion of imported inputs by almost 100%.[42]

[42] We do not observe any shift towards using other modes of transport such as air or rail transport to import inputs.

“Collusive” corruption reduces the relative cost of imported inputs while “coercive” corruption increases it. As a result, firms in Mozambique that can pay bribes to evade tariffs are less likely to source their inputs domestically, since imports are relatively cheaper due to corruption in customs, whereas in South Africa firms are more likely to source a higher proportion of their inputs domestically when facing higher levels of coercive corruption. These findings suggest that firms respond to different types of corruption by organizing production in ways that increase or decrease demand for the public service. While there may be other factors driving firms’ sourcing decisions, corruption appears to play an important role. These results warrant further investigation.

VII Robustness Checks

When we analyze a firm’s choice of port, we face a clear endogeneity challenge: the pattern of bribe payments at each port may have influenced a firm’s geographic location or its type of business, and consequently, the type of input it requires. To address this issue, we restrict our sample to firms that were already established up to twelve years before the Maputo port re-opened to international transit in 2004, when Mozambique was still engulfed in civil war. There are no significant differences in the main coefficients of interest when we use the restricted versus the full sample. Table 7 also shows p-values for a two sample t-test with unequal variances and a chi-square test for important observable characteristics of firms located close to ports and those located inland. In all cases, we fail to reject at conventional levels that these two types of firms are similar both with regards to firm-level characteristics (size, export behaviour, number of employees in 2003 and 2006, sales levels and days of inventory) and to the type of inputs they source (average tariff level in Mozambique, storage costs at the port of Durban, tonnage of average shipment, perishability, among others).

We also explore the existence of a “border effect” and how it could dissuade South African firms from shipping through a port located in a different country. To test this hypothesis, we investigate the quality of shipping services on each corridor and the additional costs imposed by the border post on South African firms that choose to ship through the port of Maputo. Since 2004, several South African freight forwarding companies have established offices both in Maputo and at the border post to facilitate the clearance of transit cargo to and from South Africa. In our survey of 220 trucking companies in the region, all companies operating internationally between Maputo and South Africa were under South African management. This mitigates our concern about differences in the quality of trucking companies serving the ports of Maputo and Durban. We also track the average time it takes for a container leaving Johannesburg to reach a vessel in both Maputo and Durban. While containers are often delayed at the border post when heading to the port of Maputo, this time difference is more than offset by the higher congestion and delays they experience at the port of Durban. Second, we tracked a random sample of 50 shipments through the South African - Mozambican border post, using the same methodology for data collection used at the ports. Consistent with our findings at the port, moving from a 2,5% to a 20% tariff good increases the amount of bribe paid by 6 to 30%, depending on whether we capture the tariff level continuously or as a dummy variable indicating a high tariff good (Table 8, columns 2 and 3). Standard errors are bootstrapped.

VIII Conclusion

In this paper we take an unusually close look at how different types of corruption affect firm behaviour. Our empirical setup and the level of detail in our data allow us to observe the entire chain of bribery, from bureaucracies competing in the provision of services, frontline bureaucrats setting bribes under the constraints imposed by the bureaucracies under which they operate, and private agents deciding how to respond to different bribe schedules.

We find that the industrial organization of port bureaucracies determines whether and how bureaucrats extract bribes. Important features of bureaucratic organization such as the level of coordination costs between bureaucrats, which types of bureaucrats have opportunities to extract bribes and their discount rates, can determine whether bureaucracies engage in perfect competition, perfect collusion or uncoordinated bribe-setting, with important implications for the efficiency costs of corruption. We also find that bureaucrats will not always price discriminate efficiently by maximizing joint welfare with the shipper, focusing instead on minimizing the informational costs of bribe-setting and the probability of detection of the illicit transaction. They engage in different types of corruption, "coercive" or "collusive", presenting firms with different sets of constraints and opportunities. "Collusive" corruption is cost-reducing, leading firms to increase demand for the public service, while "coercive" corruption is cost-increasing, reducing a firm's demand for the public service. A firm exposed to "coercive" types of corruption is more likely to try to avoid the most corrupt port, and to reduce the proportion of inputs it imports through the port. Firms exposed to "collusive" forms of corruption is more likely to import its inputs, since corruption allows them to reduce the relative cost of imports through tariff evasion. Our analysis suggests that "coercive" corruption is likely to be more distortionary, but "collusive" corruption may be more persistent as it benefits both parties to the illicit transaction.

We also find that the cost of corruption goes beyond just the transfer of money between a private agent and a public official. A salient example is the fact that "coercive" corruption increased transport costs in the region by contributing to unbalanced, and more costly cargo flows. When we restrict the analysis to Mozambican firms that pay bribes primarily to evade tariffs at the port of Maputo, we find that this type of "collusive" corruption significantly reduces government revenue. The impact of corruption 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 rent associated with evading tariffs through a bribe payment. This result adds to the growing evidence on what has been termed the "Tullock Paradox": that bribes are small relative to the size of the corresponding rent.

There are several important implications of this analysis for the study of corruption and for 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 structural *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 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 also reduce opportunities for corruption to emerge. Second, our findings suggest that port officials employ similar rules of thumb to discriminate between high and low-bribe shipments. Understanding the motivation behind the choice of price discriminating strategy and the type of corruption bureaucrats are engaging in may assist in concentrating monitoring efforts in certain categories of products and in certain phases of the clearance chain. Third, our findings suggest that corruption can affect the economy in many direct and indirect ways. Depending on the the type of corruption bureaucrats engage in, bribes can generate deadweight loss and reduce tariff revenue for the government but also increase or decrease demand for the public service, with important implications for economic activity. As suggested in Maacchi and Sequeira (2009), in the specific context of the Southern African corridors, corruption seems to be reducing demand for the Maputo port, dampening the returns to the considerable investments in the hard infrastructure of the corridor that have taken place in recent years.

This paper is primarily concerned with the static inefficiencies of corruption and its costs. How corruption can in the long-run affect the number of firms engaged in international trade, the volume of trade they engage in and their growth trajectories, remains an exciting 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 test our hypothesis of the overall comparability between services provided by the ports of Durban and 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.[43]

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 provided by the same South African freight forwarding companies that serve Durban. The port of Maputo at the time of this study was 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 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.[44]

Despite the comparability of services across both ports, it is still possible that firms' choice of shipping corridor is based on the relative cost of ocean shipping from each port. Recent work by Hummels (2008) suggests that shipping lines price discriminate across routes, depending on the prices of the products transported and on the

[43]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.

[44]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.

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.[45] A frequent feeder service between Maputo and Durban does however increase the flexibility of firms shipping through either port.[46]

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 appear to vary significantly across ports. The median of the distribution of the average number of days reported by firms 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 1,000 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. These findings allay our concern that firms could be locked into using a particular route, a particular clearing agent or a particular port.

[45] 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, attracting the largest shipping lines on a regular basis. The port of Durban averaged in the past couple of years 2 container vessels a day, which is what Maputo usually received in a week. Despite these differences, almost no firms covered in our enterprise survey highlighted this fact as a binding constraint. Furthermore, 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.

[46] 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 in, 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.

XI Figures

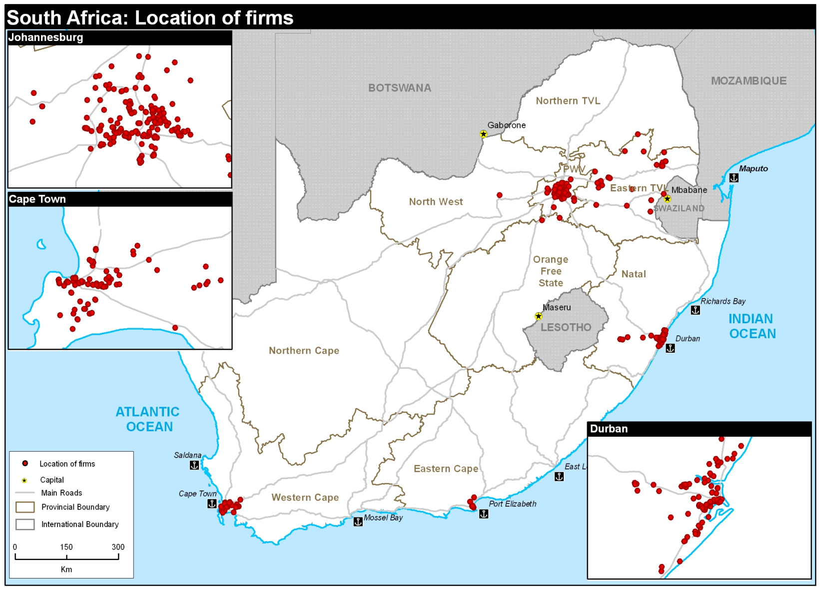

Figure 1: Map of Southern Africa identifying the Ports of Maputo and Durban. The dots correspond to the firms covered in the Enterprise Survey

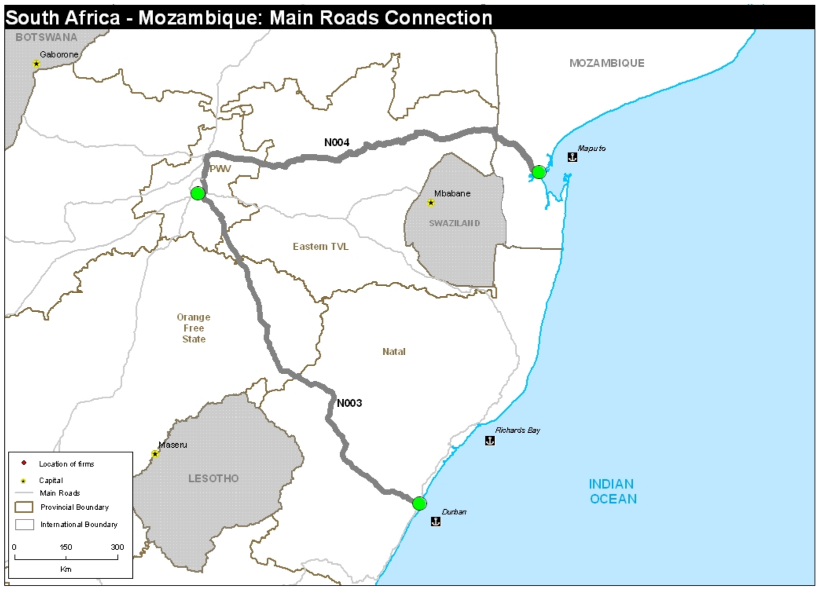

Figure 2: Road Network connecting the hub of economic activity in South Africa to the Ports of Maputo and Durban. The thick lines correspond to the main highways. There is no direct road that can competitively connect Maputo directly to Durban.

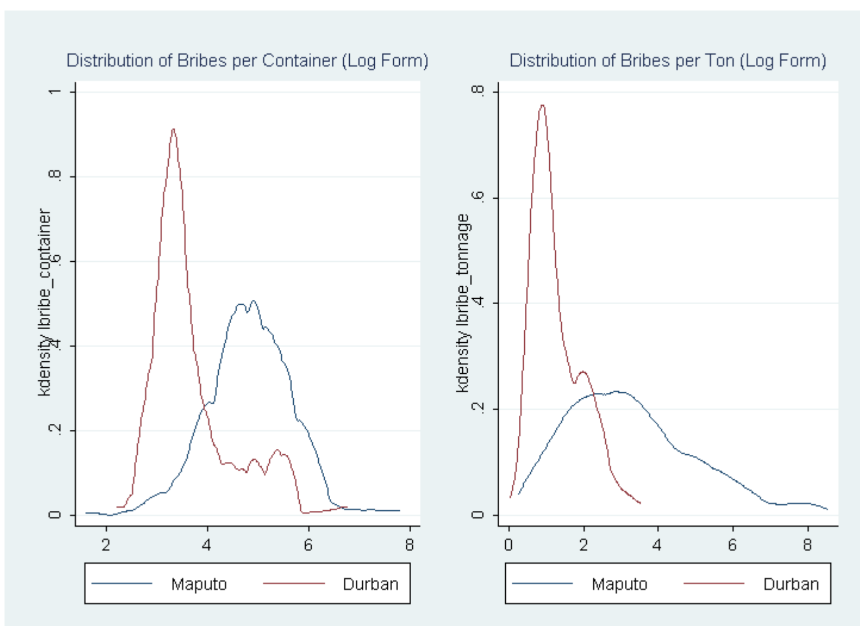

Figure 3: Distribution of Bribes across the Ports of Durban and Maputo.

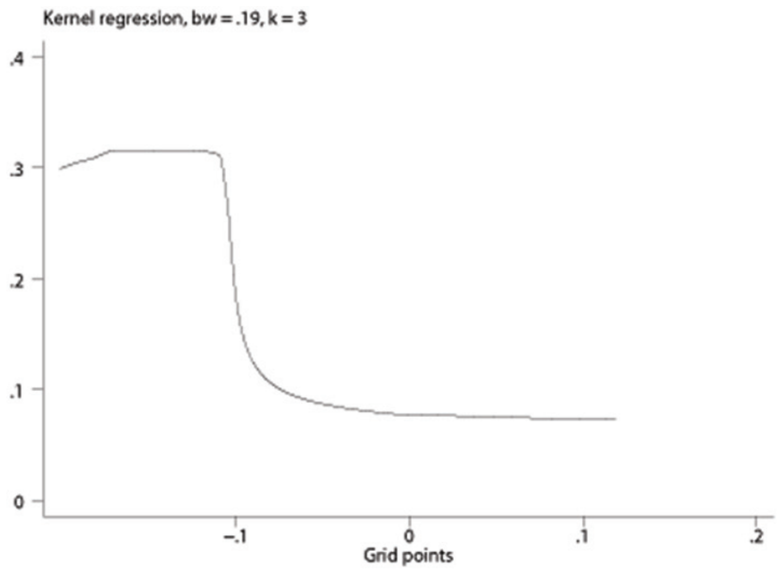

Figure 4: Non-Parametric Kernel Regression of the Probability of choosing Maputo (y-axis) on the log of the ratio of transport costs between Maputo and Durban (x-axis). Transport costs to Maputo and Durban are equalized at 0. The probability of choosing Maputo at this point is under 10%.

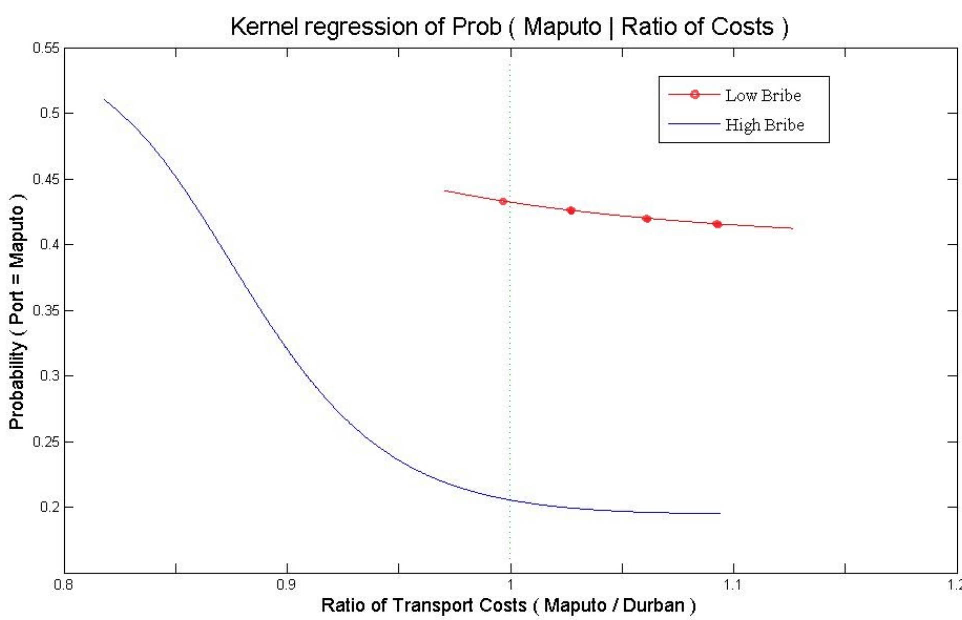

Figure 5: Non-parametric Kernel Regression of the probability of choosing Maputo (y-axis) on the log of the ratio of transport costs between Maputo and Durban (x-axis). Low Bribe corresponds to firms shipping goods that fall under a Low Tariff category in Mozambique and High Bribe corresponds to firms shipping goods that fall under a high tariff category. The point of transport cost equivalence between both ports is 1.

XII 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
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
Technology in Customs	In-person Submission	Online Submission
Port Performance Ranking (out of 5)	3.4	3.7
Security	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. 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	Durban
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/from East Africa	37%	13%
Mean Bribe as a % of ocean shipping to/from the 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

[a] Sources: Tracking Study at Maputo and Durban ports.

Table 3: **Cargo Characteristics by Port**

	Maputo Mean	**SD**	**Durban Mean**	**SD**	**P-value Durban=Maputo**
Value per Tonnage (USD)	85,894	518,432	263,539	265,847	0.01
Tonnage per Shipment	124	979.8	129	216.7	0.94
Storage Costs (USD)	800	9042	1480	2907	0.29
Import Demand Elasticity Estimate	10.6	10.01	11.27	9.49	0.23

	Maputo Percentage	**Durban Percentage**	**P-Value Durban=Maputo**
High Tariff Cargo	37%	33%	0.19
Consumer Goods	63%	68%	0.03
Friday Arrival of Shipment	19%	15%	0.17
Differentiated Good	75%	61%	0

[a] Source: Tracking Study at Maputo and Durban ports. Upper Panel: P-value for two-side t-test with unequal variances. Lower Panel: P-value for Chi Square test.

Table 4: **Variable Description**

VARIABLE	DESCRIPTION
Tariff Level Maputo	Tariff level the shipment falls under according to the Mozambican tariff code *Source:* Mozambican Customs
Tariff Level Durban	Tariff level the shipment falls under according to the South African tariff code Source: South African Customs
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 Tonnage	Natural log of shipment tonnage. Source: Tracking Study
Perishable Product	Coded 1 if products belong 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
Log Storage Costs	Natural log of expected storage costs, as estimated by the clearing agent prior to the arrival of the cargo on the docks and are based on the type of product shipped. *Source:* Enterprise Survey; Rauch (1999)
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
Frequency of Shipments	Average number of days between each firm's shipments *Source:* Enterprise Survey, IFC 2007
Low Inventory Dummy	Equals 1 if firm has average days of inventory below the mean for its size and industry group *Source:* Enterprise Survey, IFC 2007
Log Relative Transport Cost to Durban	$\frac{DM*RM+PM}{(DD*RD+PD)}$ *Source:* Enterprise Surveys, Trucking Surveys, IFC and World Bank, 2007
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 5: **Determinants of Bribe Payments at the Port of Maputo**

Dependent Variable: *Bribe Paid*	**LPM** (1)	**LPM** (2)	**LPM** (3)	**LPM** (4)	**LPM [Matched Sample]** (5)
Log Tariff Level	0.167***	0.143***	0.194***		0.215***
	(0.016)	(0.022)	(0.038)		(0.039)
High Tariff Dummy				0.280**	
				(0.14)	
Differentiated Product		0.152**	0.173	0.146	0.109
		(0.075)	(0.11)	(0.14)	(0.11)
Large Firm		0.012	0.16**	0.22**	0.18**
		(0.046)	(0.077)	(0.089)	(0.08)
Log Import Demand Elasticity		0.033	-0.0620	-0.079	-0.034
		(0.037)	(0.057)	(0.075)	(0.058)
Controls					
Value of Shipment	No	Yes	No	No	No
Value per Tonnage	No	No	Yes	Yes	Yes
Agricultural Product	No	Yes	Yes	Yes	Yes
Consumer Product	No	Yes	Yes	Yes	Yes
Pre-inspected Shipment	No	Yes	Yes	Yes	Yes
Temperature Controls	No	Yes	Yes	Yes	Yes
Temperature Controls*Perishable	No	Yes	Yes	Yes	Yes
Perishable Good	No	Yes	Yes	Yes	Yes
Arrival Date	No	Yes	Yes	Yes	Yes
Terminal	No	Yes	Yes	Yes	Yes
Observations	741	403	96	96	89
F-test	103	12.82	9.18	5.4	10.15
Adjusted R2	0.22	0.26	0.37	0.194	0.4

[a] Source: Tracking Study at Maputo and Durban ports.Note: Dependent Variable corresponds to a dummy variables that equals 1 if a bribe was paid and 0 otherwise. LPM stands for Linear Probability Model. Results are robust to different specifications such as logit and probit models. Column (7) corresponds to equation (1) fit to a sample of shipments matched by propensity scores across both ports. Log Tariff Levels corresponds to the natural log of the tariff level the product falls under; High Tariff Dummy equals 1 if tariff level is greater than 20%, and 0 if tariff level is between 0-10%, Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees); Log of Import Demand Elasticity corresponds to the Import Demand Elasticity as estimated by Broda and Weinstein (2006). Standard Errors clustered at the 4 digit harmonization code level and in parentheses. Pre-inspected Shipment equals 1 if shipment was subjected to a pre-shipment inspection, temperature controls include both deviations from monthly temperatures and precipitation levels on the day of arrival of the shipment. All regressions include clearing agents fixed effects. Significant at *** 1%, **5%, and *10%.

Table 6: **Determinants of Bribe Payments at the Port of Maputo**

Dependent Variable: ***Log Bribe Amount***	**OLS** (1)	**OLS** (2)	**OLS** (3)	**Neg.** Binomial (4)	**Neg.** Binomial (5)	**Neg.** Binomial (6)	**Neg.** Binomial (7)
Log Tariff Level	0.13***	0.12***	0.12*	0.49***	0.65***		0.71***
	(0.036)	(0.04)	(0.07)	(0.080)	(0.14)		(0.15)
High Tariff Dummy						0.879*	
						(0.5)	
Differentiated Product		0.084	-0.17	0.46*	0.27	0.19	0.21
		(0.14)	(0.22)	(0.28)	(0.33)	(0.4)	(0.27)
Large Firm Dummy		0.0516	0.16	0.142	0.5**	0.6**	0.6**
		(0.098)	(0.22)	(0.12)	(0.20)	(0.29)	(0.232)
Log Import Demand Elast.		-0.021	-0.044	0.12	-0.005	-0.09	0.09
		(0.079)	(0.17)	(0.099)	(0.18)	(0.28)	(0.18)
Controls							
Value Shipment	No	Yes	No	Yes	No	No	No
Value per Tonnage	No	No	Yes	No	Yes	Yes	Yes
Agricultural Product	No	Yes	Yes	Yes	Yes	Yes	Yes
Consumer Product	No	Yes	Yes	Yes	Yes	Yes	Yes
Pre-inspected Shipment	No	Yes	Yes	Yes	Yes	Yes	Yes
Temperature Controls	No	Yes	Yes	Yes	Yes	Yes	Yes
Temperature Controls*Perishable	No	Yes	Yes	Yes	Yes	Yes	Yes
Perishable Good	No	Yes	Yes	Yes	Yes	Yes	Yes
Arrival Date	No	Yes	Yes	Yes	Yes	Yes	Yes
Terminal	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	348	329	92	393	92	92	85
F-Test	13.63	2.98	3.65	141.98	72.89	52.81	79.73
Adjusted R2	0.04	0.05	0.02				
Log Pseudo Likelihood				-724.9	-163.19	-176.34	-149.94

[a] Source: Tracking Study at Maputo and Durban ports. Note: Dependent Variable corresponds to the natural log of bribe amounts for columns (1) through (3) and the natural log of bribe amounts +1 for columns (4) through (6). OLS corresponds to standard ordinary least squares regression in columns (1) through (3) and columns (4) through (6) correspond to a negative binomial model. Results are robust to different specifications such as a tobit model to account for the count data. Column (6) corresponds to equation (1) fit to a sample of shipments matched by propensity scores across both ports. Log Tariff Levels corresponds to the natural log of the tariff level the product falls under; High Tariff Dummy equals 1 if tariff level is greater than 20%, and 0 if tariff level is between 0-10%, Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees); Log of Import Demand Elasticity corresponds to the Import Demand Elasticity as estimated by Broda and Weinstein (2006). Standard Errors clustered at the 4 digit harmonization code level and in parentheses. All regressions include clearing agents fixed effects. Significant at *** 1%, **5%, and *10%.

Table 7: **Determinants of Bribe Payments at the Port of Durban**

Dependent Variable: *Bribe Paid*	**LPM** (1)	**LPM** (2)	**LPM** (3)	**LPM** (4)
Log Tariff Level	0.140**	0.0695	0.0529	
	(0.0666)	(0.0920)	(0.0813)	
High Tariff Dummy				-0.0348
				(0.0761)
Log Storage Costs		0.37**	1.33***	1.34***
		(0.17)	(0.31)	(0.33)
Log Storage Costs Squared		-0.029**	-0.11***	-0.11***
		(0.013)	(0.03)	(0.031)
Log Storage Costs *Large Firm		-0.041	-0.22*	-0.23*
		(0.0346)	(0.132)	(0.13)
Large Firm		0.3	1.1*	1.11*
		(0.22)	(0.62)	(0.62)
Log Import Demand Elasticity		-0.011	-0.012	-0.018
		(0.0392)	(0.0579)	(0.063)
Differentiated Product		0.021	0.056	0.045
		(0.062)	(0.091)	(0.092)
Controls				
Value Shipment	No	Yes	No	No
Value per Tonnage	No	No	Yes	Yes
Pre inspected Shipment	No	Yes	Yes	Yes
Consumer Product	No	Yes	Yes	Yes
Agricultural Product	No	Yes	Yes	Yes
Terminal	No	Yes	Yes	Yes
Shipment Date	No	No	Yes	Yes
Temperature Controls	No	No	Yes	Yes
Temperature Controls*Perishable	No	No	Yes	Yes
Observations	498	371	197	195
F-test	4.44	21.71	1.98	2.11
Adjusted R-squared	0.004	0.15	0.002	0.002

[a] Source: Tracking Study at Maputo and Durban ports. Note: Dependent Variable corresponds to a dummy variables that equals 1 if a bribe was paid and 0 otherwise. LPM stands for Linear Probability Model. Results are robust to different specifications such as logit and probit models. Log Tariff Levels corresponds to the natural log of the tariff level the product falls under; High Tariff Dummy equals 1 if tariff level is greater than 20%, and 0 if tariff level is between 0-10%; Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees); Log of Import Demand Elasticity corresponds to the Import Demand Elasticity as estimated by Broda and Weinstein (2006) and Log Storage Costs corresponds to the natural log of the storage cost the shipment would have to pay if it were stored at the port. Standard Errors clustered at the 4 digit harmonization code level and in parentheses. All regressions include clearing agents fixed effects. Significant at *** 1%, **5%, and *10%.

Table 8: **Determinants of Bribe Payments at the Port of Durban**

Dependent Variable: ***Bribe Amount***	**OLS** (1)	**OLS** (2)	**OLS** (3)	**Neg. Binomial** (4)	**Neg. Binomial** (5)	**Neg. Binomial** (6)
Log Tariff Level	0.39***	0.43*	0.43*	0.23	0.22	
	(0.032)	(0.23)	(0.25)	(0.35)	(0.35)	
High Tariff Dummy						-0.11
						(0.22)
Log Storage Costs		1.899***	-1.04	2.9***	2.56***	4.89**
		(0.388)	(1.274)	(0.849)	(0.857)	(2.318)
Log Storage Costs Squared		-0.14***	0.16	-0.25***	-0.22***	-0.43*
		(0.037)	(0.13)	(0.07)	(0.07)	(0.24)
Log Storage Costs *Large Firm		-0.31*	-0.15	-0.36*	-0.36*	-0.53
		(0.17)	(0.15)	(0.2)	(0.20)	(0.37)
Large Firms		1.43	0.72	1.98*	2.003*	2.63
		(0.88)	(0.67)	(1.06)	(1.07)	(1.75)
Log Import Demand Elasticity		-0.0857	-0.101	-0.0103	-0.0449	-0.0969
		(0.09)	(0.062)	(0.16)	(0.16)	(0.16)
Differentiated Product		0.041	0.018	0.11	0.095	0.089
		(0.18)	(0.15)	(0.25)	(0.25)	(0.27)
Controls						
Value Shipment	No	Yes	No	Yes	No	No
Value per Tonnage	No	No	Yes	No	Yes	Yes
Pre inspected Shipment	No	Yes	Yes	Yes	Yes	Yes
Consumer Product	No	Yes	Yes	Yes	Yes	Yes
Agricultural Product	No	Yes	Yes	Yes	Yes	Yes
Terminal	No	Yes	Yes	Yes	Yes	Yes
Shipment Date	No	Yes	Yes	Yes	Yes	Yes
Temperature Controls	No	Yes	Yes	No	No	Yes
Temperature Controls*Perishable	No	Yes	Yes	No	No	Yes
Observations	211	125	95	371	371	195
F-test	151.8	16.66	11.29	36.13	34.96	26.89
Adjusted R-squared	0.011	0.4	0.49			
Log Pseudo Likelihood				-502.77	-498.83	-341.33

[a] Source: Tracking Study at Maputo and Durban ports. Note: Dependent Variable corresponds to the natural log of bribe amounts paid in USD. OLS corresponds to standard ordinary least squares regression in columns (1) through (3) and columns (4) through (6) correspond to a negative binomial model. Results are robust to different specifications such as a tobit model to account for the count data. Log Tariff Levels corresponds to the natural log of the tariff level the product falls under; High Tariff Dummy equals 1 if tariff level is greater than 20%, and 0 if tariff level is between 0-10%; Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees); Log of Import Demand Elasticity corresponds to the Import Demand Elasticity as estimated by Broda and Weinstein (2006) and Log Storage Costs corresponds to the natural log of the storage cost the shipment would have to pay if it were stored at the port. Standard Errors clustered at the 4 digit harmonization code level and in parentheses. All regressions include clearing agents fixed effects. Significant at *** 1%, **5%, and *10%.

Table 9: **Corruption and Firms' Shipping Decisions**

Dependent Variable: ***Firm Uses Port of Maputo***	**OLS** (1)	**OLS** (2)	**OLS** (3)
Log Tariff Level Mozambique	-0.14*	-0.14*	
	(0.071)	(0.07)	
High Tariff Dummy Mozambique			-0.35**
			(0.14)
Log Tariff Level South Africa	0.058	0.058	
	(0.043)	(0.043)	
High Tariff Dummy South Africa			0.16
			(0.16)
Log Relative Transport Costs	-4.03**	-3.72**	-3.83**
	(1.67)	(1.83)	(1.75)
Large Firm	-0.0343	-0.04	-0.090
	(0.121)	(0.11)	(0.12)
Low Inventory Dummy	-0.0015	-0.003	0.015
	(0.049)	(0.049)	(0.045)
Log Value Average Shipment	0.0094	0.0021	-0.061
	(0.11)	(0.10)	(0.14)
Differentiated Goods	-0.09	-0.089	-0.082
	(0.14)	(0.14)	(0.16)
Firm Imports	-0.51*	-0.46	-0.65*
	(0.28)	(0.30)	(0.32)
Firm Exports	0.073	0.083	0.07
	(0.13)	(0.13)	(0.15)
Controls			
Frequency of Shipments	Yes	Yes	Yes
Firm Imports*Relative Transport Costs to Durban	Yes	Yes	Yes
Value Shipment*Relative Transport Costs to Durban	No	Yes	Yes
Observations	77	76	76
F Test	4.13	3.09	3.28
Adjusted R-Square	0.03	0.03	0.02

[a] Notes: Dependent variable corresponds to a dummy variable equal to 1 if a firm ships through Maputo and 0 otherwise. All three columns corresponds to standard ordinary least squares models. Log Tariff Level in Mozambique and South Africa corresponds to the natural log of the tariff level the product falls under according to the Mozambican and South African Tariff Code respectively. High Tariff Dummy Mozambique and South Africa equal 1 if the tariff falls under a high tariff category (above 20%) or low tariff category (below 10%) according to the Mozambican or South African code respectively. Log Relative Transport Costs corresponds to the natural log of the ratio of transport costs between each firm and Maputo over the transport costs to Maputo (including the cost of road transport and all border fees). Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees); Low Inventory Dummy equals 1 if firm has inventory levels below the median for a firm of its size and industry grouping and 0 otherwise; Firm imports/exports equals 1 if the firm imports and 0 otherwise. Standard errors clustered at the level of the industry grouping. Significant at *** 1%, **5%, and *10%

Table 10: **Firm Characteristics by Distance to the Ports**

	Ports Mean	**SD**	**Inland Mean**	**SD**	**P-value Inland=Port**
Value of Inputs	23,176	2,165	19,323	1,449	0.13
Tariff Level of Inputs in RSA	9	1.32	9	1.1	0.17
Sales in 2006	3,287,684	652,504	1.17E+07	2,323,278	0.13
Number of Employees in 2006	68	11.6	84	12.86	0.57
Number of Employees in 2003	54	10.67	73	12.99	0.56
Size of Inventory	28	2.5	23	1.7	0.18
Avg Days of Inventory	16	3.3	20	4.4	0.49
Avg Days to Clear Customs	6.3	3.2	6.7	0.77	0.84
Tonnage of Average Shipment	54	31.9	41	12.8	0.67
Log Storage Costs	5.3	0.06	5.3	0.04	0.83

	Ports Percentage	**Inland Percentage**	**P-Value Inland=Port**
Large Firm	24	25	0.81
Firm Exports	26	25	0.72
Non-containerized Cargo	49	42	0.18
Perishable Cargo	5	3	0.21
High Tariff Cargo in Mozambique	37	26	0.18
Differentiated Goods	16	20	0.42

[a] Source: Tracking Study at Maputo and Durban ports. Upper Panel: P-value for t-test of equality of means between firms located inland and those close to ports, with unequal variances. Lower Panel: P-value for Chi-Square test.

Table 11: **Corruption and Firms' Sourcing Decisions**

	Collusive	**Coercive**	**Collusive**	**Collusive**	**Coercive**	**Coercive**
	LPM	**LPM**	**OLS**	**Poisson**	**OLS**	**Poisson**
Dependent Variable	Import	Import	Log(1+ Prop Imp)	Log(1+ Prop Imp)	Log(1+ Prop Imp)	Log(1+ Prop Imp)
	(1)	(2)	(3)	(4)	(5)	(6)
Exp. Prob. of Bribe	1.64**	0.47	5.55*	1.57*	-3.73*	-1.11**
	(0.64)	(0.7)	(2.82)	(0.89)	(1.76)	(0.53)
Average Days of Inventory	0.1***	0.076*	0.47***	0.16***	0.23	0.077
	(0.026)	(0.039)	(0.12)	(0.045)	(0.15)	(0.05)
Tariff Level of Input	-0.0185	-0.00421	-0.0628	-0.019	0.016	0.0047
	(0.011)	(0.0057)	(0.054)	(0.017)	(0.039)	(0.012)
Large Firm	0.25***	0.15	0.74*	0.23***	-0.85**	-0.26***
	(0.048)	(0.101)	(0.38)	(0.089)	(0.29)	(0.09)
Controls						
Firm Exports	Yes	Yes	Yes	Yes	Yes	Yes
Frequency of Shipments	Yes	Yes	Yes	Yes	Yes	Yes
Freq. of Shipments* Tariff Level	Yes	Yes	Yes	Yes	Yes	Yes
Distance to Port	No	Yes	No	No	Yes	Yes
Storage Costs of Input at Port	No	Yes	No	No	Yes	Yes
Observations	95	90	95	95	76	76
F-Test/Chi-Square	30.05	14.82	16.05	65.46	24.53	16.5
Adjusted R-Square	0.17	0.13	0.15		0.21	
Log Pseudo Likelihood				-197.28		-131.477

[a] Source: Tracking Study at Maputo and Durban ports. Note: Dependent Variable corresponds to a Binary Variable in columns (1) and (2) equalling 1 if the firm imports inputs and 0 otherwise. In columns (3) through (6) the dependent variable corresponds to the proportion of the firms' inputs that are imported. Columns (1), (3) and (4) restrict the analysis to the sub-sample of Mozambican firms that can engage in collusive corruption at the Port of Maputo. Columns (2), (5) and (6) restrict the analysis to the sub-sample of South African firms that can engage in coercive corruption at the Port of Maputo or Durban. LPM stands for linear probability model, OLS for ordinary least square and Poisson for a Poisson regression model. Expected Probability of Paying a Bribe is based on predicted values estimated from equation 1 for Maputo and Durban ports for each firm in our sample matched to the harmonization code grouping of the product they import; average inventory days corresponds to the average inventory days each firm has available when they receive a shipment; Tariff Level of Input corresponds to the tariff level the product the firm imports falls under according to the Mozambican tariff code for columns (2), (5) and (6) and South African tariff code for columns (1), (3), and (4); Large Firm equals 1 if firm is large (with over 100 employees). Standard Errors are bootstrapped.

Table 12: **Determinants of Bribe Payments at the Border Post**

Dependent Variable: *Log (1+ Bribe Amount Paid)*	**OLS** (1)	**OLS** (2)	**Negative Binomial** (3)	**Negative Binomial** (4)
Log Tariff Mozambique	0.03***	0.026*		0.030
	(0.009)	(0.016)		(0.02)
High Tariff Dummy			0.31*	
			(0.19)	
Differentiated Product		-0.17	-0.023	-0.026
		(0.12)	(0.19)	(0.19)
Agricultural Product		-0.39**	-0.32	-0.31
		(0.19)	(0.25)	(0.25)
Consumer Product		0.078	-0.009	0.04
		(0.13)	(0.19)	(0.18)
Log Value Shipment		0.015	0.0056	0.0048
		(0.038)	(0.047)	(0.047)
Large Firm			-1.24***	-1.26***
			(0.47)	(0.47)
Observations	49	49	49	49
F-Test/Chi-Square	11	11.29	20.7	20.07
Adjusted R Squared	0.12	0.33		
Log Pseudo-Likelihood			-104.438	-104.76

Source: Tracking Study at Maputo and Durban ports. Note: Dependent Variable corresponds to the natural log of bribe amounts paid in USD + 1. OLS corresponds to standard ordinary least squares regression in columns (1) and (2) correspond to an ordinary least squares model while columsn (3) and (4) to a negative binomial model. Log Tariff Levels corresponds to the natural log of the tariff level the product falls under; High Tariff Dummy equals 1 if tariff level is greater than 20%, and 0 if tariff level is between 0-10%, Differentiated Product corresponds to 1 if the product does not have a set price in international markets according to Rauch's (1999) categorization (conservative) and 0 otherwise; Large Firm equals 1 if the shipper is a large firm (defined as having more than 100 employees). Bootstrapped Standard Errors, significant at ***10%, ** 5%, *1%