# DISPLACING CORRUPTION*

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**Abstract**

This paper uses primary data on bribe payments to investigate how corrupt public officials respond to policy reforms that change opportunities for the extraction of bribes. We exploit an exogenous change in tariff levels that affected opportunities to extract bribes through a particular method -"selling" tariff evasion-, to identify changes in the incidence, the distribution, and the levels of bribes paid through other stages of the process of clearing goods through international borders. While a reduction in tariff rates is associated with a significant reduction in the incidence of tariff evasion, this reduction is partially offset by significant substitution and income effects. Customs officials move from colluding with private agents to facilitate tariff evasion to other more extortionary and coercive types of corruption following the tariff change. We also find suggestive evidence of important direct and indirect income effects as private agents shift from paying bribes to customs officials to paying bribes to other border officials in charge of different phases of the clearing process. We argue that this displacement of corruption is a critical part of any welfare analysis of the relationship between tariff policies and corruption. These unintended effects of policy reform also provide some general insights into the optimal design of anti-corruption policies, which should attempt to prevent or mitigate the potential displacement of corruption into more costly forms of bribe extraction.

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# I Introduction

The relationship between tax policies and tax evasion has been the subject of extensive debate in both policy and academic circles. Lower taxes may decrease incentives for evasion (Allingham and Sandmo 1972), or increase the ability for private agents to pay bribes through an income effect (Cowell et al 2002, Slemrod and Yitzhaki 2000). Ultimately, this relationship is theoretically ambiguous. Disentangling these two effects remains an important empirical challenge due to the difficulty in measuring tax evasion and in identifying exogenous sources of variation in tax policies.

A particular type of tax evasion that has received significant attention in recent years is the evasion of taxes on imported goods. Tariff evasion is of great policy relevance since most governments throughout the developing world are still heavily reliant on tariffs as their main source of revenue.[1] Moreover, extensive tariff evasion can have a significant impact on government revenue, potentially leading governments to opt for more distortionary methods of public finance in the long-term. Evidence is also mounting on how tariff evasion may differ across product types and firms, rewarding companies that engage in directly unproductive activities and rent-seeking, which can distort firm survival and growth rates in non-optimal ways (Bhagwati 1964; Krueger 1974; Javorcik and Narciso 2008; Sequeira and Djankov 2011). Given the central role played by customs in the economy, corruption in this public bureaucracy can also contribute to the deterioration of a country's business environment through institutional halo effects that set the tone for corrupt practices to become the norm in all public service delivery. Finally, tariff evasion has been an often-cited reason to justify a move towards uniform tariff rates in the trade liberalization debate. The argument is that simplified and uniform tariff schedules would reduce the incentive and the opportunity for tariff evasion to occur through the misclassification of products from high to low tariff groupings (Panagaryia

[1] In Madagascar tariff revenue accounts for 62% of tax revenue, in Mozambique for 35% and in Bangladesh for 16%. According to data in Baunsgaard and Keen(2009), the share of trade tax revenue in total tax receipt over the period 2001-2006 amounted on average to 2.5% in high-income countries, 18.1% in middle-income countries and 22% in low-income countries.

1986).[2] The effect of tariff levels on tariff evasion has therefore become a central parameter for trade policy design, particularly in the developing world.

In this paper we investigate how tariff levels affect patterns of tariff evasion. We exploit an exogenous variation in tariff schedules triggered by the phasing in of a long-standing trade liberalization agreement, and measure how the incidence and distribution of bribe payments for tariff evasion change with the reduction in tariff levels. Tariff evasion is however just a subset of possible corrupt interactions between private agents and public officials in the process of moving goods across international borders. To detect the potential displacement of corruption, we track the entire process of public service delivery. The potential for displacement is a critical though often overlooked part of the analysis as it enables us to fully document the implications of policy reform. Unlike previous work, our data allow us to distinguish precisely between changes in bribes across tariff levels, across time, across products but also across stages of the clearing process, and to measure treatment effects from the tariff change on each of these separately.

We find that the reduction in tariff levels is associated with a significant drop in the probability of paying a bribe for tariff evasion and in the average amount of bribe paid immediately after the tariff change. This result is however partially offset in subsequent years by important substitution and income effects. First, customs officials extract higher bribes from products that remain in a high tariff category to compensate for the overall shortfall in bribe revenue. Second, we also find evidence that customs officials moved from extracting bribes for tariff evasion prior to the tariff change, to extracting bribes for other reasons, namely for irregularities with the clearance documentation (real or fictitious).

Following the tariff change, we observe an income effect reflected in more bribes being paid to a select number of other public officials operating along the clearing chain, beyond customs. A second though indirect type of income effect is driven by the structure of the market for clearance

[2]Gatti (1999) argues that setting trade tariff rates at a uniform level can limit tariff evasion, resulting in higher overall tariff revenue. Winters (2004) illustrates the argument by investigating the case of Chile as the country moved to uniform tariff rates in the 70s.

services. We detect that clearing agents, the shipping intermediaries who by law every importing firm has to resort to in order to clear its goods through borders, attempt to capture part of the surplus generated by the reduction in bribes for tariff evasion. While these agents possess full information on patterns of bribe payments across each time period, firms are likely to be ill-informed about the actual distribution of bribes across the clearing process, and unaware of any changes in these patterns across time. Clearing agents are then able to exploit this asymmetry of information to appropriate a share of the former bribes. While our study is not designed to understand the dynamics between the firm and clearing agent in great detail, one possible reason for this to occur is that firms budget certain funds for bribe payments (Anh 2011) and these budgets remain fixed throughout the period under analysis.

While there was a decline in the overall total amount of bribes paid, the hypothesis of zero change in average bribe payments cannot be fully rejected. As extractive opportunities associated with the duty-avoidance method declined with the tariff change, corruption was displaced to alternative methods of bribe extraction. Moreover, our findings revealed that tariff liberalization triggered a change not only in the level of bribes but also in the type of bribes paid, with important welfare implications. We observe a shift from collusive forms of corruption - tariff evasion -, which involved an element of rent-sharing between public officials and private agents, to more coercive types of bribe extraction, in which the rent is fully captured by the public official. While the former could contribute to a reduction in overall trade costs, the latter is cost-increasing for importers and could potentially also be more distortionary (Sequeira and Djankov 2011).

Our results contribute to a large body of empirical work studying the magnitude and the determinants of tariff evasion. This growing literature has attempted to document the elasticity of tariff evasion with regards to tariff levels, mostly using indirect methods of measuring tariff evasion. Bhagwati (1964) first suggested that matching dyads of business partners and then comparing reported levels of exports from the sending country to reported levels of imports from the receiving country would yield an indirect measure of tariff evasion. The underlying assumption was that the

sending country would have no reason to misreport volumes or values of trade while the receiving country would, in order to avoid import duties. Applying this methodology, Pritchett and Sethi (1994) detect only a weak association between tariff levels and collected duties in four Asian countries. Fisman and Wei (2004) match exports from China to imports from Hong Kong for a cross section of 1,600 products, and find that a 1% increase in tariff levels was associated with an increase in tariff evasion of about 2-3%. Javorcik and Narciso (2007) repeat this exercise matching trade records between ten Eastern European countries and Germany, exploiting variation not only across products but also across time. The authors find that a 1% increase in tariff levels is associated with a 1.7% increase in tariff evasion. Another example of an application of this methodology can be found in Mishra et al (2007), which exploits variation in tariff levels triggered by India's trade liberalization reform in the 1990s. The authors find similar results, though the main effects are of considerable smaller magnitude. A 1% change in tariff rates is associated with a 0.12% increase in tariff evasion.[3]

We identify three main advantages to our approach. First, we exploit three sources of variation to identify the overall effect of changes in tariffs on corruption: variation across products, across time and across stages of the clearance process. Using all three sources of variation confers some significant advantages over past strategies that have relied solely in variation of tariff levels across products (Fisman and Wei, 2004), or across products and time (Javorcik and Narciso 2007), and have therefore been unable to identify the full effect of changes in tariffs on corruption. Because we observe the entire chain of public service delivery for the clearance of goods, we also provide the first set of evidence on potential substitution and income effects across opportunities for bribe payments along a chain of complementary stages in the provision of an important public service. Furthermore, if tariff levels are systematically correlated with product characteristics or with variations in the quality of enforcement across time, previous approaches are unable to isolate the causal

[3]Arndt and van Dunem (2005) apply the same methodology to the case of trade between Mozambique and South Africa while Bout and Roy (2010) look at Nigeria, Kenya and Mauritius. Both studies find a positive and significant elasticity albeit smaller in magnitude than the results in Fisman and Wei (2004).

relationship between tariff levels and corruption, from other product-level or enforcement related reasons for changes in corruption patterns. A final advantage of our analysis is the fact that we rely on directly observed bribe payments as opposed to the indirect measures of tariff evasion often used in the literature, which may be more prone to measurement error.

The rest of the paper proceeds as follows. Section II sets the conceptual framework for the empirical analysis, section III discusses the data used in the study, section IV analyzes the main results and investigates the anatomy of behavioral responses to changes in tariffs, while section V concludes.

# II Conceptual Framework: From Theory to Empirics

An extensive literature on crime reveals a long-standing concern with the extent to which policy reforms that affect opportunities for engaging in criminal activities can result in a displacement of crime into other, potentially more inefficient or distortionary illicit activities (Reppetto 1976, Chaiken, Lawless and Stevenson 1974, McPheters, Mann, and Schlagenhauf 1984, Ayres and Levitt 1998, Levitt 1998, and Di Tella and Schargrodsky 2004). In this paper, we investigate how changes in the opportunity for public officials to engage in tariff evasion due to tariff liberalization can displace corruption into other forms of corrupt activity in the clearance of goods across international borders. This concern is exacerbated by the fact that customs and border officials have enough bureaucratic latitude to draw upon a wide array of different methods to extract a bribe. We first adapt the model described in Yang (2008) to analyze the determinants of the displacement of corruption across bribe extraction methods. This simple model described in the appendix has clear predictions: displacement into alternative forms of bribe extraction is a function of the relative fixed and variable costs of the different methods, and of the size of the illicit rents that are threatened by the policy change.

The second step is to understand the potential efficiency costs of the displacement of corruption. Previous studies have relied mostly on estimates of the elasticity of tariff evasion to tariff

levels to summarize the marginal efficiency cost of tariff rates. In this paper, we argue that tariff evasion, while a central empirical parameter, is however not a sufficient statistic for welfare analysis. Reductions in tariff levels are likely to trigger a host of behavioral responses from public officials who perceive their bribe revenue to be threatened. Identifying and measuring these behavioral responses is therefore critical to fully account for the efficiency costs of changes in tariffs, as they can be symptomatic of deadweight loss.

Appendix A presents a simple model that captures the magnitude of behavioral responses to reductions in tariffs (Saez 2010). The implication of these formulas are straightforward. The size of the behavioral response towards alternative methods of bribe extraction is an increasing function of the elasticity of tariff evasion to tariff rates, of the magnitude of the tariff change and a decreasing function of the displacement of corruption onto other stages of the clearing process controlled by different public officials.

There are two additional dimensions that can complete an assessment of the anatomy of behavioral responses of corruption to tariff changes. The first dimension relates to changes in market structure triggered by the policy change. Following Shleifer and Vishny (1993), if income effects increase the opportunity for bribe extraction across different stages of the clearing process, representing a move from centralized to decentralized forms of bribe extraction, it can result in higher bribes per transaction, but lower total bribe payments. Finally, a move away from bribe extraction based on tariff evasion can potentially represent shifts between collusive and coercive forms of extracting bribes, with important implications for the type of costs corruption imposes on private agents. Collusive corruption is by definition cost-reducing, while coercive corruption is cost-increasing for firms (Sequeira and Djankov 2011).

The empirical literature has made limited progress to date in identifying the nature, size and direction of displacement effects. Evidence on the determinants and patterns of displacement of corruption across different methods of bribe extraction can however not only shed light on the importance of economic motives behind strategies of bribe extraction but also provide a more accurate

measure of the potential effects of anti-corruption reforms. In fact, depending on the magnitude and direction of the behavioral response, it is possible that the erosion in the tariff-defined bribe base of public officials is suboptimal: slightly higher tariff rates may result, under certain conditions, in a more efficient, and less distortionary pattern of bribes in the long run.

## II.1 The Setting

To identify the responsiveness of corruption to changes in tariff levels we exploit a staggered reduction in tariff rates that took place between 2007 and 2011 in Mozambique, in Southern Africa. Mozambique joined the Southern African Development Community (SADC) in 1992, committing to the SADC Tariff Trade Protocol that required the complete phasing out of tariff rates by 2015. Changes in tariff levels for different types of products took place in a total of 10 waves between 1985 and 2015, with the most significant changes taking place in 2001 and 2008. The agreed timeline for the reduction in tariff rates was similar to the reforms adopted by other SADC member countries such as Malawi, Tanzania, Angola, Zambia and Zimbabwe. The most significant reduction in tariff levels took place in 2008, though about 12% of the shipments in our sample experienced a second wave of reductions in 2011, for goods originating in neighboring South Africa. The highest tariff decline was registered for products that went from a 20% tariff rate to 0, with an overall 5 percentage points drop in average nominal rates (see Figure 1).

We exploit this rich variation in tariffs across time and across products to measure the impact of changes in tariff levels on corruption. We then measure corruption in 2007, 2008 and 2011, before and after the major change in tariff levels that took place in 2008 and the reduction in tariff levels for products originating in South Africa, which took place in 2011. We further identify changes in the incidence, distribution and patterns of bribe payments during this period across different stages of the clearing process.

A standard econometric problem when assessing the impact of policy changes on different types of corruption is establishing a credible counterfactual, with which the causal impact of the change

can be separated from time trends in overall corruption, changes in enforcement or from reverse causation if there is a chance that high corruption is leading to the policy reform in the first place. The key element of the identification strategy is therefore the existence of a plausible control category of products - imports of products that did not experience a change in tariff levels during the period under analysis. Because changes over time in the treatment group are compared with corresponding changes in a control group, this difference-in-difference identification strategy purges the empirical estimates of time trends in the use of various bribe-extraction methods, as well as general changes in enforcement that should affect imports of all products equally, such as changes in rules conditioning clearance procedures or the salaries of customs officials.

The validity of our results hinges on the assumption that the timing and rules of the tariff reductions are exogenous to the levels of corruption and tariff evasion prevalent in Mozambique at the time the changes took place. The SADC Trade Protocol was driven primarily by the need to harmonize Mozambican and South African tariff codes as soon as possible, and previous work has provided compelling evidence on how patterns of bribe payments at ports in South Africa differed significantly from corruption patterns in Mozambique (Sequeira and Djankov 2011). Given that the schedule for the tariff phase out was agreed to in the late 1990s, it is unlikely to be correlated with corruption patterns in 2008 and 2011, providing a credible source of exogenous variation in tariff levels for our analysis.

## II.2 The Shipping Process and Opportunities for Corruption

Each individual firm-level shipment goes through several different stages in order to clear through an international border. For analytical purposes, we define two broad categories of public officials who differ in their administrative authority and in their discretion to stop cargo and generate opportunities for bribe payments at different moments of the clearing process: customs officials and port operators.

Customs officials are in charge of validating clearance documentation and collecting all tariff

payments due. As a result, customs officials have greater discretionary power to extract bribes relative to 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.

Customs officials possess discretionary power to allow a firm to engage in tariff evasion through three different channels: by misreporting physical quantities of imported products, by misrepresenting prices, or by misclassifying products from high to low tariff categories. Customs officials have an additional set of tools they can deploy to extract bribes, namely the threat of conducting a physical inspection of the shipment (which can delay clearance for up to 4 days), or citing irregularities (real or fictitious) with the documentation of the shipment. The costs and benefits of each method of bribe extraction can differ significantly but tariff evasion appears to be the most cost effective means of bribe extraction for customs officials overseeing the clearance of goods. Associating the bribe with tariff evasion combines the desirable features of reducing both the informational costs of bribe-setting and the risk associated with the illicit transaction (Sequeira and Djankov 2011). From the perspective of the customs' official, whether the good falls under a high tariff category or not carries important information on the willingness-to-pay of a shipper. Customs officials assume that all firms would be better off by evading a tariff so bribes should be an increasing function of tariff rates. All other bribe extraction tools are more costly and can potentially yield lower bribe revenue, as they rely on shipment characteristics that carry only coarse information on a firm's willingness-to-pay a bribe. This basic informational asymmetry can then force customs' officials to engage in a costly and time-consuming exercise to elicit information on the time sensitivity of the firm's shipment, or on the firm's ability to pay a bribe. 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 bargaining for bribes (Sequeira and Djankov 2011).

An illicit transaction based on tariff evasion has the additional benefit of lowering the risk of detection of the illicit transaction through a second channel: given that both parties are implicated in the illicit deal, neither side will have an incentive to deviate from it resulting in a more credible commitment (Schelling 1956). 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.

Regular port operators on the other hand have a narrower mandate to move or protect cargo on the docks, and they sometimes lack access to the cargo's documentation specifying the value of the cargo, the client firm and the origin/destination of the shipment, among others. Bribes can be paid to different types of port officials along different stages of the clearing process ranging from 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; 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.

The third type of official involved in the clearing process is the clearing agent. In our setting, by law, no firm is allowed to interact directly with customs or port operators. Firms have instead to resort to private clearing agents who specialize in clearing cargo through the port or border post, mostly through *ad hoc*, shipment-based contracts. Clearing agents submit all the required documentation, monitor the clearance process and make all necessary payments to customs officials and port operators, including bribes. Clearing agents are a common feature of the clearing process in several countries worldwide. While in places such as the US and other European countries resorting to clearing agents is optional, several countries throughout the developing world have made them a mandatory fixture of the clearing process namely Mali, Burkina Fasu, Honduras, and Venezuela, among others.[4]

[4]For more detailed information on the role of clearing agents see http://docsonline.wto.org/.

# III Data

This paper relies on primary data obtained through a tracking study that monitored a random sample of over 2,000 shipments going through the port of Maputo in Mozambique and the border post with South Africa. This represents one of the most developed transport corridors in Mozambique and in the region.

We first conducted a listing of all official clearing agents in the region under study. Most (76%) were independent clearing agents working for several client firms, with 50% of them handling between 10 and 50 shipments per month. We selected 15 clearing agents out of a universe of 117, four of whom were stationed at the border post while the remainder were working at the port of Maputo. Each clearing agent provided the listing of shipments they expected for a given week and were instructed to monitor every third shipment. This sampling procedure was then verified by independent enumerators who received the listings from the clearing agents, prior to the arrival of the shipments. Each clearing agent would fill-in a questionnaire recording detailed information on the date, time of arrival and date of clearance of the shipments; 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.

The questionnaire was designed in conjunction with the clearing agents participating in the study so as to ensure that we were capturing the most relevant features of the shipment and of the clearing process and, more importantly, to ensure that we accommodated any confidentiality concerns regarding how much information the clearing agents were willing to report. One such sensitive dimension related to information on the characteristics of client firms. To satisfy the clearing agents' participation constraint, we agreed to only collect information on the average size of the shipper and on the frequency of interactions between the clearing agents and the shipper, as a proxy for the regularity of a firms' imports.

Throughout the data collection exercise, emphasis was placed on capturing all formal and informal costs of importing and exporting goods through the ports and border posts. The goal was to minimize the possibility of clearing agents strategically misreporting data on bribe payments. However, in this particular setting, there was limited stigma attached to the payment of bribes to port or border officials, since clearing agents saw the 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 (Sequeira and Djankov 2011).

To cross-check the accuracy and reliability of the data collected, we conducted an experiment by which clearing agents were randomly assigned to sequences of unmonitored and monitored data collection. To conduct the monitoring, we hired local observers who would shadow clearing agents and verify the accuracy of the data reported. The observers 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.

Tables 1 and 2 display the results from the experiment. We detect clear Hawthorne effects as monitoring a shipment with our observers present was associated with a 14% lower probability of reporting a bribe and, conditional on reporting a bribe being paid, a significantly lower reported amount for the average bribe paid. These results are robust to the inclusion of a variety of controls including clearing agent and observer fixed effects, cargo and shipper-level characteristics, and shipment-level characteristics such as the day of the week the shipment arrived, the month of arrival, and the temperature on arrival.

While surprising, the observed lower probability of reporting a bribe when monitored 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 (Bradburn and Sudman 1979; Groves 1989; Turner 1992; Waterton and Duffy 1984; Weinrott and Saylor 1991). Given that clearing agents knew from the onset that they would be monitored at some point

during the project, it is unlikely that they would try to strategically overreport information on bribe payments while they were not being monitored. The hypothesis supported by our observers and clearing agents was that the presence of the observer may have altered the type of interactions that took place between the clearing agent and the public officials, as the latter would be more reluctant to extract bribes in the presence of our observer.[5] Interestingly, when we interact the tariff level of the product with the monitoring indicator we find a higher probability of reporting a bribe payment and a higher reported amount of bribe paid. This is consistent with a story in which public officials feel less constrained and affected by the presence of our observers when a rent is being shared with the private agent, as both would be implicated in the illicit transaction. In light of these results, we restrict our analysis to the data reported directly by the clearing agent, which enable us to measure expected bribes at each border (port and land border post) for different types of shippers and different types of shipments.

# IV Determinants of Bribe Payments

## IV.1 Tariff levels and Corruption

To identify the relationship between tariff levels and corruption we begin by estimating the impact of tariff levels on the probability of paying a bribe and on the amount of bribe paid. Our dependent variables are a binary variable that equals 1 if a bribe was paid and 0 otherwise, and, conditional of having to pay a bribe, the natural log of the amount of bribe paid, for each shipment in our sample. Our main regressor in both cases is the tariff level for each product in shipment $i$:

$$\alpha_i + p_i + \alpha_t + \beta_1 LogTariff\ Level_i + \phi_1 X_i + \epsilon_i \tag{1}$$

where the coefficient of interest $\beta_1$ represents the semi-elasticity of bribe payments with respect to tariff levels. We also include a vector of product and shipper level characteristics $X_i$ such as a

[5]For a more detailed description of the methodology of bribe collection see Sequeira (2011).

dummy variable signalling if the shipper is a large firm (defined as having more than 100 employees); dummy variables defining the product as perishable, a consumer good or an agricultural product; the value of the shipment; temperature controls including the maximum temperature registered the day the shipment arrived and the deviation between the temperature registered the day of arrival and the average monthly temperature; temperature controls interacted with the perishable dummy; the baseline tariff level at the beginning of the study (2007); as well as product fixed effects at the level of the 4 digit harmonization code $p_i$ and year fixed effects $\alpha_t$. We include higher order polynomials (quadratics) for the baseline tariff level and the value of the shipment.

Tariff evasion can take place through the misrepresentation of import prices (underinvoicing) or through the misclassification of goods into lower tariff categories. A growing literature has tested the hypothesis that certain types of products without fixed prices may be more prone to corrupt practices due to the difficulty in assessing the tariff duties that are due. Honest customs officials find it more difficult to detect an invoice stating an incorrect price while corrupt customs officers have a plausible excuse for why they did not detect any underinvoicing. We follow the classification conventionally used in the trade literature to identify differentiated products as those that lack a reference price in the market (Rauch 1999). Examples of differentiated goods are clothes and cars, while non-differentiated goods could be oil or wheat. Several studies on tariff evasion have resorted to this classification in the past, but have found mixed results. Fisman and Wei (2004) failed to find a significant relationship between differentiated gods and tariff evasion whereas Javorcik and Narciso (2007) and Mishra et al (2007) find that the trade gap is more responsive to the tariff level for differentiated products. We test this hypothesis in our data by including a dummy variable in our specification that equals 1 if the product is differentiated and 0 otherwise. Rauch's classification is at the 4-digit SITC level, which we match based on the concordance in Feenstra (1996). Standard errors are clustered at the level of the product's 4 digit harmonization code to allow for within product type correlation across time, while accounting for this coarser industry classification.

We then augment the model by interacting the tariff level with year dummies:

$$\alpha_i + p_i + \alpha_t + \beta_{1t} LogTariff\ Level_i * Year_t + \phi_t X_i + \epsilon_i \tag{2}$$

with $\beta_{1t}$ denoting year-specific coefficients. The difference between $\beta_t$ and $\beta_{t+1}$ tells us how tariff levels affected bribe payments in years 2008 and 2011 relative to 2007. $X_i$ denotes the same vector of product and shipper characteristics as in equation (1) but $\phi_t$ now represent year-specific coefficients.

## IV.2 Differences-in-Differences

To investigate whether the relationship between tariff levels and corruption is causal we adopt a standard difference-in-differences framework applied to the same pooled cross-section of shipments tracked in 2007, 2008 and 2011. We being by identifying products in our sample that changed tariff category in 2008 and 2011.

To estimate the impact of falling in a tariff category that changed during this period on bribe payments our dependent variables are again a binary variable that equals 1 if a bribe was paid and 0 otherwise, and the amount of bribe paid, for each shipment in our sample. The first vector of independent variables includes our main difference-in-differences estimator, the main effects of being in tariff change categories in 2008 and 2011, as well as key controls:

$$\gamma_1 Tariff\ Change\ Category\ in\ 2008_i * Year\ 2008 +$$
$$\gamma_2 Tariff\ Change\ Category\ in\ 2011_i * Year\ 2011 + \beta_2 Baseline\ Tariff + X_i + \epsilon_i \tag{3}$$

In the base model, we consider binary treatment variables equalling 1 if the product falls under a tariff category that changes in 2008 or 2011 and 0 otherwise. The coefficients of interest are $\gamma_1$ and $\gamma_2$, capturing the difference in the probability of paying a bribe for products that changed tariff level, before and after each tariff change took place, relative to products that did not experience

any change in tariffs throughout the period under analysis. We also include in the base model the product's initial tariff level (in 2007), all double interactions and main effects, plus the same vector of product, shipment and firm-level characteristics used in equation 3, including the log tariff level.

We then augment the base model to include the triple differences estimator, interacting the main treatments, the year of the treatment and an indicator of the baseline tariff level of each product in our sample.

$$\begin{aligned}
&\gamma_3 Tariff\,Change\,Category\,in\,2008_i * Year\,2008 + \\
&\delta_1 Tariff\,Change\,Category\,in\,2008_i * Baseline\,Tariff_i * Year\,2008 + \\
&\gamma_4 Tariff\,Change\,Category\,2011_i * Year\,2011 + \\
&\delta_2 Tariff\,Change\,Category\,in\,2011_i * Baseline\,Tariff_i * Year\,2011 + \\
&\beta_2 BaselineTariff + X_i + \epsilon_i
\end{aligned} \tag{4}$$

where $\delta_1$ and $\delta_2$ are the triple differences coefficients, which capture the potentially differential effect of being in a tariff category that changed tariff level, for products that started at a high tariff at baseline.

Finally, we change our specification to replace the binary treatment variable with a continuous treatment variable that captures the percentage point decline in tariffs experienced by each product. The rest of the specification is unchanged.

## IV.3 Discussion of Results

Table 3 reports the first set of results on the determinants of the probability of paying a bribe between 2007 and 2011. The coefficient on the tariff level regressor is insignificant in columns (1) and (2), (4) and (5) (equation 1), which represent the base model with log tariff rate as the main regressor, suggesting no relationship between tariff levels and bribe payments. A closer look at the year-specific coefficients in columns (3) and (6) reveal however that the relationship may be

non-linear, with important shifts taking place in 2008 and 2011, before and after the tariff changes. This is reflected in a positive coefficient on the amount of bribe paid in 2007, a negative coefficient in 2008 -right after the main change in tariff levels- and finally, a statistically negative coefficient in 2011. In column (3) we have a similar pattern driving the probability of paying a bribe, though the results are not as precise.

Table 4 presents the simple differences in means in the probability of paying a bribe and in the amount of bribe paid in 2008 and 2011 for different types of products. We detect an across the board decline in the probability of paying a bribe for all products during this period, but a stronger effect for products that experienced a tariff change. The results on the amount of bribe paid are however less clear. The amount of bribe paid appears to decline following the first tariff change but by 2011, we observe no statistically significant difference in bribe amounts from baseline (2007). This suggests that despite the lower overall number of bribe transactions, average bribes per transaction appear to have increased.

We then exploit variations across products and years in a differences-in-differences framework with full controls to provide further evidence that the non-linearities observed in Table 3 are driven by the exogenous tariff changes. Column (1) in Table 5 represents a linear probability model, with the differences-in-differences estimate revealing that the tariff change in 2008 is associated with a significant (0.89 point estimate) drop in the probability of paying a bribe. Before and after the main tariff change, it became differentially less likely that a shipment of a product experiencing a tariff reduction would pay a bribe. This change is statistically significantly different from zero, providing strong evidence that the tariff change discouraged public officials from engaging in bribe extraction for tariff evasion for these products. The result is robust to the inclusion of interactions between the year dummies and the covariates of interest. The second tariff change, which affected a much smaller subset of shipments in our sample, is nonetheless associated with a (0.53 point estimate) reduction in the probability of paying a bribe. We find no support in the data that shipping an agricultural, consumer or differentiated good led to a higher probability of paying a bribe. We

find that goods that were pre-inspected at origin to determine their value and tariff rate are 3% less likely to pay a bribe, even more so after the tariff change though this result is unstable across specifications.

Columns (3) and (4) present the results for the triple differences estimation. In column (3) we find that the difference-in-differences estimate remains negative and significant, and the triple differences estimate reveals that products that started from higher tariff levels at baseline (in 2007) experienced a more significant drop (an additional 2 and 5 percentage point drops in 2008 and 2011, respectively) in the probability of paying a bribe relative to products with a low tariff at baseline. The interaction of baseline tariff with the year dummies also provides evidence that products that remained at a higher tariff level had a higher probability of paying a bribe in 2008, right after the tariff change, but that this probability declined slightly in 2011. One possibility is that officials continue to target private agents who were previously paying more bribes for tariff evasion, as their willingness to pay may be higher and the costs of negotiating repeated bribes lower.

Table 6 presents the results on the determinants of the amount of bribes paid. We find that the point estimates for the difference-in-differences and the triple differences estimators are less precise than in Table 5 though they are still negative, suggesting that products changing tariff levels in 2008 and 2011 experienced a reduction in the amount of bribes paid. In columns (1) and (2) we also find that certain product and shipment characteristics are associated with higher bribes: conditional on paying a bribe, differentiated products pay on average 31% higher bribes and cargo subject to pre-inspection at origin tend to pay on average 20% lower bribes. These results are not however robust to the inclusion of the interaction terms between the treatment variables, year dummies and the remaining co-variates. In column (3), we test that our results are robust to a change in specification that takes into consideration the count nature of our outcome variable. Given over dispersion in the data, we adopt a negative binomial model and find that the results are even stronger.

In columns (4) and (5) we find that the difference-in-differences estimate is negative and significant at conventional levels and the triple differences estimate reveals that products with high

tariffs at baseline experienced 11% lower bribes in 2008 and 39% lower bribes in 2011, relative to products that remain tariff-free throughout the period under analysis. Finally, we control with a quadratic polynomial for any non-linearity in the relationship between tariff levels and corruption, or between corruption and the value of the shipment, though neither of these coefficients are statistically significant.

In Table 7 we replace our binary treatment dummy with a continuous treatment variable, capturing the percentage point reduction in tariff levels that occurred in 2008.[6] Results using the linear treatment variable are broadly consistent, though less precise, than in the case of a binary treatment. Column (1) reveals that products that experienced a higher reduction in tariff rates are associated with a lower probability of paying a bribe than products that experienced no change in tariff levels. This effect is however small in magnitude (0.5%) and is not robust to the inclusion of the full set of interactions (column 2).

## IV.4 Substitution and Income Effects

Our results so far suggest important non linearities in the relationship between tariff levels and overall levels of corruption. We now turn to how the impact the tariff reduction may have had in displacing corruption into different types of products or different phases of the clearance process.

A closer look at tables 3 through 7 reveals that there are important substitution effects at play. In columns (3) and (4) in tables 5 and 6, and columns (4) and (5) in table 6, we find that products with high baseline tariffs that remained in the high tariff category experience a statistically significant higher probability of paying a bribe in 2008 (the double interaction).

We then investigate the relationship between changes in tariff rates and changes in the pattern of bribe recipients and in the reasons for bribe payments(see table 8 for summary statistics). The most striking result is captured by Figure 2, showing a clear substitution effect through which customs officials move from focusing primarily on tariff evasion prior to the tariff reduction, to

[6]The tariff change in 2011 only affected a small subset of products with less significant tariff reductions so we restrict our analysis to changes that occurred in 2008.

extracting bribes through other means. The most frequently cited reason for a bribe payment went from tariff evasion in 2007 to selling "speed" in the clearance queue given irregularities with the clearance documentation (real or fictitious), or allowing the cargo to skip the scanning process. As congestion levels and clearing times remained fairly stable across this period, this represents a clear move from collusive forms of corruption (tariff evasion) to coercive bribe extraction. These results therefore suggest two types of substitution effects triggered by the reduction in tariffs: a move towards extracting more bribes from products that remained in the high tariff category, and a move towards adopting alternative bribe extraction methods targeting products that experienced a tariff change, which had already signalled a high willingness (and ability) to pay bribes. A straightforward revealed preference argument suggests that this shift is potentially suboptimal for customs officials, relative to the possibility of extracting bribes solely based tariff evasion schemes.

We identify two additional types of direct and indirect income effects triggered by tariff liberalization. The first direct income effect translates into a shift in the recipients of bribe payments from customs to other public officials. Before the tariff change, the overwhelming majority (94%) of bribe payments were made to customs officials as shown in Table 8. We are unable to test whether this is a demand driven income effect, as other agents are aware of the surplus created by the reduction in tariff levels, or if this is supply driven, as firms and clearing agents continue to earmark budgets towards facilitating the clearance process and, given the reduction in tariffs, now have more liquidity to make payments at other stages of the clearing process. We then detect a second unintended and indirect income effect of the tariff change: it allowed clearing agents to capture some of the surplus from the reduction in tariff rates. Between 2008-2011, we recorded the first set of cases in which the clearing agent would report to their clients that the cargo was retained in customs or at other stages of the clearing process, in order to justify the payment of a fictitious bribe, which was then pocketed by the clearing agent himself. Because of the structure of the market in which firms rely on clearing agents to make all bribe payments and helm the clearing process, this "bribe" can easily be captured by the clearing agent without the awareness of the client firm. After the tariff change,

the percentage of payments made to customs officials declined to 63%, with an increase in payments appropriated by clearing agents to 13%, and of 19% to other border officials. Taken together, these results suggest that while the tariff reduction is associated with an overall decline in the probability of paying a bribe, this decline is partially offset by an increase in the average amount of bribe paid (conditional on a shipment having to pay a bribe), an increase in other forms of corruption both within customs and among other border officials, and finally an increase in the clearing agents' ability to appropriate part of the surplus generated by the bribe reduction. Figure 3 illustrates these two trends: a shift of bribe payments from customs to other port officials, and a second shift from payments to customs officials or other port operators to clearing agents. While our data do not allow us to completely understand how the clearing agents capture part of this surplus, one possible reason is that firms have limited knowledge of the exact nature and distribution of clearing costs, becoming accustomed to fixed "budgets for bribes" (Ahn 2009). This may have generated opportunities for clearing agents to appropriate part of the reduction in the bribes that occurred due to the tariff change, going undetected as long as it remained within the original bribe budget of each firm.[7]

To verify that these shifts in the patterns of bribes paid are causally driven by changes in tariff levels, we restrict our analysis to the sample of bribe payments and estimate equations (1) and (2) placing as our dependent variable a binary outcome equalling zero if the bribe paid is collusive (for tariff evasion or to jump a queue) and one if the bribe paid is coercive, without any element of rent-sharing between the public official and the private agent. We also focus mostly on the tariff change that occurred in 2008 and include in our specification the interaction defining the impact of the tariff change on products that change tariffs in 2008 and the year dummy 2011 (tariff change category in 2008 * year 2011). The goal is to detect any trends in payments by these products across time. Table 9 displays the results. The positive sign and statistical significance of the difference-in-difference estimate (tariff change category * year 2008) confirms that conditional on paying a bribe,

[7]In ongoing work, we have confirmed very low levels of firm awareness of the nature and distribution of actual clearance costs and of the exact nature of bribe payments for the clearance of goods.

products that changed tariff level had a significantly higher probability of paying a coercive bribe than a collusive one after 2008 (with a point estimate of 0.69), particularly those that had started at baseline with higher tariff levels. In 2008, we also observe that the average amount of bribe paid for products that experienced the tariff reduction was lower. However, by 2011, this trend appears to have been reversed. The hypothesis that the tariff change led to zero change in the average amount of bribes paid cannot be fully rejected. While the amount of bribe per transaction declined in 2008, by 2011 it had already increased. This appears to be driven mostly by an increase in bribe payments to other officials along the clearance chain.

These results are consistent with the theoretical predictions: displacement responded positively to the size of the rents threatened by the tariff change as it was more pronounced for products that went from being a high tariff to a low tariff good(particularly for those starting at higher tariff levels) and it was driven by the relative fixed and variable costs of different bribe extraction methods. Customs officials continued to extract bribes for tariff evasion for goods that remained in the high tariff category but switched to extracting bribes through alternative methods for products that experienced a significant decline in tariff rates. A revealed preference argument can substantiate our assumption that fixed and variable costs are lower for bribe extraction through tariff evasion than for other coercive methods of bribe extraction. The results are also consistent with the predictions in the Shleifer and Vishny model (1993) as the tariff change induced a shift from centralized to decentralized forms of bribe-taking, resulting in an increase in bribes per transaction but a decline in total amount of bribes paid. This trend is made clear in Figure 4. Taken together, the shift from centralized to decentralized corruption and from collusive to coercive forms of corruption can potentially represent important sources of inefficiency.

# V Robustness Checks

As in any difference-in-differences estimation, the validity of our results hinges on the key identifying assumption that corruption trends would have been similar for products that changed tariffs and

products that remained in the same tariff grouping, in the absence of the tariff change. To investigate this assumption further, ideally we would observe corruption patterns for both sets of products for several years, prior to the tariff changes that took place in 2008 and 2011. Since data on overall corruption are not available for this period, we resort to an indirect measure of corruption in the clearance of goods that has been commonly used in the literature: the trade gap between declared exports from sending countries and declared imports from receiving countries (Bhagwati, 1964, Fisman and Wei 2004, Javorcik and Narciso 2007). While this measure can only capture corruption related to tariff evasion and smuggling, prior to the tariff changes in 2008 and 2011, tariff evasion appeared to be the most common form of corruption in our setting. To avoid any bias introduced by differential reporting capacity across trading partners, we focus on trade between Mozambique and its main trading partner, South Africa. South Africa is likely to have much higher reporting capacity than Mozambique and accounts for a significant portion of all Mozambican trade. For this type of trade, tariff changes took place in 2007, 2008 and 2011 as illustrated in Figure 1.

We observe reported exports and imports from 2006 until 2010 both measured in terms of the value and volume of trade (quantities), using data from the UN Comtrade Database. We identify four categories of products: products under category A which experienced a change in tariffs in 2007; products in category B, which experienced a change in tariffs in 2007 and 2008; products in category C1, which experienced a change in tariffs in 2009; and finally, products in category C21-23, which only experienced a tariff change in 2011. Figures 5 and 6 reveal trends in the trade gap for each product category, measured in quantities and values of trade. A concern with our identification strategy would be that an anticipation effect could lead customs agents to increase bribe extraction from a given product category immediately before a change in tariffs takes place, particularly since these tariff changes were in principle well-known in advance. This could have led us to overestimate the elasticity of bribe payments to changes in tariffs reported in section IV. Figures 5 and 6 do not suggest that this is a real concern: there is no spike in tariff evasion for any product in our sample before a change in tariff levels, and we detect a clear parallel trend

across both treatment and control products when we isolate the 24 months preceding the change in tariffs for products in categories C21-23, as shown in Figures 7 and 8. Figures 9 and 10 show the elasticity of the trade gap measured in values and quantities relative to tariff levels. Table 10 shows the comparison between the elasticities of tariff evasion to tariff levels computed with the secondary trade data relative to the elasticities estimated with the primary data collected in this study. Elasticities vary significantly between 2006 and 2010 when we use the secondary trade data (see Figures 10 and 11) and while the point estimate of the elasticities for 2008 and 2011 differ from the elasticities computed with the primary bribe data, the confidence intervals overlap.

Our estimation also depends on the assumption that our error terms are uncorrelated with our measurement of bribes. This would be violated if for instance our measure of bribes in each year between 2007-2011 came from very different samples of products. The pattern of bribe payments observed would then be driven not by the tariff reduction but by changes in the composition of shipments in our sample. In particular, it is possible that the composition of the treatment and control groups change in response to the treatment, namely that importers begin to import more of a certain type of product following each tariff change. In a difference-in-differences framework, this sort of treatment-induced change could bias our estimates. We test for this hypothesis directly in our data. Table 11 shows the p-values for a test of means for important product and shipment level characteristics for each year in our sample. For the most, we fail to reject the hypothesis of equality of means for important variables like the value and size of the shipment. Trade volumes for products before and after the tariff change using the UN Comtrade data also does not suggest significant changes in volumes traded driven by changes in tariff rates. While this result is reassuring for our identification strategy, it is nevertheless puzzling: one may have expected that the change in tariff rates would have induced a change in the composition of imports as well. Assuming that we are indeed capturing a random sample of shipments in our tracking study, these changes should be reflected in our sample as well. While we are unable to fully explain this result, possible reasons behind it could be the slow adjustment of firms' sourcing strategies or the poor enforcement of tariff

payments due to significant tariff evasion even prior to the tariff change. Lack of enforcement may drive the apparent low responsiveness of changes in volumes or values of imports to changes in tariff rates.

# VI Conclusions

In this paper we investigate how corrupt officials respond to important policy reforms that alter their ability to adopt different types of bribe extraction methods. We exploit an exogenous variation in tariff levels that took place between 2007-2011 and an unusually rich and original dataset of bribe payments at different borders in a major transport corridor in Southern Africa. Our data allows us to identify how bribe patterns vary across tariff levels, across products, across time and across different phases of the process of clearing goods.

Motivated by theories of crime displacement and behavioral responses to changes in tax levels, we analyze the direct and indirect effects of the tariff change in the levels and patterns of corruption. While we find an important overall reduction in the probability of paying a bribe after the tariff reduction takes place, we also find that these results are partially offset by two types of substitution effects and two types of direct and indirect income effects. The first substitution effect is a mechanic decline in the method of extracting bribes in exchange for tariff evasion, and a displacement of corruption to alternative forms of bribe extraction by customs officials, such as citing irregularities with clearance documentation (real or fictitious). As predicted by theory, displacement was greatest for products with higher tariff rates, consistent with the existence of fixed costs of switching to alternative methods of bribe extraction. The second substitution effect translates into an increase in the probability of products that remained in a high tariff category of paying a bribe to partially compensate customs officials for the shortfall in tariff revenue. We also identify an indirect income effect as we observe that clearing agents, the shipping intermediaries making all formal and informal payments to clear goods on behalf of their client firms, are able to capture part of the surplus generated by the tariff reduction. Since firms are likely to be ill-informed about the

actual distribution of bribes across the clearing process and are accustomed to working with specific budgets for bribes, clearing agents can exploit this asymmetry of information to appropriate part of the former bribes.

The immediate implication of these results is that the elasticity of tariff evasion to changes in tariff levels is insufficiently rich to capture important aspects of the behavioral response to changes in bribe extraction opportunities. Understanding the "anatomy" of the behavioral response to changes in tariff levels (Slemrod 1996) is however critical as these behavioral responses can be substantial and represent important sources of economic inefficiency.

While our results confirm previous findings in the literature on the positive relationship between tariff levels and tariff evasion, they also suggest that any reduction in tariffs may not yield the expected reduction in corruption in the clearing process due to important substitution and income effects. Our findings also illustrate the importance of understanding the type of corruption firms and other agents engage in when accessing a public service, and how different types of corruption can be associated with different sources of inefficiency. Finally, our study highlights the importance of accounting for potential displacement effects that can at best dampen the returns to anti-corruption policies, and at worst lead to more distortionary, more costly and less efficient forms of extracting bribes. In fact, it is possible that the erosion in the tariff-defined bribe base of public officials in our example is suboptimal: slightly higher tariff rates could have resulted in a more efficient, and less distortionary pattern of bribes in the long run. The implications of these shifts across different types of corruption for firms will remain the subject of future research.

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# VIII Appendix

We adapt a standard model discussed in Yang (2008) to illustrate the determinants of the displacement of corruption following policy reforms and we follow Saez et al (2010) to illustrate the importance of behavioral responses to changes in taxes on evasion. Let there be many identical customs officials each overseeing at capacity the clearance of a fixed amount of products. The customs agent needs to decide which bribe extraction method to use and the bribe incidence rate $\gamma_1$, the fraction of goods that the official will stop and attempt to extract a bribe from. The bribe revenue function for method 1 of tariff evasion is given by:

$$br_1 \equiv \gamma_1 \tau M - c_1 \gamma_1^2 - F_1 \tag{5}$$

where $\tau$ is the tariff rate and $M$ represents the volume of overall imports. Customs officials face both fixed and variable costs for each method of bribe extraction. Fixed costs $F_1$ can represent the costs of reaching an agreement with private shippers. Variable costs $c_1$ include the increasing risk of detection as bribes increase in size or in frequency. The customs' official selects an extraction rate $\gamma_1*$ to maximize:

$$\gamma_1* = \frac{\tau M}{2c_1} \tag{6}$$

Alternative methods of bribe extraction are also available. Let's consider a method 2 of bribe extraction, which has in principal higher fixed and variable costs than the previous method and does not depend on tariffs. The bribe revenue function is now given by:

$$br_2 \equiv \gamma_2 M - c_2 \gamma_2^2 - F_2 \tag{7}$$

and $\gamma_2*$ is given by

$$\gamma_2* = \frac{M}{2c_2} \tag{8}$$

Whether the overall share of goods targeted for bribe extraction increases or decreases depends on the tariff level and on the difference in variable costs between methods 1 and 2. The customs' official switches from method 1 of tariff evasion to method 2 when:

$$br_1* < br_2* \tag{9}$$

which implies that:

$$\tau M < 2\sqrt{\frac{(F_1 - F_2)}{\frac{1}{c_1 - \frac{c_2}{\tau^2}}}} \tag{10}$$

The theoretical prediction from this model is straightforward: the public official will switch from method 1 to method 2 of bribe extraction when the potential bribe revenue from tariff evasion is lower than a critical threshold that is given by the relationship between fixed and variable costs across methods. The extent of displacement is therefore bounded by the tariff change and the relative magnitude of variable costs of alternative methods. If $c_1$ increases, it will be easier to satisfy the inequality and therefore the official is more likely to shift to method 2. If $c_2$ increases, the inequality is harder to satisfy and the official is less likely to shift to method 2.In this particular setting, we assume that $F1 < F2$ to reflect the lower costs of setting collusive bribes but $c_1 > c_2$ need to cover up the theft resulting from tariff evasion.

To better understand the magnitude of the behavioral responses to a tariff change we adapt a model developed in Saez et al (2010). A tariff change in the amount $d\tau$ can have two effects on overall bribe revenue. First, there is a "mechanical" decrease in bribe revenue since now the

tariff duties that shippers want to avoid are considerably smaller. The mechanical effect is given by $dm \equiv dMd\tau < 0$. This mechanical effect is the drop in bribe revenue from selling tariff evasion, absent any behavioral response. It depends on the magnitude of the tariff decline and in the proportion of high tariff goods.

But under the conditions discussed above, the drop in tariff rate can also trigger a behavioral response on behalf of the public official who tries to find alternative methods of bribe extraction to offset the loss in bribe revenue. The change in bribe revenue due to this behavioral response is given by: $dB \equiv -eM\frac{d\tau}{\tau} > 0$, where $M$ is now the proportion of goods that originally had a positive tariff rate, and $e$ is the elasticity of tariff evasion to tariff rates ($e = \frac{\partial b}{\partial \tau}\frac{\tau}{b}$).

Summing the mechanical and the behavioral effects, we obtain the total change in bribe revenue due to the tariff change: $dT = dm + dB = Md\tau - eM\frac{d\tau}{\tau}$ which is equal to $dT = dM[1 - \frac{1}{t}ea]d\tau$ and $a = \frac{M}{dM}$. This formula shows that the fraction of bribe revenue extracted via alternative methods following changes in opportunities for selling tariff evasion, the second term in the square bracket expression, is a simple function increasing in the elasticity of tariff evasion and in the proportion of goods that used to be in the high tariff group, but decreasing in the average tariff level $\tau$. This captures the intuition that bribe extraction by selling tariff evasion is the preferred extraction method of customs officials, but also the possibility of stickiness in bribe payments even after the tariff change if customs officials perceive as targets shippers of previously high tariff goods who may continue to have a high willingness to pay a bribe as well as those who remain in the high tariff group.

We now extend this model to include income effects triggered by the change in tariffs. If we assume that a fraction $b_2 < 1$ of bribes that was previously paid for tariff evasion is shifted to other stages of the clearance process, the behavioral response becomes: $dB = -eM\frac{d\tau}{\tau} + eM\frac{d\tau}{\tau}b_2$, and the effect of a tariff change on bribe revenue for the customs official is given by: $dT = dM[(1-\frac{1-b_2}{t}ea)]d\tau$. The total change in bribe revenue driven by a behavioral response is now also decreasing in the share of bribes paid to other officials along the clearance chain. This result captures the intuition

behind the canonical Shleifer and Vishny (1993) model in which corruption levels depend on market structure: an increase in competition for bribes along a string of complementary monopolies in the public service delivery process is associated with higher bribes per transaction but lower overall bribes.

# IX Figures

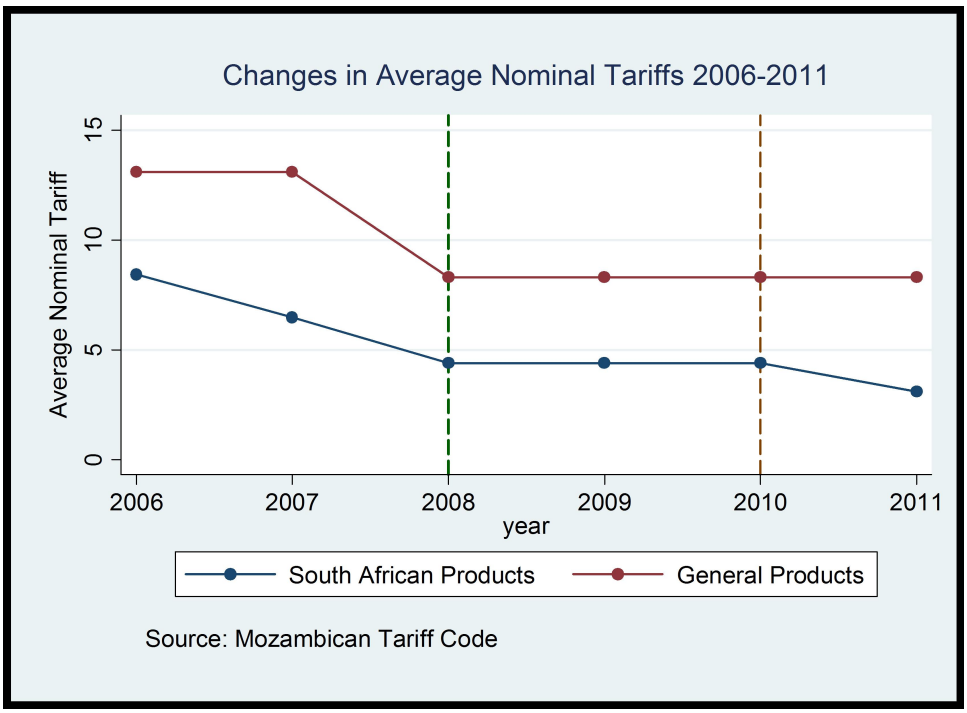


Figure 1: Changes in Nominal Tariffs in 2008 and 2011 for products originating in South Africa and the Rest of the World.

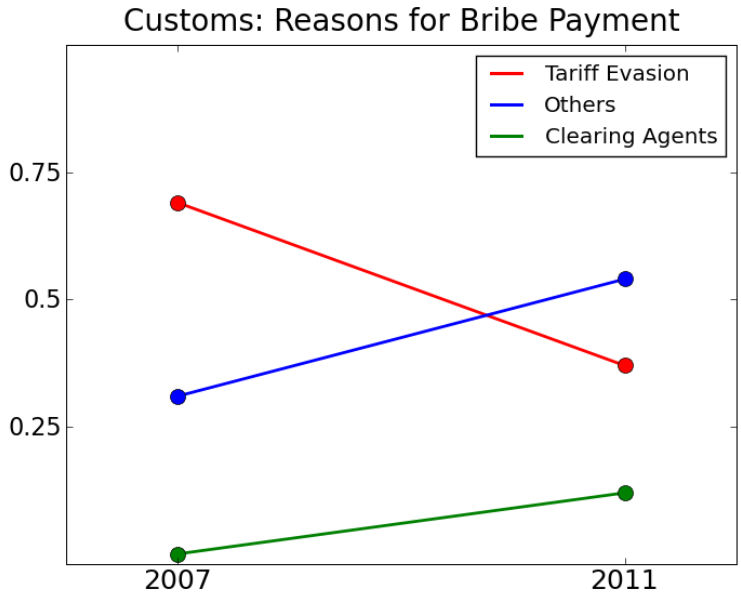


Figure 2: Changes in the reason for bribes payments before and after the change in tariff levels.

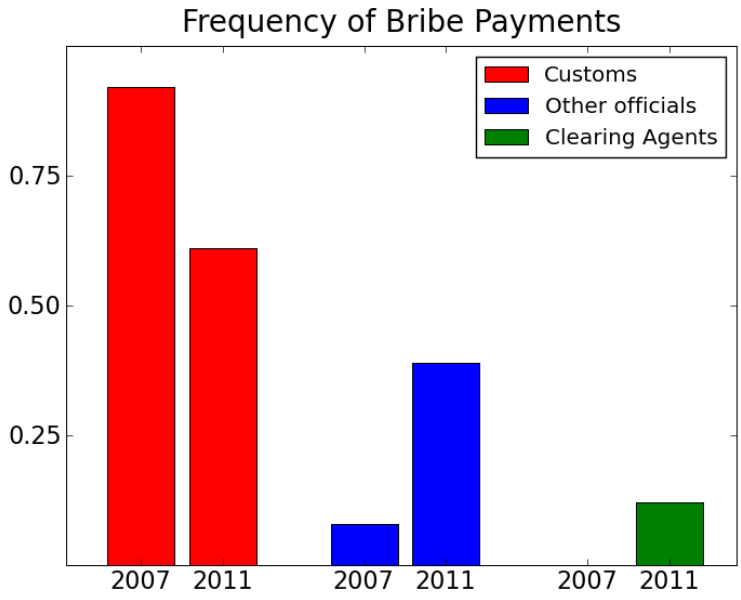


Figure 3: Changes in the reason for bribe payments across different types of officials involved in the clearing process.

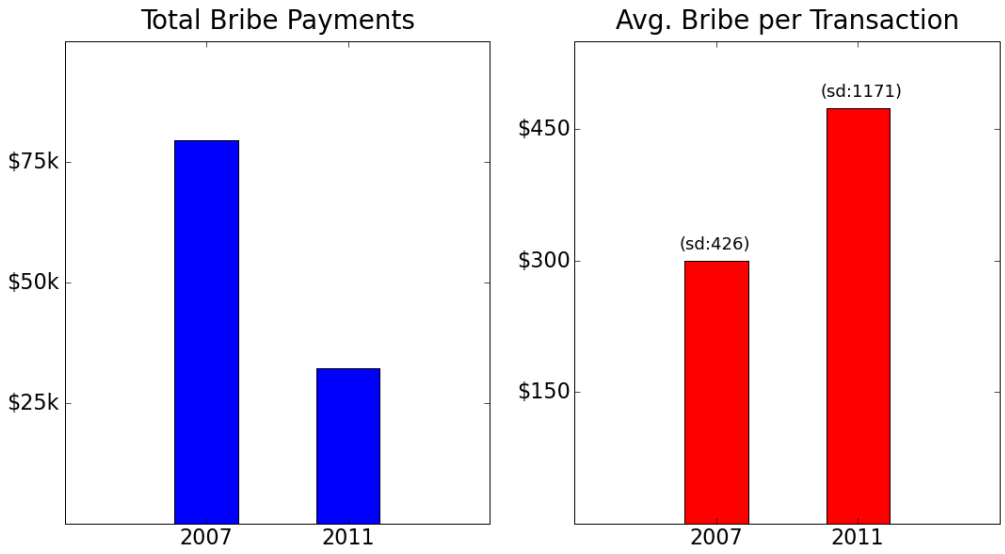


Figure 4: Changes in overall bribe payments and average bribes per transaction.

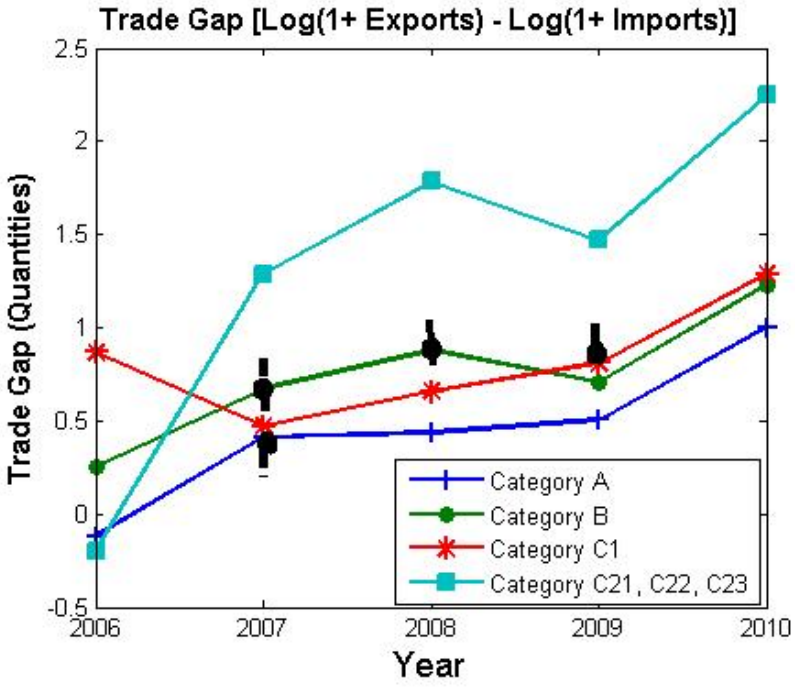


Figure 5: Trade Gap in Quantities for all products between 2006 and 2011. The vertical black lines represent a tariff change year for products in category A, B and C1

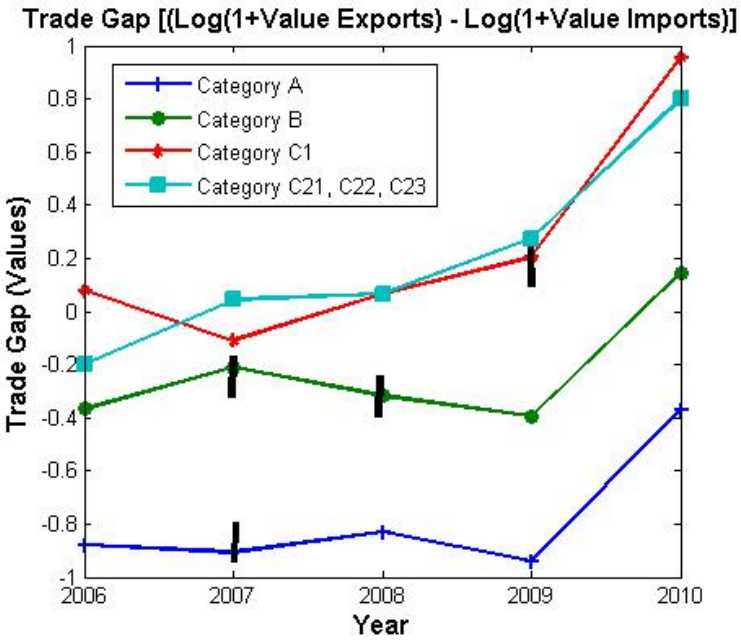


Figure 6: Trade Gap in Values for all products between 2006 and 2011. The vertical black lines indicate a tariff change year for products in category A, B and C1

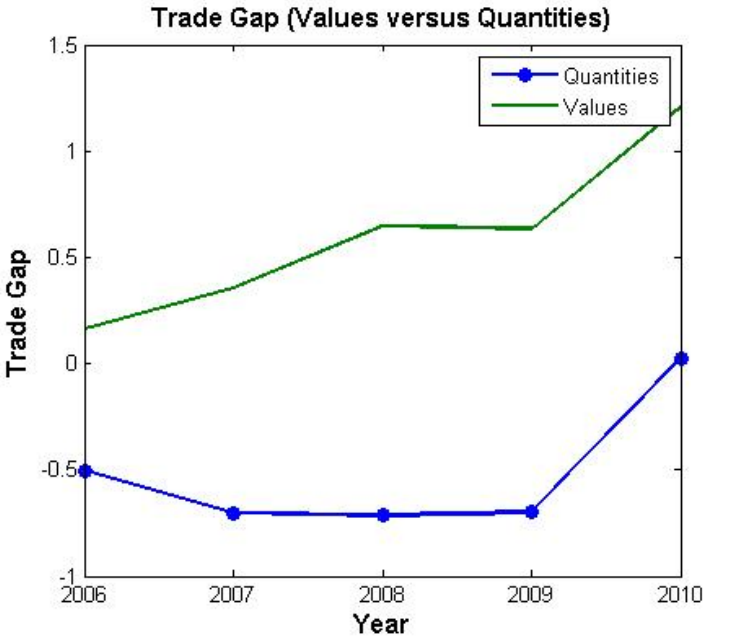


Figure 7: Trade Gap in Quantities versus Trade Gap measured in Values for all products between 2006 and 2010.

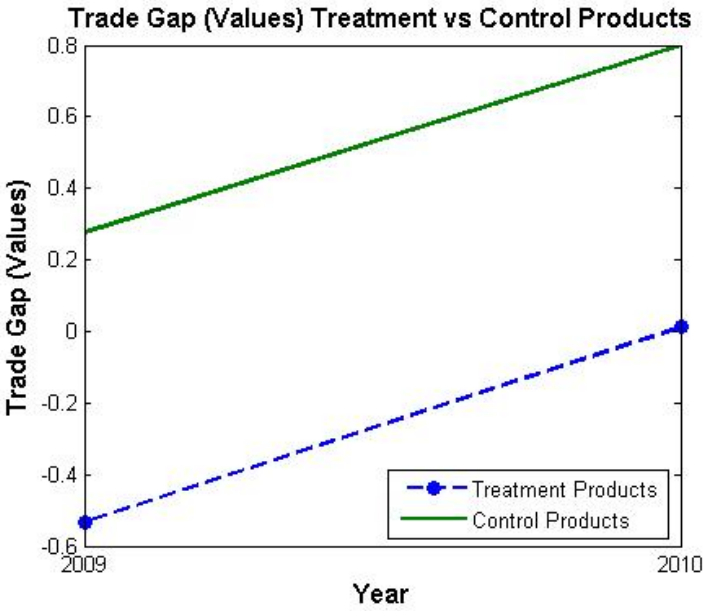


Figure 8: Trade Gap in Values for Treatment Products (which changed tariff in 2011) and Control Products (which changed tariffs in 2008).

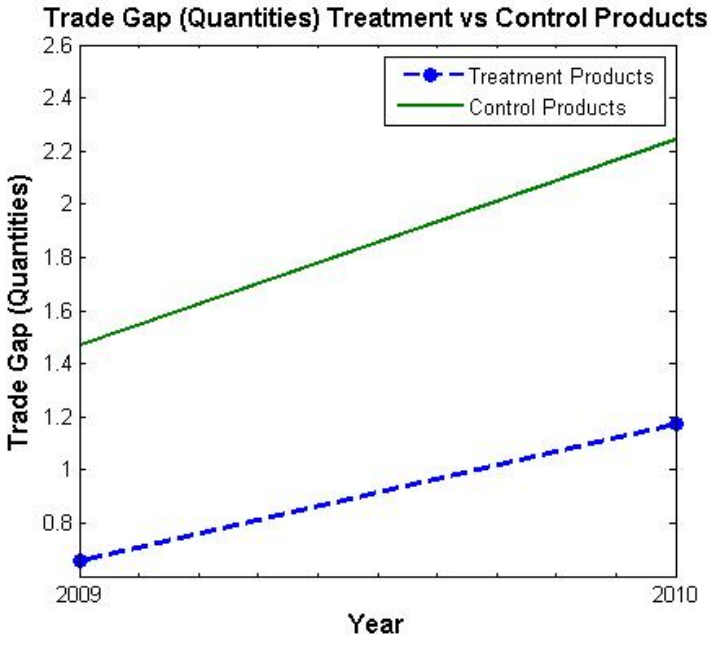


Figure 9: Trade Gap in Quantities for Treatment Products (which changed tariff in 2011) and Control Products (which changed tariffs in 2008).

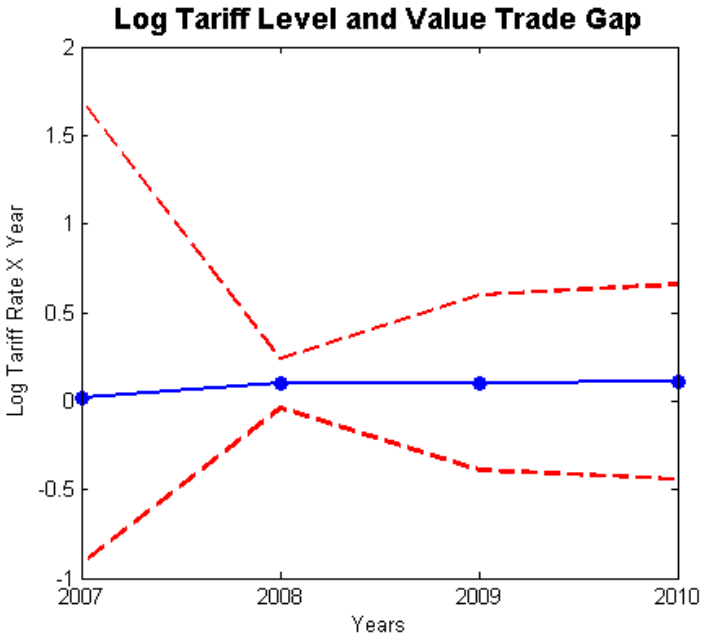


Figure 10: Annual coefficients from regressing the Value Trade Gap on the Log Tariff Rate interacted with year dummies.

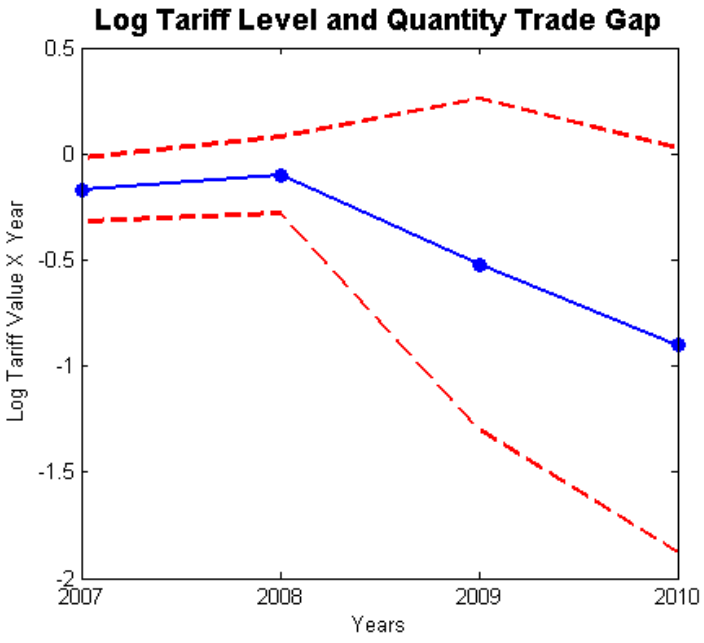


Figure 11: Annual coefficients from regressing the Quantity Trade Gap on the Log Tariff Rate interacted with year dummies.

# X Tables

Table 1: **Monitoring Experiment**

| **Differences in Means** | **Monitored** | **Not Monitored** | **P-value** |
|---|---|---|---|
| Probability of Paying a Bribe | 2% | 9% | 0 |
| Amount of Bribe Paid (USD) | 389 | 774 | 0.47 |

Table 2: **Monitoring Experiment**

| | LPM Bribe Paid (1) | LPM Bribe Paid (2) | OLS Bribe Amount (3) | OLS Bribe Amount (4) |
|---|---|---|---|---|
| Monitored Shipment | -0.07** | -0.14*** | -0.34** | -0.75* |
| | (0.03) | (0.024) | (0.15) | (0.11) |
| **Controls** | | | | |
| Agricultural Product | No | Yes | No | Yes |
| Value of Shipment | No | Yes | No | Yes |
| Tonnage of Shipment | No | Yes | No | Yes |
| Differentiated Product | No | Yes | No | Yes |
| Temperature Controls | No | Yes | No | Yes |
| Temperature Controls *Perishable Product | No | Yes | No | Yes |
| Perishable | No | Yes | No | Yes |
| Tariff Level | No | Yes | No | Yes |
| Non Containerized Shipments | No | Yes | No | Yes |
| Large Client Firm | No | Yes | No | Yes |
| Consumer Products | No | Yes | No | Yes |
| Terminal | No | Yes | No | Yes |
| Clearing Agent | No | Yes | No | Yes |
| Pre-Inspected at origin | No | Yes | No | Yes |
| Month Arrival | No | Yes | No | Yes |
| Day of the week arrival | No | Yes | No | Yes |
| Observer Code | No | Yes | No | Yes |
| Observations | 1,301 | 717 | 1,302 | 750 |
| F Test | 6 | 17.6 | 5.14 | 16.87 |
| Adjusted R2 | 0.02 | 0.02 | 0.02 | 0.02 |

[a] Sources: Tracking Study.

[b] NOTES: In columns (1) and (2) the dependent variable equals 1 if a bribe was paid and 0 otherwise, while in columns (3) and (4) the dependent variable corresponds to the log of the amount of bribe paid plus 1. Temperature Controls include the deviation from average precipitation levels and average temperature levels on each shipment's day of arrival. Differentiated Product corresponds to products without a set international market price as conservatively defined in Rauch (1999). Pre-Inspected at origin corresponds to shipments subjected to Pre-Shipment Inspection. Observer Code corresponds to the code of our observer who shadowed the clearing agent throughout the period of the experiment. Standard errors are clustered at the 4 digit harmonization code grouping of each product.

Table 3: **Tariff Levels and Corruption**

| **Dependent Variable** | Bribe Paid (1) | Bribe Paid (2) | Bribe Paid (3) | Bribe Amount (4) | Bribe Amount (5) | Bribe Amount (6) |
|---|---|---|---|---|---|---|
| Log Tariff Level | 0.0045 | -0.001 | 0.0325 | 0.0510 | 0.0209 | 0.319** |
| | (0.012) | (0.007) | (0.0213) | (0.0720) | (0.0448) | (0.132) |
| Log Tariff Level * Year 2008 | | | -0.0377 | | | -0.363** |
| | | | (0.0265) | | | (0.158) |
| Log Tariff Level * Year 2011 | | | -0.0406* | | -0.353*** | |
| | | | (0.0207) | | (0.129) | |
| **Controls** | | | | | | |
| Baseline Tariff Level | Yes | Yes | Yes | Yes | Yes | Yes |
| Baseline Tariff Level Squared | Yes | Yes | Yes | Yes | Yes | Yes |
| Clearing Agent Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Terminal | Yes | Yes | Yes | Yes | Yes | Yes |
| Product Fixed effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Year Fixed Effects | Yes | Yes | Yes | Yes | Yes | Yes |
| Differentiated Products | No | Yes | Yes | No | Yes | Yes |
| Temperature Controls | No | Yes | Yes | No | Yes | Yes |
| Pre-Inspected Cargo | No | Yes | Yes | No | Yes | Yes |
| Large Shipper | No | Yes | Yes | No | Yes | Yes |
| Perishable Product | No | Yes | Yes | No | Yes | Yes |
| Consumer Product | No | Yes | Yes | No | Yes | Yes |
| Agricultural Product | No | Yes | Yes | No | Yes | Yes |
| Shipment Value | No | Yes | Yes | No | Yes | Yes |
| Shipment Value Squared | No | Yes | Yes | No | Yes | Yes |
| Observations | 1,652 | 1,385 | 1,641 | 1,385 | 1,379 | 1,379 |
| R2 | 0,674 | 0.82 | 0.66 | 0.82 | 0.80 | 0.804 |

[a] Sources: Tracking Study.

[b] NOTES: In columns (1) through (3), the dependent variable equals 1 if a bribe was paid and 0 otherwise. In columns (4) through (6), the dependent variable corresponds to the log (bribe amount paid +1). Results are robust to the exclusion of all the zeroes from the bribe amoutn variable. Standard errors are correlated at the level of the 4 digit grouping of product harmonization codes. Results significant at *** 1%, **5% and *1%.

Table 4: **Simple Differences in Means**

| **Years** | 2007 | 2008 | Difference | 2007 | 2008 and 2011 | Difference |
|---|---|---|---|---|---|---|
| *Panel A:* | | | | | | |
| Probability of Paying Bribe (Pctg) | | | | | | |
| All products | 53 | 26 | -27*** | 53 | 11 | -42*** |
| Tariff Change | 55 | 28 | -27*** | 55 | 11 | -44*** |
| No Tariff Change | 43 | 21 | -22*** | 43 | 9 | -34*** |
| *Panel B:* | | | | | | |
| Bribe Amount Paid | | | | | | |
| All products | 300 | 176 | -124*** | 300 | 306 | 6 |
| | (26) | (12) | (29) | (26) | (63) | (68.4) |
| Tariff Change | 293 | 179 | -113*** | 293 | 366 | 73.33 |
| | (27) | (14) | (30) | (27) | (95) | (98) |
| No Tariff Change | 322 | 173 | -149** | 322 | 198 | -124* |
| | (60) | (23) | (65) | (60) | (22) | (64) |
| *Panel C:* | | | | | | |
| Probability of Paying a Bribe | | | | | | |
| High Tariff to High Tariff | 53 | 29 | -24*** | 52 | 11 | -41*** |
| High Tariff to Low Tariff | 51 | 29 | -22*** | 50 | 12 | -38*** |
| Low Tariff to Low Tariff | 49 | 19 | -30*** | 49 | 8 | -41*** |
| *Panel D:* | | | | | | |
| Bribe Amount Paid | | | | | | |
| High Tariff to High Tariff | 405.8 | 172.9 | -232.9 | 41 | 191.8 | -214.02* |
| | (700.2) | (123) | (158) | (99.02) | (24.39) | (127.5) |
| High Tariff to Low Tariff | 280 | 173.8 | -105.8** | 279.6 | 305.04 | -25.5 |
| | (287) | (113.3) | (41.35) | (24.006) | (69.9) | (62.8) |
| Low Tariff to Low Tariff | 269 | 193.85 | -75.15 | 269.34 | 449.5 | 180.2 |
| | (418.7) | (111.4) | (106.02) | (51.5) | (240.1) | (182.1) |

[a] Sources: Tracking Study.

[b] NOTES: Probability of Paying a Bribe in Panel A is displayed in percentages. We compare the probability of bribe payments and the amount of bribe paid for two types of period: comparing the immediate impact of tariff reductions in 2008 and then the overall effects comparing the baseline year of 2007 to the final year of 2011. Panels C and D display results broken down by the exposure of each product type to the direct reduction in tariff rates: products that remained in the high tariff category throughout the period under analysis, products that went from being in the high tariff category to the low tariff category in 2008 and products that remained in the low tariff categories throughout this period. Results significant at *** 1%, **5% and *1%.

Table 5: **Differences in Differences: Determinants of Probability of Bribe**

| *Dependent Variable* | LPM DID Bribe Paid (1) | LPM DID Bribe Paid (2) | LPM 3DID Bribe Paid (3) | LPM 3DID Bribe Paid (4) |
|---|---|---|---|---|
| Tariff Change Category in 2008 | 0.54* | 0.49 | 0.97*** | 1.21*** |
| | (0.3) | (0.39) | (0.04) | (0.221) |
| Tariff Change Category in 2011 | 0.037* | 0.005* | -0.015 | -0.036 |
| | (0.02) | (0.03) | (0.059) | (0.049) |
| Tariff Change Category * Year 2008 | -0.896** | -1.01* | -0.41*** | -0.42 |
| | (0.428) | (0.577) | (0.112) | (0.370) |
| Tariff Change Category * Year 2011 | -0.518* | -0.552** | -1.012*** | -1.012*** |
| | (0.29) | (0.26) | (0.025) | (0.021) |
| Baseline Tariff * Tariff Change in 2008 * Year 2008 | | | -0.022*** | -0.028*** |
| | | | (0.0059) | (0.008) |
| Baseline Tariff * Tariff Change in 20011 * Year 2011 | | | -0.053*** | -0.052*** |
| | | | (0.0019) | (0.0018) |
| Tariff Change in 2008 * Baseline Tariff | | | 0.00216* | 0.0021* |
| | | | (0.0012) | (0.0012) |
| Tariff Change in 2011 * Baseline Tariff | | | 0.052*** | 0.052*** |
| | | | (0.0039) | (0.0029) |
| Baseline Tariff * Year 2008 | | | 0.019*** | 0.025*** |
| | | | (0.0055) | (0.0066) |
| Baseline Tariff * Year 2011 | | | -0.003** | -0.0038** |
| | | | (0.0014) | (0.0017) |
| **Controls** | | | | |
| Baseline Tariff | Yes | Yes | Yes | Yes |
| Baseline Tariff$^2$ | Yes | Yes | Yes | Yes |
| Year Dummies | Yes | Yes | Yes | Yes |
| Terminal | Yes | Yes | Yes | Yes |
| Log Shipment Value | Yes | Yes | Yes | Yes |
| Clearing Agent | Yes | Yes | Yes | Yes |
| Temperature Controls | Yes | Yes | Yes | Yes |
| Precipitation Control | Yes | Yes | Yes | Yes |
| Pre-Inspected Shipment | Yes | Yes | Yes | Yes |
| Large Firm | Yes | Yes | Yes | Yes |
| Perishable Product | Yes | Yes | Yes | Yes |
| Consumer Product | Yes | Yes | Yes | Yes |
| Agricultural Product | Yes | Yes | Yes | Yes |
| Product 4 digit harmonization code | Yes | Yes | Yes | Yes |
| Tariff Change 2008 *Covariates | No | Yes | No | Yes |
| Tariff Change 2008 *Covariates*Year 2008 | No | Yes | No | Yes |
| Observations | 1,314 | 1,314 | 1,314 | 1,314 |
| R2 | 0.801 | 0.807 | 0.812 | 0.818 |

[a] Sources: Tracking Study.

[b] NOTES: Dependent Variable equals 1 if a bribe was paid and 0 otherwise. LPM stands for Linear Probability Model. Columns (1) and (2) represent the standard differences in differences framework and columns (3) and (4) represent the triple differences, interacting the treatment variables (tariff change) with the tariff level at baseline. Standard errors are correlated at the level of the 4 digit grouping of product harmonization codes. Results significant at *** 1%, **5% and *1%.

Table 6: **Differences in Differences: Determinants of the Amount of Bribe Paid**

| *Dependent Variable: Amount of Bribe Paid* | OLS DID (1) | OLS DID (2) | Neg. Bin DID (3) | OLS 3DID (4) | OLS 3DID (5) |
|---|---|---|---|---|---|
| Tariff Change Category in 2008 | 2.55 | 2.56 | 2.07 | 5.23*** | 5.93*** |
| | (1.855) | (2.532) | (1.290) | (0.227) | (1.117) |
| Tariff Change Category in 2011 | 0.268* | 0.366* | 0.682 | -0.135 | -0.211 |
| | (0.159) | (0.213) | (0.556) | (0.314) | (0.239) |
| Tariff Change Category * Year 2008 | -4.285* | -5.154 | -2.447** | -2.099*** | -2.565 |
| | (2.564) | (3.339) | (1.041) | (0.608) | (1.986) |
| Tariff Change Category * Year 2011 | -2.394 | -2.624 | -1.994* | -5.526*** | -5.529**** |
| | (1.860) | (1.683) | (1.199) | (0.149) | (0.149) |
| Baseline Tariff * Tariff Change in 2008 * Year 2008 | | | | -0.0876 | -0.0907 |
| | | | | (0.0654) | (0.0661) |
| Baseline Tariff * Tariff Change in 2011 * Year 2011 | | | | -0.33*** | -0.33*** |
| | | | | (0.0580) | (0.0600) |
| Tariff Change in 2008 * Baseline Tariff | | | | 0.01** | 0.015** |
| | | | | (0.006) | (0.007) |
| Tariff Change in 2011 * Baseline Tariff | | | | 0.33*** | 0.33*** |
| | | | | (0.061) | (0.06) |
| Baseline Tariff * Year 2008 | | | | 0.05 | 0.05 |
| | | | | (0.07) | (0.006) |
| Baseline Tariff * Year 2011 | | | | -0.03*** | -0.04*** |
| | | | | (0.009) | (0.009) |
| **Controls** | | | | | |
| Baseline Tariff | Yes | Yes | Yes | Yes | Yes |
| Baseline Tariff$^2$ | Yes | Yes | Yes | Yes | Yes |
| Log Shipment Value | Yes | Yes | Yes | Yes | Yes |
| Terminal | Yes | Yes | Yes | Yes | Yes |
| Clearing Agent | Yes | Yes | Yes | Yes | Yes |
| Temperature Controls | Yes | Yes | Yes | Yes | Yes |
| Precipitation Control | Yes | Yes | Yes | Yes | Yes |
| Pre-Inspected Shipment | Yes | Yes | Yes | Yes | Yes |
| Large Firm | Yes | Yes | Yes | Yes | Yes |
| Perishable Product | Yes | Yes | Yes | Yes | Yes |
| Consumer Product | Yes | Yes | Yes | Yes | Yes |
| Agricultural Product | Yes | Yes | Yes | Yes | Yes |
| Product 4 digit harmonization code | Yes | Yes | Yes | Yes | Yes |
| Tariff Change 2008 *Covariates | No | Yes | No | Yes | Yes |
| Tariff Change 2008 *Covariates*Year 2008 | No | Yes | No | Yes | Yes |
| Observations | 1,308 | 1,308 | 1,308 | 1,308 | 1,308 |
| R2 | 0.777 | 0.785 | | 0.795 | 0.799 |
| Log Pseudo-Likelihood | | | -947.85255 | | |

[a] Sources: Tracking Study.

[b] NOTES: Dependent Variables corresponds to the log of the amount of bribe paid. Tariff Change variable captures the percentage point reduction in tariff level experienced by each product. OLS stands for ordinary least squares. Results are robust to the use of other models such as negative binomial and the tobit model. Columns (1), (2) and (3) represent the standard differences in differences framework and columns (4) and (5) represent the triple differences estimates, interacting the treatment variables (tariff change) with the tariff level at baseline. Column (3) fits a negative binomial model to account for over dispersion in our count data. All other columns represent an ordinary least squares model estimation. Standard errors are correlated at the level of the 4 digit grouping of product harmonization codes. Results significant at *** 1%, **5% and *1%.

Table 7: **Determinants of Bribe Payments: Continuous Treatment**

| *Dependent Variable* | OLS DID Bribe Paid (1) | OLS DID Bribe Paid (2) | OLS 3DID Bribe Amount (3) | OLS 3DID Bribe Amount (4) |
|---|---|---|---|---|
| Baseline Tariff | -0.0009 | -0.001 | -0.0004 | 0.02 |
| | (0.0008) | (0.0008) | (0.005) | (0.013) |
| Tariff Change in 2008 | 0.00016*** | 0.006 | 0.008 | 0.009 |
| | (0.0005) | (0.003) | (0.003) | (0.01) |
| Tariff Change * Year 2008 | -0.005** | 0.006 | -0.033*** | -0.32*** |
| | (0.002) | (0.015) | (0.01) | (0.08) |
| Baseline Tariff * Tariff Change * Year 2008 | | | | -0.0001 |
| | | | | (0.0005) |
| Tariff Change * Baseline Tariff | | | | 0.17*** |
| | | | | (0.06) |
| Baseline Tariff * Year 2008 | | | | -0.024 |
| | | | | (0.01) |
| Baseline Tariff * Year 2011 | | | | 0.17*** |
| | | | | (0.06) |
| **Controls** | | | | |
| Value Shipment | Yes | Yes | Yes | Yes |
| Value SHipment$^2$ | Yes | Yes | Yes | Yes |
| Terminal | Yes | Yes | Yes | Yes |
| Clearing Agent | Yes | Yes | Yes | Yes |
| Temperature Controls | Yes | Yes | Yes | Yes |
| Precipitation Control | Yes | Yes | Yes | Yes |
| Pre-Inspected Shipment | Yes | Yes | Yes | Yes |
| Large Firm | Yes | Yes | Yes | Yes |
| Perishable Product | Yes | Yes | Yes | Yes |
| Consumer Product | Yes | Yes | Yes | Yes |
| Agricultural Product | Yes | Yes | Yes | Yes |
| Product 4 digit harmonization code | Yes | Yes | Yes | Yes |
| Tariff Change 2008 *Covariates | No | Yes | No | Yes |
| Tariff Change 2008 *Covariates*Year 2008 | No | Yes | No | Yes |
| R2 | 0.79 | 0.80 | 0.86 | 0.88 |
| Observations | 1,338 | 1,338 | 1,338 | 1,338 |

[a] Sources: Tracking Study.

[b] NOTES: In columns (1) and (2) dependent variable equals 1 if a bribe was paid and 0 otherwise. In columns (3) and (4) the dependent variable corresponds to the log of the amount of bribe paid. LPM stands for linear probability model and OLS stands for ordinary least squares. Results are robust to the use of other specifications such as logit and probit for regressions in columns (1) and (2), and the negative binomial and the tobit model in regressions (3) and (4). Columns (1) and (2) represent the standard differences in differences framework and columns (3) and (4) represents the triple differences, interacting the treatment variables (tariff change) with the tariff level at baseline. Standard errors are correlated at the level of the 4 digit grouping of product harmonization codes. Results significant at *** 1%, **5% and *1%.

Table 8: **Summary Statistics**

| **YEARS** | **2007** | **2008** | **2011** |
|---|---|---|---|
| **Shipment Characteristics** | | | |
| Average Shipment Size (tons) | 21 | 19.7 | 17.2 |
| | (47) | (73) | (172) |
| Average Shipment Value (USD) | 58,772 | 76,582 | 92,438 |
| | (163,377) | (352,493) | (532,030) |
| **Bribe Characteristics** | | | |
| Probability of Paying a Bribe | 53 | 26 | 6 |
| Average Bribe Amount (USD) | 253 | 176 | 246 |
| | (226) | (114) | (206) |
| Probability of Paying a Bribe for Tariff Evasion | 63% | 31% | 28% |
| Average Amount of Bribe Paid for Tariff Evasion | 302 | 186 | 382 |
| | (391) | (101) | (582) |
| Primary Bribe Recipient | Customs (95%) | Customs (90%) | Customs (63%) |
| Primary Reason for Bribe Payment | Tariff Evasion (63%) | Congestion (45%) | Cong. and Missing Docs (27%) |

[a] Sources: Tracking Study.

[b] In 2011, the secondary reason for bribe payments was tariff evasion (26%).

Table 9: **Shifting from Collusive to Coercive Corruption**

| *Dependent Variable* | LPM DID Bribe Paid (1) | LPM 3DID Bribe Paid (2) | OLS DID Bribe Amount (3) | OLS 3DID Bribe Amount (4) |
|---|---|---|---|---|
| Tariff Change in 2008 | 0.03 | -0.09 | 0.59 | -0.39 |
| | (0.12) | (0.92) | (0.59) | (1.17) |
| Tariff Change in 2008 * Year 2008 | 0.27 | 0.22 | 1.64* | -2.62** |
| | (0.18) | (0.29) | (0.91) | (1.14) |
| Tariff Change in 2008 * Year 2011 | 0.45** | 0.78** | 1.08 | 0.35 |
| | (0.22) | (0.25) | (0.19) | (1.95) |
| Baseline Tariff * Tariff Change * Year 2008 | | 0.04*** | | 0.20*** |
| | | (0.008) | | (0.06) |
| Baseline Tariff * Tariff Change *Year 2011 | | 0.03* | | 0.098 |
| | | (0.015) | | (0.119) |
| Tariff Change * Baseline Tariff | | -0.003 | | 0.05 |
| | | (0.01) | | (0.082) |
| Baseline Tariff * Year 2008 | | -0.04*** | | -0.23*** |
| | | (0.006) | | (0.05) |
| Baseline Tariff * Year 2011 | | -0.23** | | -0.09 |
| | | (0.009) | | (0.09) |
| **Controls** | | | | |
| Value of shipment | Yes | Yes | Yes | Yes |
| Value of shipment$^2$ | Yes | Yes | Yes | Yes |
| Terminal | Yes | Yes | Yes | Yes |
| Clearing Agent | Yes | Yes | Yes | Yes |
| Pre-Inspected Shipment | Yes | Yes | Yes | Yes |
| Large Firm | Yes | Yes | Yes | Yes |
| Perishable Product | Yes | Yes | Yes | Yes |
| Consumer Product | Yes | Yes | Yes | Yes |
| Agricultural Product | Yes | Yes | Yes | Yes |
| Product 4 digit harmonization code | Yes | Yes | Yes | Yes |
| Tariff Change 2008 *Covariates | No | Yes | No | Yes |
| Observations | 227 | 227 | 232 | 235 |
| R2 | 0.23 | 0.26 | 0.23 | 0.24 |

[a] Sources: Tracking Study.

[b] NOTES: In columns (1) and (2) dependent variable equals 1 if a bribe was paid and 0 otherwise. In columns (3) and (4) the dependent variable corresponds to the log of the amount of bribe paid. LPM stands for linear probability model and OLS stands for ordinary least squares. Results are robust to the use of other specifications such as logit and probit for regressions in columns (1) and (2), and the negative binomial and the tobit model in regressions (3) and (4). Columns (1) and (2) represent the standard differences in differences framework and columns (3) and (4) represents the triple differences, interacting the treatment variables (tariff change) with the tariff level at baseline. Standard errors are correlated at the level of the 4 digit grouping of product harmonization codes. Results significant at *** 1%, **5% and *1%.

Table 10: **Elasticities of Corruption to Tariff Levels**

| | **Trade Data** | | | **Primary Bribe Data** | | |
|---|---|---|---|---|---|---|
| | **Elasticity of tariffs to trade gap** | Lower CI | Upper CI | **Elasticity of tariffs to corruption** | Lower CI | Upper CI |
| | (1) | | | (2) | | |
| **2007** | 0.18 | -0.87 | 1.22 | | | |
| **2008** | 0.08 | -0.38 | 0.54 | -0.02 | -0.28 | 0.24 |
| **2009** | 0.008 | -0.04 | 0.05 | -0.04 | -4.8 | 4.7 |
| **2010** | 0.14 | -0.67 | 0.95 | | | |

[a] Sources: Tracking Study, UN Comtrade Data for South Africa and Mozambique and Mozambican Tariff Code.

[b] NOTES: Column (1) is the elasticity of the trade gap to tariff levels in each year, using secondary trade data. Column (2) denotes the elasticities estimated based on the primary bribe data collected by the author.

Table 11: **Test for Equality of Means of Shipments Across Time**

| **P values Eq Means** | **2007-2008** | **2008-2011** | **2007-2011** | **2007-2008** | **2007-2011** |
|---|---|---|---|---|---|
| *Panel A:* All products | | | | *Panel D:* High Tariff | |
| Shipment Value | 0.19 | 0.17 | 0.09 | 0.3 | 0.82 |
| Tonnage Shipment | 0.09 | 0.15 | 0.38 | 0.62 | 0 |
| *Panel B:* Treat. Products | | | | *Panel E:* High-Low Tariff | |
| Shipment Value | 0.45 | 0.18 | 0.16 | 0.48 | 0.18 |
| Tonnage Shipment | 0.17 | 0.29 | 0.42 | 0.13 | 0 |
| *Panel C:* Control products | | | | *Panel F:* Low Tariff | |
| Shipment Value | 0.21 | 0.16 | 0.43 | 0.06 | 0.67 |
| Tonnage Shipment | 0.65 | 0.28 | 0 | 0.39 | 0.79 |