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GTAP Annual Conference on Global Economic Analysis  
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# **The impact of corruption on intra-SADC trade in agrifood products**

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**15<sup>th</sup> April 2014**

## **Abstract**

This research investigated the role of corruption as a barrier to trade with the SADC region and across three staple agrifood products namely maize, rice and wheat. The paper employed panel data econometrics and found that corruption impedes intra-SADC trade across the three crops. In terms of policy suggestions, the study's results provide some support to policies which reduces corruption on the basis that reducing the scope for corruption does, in the majority of cases, and especially if starting from very high levels, reduce the impediments to trade. To this end, SADC countries are encouraged, as they continue negotiating and improving on the trade facilitation, to promote transparency, reduce red-tape and diminish the scope for arbitrary decision making and cheating.

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## 1 Introduction

Studies on international trade suggest that corruption in ports and borders of entry (and exit) increases cost of trade (Yang, 2008; Clark et. al, 2004). However, given the complexity and nature of corruption, unavailability of data on actual bribe payments makes it difficult to understand how corruption affects the trade. Despite data problem, Sequeira and Djankov (2008) argue that ports provide fertile ground to analyze corrupt behaviour since opportunities for rent-seeking abound. Furthermore, that fact that ports represents an administrative monopoly over an essential public service with broad discretionary powers and scant institutional accountability implies that the probability of corruption happen can be very high.

Makochekanwa et al (2010) argues that trade in agrifood at any level of cooperation, from bilateral to regional and from inter-regional to multilateral, remains more complex than any other sector, and varies across agreements (Aksoy, 2004). Thus, even though negotiations at regional trade agreements (RTAs) and World Trade Organization/General Agreement on Tariffs and Trade (WTO/GATT) levels have generally reduced existing tariffs on agricultural products, other impediments which include corruption has impact on the smooth flow of such products; thus in some instances resulting in subdued trade in such products. The situation is made worse by agriculture protection which still exists at WTO negotiation level, and which has meant that getting agrifood products across border remains a difficult, thus resulting in customs officials getting bribes to smooth the flow of these products.

Previous studies and theoretical underpinnings the manner in which bribes are set and the mechanisms through which corruption affects the economy are ambiguous (Sequeira and Djankov, 2008). On the positive side and in line with the “corruption as grease” or “grease the wheels of trade” theory, bribes are considered to be set according to the time-preferences of private agents, resulting in corruption being an efficiency-enhancing by virtue of reducing delays in slow-moving queues for public services (Leff, 1964; Huntington, 1968; and Lui, 1985). In fact, Leff (1964) and Huntington (1968) argues that corruption can be efficiency enhancing because it removes government-imposed rigidities that impede investment and interfere with other economic decisions favorable to growth. Dutt and Traca (2007) point out that in a territory rife with burdensome and time-consuming regulations; the opportunity to offer bribes allows firms to circumvent bad government control, and this can be welfare improving. On the negative side, scholars such as Klitgaard (1991); Shleifer and Vishny (1992); Shleifer and Vishny (1993) and Rose-Ackerman (1999) among others, argues that bribes are set according to the strategic preferences of bureaucrats, representing a “distortionary transaction tax” that leads to an inefficient allocation of public and private resources. Studies by Mauro (1995); and Keefer and Knack (1995) has shown that corruption reduce economic growth, while Mauro (1998); and Tanzi and Davoodi (1997) found corruption to distort governmental expenditures and the research by (PSRA 2003) found corruption to reduce the effectiveness of foreign aid.

Chene (2013) argues that corruption at borders and ports is not the privilege of one agent, but rather involves various economic agents including customs officials, border guards and port operators, with different powers and bureaucratic mandates, resulting in different discretionary powers and opportunities to extract bribes. For instance, customs officials as mandated by their respective constitution are responsible for collecting taxes on particular types of goods and for ensuring that import/export procedures are adhered to. As such, they

are considered to have greater discretionary powers and opportunities to extract bribes than port operators (Sequeira; Djankov No date).

In terms of the possible types of corruption involving customs officials at ports and borders, Bardhan (2006) and Sequeira and Djankov (2013) provides two different categories of border corruption. Bardhan (2006) argues that the impact of corruption on any economy depends on its (corruption) interaction with various existing regulations. The author defines two types of corrupt behaviour relevant to international trade namely: extortion and evasion. Extortion as a form of corruption happens when customs officials (bureaucrats) request bribes to do what they are supposed to do, as mandated by their status as gatekeepers. Conversely, evasion corruption occurs when customs officials are bribed to do what they are not supposed to do, for instance, allowing firms to avoid regulations.

Sequeira and Djankov (2013) categorises corruption into collusive and coercive. Collusive corruption occurs when public officials and private agents collude to reduce or evade tariffs, and there after share rents generated by the illicit transaction. Coercive" corruption takes place when a public bureaucrat coerces a private agent into paying an additional fee, just to gain access to the public service, above and beyond the official price. In other words, "coercive" corruption exists where port or customs officials extract bribes from companies or clearing agents for performing routine processes (what is referred to as facilitation payments). Sequeira and Djankov (2013) argue that bureaucrats will engage in "collusive" or "coercive" corruption depending on the opportunities and constraints created by the bureaucratic structure under which they operate.

Rose-Ackerman (1997) points that customs officials have a high probability of engaging in both extortion corruption and evasion corruption. Extortion results from the fact that customs clearance procedures offer officials monopoly power over economic and trade transactions that firms value - access to and from the outside world. Extortion therefore affects the sharing of rents between importers and customs officials. On the other hand, evasion emerges as the bribes to customs officials are used as the means of reducing tariffs and other regulatory burdens which hinder the smooth flow of trade. Evasion bribes augment the rents to be shared by the two participants to this inappropriate activity that is importers and customs officials.

This study investigates the impact of corruption of customs officials on intra-SADC trade in agrifood products, stressing the dichotomy between extortion and evasion. Three types of agrifood products are analyzed and these are maize (HS 1005), rice (HS 1006), and wheat (HS 1001). These products are chosen solemnly on the basis that they are the major staple diet consumed (in various combination) across the SADC countries. Furthermore, given that some countries have extreme weather such as droughts and floods in other years which render them food insufficient, implies that they have to import, among others from other regional countries. Preference to trade or import in agrifood products with other SADC countries is underpinned by a number of factors which include the SADC Protocol on Trade whose objectives, as indicated in Article 2, paragraph 1 encourages member countries to "To further liberalize intra-regional trade in goods and services on the basis of fair, mutually equitable and beneficial trade arrangements, complemented by Protocols in other areas". The other factor which encourages intra-SADC trade in agrifood is the geographic proximity which helps in reducing transport costs given that these three products are bulky and of low value, thus mainly transported by either road or railway, than air which is very expensive.

In the SADC region few case studies have been done which shows the impact of corruption on trade. Sequeira and Djankov (2008) analysed corruption on Durban (South Africa) and Maputo (Mozambique). The study found that that bribe payments, far from only “greasing” cumbersome bureaucratic procedures, act as a distortionary tax on trade and a significant revenue drain for the government. Elsewhere, Parayno (1999) found both extortion and evasion corruption in the Philippines was prevalent as most businesses became accustomed to giving small bribes for customs services and it was necessary to pay to “facilitate” even fully legitimate transactions. The research also found that mis-declaration, mis-classification and undervaluation in formal entry declaration processing were common means which were employed by firms to circumvent official trade barriers, in collusion with corrupt custom officials. The study by Arduz (2000) describes a system in Bolivia, where most goods go through a system of “parallel customs”, in which customs officers levied their own taxes rather than the official trade taxes. In a study on bilateral trade between Hong Kong and China, Fisman and Wei (2004) found evidence of tariff evasion. The research found strong evidence for mislabeling and misclassification of imports (where by imports were shifted from a higher to a lower tax category).

### 1.1 Corruption in SADC region

SADC countries are considered to be among the corrupt countries in the world. The World Economic Forum Global sponsor an annual survey based index which produces the Global Competitiveness Report (GCR) survey based index of corruption. In the survey, the report provide average score across the five components of the following Executive Opinion Survey question: *In your country, how common is it for firms to make undocumented extra payments or bribes connected with* (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favourable judicial decisions. In each case, the answer ranges from 1 (very common) to 7 (never occurs).

**Table 1: Corruption scores in selected SADC countries**

	Country/Year	2010	2011	2012
1	Angola	3.2	2.9	n/a
2	Botswana	5.1	5.1	5
3	Lesotho	3.4	3.4	3.5
4	Madagascar	3.1	2.9	2.9
5	Malawi	4.2	3.7	3.4
6	Mauritius	4.8	4.6	4.7
7	Mozambique	3.7	3.8	3.6
8	Namibia	4.8	4.5	4.2
9	South Africa	4.6	4.6	4.6
10	Swaziland	4.1	3.9	3.7
11	Tanzania	3.1	3.2	3.1
12	Zambia	3.8	3.7	3.6
13	Zimbabwe	3.9	3.9	3.9

**Source:** Global Competitiveness Reports (Various issues)

As indicated in the table, Botswana is the best performer with less corruption when compared to other SADC countries, where the country’s average score for the three years reported was



around 5. On the other hand, Madagascar is one of the worst performers where corruption is perceived to be very high when compared to other regional countries.

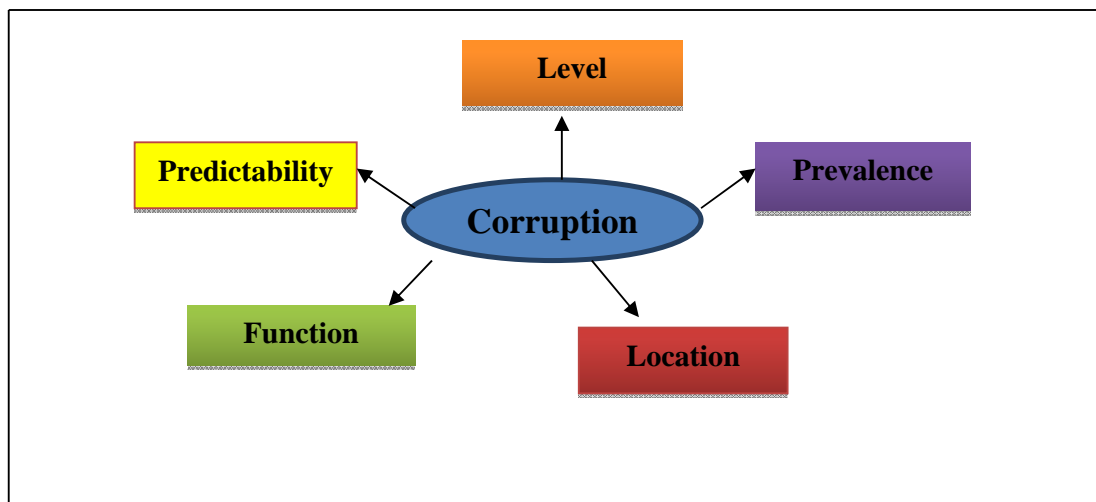
## 1.2 Conceptual framework

The concept of corruption remains problematic given that there is no generally agreed definition of corruption. Although the common definition of used in literature considers corruption to refer to a misuse of public office for personal gain, (Jain, 2001) and Aidt, 2003), given that the this study analysis corruption affecting international trade exchange, and thereby deals with outcomes of private sector activities, this research define corruption in line with Thede and Gustafson (2009) who broadly defined corruption to include the misuse of organizational assets for personal gain. With this broader definition, the study will be able to provide a general examination of trade effects of corruption in the public and private sector.

Thede and Gustafson (2009 provides five dimensions and characteristics through which corruption is expected to affect international trade. These five characteristics are: (i) level, (ii) prevalence, (iii) location, (iv) function, and (v) predictability. Figure 1 provides a diagrammatic exposition of the dimensions through which corruption affects trade.

The first corruption dimension that impact on economic exchange, and the resulting economic activity, is the *level* of corruption. According to Thede and Gustafson (2009), this dimension measures the severity and direct costs of corruption on economic exchange. Higher levels imply higher costs, which in turn lower the profitability of productive activities, including the trade transactions of import firms. In the context of international trade, the impact severity of corruption can therefore reduce trade volumes and/or obstruct trade transactions altogether.

**Figure 1: The five dimensions of corruption**



**Source:** author construction

While the level of corruption reveals the impact of corruption when it occurs, the second dimension of corruption, namely *prevalence* of corruption provides an indication of how

often corrupt practices takes place. Prevalence affects economic transactions in defining the social norm of making business (Bardhan, 1997; and Svensson, 2005). In this dimension, the issues does not end only on the higher likelihood of encountering corruption in a randomly chosen economic transaction, but in this instance, corruption also tends to enforce self-sustained corrupt behavior (Miller, 2006). With high prevalence, there is a tendency for corrupt agents prefer to do business with corruptible agents, which works to the disadvantage of honest potential business partners. Similar behavioural patterns tend to be replicated and/or sustained by government officials, further exacerbating the corruption effects on private sector.

Customs *location* of corruption is the third dimension. Compared to other government agencies and officials, customs authorities (at ports and borders) tend to be more infiltrated with corruption problems due to the strong discretionary power of its officials (Miller, 2006). Given the limited opportunity to circumvent customs processing on import transactions, bribe collection can become very lucrative if levied by this authority (Aidt, 2003). Furthermore, customs officials who use their power to collect bribes may create an opportunity to avoid the enforcement of trade regulation, which can enhance trade compared to uncorrupt customs processing. A study by Dutt and Traca (2009) provides evidence of this trade-enhancing effect which the authors said can prevail when tariffs are high and provide evidence of that it can be found in a small share of their trade observations.

The fourth dimension of corruption relates to its *function*, which captures if corruption is used to obstruct the business opportunities of firms. Thede and Gustafson (2009) divide the function characteristic into two categories: common and restrictive. The former (common) includes corruption that affects firms in the same way and works as an additional transaction cost for all importers. The second category, restrictive, includes corruption used to benefit some firms at the expense of their competitors and thus can be used to favour some firms by improving the market access for their imports and/or counteracting the market access of their competitors' imports. These functions could affect the transaction costs of import transactions in many ways, for example by influencing transport costs or bribing opportunities in the customs.

The last dimension of corruption is its *predictability*. This dimension is used in literature to explain differences in economic performance between countries infiltrated with corruption problems (see for example Schleifer and Vishny, 1993). In our context predictability indicates the extent to which corruption is part of a centralised institutional system where economic agents know what to expect and confirm their expectations. Thede and Gustafson (2009) argue that in a predictable corrupt system (such as those identified in South Korea and China), the economic exchange and performance of firms is not regularly obstructed by corruption uncertainties and irregularities. Conversely, systems permeated by unpredictable corruption (that can be found in, for instance, many Sub-Saharan African countries) are likely to deter economic transactions and limit economic activity.

## **2 Literature review**

The study by Dutt and Traca (2007) analyzed the effect of corruption of customs officials on international trade flows, stressing the dichotomy between extortion and evasion. The paper's

results, theoretically and empirically, stressed the nonlinearities of that relationship, and the key role of the interaction with the level of legal protectionism, as set by trade policy. The research found that, overall; corruption impedes trade for the vast majority of countries. However, when the degree of regulatory protectionism is high a little bit of corruption can produce a trade enhancing effect. As corruption becomes too strong, its marginal effect is to deter trade. The authors concluded that underlying these nonlinearities were the conflicting roles of corruption in facilitating extortion by customs officials, while, simultaneously, creating an environment prone to the evasion of restrictive regulations. The results the study highlighted non-linearity effects of corruption and their inter-relationship with the extent of regulatory barriers to markets.

Theede and Gustafson (2009) examined the multifaceted corruption impact on trade based on corruption characteristics known to affect economic exchange within the corruption research field. These characteristics are the level, prevalence, customs location, function and predictability of corruption. The paper empirically employed a corruption-augmented gravity equation and estimated it using a Heckman version of a generalized method of moments (GMM) instrumental variable method. The results of the study provides strong evidence of that import flows vary systematically with the investigated corruption characteristics and enable the identification of channels through which corruption affects international trade.

Sequeira and Djankov (2008) used the case studies of Durban (South Africa) and Maputo (Mozambique) ports and analyzed how bureaucrats set bribes and whether these payments impose significant economic costs. The paper found that bribes were product-specific, frequent and substantial. In their analysis, the author found that bribes can represent up to a 14% increase in total shipping costs for a standard 20ft container and a 600% increase in the monthly salary of a port official. In these two ports, the main aim of paying bribes was paid primarily to evade tariffs, protect cargo on the docks and avoid costly storage. The study identified three systemic effects associated with this type of corruption: (i) a diversion effect, (ii) a revenue effect, and (iii) a congestion effect. The first effect occurs when firm go the long way around to avoid the most corrupt port; while the second effect emerges as bribes reduce overall tariff revenue which was suppose to accrue to government coffers. The last effect happens as the re-routing of firms increases congestion and transport costs in the region by generating imbalanced flows of cargo in the transport network.

The 2007 study by USAID<sup>1</sup> explores the state of corruption from the perspective of “Clearing and Forwarding Agents” (CFAs) as well as customs officials along the Northern corridor at transit points in Kenya, Uganda, Tanzania, Rwanda, Burundi and Democratic Republic of Congo (DRC). The research found that delays and high taxation were perceived to be major constraints to cross-border business and one of the greatest opportunities for bribery. In its analysis, the study found that incidence of corruption ranged from 15% in Kenya to 59% in Tanzania, while as a whole, 28% of all shipments were subject to bribery. The payable bribe was found to be normally based on consignment value, roughly half of all corruption incidences. In these six countries, although corruption was perceived to pervade all public border services, customs and port authorities were viewed to be the most corrupt departments. Revenue loss was made evident by the study in Tanzania, Uganda and Kenya, with Uganda recording the highest revenue loss per transaction.

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<sup>1</sup> USAID (2007). Assessment study on corruption at the northern corridor transit point. Available at: <http://eastafrika.usaid.gov/documents/document/document/1185>.

### 3 Methodology

#### 3.1 Theoretical model

The study relies on vast literature covering the perceived and/or actual corruption tendencies and behaviour of both customs officials and importers (exporters). Specifically, the study follows Dutt and Traca (2007) in which the authors developed a model with three stages starting with a given firm's decision on the quantity to export, followed in the second stage whereby when the exported product crosses into the destination territory, the customs official has to decide the zeal with which to implement the nominal tariff for each respective product. The last stage, which is the final step of the customs clearance procedure, the customs official may engage in extortion and require a bribe to allow the merchandise through the port/border.

The model by Dutt and Traca (2007) start by considering a destination country,  $d$ , where there are consumers who have demand preferences given by  $U = \int_l x_l^{\frac{\varepsilon-1}{\varepsilon}}$ , where  $x_l$  is the consumption of good  $l$  and  $\varepsilon > 1$  denotes the elasticity of substitution. Letting  $Y_d$  represent the income/expenditure and  $p_l$  the price of  $l$  in country  $d$ , country  $d$ 's demand for  $l$  will be given by the following equation:

$$x_l = p_l^{-\varepsilon} P_d^{\varepsilon-1} Y_d \quad (1)$$

$$\text{With } P_d^{1-\varepsilon} = \int_l p_l^{1-\varepsilon}$$

Assuming that  $l$  is produced by a single company from the exporting country  $o$  (origin), so that  $x_l$  is the volume of exports of the firm to country  $d$ , it follows that the unit cost of production of product  $l$ , in country  $o$ , is given by  $c$ . as expected, when exporting to  $d$ , firm producing product  $l$  incurs in transport and border costs, and these costs are denoted by  $\lambda$ . Border costs are related to customs clearance procedures, that is, they depend on the nominal tariff in  $d$  to imports from  $o$ , denoted by  $T_{od}$  ( $0 < T < 1$ ) and set by trade policy<sup>2</sup>.

In this model, customs clearance depends also on the actions of the customs official. Following their constitutional mandate, customs officials have the final word on whether or not the good is allowed through customs. This prompts two types of behavior by customs officials. In the first instance, customs officials may abuse their role as gatekeepers to extort bribes from the exporter, in order to allow the merchandise to transit through customs. Bribes are set through the bargaining between the exporter and the customs official. Extortion carries the risk to the official of being caught and punished by the authorities<sup>3</sup>. The model assume that a high level of corruption in the country reduces the probability of getting caught in extortion and/or the social or pecuniary penalty associated, and so increases the utility of the bribe to the customs official.

<sup>2</sup> The nominal tariff can be thought of as capturing all of country  $d$ 's regulatory barriers to imports from country  $o$ , including import taxes and the financial and time costs of administrative procedures and inspections.

<sup>3</sup> To simplify the analysis, we assume that the bribe is the only source of revenue for the customs officer, who will not obtain any other benefit from allowing for a lower effective rate.

Second, customs officials can exert more or less zeal in making sure that the merchandise has complied with all regulatory barriers. For example, the customs official may overlook underinvoicing, allow for a wrongful classification of the merchandise into categories with lower tariffs, exonerate the merchandise from time-consuming inspections, or ignore some documentation requirements. We can thus define the effective tariff paid by the exporter as  $zT$ , where  $0 < z \leq 1$  is the zeal of the customs official.  $z < 1$  implies evasion of tariffs. Of course, because these actions imply weak job performance, the customs official runs the risk of being caught and punished by her supervisors. The benefit to the official is that, as a lower zeal lowers the effective tariff and increases import-rents, it raises the size of the pie over which the customs official can bargain with the exporter, for the bribe.

The impact of these types of behavior for the welfare of the customs officials can be captured in the following utility function:

$$U = b^\psi \exp \delta(1 - z^{-1} - \ln z) \quad 0 < \psi < 1 \quad (2)$$

where  $b$  is the amount of the bribe and  $\psi$  denotes the level of corruption ( $0 < \psi < 1$ )<sup>4</sup>. Note that  $\psi = 0$ , depicting a corruption-free environment, implies that there is no utility to the customs official from the bribe. Moreover, (2) posits that the marginal utility of an increase in the bribe is positive ( $U'_b > 0$ ) and increases with the level of corruption, as the latter lowers the expected penalty to the customs official of being caught in extortion. On the other hand, (2) implies that an increase in zeal raises the official's utility ( $U'_z > 0$ ). Note that, here, we are implicitly assuming that the decline in expected sanctions outweighs the potential costs of a higher effort. Parameter  $\delta$  captures the supervision of the customs' official (including her own sense of duty) in enforcing the legal border procedures; - a higher  $\delta$  implies a higher cost of lowering zeal<sup>5</sup>.

Exporting good  $l$  to country  $d$  from country  $o$  happens in three stages. In stage one, the exporter decides the quantity to export and the shipment makes its way to the customs of  $d$ , incurring in the transport costs. In stage two, when reaching country  $d$ , the merchandise must go through customs procedures. At this stage, the customs official must decide the zeal with which she will implement the nominal tariff. Finally in stage three, at the final step of the customs clearance procedure, the customs official may engage in extortion and require a bribe to allow the merchandise through.

In this context, the total profit of firm  $l$  in country  $d$ 's is given by:

$$\begin{aligned} \Pi &= \pi - \lambda c x_l \\ \pi &= p x_l (1 - zT) - b \end{aligned} \quad (3)$$

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<sup>4</sup> This utility function ignores other income or wealth of the official, and thus cannot capture some important determinants of corruption, such as low salaries. In this paper, we focus on the role of trade variables for the returns to corruption. The analysis is greatly simplified by this utility function.

<sup>5</sup> It could be argued that, in a more corrupt environment, supervision declines as the sense of guilt of officers in avoiding regulatory procedures declines. We will ignore this mechanism, and focus on the impact of corruption on the size of the bribe.

where  $p_{xi}(1 - zT)$  are the revenues obtained from the sale of the merchandise in  $d$  net of the effective tariff. By lowering zeal, the custom official raises the revenues. Then, in stage three, the bribe works as rent-sharing device between the exporter and the customs official, with  $\pi$  denoting the rents captured by the exporter<sup>6</sup>. Ultimately, by affecting the continuation payoff of the firm ( $\pi$ ), the bribe ( $b$ ) and the zeal of the customs official ( $z$ ) affect the firm's earlier decisions on the exports to ship to country  $d$ , in stage one.

Characterization of the equilibrium of model, including the bribe, the customs official decision on zeal, and the firm's decision on exports; as well as the model of how the corruption tax  $\Delta$  is affected by increases in the level of corruption,  $\psi$  is left for the reader for further reading in Dutt and Traca (2007).

### Corruption Tax

This sub-section considers how the corruption tax ( $\Delta$ ) is affected by increases in the level of corruption ( $\psi$ ). The corruption tax is represented by:

$$\overset{\text{corruption}}{\Delta} \overset{\text{tax}}{\equiv} \overset{\text{extortion}}{\psi} - F \overset{\text{evasion}}{(\psi | \delta, T)} \quad (4)$$

$$\text{Where } F(\psi | \delta, T) \equiv \delta \frac{1 + \psi}{\psi} (1 / z(\psi, \delta, T) - 1)^2 \geq 0 \quad (5)$$

Eq. (10) separates the impact of corruption on the two actions of the customs official: extortion and evasion. When  $\psi = 0$  (i.e. in a corruption-free environment), we have  $\tilde{z} = 1$ , and both components of the corruption tax are zero. For  $\psi > 0$ , the first term, *extortion* ( $\psi$ ), is positive, as an increase in corruption raises the corruption tax by raising the bribe captured by the official, due to the increase in impunity. On the other hand, the second term, *evasion* ( $-F$ ), is negative, i.e. corruption lowers the corruption tax, as the customs official lowers her zeal, reducing the effective tariff. As a result, the net impact of corruption on the corruption tax can be positive or negative, depending on how the impact on extortion (i.e. the bribe) compares with the effect on evasion.

### 3.2 The augmented gravity model

To investigate the relationship between trade flows and corruption the study extend the gravity model to include the corruption by following the works of Anderson and van Wincoop (2003) as presented in Dutt and Traca (2007). The subscript *od* is introduced to

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<sup>6</sup> Through this sequencing we capture the notion that bribes are likely to be paid only when the merchandise clears customs and after the official has already facilitated most of the clearance procedure. The firm cannot commit to an evasion contract, because these transactions cannot be protected by enforceable contracts.

denote all variables that are specific to that country-pair  $o$  and  $d$ , such as  $T_{od}$  which measures the legal tariff rate in  $d$  to imports from  $o$ ,  $\lambda_{od}$  the transport costs between  $o$  and  $d$ <sup>7</sup>. Let the unit cost of  $l$  be given by  $c = w_o$ , where  $w_o$  is the wage in country  $o$ . Suppose also that  $N_o$  measures the number of goods produced in country  $o$ . It follows that the total value of total exports of  $o$  to  $d$  are given by<sup>8</sup>:

$$X_{od} = \int_l p_d x_d = N_o w_o^{1-\varepsilon} \left( \frac{\varepsilon}{1-\varepsilon} \right)^{1-\varepsilon} [(1 + \Delta_{od}) / (1 - T_{od})]^{1-\varepsilon} \lambda_{od}^{1-\varepsilon} P_d^{\varepsilon-1} Y_d \quad (6)$$

As common in the gravity literature the income in country  $o$  is defined as equal to what it sells to all trading partners including itself, giving the following total income:

$$Y_o = N_o \sum_k p_k x_k \quad (7)$$

In this case care has to be taken to ensure that the locally produced goods are not subjected to trade costs. Solving for  $P_d$ , the following equations are obtained:

$$Y_o = N_o w_o^{1-\varepsilon} \left( \frac{\varepsilon}{1-\varepsilon} \right)^{1-\varepsilon} Y_w \gamma_o^{1-\varepsilon} \quad (8)$$

with,

$$\gamma_o^{1-\varepsilon} = P_o^{\varepsilon-1} \theta_0 + \sum_{d \neq o} [(1 + \Delta_{od}) / (1 - T_{od})]^{-\varepsilon} \lambda_{od}^{1-\varepsilon} P_d^{\varepsilon-1} \theta_d \quad (9)$$

$$P_d^{1-\varepsilon} = \gamma_o^{\varepsilon-1} \theta_0 + \sum_{d \neq o} [(1 + \Delta_{od}) / (1 - T_{od})]^{-\varepsilon} \lambda_{od}^{1-\varepsilon} \gamma_o^{\varepsilon-1} \theta_d$$

where  $\theta_j = Y_j / Y_w$  and  $Y_w = \sum_j Y_j$  is world income.  $\gamma_o$  and  $P_d$  are price-levels for the two countries.  $P_d$  is the price index for consumers in  $d$ , whereas  $\gamma_o$  is the price index for firms' sales. The terms  $P_o^{\varepsilon-1} \theta_0$  and  $\gamma_d^{\varepsilon-1} \theta_d$  capture the goods produced in the respective country, which are not subject to transport or border costs. Finally, we can use (8) to substitute for

$N_o w_o^{1-\varepsilon} \left( \frac{\varepsilon}{1-\varepsilon} \right)^{1-\varepsilon}$  in (6) to obtain

$$X_{od} = \left( \frac{1 + \Delta_{od}}{1 - T_{od}} \right)^{1-\varepsilon} \lambda_{od}^{1-\varepsilon} \frac{Y_d Y_o}{Y_w P_d^{1-\varepsilon} \gamma_o^{1-\varepsilon}} \quad (10)$$

<sup>7</sup> As before, the subscripts  $o$  and  $d$  denote variables specific to the exporting country ( $o$ ) and the importing country ( $d$ ), respectively.

<sup>8</sup> For simplicity, we assume that imports are valued at a price that includes the border cost.

This expression augments the traditional gravity equation to include border costs, captured by the term  $(1 + \Delta_{od}) / (1 - T_{od})$ . Note that, since  $\varepsilon > 1$ , the sign of the effects of corruption on trade flows is the opposite of its effect on the corruption tax. This implies an inverted-U shaped relationship between bilateral trade flows and corruption.

The traditional components include transport costs, the size of market, for exporters and importers, captured by  $Y_o$  and  $Y_d$ , and the price-indices:  $P_d$  and  $Y_o$ . The multilateral trade resistance terms reflect both the openness of the importing nation to all goods and the openness of the world to the exporter's goods (not simply the openness of a pair of exporter and importer). Trade between any pair of countries depends on their bilateral trade costs (including here transport and border costs) relative to average trade costs with all trade partners (measured by the multilateral trade resistance terms).

Accounting for these terms is very important in the context of this paper, because the components of border costs we estimate (i.e. tariffs and corruption) are likely to affect the majority of imports into a country. Hence they are an important determinant of the multilateral trade resistance indices. To see the implications of this, assume that the border cost is import country specific, affecting all firms exporting to country  $d$ , i.e.  $(1 + \Delta_d)/(1 - T_d)$ . Then, if we re-write (10) by replacing  $P_d$  with the expression in (9), the following expression is obtained:

$$X_{od} = \frac{\lambda_{od}^{1-\varepsilon} Y_d Y_o / Y_w \gamma_o^{1-\varepsilon}}{\sum_{o \neq d} \lambda_{od}^{1-\varepsilon} \gamma_o^{\varepsilon-1} \theta_o + [(1 + \Delta_d)/(1 - T_d)]^{\varepsilon-1} \gamma_d^{\varepsilon-1} \theta_d} \quad (11)$$

Equation (11) indicates that, if multilateral trade resistance is not controlled for, the border cost affects bilateral trade flows from  $o$  to  $d$ , only to the extent that it affects the choice of  $d$ 's consumers between imported goods (regardless of their origin) and locally produced goods (which do not pay border costs). It is however important to note that if the local economy is very small ( $\theta_d \approx 0$ ), the border cost has no effect on the bilateral trade-flows. The important point is that estimates of the border cost that do not control for multilateral trade resistance would clearly underestimate its magnitude of the border cost. In the estimation procedure that follows, we will always include controls for multilateral trade resistance.

### 3.3 Empirical model

The gravity empirical model used in this study borrows from Dutt and Traca (2007) and Equation (10) is employed to produce an estimable equation. First, we obtain a polynomial approximation for the corruption tax, given the expression in (4). Using (5), we can take a second order approximation to  $F$  to obtain:

$$F_{od} \approx (d_1 \psi_d - d_2 \psi_d^2) T_{od} \quad (11)$$

where  $d_1 > d_2/2 > 0$  ensures that  $F$  is increasing and concave for  $\psi \leq 1.16$ . It implies also that  $F$  is zero when  $\psi = 0$  or  $T = 0$ . Given (4), we can obtain



$$\Delta_{od} \approx \psi_d - d_1 \psi_d T_{od} + d_2 \psi_d^2 T_{od} \quad (12)$$

Now, to obtain the country-pair specific nominal tariff, we take into account the possibility that the trading partners are involved in a customs-union or a free-trade-area. Specifically, letting  $\gamma_{od}$  denote a trade-agreement dummy, that takes the value 1 if the two countries are members of a free trade area (FTA) or a customs unions (CU) or have a bilateral trade-agreement, we can express  $T_{od}$  as:

$$T_{od} = (1 - \gamma_{od}) T_d$$

where  $T_d$  is the importing-country specific nominal tariff.

Finally, taking a log-linearization of (10), this produces the following estimable equation:

$$\begin{aligned} \ln X_{odt} = & \alpha_1 \psi_{dt} + \alpha_2 \psi_{dt} T_{odt} + \alpha_3 \psi_{dt}^2 T_{odt} + \alpha_4 T_{odt} + \Theta Z_{odt} \\ & + b_1 \ln Y_{dt} + b_2 \ln Y_{ot} + c_1 \ln \gamma_o + c_2 \ln P_d + C + \varepsilon_{odt} \end{aligned} \quad (13)$$

where time-subscripts have been added to the variables. Equation (13) can be estimated using data on the trade flows between country-pairs.

The coefficients denoted by  $\alpha$  are our main coefficients of interest. From (10) and (12), our model's predictions imply  $\alpha_1 = -\varepsilon < 0$ ,  $\alpha_2 = \varepsilon d_1 > 0$ ,  $\alpha_3 = -\varepsilon d_2 < 0$ ,  $\alpha_4 = -\varepsilon < 0$ . Estimation would require measures of corruption and tariff rates. The term  $\Theta Z_{odt} \equiv (1 - \varepsilon) \ln \lambda_{odt}$  captures a host of traditional gravity variables that are related to transport costs, such as geographical, cultural and linguistic distance. The  $b$  coefficients look at the impact of country incomes on trade, and can be estimated using data on GDP. Following the traditional gravity literature,  $b_1 = b_2 = 1$  is expected. The  $c$  coefficients capture the impact of multilateral trade resistance terms, and our model suggest  $c_1 = c_2 = (1 - \varepsilon) < 0$ .

### 3.4 Data description and sources

#### 4.2.1 Bilateral Trade Flows

The study use bilateral trade as the value of imports from the United Nations Commodity Trade Database (UNCOMTRADE). While more comprehensive data is available for bilateral imports, as a robustness check, we also present results using bilateral exports. All trade data are in current US dollars.

## **Corruption – Irregular payments and bribes**

The study uses the Global Competitiveness Report (GCR) survey based index of corruption and the report is produced annually by the World Economic Forum. The measure or indicator used in this study to capture corruption is “*Irregular payments and bribes*”. This indicator represents the average score across the five components of the following executive opinion survey which asks the question: In your country, how common is it for firms to make undocumented extra payments or bribes connected with (a) imports and exports; (b) public utilities; (c) annual tax payments; (d) awarding of public contracts and licenses; (e) obtaining favourable judicial decisions. The answer to each question ranges from 1 (very common) to 7 (never occurs). To avoid awkwardness in the interpretation of the coefficients, the index was recorded as seven minus the original corruption index, so that now higher numbers indicate higher corruption. While we are concerned with corruption in customs in this paper, Dutt and Traca (2007) indicates that there is no measure of corruption available across countries and over time that exactly captures corruption in customs. The GCR measure has the most extensive coverage, across countries and over time (2008-2013). Since a single survey methodology is used, cross-country and overtime comparisons using this measure are likely to be valid. However, as with all research that employs corruption data, we must recognize these are subjective assessments of corruption and subject to measurement error.

### **4.2.3 Trade Policies**

The country-specific and the product specific legal tariff rates are obtained from one measures of trade policy, namely the unweighted average import tariff duty levied on each of the three agrifood products understudy. The duty rates are extracted from World Bank’s TRAINS database.

### **4.2.4 Transport costs, GDP and Price Indices**

The paper employs traditional gravity variables such as geographic distance, contiguity, colonial links, and linguistic similarities, to capture factors that facilitate or impede trade. Data on these variables are obtained from the CEPII bilateral distance database ([www.cepii.fr](http://www.cepii.fr)). Data on nominal GDP and GDP price deflators are from the World Development Indicators.

## **4 Econometric Results**

This section provides the regression estimates from our model. All the three respective product models indicate that the explanatory variables account for at least 58% of the variation in trade flows. Overall, the traditional gravity variable estimates are in line with the literature: positive for GDP, common border, common language, and negative for both import duty and distance.

**Table 2: Effects of corruption and import duty on bilateral imports**

Variable	Maize	Rice	Wheat
Corruption (importer)	-0.110*** (0.015)	-0.215*** (0.012)	0.032*** (0.021)
Corruption (exporter)	-0.108*** (0.010)	-0.121 (0.146)	-0.042* (0.560)
Import duty	-1.29 (0.121)	-0.001 (0.005)	-0.421 (0.032)
Log GDP (importer)	0.971** (0.013)	0.725** (0.019)	0.080*** (0.041)
Log GDP (exporter)	0.901** (0.009)	0.821* (0.015)	-0.002 (0.056)
Log distance	-1.01*** (0.021)	-0.910*** (0.29)	0.812*** (0.001)
Common border	0.142** (0.019)	0.228 (0.091)	0.109** (0.050)
Common language	0.220 (0.58)	-0.110 (0.231)	0.220** (0.028)
Constant	-4.901*** (0.657)	-3.183*** (0.924)	0.521 (0.921)
R <sup>2</sup>	0.71	0.58	0.69

**Key:** \* Significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Standard errors in brackets

Looking at our variables of interest which are corruption and import duties (tariffs), their respective impacts are different in terms of significance. The presented results show that corruption, both of the exporters and importers is significantly and negatively related to trade across the three crops. These findings support the view that corruption acts as a tax on trade.

Tariffs, though they have a negative sign, they are however not significant and as such, they do not play any significant effect on intra-SADC trade. The fact that tariffs do not affect intra-regional trade is not a surprise given that all member countries in the gravity trade model sample have been implementing tariff phase downs which started in 2000. These tariff phase downs resulted in SADC becoming a free trade area in 2008. Thus, most import duties for the period under study (2006 to 2010) were nearly, (if not totally), zero for goods originating in SADC countries.

Considering the traditional gravity trade model variables, a 1% increase in *gross domestic product* (GDP) of both the importer and exporter countries will increase intra-SADC export trade in maize by 0.97% and 0.90%, respectively. The same significant and positive impacts of GDP of both importer and exporter countries are witnessed in the case of intra-trade in both rice and wheat. This positive relationship is, as pointed earlier, according to theoretical expectations. These results compare well with the findings of most studies on gravity equations estimated on trade, including a study by Chan-Hyun (2001), Jayasinghe and Sarker (2007) and Rojid (2006). The Chan-Hyun study showed that Korea's exportation was, among other factors, propagated by both the importers' and exporter's GDPs. In particular, the paper found that a 1% increase in the product of Korea's GDP and the GDP of any of its trading partners resulted in an increase in mineral exportation by 1.1%. In the case of the Jayasinghe and Sarker's (2007) study, a 1% increase in the GDPs of the exporter and importer trading partners increased the export trade of the exporting partner by 8.24% and 17.49%, respectively. Finally, Rojid's (2006) findings showed that a 1% increase in GDP of both the importing and exporting trading partners increase export trade of the exporting partner by 0.9% and 0.8%, respectively.

The negative coefficient on *distance* is according to theoretical expectation, whereby an increase in distance will increase such things as transaction and transportation costs, among other expenses, thus resulting in a reduction in exports of all the three products. According to Table 4, a 1% increase in distance reduces intra-SADC export trade by 3.3%. Previous

studies by Marques (2008), Kandogan (2008), Baier and Bergstrand (2005), among others, also found a negative sign for the coefficient of distance in their respective gravity trade equations.

## **5 Conclusions and policy recommendations**

This study analysed the theory and evidence on the role of corruption as a barrier to trade. Our results, theoretically and empirically, have stressed the nonlinearities of that relationship, and found that corruption impedes intra-SADC trade across the three crops under study namely maize, rice and wheat. In terms of policy suggestions, the study's results provide some support to policies which reduces corruption on the basis that reducing the scope for corruption does, in the majority of cases, and especially if starting from very high levels, reduce the impediments to trade. Thus, SADC countries are encouraged, as they continue negotiating and improving on the trade facilitation, to promote transparency, reduce red-tape and diminish the scope for arbitrary decision making and cheating.

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