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Trade Protection and Tax Evasion

Evidence from Kenya, Mauritius, and Nigeria

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

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ABSTRACT

We examine the effect of trade protection rates on evasion in three African countries: Kenya, Mauritius, and Nigeria. In capturing the effect of trade protection on tariff evasion, we use a much improved measure of trade protection from MacMAP 2001 and 2004. For two of these countries, the MacMAP data set allows the novelty of using variation in trade protection across product, time, and trading partners, leading to significantly refined estimates of evasion elasticity relative to existing studies on tariff evasion. We find a positive elasticity of evasion with respect to tariffs in all three countries. Further, our results match the rankings of countries in terms of institutional quality. Greater responsiveness of evasion to the level of tariffs is established in Nigeria (comparatively weak institutional quality) vis-à-vis Kenya, and in Kenya vis-à-vis Mauritius (comparatively good institutional quality). This pattern is preserved even when focusing on the same set of trading partners and the same set of imported products for the three countries. This result is robust to controlling for protection on related products (that create incentives/opportunities for evasion) and also for degree of differentiation of the product in question (characteristics that determine the ease of detection of evasion).

Keywords: evasion, tariffs, enforcement

JEL Classifications: F13; H26; K42

1. INTRODUCTION

The effect of trade protection on tax evasion is of considerable policy interest in low-income countries because an overwhelming share of total government revenues comprises tariff revenues. Between 2001 and 2003, the trade tax revenues comprised 22 percent of total government revenues in low-income countries, while in the Organization for Economic Cooperation and Development (OECD) countries it was just 1 percent (Fukasaku 2003). For Kenya and Mauritius, in 2005 the share of taxes on international trade in central government revenues was 11 percent and 20 percent, respectively (World Development Indicators 2007; this statistic is not available for Nigeria). Even though these shares have gone down over time, they continue to be significant in government budgets. Thus, fear of a loss of a major source of revenue is widely perceived to be a deterrent to trade liberalization (see for example Ng'eno et al. 2003). However, if evasion is positively correlated with the level of trade protection, then the expectation of loss of trade revenue need not be valid.

The effect of the level of tax rate on tax evasion has been highly contentious in the literature, owing to the theoretical ambiguity about the direction of the impact as well as the problems of measurement of evasion. In a pioneering work, Allingham and Sandmo (1972) showed that the sign of the elasticity of tax evasion with respect to tax rates is ambiguous, depending on taxpayers' risk aversion and the punishment for evasion. Though the theoretical ambiguity remains for the relationship between tax rates and evasion, Bhagwati (1964) suggested that the discrepancies between a country's reported imports and the corresponding exports reported by its trading partners may be explained by the undervaluation or misclassification of imports at the border in order to reduce the tariff burden. More recently, Fisman and Wei (2004) argued that trade flows in fact offer a good opportunity to analyze the relationship between tax rates and evasion with the measurement of evasion suggested by Bhagwati (1964).

Fisman and Wei (2004) quantify this effect for trade between mainland China and Hong Kong. Following Fisman and Wei, several studies have explored the correlation between trade taxes and evasion using the reporting gap between exporting and importing country agencies. These include Levin and Widell (2007) for Kenya and Tanzania, Mishra et al. (2008) for India, Javorcik and Narciso (forthcoming) for East European countries, and Dunem and Arndt (2006) for Mozambique.

These studies use different sources of variation to assess the correlation between trade taxes and evasion. Fisman and Wei (2004) examine whether variation in tariffs across 1,600 imported goods at the harmonized system (HS) six-digit level was systematically correlated with evasion. Similarly, Levin and Widell (2007) and Dunem and Arndt (2006) use across-product variation mainly with one trading partner. Mishra et al. (2008) and Javorcik and Narciso (forthcoming) improve upon the estimation methods used in these papers by using within-product variation over time. Mishra et al. (2008) further include trade with several trading partners (top 40 trading partners of India). Their results show that controlling for product fixed effects has a significant effect on the estimates of evasion elasticity.

In this paper, we study the tariff evasion for Kenya, Mauritius, and Nigeria. The choice of the three African countries is dictated by the fact that they are highly dependent on tariffs as a source of revenue. Among these countries Mauritius ranks high in institutional quality among African countries, Nigeria is among the lowest-ranked African countries, and Kenya gets an intermediate rank. The existing studies on tariff evasion, excluding the countries in Javorcik and Narciso (forthcoming), cover countries that are all ranked below Mauritius and above Kenya and Nigeria in perceived institutional quality.

Here, we employ a much-improved trade protection data (MacMAP 2001 and 2004) relative to the existing studies. This data set provides extended measures of protection. The MAcMAP (2001 and 2004) database on trade protection includes ad valorem equivalent (AVE) of specific tariffs, AVE of tariff rate quotas, and AVE of antidumping duties apart from ad valorem tariffs. Further, the data set also captures country-specific trade protection by accounting for all regional agreements and preferential schemes.

Hence, the analysis captures evasion with respect to a more comprehensive set of trade protection variables relative to the existing measures (that focus mostly on ad valorem tariffs or Most Favored

Nation [MFN] tariffs). Though not the central focus of this paper, we find that the breadth of the measure of protection is important because estimated evasion elasticity varies with it.

In this paper, evasion is postulated to be a function of level of applied tariffs. Hence, variation in tariffs by trading partners implies that incentives to evade vary across exporters. The construction of the MacMAP data set allows us to account for this with applied tariffs varying across trading partners. Variation across trading partners is particularly important, owing to the role of some unobserved factors determining evasion. For example, the customs enforcement is likely to vary depending upon the origin of imports. Reputation effects imply that customs officials are more circumspect when the same product is shipped from particular countries. Also the mode of shipment could differ across trading partners, affecting the ease of evasion. Another trading partner characteristic that could be extremely important for determining evasion is the system of preshipment inspection (Anson et al. 2006).[1] Additionally, evidence for the exporter country characteristics to be important comes from differences in match between export- and import-country data. In the cases studied here, as well as in Mishra et al. (forthcoming), match rates tend to go up with developed country exporters.

Controlling for product, time, and trading partner fixed effects implies that our estimates are likely to be more refined, relative to the existing studies. In effect, we exploit variation across three dimensions: across product (as in Fisman and Wei 2004, Levin and Widell 2007, and Dunem and Arndt 2006), across time (product and time variation, hence as in Mishra et al. 2008, and Javorcik and Narciso forthcoming), and across trading partners. The variation in trade protection over time is much less in Kenya, and close to zero in Nigeria. Hence, for comparison between Kenya, Mauritius, and Nigeria, we rely on cross-sectional analysis for 2001 and 2004 separately and by pooling the sample of two years for the three countries.

Our results indicate that in these three African countries, the evasion elasticity is significant. Moreover, the evasion elasticity is much higher in Nigeria, followed by Kenya and then Mauritius. The difference between the three cases is preserved when comparing the same set of products and trading partners. In this case the evasion elasticity differences are likely to be a function of enforcement quality. This relative ordering of the estimated evasion elasticity in fact matches the ordering in different indexes of perceived institutional quality (e.g., as provided by Transparency International). While most indexes of institutional quality are based on perception surveys and are subject to enumerator and respondent bias, the estimated evasion elasticity particularly with the same partners and the same products could provide an objective basis for comparison of institutional quality across countries. The implicit metric for measuring institutional quality in this case is the quality of enforcement of customs regulation.

In our econometric specification, we also account for characteristics that could be correlated with enforcement such as degree of product differentiation (which is expected to make evasion more likely). Even after accounting for degree of product differentiation, the evasion elasticity continues to be higher for Nigeria relative to Kenya and higher for Kenya relative to Mauritius. The supportive evidence for enforcement being the factor determining evasion follows the Mishra et al. (2008) and Javorcik and Narciso (forthcoming) criteria of ease of detection. The authors argue that evasion is simpler with greater degree of product differentiation. In each of the countries, the evasion elasticity per se is higher for differentiated products, hinting that enforcement is weaker for such products.

This paper is organized as follows: Section 2 describes the three countries in terms of trade policy and institutional quality. Section 3 outlines the definition of the evasion measures and the methodology. Section 4 describes the data and provides summary statistics of the variables used in the paper. Section 5 presents the results of the regression analysis. Section 6 presents results for evasion with common sets of products and trading partners, and section 7 concludes.

[1] The empirical results for different countries in Anson et al. (2006) are mixed with regard to the effect of pre-shipment inspection (PSI) on import tariff evasion.

2. TRADE AND INSTITUTIONAL CHARACTERISTICS OF KENYA, MAURITIUS, AND NIGERIA

Kenya, Mauritius, and Nigeria are all members of the World Trade Organization (WTO). The three countries' tariff profiles are very similar: For Kenya, Mauritius, and Nigeria respectively, only 14.6, 17.8, and 19.2 percent of tariff lines are bound, with simple average bound tariffs equal to 95.7, 93.7, and 118.3 percent, and simple average applied tariffs equal to 12.7, 3.5, and 12 percent respectively (WTO Tariff Profiles 2006). To put the level of tariff protection in these countries in context, Table 1 gives estimates of protectionism in the African continent in 2004 with reference to world, continents, and income-level groups of countries.[2] The African continent is clearly highly protectionist, and the three countries studied here are among the most protectionist countries, with average duty on imports at 16.3, 17.8, and 26.5 percent, respectively.

Table 1. Protection applied on imports in 2004

Country	Global	Agriculture	Industry	Primary
Madagascar	3.7%	4.5%	3.6%	0.1%
Swaziland	5.2%	16.3%	4.6%	0.2%
Namibia	5.2%	16.3%	4.6%	0.2%
Lesotho	5.2%	16.4%	4.6%	0.2%
Eritrea	6.0%	8.3%	5.6%	3.1%
Rwanda	6.8%	11.6%	6.5%	4.8%
South Africa	7.0%	16.8%	6.1%	0.6%
Botswana	7.1%	17.9%	6.1%	0.6%
Uganda	7.4%	10.5%	6.3%	13.0%
Côte d'Ivoire	8.2%	12.6%	8.5%	1.3%
Mayotte	8.3%	7.0%	9.1%	0.5%
Senegal	8.3%	13.0%	8.6%	1.3%
Togo	8.3%	13.0%	8.6%	1.3%
Mauritania	8.7%	10.0%	8.9%	5.1%
Angola	8.8%	9.1%	7.2%	28.6%
Burkina Faso	9.5%	11.8%	9.2%	1.8%
Mozambique	9.5%	13.2%	8.9%	3.8%
Niger	9.5%	11.9%	9.2%	1.8%
Mali	9.5%	11.8%	9.2%	1.8%
Benin	9.6%	11.8%	9.2%	1.8%
Guinea Bissau	9.7%	11.8%	9.4%	1.8%
Zambia	10.5%	14.1%	9.9%	5.7%
Congo DR	10.6%	12.1%	10.4%	6.3%
Tanzania	10.7%	18.2%	9.4%	1.6%
Malawi	11.0%	12.5%	10.9%	1.2%

[2] Comparisons between averages from WTO's Tariff Profiles and the MacMAP-HS6 database reveal substantial differences, which can be explained by differences of computational methods (simple average vs. reference group's trade-weighted averages; MFN applied duties vs. applied duties) and different periods of reference.

Table 1. Continued

Country	Global	Agriculture	Industry	Primary
Ethiopia	12.9%	17.8%	12.1%	5.7%
Algeria	13.1%	17.5%	13.2%	7.3%
Gabon	13.8%	20.2%	13.5%	10.0%
Equatorial Guinea	13.8%	20.2%	13.5%	10.0%
Zimbabwe	14.3%	23.1%	13.5%	12.9%
Egypt	14.4%	64.7%	10.7%	3.7%
Central African Republic	15.0%	23.3%	14.6%	10.0%
Cameroon	15.0%	23.3%	14.6%	10.0%
Chad	15.1%	21.1%	13.9%	10.0%
Congo	15.1%	21.1%	13.9%	10.0%
Kenya	16.3%	29.4%	13.9%	4.2%
Ghana	17.2%	19.6%	18.7%	2.7%
Mauritius	17.8%	24.1%	17.8%	2.3%
Sudan	18.5%	25.8%	17.2%	7.5%
Morocco	19.2%	44.7%	17.3%	13.7%
Tunisia	19.6%	54.8%	17.3%	9.0%
Burundi	20.4%	27.4%	19.1%	13.3%
Libya	21.0%	13.7%	18.3%	60.5%
Nigeria	26.5%	41.8%	23.6%	14.9%
Seychelles	28.6%	44.0%	26.9%	28.0%
Djibouti	30.5%	14.9%	32.1%	32.4%
World	4.4%	15.5%	3.6%	1.5%
Africa	14.3%	27.6%	12.9%	9.9%
Asia - Oceania	6.9%	22.5%	5.8%	2.4%
Europe	2.3%	13.2%	1.5%	0.2%
North America	3.2%	7.9%	2.9%	1.7%
South America	8.2%	12.4%	8.1%	3.8%
OECD	2.8%	13.9%	2.0%	0.5%
Middle Income Countries	8.4%	19.6%	7.7%	3.9%
Least Developed Countries	12.2%	15.3%	11.5%	14.4%

Source: MacMAP-HS6 2004.

Our hypothesis is that the elasticity of fiscal evasion depends on the institutional quality of the importing country. The countries selected here follow an ordered ranking in terms of perceived institutional quality across different indexes. To rank institutional quality, an index that is often used is the Corruption Perception Index (CPI) constructed by Transparency International.[3] The CPI ranks 180 countries by their perceived levels of corruption. These perceived levels are determined by expert assessments and opinion surveys. Table 2 provides the three countries' ranks and scores in 2001 and 2004.

[3] http://www.transparency.org/policy_research/surveys_indices/cpi.

Table 2. Corruption perception index (2001 and 2004)—ranking and score

	2001		2004	
	Country Rank	**Country Score**	**Country Rank**	**Country Score**
Kenya	84/91	2.0/10	129/145	2.1/10
Mauritius	40/91	4.5/10	54/145	4.1/10
Nigeria	90/91	1.0/10	144/145	1.6/10

Source: Transparency International

Among African countries, Mauritius is clearly one of the less corrupted countries (as perceived by experts, business leaders, and external and internal stakeholders). Nigeria on the other hand is frequently pointed out as one of the worst countries in Africa in terms of perceived institutional quality and in the world in terms of corruption. Kenya gets an intermediate rank.[4]

[4] It is noteworthy that according to the last survey conducted by Transparency International in 2007, scores of Mauritius and Nigeria have improved significantly compared to 2004 (4.7 and 2.2, respectively, while Kenya's score has been stable at 2.1). Consequently, Nigeria has outranked Kenya in 2007, but the difference in score is not significant. This study focuses on 2001 and 2004, when the relevant indexes for the three countries still had Mauritius with best ranking and Nigeria with worst ranking.

3. METHODOLOGY

Basic Specification

We follow Fisman and Wei (2004) and Mishra et al. (2008) in defining the measures of evasion. The first definition of evasion in value is identical to Fisman and Wei (2004) and is defined as

$$\text{EvValue1ptc} = \log(\text{XValueptc}) - \log(\text{MValueptc}) \quad (1)$$

where EvValue1ptc refers to evasion in value of product p (at the HS six-digit level) at time t (2001 and 2004) with trading partner c (all the trading partner countries). XValueptc refers to the export value reported in year *t* by the country *c* from which the good *p* is exported to Kenya, Mauritius, or Nigeria; and MValueptc is the value of imports reported by Kenyan, Mauritian, or Nigerian authorities. Note that this measure of evasion, named definition 1, exists only when both imports as well as exports at the six-digit level appear in the data. However, a sizable number of cases exist where there is not an entry in the import data corresponding to the entries in the export data.

For these cases we follow the second measure of evasion EvValue2ptc as in Mishra et al. (2008), which is based on the extreme assumption of complete smuggling in such cases. Thus, if an export transaction is recorded by the partner country but not by the Kenyan/Mauritian/Nigerian authorities, these exports are assumed smuggled into the country, and import value is coded as zero. Thus, the second measure of evasion is defined as follows:

$$\text{EvValue2ptc} = \log(1 + \text{XValueptc}) - \log(1 + \text{MValueptc}) \quad (2)$$

Unlike Mishra et al. (2008) we do not find (for the pooled data for 2001 and 2004) that trade protection measures for those exports having no corresponding imports are significantly higher on average, thus creating greater incentives to evade taxes. In Nigeria, however, such an ordering is observed where the average applied tariff is 33.6 percent in this case, while it is 25.0 percent otherwise. For all three countries, we employ specifications with the assumption of complete smuggling as a test for robustness and also to tally with existing measures of evasion as referred to by Fisman and Wei (2004) and implemented by Mishra et al. In cross-sectional estimation on 2001, 2004, and pooled sample data with the measures of evasion as defined in equations 1 and 2, our basic specification is

$$\forall i = 1,2 \; EvValueptc = \propto + \beta * Tariff\ ptc + \rho * Tariffrelptc + \theta * (Tariffptc * d) + \varepsilon_{ptc} \quad (3)$$

where the right-hand side is specified for both measures of evasion. The main coefficient of interest is β: it measures the (semi)elasticity of evasion with respect to Tariffptc, the tariff imposed by Kenya, Mauritius, or Nigeria on product *p* coming from partner *c* at time *t*. Following Fisman and Wei (2004), in addition to under reporting of the value of imports, evasion may take the form of misclassification, that is, reporting a higher-taxed product as a lower-taxed one. To investigate this type of evasion we add the tariff on related products as an additional regressor. The variable Tariffrelptc is defined as the tax on related products (i.e. the average tariff on other products in the same HS-4 category, weighted by their value of exports from their source countries).[5]

d is the dummy that equals 1 if products are non-differentiated based on Rauch classification. Degree of differentiation is one of the intrinsic characteristics of products that may affect the ease of enforcement. The Rauch classification (Rauch 1999) distinguishes goods by whether they are homogenous goods (whose prices are widely known or quoted in exchanges) or differentiated goods (whose prices are less well known and determined more by specific transactions). Following Mishra et al. (2008), the fact that prices are widely known and quoted in exchanges make it easier for compliance, as underreporting or misclassification can be more easily spotted from available information. We thus

[5] Note that tariffs weighted by own exports are generally lower than simple averages, owing to negative relationship between level of tariffs and level of exports.

interact tariffs with the nondifferentiated dummy to capture the effect of this product characteristic on evasion.

The counterpart of equation 3 in quantity is specified as:

$\forall$i=1,2

$$\text{EvQtyiptc} = \propto + \beta * Tariff\ ptc + \rho * Tariffrelptc + \theta * (Tariffptc * d) + \varepsilon_{ptc} \quad (4)$$

where EvQtyiptc = log(XVolumeptc) – log(MVolumeptc) and EvQty2ptc =log(1+XVolumeptc) – log(1+MVolumeptc); XVolumeptc and MVolumeptc refer to trade in volume (exports and imports respectively). Thus, the equation is specified for both the measures of evasion. For a check of robustness both equations 3 and 4 are estimated for all sets of trading partners, top 20 trading partners, and top 5 trading partners, respectively.[6]

Fixed Effects Estimation

As discussed above, because trade protection data (for Mauritius in particular) based on MacMAP (2001) and MacMAP (2004) allows variation over time, products, and trading partners, we employ the following very rich specification.

Our main specification takes the following form:

$$\text{EvValueip} \propto + \beta * Tariffptc + Dp + Dt + Dc + \gamma * Tariffrelptc + \delta * (Tariffptc * d) + \in_{ptc} \quad (5)$$

The dependent variable in equation 5 is evasion, as described earlier, which is measured at product, time, and trading partner level (to match with the trade protection data). Tariffptc refers to the tariff and varies by product, time, and trading partner. D's are vectors of product, year, and trading partner fixed effects. It is important to note that given the fixed effects, our identification will rely on within-product (at the six-digit level) and partner variation over time and will not be affected by product or partner country characteristics. We cluster the standard errors at the six-digit product level, to account for potential serial correlation of evasion for a particular product. A counterpart of equation 5 is also estimated for evasion in terms of quantity that is specified in the following equation:

$$EvQtyiptc = \propto + \beta * Tariffptc + Dp + Dt + Dc + \gamma * Tariffrelptc + \delta * (Tariffptc * d) + \in_{ptc} \quad (6)$$

The generality of the specification in equations 5 and 6 implies that the endogeneity issue is much less of a concern for the coefficient on tariffs. If tariffs at the product and trading partner levels were changed between 2001 and 2004 taking into account the evasion at the product and partner levels, then it will be a concern. The identification of the coefficient of evasion elasticity relies on within-product trading partner variation over time. Such a minute basis for policymaking is highly unlikely. Hence, the richness of the specification makes the possibility of bias in coefficients to be minimal, leading to a very refined estimate of the evasion (semi)elasticity. Moreover, as Fisman and Wei (2004) have pointed out, if the government tries to protect tax revenue by setting tax rates systematically in inverse proportion to importers' ability to evade them, then the estimated elasticity will be an underestimate, implying a favorable direction of bias.

[6] It is conjectured that data with main partners is likely to have less noise.

4. DATA

Our main sources of data are twofold. The data on imports by Kenya, Mauritius, and Nigeria as recorded by their respective authorities, and on exports as recorded by authorities in countries that export to Kenya, Mauritius, and Nigeria, come from UN COMTRADE data. These data are available as a time series. The data are available at the HS six-digit level for about 4,700 products for our case. We use the data for 2001 and 2004 to match the data for trade protection from MacMAP. For details please see Bouet et al (2007).

We term the missing imports definition match rate as the proportion of cases for any particular year for which the data on exports at HS six-digit level has a counterpart entry at the import end. The corresponding extreme smuggling definition match rate is defined as the proportion of cases for any particular year for which the data on exports at HS six-digit level have a counterpart entry at the import end, plus the cases for which data on exports have no counterpart entry at the import end.

Table A.1 (in the appendix) provides summary indicators of match rates for the three countries. These rates vary by partner, country, and year. Overall, the missing imports definition match rate for the pooled sample is 35 percent for Kenya, 38 percent for Mauritius, and 30 percent for Nigeria. The extreme smuggling definition match rate percentages are much higher. In general, match rates are higher for the more advanced trading partners. In the empirical analysis, we do the analysis with all trading partners but also include the analysis restricting the sample to top 20 trading partners and top 5 trading partners. The top 20 trading partners account for more than 90 percent of trade for Kenya and Mauritius and more than 88 percent for Nigeria. The extreme smuggling definition match rate here is greater than 80 percent. The match rate changes marginally with the top 5 trading partners vis-à-vis the top 20 trading partners.

Unlike earlier studies, our measure of evasion is not averaged across partner countries since the variable of interest—Kenyan, Mauritian, and Nigerian tariffs (Nigerian tariffs do not vary with time)—varies not only by product and time but also with partner countries. The sample that makes the extreme smuggling assumption has more than 56,000 observations for Kenya and Nigeria and more than 51,000 observations for Mauritius. In the specification without the extreme smuggling assumption, the sample size reduces to about 24,000 observations for Kenya, 23,000 for Mauritius, and 26,000 for Nigeria. Note that this size of sample is for the case where we include all the trading partners.

Data on trade protection come from MacMAP 2001 and MacMAP 2004. As discussed above, the import duty from the MAcMap database includes all preferential schemes and regional agreements prevailing in 2001 and 2004 and other measures of bilateral protection (specific tariffs, tariff rate quotas, and antidumping duties). The MAcMap database is a three-dimensional database that gives for all vectors (importer/exporter/product) AVE tariffs from information on either bound MFN regime or applied MFN regime or preferential regime granted by the importer to the exporter on this product.[7] Tariff information is available at the HS six-digit level for 163 importing countries and 208 exporting countries on 5,111 products.

Figures 1, 2, and 3 show the scatter plot of the applied tariffs for Mauritius, Kenya, and Nigeria (at the product and trading partner level) for 2001 and 2004 data. At the product–trading partner level there is significantly greater variation between the two time periods for Mauritius that we exploit in the estimations of equations 5 and 6. The corresponding variation for Kenya is much smaller, and there is almost no change in the Nigerian tariff between 2001 and 2004. This is an important element to keep in mind because it will explain some of the next results.

[7] We do implement the specifications in equations 3–6 with alternate measures of protection such as specific tariffs and MFN tariffs. The results are qualitatively similar and are not reported here. Importantly, however, the estimated elasticities are significantly different.

Figure 1. Applied tariffs in Mauritius (2001 and 2004)

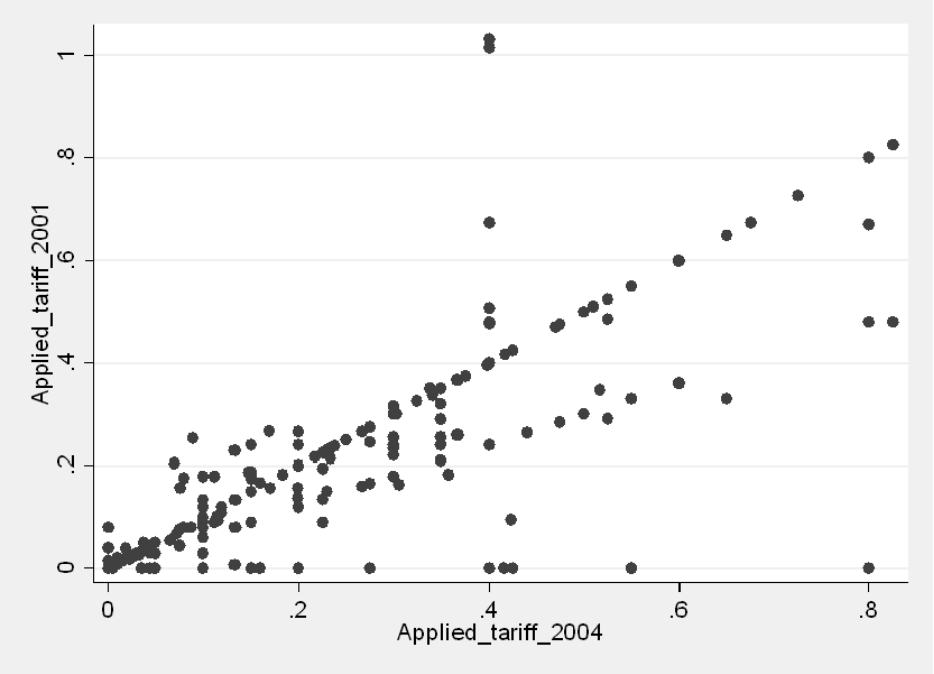

Figure 2. Applied tariffs in Kenya (2001 and 2004)

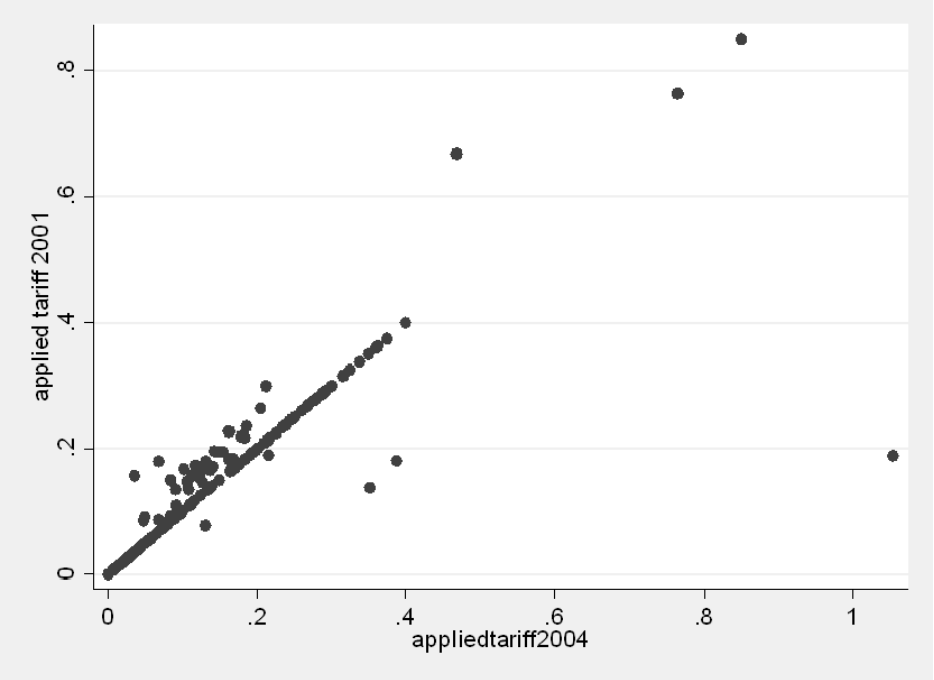

Figure 3. Applied tariffs in Nigeria (2001 and 2004)

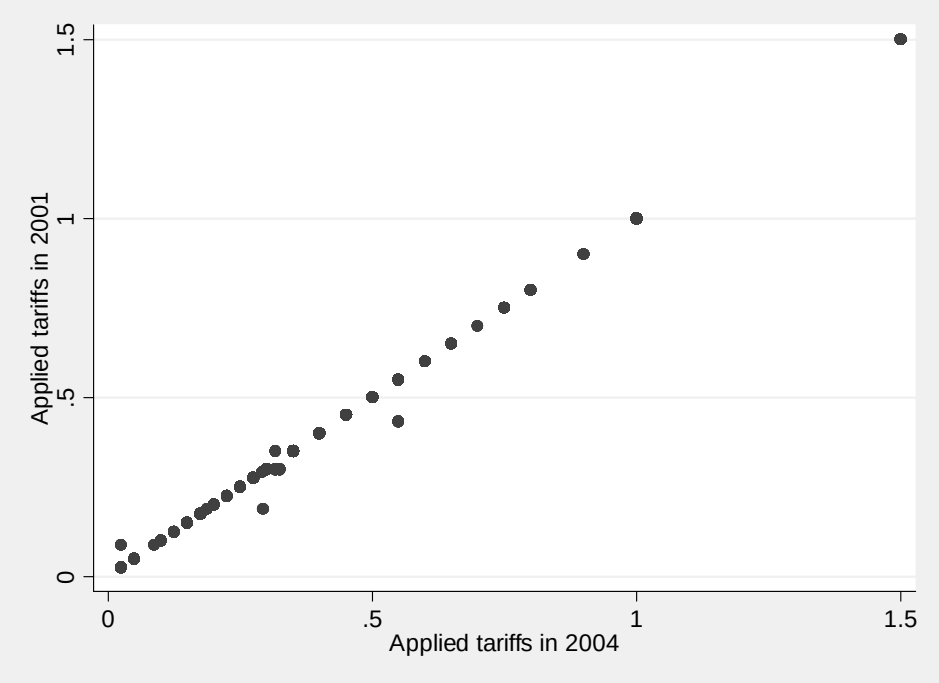

Table 3 provides summary statistics of the evasion measures used in the paper for Kenya, Mauritius, and Nigeria based on the pooled sample of 2001 and 2004.

Table 3 shows that the evasion gap is generally higher with the definition of complete smuggling, which is expected. Moreover, the variance is higher with the latter definition. The average evasion gap in value for the three countries is higher for differentiated products relative to nondifferentiated products based on Rauch (1999) classification, (0.48 in Kenya, 0.36 in Mauritius, and 0.27 in Nigeria for differentiated products; and 0.19, 0.16, and 0.20 respectively for nondifferentiated products). In quantity, it holds only for Kenya and Mauritius.

Table 3. Summary statistics for the sample

	Kenya			Mauritius			Nigeria		
	Mean	**Std dev.**	**No. of observations**	**Mean**	**Std dev.**	**No. of observations**	**Mean**	**Std dev.**	**No. of observations**
Log value of exports	9.42	2.15	24926	9.19	2.11	38158	10.94	2.31	23075
Log value of imports	9.25	1.92	24926	9.11	1.88	38158	10.73	2.16	23075
Evasion in value	0.06	1.79	24926	0.09	1.75	38158	0.214	2.21	23075
Log quantity of exports	7.14	3.29	22766	6.99	3.05	35810	8.39	3.78	23075
Log quantity of imports	6.99	3.33	22766	6.55	3.05	35810	9.68	2.65	23075
Evasion in quantity	0.09	2.76	22766	0.17	2.46	21804	-1.30	3.58	23075
Log value of exports –complete smuggling	9.42	2.15	41658	9.19	2.2	46902	9.93	2.54	53430
Log value of imports – complete smuggling	9.25	1.92	41658	9.29	1.90	46902	10.23	2.12	51394
Evasion in value – complete smuggling	0.23	6.80	41658	0.22	6.58	46902	1.85	7.55	67727
Log quantity of exports – complete smuggling	4.91	4.27	38840	6.99	3.01	45830	7.49	3.70	49848
Log quantity of imports – complete smuggling	5.13	4.15	38840	6.70	3.10	45830	9.23	2.62	51158
Evasion in quantity – complete smuggling	0.06	5.70	38840	0.22	5.21	45830	0.15	6.89	67727

5. RESULTS

Results from Cross-Sectional Analysis

Tables 4, 5, and 6 present the results from cross-sectional regression based on the first definition of evasion for Kenya, Mauritius, and Nigeria (for evasion in value). Table A.2 (in the appendix) presents the results from the evasion in value regression for Kenya, Mauritius, and Nigeria using the second definition of evasion gap. In Table A.3 (appendix) the regression results for evasion in quantity are presented.

Tables 7, 8, and 9 present the same results for Kenya, Mauritius, and Nigeria for the top five trading partners.[8] Note that these regressions need not involve the same set of products and/or trading partners. Based on the average of the two years 2001 and 2004, the top five trading partners for Mauritius are China, France, Germany, India, and South Africa. In the case of Kenya, the top five trading partners are China, India, South Africa, United Kingdom, and United States. In the case of Nigeria these are China, Germany, Italy, United Kingdom, and United States. So the only country common among the top five trading partners for Kenya, Mauritius, and Nigeria is China.

The evasion in quantity data tends to be noisier. Following the literature, we do run the specification with evasion in quantities. Resulted are reported in the appendix (Table A.3). However, for comparing across three countries we rely on evasion in value because the noise is likely to be smaller in value data than in quantity data.

The columns in Tables 4–9 present results with increasing level of generality by adding controls. Moving across the columns, we add controls for effective incentives to evade taxes in terms of tariffs on related products and interaction of tariffs with dummies for nondifferentiation, the variables which are expected to capture the incentive to misclassify and evade and ease evasion, respectively.

The results in Tables 4–9 suggest that in Kenya, Mauritius, and Nigeria there is evidence for positive and significant elasticity of tariff evasion. The controls, average tariffs on related products, and interaction of tariffs with indicator for nondifferentiation have the expected negative sign in most specifications. The sign of the coefficient (and if it is significant) suggests that greater is the tariff on related products, lower is the elasticity of tariff evasion. If misclassification by listing the product as some other similar products is the channel to evade taxes, then incentive to evade taxes is lower with higher tariffs on those similar or related products. Also, the coefficient on interaction between the indicator variable for nondifferentiated product with tariffs is usually negative, indicating that as postulated the evasion is higher in differentiated products.

The results also indicate that measured evasion elasticity is sensitive to the exact measure of protection. Results reported in the appendix show that the estimates are different if the MFN tariffs are used compared with a case where actual applied tariffs are used. Similarly, it matters whether or not AVE of specific tariffs are included in the measure. Though we do not pursue this point, we believe that this is an important consideration as existing estimates from several studies (based only on MFN tariffs or only ad valorem tariffs) are hence prone to measurement errors. Table A.4 in the appendix presents the difference in estimates from cross-sectional regression when MFN tariffs are used versus when actual applied tariffs are used.

Comparing the estimates for Kenya, Mauritius, and Nigeria, the (semi)elasticity of evasion is higher for Nigeria relative to Kenya, and higher for Kenya relative to Mauritius. This is true in almost all specifications, including the regressions restricted to the sample with the top five trading partners. We will see later that this ordering of the estimated (semi)elasticity holds in most cases, even when focusing on the same set of products and identical set of trading partners for Kenya, Mauritius, and Nigeria. Further, in specifications that control for all possible fixed effects, the significance of applied tariffs on evasion vanishes for Mauritius in some specifications.

[8] Similar analysis has been done for the top 20 partners. Results are qualitatively similar and are not reported here.

Table 4. Cross-sectional results for evasion in value (Kenya)—all trading partners

Coefficient	2001	2004	Pooled	2001	2004	Pooled	2001	2004	Pooled
Applied tariff	0.815***	1.036***	0.927***	1.354***	1.340***	1.360***	1.434***	1.400***	1.434***
	(0.12)	(0.17)	(0.10)	(0.28)	(0.41)	(0.24)	(0.28)	(0.41)	(0.24)
Tariff on related products				-0.612**	-0.211	-0.421*	-0.600**	-0.217	-0.419*
				(0.29)	(0.43)	(0.25)	(0.29)	(0.43)	(0.25)
Nondifferentiated dummy X tariff							-0.602***	-0.416	-0.536***
							(0.20)	(0.27)	(0.16)
Constant	-0.175***	-0.0712*	-0.134***	-0.171***	-0.0789*	-0.136***	-0.165***	-0.0733*	-0.130***
	(0.027)	(0.036)	(0.022)	(0.031)	(0.042)	(0.025)	(0.031)	(0.042)	(0.025)
Observations	11204	8222	19426	9457	7146	16603	9457	7146	16603
R-squared	0.001	0.001	0.001	0.001	0.01	0.001	0.01	0.01	0.01

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level.

Table 5. Cross-sectional regression for evasion in value (Mauritius)—all trading partners

Coefficient	2001	2004	Pooled sample	2001	2004	Pooled sample	2001	2004	Pooled sample
Applied tariff	0.231***	0.173**	0.193***	0.405**	0.649***	0.515***	0.492***	0.640***	0.552***
	(0.064)	(0.076)	(0.049)	(0.16)	(0.18)	(0.12)	(0.16)	(0.18)	(0.12)
Tariff on related products				-0.251	-0.583***	-0.416***	-0.262	-0.582***	-0.421***
				(0.17)	(0.19)	(0.13)	(0.17)	(0.19)	(0.13)
Nondifferentiated X tariff interaction							-0.261**	0.0298	-0.115
							(0.11)	(0.13)	(0.087)
Constant	-0.0810***	-0.304***	-0.179***	-0.0647***	-0.264***	-0.152***	-0.065***	-0.264***	-0.152***
	(0.022)	(0.028)	(0.018)	(0.025)	(0.032)	(0.020)	(0.025)	(0.032)	(0.020)
Observations	10004	8207	18211	8592	7172	15764	8592	7172	15764
R-squared	0.001	0.003	0.004	0.001	0.003	0.005	0.001	0.003	0.005

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table 6. Cross-sectional regression for evasion in value (Nigeria)—All trading partners

Coefficient	2001	2004	Pooled	2001	2004	Pooled	2001	2004	Pooled
Applied tariff	1.219***	1.587***	1.404***	1.135*	2.037***	1.614***	1.242**	2.053***	1.671***
	(0.148)	(0.148)	(0.105)	(0.602)	(0.588)	(0.421)	(0.608)	(0.582)	(0.424)
Tariff on related products				0.107	-0.338	-0.144	0.136	-0.335	-0.132
				(0.615)	(0.596)	(0.432)	(0.617)	(0.596)	(0.432)
Nondifferentiated dummy X tariff							-0.372	-0.062	-0.204
							(0.227)	(0.229)	(0.161)
Constant	0.046	-0.272***	-0.120***	0.067	-0.286***	-0.117***	0.061	-0.287***	-0.12
	(0.046)	(0.045)	(0.032)	(0.052)	(0.051)	(0.036)	(0.052)	(0.051)	(0.037)
Observations	5428	6158	11586	4559	5238	9797	4559	5238	9797
R-squared	0.013	0.020	0.016	0.013	0.022	0.018	0.014	0.023	0.018

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table 7. Cross-sectional regression for evasion in value (Kenya)—top five trading partners

Coefficient	2001	2004	Pooled sample	2001	2004	Pooled sample	2001	2004	Pooled sample
Applied tariff	0.672***	0.878***	0.779***	0.996**	0.959**	0.981***	1.045***	0.996**	1.025***
	(0.18)	(0.22)	(0.14)	(0.39)	(0.48)	(0.31)	(0.39)	(0.48)	(0.31)
Tariff on related products				-0.408	-0.0765	-0.237	-0.402	-0.0735	-0.232
				(0.41)	(0.51)	(0.33)	(0.41)	(0.51)	(0.33)
Nondifferentiated X tariff interaction							-0.414	-0.316	-0.374*
							(0.29)	(0.33)	(0.22)
Constant	-0.209***	-0.106**	-0.160***	-0.203***	-0.109**	-0.158***	-0.198***	-0.106**	-0.155***
	(0.041)	(0.049)	(0.032)	(0.046)	(0.053)	(0.035)	(0.046)	(0.053)	(0.035)
Observations	5282	5021	10303	4714	4596	9310	4714	4596	9310
R-squared	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table 8. Cross-sectional regression for evasion in value (Mauritius)—Top five trading partners

Coefficient	2001	2004	Pooled sample	2001	2004	Pooled sample	2001	2004	Pooled sample
Applied tariff	0.222**	0.403***	0.285***	0.425*	0.695***	0.546***	0.519**	0.673***	0.579***
	(0.089)	(0.11)	(0.069)	(0.22)	(0.25)	(0.17)	(0.23)	(0.25)	(0.17)
Tariff on related products				-0.294	-0.356	-0.342*	-0.309	-0.355	-0.346*
				(0.23)	(0.27)	(0.18)	(0.23)	(0.27)	(0.18)
Nondifferentiated X tariff interaction							-0.308**	0.0845	-0.119
							(0.15)	(0.18)	(0.11)
Constant	-0.157***	-0.524***	-0.313***	-0.144***	-0.503***	-0.297***	-0.144***	-0.503***	-0.297***
	(0.030)	(0.040)	(0.025)	(0.033)	(0.044)	(0.027)	(0.033)	(0.044)	(0.027)
Observations	5273	4118	9391	4760	3747	8507	4760	3747	8507
R-squared	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table 9. Cross-sectional regression for evasion in value (Nigeria)—top five trading partners

Coefficient	2001	2004	Pooled sample	2001	2004	Pooled sample	2001	2004	Pooled sample
Applied tariff	1.182***	2.1***	1.664***	2.023**	2.909***	2.495***	1.997**	3.015***	2.534***
	(0.252)	(0.251)	(0.179)	(0.908)	(0.892)	(0.642)	(0.913)	(0.9)	(0.647)
Tariff on related products				-0.859	-0.714	-0.79	-0.866	-0.689	-0.78
				(0.924)	(0.921)	(0.658)	(0.924)	(0.921)	(0.658)
Nondifferentiated X tariff interaction							0.109	-0.395	-0.156
							(0.376)	(0.354)	(0.258)
Constant	0.099	-0.499***	-0.224***	-0.113	-0.494***	-0.214***	0.115	-0.505***	-0.217***
	(0.079)	(0.074)	(0.054)	(0.084)	(0.08)	(0.058)	(0.085)	(0.081)	(0.059)
Observations	2035	2490	3981	1843	2270	4113	1843	2270	4113
R-squared	0.115	0.032	0.042	0.012	0.036	0.023	0.012	0.037	0.023

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Among the three countries, a study on tariff evasion exists only in the case of Kenya, which is constrained, however, by the use of a small sample. Even though Kenya ranks low in the index of institutional quality, Levin and Widell (2007) argue that between 2001 and 2004, the overall bribery index declined in Kenya. The Kenyan tax authority was in fact ranked as one of the most improved organizations within the country in 2004. A simple test for the improvement in institutional quality during this time period would be a decline in tariff evasion after controlling for characteristics that determine enforceability. Our results indicate that this is hardly true, and after controlling for incentives for evasion and potential for evasion in terms of differentiation in products or focusing on the same set of products for the two time periods, the evasion elasticity in 2004 continues to be significant for Kenya and is as high (if not higher) as in 2001.

Levin and Widell (2007), who assess the evasion elasticity for Kenya (in values) for imports coming in from Tanzania, do not find significant evasion elasticity for Kenya after adding controls for tariffs on related products. In the specification where Levin and Widell do find significant evasion elasticity, the estimate for 2004 is 1.8. Compared with our estimates for 2004, the estimated elasticity is lower in our case. With the addition of controls, the highest estimate of elasticity is 1.4, still 0.4 points below the estimate in Levin and Widell. However, like Levin and Widell, we do find that evasion elasticity in Kenya has risen over time. Looking at the restricted sample of Tanzania as exporter, as Levin and Widell do, but using the MacMAP data set for trade protection, we also find insignificant estimates of evasion elasticity (though still lower than Levin and Widell). As in Levin and Widell, the sample size is extremely small (only 72 data points).

Levin and Widell (2007) also analyze evasion with respect to trade only with the UK. To compare with Levin and Widell, the estimated evasion elasticity for trade with the UK is positive and insignificant (as in Levin and Widell). Our evidence, however, is based on a much larger sample and using a broader measure of protection from MacMAP (2001 and 2004). The results for the data on top five trading partners (Table 5), however, shows positive and significant elasticity of evasion in a sample that includes the UK as well.

The difference in our estimates with the existing estimate for Kenya can be explained based on several factors. First, our estimated elasticity comes from use of data for all trading partners or top five trading partners and not one country (Tanzania or UK) as in Levin and Widell (2007). The sample in Levin and Widell is extremely small, with a maximum of 160 observations. Hence, their estimates are likely to be highly imprecise. In this paper, the estimated elasticity for Kenya is the average across all trading partners. Secondly, our trade protection measure is different from the ones used in Levin and Widell.

Further, point estimates exist for different countries, based on cross-sectional regressions starting with the pioneering work by Fisman and Wei (2004). The point estimates for Tanzania in Levin and Widell (2007) are much higher at 3.8. Dunem and Arndt (2006) apply the cross-sectional methodology of Fisman and Wei (2004) to the imports of Mozambique from South Africa in 2003. The estimated coefficient in their case is 1.4. Estimates of elasticity in 2004 for evasion in value for other African countries are generally higher than for Kenya, except for Mozambique, which is nearly identical. Similar point estimates exist for non-African countries: China from Fisman and Wei (2004) and India from Mishra et al. (2008). Without adding any controls the point estimates are 2.7 and 0.9, respectively, in the two studies. In Javorcik and Narciso (forthcoming), the highest estimate of evasion elasticity is for Ukraine at 0.04.

Interestingly, all these countries are ranked higher than Kenya and Nigeria and lower than Mauritius in the Corruption Perceptions Index of Transparency International. However, the caveat is that de facto institutional quality might require evasion elasticity to be estimated using data sets for the same trading partners, products, and also time periods. Without focusing on the same set of products and trading partners, the comparison shows that the link between perceived institutional quality and observed tax evasion could be weak and not necessarily monotonic.

The estimation of the (semi)elasticity of evasion as discussed above exploits only one source of variation to identify the effects of tariffs on evasion, namely, across products. However, exploiting

variation only across products has some limitations. As Mishra et al. (2008) have argued, if tariffs are systematically correlated with some other aspect of the product (say ease of enforcement) that also affects evasion, then including the time variation can control for such product-specific characteristics. This can better isolate the impact of tariffs on evasion. Mishra et al. motivate their analysis by exploiting the variation in tariffs within six-digit products over time for India and deem it a very general and demanding specification. Similar identification strategy has been used in Javorcik and Narciso (forthcoming).

However, one variation that the data set in Mishra et al. (2008) and Javorcik and Narciso (forthcoming) do not use is across trading partners. In the next section we run specification that captures the variation across all three dimensions (for Kenya and Mauritius). Figure 2 shows that for Kenya, the variation across time is limited. It is negligible in the case of Nigeria. Hence, the identification that relies on within-product trading partner relationships over time is constrained by only a small number of observations varying over time, with the magnitude of variation itself being small. It cannot be carried out in the case of Nigeria. In case of Mauritius, however, there is sizeable variation over time in the product/trading partner–specific trade protection measure.

Results from Fixed Effects Regression

The estimated (semi)elasticity of evasion for values and quantities in the two cases discussed above captures the effect by exploiting only the variation across products. It is plausible that there are unobserved product and trading partner characteristics that bias the coefficients on tariffs. Evasion is more likely, for example, if the product is bulkier. Evasion is also more likely if it is more easily identified by inspectors in terms of originating from countries where there is a greater ex-ante subjective assessment of potential for evading taxes or smuggling.

Table 10 presents the results from regression on the pooled sample for 2001 and 2004 respectively, where for Kenya, trading partner and product fixed effects are added one by one in columns 2 and 3 respectively. The fourth column adds all the fixed effects. Columns 5 and on repeat the same exercise for Mauritius and Nigeria. Tables A.5 and A.6 in the appendix provide the same results for evasion in quantity using the two definitions.

The results in Tables 10 and 11 show the importance of adding trading partner and product fixed effects. In the three cases, adding a trading partner fixed effect changes the coefficient of evasion to some extent, but only marginally in the case of Nigeria. However, in the case of Kenya and Mauritius, a much greater impact occurs because of the addition of product fixed effects. Also, note that the addition of product fixed effects is important enough to even outdo the significance of the coefficient on evasion for Mauritius.

The results from the fixed effects estimation provide strong evidence for evasion elasticity to be significant in Kenya. In the case of Mauritius, not only is the evasion elasticity lower, but after controlling for product and trading partner unobserved characteristics, the evasion elasticity is no longer significant. As far as Nigeria is concerned, owing to the absence of variation across time, we only add the trading partner fixed effects. In this case the evasion elasticity is greater as compared with Kenya and Mauritius.

Table 11 presents the results from fixed effects regressions using the second definition of evasion, with which the estimated evasion elasticity is higher for the three countries. Again, addition of all fixed effects wipes away the significance of the coefficient of applied tariff variable in the case of Mauritius, and when only trading partner fixed effects are added, the evasion elasticity is much bigger in Nigeria.

We find that controlling for product fixed effects nearly doubles the estimate from pooled sample cross-sectional regression for Kenya for both evasion in value and evasion in quantity. This contrasts with Mishra et al. (2008), where addition of the product fixed effects actually reduces the coefficient of elasticity of evasion. Nevertheless the point remains that as the magnitude of the coefficient changes significantly, there is a systematic correlation between our trade protection measures and product characteristics relevant for evasion. One of the characteristics—whether or not good is differentiated—we control for in the specifications above. However, several other product characteristics, observed and unobserved, could correlate with product-specific amenability to evasion and therefore bias the results.

Hence, the inclusion of the product fixed effects is likely to refine the estimates. It also implies that estimation of evasion elasticity based on exploiting only the product-level variation as in several studies discussed above potentially leads to inconsistent estimates.

A result that is novel in the fixed effect regressions above for Kenya, Mauritius, and Nigeria is that the trading partner fixed effects have a significant effect on the estimates of evasion elasticity. This trading partner specificity in evasion has not been captured in any of the existing studies. In the results above, note that adding the trading partner fixed effects actually brings down the coefficient on tariffs. There are several ways in which, for the same products and at the same time, evasion could be related to whom the trading partner is. For example, it could be correlated with mode of transport. Mishra et al. (forthcoming), for example, find that evasion differs based on mode of entry (by air or by sea). Otherwise, evasion technology that is largely unknown can be conjectured to require inputs from both exporter and importer. For example, exporters and importers could collude with an implicit or explicit side payment to foster evasion. Similarly, historical reputation of trade with some particular trading partners often determines the bias of inspectors and could ease or tighten enforcement. All these possibilities are likely to be correlated with characteristics of the trading partner, for example, unobserved institutional quality.

Table 10. Fixed effects regression for evasion value in Kenya, Mauritius, and Nigeria (all trading partners—first definition)

Coefficient	Kenya			Mauritius			Nigeria		
Applied tariff	1.335***	2.658***	2.939**	0.564***	0.460	0.662	1.675***	n.a.	n.a.
	[0.291]	[1.025]	(1.306)	[0.169]	[0.393]	[0.409]	(0.559)		
Tariff on related products	-0.524*	-0.854	-0.825	-0.411**	-0.433	-0.168	-0.151	n.a.	n.a.
	[0.304]	[0.813]	[0.856]	[0.175]	[0.332]	[0.333]	(0.557)		
Nondifferentiated dummy X tariff	-0.436**	-3.409**	-1.832	-0.109	0.187	0.731	-0.2	n.a.	n.a.
	[0.208]	[1.389]	[1.340]	[0.126]	[0.937]	[0.902]	(0.2)		
Product fixed effect		Y	Y		Y	Y			
Trading partner fixed effect	Y		Y	Y		Y	Y		
Time fixed effect			Y			Y			
Observations	16604	16604	16604	15764	15764	15764	9797	n.a.	n.a.
R-squared	0.24	0.27	0.29	0.04	0.29	0.33	0.041	n.a.	n.a.

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level, n.a. is not applicable

Table 11. Fixed effects regression for evasion value in Kenya, Mauritius, and Nigeria (all trading partners—second definition)

Coefficient	Kenya			Mauritius			Nigeria		
Applied tariff	2.996***	2.658***	14.088***	0.318	1.878**	-0.077	7.311***	n.a.	n.a.
	[0.807]	[1.025]	[2.345]	[0.388]	[0.873]		(1.211)		
						[0.781]			
Tariff on related products	-0.381	-0.854	-0.556	-0.553	-0.192	0.294	-1.02	n.a.	n.a.
	[0.831]	[0.813]	[2.105]	[0.395]	[0.751]		(1.216)		
						[0.654]			
Nondifferentiated dummy X tariff	-2.468***	-3.409**	1.577	-1.324***	0.745	0.528	-3.189***	n.a.	n.a.
	[0.550]	[1.389]	[2.421]	[0.284]	[1.433]	[1.367]	(0.439)		
Product fixed effect		Y	Y		Y	Y		Y	Y
Trading partner fixed effect	Y			Y		Y	Y		Y
Time fixed effect						Y			Y
Observations	32768	16604	32768	30726	30726	30726	20829	n.a.	n.a.
R-squared	0.20	0.27	0.25	0.16	0.25	0.44	0.164	n.a.	n.a.

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level, n.a. is not applicable

6. COMMON SET OF PRODUCTS AND TRADING PARTNERS

The comparison among Kenya, Mauritius, and Nigeria as discussed above does not put any restriction on the set of trading partners or imported products. The analysis above shows that both the products and the trading partners with which evasion is considered matter. As discussed above, a more meaningful comparison of tariff evasion between Kenya, Mauritius, and Nigeria would be restricting the sample to the same set of traded products and trading partners. There are three ways in which we restrict samples for comparison. First we restrict the sample for all three countries to include the same set of traded products. Next we restrict it to contain the same set of trading partners. Finally, the samples are restricted to contain the same set of trading partners as well as products. Below we conduct the same analysis as above but impose these restrictions. Table 12 presents the results from cross-sectional regression with these restrictions. Table A.7 in the appendix presents the same results for the second definition of evasion.

These results show that even after restricting ourselves to a sample that is directly comparable across the three countries, we find consistent evidence for the evasion elasticity to be significantly higher in Nigeria vis-à-vis Kenya, and in Kenya vis-à-vis Mauritius. We do have an exception for Nigeria in the case of perfectly matched trade by products and trading partners. This occurs while we employ the first definition of evasion. Note that comparatively the Nigeria sample is small, containing a large number of missing imports in the matched sample. Indeed, using the second definition, the estimates of evasion elasticity for Nigeria are significantly higher both in the absolute sense as well as in comparison with Kenya and Mauritius.

In a sample that imposes the restriction of matched trade, comparison is most meaningful because difference in estimates is not driven by differences in product or trading partner characteristics but by countries' levels of trade protection and their efficiency in enforcement.

In the analysis above, there is one reason to believe that our estimate of the evasion elasticity might be biased downward. Recall that the policy measure that we use is applied tariffs. Though the measure of applied tariffs (from MacMAP) is extensive and incorporates several instruments of trade protection, yet one important measure that could be missing in the analysis is the quantitative restriction. It is not clear how extensive these measures are, and good product-level measures of such restrictions do not exist. Note that the three countries are members of WTO, and therefore several quantitative restrictions would have been reduced over time.

Table 12. Cross-sectional regression Kenya, Mauritius, and Nigeria (common universe of products or trading partners, and perfectly matched trade)—First definition of evasion

	Same products			Same trading partners			Same trading partners and same products (matched)		
	Evasion value			Evasion value			Evasion value		
	Kenya	Mauritius	Nigeria	Kenya	Mauritius	Nigeria	Kenya	Mauritius	Nigeria
Applied tariff	1.44***	0.52***	1.69***	1.42***	0.36***	1.59***	1.559***	0.811***	0.555
	0.23	0.12	0.42	0.23	0.12	0.42	0.38	0.23	0.83
Tariff on related products	-0.39	-0.36***	-0.09	-0.40*	-0.39***	-0.00	-0.3	-0.373	1.511*
	-0.24	-0.12	-0.43	-0.24	-0.13	-0.43	-0.39	-0.23	-0.85
Nondifferentiated dummy X tariff	-0.47***	0.11	-0.33**	-0.29***	1.10***	0.32	-1.177***	-0.659***	-0.843***
	-0.14	-0.07	-0.15	-0.08	-0.07	-0.2	-0.24	-0.14	-0.32
Constant	-0.12***	-0.14***	-0.10***	-0.12***	-0.23***	-0.20***	-0.226***	0.0287	0.158*
	-0.021	-0.01	-0.04	-0.02	-0.02	-0.04	-0.045	-0.038	-0.082
Observations	22281	24272	10864	23373	20776	10515	5122	4387	2160
R-squared	0.01	0.01	0.02	0.01	0.01	0.02	0.01	0.01	0.03

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

7. CONCLUSIONS

In this paper, we use the case of Kenya, Mauritius, and Nigeria to examine the effect of tariff policies on evasion. The analysis was motivated by the relative ordering of these three African countries in terms of their perceived institutional quality and the fact that in these countries tariff revenues constitute a very important component of the government budget. The methodological contribution of the paper has been to better identify the effect of tariffs on evasion using the variations in trade protection measures across three dimensions (time, product, and trading partner). We also find evidence for the effect of enforcement-related factors on evasion elasticity.

Our main findings are as follows. First, we find a significant and robust impact of tariffs on evasion (semielasticity) for Kenya and Nigeria in different specifications. The result on Mauritius provides weaker evidence for the relationship between evasion and trade protection. Further, we find evidence that the evasion elasticity is affected by product-related characteristics that potentially capture the ease of enforcement. For differentiated products, in most specifications we find that the elasticity of evasion is higher.

The ranking of estimated evasion elasticity actually matches the ranking of these countries in terms of institutional quality. However, this evidence is not necessarily supportive of a monotonic relationship between evasion and institutional quality. The evidence from different studies does map well with rankings in terms of institutional quality vis-à-vis the estimated evasion elasticities for Kenya, Mauritius, and Nigeria. Still, the aggregative nature of the institutional quality indexes implies that this mapping may be far from perfect. Hence, the Kenya bribery index seems to have improved over time, but the estimate of evasion elasticity also seems to have risen between 2001 and 2004.

The results here suggest that the evasion gap is positively correlated with trade protection measures, especially in Kenya and Nigeria. Thus, the evasion gap can potentially be reduced through trade reform. Importantly, it is possible that trade reform can lead to higher, and not necessarily lower, tax revenues.

APPENDIX SUPPLEMENTARY TABLES

Table A.1. Match rates for Kenya, Mauritius, and Nigeria for the pooled 2001 and 2004 sample

Coverage	Assumption about missing imports	Kenya	Mauritius	Nigeria
Full sample	Missing	33%	38%	30%
Top 20 trading partners	Missing	43%	42%	39%
Top 5 Trading Partners	Missing	50%	52%	48%
Full sample	Extreme smuggling	80%	83%	83%
Top 20 trading partners	Extreme smuggling	83%	84%	84%
Top 5 Trading Partners	Extreme smuggling	84%	85%	85%

Table A.2. Cross-sectional results on evasion in value using the second definition of evasion gap

Coefficient	Kenya (Pooled sample)	Mauritius (Pooled sample)	Nigeria (Pooled Sample)
Applied tariff	3.483***	0.327	7.52***
	(0.64)	(0.29)	(0.91)
Tariff on related products	-0.0689	-0.689**	-0.51
	(0.67)	(0.29)	(0.92)
Nondifferentiated X tariff interaction	-2.811***	-1.345***	-3.15***
	(0.40)	(0.21)	(0.3)
R-squared	0.01	0.001	0.05
Observations	32678	30725	20829

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table A.3. Cross-sectional results on evasion in quantity

Coefficient	Kenya (Pooled sample)		Mauritius (Pooled sample)		Nigeria (Pooled sample)	
	First definition of evasion gap	Second definition of evasion gap	First definition of evasion gap	Second definition of evasion gap	First definition of evasion gap	Second definition of evasion gap
Applied tariff	0.281	2.585***	0.214	0.427*	1.48***	8.14***
	(0.37)	(0.59)	(0.15)	(0.23)	(0.67)	(0.89)
Tariff on related products	-0.949**	-0.568	-0.866***	-1.031***	2.26 ***	0.70
	(0.38)	(0.61)	(0.16)	(0.23)	(0.68)	(0.90)
Nondifferentiated X tariff interaction	0.772***	-1.898***	-0.0132	-1.246***	-2.10***	-4.55***
	(0.25)	(0.36)	(0.12)	0.17)	(0.24)	(0.31)
Observations	15053	32563	14675	30601	9000	20829
R-squared	0.01	0.002	0.01	0.003	0.03	0.08

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table A.4. Evasion with respect to MFN tariffs and applied tariffs in Kenya and Mauritius

Coefficient	evasion_val (Kenya)	evasion_val (Kenya)	evasion_val (Mauritius)	evasion_val (Mauritius)
ut_uv	0.927***		0.193***	
	(0.10)		(0.049)	
mfn_uv		0.787***		0.150***
		(0.12)		(0.047)
Constant	-0.134***	-0.171***	-0.179***	-0.172***
	(0.022)	(0.027)	(0.018)	(0.018)
Observations	19426	11204	18211	18211
R-squared	0.001	0.001	0.001	0.001

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table A.5. Fixed effects regression for evasion in quantity in Kenya, Mauritius, and Nigeria (All trading partners—First definition)

Coefficient	Kenya			Mauritius			Nigeria		
Applied tariff	0.252	2.247	4.131*	0.239	0.728	0.931*	1.565	n.a.	n.a.
	[0.491]	[1.782]	[2.720]	[0.197]	[0.490]	[0.526]	(1.087)		
Tariff on related products	-0.850	-2.514*	-1.904	-0.801***	-0.615	-0.324	1.93	n.a.	n.a.
	[0.496]	[1.335]	[1.367]	[0.206]	[0.413]	[0.424]	(1.087)		
Nondifferentiated dummy X tariff	0.711*	-5.338*	-1.542	-0.051	-0.647	-.0.082	-2.03***	n.a.	n.a.
	[0.392]	[2.763]	[2.689]	[0.172]	[1.072]	[1.047]	(0.43)		
Product fixed effect		Y	Y		Y	Y		Y	Y
Trading partner fixed effect	Y		Y	Y		Y	Y		Y
Time fixed effect			Y			Y			Y
Observations	15054	15054	15054	14676	14676	14676	9000	n.a.	n.a.
R-squared	0.28	0.31	0.34	0.04	0.33	0.37	0.103	n.a.	n.a.

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level, n.a. not applicable

Table A.6. Fixed effects regression for evasion in quantity in Kenya, Mauritius, and Nigeria (all trading partners—second definition)

Coefficient	Kenya			Mauritius			Nigeria		
Applied tariff	2.306***	11.644***	5.070**	0.391	2.234***	0.754	7.846***	n.a.	n.a.
	[0.771]	[2.027]	[2.452]	[0.330]	[0.697]	[0.650]	(1.17)		
Tariff on related products	-0.741	-0.721	-0.731	-0.979***	-0.502	-0.391	-0.25	n.a.	n.a.
	[0.801]	[1.919]	[1.868]	[0.338]	[0.573]	[0.532]	(1.171)		
Nondifferentiated dummy X tariff	-1.735***	0.726	-0.331	-1.218***	-0.020	-0.524	-4.39***	n.a.	n.a.
	[0.555]	[2.097]	[1.696]	[0.256]	[1.336]	[1.243]	(0.479)		
Product fixed effect		Y	Y		Y	Y		Y	Y
Trading partner fixed effect	Y		Y	Y		Y	Y		Y
Time fixed effect			Y			Y			Y
Observations	32564	32564	32564	30602	30602	30602	20829	n.a.	n.a.
R-squared	0.19	0.27	0.43	0.12	0.27	0.40	0.164	n.a.	n.a.

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

Table A.7. Cross-sectional regression Kenya, Mauritius, and Nigeria (common universe of products or trading partners, and perfectly matched trade)—Second definition

	Same products			Same trading partners			Same trading partners and same products (matched)		
	Evasion value			Evasion value			Evasion value		
	Kenya	Mauritius	Nigeria	Kenya	Mauritius	Nigeria	Kenya	Mauritius	Nigeria
Applied tariff	3.76***	0.47***	7.93***	5.86***	0.80***	7.70***	3.14***	0.15	6.20***
	[-0.64]	[-0.12]	[-0.92]	[-0.65]	[-0.29]	[-0.93]	[-0.79]	[-0.48]	[-1.55]
Tariff on related products	-0.13	-0.28**	0.03	4.15***	1.49***	1.09	0.9	-0.46	1.25
	[-0.66]	[-0.12]	[-0.92]	[-0.66]	[-0.3]	[-0.94]	[-0.81]	[-0.49]	[-1.58]
Nondifferentiated dummy X tariff	-3.57***	0.10	-4.43***	-4.78***	0.24	-1.52***	-3.71***	-1.03***	-5.29***
	[-0.35]	[-0.07]	[-0.27]	[-0.37]	[-0.25]	[-0.29]	[-0.49]	[-0.32]	[-0.55]
Constant	0.26***	-0.14***	0.85***	-1.14***	-1.47***	-0.66***	0.94***	3.13***	2.10***
	[-0.06]	[-0.02]	[-0.07]	[-0.05]	[-0.04]	[-0.07]	[-0.09]	[-0.09]	[-0.15]
Observations	47042	24330	25975	49623	54788	29711	6219	5920	3338
R-squared	0.01	0.01	0.07	0.04	0.01	0.06	0.02	0.01	0.1

Notes: *** denotes significance at 1% level, ** denotes significance at 5% level and * denotes significance at 10% level

REFERENCES

Allingham, Michael G., and Agnar Sandmo. 1972. Income tax evasion: A theoretical analysis. *Journal of Public Economics* 1:323–38.

Anson, José, Olarreaga, Marcelo and Cadot, Olivier,Tariff Evasion and Customs Corruption: Does Pre-Shipment Inspection Help?(October 2003). World Bank Policy Research Working Paper No. 3156

Bhagwati, Jagdish. 1964. On the underinvoicing of imports. Bulletin of the Oxford University Institute of Economics and Statistics, 26 (November), 389–97.

Bouët A., Y. Decreux, L. Fontagné, S. Jean, and D. Laborde. 2007. A consistent measure of applied protection. *Review of International Economics*, forthcoming.

Dunem, João E. Van, and Channing Arndt. 2006. Confronting the issue of the elasticity of customs evasion in Mozambique: An empirical study. Ninth Annual Conference on Global Economic Analysis. Addis Ababa, Ethiopia. June 2006. https://www.gtap.agecon.purdue.edu/events/Conferences/default.asp#Past.

Fisman, Raymond, and Shang-Jin Wei. 2004. Tax rates and tax evasion: Evidence from missing imports in China. *Journal of Political Economy* 112 (2): 471–96.

Fukasuku, K. 2003. Fiscal Impact of Trade Liberalization. A Review of Recent Country Experiences in Africa, Ad-hoc Expert Group Meeting of UNECA in Addis Ababa, Ethiopia. October 1–2, 2003.

Javorcik, B., and G. Narciso. Forthcoming. Differentiated goods and evasion of import tariffs. *Journal of International Economics.*

Kenya Bribery Index. 2005. Available at: http://ww1.transparency.org/surveys/dnld/kenya_bribery_index2005.pdf.

Levin, Widell, and Lars M. Widell. 2007. "Tax Evasion in Kenya and Tanzania: Evidence from Missing Imports." Working Paper Number 8, Orebro University, Sweden.

Mishra Prachi, Arvind Subramanian, Petia Topalova,2008.Tariffs, enforcement, and customs evasion: Evidence from India, Journal of Public Economics, Volume 92, Issues 10-11, October. Pages 1907-1925.

Ng'eno, Nehemiah K, Hezron O. Nyangito, Moses M. Ikiara, Eric E. Ronge, and Justus Nyamunga. 2003. "Regional Integration Study of East Africa: Case of Kenya, Kenya Institute for Public Policy Research and Analysis." KIPPRA Working Paper Number 9.

Rauch, James E. 1999. Networks versus markets in international trade." *Journal of International Economics* 48 :7–35.

Transparency International Corruption Perceptions Index. 2005. Available at: http://www.transparency.org/policy_and_research/surveys_indices/cpi/2005.

World Development Indicators. 2007. World Bank. Washington DC

World Tariff Profiles. 2007. World Trade Organization/UNCTAD/ITC Geneva

Yitzhaki, Shlomo. 1974. A note on income tax evasion: A theoretical analysis. *Journal of Public Economics* 3:201–202.

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