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Tax Evasion in Kenya and Tanzania: Evidence from Missing Imports*

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Abstract

In this paper we estimate the amount of tax evasion in customs authorities in both Kenya and Tanzania by calculating measurement errors in reported trade flows between the two countries and correlate those errors with tax rates. We find that the measurement error is correlated with the tax rates in both Kenya and Tanzania. According to the Transparency International Corruption Perceptions Index, Kenya is more corrupt than Tanzania, but we find that the coefficient on tax is higher in Tanzania compared to Kenya implying that tax evasion on imported goods is higher in Tanzania compared to the Kenya. We also introduced a third country into our analysis, the United Kingdom, and tax evasion seems to be more severe in trade flows between Kenya and Tanzania compared to trade flows between the United Kingdom and Kenya/Tanzania. Finally we also find that the tax evasion coefficient is lower in the Kenya-United Kingdom case compared to the Tanzanian-United Kingdom case which supports our previous finding that tax evasion is more severe in the Tanzanian customs authority.

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1. Introduction

Building the capacity of low-income countries to mobilize more tax revenues is now at the top of the development policy agenda. Tax-systems have undergone some major changes since the mid-1990s, and the reform-process is expected to continue. Some of the important changes expected are: a simplification of the tax-regime, including broadening of the tax-base; rationalization of the exemption-system to avoid further erosion of the tax-base; and review/change of tariff-rates and introduction of revenue- raising measures to compensate for possible losses arising from further liberalization of the trade-regime. Another important change is to improve the efficiency of the tax administration itself. A number of African countries have implemented comprehensive reforms of their tax administration. Part of the exercise has been to establish autonomous revenue authorities, which would be less vulnerable to political intervention and tax evasion practices. Although the empirical evidence is mixed, it seems that these 'independent' authorities in some countries have not helped to reduce tax evasion and corruption (Fjeldstad and Rakner, 2003). According to the Transparency International Corruption Perception Index Tanzania is ranked as number 88 and Kenya as number 144 out of 158 rankings in 2005 (Transparency International (TI), 2005). In the Kenyan case, a more detailed analysis shows that the overall bribery index has declined over the years (TI-Kenya bribery reports, various issues). The Kenyan tax authority has improved its overall index over the period 2002 – 2004 and it was ranked as one of the most improved organizations within the country in 2004. Corrupt practices have also been reported within the tax administration in Tanzania (Ehrhart and Mwaipopo, 2003 and Fjeldstad and Rakner, 2003).

In this paper we estimate the amount of tax evasion in both Kenya and Tanzania. Following the methodology outlined by Fisman and Wei (2004) we compare the discrepancy in Tanzania's recorded imports from Kenya with Kenya's recorded exports to Tanzania. The same approach, but opposite, is used to evaluate tax evasion on the Kenyan side. The trade gap is assumed to be a proxy for tax evasion. In principal the reported trade flows should be the same, assuming no evasion (and measurement errors). In their study on China, Fisman and Wei (2004) matched the measurement error with product-specific tax rates and found that the measurement error is highly correlated with Chinese tax rates. A novel feature of their approach is that they were able to differentiate between three different aspects of tax evasion:

underreporting of unit value, underreporting of taxable quantities, and mislabelling a higher-taxed product as a lower-taxed type.

In the paper we present some evidence of tax evasion in both Kenya and Tanzania. By studying the developments over a number of years we are also able to report if tax evasion in customs agencies is improving or worsening over time. Furthermore, introducing a third country, the United Kingdom (UK), enables us to compare tax evasion not only between two developing countries but also between a developed and a developing country. Finally, using the method of Pritchett and Sethi (1994), we examine the responsiveness of tariff revenues to tax rates for Kenya and Tanzania respectively and use those results as a robustness check of the other results obtained in this paper.

The paper proceeds as follows: in the next section we give a brief overview of the theory of tax evasion and related empirical studies. Section three describes the methodology and the data used in the study. The empirical results are presented and analyzed in section four. Finally, conclusions are provided in the closing section.

2. Tax evasion – theory and empirics

A number of theoretical models have been developed which aim to incorporate tax evasion. The seminal work in the area is Allingham and Sandmo (1972) who created a model based on a risk-averse tax payer and the outcome of the model shows that a higher penalty rate or a higher probability of detection tends to discourage tax evasion and that a higher tax rate will induce more tax evasion. More recent studies have questioned the expected utility maximization framework of the Allingham-Sandmo model (A-S model) due to the poor fit to observed behaviour of choice under uncertainty. For example, Eide (2002) replaced the expected utility with a rank-dependent expected utility, which resulted in a more restricted model, but the comparative statics of the evading person were still the same as before. Another critique of the A-S model is that it isolates the decision to evade from other types of economic decision, e.g. the decision to work in the informal market. Sandmo (2004) sketches an extension of the A-S model to allow for a labour-leisure choice in the utility function, mirroring the choice between hours spent to earn regular income and hours spent either on leisure or on informal market activities.

The theoretical literature is often concerned with evasion by individual taxpayers, but firms can also be evaders of indirect taxes. The seminal work in this area is Marrelli (1984) who extended the A-S model to fit a risk-averse firm instead and established results very similar to the A-S model. In a later study Marrelli and Martina (1988) extended the Marrelli (1984) work to an oligopolistic framework with strategic interaction between firms. More recently the research about the connection between firm behaviour and tax evasion has shifted attention from indirect taxes to corporate income taxes (Chen and Chu, 2002 and Crocker and Slemrod, 2003). According to this literature, the theoretical framework of the A-S model is inadequate since the model does not distinguish between ownership and control of a firm, which is crucial since the choice of evasion depends on who is penalized. A recent review of the literature of tax evasion has shown that the theoretical predictions of the effect of tax rates on evasion are dependent on modelling assumptions (Slemrod and Yitzhaki, 2000). Hence, empirical studies would be useful both from a theoretical and policy perspective.

Pritchett and Sethi (1994) examine the relation between tariff revenues and tariff rates using data from Jamaica, Kenya, and Pakistan. They find a weak relation between *de facto* tariff rates, calculated by dividing tariff revenues with import values for each product, and statutory rates. Fisman and Wei (2004) analyze the effect of tax rates on tax evasion in the trade flow between Hong Kong and China, and they note that the evasion gap is highly correlated with tax rates: much revenue is lost on products with higher tax rates. The point estimates suggest that China's average tax rate on its imports is already on the wrong side of the Laffer curve: any increase in the tax rate is likely to produce a reduction rather than an increase in tax revenue. On average, a one percentage point increase in the tax rate induces a three per cent increase in evasion. They also conclude that practices such as underreporting import unit values and mislabelling higher-taxed products, as lower-taxed varieties are widespread.

One important area where tax evasion has been reported to be a severe problem is customs duties. There are to our knowledge only a few studies in this area focussed on African data. For instance, in Mozambique there are substantial differences between the policy stance as given in the published tariff rates and *de facto* trade policy (Arndt and Tarp, 2003). Overall, the actual tariff revenue in 1997 was slightly less than 40 per cent of the level projected by the *de jure* tariff rates and estimated import volumes. Similarly Tsikata (1999) finds large discrepancies for Tanzania between revenues as implied by the published tariff and estimated import volumes versus actual receipts. The differences are explained by a combination of

(legal) exemptions; corruption/smuggling across official entry points (ports and roads) and smuggling across unofficial entry points (unguarded borders).

A study by Mpango (1996) focused on measuring the magnitude of deliberate under-invoicing of imports in Tanzania and the related motivating factors. The magnitude of deliberate aggregate under-invoicing of imports was found to be about 20 per cent, induced by high scheduled tariff rates, vigorous exchange rate adjustment, low salaries and minimal incentives offered to the customs staff, and opportunities for evasion offered by commodity heterogeneity. The issue of tax evasion as a factor that contributes to poor tax performance is also discussed in Mwinyimvua (1996), who cites avenues of evasion of import duties and sales and excise taxes to include under-invoicing, smuggling, use of tax exemptions, and complex tax schedules, excessive documentation, and corruption.

3. Methodology and data

In this study we will focus on four issues. The first is whether there is any correlation between the measurement error, as reported by the trade gap, and the tax rate in both Tanzania and Kenya.[1] This is done in two ways, where we first utilize data on imports and exports reported in values and secondly we utilize data on imports and exports reported in quantities. The second issue that we want to analyze is whether the trade gap is due to mislabelling a higher-taxed product as a lower-taxed type or not, using both value and quantity data. Thirdly, we will also analyze if there is any difference in the magnitude of the coefficient on tax rate in the two countries. If the answer is yes, that would imply that tax evasion is more severe in that particular country. Finally, we introduce a third country into our analysis, the UK, which enables us to undertake a similar analysis between the UK and Kenya and Tanzania respectively.

As mentioned the methodology follows Fisman and Wei (2004). For every product that country A imports from country B, the value of exports *(Export_value)* is defined as the value reported by country B and the import value *(Import_value)* as that reported by country A. Furthermore, the export quantity *(Export_qty)* is defined as the quantity of exports reported by

[1] In this study legal import tax exemptions are accounted for. The gap between exports and imports includes all registered trade-flows including legal exemptions. As statutory tax rates are used in the regressions the results are not affected by any difference in legal exemptions between the two countries. However, using *de facto* tax rates (as in section 4.4) legal exemptions could affect the results.

country B and the quantity of imports *(Import_qty)* is defined as the quantity of imports reported by country A. We define the evasion gap in values *(Gap_value)* to be given by the difference between the logged values of exports and imports measured in values and the gap in quantities reported *(Gap_qty)* by the same difference measured in quantities.[2]

The basic issue that we will investigate is if the difference between exports and imports is increasing in the tax rate (*Taxrate*), due to evasion (Equation 3.1):

$$\text{Gap\_value}_i = \beta_0 + \beta_1 \times \text{Taxrate}_i + \varepsilon_i \qquad (3.1)$$

where subindex *i* denotes products and *(Taxrate)* denotes product specific tax rates (tariffs plus value-added tax rates, where tariffs include import duties and excise duties) in the importing country. If evasion is induced by tax rate we expect $\beta_1 > 0$. The interpretation of β_1 (if β_1 = 3 for example) will be that if the tax rate increases by one percentage point, the gap between reported exports and imports increases by three per cent.

The approach in this study is that tax rates are implicitly supposed exogenous in the equation explaining tax evasion. It is however possible that a strong evasion on a product incites the government to reduce tax rates. This is probably more likely when it comes to local government taxes. For example, in Tanzania several nuisance taxes were recently abolished (Levin, 2005). Import duties and value added taxes, which are the focus in this study, are less likely to be endogenous and particularly when a country is a member of a regional integration zone.[3]

Due to the problem that part of tax evasion does not only take the form of underreporting but also of mislabelling imports, Fisman and Wei (2004) assume that this type of mislabelling is

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[2] The ideal way to measure the gap is to use import values and export values exclusive of CIF/FOB. However, by regressing gap_qty on tax_rate this problem is circumvented and this results in similar β-values. In the cases where values are used instead of quantities, the CIF-FOB problem creates a gap value, but there is no reason why it should be correlated with the tax_rate. The same discussion also holds, according to us, in the case of *errors*.

[3] Kenya and Tanzania are both members of the East African Community (EAC). Kenya is a member of COMESA (Common Market for Eastern and Southern Africa), which Tanzania left in 1999. Tanzania is still a member of SADC (Southern African Development Community). Tanzania decided to leave COMESA mainly because its regional integration interests were thought to be better served by its membership in SADC. Concerns about revenue losses as a result of ongoing COMESA trade liberalization are also believed to have contributed to the decision. Nevertheless, Tanzania continues to be influenced by trade policy developments in COMESA, not least because the two other current EAC members, Kenya and Uganda, are both members of COMESA.

easier among similar products. Therefore, the average tax variable *(Avg(tax_o))* is defined as being the average level of tax rate of *all other products* in a goods 4-digit class, weighted by the export value. Adding the average tax variable to the right hand side of the regression function gives the following (Equation 3.2):

$$\text{Gap\_value}_i = \beta_0 + \beta_1 \times \text{Taxrate}_i + \beta_2 \times \text{Avg(tax\_o)}_i + \varepsilon_i . \qquad (3.2)$$

If evasion by mislabelling is a problem, one would expect β_2 to be negative, i.e. the lower the tax rate on product *i*'s similar varieties, the greater the incentive for mislabelling the import of product *i*.

So far we have dealt with evasion in values, but evasion in quantities by underreporting may also be common. For that reason, the following regressions will also be examined:

$$Gap\_qty_i = \beta_0 + \beta_1 \times \text{Taxrate}_i + \varepsilon_i \qquad (3.3)$$

and

$$Gap\_qty_i = \beta_0 + \beta_1 \times \text{Taxrate}_i + \beta_2 \times \text{Avg(tax\_o)}_i + \varepsilon_i \qquad (3.4)$$

If underreporting in quantities is established, one would expect $\beta_1 > 0$ in equation (3.3) and if mislabelling of imports is established, one would expect $\beta_2 < 0$ in equation (3.4).

The trade data used in the study is taken from the COMTRADE database, maintained by the United Nations (UN), and is recorded according to the Harmonized Commodity Description and Coding System (HS) at six-digit level. The years used in this study are 2000, 2002 and 2004 recorded according to HS (1996).[4] The Tanzanian Tax Authority provided data on tariff and tax rates at the eight-digit HS level for the year 2000. The Kenyan data were provided by the Kenya Institute for Public Policy Research Analysis (KIPPRA).[5]

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[4] Data from 2003 has been used as well in the analysis and the results are available on request.

[5] Since the trade data are available at the six-digit HS level, an aggregation of the tax data is necessary. In most of the cases there were uniform tax rates among those eight-digit HS products belonging to a single six-digit HS product group. In a few cases where there were variations in tax rates, we used the tax rate at eight-digit HS level with the highest import value to represent the six-digit HS level.

Tables 3.1–3.4 describe some characteristics of the variables used in the study. An important difference between the two countries is in the number of observations. Kenya has a more diversified export structure, which implies that a larger number of Kenyan products are entering the Tanzanian market compared to Tanzanian products entering the Kenyan market (Tables 3.1-3.2). Thus, the number of observations in measuring tax evasion in Tanzania is larger than in the Kenyan case. This is also the case when analyzing evasion between the UK and the two African countries.

Table 3.1 *Summary statistics of trade flows from Kenya to Tanzania, full sample year 2004*

Variable	Obs	Mean	Std. Dev.	Min	Max
log(Export_value)	733	10.09	2.05	6.24	16.08
log(Import_value)	733	9.76	1.81	6.22	15.61
Gap_value	733	0.33	1.81	-6.59	6.55
log(Export_qty)	566	9.65	2.65	0.00	17.05
log(Import_qty)	566	9.55	2.26	2.20	16.51
Gap_qty	566	0.10	2.09	-7.97	6.59
Taxrate (tariff + VAT)	733	0.37	0.13	0.00	0.80
Avg(tax_o) (at HS4-digit)	531	0.37	0.13	0.00	0.75

Note: Summary statistics from the balanced data, i.e. those observations containing data on both export- and import values.

Table 3.2 *Summary statistics of trade flows from Tanzania to Kenya, full sample year 2004*

Variable	Obs	Mean	Std. Dev.	Min	Max
log(Export_value)	160	10.12	1.87	6.23	16.85
log(Import_value)	160	9.83	1.99	6.24	14.78
Gap_value	160	0.29	1.76	-4.37	8.06
log(Export_qty)	109	10.90	2.75	4.44	16.88
log(Import_qty)	109	10.63	2.78	3.14	20.28
Gap_qty	109	0.27	2.64	-8.99	8.17
Taxrate (tariff + VAT)	160	0.31	0.16	0.00	1.13
Avg(tax_o) (at HS4-digit)	71	0.30	0.14	0.00	0.69

Note: Summary statistics from the balanced data, i.e. those observations containing data on both export- and import values.

Table 3.3 *Summary statistics of trade flows from the UK to Tanzania, full sample year 2002*

Variable	Obs	Mean	Std. Dev.	Min	Max
log(Export_value)	465	9.89	1.79	6.87	15.57
log(Import_value)	465	10.15	1.81	6.23	15.43
Gap_value	465	-0.26	1.77	-4.63	6.34
log(Export_qty)	465	7.35	2.85	0.00	16.03
log(Import_qty)	465	8.47	2.09	0.69	15.71
Gap_qty	465	-1.12	2.53	-9.68	6.17
Taxrate (tariff + VAT)	465	0.37	0.13	0.00	0.80
Avg(tax_o) (at HS4-digit)	310	0.37	0.13	0.00	0.75

Note: Summary statistics from the balanced data, i.e. those observations containing data on both export- and import values.

Table 3.4 *Summary statistics of trade flows from the UK to Kenya, full sample year 2002*

Variable	Obs	Mean	Std. Dev.	Min	Max
log(Export_value)	1320	10.10	1.80	6.25	16.88
log(Import_value)	1320	10.09	1.82	6.22	16.14
Gap_value	1320	0.01	1.79	-5.91	8.31
log(Export_qty)	843	7.82	2.44	0.00	16.88
log(Import_qty)	839	7.86	2.69	0.00	16.51
Gap_qty	839	-0.04	2.58	-9.62	11.08
Taxrate (tariff + VAT)	1320	0.34	0.15	0.00	1.78
Avg(tax_o) (at HS4-digit)	1078	0.33	0.15	0.00	1.78

Note: Summary statistics from the balanced data, i.e. those observations containing data on both export- and import values.

The average measurement error *(Gap_value)* variable in the trade statistics has an average value of 0.33 in Tanzania compared to 0.29 in the Kenyan case (Tables 3.1-3.2). The average error value between the UK and Tanzania is -0.26 and 0.01 between Kenya and the UK (Tables 3.3–3.4).[6] These results indicate that measurement errors (values) in the trade data are on average higher between Kenya and Tanzania compared with the UK and Kenya and Tanzania respectively. With regard to quantities, measurements errors follow a similar pattern: Tanzania's calculated errors are higher than Kenya's. These results indicate that there is some tax evasion also in physical quantities. One interesting observation from Tables 3.1–3.4 is that the average measurement error value is higher than the average error measured in quantities, indicating that some evasion takes the form of underreporting of per unit values.

The average tax rate in Tanzania is 37% with a maximum of 80% (Tables 3.1 and 3.3) and in Kenya the average value is between 31-34% with a maximum tax rate at 178% (Tables 3.2

[6] The average measurement errors as a share of the average export value are 0.30, 0.25, 0.30 and 0.01 respectively in the four data sets.

and 3.4).[7] This shows that the average tax rate is higher in Tanzania than in Kenya and that the spread of the tax rate is higher in Kenya. This indicates that a tax authority official in Tanzania can gain more from involvement in tax evasion than a similar official in Kenya.

4. Empirical results

In this section the empirical results are presented, based on the four regression equations outlined in the previous section. The first issue to be analyzed is whether there is any correlation between measurement errors, both in value terms and quantities, and tax rates in each of the two countries Tanzania and Kenya. The second issue is if the measurement errors are due to mislabelling of higher-taxed into lower-taxed products. The third issue is whether there is a difference in magnitudes and over time of tax evasion in the two countries. Finally, to check the results the analysis is repeated with a pair-wise comparison between Kenya and the UK and Tanzania and the UK.

4.1 Tax evasion in Tanzania

The result for the degree of tax evasion in Tanzania in the year 2004 is reported in Table 4.1. Column 1 indicates that a one-percentage point increase in the tax rate leads to a 3.8 percent increase in tax evasion. When excluding outliers[8], the coefficient on tax rate changes to 2.9 (Column 2). In column 3 the sample is restricted by excluding observations lacking information on taxes on similar products and in the fourth column the sample is constrained by excluding observations with missing information on quantities. The rationale for doing the latter is that we want to compare regressions on values with those on quantities. In columns 5-7 several of the restrictions are used simultaneously, which is a sensitivity check for the main results.

As can be seen from Table 4.1, the coefficient on tax rate is in the range of 2.6-4.4. Analyzing the results of the remaining years, the tax rate coefficient is significant in all specifications, except for 2002 (Tables A.1–A.2). The value of the coefficient ranges from 1.4-4.4 which indicates that a one percentage point increase in the average tax rate in Tanzania will lead to a

[7] The products with a tax rate above 100% are exclusively spirits, cigarettes and other products of tobacco, and they comprise approximately 0.8% of total imports into Kenya from the UK in 2004.

[8] Outliers defined as those observations with the highest and lowest 5 percent of values or quantities of Gap_Value or Gap_Qty, respectively, are excluded.

1.5-4.5 percent increase in the gap value. In addition, the coefficient is at its highest value in 2004 indicating that tax evasion has been increasing over time.

Table 4.1 *The effect of tax rates on evasion (measured in values) in year 2004 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	3.817 (7.03)***	2.908 (7.67)***	3.684 (5.60)***	4.366 (7.64)***	3.301 (7.72)***	2.578 (5.73)***	2.672 (5.63)***
Constant	-1.074 (4.87)***	-0.755 (5.01)***	-1.042 (3.87)***	-1.259 (5.55)***	-0.883 (5.32)***	-0.639 (3.53)***	-0.632 (3.38)***
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
# observations	733	659	531	566	508	477	369
R^2	0.07	0.08	0.07	0.09	0.10	0.06	0.07

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

The second issue was whether the measured trade gap is due to mislabelling a higher taxed product as a lower taxed similar variant or not. If evasion by mislabelling is a problem, one would expect the coefficient on tax on similar products to be negative. Column 1 in Table 4.2 reports the estimate of the sensitivity of evasion on tax on similar products and column 2 reports the estimates of the sensitivity of evasion on tax rate and on tax on similar products. In columns 3-5 the sample are restricted by excluding outliers, excluding products lacking observations on quantities or both.

Table 4.2 *Incorporating the average tax on similar products (measured in values) in year 2004 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)
Tax rate		3.723 (3.64)***	2.504 (3.87)***	2.227 (2.54)**	1.792 (2.39)**
Tax on similar products	3.341 (4.92)***	-0.044 (0.04)	0.119 (0.18)	2.036 (2.19)**	1.155 (1.47)
Constant	-0.913 (3.31)***	-1.040 (3.71)***	-0.649 (3.41)***	-1.213 (4.51)***	-0.739 (3.78)***
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
# observations	531	531	478	411	372
R^2	0.06	0.07	0.06	0.09	0.08

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

When including the tax rate on similar products as regressor (Table 4.2) the coefficient on tax decreases (compare Tables 4.1 and 4.2) and the coefficient on tax on similar products is positive and significant in column 4.[9] These results indicate that mislabelling is not present in the data. Analyzing the remaining years in the sample, there is no evidence that mislabelling explains tax evasion in values (Tables A.3 – A.4). The same conclusion holds when the data is based on quantities (Tables A.5 – A.7).

4.2 Tax evasion in Kenya

As Kenya is ranked considerably lower than Tanzania in the Transparency International Perception Index, one might suspect that tax evasion is a significantly larger problem in Kenya compared to Tanzania. However, Table 4.3 shows that the tax rate coefficient is below the corresponding estimates for Tanzania and it is only significant in column 1. For the other years in the study the coefficient on tax rate is insignificant in all specifications for 2000 and 2002 (Tables A.8 – A.9).

[9] This result is probably driven by outliers since when excluding those (column 5), the coefficient on tax on similar products become insignificant.

Table 4.3 *The effect of tax rates on evasion (measured in values) in year 2004 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	1.806 (1.85)*	1.015 (1.37)	1.056 (0.55)	2.015 (1.63)	1.316 (1.37)	1.033 (0.85)	1.236 (0.64)
Constant	-0.273 (0.73)	-0.090 (0.36)	-0.082 (0.11)	-0.266 (0.60)	-0.147 (0.48)	-0.224 (0.57)	-0.119 (0.21)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	160	144	71	110	98	63	43
R^2	0.03	0.02	0.01	0.03	0.02	0.02	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table 4.4 provides some evidence on whether evasion is due to mislabelling or not. The coefficient on tax rate is found to be positive and significant and the coefficient on tax on similar products to be negative and significant. Looking at the other years of the study significant results is found in the 2000 regressions (Tables A.10 – A.11). However, the results from most of the years are probably affected by the low number of observations[10] or are driven by outliers.[11]

[10] This is sometimes labelled micronumerosity. Due to the low number of observations, the variable tax on similar products will be almost collinear with the variable tax rate, which is probably why we get those results. As a consequence, the variable tax on similar products could not be included in the 2002 regression because it was fully collinear with the tax rate in this year.

[11] We have also performed pooled OLS using all years and the results are virtually identical to those previously reported. Results from these estimations are available on request from the authors.

Table 4.4 *Incorporating the average tax on similar products (measured in values) in year 2004 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)
Tax rate		4.580 (3.25)***	4.203 (3.91)***	6.211 (2.43)**	5.193 (1.69)
Tax on similar products	-1.939 (1.06)	-5.184 (3.76)***	-4.020 (4.13)***	-5.983 (2.97)**	-4.327 (1.10)
Constant	0.831 (1.07)	0.420 (0.53)	-0.028 (0.09)	0.303 (0.27)	-0.076 (0.14)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	71	71	63	49	42
R^2	0.02	0.08	0.16	0.06	0.07

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

When using data on physical quantities instead of values the coefficients on tax rate and on tax on similar products are insignificant in almost all specifications and years. Thus, in general there is no evidence of tax evasion in physical quantities or of mislabelling (Tables A.12 – A.14).

The conclusions that can be drawn so far from the empirics presented above in this section are first that there is evidence of underreporting in values and in quantities in the trade flow from Kenya to Tanzania for the years 2000 and 2004. Second, tax evasion does not take the form of mislabelling from a higher taxed product to a lower taxed variant regardless of year or trade flow. Third, there is some evidence of underreporting of values but not in quantities in the trade flow from Tanzania to Kenya. Fourth, there is no evidence of mislabelling from a higher taxed product to a lower taxed variant in both values and quantities. Fifth, the magnitude of the coefficient on tax rate is higher in the Tanzanian case compared to the Kenyan case indicating more tax evasion in Tanzania compared to Kenya.

4.3 Tax evasion between Tanzania/Kenya and the UK.

In order to check whether the Tanzanian tax authority is less efficient compared to the Kenyan counterpart a third country is introduced into the analysis, the UK.[12] Table 4.5 shows that in 2002 the coefficient on tax rate is significant in most specifications in the trade flow from the UK to Tanzania with a value ranging between 1.0 – 1.8. The coefficient is also significant for some specifications in 2000 and show a slightly lower value compared to the results for the year 2002 (Table A.15). Irrespective of using values or quantities, there is no evidence of mislabelling from a higher taxed product to a lower taxed variant for the two years (Tables A.16-A.19). The interpretation of these results is that tax evasion still occurs in Tanzania but at a lower degree compared to goods entering from the Kenyan market.

Table 4.5 *The effect of tax rates on evasion (measured in values) in year 2002 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	1.046 (1.63)	0.919 (1.89)*	1.773 (2.63)**	1.046 (1.63)	0.919 (1.89)*	1.633 (2.97)***	1.633 (2.97)***
Constant	-0.640 (2.48)**	-0.620 (3.35)***	-0.997 (3.60)**	-0.640 (2.48)**	-0.620 (3.35)***	-0.945 (4.36)***	-0.945 (4.36)***
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	465	417	310	465	417	278	278
R^2	0.01	0.01	0.02	0.01	0.01	0.02	0.02

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

When repeating the analysis using data from Kenya and the UK instead, Table 4.6 shows that the coefficient on tax rate is insignificant in all specifications. The coefficient is also insignificant for all specifications in 2000 (Table A.20). This indicates that there is no tax evasion present in the data from those years. There are also insignificant results when including the variable tax on similar products in both 2000 and 2002 (Tables A.21 and A.22) except in column 5 in 2002, where there is evidence of mislabelling a higher taxed product as

[12] The methodology used in this paper requires a certain amount of trade between the two countries used in the analysis. The United Kingdom has been chosen, as it is an important trading partner for both Kenya and Tanzania.

a lower taxed variant. The results do not change when using data on quantities instead (Tables A.23 and A.24).

Table 4.6 *The effect of tax rates on evasion (measured in values) in year 2002 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	-0.030 (0.10)	-0.069 (0.30)	-0.027 (0.08)	0.148 (0.46)	0.307 (1.38)	-0.011 (0.04)	0.180 (0.72)
Constant	0.019 (0.17)	-0.034 (0.38)	0.018 (0.14)	-0.115 (0.96)	-0.171 (1.81)*	0.021 (0.21)	-0.108 (1.01)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	1320	1188	1078	843	757	970	593
R^2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

When looking at tax evasion from a third country perspective, we find that the Tanzanian customs authority is still less efficient than the Kenyan counterpart. This is based on the fact that the null hypothesis, that the coefficient on tax rate is equal to zero, cannot be rejected in the UK to Kenya case while it can be rejected in the UK to Tanzania case.

4.4 Robustness check.

The results so far show that tax evasion is more severe in Tanzania compared to Kenya, even when using data on trade flows from United Kingdom to the two countries. As robustness check of those results we follow Pritchett and Sethi (1994) and regress the collected tariff rate on the official tariff rate, i.e. (equation 4.1).

$$\left(Collected\ rate\right)_i = \beta_0 + \beta_1 \times (Official\ rate)_i + \varepsilon_i\,, \qquad (4.1)$$

where the collected rate is calculated as the ratio of import tax revenues to import value. Bilateral trade data between Kenya and Tanzania are used together with Tanzanian tariff rates when estimating equation 4.1 for Tanzania and Kenyan tariff rates when estimating for Kenya.

***Table 4.7**. Estimation Results of Regressing the Collected Rate on the Official Rate*

	Kenya		Tanzania	
Type of OLS regression	*Coefficient*	R^2	*Coefficient*	R^2
Linear	0.73	0.24	0.68	0.09
	(0.10)		(0.04)	
Weighted by import values	0.73	0.24	0.68	0.09
	(0.10)		(0.04)	
Weighted by official rate	0.60	0.17	0.68	0.13
	(0.08)		(0.04)	
Linear, excl. obs. where the collected rate is zero	0.75	0.23	0.68	0.09
	(0.11)		(0.04)	

Note: Robust standard errors in parentheses. For the first three regressions, the number of observations for Kenya is 272; and for Tanzania is 1704. When zero collected rates are excluded, the numbers of observations do not change for Tanzania; and fall to 241 for Kenya.

The results in Table 4.7 are based on regressing the collected rate for each tariff on products on the official rate. In the first row a simple linear model is used and for each country the slope is statistically significant from one. An increase of 1 percentage point in the official rate produces only 0.73 percentage points increase in the collected rate in Kenya and 0.68 percentage points in Tanzania. The subsequent rows of Table 4.7 verify this basic result. The second and third rows show results from weighted ordinary least squares, using import values as weights in row two and statutory tariff rate in row three. Those rows show coefficients that are the same or lower than the unweighted results. The fourth row excludes those products for which the collection rate is zero even though recorded import values are positive. The coefficient rose slightly in the Kenyan case but remained constant in the Tanzanian case since no products were excluded. The results in Table 4.7 seem to support our previous results that the Kenyan customs authority is more efficient in tax collection compared to the Tanzanian counterpart.[13]

5. Conclusions

In this paper we use the Fisman and Wei (2004) approach in measuring the effect of tax rates on tax evasion using data on the trade flow between Kenya and Tanzania. Unlike Fisman and Wei, we estimate the amount of tax evasion in the trade flows between the two countries in both directions. In the Tanzanian case, on the one hand, we find evidence of underreporting of unit value for all years except 2002. The coefficient on tax rate is around 2.3 in 2000 and around 3.5 in 2004. This indicates that the problem of tax evasion has increased over the

[13] These results have to be interpreted with some caution since using *de facto* tax rates in the regression (equation 4.1), legal exemptions might affect the results.

investigated period. When utilizing data on quantities, the above stated results barely change. In the Kenyan case, on the other hand, we find some evidence of underreporting in unit values for the year 2004. The coefficient on tax rate is around 1.8 in 2004 indicating a small (or no) increase in the coefficient over the years. When utilizing data on quantities, the coefficient is insignificant for all years except in one specification in 2004 where it is 2.6 and significant at the 10% level. Since tax evasion may not only take the form of underreporting but also of the mislabelling of imports, we investigate whether the measured trade gap is due to mislabelling a higher taxed product as a lower taxed similar variant or not. The regressions on Tanzania show no evidence that mislabelling is present in the data. In the Kenyan case, however, we find some evidence of mislabelling, but this might be due to a problem of micronumerosity.

This paper also provides an extension of the Fisman and Wei approach by including a third country into the investigations, the United Kingdom. By doing this we are able to capture whether there is any difference in tax evasion behaviour in the trade between two developing countries and between a developed and the two developing countries respectively. In the regressions on Tanzania there is evidence of tax evasion in values with a coefficient on tax rate ranging between 0.9 – 1.8, while in the regressions on Kenya there is no evidence of tax evasion. Moreover, there is almost no evidence of mislabelling in the regressions on either Kenya or Tanzania. In 2002 the coefficient on tax on similar products takes on values of -1.2 in the value regression and -1.1 in the quantity regression on Kenya.

Furthermore, this paper provides evidence that tax evasion (on imported goods) is more severe in Tanzania compared to Kenya. The coefficient on tax rate is higher in Tanzania in all years except 2002 when it is insignificant for both countries. These results are also supported in the regressions using data on the trade flows from the UK to the two countries respectively. In order to find out whether these results are robust or not, we followed Pritchett and Sethi (1994) and examined the responsiveness of tariff revenues to tax rates for the two countries respectively and the results corroborated with our earlier results.

One shortcoming of the methodology used in this study is due to the fact that it needs a certain number of products traded between the specific countries analysed and many developing countries do not have a well diversified export sector. This gives us a limited sample of countries, for example in Africa, which we can use to perform these kinds of studies.

We showed that the Kenyan customs authority were more efficient than the Tanzanian counterpart for the period measured, although Kenya was more corrupt than Tanzania according to the Transparency International Corruption Perceptions Index. One policy recommendation, due to this, is that one should not use an aggregate index as an indicator of reforming a specific sector of the economy (e.g. the customs union).

An interesting task for future studies is to remake this study using data collected after the formation of the customs union including Kenya, Tanzania and Uganda (East African Community, EAC)[14] in late 2004. When trade data is available for 2005 and 2006 one can use it to test whether tax evasion still prevails in the trade data between the countries in the union. One further extension might be to treat the customs union as a single country and study the effect of tax evasion on tax rate in the trade between the union and the UK for example.

[14] See www.eac.int.

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Appendix

Table A.1 *The effect of tax rates on evasion (measured in values) in year 2000 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	2.678 (5.00)***	1.898 (4.96)***	2.521 (3.91)***	2.870 (4.34)***	2.076 (4.53)***	1.872 (4.06)***	1.508 (2.96)***
Constant	-0.942 (4.44)***	-0.686 (4.57)***	-0.901 (3.45)***	-0.956 (3.72)***	-0.716 (4.05)***	-0.678 (3.65)***	-0.498 (2.47)**
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
# observations	767	681	549	546	490	493	344
R^2	0.05	0.04	0.04	0.05	0.05	0.04	0.03

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.2 *The effect of tax rates on evasion (measured in values) in year 2002 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	0.675 (1.09)	0.174 (0.35)	0.167 (0.24)	0.746 (1.02)	0.269 (0.47)	0.339 (0.65)	-0.042 (0.06)
Constant	-0.299 (1.35)	-0.142 (0.80)	-0.161 (0.64)	-0.454 (1.77)*	-0.313 (1.54)	-0.000 (0.00)	-0.248 (1.01)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
# observations	695	625	485	531	477	435	324
R^2	0.00	0.00	0.00	0.00	0.01	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.3 *Incorporating the average tax on similar products (measured in values) in year 2000 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)
Tax rate		2.610 (2.01)**	1.426 (1.52)*	2.459 (1.17)	0.779 (0.48)
Tax on similar products	2.225 (3.58)***	-0.101 (0.08)	0.276 (0.30)	-0.075 (0.04)	0.749 (0.47)
Constant	-0.790 (3.17)***	-0.897 (3.43)***	-0.589 (3.39)***	-0.793 (2.54)**	-0.460 (2.39)**
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
# observations	549	549	484	384	338
R^2	0.03	0.04	0.03	0.04	0.03

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.4 *Incorporating the average tax on similar products (measured in values) in year 2002 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)
Tax rate		1.538 (1.28)	-0.845 (1.11)	2.849 (1.24)	-0.863 (0.74)
Tax on similar products	-0.096 (0.13)	-1.518 (1.18)	0.816 (1.02)	-2.948 (1.23)	0.851 (0.68)
Constant	-0.066 (0.25)	-0.109 (0.41)	-0.067 (0.30)	-0.213 (0.69)	-0.201 (0.77)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
# observations	485	485	443	360	330
R^2	0.00	0.0 0	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.5 *Evasion in physical quantities in year 2000 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	2.926 (4.06)***	3.048 (3.51)***	2.349 (5.22)***		1.832 (1.00)	1.768 (1.27)
Tax on similar products				3.036 (3.53)***	1.346 (0.76)	0.405 (0.28)
Constant	-1.047 (3.70)***	-1.065 (3.07)***	-0.843 (5.02)***	-1.061 (3.11)***	-1.112 (3.19)***	-0.750 (3.63)***
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
# observations	546	364	490	364	364	326
R^2	0.04	0.05	0.05	0.05	0.05	0.04

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.6 *Evasion in physical quantities in year 2002 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-0.244 (0.29)	-0.305 (0.31)	-0.347 (0.57)		2.977 (0.92)	-2.689 (1.08)
Tax on similar products				-0.555 (0.56)	-3.465 (1.06)	2.623 (1.00)
Constant	-0.344 (1.13)	-0.515 (1.38)	-0.262 (1.18)	-0.424 (1.15)	-0.448 (1.20)	-0.522 (1.80)*
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
# observations	528	331	474	331	331	297
R^2	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.7 *Evasion in physical quantities in year 2004 in the trade flow from Kenya to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	3.588 (5.16)***	3.508 (4.71)***	2.775 (5.32)***		1.615 (1.35)	1.318 (1.25)
Tax on similar products				3.580 (4.76)***	2.062 (1.71)*	1.192 (1.16)
Constant	-1.204 (4.49)***	-1.120 (3.77)***	-0.876 (4.37)***	-1.143 (3.84)***	-1.180 (3.92)***	-0.730 (3.14)***
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
# observations	566	400	508	400	400	360
R^2	0.05	0.05	0.06	0.06	0.06	0.05

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.8 *The effect of tax rates on evasion (measured in values) in year 2000 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	-0.499 (0.69)	0.144 (0.25)	-4.188 (1.54)	-0.877 (1.20)	-0.500 (1.04)	-0.698 (0.29)	-0.830 (0.38)
Constant	0.637 (1.77)*	0.413 (1.53)	1.571 (1.54)	0.752 (1.88)*	0.575 (2.27)**	0.597 (0.91)	0.715 (0.99)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	76	68	30	58	52	26	20
R^2	0.00	0.00	0.08	0.02	0.01	0.00	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.9 *The effect of tax rates on evasion (measured in values) in year 2002 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	0.249 (0.22)	-0.471 (0.58)	2.154 (0.74)	0.559 (0.43)	-0.529 (0.61)	-2.310 (1.56)	1.686 (0.55)
Constant	0.342 (0.77)	0.557 (1.80)*	-0.101 (0.09)	0.270 (0.56)	0.589 (1.76)*	1.130 (1.93)*	0.233 (0.27)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	84	74	22	71	63	18	17
R^2	0.00	0.00	0.02	0.00	0.01	0.06	0.02

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at 10% level respectively.

Table A.10 *Incorporating the average tax on similar products (measured in values) in year 2000 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)
Tax rate		-16.018 (11.88)***	-8.936 (4.81)***	-16.199 (9.61)***	-8.928 (6.48)***
Tax on similar products	-2.591 (0.95)	12.531 (9.29)***	8.676 (4.00)***	12.350 (7.33)***	8.280 (3.42)***
Constant	1.169 (1.12)	1.395 (1.33)	0.282 (0.42)	1.519 (1.24)	0.412 (0.59)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	30	30	25	24	19
R^2	0.03	0.16	0.06	0.19	0.10

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.11 *Incorporating the average tax on similar products (measured in values) in year 2002 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)
Tax rate		2.154 (0.74)	-1.277 (0.64)	4.259 (1.15)	-0.516 (0.22)
Tax on similar products	2.154 (0.74)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Constant	-0.101 (0.09)	-0.101 (0.09)	0.495 (0.64)	-0.445 (0.37)	0.391 (0.48)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	22	22	18	19	15
R^2	0.02	0.02	0.04	0.07	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.12 *Evasion in physical quantities in year 2000 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-0.421 (0.60)	2.054 (0.77)	-0.743 (1.25)		0.181 (0.13)	-2.175 (1.53)
Tax on similar products				2.209 (0.83)	2.043 (1.43)	-0.313 (0.22)
Constant	0.847 (2.02)**	0.477 (0.49)	0.902 (3.16)***	0.443 (0.46)	0.440 (0.43)	1.343 (1.65)
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	58	21	52	21	21	17
R^2	0.00	0.02	0.02	0.02	0.02	0.04

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.13 *Evasion in physical quantities in year 2002 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	1.781 (1.00)	5.761 (1.26)	0.624 (0.51)		-69.933 (0.43)	-132.923 (1.30)
Tax on similar products				5.741 (1.28)	74.698 (0.46)	133.746 (1.32)
Constant	0.345 (0.51)	-1.325 (0.86)	0.616 (1.35)	-1.304 (0.87)	-0.853 (0.37)	0.407 (0.32)
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	71	18	63	18	18	16
R^2	0.01	0.10	0.00	0.10	0.12	0.14

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.14 *Evasion in physical quantities in year 2004 in the trade flow from Tanzania to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	2.262 (1.40)	-0.357 (0.11)	2.640 (1.94)*		3.627 (1.02)	4.861 (1.38)
Tax on similar products				-2.691 (0.89)	-5.372 (1.57)	-3.223 (0.96)
Constant	-0.380 (0.71)	0.376 (0.38)	-0.455 (1.17)	1.001 (1.03)	0.747 (0.72)	-0.133 (0.25)
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	109	49	97	49	49	43
R^2	0.02	0.00	0.04	0.01	0.02	0.05

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.15 *The effect of tax rates on evasion (measured in values) in year 2000 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	1.133 (1.94)*	0.723 (1.38)	1.656 (2.56)**	1.133 (1.94)*	0.723 (1.38)	0.936 (1.51)	0.936 (1.51)
Constant	-0.398 (1.67)*	-0.259 (1.27)	-0.599 (2.23)**	-0.398 (1.67)*	-0.259 (1.27)	-0.339 (1.36)	-0.339 (1.36)
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	499	449	334	499	449	300	300
R^2	0.01	0.01	0.02	0.01	0.01	0.01	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.16 *Incorporating the average tax on similar products (measured in values) in year 2000 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)
Tax rate		1.131 (1.25)	1.086 (1.56)	1.131 (1.25)	1.086 (1.56)
Tax on similar products	1.633 (2.33)**	0.637 (0.63)	-0.299 (0.35)	0.637 (0.63)	-0.299 (0.35)
Constant	-0.590 (2.06)**	-0.641 (2.19)**	-0.256 (0.96)	-0.641 (2.19)**	-0.256 (0.96)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	334	334	297	334	297
R^2	0.01	0.02	0.01	0.02	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.17 *Incorporating the average tax on similar products (measured in values) in year 2002 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)
Tax rate		1.881 (2.12)**	2.159 (2.77)***	1.881 (2.12)**	2.159 (2.77)***
Tax on similar products	1.512 (1.91)*	-0.134 (0.12)	-0.896 (0.87)	-0.134 (0.12)	-0.896 (0.87)
Constant	-0.901 (2.76)***	-0.988 (3.08)***	-0.723 (2.82)***	-0.988 (3.08)***	-0.723 (2.82)***
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	310	310	280	310	280
R^2	0.01	0.02	0.02	0.02	0.02

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.18 *Evasion in physical quantities in year 2000 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-1.490 (1.65)	-0.820 (0.78)	-0.483 (0.87)		2.589 (1.53)	0.895 (0.75)
Tax on similar products				-1.864 (1.67)*	-4.142 (2.32)**	-1.073 (0.88)
Constant	-0.243 (0.66)	-0.459 (1.05)	-0.564 (2.68)***	-0.074 (0.16)	-0.190 (0.41)	-0.628 (2.48)**
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	499	334	449	334	334	300
R^2	0.01	0.00	0.00	0.01	0.01	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.19 *Evasion in physical quantities in year 2002 in the trade flow from the UK to Tanzania*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-1.537 (1.69)*	-1.277 (1.26)	-0.597 (0.99)		-1.605 (1.35)	-1.577 (1.61)
Tax on similar products				-1.000 (0.93)	0.404 (0.31)	0.841 (0.77)
Constant	-0.558 (1.57)	-0.756 (1.88)*	-0.858 (3.58)***	-0.857 (1.98)**	-0.784 (1.77)*	-0.925 (2.92)***
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	465	310	417	310	310	278
R^2	0.01	0.00	0.00	0.00	0.00	0.01

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.20 *The effect of tax rates on evasion (measured in values) in year 2000 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax rate	0.128 (0.46)	0.111 (0.56)	0.181 (0.57)	0.164 (0.54)	0.189 (0.90)	0.073 (0.33)	0.210 (0.87)
Constant	-0.203 (1.82)*	-0.215 (2.74)***	-0.225 (1.77)*	-0.301 (2.48)**	-0.321 (3.69)***	-0.213 (2.36)**	-0.343 (3.34)***
Excluding outliers	No	Yes	No	No	Yes	Yes	Yes
Excluding products lacking tax on similar products	No	No	Yes	No	No	Yes	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes	No	Yes
No. of observations	1411	1269	1161	810	728	1043	565
R^2	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.21 *Incorporating the average tax on similar products (measured in values) in year 2000 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)
Tax rate		-0.330 (0.37)	-0.062 (0.09)	0.489 (0.45)	0.856 (0.92)
Tax on similar products	0.281 (0.87)	0.587 (0.65)	0.168 (0.24)	-0.202 (0.19)	-0.704 (0.76)
Constant	-0.258 (2.04)**	-0.250 (1.95)*	-0.218 (2.42)**	-0.355 (2.53)**	-0.310 (3.09)***
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	1161	1161	1039	629	560
R^2	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.22 *Incorporating the average tax on similar products (measured in values) in year 2002 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)
Tax rate		0.015 (0.02)	0.667 (1.28)	0.792 (1.19)	1.253 (2.56)**
Tax on similar products	-0.038 (0.11)	-0.051 (0.07)	-0.775 (1.47)	-0.723 (1.05)	-1.171 (2.31)**
Constant	0.021 (0.16)	0.021 (0.16)	-0.008 (0.08)	-0.063 (0.45)	-0.093 (0.82)
Excluding outliers	No	No	Yes	No	Yes
Excluding products lacking observations on quantities	No	No	No	Yes	Yes
No. of observations	1078	1078	966	659	593
R^2	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.23 *Evasion in physical quantities in year 2000 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-0.068 (0.14)	0.360 (0.66)	-0.097 (0.29)		-0.492 (0.37)	-0.129 (0.11)
Tax on similar products				0.457 (0.83)	0.920 (0.66)	0.091 (0.08)
Constant	-0.628 (3.48)***	-0.894 (4.23)***	-0.564 (4.53)***	-0.927 (4.29)***	-0.916 (4.22)***	-0.679 (4.72)***
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	794	551	713	551	551	495
R^2	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.

Table A.24 *Evasion in physical quantities in year 2002 in the trade flow from the UK to Kenya*

	(1)	(2)	(3)	(4)	(5)	(6)
Tax rate	-0.425 (0.89)	-0.056 (0.11)	0.268 (0.87)		0.896 (0.85)	1.284 (2.40)**
Tax on similar products				-0.341 (0.60)	-1.116 (1.04)	-1.089 (1.78)*
Constant	0.109 (0.59)	-0.097 (0.45)	-0.165 (1.29)	0.003 (0.01)	-0.041 (0.18)	-0.239 (1.43)
Excluding products lacking observations on Avg(Tax_o)	No	Yes	No	Yes	Yes	Yes
Excluding outliers	No	No	Yes	No	No	Yes
No. of observations	839	585	755	585	585	525
R^2	0.00	0.00	0.00	0.00	0.00	0.00

Note: Robust t-values in parentheses, accounting for clustering of standard errors by four-digit HS code. *** indicates significance at 1% level; ** at 5% level; and * at10% level respectively.