CHAPTER TWO

TARIFF EVASION IN SUB-SAHARAN AFRICA: TRENDS AND COMPARISONS[3]

Abstract: Various multilateral organizations and policy-makers are interested in assessing the level of tariff evasion in Sub-Saharan Africa (SSA), as it can directly affect economic growth. We employ trade and tariff data from 2008-2015 to estimate tariff evasion in this region (as indicated by the association between the tariff rate and the trade gap). We assess whether tariff evasion changes during this period, and whether it is different than in other groups of countries around the world. The data indicate that tariff evasion in SSA (i) increases during this period, (ii) is significantly higher than in high income countries, and (iii) is comparable to the rest of the world (excluding high income countries). We further explore whether the increase in tariff evasion is associated with the change in market share of the region's trading partner portfolio. Tariff evasion in SSA shows an increase for trade from BRIC countries as compared to trade from OECD countries.

[3] This chapter is based on: Worku, T., Mendoza, J. P., & Wielhouwer, J. L. (2016). *Tariff evasion in Sub-Saharan Africa: Trends and Comparisons*. Unpublished manuscript, Department of Accounting, Vrije Universiteit Amsterdam, the Netherlands. We thank participants of the 71st Congress of the International Institute of Public Finance, and seminar participants at Vrije Universiteit Amsterdam for useful comments on earlier drafts. We also thank the financial support provided by the Netherlands NUFFIC grant Niche/ETH/020.

2.1. Introduction

Multilateral organizations identify trade facilitation and tax revenue mobilization as key engines of economic growth for Sub-Saharan Africa (SSA; Bhushan et al., 2013; IMF, 2011, 2015b; OECD, 2014). The efficient collection of tariffs, in particular, can contribute to sustainable development and higher independence from foreign aid (Brűckner and Lederman, 2012; IMF, 2016). But SSA faces critical challenges, such as weak customs administration capacity, inefficient collection procedures, and corruption (OECD, 2013b; Transparency International, 2014; World Bank, 2014; Zake, 2011). All these elements make SSA vulnerable to tariff evasion, and to the consequences that it entails.

From a public policy perspective, the design, implementation, and evaluation of trade-related initiatives in SSA can benefit greatly from the assessment of tariff evasion. By definition, evasion is difficult to detect, so a first step is to establish whether the data are indicative of its presence, and a second step is to assess its magnitude. However, under which criteria can evasion be classified as either high or low? In this chapter, we employ a comparative approach, so that the assessment is done in relative terms. More specifically, we compare tariff evasion across years, and against other groups of countries around the world.

Following prior research in this area, we infer that tariff evasion is present when there is a positive and significant association between tariff rates and trade value gaps (i.e., discrepancies between product-level values which are reported by trading partners; Fisman and Wei, 2004; Javorcik and Narciso, 2008; Mishra et al., 2008). We then compare the strength of this association across years, and against high-income countries (HIC) and the rest of the world (ROW).

The results of the analysis indicate that tariff evasion in SSA increases from 2008 to 2015, is higher than in HIC, and is comparable to the ROW. These findings trigger a follow-up research question: why has tariff evasion increased in this region? We note that trade with BRIC countries has grown more rapidly than trade with OECD countries during this period, so we further explore whether tariff evasion is affected by the composition of its trading partner portfolio. The data indicate that in the last couple of years evasion on imports from BRIC countries is significantly higher than evasion on imports from OECD countries. The relatively high growth of trade with BRIC countries may therefore be a possible explanation for the observed increasing trend in tariff evasion.

Overall, this chapter has two concrete contributions. First, it can serve as part of a diagnosis, and complement discussions about the impact of the trade-related initiatives that have been recently introduced in the region. In this sense, our findings may contribute to the evaluation of public policy. Second, this chapter indicates that the problem of tariff evasion in SSA is not only explained by internal factors, which are well contained within the regions' borders, but may be also influenced by an external element: the region's trading partner portfolio. This goes in line with recent research in this area, which suggests that both trade partners can influence – and therefore help reduce – tariff evasion in SSA (Worku et al., 2016). We elaborate more on these points in the discussion section.

2.2. Setting and Research Questions

SSA comprises 49 countries and covers most of the African continent. Research shows that trade openness and integration have a positive impact on the economic growth of this region (Brűckner and Lederman, 2012; IMF, 2016). As compared to other regions, however, SSA has limited

capacity to enforce customs laws and prevent non-compliance, including practices associated with tariff evasion (OECD, 2013b; Transparency International, 2014; World Bank, 2014; Zake, 2011). This poses a fundamental problem, as taxes on trade still represent a main source of fiscal revenues in the region (IMF, 2015). For these reasons, multilateral, regional, and local actors have been promoting numerous trade reforms in SSA that aim at improving the ease of trading across borders while increasing revenue mobilization (IMF, 2015; Lesser and Moïsé-Leeman, 2009; Moore, 2014; Zake, 2011).

The interplay between these two opposing elements- structural limitations and initiatives to overcome them- makes it difficult to predict whether tariff evasion has increased or decreased in this region, and whether it has been consistently different than in other groups of countries around the world. With this in mind, in this section we develop research questions instead of hypotheses, as we explain in more detail next.

2.2.1. Challenges

We identify five factors that contribute to tariff evasion in SSA: high tariff rates, limited institutional and professional capacity, limited infrastructure, informal trade, and corruption.

Tariff rates. High tariff rates have special relevance in this context, as they provide the economic incentive to evade tariffs (Fisman and Wei, 2004; Javorcik and Narciso, 2008). Rates in SSA are amongst the highest across the world. For reference, the average tariff rate on world trade was approximately 2% in 2012 (UNCTAD, 2013b). In sharp contrast, SSA was the only region to impose rates of at least 5% on 60% of its imports, and at least 15% on over 20% of its imports (UNCTAD, 2013b).

Institutional and professional capacity. SSA scores low in several institutional and professional capacity indicators (Moïsé et al., 2013; OECD, 2013b; WEF, 2016; World Bank, 2014). As compared to 107 non-OECD countries, SSA lags behind in terms of simplification and harmonization of document formalities, automation of border procedures, governance (e.g., accountability, impartiality), use of risk management, and availability of trade-related information (OECD, 2013b). This has negative consequences, such as delays in importing and exporting, and at a larger scale, the slow ratification and implementation of trade agreements and standard protocols (AfDB et al., 2014; Hartzenberg, 2011). For some African economies, revenue losses from inefficient border procedures are estimated to exceed 5% of GDP (World Bank, 2014). Cumbersome and slow procedures generate incentives to engage in evasive strategies, which are further facilitated by customs officials who struggle to ensure compliance and to keep pace with the increasing volume of trade.

Infrastructure. Limited transport infrastructure and services remain key bottlenecks to SSA participation in international trade (WEF, 2016). Logistics professionals report that the quality of transport infrastructure in SSA is a major concern (Lesser and Moïsé-Leeman, 2009). Together with inefficient procedures, limited infrastructure contributes to slow inland travel to move cargo. When physical barriers delay imports, there is an incentive to engage in informal trade practices through official ports and points of entry (such as by bribing customs officials) or through unofficial routes and crossings, and in this way avoid slow and costly import procedures (Lesser and Moïsé-Leeman, 2009).

Informal trade. The volume of informal cross-border trade in SSA is substantial, and in some countries may exceed the volume of formal trade (Lesser and Moïsé-Leeman, 2009).

Informal trade refers to trade in legitimately produced goods and services, which escapes the regulatory framework, and is in consequence excluded from official government records. Informal trade avoids taxes, customs controls, import permits, and other required paperwork. Practices associated with informal trade may include under-invoicing (i.e., reporting lower imported quantities, weights, or monetary values), misclassification (i.e., falsifying product descriptions), mis-declaration of the country of origin, or bribery of customs officials. In all cases, a direct consequence of informal trade is tariff evasion.

Corruption. Customs and port corruption is pervasive in SSA, and represents a major barrier to tax revenue collection (Transparency International, 2014). Corruption creates the opportunity to evade import costs and taxes, and research shows that it is indeed positively associated with tariff evasion (Worku et al., 2016).

2.2.2. Initiatives

SSA has undertaken numerous reforms to tackle the above-mentioned challenges, improve the ease of trading, and increase tariff revenue mobilization. In fact, SSA is identified as the region that introduced the largest number of trade-related reforms in recent years. Of the 133 trade facilitation reforms recorded in the Doing Business reports between 2010 and 2014, SSA was ‘’by far" the region that implemented the most, with 46 (World Bank, 2014). Moreover, SSA is the largest recipient of the Aid for Trade programs, which aim at reducing trade costs, and improving trade policy and regulations, transport infrastructure, and border procedures (OECD, 2013a).

These reforms have contributed directly to the reduction of tariffs (although these can be lowered further), the number of documents required by customs and port procedures (together with

the simplification and harmonization of manifests and declarations), and consequently, the time to trade across borders (Bhushan and Samy, 2012; IMF, 2015; World Bank, 2014). These improvements have been accompanied by increased reliance on automation of border procedures and use of electronic tools to submit and process customs declarations (Kariuki, 2013; OECD, 2013b; Zake, 2011). To fight corruption in tax and customs administration, SSA has taken measures to reduce interactions with tax officials (e.g., through the electronic exchange of information), and implemented the use of unique identification numbers (to facilitate the detection of evasion), mandatory staff rotation, and codes of conduct (Transparency International, 2014).

2.2.3. Research questions

The limitations and initiatives presented thus far act simultaneously against and in favor of tariff evasion in SSA. The efforts to reduce trade barriers, e.g., by reducing tariffs and increasing the efficiency of customs procedures, may have led to lower tariff evasion. On the other hand, trade in the region has grown at very high rates which may have put pressure on customs' capacity leading to delays or increased incentives to avoid these procedures. Similarly, although the reduction in tariff rates could have resulted in a decrease in evasion, the rates are however still higher than in other regions. On top of this, while trade agreements may lower evasion, the delays in ratification in this region (AfDB et al., 2014; Hartzenberg, 2011) may have caused perceptions of procedural unfairness and unfairly high rates resulting in increased evasion. Because these limitations and initiatives act as opposing forces, it is difficult to make a clear-cut prediction of what the relative level of tariff evasion is - in comparison with prior years or other regions around the world. Hence, we develop two research questions, which are formulated as follows:

RQ1: Has tariff evasion in SSA decreased, increased or remained stable throughout 2008-2015?

RQ2: Is tariff evasion in SSA lower, higher or similar as in other regions around the world?

2.3. Data and Empirical Strategy

Prior research suggests that a positive association between tariff rates and trade gaps is indicative of tariff evasion (Fisman and Wei, 2004). Trade gaps refer to discrepancies between a country's reported imports and its trading partners' reported exports- in terms of weight, value, or quantity. Trade value gaps, which are recorded in US dollars, are particularly relevant in the context of tariff evasion. The rationale is as follows (Bhagwati, 1964; Ferrantino et al., 2012; Fisman and Wei, 2004).

Exports are recorded at free-on-board value, while imports are recorded at free-on-board value plus costs of freight and insurance. This implies that the difference of export and import values should be negative. A positive difference, however, is indicative of evasion- through the undervaluation of imports- especially when the gap size correlates with the tariff rate. This is because trade value gaps that consistently increase with corresponding tariff rates are indicative of a pattern of evasive practices that aims at reducing tariff obligations. Therefore, we concentrate our attention on the trade value gap.

Our empirical strategy follows prior research in this area, and consists in first estimating product-level trade gaps, and then testing whether these gaps correlate with corresponding product-level tariff rates.

2.3.1. Data

The analysis employs all the data of imports, exports, and tariff rates that are currently available at the World Integrated Trade Solution database of the World Bank (WITS, 2017), which gathers information from the UN Statistical Division of Commodity Trade (COMTRADE) and the UNCTAD Trade Analysis and Information System (TRAINS).

Data of imports and exports are retrieved from COMTRADE, while data of tariffs are retrieved from TRAINS. We retrieve product-level data of the following three groups of countries (these data sources provide aggregate data at the “regional" level): SSA, high income countries (HIC), and the rest of the world (ROW; i.e., all countries excluding SSA and HIC), covering the period 2008-2015.

Product-level import, export, and tariff observations are matched by product, using the 6-digit Harmonized Commodity Description and Coding System nomenclature (HS code; WCO, 2016; Fisman and Wei, 2004; Mishra et al., 2008). We use post-2007 data because they consistently employ the 2007 edition of HS code nomenclature, and are available for a vast majority of economies. The generated dataset contains 147,675 valid region-year-product observations.

2.3.2. Variable Measurement

Trade gap. For each region, year, and product, the trade value gap is equal to the natural logarithm of the exporter’s reported exports minus the corresponding importer’s reported imports (in US dollars; Fisman and Wei, 2004; Mishra et al., 2008).

Tariff rate. The tariff rate corresponds to the average HS6 tariff rate, which is recorded as a percentage and includes the ad valorem equivalent of non-ad valorem tariffs. Table 2.1 contains means and standard deviations of tariff rates and value trade gaps for each of the three groups of countries. Table 2.1 shows that, on average, both the tariff rates and trade value gaps are higher in SSA than in HIC and ROW.

Table 2.1: Summary statistics: Mean and standard deviation value of tariff rate and trade gap

	Entire period (2008-2015)	First half (2008-2011)	Second half (2012-2015)
tariff rate			
SSA	11.147	11.526	10.780
	(7.583)	(7.335)	(7.799)
HIC	5.897	5.792	5.993
	(7.258)	(7.358)	(7.164)
ROW	8.579	8.731	8.444
	(6.844)	(7.010)	(6.691)
trade value gap			
SSA	0.137	0.131	0.144
	(1.524)	(1.467)	(1.578)
HIC	-0.023	-0.045	-0.004
	(1.222)	(0.950)	(1.428)
ROW	-0.068	0.083	-0.202
	(1.421)	(1.169)	(1.599)

Note: Standard deviations are in parenthesis; SSA: Sub-Saharan Africa; HIC: high income countries; ROW: rest of the world (excluding SSA and HIC).

2.3.3. Empirical Strategy

In this line of literature, a positive and significant tariff-gap association is indicative of evasion. This association is commonly examined using a linear regression model in which the trade gap is the dependent variable and the tariff rate is the independent variable (this is why this association is often referred to as the tariff evasion elasticity).

Our analysis includes two models. Model 1 examines the tariff-gap association separately for each group of countries. We do this for the entire period (2008-2015), as well as for the first and second halves of the period (2008-2011 and 2012-2015, respectively). Model 1 includes time fixed-effects, as we analyze data from several years. Overall, this Model 1 allows us to assess whether there is an indication of the presence of tariff evasion in each of these regions and periods.

Model 2 is an extended version of Model 1, and allows us to make proper comparisons and provide rigorous answers to our research questions. Model 2 is a pooled regression model that makes use of all available observations simultaneously. This model is specified as follows:

$$\begin{aligned} GAP_{ptb} = {} & \beta_0 + \beta_1 R_{ptb} + \beta_2 (R_{ptb} * HIC_{ptb}) + \beta_3 (R_{ptb} * ROW_{ptb}) \\ & + \beta_4 (R_{ptb} * PERIOD_{pbt}) + \beta_5 (R_{ptb} * HIC_{ptb} * PERIOD_{pbt}) \\ & + \beta_6 (R_{ptb} * ROW_{ptb} * PERIOD_{pbt}) + \beta_7 (HIC_{ptb} * PERIOD_{pbt}) \\ & + \beta_8 (ROW_{ptb} * PERIOD_{pbt}) + \beta_9 HIC_{ptb} + \beta_{10} ROW_{ptb} \\ & + \beta_{11} PERIOD_{pbt} + \varepsilon_{ptb}, \end{aligned} \tag{2.1}$$

where, GAP_{ptb} represents the trade gap in value of product *p* measured at HS six-digit at year *t* of block *b*. R_{ptb} represents the average tariff rate applied by block *b* on the import from the world of product *p* at time *t*. *HIC* is a dummy which takes the value 1 if the block is HIC and 0 otherwise. Similarly, *ROW* is a dummy which equals 1 if the block is the rest of the world and 0 otherwise. *PERIOD* is a dummy which takes the value 1 if the period is 2012-2015 and 0 if the period is 2008-2011. In the equation SSA and the period 2008-2011 are the reference group. Accordingly, β_1 represents tariff evasion elasticity of SSA for the period 2008-2011; β_2 and β_3 indicate the evasion elasticity differences of SSA with HIC and ROW, respectively.

β_4 predicts whether tariff evasion in SSA changed during 2012-2015 as compared to 2008-2011. If it is positive (negative) and statistically significant it indicates that tariff evasion of SSA has increased (decreased) over the years. Similarly, the sum of β_4 and β_5 and the sum of β_4 and β_6, respectively, predict whether tariff evasion in HIC and ROW increased during 2012-2015 as compared to 2008-2011. So $\beta_5(\beta_6)$ indicate whether the change over time is different for HIC (ROW) compared to the change observed for SSA. Note that the variables with the coefficients from β_7 to β_{11} are necessary control variables to properly measure the interaction with tariff rate.

Because the model includes different interactions, the interpretation of individual regression coefficients must done with caution. This is because the potential influence of each independent variable is captured in all the coefficients that contain it. The procedure to estimate the effect of the tariff rate on the trade value gap- for each group of countries and period, is described next.

Comparing marginal effects

To make the comparisons and answer our research questions, we first run Model 2, and then estimate the marginal effects of the tariff rate on the trade gap - conditional to each group of countries and period (this yields point estimates with standard errors and 95% confidence intervals; Dawson and Richter, 2006; Williams, 2012). This allows us to make formal statistical comparisons between marginal effects. To ease the interpretation of these comparisons and visualize potential differences, we plot the obtained marginal effects for each group of countries and period in graph.

Overall, this procedure allows us to assess whether tariff evasion in SSA is different than in HIC and ROW, and whether it has increased during the studied period.

Robustness strategy

Following prior studies in this area, we conduct the analysis with and without outliers (defined as trade value gap values winsorized at 1% and 99%; Javorcik and Narciso, 2008), and with and without special products, which could potentially suffer from data distortions[4].

Finally, to rule out the possibility that the results are influenced by the different products that are imported by each group of countries, we also conduct the analysis for all products imported by each of the groups as well as for only those products that are imported in all three regions.

2.4. Results

2.4.1. Main findings

The association between the tariff rate and the trade value gap is examined separately for each group of countries in Model 1, and simultaneously for all groups of countries in Model 2. In both models, the tariff rate acts as a predictor of the trade value gap, and the estimations are based on robust standard errors clustered by product. Table 2.2 presents the results of Model 1 for each block for 2008-2015, 2008-2011, and 2012-2015.

Table 2.2 shows that the tariff-gap association during the entire period (2008-2015) is positive and significant for SSA and ROW, but not for HIC. When splitting the period in halves, the tariff-gap association is positive and significant for the three groups of countries during the first half (2008-2011), and only for SSA and ROW during the second half (2012-2015). We

[4] Special products include goods that are commonly excisable (HS22 and HS24), ores (HS 26), oil (HS 27), nuclear reactors (HS 8401), aircraft and space crafts (HS88), ships (HS 89), arms and ammunition (HS 93), works of art, and collectors' pieces and antiques (HS 97).

observe a higher tariff evasion elasticity for SSA and ROW than for HIC. SSA and ROW also show a higher evasion elasticity in the more recent years compared to the earlier period. This holds when we exclude outliers, special products, and products that were not imported by the three groups of countries (not tabulated).

Table 2.2: Model 1: Association between tariff rate and value trade gap for each group of countries

		(1) SSA	(2) HIC	(3) ROW
Entire period (2008-2015)	*tariff rate*	.016***	.002	.013***
		(.002)	(.001)	(.002)
	F-test	93***	3***	61***
	R^2	.018	.004	.029
	N	45,701	50,583	51,391
First half (2008-2011)	*tariff rate*	.011***	.002*	.007***
		(.002)	(.001)	(.001)
	F-test	36***	5***	23***
	R^2	.018	.002	.011
	N	22,498	24,230	24,172
Second half (2008-2011)	*tariff rate*	.020***	.001	.019***
		(.002)	(.002)	(.002)
	F-test	100***	1***	66***
	R^2	.019	.005	.024
	N	23,203	26,353	27,219

Note: in all regressions, the dependent variable is the value trade gap, and the independent variable is tariff rate; all regressions include year fixed effects; SSA: Sub-Saharan Africa; HIC: high income countries; ROW: rest of the world (excluding SSA and HIC); robust standard errors clustered by six-digit product level are in parentheses; $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$.

Model 2 is an extended version of Model 1, and is used to more rigorously compare tariff-gap associations between groups of countries and periods. The results of Model 2 are presented in Table 2.3.

Table 2.3: Model 2: Association between tariff rate and value trade gap

	(1) All observations	(2) Winsorizing outliers	(3) Excluding special products	(4) Including same products
tariff rate	.011***	.012***	.011***	.011***
	(.002)	(.002)	(.002)	(.002)
tariff rate X HIC	-.009***	-.010***	-.008***	-.010***
	(.002)	(.002)	(.002)	(.002)
tariff rate X ROW	-.004*	-.005*	.002	-.003
	(.002)	(.002)	(.002)	(.002)
tariff rate X Period	.009***	.008***	.010***	.010***
	(.002)	(.002)	(.002)	(.002)
tariff rate X HIC X Period	-.011***	-.009***	-.013***	-.009***
	(.003)	(.002)	(.003)	(.002)
tariff rate X ROW X Period	.003	.001	.009**	-.007**
	(.003)	(.002)	(.003)	(.002)
HIC	-.061*	-.043	-.062*	-.060*
	(.027)	(.024)	(.026)	(.026)
ROW	.021	.034	-.030	-.027
	(.029)	(.026)	(.028)	(.028)
Period	-.073**	-.056*	-.084***	-.072**
	(.026)	(.023)	(.025)	(.026)
HIC X Period	.125***	.091***	.150***	.089**
	(.030)	(.026)	(.029)	(.027)
ROW X Period	-.305***	-.247***	-.348***	-.007
	(.033)	(.029)	(.035)	(.028)
constant	.001	-.022	-.011	-.001
	(.026)	(.023)	(.024)	(.026)
F-test	90***	90***	92***	42***
R^2	.012	.013	.014	.011
N	147,675	147,675	142,378	136,056

Note: the dependent variable is the value trade gap; *HIC* and *ROW* are dummy variables taking the value 1 if the group of countries is high income countries or the rest of the world, respectively, and 0 otherwise; *Period* is a dummy variable taking the value 1 if the period corresponds to the second half (2012-2015), and 0 otherwise; robust standard errors clustered by six-digit product level are in parentheses; $^{*}p<.05$, $^{**}p<.01$, $^{***}p<.001$.The resulting elasticities are depicted in Figure 2.1.

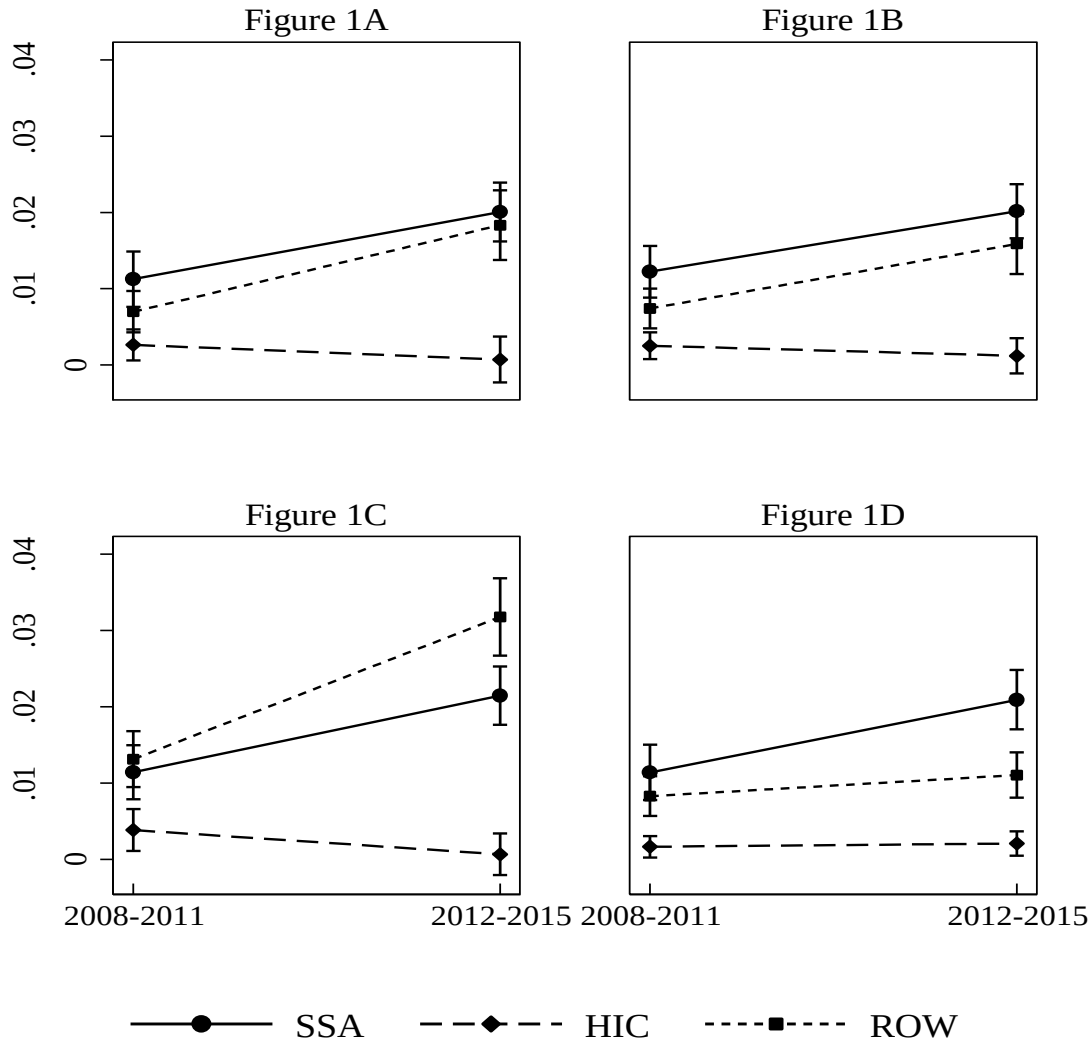
Column 1 of Table 2.3 reports the main and interaction effects of the tariff rate, the group of countries (using dummies for HIC and ROW), and the period (using a dummy to identify the second half of the studied period) on the trade value gap, using all the available observations. We focus our attention on the coefficients that capture marginal effects of the tariff rate (as these are the ones that are indicative of evasion).

The interaction effects reveal that compared to the reference group SSA, evasion was lower in HIC and ROW in the early period (tariff X HIC and tariff X ROW, respectively). Tariff evasion increased for SSA (tariff X period 2), but not for HIC (tariff X period 2 combined with tariff X period 2 X HIC). There is no significant difference in the increase between SSA and ROW (tariff X period 2 X ROW). To robustly estimate the significance of these effects, it is possible to estimate, based on these results, the total marginal effects of the tariff rate on the trade gap for each region and period, while holding all other influences constant. Graphs of the total marginal effects of Model 2 and the subsequent robustness tests are presented in Figure 2.1. The regression results of the robustness test are presented in the last three columns of Table 2.3.

Figures 1A-1D consistently indicate that tariff evasion in SSA (i) is higher than in HIC, (ii) increases during this period, and (iii) is comparable to ROW (we use the word “comparable" because the level of tariff evasion in SSA is in all cases relatively close to ROW, and depending on the test, it can be statistically higher, lower, or equal). The four figures also show that tariff evasion in HIC is negligible or relatively low. In all cases, these results are supported by statistical comparisons of marginal effects, using 95% confidence intervals. Although the level of tariff evasion consistently increases for both SSA and ROW, the analysis does not provide a clear indication of their relative difference. As compared to ROW, tariff evasion in SSA may be higher,

lower or similar depending on the products that are included in the analysis. Therefore, comparisons between these two groups of countries should be made with caution.

Figure 2.1: Marginal effects of the tariff rate on the trade value gap (main analysis and robustness tests)



Note: Figure 1A includes all available observations; Figure 1B winsorizes outliers at 1% and 99%; Figure 1C excludes special products; Figure 1D excludes products that were not imported by all; vertical lines at the extremes of each series represent 95% confidence intervals.

2.4.2. Exploratory additional analysis

The results presented thus far trigger a follow-up question: what explains the increase of tariff evasion in SSA? One important observation is that, in this region, trade with BRIC countries (Brazil, Russia, India, and China) has grown much more rapidly than trade with OECD countries (Bayraktar, 2017). Interestingly, prior studies suggest that trade partners can have an influence on tariff evasion (e.g., Dutt and Traca, 2010; Worku et al., 2016). Taking these two points into consideration, we conduct an additional exploratory analysis to examine the following research question:

RQ3: Is the increasing level of tariff evasion in SSA associated with the composition of its trade partner portfolio?

To answer this question, the procedure followed is similar to the procedure applied with Model 2. We first retrieve HS6 product-level data from SSA, BRIC, and OECD countries. The analysis takes SSA countries as importers, and BRIC and OECD countries as exporters. Contrary to the previous analysis, the relatively limited number of countries allows to gather product trade gaps for each SSA importer country - BRIC/OECD exporter country combination individually. We run a pooled regression in which the dependent variable is the trade value gap in SSA countries, and the regressors are the tariff rate, a dummy variable taking the value 1 if the year belongs to the second part of the period (and 0 otherwise), and a dummy variable taking the value 1 if the good is imported from an OECD country (and 0 if imported from a BRIC country). The tariff rates are the most-favored-nation tariff rates. However, when a SSA country offers preferential tariff rates those preferential rates are used. The regression includes the three main effects and 2-way interactions, as well as the 3-way interaction between these variables. The number of country-year-

product observations included in this regression is N =1,211,679. Robust standard errors are clustered by product.

The results of this pooled regression are presented in Table 2.4 and, similarly to the earlier analysis then used to robustly estimate the marginal effects of the tariff rate on the trade value gap-conditional to the period and group of exporters. These marginal effects are visualized in Figure 2.2.

Table 2.4: Association between tariff rate and value trade gap on imports from OECD and BRIC countries simultaneously

tariff rate	.010***
	(.003)
*tariff rate * OECD*	-.000
	(.003)
*tariff rate * Period*	.007***
	(.001)
*tariff rate * OECD * Period*	-.010***
	(.002)
Period	.088***
	(.016)
OECD	.255***
	(.040)
*OECD * Period*	-.152***
	(.021)
constant	-.165***
	(.037)
N	1,211,679
F-test	83***
R^2	.004

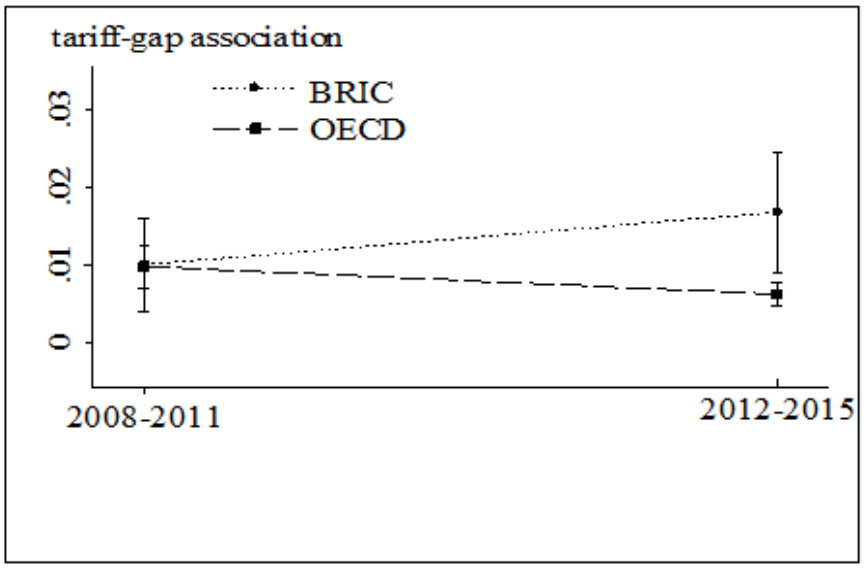
Note: the dependent variable is the value trade gap; *OECD* is dummy variable taking the value 1 if the exporting country is OECD country and 0 if it is BRIC country; *Period* is a dummy variable taking the value 1 if the period corresponds to the second half (2012-2015), and 0 otherwise; robust standard errors clustered by six-digit product level are in parentheses; *p<.05, **p<.01, ***p<.001

The results in Table 2.4 indicate that there was no significant difference between OECD and BRIC exporters in the early period (*tariff* X *OECD*), but that evasion increased in the second period

for BRIC exporters (*tariff* X *Period*), but not for OECD exporters (*tariff* X *Period* combined with *tariff* X *Period* X *OECD*).

The marginal effects plotted in Figure 2.2 reveals the significance of the combined effects. The margins confirm that trade with OECD and BRIC countries is associated with a similar level of tariff evasion during the first half of the period (2008-2011). During the second half of the period, however, the data indicate that the level of tariff evasion is higher for trade with BRIC countries compared to trade with OECD countries. This difference is statistically significant.

Figure 2.2: Marginal effects of the tariff rate on the trade value gap based on imports from OECD and BRIC countries.



Note: vertical lines at the extremes of each series represent 95% confidence intervals

Connecting the results of the main and additional analyses, the recent increase of tariff evasion in SSA may be associated with the increasing volume of imports that come from BRIC countries. A more thorough examination of this association lies beyond the scope of this additional exploratory analysis, and future research may more rigorously assess whether this association is

explained by an increasing volume of imports (related to, e.g., SSA countries' limited infrastructure or administrative capacity) or relevant characteristics of these groups of trade partners.

2.5. Discussion and conclusion

In this chapter we compare tariff evasion in Sub-Saharan Africa (SSA) during recent years (i.e., 2008-2015), and against high income countries (HIC) and the rest of the world (excluding SSA and HIC) for the same period. We also explore whether tariff evasion in SSA is affected by the composition of its trading partner portfolio. The results of the analysis indicate that tariff evasion in SSA has increased over the years and remained higher than in high income countries. It is comparable to the rest of the world. We also show the presence of an increase in tariff evasion on goods imported from BRIC countries while evasion decreased on imports from OECD countries. Interestingly, between 2008 and 2015 import from BRIC countries to SSA has increased by 74% while import from OECD countries increased by 11%. The general increase in evasion in SSA may thus be explained by the change in the trading partners portfolio of SSA. Our results are robust to a number of tests.

The chapter has important contributions to the post-2015 global development discussions which have given special attention to trade facilitation and tax revenue mobilization as a tool to foster economic development in SSA. While international assistance has been flowing to SSA to support the trade liberalization and facilitation endeavors of the region, this chapter shows that the region has also been losing significant amount of public money due to tariff evasion. Using the methodology of Javorcik and Narciso (2008), our estimation shows that between 2008 and 2015 the region has lost tariff revenues of USD 16.4 billion on imports from BRIC and OECD countries

with more than 82% of the evasion relating to imports from BRIC countries. This loss of revenue is three times higher than the official development assistance granted to the region for the same period. When other import taxes – such as excise tax and value-added tax which are imposed on the value of imports – are considered, the loss of revenue on imports in SSA would be even more substantial. The chapter therefore suggests that trade facilitation assistances and reforms indeed facilitate trade but should also go hand in hand with the identification of the determinants of tariff evasion in SSA and implementation of diagnostic measures which would help the region reduce evasion and its fiscal consequences.

Furthermore, this chapter indicates that the problem of tariff evasion in SSA is not only explained by internal factors but may be also influenced by the region's trading partner portfolio. This goes in line with recent findings by Worku et al. (2016) which show both trade partners can influence – and therefore help reduce – tariff evasion in SSA. In this sense, our findings may contribute to the evaluation of trade policies and risk management systems of customs offices in SSA.

Since the data we use in the analysis to answer the first two research questions is aggregated by blocks and to answer our third question by country our results are subject to the limitations this brings. A higher aggregation level lowers the precision and thus the quality of the analysis. The results may therefore provide clear indications about the existence and trend of evasion and allow to compare between blocks and countries, but may not reflect the true extent of evasion in the region and the comparison is subject to these limitations too. In fact, we use robustness tests, fixed effect controls, marginal effects, and robust standard errors clustered by products to account for unobserved factors and measurement noises that may influence our results.