Taxes Rates, Economic Crisis and Tax Evasion: Evidence using Zimbabwe and South Africa Bilateral Trade Flows

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Abstract

Prompted by the theoretical ambiguity in the relationships between tax rates and tax evasion, this study investigates the relationship between tariff (tax) rates and tax evasion using highly disaggregated trade data for Zimbabwe and South Africa. The study uses cross sectional data analysis which is divided into three periods, namely; Zimbabwe pre-crisis (1980 to 1999), crisis (2000-2008) and post crisis period (2009-2012). The results show different responses of tax evasion to tariff changes in the three periods. During the pre-crisis period and post crisis period, decrease in tariff rates is associated with reduction in tax evasion while during the crisis period; decrease in tariff rates is sometimes associated with an increase in tax evasion. The results suggest that tariff reduction during economic crisis is not always associated with decrease in tax evasion. This implies that during crisis period, no matter what happens to border tax rates, the need for survival (minimisation of costs) supersedes the tariff rate changes. Further disaggregating products using Rauch and UNCTAD product classification shows that tariff changes have a positive impact on consumer goods and differentiated products across all periods. This might imply that the government may generate more revenue through further tariff liberalisation. Generally, the results show a positive relationship between tax rates and tax evasion.

Key words: Economic crisis, tariff rates, tax evasion, trade flows

JEL codes: F14, F18, H26

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1. Introduction

Theoretically, the relationship between tax rates and tax evasion is not straight forward (Slemrod, 2007; Slemrod and Wilson, 2009). An early theoretical prediction assumes positive relationship between tax rates and tax evasion (Allingham and Sandmo, 1972; Slemrod and Yitzhaki, 2002). However, later theoretical developments could not ascertain (Slemrod, 2007). The presence of economic crisis might even complicate this relationship. The game theoretical gambler model suggest that the fear of being caught cheating especially in crisis period likely increases the possibility of paying tax by traders (Buehn and Eichler, 2011). However, the financial hardships might also suggest that traders are likely to be more wary about saving the little income they have, which eventually leads to increase in tax evasion. This study contributes to this debate by focusing on bilateral trade between Zimbabwe and South Africa.

This study is important to Zimbabwe in that it provides a basic understanding of how importers respond to border taxes under different economic situations. The knowledge about the behaviour of traders under economic crisis or during normal growth period gives direction on how government should formulate revenue collection strategies. The importance of trade taxes has also been weakened further by trade liberalisation which has perpetually seen a reduction in import taxes, hence the need for tighter control strategies on this already dwindling revenue source. The ability for government to collect more revenue and proper spending aid economic growth and development. The case that South Africa reimburse value added tax on South African side provide an incentive for traders to correctly declare their products on the South African side. Whereas the levying of import tax may encourage tax evasion on the Zimbabwean side. This scenario requires clear knowledge of how traders behave.

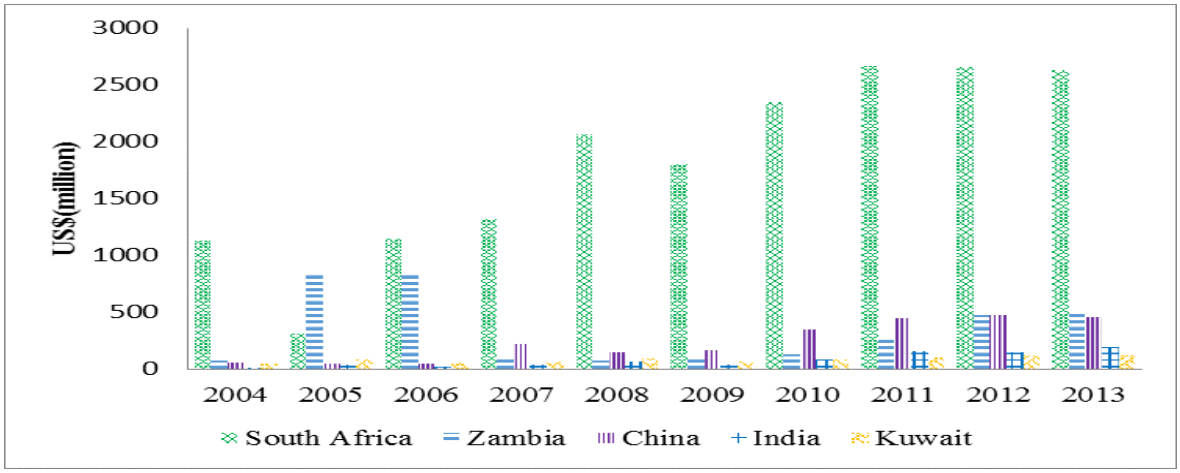
The contribution of this study is twofold. Firstly, it investigates the relationship between tax rates and tax evasion in a country that experienced economic crisis. This study provides an opportunity to assess the impact of tax rates on tax evasion when the economy is and is not in crisis period. The Zimbabwean economy has been characterised by stable growth period from 1980 to 2000, crisis period from 2000 to 2009 and further growth period (post-crisis) from 2009 to 2014. Until now, no study has investigated the relationship between tax evasion and taxes rates in Zimbabwe. Although similar research have been conducted in other African

countries such as Mozambique (e.g van Dunem and Arndt, 2009) and Kenya as well as Tanzania (see Levin and Widell, 2014), none of them specifically investigate tax evasion in an economic crisis period. Secondly, the study uses both cross sectional and panel data analysis using highly disaggregated trade data for Zimbabwe and South Africa. The use of highly disaggregated data helps identify products that are more likely to experience tax evasion.

2. Background

South Africa is the major trading partner of Zimbabwe. During the period 2007-2013, above 60% of Zimbabwe's imports are from South Africa. China and Zambia have also consistently exported huge volumes of goods to Zimbabwe (see Figure 1).

Figure 1: Top five importers to Zimbabwe



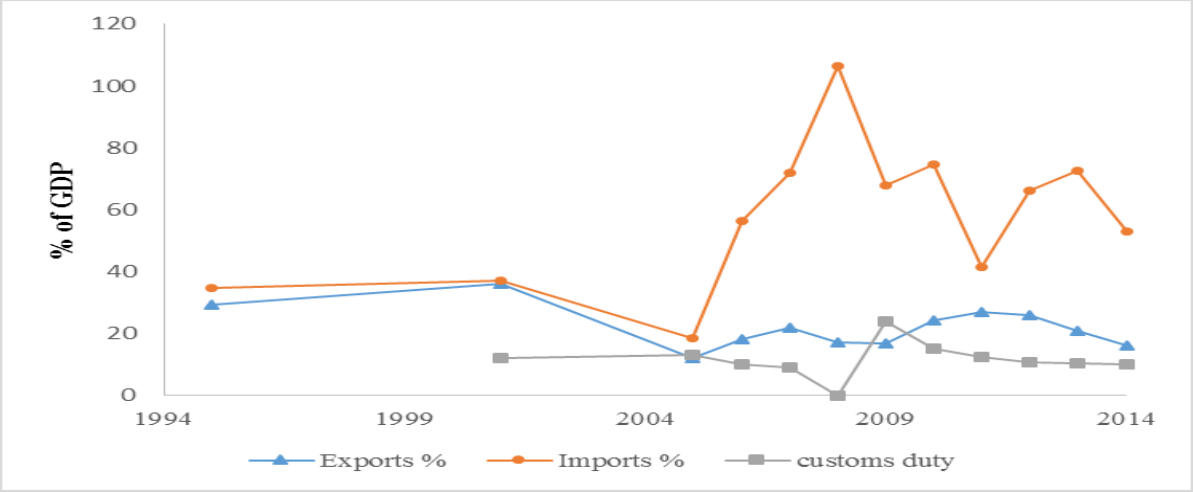
Data Source: IMF

The huge volume of imports from South Africa provides conducive conditions for tax evasion. It is estimated that 450 000 people, 3200 buses, 30 000 private cars and 21 000 trucks pass through the border every month congesting the border which likely prevents customs officials from properly searching and documenting goods for duty purposes (Zifudzi, 2015). A number of goods that also pass through the border are destined for other countries, providing further fertile ground for tax evasion. There is possibility that other goods can be declared as if they are in transit whilst they are destined for Zimbabwe. On average 469 goods smugglers are intercepted at the Beit Bridge border post and on average 9 are prosecuted every month (Zifudzi, 2015).

Further, the double declaration on the Zimbabwe-South African border post is characteristic of long delays and queues that frustrate declaration of customs duty. Tax payers are tempted to pay bribes to customs officer as a way to quickly facilitate clearance of goods (Epaphra, 2015). In addition, customs officers deliberately frustrate tax payers by not providing efficient service in order indirectly induce them to pay bribes. Zimbabwe's tax system is complicated and is made up of a number of procedures carried by government officials operating from different counters or offices (Zifudzi, 2015). The winding procedures and long clearing time consisting of middle men who facilitate the importation and exportation of goods also provides breeding space for corruption which results in government losing large amounts of revenue.

During economic crisis trade between Zimbabwe and South Africa increased astronomically. Figure 2 shows that Zimbabwe imported more goods than it exported to South Africa. The trade gap widened during the economic crisis period, especially during the 2006-2009 period. Further, the revenues from customs duty fell drastically during the same period. This might suggest the possibility of increased tax evasion during this period.

Figure 2: Customs duty, imports and exports of goods by Zimbabwe to SA



Data Source: UNCOMTRADE 2015

Moreover, during the crisis period, most Zimbabweans migrated to South Africa. The Department of Home Affairs in South Africa put the figure at two hundred and fifty thousand legally documented Zimbabwean citizens with a substantial number living in the country illegally, while others like Alexander (2010) put the figure at three million. The migrants

play a pivotal role in trade as majority of them still maintain ties with their relatives in Zimbabwe and send cash remittances and goods. This has also increased trade and probability of tax evasion as most of them use informal means to send these goods into Zimbabwe, either through bus or truck drivers

Economic situation and Tax evasion

Economic policies pursued by a country play a vital role in determining trade patterns. Zimbabwe has passed a raft of economic policies from 1980 to date that have immensely affected trade patterns. Between 1980 and 1989, the Zimbabwean government used licensing, administered prices, subsidies, redistributive transfers, and protectionism to keep private firms under tight control (Brett, 2005). In the early 1990s the authorities adopted a classical ESAP involving the removal of many restrictions on trade, credit, foreign exchange, investments, and labour. ESAP resulted in a major restructuring, involving significant costs, benefits and losses, by 1996 the economy showed signs of recovery. In the year 1996, the economy grew by 7.3 percent; exports increased from 23.9 percent of GDP in 1991 to 36.1 percent, foreign exchange reserves were higher compared to 1991; and employment was beginning to recover after a sustained period of downsizing occasioned by the implementation of ESAP. The implementation of ESAP promoted liberalisation of the economy and a wide range of tax rates reduction in the year 1997 (Chitiga et al., 2007; Chitiga and Mabugu, 2005).

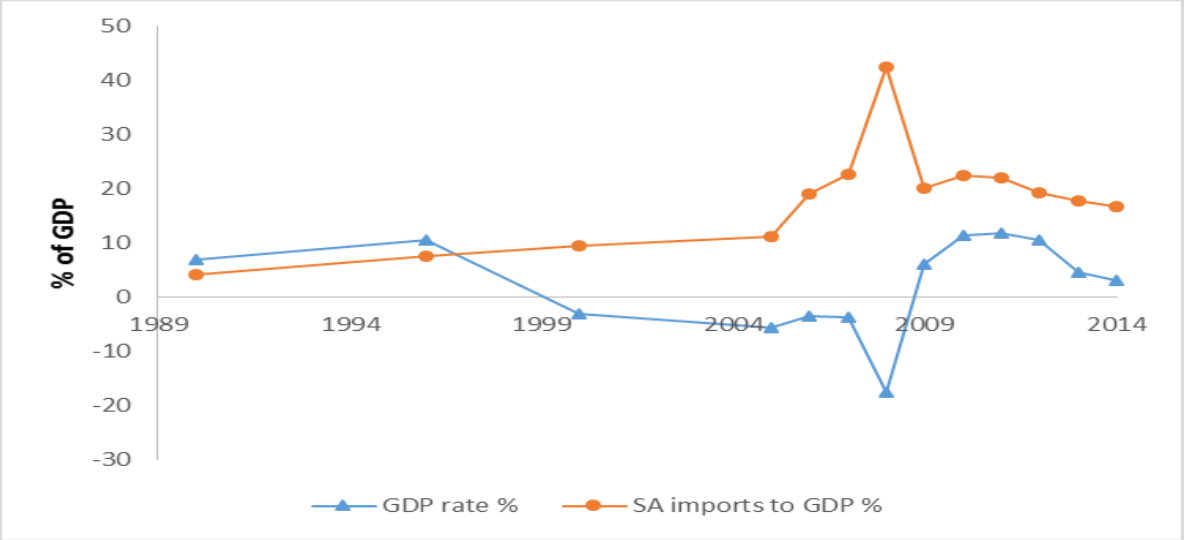
A series of counterproductive political decisions which precipitated the Zimbabwe economic crisis were taken from late 1997. These include large unplanned payments to war veterans which undermined fiscal discipline, land appropriation, policy reversals on taxation, price controls, and a decision to send the Zimbabwean army to the Congo (at own expense) (Brett, 2005; Sampson, 2010). Corporatist controls over the exchange rate and many other prices were re-established that destroyed the viability of many firms and reduced the incentive to invest which was followed by violent land expropriations.

Symptoms that characterised the prevalence of economic crisis in Zimbabwe are the hyper-inflation environment compounded by a huge black market premium between the official foreign exchange rate and the parallel (black market) exchange rate. The two variables explained the supply bottle necks within the economy. GDP fell by about 26 percent between

2000 and 2002 and inflation was more than 600 percent by the beginning of 2004. Food production fell below 50 percent of a normal year in 2003 (Barry et al., 2009; Unit, 2003). This led to the beginning of the economic crisis and by September 2007, inflation soared, peaking at an astounding monthly rate of 79.9 billion percent by mid-November 2008 (Hanke and Kwok, 2009).

Figure 3 shows that there is a correlation between imports and economic growth. The lower the economic growth, the higher the imports.

Figure 3: Trends of Zimbabwe's economic growth and Zimbabwe's imports from South Africa



Data Source: World Bank, 2015

High inflation led to company closures leading to reduced domestic production of goods and services which resulted in an increase of imported goods. The trend shows that during the peak of the crisis between the periods (2006-2009), the GDP fell to below -17% and imports from South Africa to Zimbabwe rose astronomically. The Zimbabwean government adopted the multi-currency system (dollarization) in 2009 (Pilossof, 2009). There was a marked increase in growth when the ZANU PF government entered into a Government of National Unity with the opposition MDC party that lasted until 2013 but generally this did not significantly reduce importation of goods by Zimbabwe especially from South Africa. The economy has experienced sluggish growth after the end of the Government of National Unity. The economic crisis has seen a widespread closure of companies and shrinking of production in Zimbabwe, forcing Zimbabwean citizens to increase consumption of imported goods sourced from a wide spectrum of countries.

Supply bottlenecks in 2008-2012 forced the government of Zimbabwe to suspend duty on all basic commodities especially foodstuffs (Zimbabwe government budget Statement, 2011). Clothing, footwear, blankets, cigarettes and travel bags are some of the items that have a high duty in excess of 40% plus specific tax. Usually a specific tax is charged to counter people who tax evade on imports. Majority of local manufacturers have resorted to importing raw materials from South Africa due to the decline in domestic raw materials supplies. A huge number of Zimbabwean supermarket shelves are constituted by around 70 percent imported products mainly from South Africa and 30 percent locally manufactured products. The underground economy for Zimbabwe is estimated at 58.3% of the GDP which provide a favourable environment for tax evasion (Epaphra, 2015)

3. Brief literature review

Allingham and Sandmo (1972) and Fedeli (2012)'s theoretical model provides a starting point on how traders decide to evade tax given tax rate in force. It puts tax evasion in a game theoretical context. Tax evasion often entails taxpayers deliberately misrepresenting the true state of their affairs to the tax authorities to reduce their tax liability (Slemrod, 2007). In trade, tax evasion includes misstatement of imports or exports in a bid to avoid tax liability by traders. Buehn and Eichler (2011) notes that an act closely linked to tax evasion is trade mis-invoicing. Tax evasion is illegal and punishable by law. The fact that tax evasion is punishable by law forces traders to be involved in the act secretly, hence it is not easy to detect.

The decision to evade tax is affected by the probability to be detected by the authorities, magnitude of penalty as well as the wealth effect (Buehn and Eichler, 2011; Slemrod and Yitzhaki, 2002). If there is a low probability of detection that is compounded by a higher income return from evading tax, importers and exporters put a huge effort to evade tax. In a related tax evasion model, Slemrod and Yitzhaki (2002) also emphasise that if the probability of detection is high and if the punishment is punitive enough, evasion is most likely going to decrease. They further note that relative to income, evasion may rise, fall or remain the same depending on whether relative risk aversion is decreasing, rising or remain constant respectively. This suggests that the degree of risk aversion in conjunction with

income also plays a pivotal role in determining tax evasion. Risk averse individuals are less likely to evade tax as compared to risk takers.

Buehn and Eichler (2011) designed a conceptual framework analysis that reflect how importers decide to evade tax. Buehn and Eichler (2011) suggest that importers in the domestic market, in this case Zimbabwe, import goods amounting to $\boldsymbol{M}$ and decide how much to report, that is, $\boldsymbol{M-S^M}$, where $\boldsymbol{S^M}$ is the value of unreported imports. If the importer decides to evade tax by underreporting, then unreported imports will be $\boldsymbol{S^m > 0}$, where as if the importer decides to evade tax by over reporting, then unreported imports will be $\boldsymbol{S^m < 0}$**.** The importer has to determine the optimal absolute amount of tax evaded imports subject to expected return, probability of detection and the severity of the punishment he faces when he is caught (Slemrod and Yitzhaki, 2002).

Empirically, most of existing studies focus on tax evasion and tax revenue for developing countries during normal economic conditions (see Fisman et al., 2007; Fisman and Wei, 2007; Pommerehne and Weck-Hannemann, 1996; Van Dunem and Arndt, 2009). Existing studies have concentrated on the impact of trade liberalization on tax evasion in developing countries (Arndt and Tarp, 2009). A widely accepted notion is that higher tax rates result in increasing cases of tax evasion (Fisman and Wei, 2007; Levin and Widell, 2014; Marrelli, 1984; Torgler and Schneider, 2007; Van Dunem and Arndt, 2009).

Van Dunem and Arndt's (2009) study in Mozambique reports that a 1% increase in taxes leads to a 1.4% increase in tax evasion. Similar results are concluded by Levin and Widell (2014) in a study in Tanzania, Kenya and UK. Tax evasion cases are found to be prevalent in Tanzania compared to Kenya and UK. A worrying fact is that under reporting and tax evasion are concluded to be increasing over the years 2000 and 2004 with coefficient of 2.6 and 3.5 respectively.

Existing studies for Iran (Maddah and Nematollahi, 2013); Brazil (Kume et al., 2011), and China ((Fisman and Wei, 2001) reached a similar conclusion. Higher tax rates increase chances of tax evasion. In Iran a total of 27 917 goods showed a significant positive relationship between tax rates and tax evasion on imports from 12 major trading partners. In Brazil evidence of under reporting of imports are concluded with an elastic response of 1% increase in tax rates leading to a 3.2% increase in tax evasion of imported goods from trading

partners. Similar conclusions were arrived at in China where a 1% change in tax rates resulted in a 3% increase in tax evasion of goods imported from Hong Kong.

Javorcik and Narciso (2008) find that that tax evasion is more common on differentiated than homogenous goods in Germany. A one percent increase in tariff rates in Germany led to a 0.4 percent and 1.7 percent increase in tax evasion of homogenous and differentiated goods respectively (Javorcik and Narciso, 2008).

4. Methodology

Data

Zimbabwe imports from South Africa and South Africa exports to Zimbabwe data at 6 digit Harmonised System (HS) as well as tariff data are from UNCOMTRADE trade database contained in the World Integrated Solution (WITS) database. The tax evasion gap is calculated both from the import trade values and quantities for robustness check purposes. However, the data on quantities is less reliable as it has many missing values. This might be necessitated by the fact that customs officials are more concerned with the values rather than quantities in calculating customs duties. To test for the influence of economic crisis and also missing data, the regression analysis is broken into three phases: the pre-crisis, crisis and post crisis (dollarization period) represented by the periods 1980-2000, 2000-2009 and 2010-2014 respectively. However, from these three periods the study chooses only a single year for each period, 1995 for 1980-2000; 2007 for 2000-2009 and 2012 for 2010 to 2014. The selection for 1995 is mainly driven by data availability. The study chose 2007 as the crisis year, since this is the year when the crisis reached its apex. 2012 is chosen because it shows the post crisis period and when the economy was performing fairly better.

Empirical model

This study employs methodology used by Fisman and Wei (2004) that defines tax evasion as the ratio of the value of South African exports to Zimbabwe (X), to the value of Zimbabwe import from South Africa (M). In principle, if there is no tax evasion, the numerator and denominator should be the; $\frac{X}{M} = 1$. In the presence of tax evasion on the Zimbabwean side; $\frac{X}{M} > 1$. This shows that the study is concerned with exports that are recorded in South

Africa as going to Zimbabwe and are not recorded in Zimbabwe as imports. Either they are smuggled into Zimbabwe or they are misclassified as other similar products.

The baseline model is specified as exploiting variation across products (cross sectional analysis) for the three different years, 1995, 2007 and 2012;

$$\log(\frac{X_{it}}{M_{it}}) = \alpha_{it} + \beta_1 Taxes_{it} + \varepsilon_{it} \quad (1)$$

Where $\frac{X_{it}}{M_{it}}$ is the measure of tax evasion, where X_{it} is export of product i by South Africa to Zimbabwe and M_{it} is imports of product i at time t recorded by Zimbabwe from South Africa. α_{it} and ε_{it} is constant term and error term respectively.

Coefficient of interest is β_1 and is expected to be positive. This shows that as border taxes increase tax evasion increases.

In order to test for the influence of economic crisis, the study estimates equation 1 using different years. It first estimate the equation during the pre-crisis period using 1995, then estimate the same equation during crisis period for 2007 and after crisis period in 2012. This is cross sectional analysis.

For robustness checks the study uses quantities instead of values to calculate tax evasion. This involves repeating estimation of above equations using ratios of quantities of exports (Qx_{it}) to imports (Qm_{it}) as proxy of tax evasion. The ratio of quantities should be one if there is no evasion;

$$\log(\frac{Qx_{it}}{Qm_{it}}) = \alpha_{it} + \beta_1 Taxes_{it} + \varepsilon_{it} \quad (2)$$

The study also exploits variation across products over time. This is a panel setting.

$$\log(\frac{X_{it}}{M_{it}}) = \alpha_{it} + \beta_1 Taxes_{it} + \lambda_i + \theta_t + \varepsilon_{it} \quad (3)$$

Where λ_i is product fixed effects to control for unobservable product characteristic and θ_t is time fixed effects to control for other macroeconomic shocks. This is also repeated for quantity data. The study also add other variables like taxes squared and lag tax rates to check for the tax evasion turning point and the influence of previous taxes on tax evasion respectively.

For robustness checks the study estimates the above equations using different product classifications. The first is the UNCTAD stages of processing (SoP) harmonised system (HS) standard product group classifications, which groups products along the production chain. Stage 1 has raw material products, stage 2 intermediate products, stage 3 has consumer products and stage 4 has capital products. The second classification uses the classification from Rauch (1999). This classification groups goods into those traded on an organised exchange (homogeneous goods), reference priced and differentiated products.[3]

5. Results

Descriptive statistics

Table 1 shows the descriptive statistics. The results show that tax evasion measure using the value has more observations than when using quantity measure. This is mainly that customs officials are more concerned with the value rather than quantity in calculating customs duty. It therefore shows that they are not strict in quantity recording. Tariff data shows positive values within a minimum of zero, indicating that in the sample there are zero rated goods.

Table 1: Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
Tax evasion (Value)	27539	-.0724939	1.842349	-13.37447	12.08556
Tax evasion (quantity)	21604	.0566522	2.135082	-13.24299	13.34316
In(tariff)	41021	.1539199	.1398413	0	2.171337
$In(tariff)^2$	41021	.0432465	.0751793	0	4.714704

[3] http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeData.html#Rauch

Kernel Density (kd) and Cumulative Distribution Function (cdf) Results

The study uses Cumulative Distribution Functions (cdf) and Kernel Density (kd) to show the discrepancy between the reported exports from South Africa to Zimbabwe and the reported imports by Zimbabwe from South Africa. The purpose of the Kernel Density is to construct a surface that accurately reflects the likelihood of tax evasion occurring in each cell. The Cumulative Distribution Function shows the discrepancy that may exist on the aggregated trade data reported by the two countries. The results shows that the trend is the same when using the value and quantity measure of tax evasion. Therefore, the study only reports results from the value measure.

Figure 4 shows the results for the whole sample period from 1988 to 2014. The left hand side show CDF while the right hand side shows KD

Figure 4: CDF and KD for the period 1988-2014

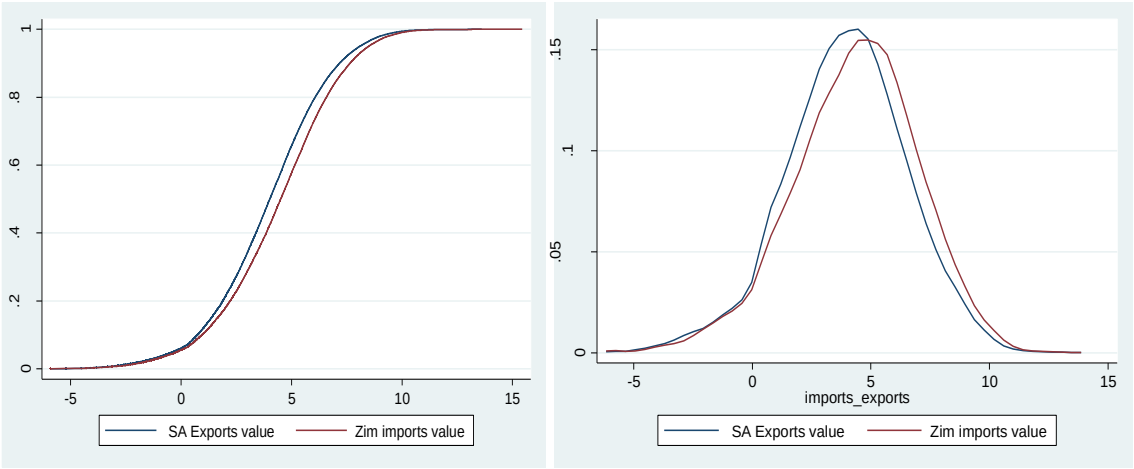
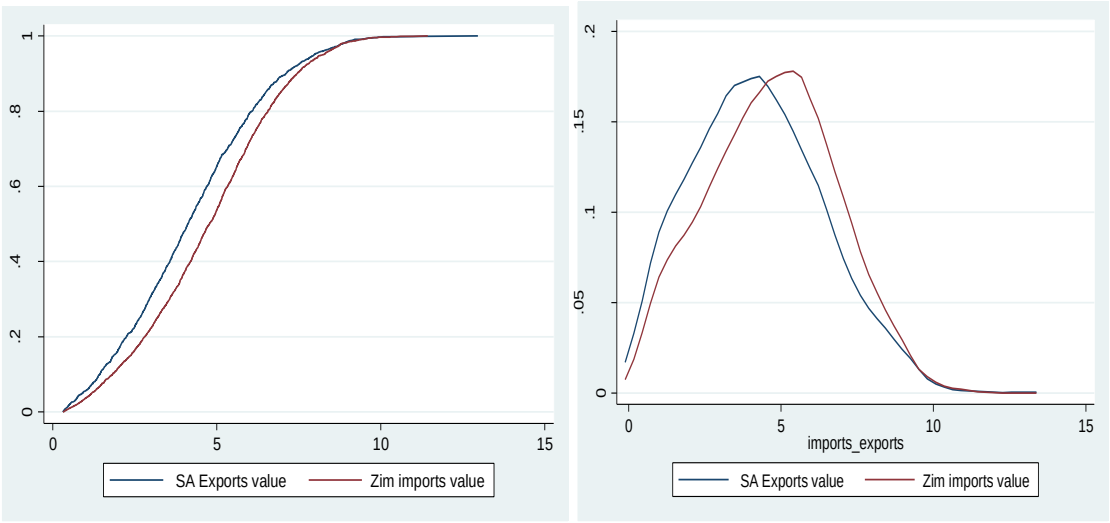


Figure 4 shows that at low value of imports, traders reported similar figures in Zimbabwe compared to the one reported on the South African side, suggesting that tax evasion is very low for importers of low value goods. This may suggest that consumers with small values of goods may not want to lose the little they have if caught evading tax. They therefore reported the true value of goods imported. The results from the cdf and kd for the period 1988 - 2012 show that tax evasion is prevalent with traders of moderate value imports. The importers reported a lower value imported from South Africa to Zimbabwe compared to the reported figures of South African exports to Zimbabwe. At higher value of imports, importers reported higher figures in Zimbabwe than in South Africa. This confirms the assertion that risk

aversion is partly determined by the level of income (Slemrod and Yitzhaki, 2002). The study concludes that lower value as well as higher value goods importers have lower levels of tax evasion over the 1988-2012 period, suggesting that they are risk averse. In the case of moderate valued goods, importers are more likely to evade tax, suggesting that they are risk takers. The results suggest that for moderate value goods, importers tend to negotiate the tax they pay for their goods or they use other methods to misrepresent the value of goods imported over the period 1988-2012.

Figure 5 shows CDF and KD for the year 1995, the pre-crisis period

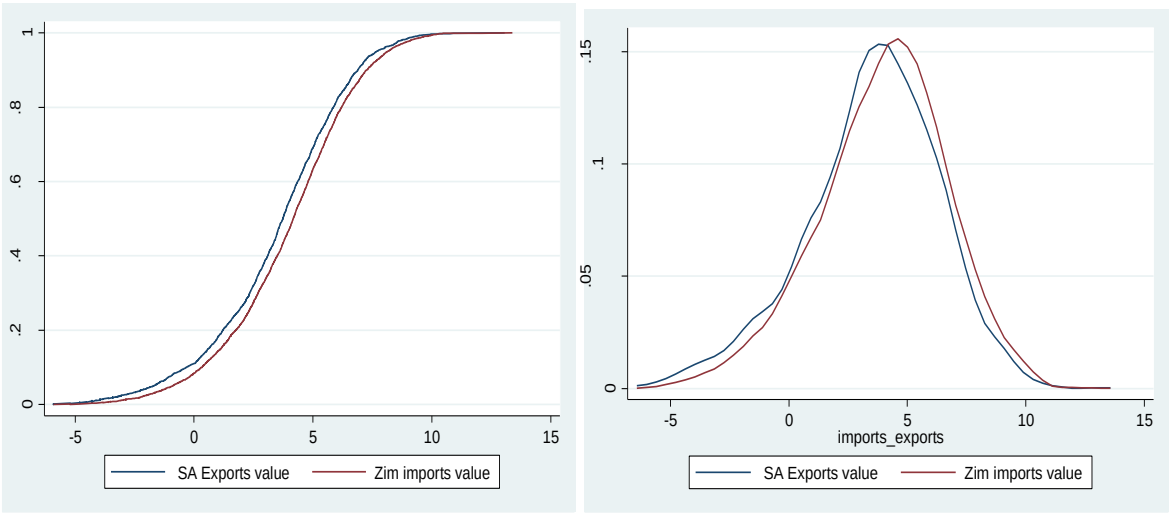
Figure 5 : CDF and KD for the pre-crisis period- year 1995



Results from the cdf in Figure 5 suggests that tax evasion is prevalent during the pre-crisis period. In fact cumulatively imports reported in Zimbabwe from South Africa are dominantly lower than exports reported by South Africa to Zimbabwe for the low and moderate value goods importers. Results from the associated kd suggest that tax evasion is prevalent amongst low to moderate value goods importers, suggesting that this group of importers are risk takers. The kd in Figure 5 shows higher instances of tax evasion amongst moderate value goods importers. However, high value goods importers did not evade tax but rather reported a higher value on the Zimbabwean side than the value they reported on the South African side.

Figure 6 shows the CDF and KD for the year 2007 data to investigate tax evasion trend during the crisis period.

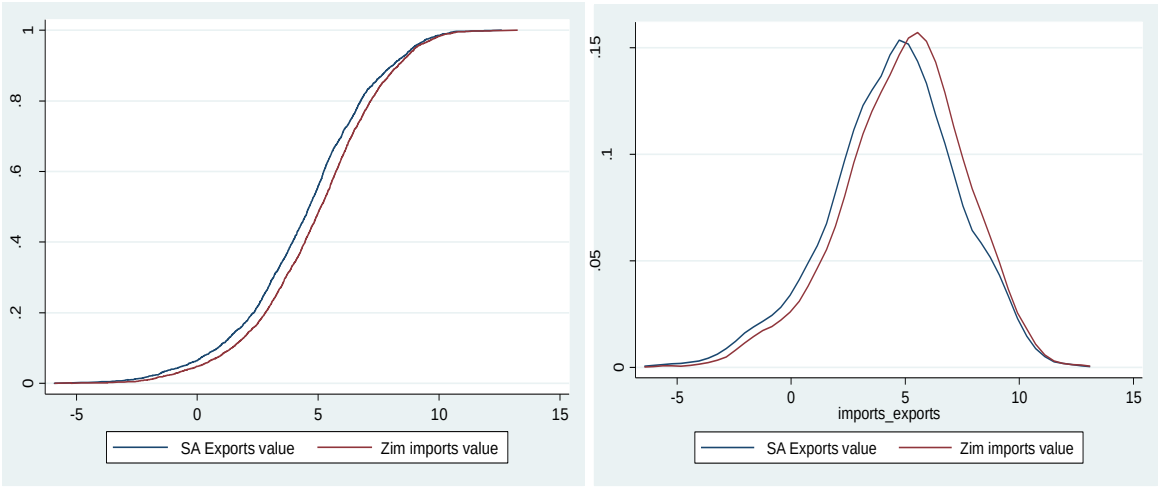
Figure 6 : CDF and KD for the crisis period year 2007



Results from the cdf in Figure 6 suggests that tax evasion is marginally present during the crisis period compared to the pre-crisis period. Cumulatively, the reported imports in Zimbabwe are lower than the reported exports from South Africa to Zimbabwe showing the presence of tax evasion. Results from the kd suggest that tax evasion is present among the low and moderate goods value importers. The kd shows higher tax evasion incidence for low value goods importers, suggesting low value goods importers could have been involved in a risk behaviour during the crisis period as a survival strategy. The economic crisis could have caused low value goods importers to be risk takers. There is no evidence of tax evasion on high value goods. Generally the gap between the reported imports on the Zimbabwean side and exports reported on the South African side during the crisis period is narrower compared to the pre-crisis period, suggesting that the Zimbabwean government could have implemented strict measures to reduce tax evasion.

The study uses data for the year 2012 to represent post – crisis period (see Figure 7).

Figure 7 : CDF and KD post - crisis Period year 2012



The cdf and kd in Figure 7 show the presence of tax evasion amongst the low and moderate value goods importers. The cdf results suggest that there are discrepancies on the reported imports to Zimbabwe from South Africa compared to exports from South Africa to Zimbabwe. Comparatively, the discrepancies are lower than in the pre-crisis period, but they are higher than reported discrepancies during the crisis period. The kd in Figure 7 shows that evasion occurred amongst low and moderate value goods importers, but it is absent on high value goods importers.

The findings reveal that tax evasion is rampant amongst low and moderate value goods importers. Confirming that the decision to evade tax is affected by the probability to be detected by the authorities, magnitude of the penalty as well as the wealth effect (Buehn and Eichler, 2011; Slemrod and Yitzhaki, 2002). Low value goods importers put a huge effort to evade tax during the crisis period. This asserts that relative to income, evasion may rise, fall or remain the same depending on whether relative risk aversion is decreasing, rising or remain constant respectively (Slemrod and Yitzhaki, 2002). High value goods importers are less likely to evade tax. This finding suggests that high value goods are difficult to hide if one would like to evade tax. Another possibility is that high value goods importers are more likely to be corporates who mostly use their workers to import goods. Workers may not have the incentive to misrepresent the value of goods imported by corporates they work for. All the kd presented above are skewed to the right suggesting that it is easy to evade tax for low and moderate value goods imports than high value goods imports.

Econometric results

Base results

Table 2 shows cross sectional results from estimating equation 1. The estimation is done for 1995 (pre-crisis period), 2007 (crisis period) and 2012 (post-crisis) period. This estimation exploits variation across products and uses 1988 HS nomenclature. The study also uses 2007 and 2012 HS nomenclature and the results were largely the same.

Table 2 : Base line results

	Value measure- 1988 HS classification		
	Pre-Crisis	Crisis	Post crisis
ln(tariff)	0.23	-0.044	0.93***
	(0.431)	(0.387)	(0.307)
Constant	-0.26*	-0.13*	-0.27***
	(0.150)	(0.075)	(0.061)
N	1667	1687	1665
R^2	0.000	0.000	0.005

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Key: pre-crisis= 1995, Crisis= 2007 and Post crisis =2012

The results in Table 2 show different responses of tax (tariff) evasion to changes in taxes rates across different periods. The results show that during the pre-crisis and post crisis period, decrease in tax (tariff) rates is associated with decrease in tax evasion which is what is theoretically expected. For example, during the post-crisis period a decrease in tariff is associated with 0.93% decrease in tax evasion and it is statistically significant. The results for the pre-crisis and post-crisis are consistent with Fisman and Wei (2004) results who find that reduction in tariff in China is associated with reduction in tax evasion. This is also supported by Van Dunem and Arndt (2009) for the case of Mozambique and South Africa and Jovorcik and Narciso (2008) for Germany. This suggests that under normal growth periods an increase in tariff will lead to reduction in tariff revenue.

The results for the crisis period show a negative relationship between tariff rate and tariff evasion and the coefficient is statistically insignificant. The results suggest that the decrease in tariff during the crisis period was associated with an increase in tax (tariff) evasion. This opposes what is expected a priori. The possible reason for the results might be that during the

crisis period importers are more concerned about survival and minimisation of leakages (costs) as much as possible. It shows that even if the tax rates were generally decreasing during this period, this did not incentivise traders to report honestly the values they were importing from South Africa. The income effect might have been the sole driver. This shows that during economic crisis the possibility of evading tax is high, exacerbating the revenue shortages, pointing to the need for government to strengthen tax controls at the border.

Product level estimation results

Table 3 tests if the results hold for different products using UNCTAD stages of processing (SoP). For Table 4, the pre-crisis and crisis period does not have capital goods due to fewer data points under this product classification.

Table 3: Product Regression: Using UNCTAD classification

	Pre-Crisis period			Crisis period			Post crisis period			
	consumer	intermediate	raw material	consumer	intermediate	raw material	capital	consumer	intermediate	raw material
ln(tariff)	1.44**	-0.87	-0.39	0.96*	0.78	-2.52**	15.5	0.85*	0.65	0.99
	(0.718)	(0.684)	(1.987)	(0.548)	(0.923)	(1.273)	(24.924)	(0.450)	(0.929)	(0.811)
Constant	-0.72**	0.096	-0.21	-0.41***	-0.19*	0.38	-0.27	-0.23**	-0.27***	-0.26
	(0.292)	(0.222)	(0.573)	(0.140)	(0.104)	(0.260)	(0.993)	(0.114)	(0.093)	(0.165)
N	601	903	158	584	868	234	3	566	850	246
R2	0.007	0.002	0.000	0.005	0.001	0.017	0.279	0.006	0.001	0.006

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results show that the consumer goods have the expected sign across all periods and the coefficient is statistically significant. This shows that the decrease in taxes on consumer goods led traders of consumer goods to pay taxes or declare more goods for duty purposes. This is expected since in many cases the tariff on consumer goods were decreasing during this period, with government sometimes declaring consumer goods duty free. The coefficient is largest under pre-crisis period.

Under the crisis period raw materials coefficient has a negative and statistical significant relationship between tax rates and tax evasion. It shows that generally during crisis period tax rates reduction resulted in an increase in tax evasion on raw materials. This might suggest that tax rates reduction could not incentive importers to reduce tax evasion during the crisis period. The pre-crisis period also shows an insignificant negative coefficient for intermediate and raw materials products.

For post-crisis all the coefficients have the expected positive sign. However, it is only consumer goods which are significant. This shows that under growth periods traders are more risk averse since the results show that they declare products for duty purpose. It shows that during this period, if government reduces tariffs, they can benefit from a reduction in tax evasion, hence the possibility of tax revenue increase. These results support evidence in existing literature (Bouet and Roy, 2012; Chetty, 2008; Cremer and Gahvari, 1993; Fisman and Wei, 2007; Levin and Widell, 2007; Marrelli, 1984; Van Dunem and Arndt, 2009) which find that if border taxes increase, importers will find ways to evade taxes.

Table 4 test if the results hold for different products using Rauch product classification.

Table 4 : Product regression: Using Rauch classification

	Pre-crisis period			Crisis period			Post-crisis period		
	Differentiated	Reference	Homogenous	Differentiated	Reference	Homogenous	Differentiated	Reference	Homogenous
ln(tariff)	0.55	-0.97	-3.20	0.44	1.78*	-3.87	0.82	-0.042	3.53
	(1.030)	(1.460)	(4.859)	(0.833)	(1.019)	(2.614)	(0.756)	(1.010)	(2.521)
Constant	-0.47	0.060	1.36	-0.16	-0.33*	-0.16	-0.35**	-0.069	-0.53
	(0.384)	(0.463)	(1.531)	(0.189)	(0.196)	(0.582)	(0.160)	(0.196)	(0.489)
N	217	185	26	226	198	48	222	205	53
R^2	0.001	0.002	0.018	0.001	0.015	0.046	0.005	0.000	0.037

Table 4 shows mixed results across all the periods when using Rauch product classification. The coefficients on differentiated products show the expected positive sign, bust statistically insignificant across all periods. This shows that no matter under what economic conditions differentiated goods will be easy to capture and it might be difficult for importers to evade taxes. This supports the results found by Jovorcik and Narciso (2008) for a Germany study, which concluded that the responsiveness of the trade gap to the tariff level is greater for differentiated products than for homogeneous goods. Further, reference priced goods have the expected significant positive sign during the crisis period. For the post crisis period it is only the referenced priced goods that have a negative and statistically insignificant coefficient.

Robustness checks

The study examines if there is a turning point on this tax evasion as illustrated in Table 5. This is done for both the value and product measure.

The results point to the presence of turning point across all the periods. This is illustrated by the coefficient on tariff squared. It shows that during the crisis and post crisis growth period a continuous decrease in tax rates will reach a point where tax evasion will not respond

positively to decrease in taxes. The crisis period and pre-crisis tariff coefficient switches signs. However, the coefficient for the crisis period is not significant. The pre-crisis period shows that a decrease in tariff will lead to an increase in tax evasion. These results are not what was expected a priori. The right panel of Table 5 shows the quantity measure of tax evasion results. It shows that both during crisis and post crisis period, the results are significant and have expected positive coefficient.

Table 5 : Value and Quantity results

	Value Measure			Quantity measure	
	Pre-crisis	Crisis	Post crisis	crisis	Post crisis
ln(tariff)	-4.62*	0.68	2.81***	4.98***	2.55**
	(2.618)	(1.362)	(0.882)	(1.616)	(0.991)
$\ln(\text{tariff})^2$	6.74*	-1.78	-4.46**	-7.13**	-4.36**
	(3.721)	(3.172)	(1.733)	(3.542)	(1.915)
Constant	0.55	-0.17	-0.38***	-0.88***	-0.12
	(0.441)	(0.110)	(0.081)	(0.146)	(0.091)
N	1667	1687	1665	1439	1637
R^2	0.001	0.000	0.007	0.013	0.004

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6 shows the results for pooled regression analysis over time from 1988 to 2014 using the value and quantity tariff measure. This is to test the period that outweighs other periods during the study period. All the columns from 1-5 have year fixed effects. The columns show different variables considered; for example, column 1 shows regression equation having tariff, lagged tariff and tariff squared as independent variable which is different from, for example, column 3 that only has tariff and lagged tariff as independent variables.

Table 6 : Pooled regression results

	Value					Quantity				
	1	2	3	4	5	1	2	3	4	5
ln(tariff)	0.31	0.62***	0.20	0.37***		1.07**	1.51***	0.41**	0.86***	
	(0.339)	(0.186)	(0.147)	(0.126)		(0.458)	(0.279)	(0.191)	(0.214)	
ln(lagtariff)	0.23		0.062		0.15	0.66**		0.15		0.81***
	(0.202)		(0.142)		(0.132)	(0.298)		(0.193)		(0.234)
$\ln(\text{tariff})^2$	0.012	-0.48**				-1.37**	-1.23***			
	(0.491)	(0.193)				(0.674)	(0.232)			
Constant	-0.25***	-0.25***	-0.29***	-0.23***	-0.077	-0.40***	1.39*	-0.16***	1.47*	-0.32***
	(0.055)	(0.052)	(0.025)	(0.051)	(0.049)	(0.072)	(0.779)	(0.034)	(0.776)	(0.068)
N	11134	13258	11134	13258	11548	7850	8124	7850	8124	8069
R^2	0.027	0.023	0.000	0.023	0.033	0.009	0.010	0.001	0.009	0.008

Standard errors in parentheses, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The results show that across all periods and using different specifications the decrease in tariff is associated with a decrease in tax evasion. It shows that the negative effects observed on some products is outweighed by positive effects in pooled regressions. The coefficient on tariff has a positive sign and is statistically significant across all specifications when using the quantity measure. For example, under column 4, a decrease in tariff is associated with a 0.37% decrease in tax evasion during the period using the value measure and 0.86% using the quantity measure. These results are similarly observed for the lagged tariff coefficient. This may suggest that the effect of a decrease in tariff has an influence in subsequent periods (that is a one year lag). The impact of tariff decrease on tax evasion is significantly felt in the successive years after implementation. This might imply that an increase in tariff increases tax evasion by importers in the future period as they learn about loop holes over time after the tariff imposition. The coefficient on tariff squared shows a turning point that a continual decrease in tariff is associated with an increase in tariff evasion at some point. The coefficient is positive and is significant for almost all specifications except under column 1, 3 and 5 for value measure.

6. Conclusion

This study investigates the relationship between tariff (tax) rates and tax evasion using highly disaggregated trade data between Zimbabwe and South Africa, using cross sectional and panel data analysis. The analysis is divided into three periods: Zimbabwe pre-crisis (1980 - 1999), crisis (2000- 2008) and post crisis period (2009-2012). The results show different responses of tax evasion to tariff changes in the three periods.

During the pre-crisis period and post crisis, decrease in tariff rates is associated with reduction in tax evasion. However, under the crisis period, decrease in tariff rates is associated with an increase in tax evasion. The results suggest that tariff reduction during economic crisis is not always associated with decrease in tax evasion. This implies that during crisis period, no matter what happens to the border tax rates, the need for survival (minimisation of costs) supersedes the tariff rate changes. South Africa has been a major supplier of Zimbabwe products during the crisis period and the results suggest that Zimbabwe lost significant customs revenue during this period. The government needs to monitor

importation of low and moderate value goods imports as importers are more likely to evade tax.

Further disaggregating products using Rauch and UNCTAD product classification shows consumer and differentiated goods have the expected positive relation between tax and tax evasion. The results show that decrease in tariff rates is largely beneficial for consumer goods. This study is not conclusive.

Future studies will focus on comparing the response of tax evasion on different Zimbabwe trading partners in order to find out the level of tax evasion on the trading partners. This can also be extended to trade agreements and experiments on tax evasion.

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