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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 for three periods; pre-crisis (1980 to 1999), crisis (2000-2008) and post-crisis (2009-2014). The results show different responses of tax evasion to tariff changes in the three periods. During both the pre-crisis and post-crisis periods, a decrease in tariff rates is associated with a reduction in tax evasion, while during the crisis period, a decrease in tariff rates is associated with an increase in tax evasion. The results suggest that tariff reduction during an economic crisis is not always associated with a decrease in tax evasion. Further disaggregating products using Rauch and UNCTAD product classification show that tariff changes have a positive impact on tax evasion for consumer goods and differentiated products.

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

JEL codes: F14, F18, H26

1 Introduction

Theoretically, the relationship between tax rates and tax evasion is not straightforward (Slemrod, 2007; Slemrod and Wilson, 2009). Early theoretical prediction assumes a positive relationship between tax rates and tax evasion (Allingham and Sandmo, 1972; Slemrod and Yitzhaki, 2002). However, later theoretical developments could not ascertain the positive relationship (Slemrod, 2007). The presence of an economic crisis might even complicate this relationship. The game theoretical gambler model suggest that the fear of being caught

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cheating - especially in a crisis period - increases the possibility of traders paying tax (Buehn and Eichler, 2011). However, financial hardship might also cause traders to be more wary of saving the little income they have, which eventually leads to an 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 insight into how importers respond to border taxes under different economic situations. The knowledge about the behaviour of traders in an economic crisis or during a normal growth period may provide 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 of government to collect more revenue and properly spend it, aids the economic growth and development of a country. The fact that South Africa reimburses value-added tax to exporters on the South African side provides an incentive to traders to correctly declare their products on the South African side, whereas the levying of import tax on the Zimbabwean side may encourage tax evasion. This scenario requires a clear understanding of traders' behaviour.

The contribution of this study is twofold. Firstly, it investigates the relationship between tax rates and tax evasion in a country that experienced an 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 a crisis period. The Zimbabwean economy has been characterised by a stable growth period from 1980 to 2000, a crisis period from 2000 to 2009, and a further growth period (post-crisis) from 2009 to 2014. Only a few studies have so far investigated the relationship between tax evasion and taxes rates in Zimbabwe. The existing studies are mainly descriptive (Hove et al., 2014). Although similar studies 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 investigated tax evasion in an economic crisis period. Secondly, the study uses both cross-sectional and panel data analysis for highly disaggregated trade data for Zimbabwe and South Africa. The benefit of using highly disaggregated data resides especially in identifying products that are more likely to experience tax evasion.

The body of this paper is structured as follows: section 2 provides background to the study, section 3 focuses on the brief literature review, and section 4 on methodology; section 5 presents the results and section 6 concludes the study.

2 Background

South Africa is the major trading partner of Zimbabwe. During the period 2007-2013, more than 60% of Zimbabwe's imports were from South Africa. In addition, China and Zambia have also consistently exported huge volumes of

goods to Zimbabwe (see Figure 1).

The huge volume of imports from South Africa provides conducive conditions for tax evasion. It is estimated that 450 000 people, 3 200 buses, 30 000 private cars and 21 000 trucks pass through the border every month, congesting the border - which may likely prevent 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 the possibility that other goods can be declared as if they are in transit, while in reality they are destined for Zimbabwe. On average, as many as 469 goods smugglers are intercepted at the Beit Bridge border post (a link between Zimbabwe and South Africa) every month, of whom on average 9 are prosecuted (Zifudzi, 2015).

Further, the double declaration on the Zimbabwe-South African border post is characterised by long delays and queues that frustrate declaration of customs duty. Tax payers are tempted to pay bribes to customs officers 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 to indirectly induce them to pay bribes. Zimbabwe's tax system is complicated and comprises a number of procedures carried out by government officials operating from different counters or offices (Zifudzi, 2015). The winding procedures and long clearing time consisting of middlemen who facilitate the importation and exportation of goods also provide breeding space for corruption, which ultimately results in government losing tax revenue.

During the economic crisis, trade between Zimbabwe and South Africa increased astronomically. Figure 2 shows that Zimbabwe imported more goods than it exported to South Africa during the period under study. The trade gap widened during the economic crisis period, especially during the 2006-2009 period. Moreover, the revenues from customs duty fell drastically during the same period.

In addition, during the crisis period, a huge number of 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 the majority of them still maintain ties with their relatives in Zimbabwe and send cash as well as goods remittances. This has also increased trade and the probability of tax evasion as most of them use informal means to send these goods into Zimbabwe – such as via bus and truck drivers.

2.1 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 (Brett, 2005). In the early 1990s, the authorities

adopted Economic Structural Adjustment Programme (ESAP) involving the removal of many restrictions on trade, credit, foreign exchange, investments, and labour. ESAP resulted in a major restructuring of trade patterns, involving significant costs, benefits and losses; by 1996, the economy showed signs of recovery. In 1996, the economy grew by 7.3%; exports increased from 23.9% of GDP in 1991 to 36.1%; 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, which promoted liberalisation of the economy and a wide range of tax rate reductions in 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 regulation of many other prices were re-established, which destroyed the viability of many firms and reduced the incentive to invest, and were succeeded by violent land expropriations.

Symptoms that characterised the prevalence of an 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 explain the supply bottlenecks within an economy. GDP fell by about 26% between 2000 and 2002 and inflation was more than 600% by the beginning of 2004. Food production fell below 50% 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% by mid-November 2008 (Hanke and Kwok, 2009).

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

High inflation led to company closures, which led to reduced domestic production of goods and services - which, in turn, resulted in job losses and an increase in consumption of imported goods. This forced more and more people to get into the informal sector such as cross-border trading. The trend shows that during the peak of the crisis (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 (Pilosof, 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).

Supply bottlenecks in 2008-2012 forced the government of Zimbabwe to suspend duty on all basic commodities, specifically 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. The majority of local manufacturers resorted to importing raw ma-

terials from South Africa due to the decline in domestic raw material supplies. What needs to be kept in mind is that the underground economy in Zimbabwe is estimated at 58.3% of the GDP and also provides a favourable environment for tax evasion (Epaphra, 2015).

2.2 Brief literature review

Allingham and Sandmo (1972) and Fedeli (2012)'s theoretical model provides a starting point concerning how traders decide to evade tax, given the prevailing tax rate. It puts tax evasion in a game-theoretical context. Tax evasion often entails taxpayers deliberately misrepresenting the true value or quantity of goods traded to the tax authorities in order 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) note that an act closely linked to tax evasion is trade mis-invoicing. Tax evasion is illegal and punishable by law, which forces traders to be involved in the act secretly and makes it difficult to detect.

The decision to evade tax is affected by the probability of being detected by the authorities, but also the magnitude of the 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 into evading tax. In a related tax-evasion model, Slemrod and Yitzhaki (2002) also emphasise that if the probability of detection is high and the punishment is punitive enough, tax evasion will most likely 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 remaining constant. 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. They suggest that importers in the domestic market, in this case Zimbabwe, import goods amounting to M and decide how much to report; that is, $M - S^M$, where S^M is the value of unreported imports. If the importer decides to evade tax by underreporting, then unreported imports will be $S^m > 0$, whereas if the importer decides to evade tax by over-reporting, then unreported imports will be $S^m < 0$.

Empirically, most of the 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 on 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 the UK. Tax evasion cases are found to be prevalent in Tanzania compared to Kenya and the UK. The study finds that under-reporting and tax evasion in Tanzania have been prevalent between the years 2000 and 2004, with coefficients of 2.6 and 3.5 respectively.

Recent studies concerning Iran Maddah and Nematollahi, 2013), Brazil (Kume et al., 2011) and China (Fisman and Wei, 2001) reached similar conclusions. 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) conclude that tax evasion is more common on differentiated than homogenous goods in Germany. More specifically, a 1% increase in tariff rates in Germany led to a 0.4% and 1.7% increase in tax evasion of homogenous and differentiated goods respectively (Javorcik and Narciso, 2008).

3 Methodology

3.1 Data

Zimbabwe imports from South Africa and South Africa exports to Zimbabwe data at Harmonised System (HS) 6 digit level as well as tariff data are from UNCOMTRADE trade database contained in the World Integrated Trade Solution (WITS) database. For robustness checks purposes, the tax evasion gap is calculated both from the trade values and quantities. However, the data on quantities are less reliable because of many missing values. To test for the influence of economic crisis and also missing data, the regression analysis is broken down 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, namely 1995 for 1980-2000; 2007 for 2000-2009 and 2012 for 2010-2014. The selection for 1995 is mainly driven by data availability. The study chose 2007 as the crisis year since the momentum of economic crisis in Zimbabwe increased astronomically towards its peak in 2008, in turn, 2012 is chosen because it shows the post-crisis period and when the economy is on a growth path.

3.2 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 value should be the same; $\frac{X}{M} = 1$. 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 that fail to be recorded in Zimbabwe as imports.

The baseline model exploits 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; X_{it} is export of product i by South Africa to Zimbabwe; and M_{it} is imports of product i at year t recorded by Zimbabwe from South Africa. In the equation α_{it} and ε_{it} represent the constant term and the error term respectively. The coefficient of interest is β_1 and is expected to be positive. This shows that as border taxes increase, tax evasion increases.

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

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

Secondly, the study uses panel setting, exploiting variation across products over time;

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

where λ_i is product-fixed effects to control for unobservable product characteristics and θ_i is time-fixed effects to control for other macroeconomic shocks. This is also repeated for trade data in quantities. The study, furthermore, adds other variables such as taxes squared and lagged tax rates in order to check whether there is a tax evasion turning point and to determine the influence of previous taxes on tax evasion.

Thirdly, 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 consumer products and stage 4 capital products. The second classification uses the Rauch classification (1999), which groups products

into those traded on an organised exchange (homogeneous products), reference-priced and differentiated products.¹

4 Results

4.1 Descriptive statistics

Table 1 shows the descriptive statistics. The trade data of Zimbabwe and South Africa analysed in the study is for the period 1980-2014. The results show that a tax evasion measure using the value has more observations than when using quantity measure. This suggests that the customs officials are more concerned with the value rather than the quantity when calculating customs duty, and are therefore not strict in recording quantities of goods traded. Tariff data show positive values with a minimum of zero, indicating that in the sample there are zero-rated goods.

4.2 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 Kernel Density is to construct a surface that accurately reflects the likelihood of reporting imports or exports occurring in each cell. The Cumulative Distribution Function shows the aggregated trade data reported by the two countries over a given period. All the values used in plotting the (CD) and (KD) are in logarithms. The results show a similar trend when using the value or quantity of goods traded as a measure of tax evasion. The study, therefore, reports only results obtained using the value of goods/products.

Figure 4 captures the results for the whole sample period from 1988 to 2014. In the figure, CDF is shown on the left side and KD to the right.

The results from the CDF and KD for the period 1988-2014 show that tax evasion was prevalent among all traders (see Figure 4). The importers reported a lower value of goods imported from South Africa to Zimbabwe compared to the reported figures of South African exports to Zimbabwe.

The study concludes that very low value as well as very high value goods importers recorded lower levels of tax evasion over the 1988-2014 period. Moderately high value goods importers were more likely to evade tax, suggesting that they are risk takers. The results suggest that for moderately high value goods importers tended to negotiate the tax they pay for their goods or used other methods to misrepresent the value of goods imported over the period 1988-2014. This strengthens the assertion by Hove *et al.* (2014) that low to

¹<http://www.macalester.edu/research/economics/PAGE/HAVEMAN/Trade.Resources/TradeData.html#Rauch>

moderate valued goods importers are highly sensitive to tax compared to high value goods importers.

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

In Figure 5, the CDF results reveal that tax evasion was prevalent during the pre-crisis period. In fact, cumulatively, imports reported in Zimbabwe from South Africa were dominantly lower than exports reported by South Africa to Zimbabwe for the low and moderate value goods importers. The KD results indicate that tax evasion was more prevalent among low to moderate value goods importers, suggesting that this group of importers were risk takers and highly sensitive to import tax. The KD in Figure 5 shows higher instances of tax evasion among the low and moderate value goods importers.

Figure 6 shows the CDF and KD for the year 2007 data, the crisis period.

Results from the CDF (Figure 6) reveal that tax evasion was present during the crisis period. Cumulatively, the reported imports on the Zimbabwean side were lower than the reported exports from South Africa to Zimbabwe, showing the presence of tax evasion. Results from the KD suggest that tax evasion was present at all levels. Tax evasion gap is wider amongst moderate value goods importers.

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

The CDF and KD in Figure 7 above show the presence of tax evasion among the low and moderately low value goods importers during the post-crisis period. The CDF results show that there are discrepancies on the reported imports into Zimbabwe from South Africa compared to exports from South Africa to Zimbabwe. The KD in Figure 7 shows that evasion occurred more among low and moderately value goods importers.

The findings from the CDF and KD reveal that tax evasion is higher among low and moderately value goods importers. This confirms 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). High value goods importers were less likely to evade tax, suggesting that they are high income tax payers and less sensitive to import tariffs. This finding purports that high value goods are difficult to hide if one wishes 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, because the tax liability falls on the company. All the KD presented above are skewed to the right, suggesting that it is easier to evade tax for low to moderately value goods imports than for moderately high to high value goods imports.

4.3 Econometric results

4.3.1 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.

The results in Table 2 show different responses of tax (tariff) evasion to changes in tax rates across different periods. The results show that during the pre-crisis and post-crisis periods, a decrease in tax (tariff) rates is associated with a decrease in tax evasion - which is what is expected theoretically. For example, during the post-crisis period, a decrease in tariff is associated with a 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's (2004) results in terms of which 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 Javorcik and Narciso (2008) for Germany. The findings suggests that under normal growth periods, an increase in tariff will lead to a reduction in tariff revenue through tax evasion.

The results for the crisis period show a negative relationship between tariff rate and tariff evasion and the coefficient is statistically insignificant. The results reveal that the decrease in tariff during the crisis period is associated with an increase in tax (tariff) evasion. This opposes what is expected a priori. One possible reason for the results might be that during the crisis period, importers were more concerned about survival, and minimisation of leakages (costs) as far as possible. It shows that even if the tax rates are generally decreasing during this period, this did not incentivise traders to report the values they were importing from South Africa honestly. The income effect might have been the sole driver. In addition, the negative coefficient might suggest an inelastic demand for imports during the crisis period. This indicates that during an economic crisis, the possibility of evading tax is high, exacerbating the revenue shortages, and pointing to the need for government to strengthen tax controls at the border. Government should also enact policies that ensure absence of economic crises as far as possible at all times.

4.3.2 Product level estimation results

Table 3 reflects the tests as to whether the results hold for different products using UNCTAD stages of processing (SoP). For Table 3, the pre-crisis and crisis periods do not have capital goods due to fewer data points under such product classification.

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 tariffs on consumer goods led traders of consumer goods to pay taxes or report the true value of imported products for duty purposes. This

is expected since in many cases the tariff on consumer goods are decreasing during this period, with government sometimes declaring consumer goods duty free. The coefficient is larger during the pre-crisis period.

In the crisis period, the raw materials coefficient has a negative and statistically significant relationship between tax rates and tax evasion. It shows that, generally, during a crisis period, tax rates reduction resulted in an increase in tax evasion on raw materials. This might suggest that a tax rate reduction could not incentive importers to reduce tax evasion on raw materials during the crisis period, suggesting that imports for raw materials has an inelastic demand during the crisis period. The findings confirm the importance of imported raw materials from South Africa by Zimbabwe during the crisis period. The pre-crisis period also shows an insignificant negative coefficient for intermediate and raw materials products.

For the post-crisis, all the coefficients have the expected positive sign. However, it is only consumer goods that respond significantly to tax rate changes. It shows that during such a period, if government reduces tariffs, they can benefit from a reduction in tax evasion - and, subsequently, the possibility of tax revenue increase. These results support evidence in the 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) that if border taxes increase, importers will find ways to evade taxes.

Table 4 presents the test as to whether the results hold for different products using Rauch product classification.

Table 4 shows mixed results across all the periods when using Rauch product classification. The coefficients on differentiated products show the expected positive sign, but are statistically insignificant across all periods. This may suggest that no matter under what economic conditions, differentiated goods will be easy to detect and therefore rightly respond to tax/tariff incentives and it might be difficult for importers to evade taxes. This supports the results of Javorcik 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. Furthermore, 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.

4.3.3 Robustness checks

Table 5 reflects an examination into whether there is a turning point on such tax evasion. This is done for both the value and product tax evasion measure.

The results point to the presence of a turning point across all the periods. This is illustrated by the coefficient on tariff squared. It shows that during the crisis and post-crisis periods, 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 is expected a priori. The right panel of Table 5 shows the quantity measure of tax evasion results. It shows that during both the crisis and post-crisis periods, the results are significant and have the expected positive coefficient.

Table 6 shows the results for pooled regression analysis over time, from 1988 to 2014 using the value and quantity tariff measure. This was done 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.

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. 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 columns 1, 3 and 5 for the tax evasion value measure.

5 Conclusion

This study investigates the relationship between tariff (tax) rates and tax evasion using highly disaggregated trade data for Zimbabwe and South Africa, via cross-sectional and panel data analysis. The study also uses the Cumulative Distribution Function and Kernel Density to investigate the presence of tax evasion. The analysis is divided into three periods: Zimbabwe pre-crisis (1980-1999), crisis (2000-2008) and post-crisis (2009-2014). The results show different responses of tax evasion to tariff changes in the three periods.

Regression analysis suggests that during the pre-crisis and post-crisis periods, a decrease in tariff rates is associated with reduction in tax evasion. However, during the crisis period, a decrease in tariff rates is associated with an increase in tax evasion. The results suggest that tariff reduction during an economic crisis is not always associated with a decrease in tax evasion, probably due to the inelastic demand for imports. This implies that during a crisis period, no matter what happens to the border tax rates, the need for survival (minimisation of costs) supersedes tariff rate changes. South Africa has been a major supplier of Zimbabwe imported products before, during and after the

economic crisis. Results from the Cumulative Distribution Function and Kernel Density show consistency of the prevalence of tax evasion among low to moderate value goods across all the different periods. The government needs to monitor importation of low and moderate valued goods, because importers of such goods are more likely to evade tax.

Further disaggregating products using Rauch and UNCTAD product classification shows that consumer and differentiated goods have the expected positive relationship between tax rates and tax evasion. The results show that a decrease in tariff rates is largely beneficial for consumer goods. However results for raw materials, homogenous, and reference goods shows mixed signs. This study is not conclusive. Future studies will focus on comparing the response of tax evasion on different trading partners of Zimbabwe in order to establish the level of tax evasion on particular trading partners. This can also be extended to experimental studies investigating the impact of trade agreements on tax evasion.

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Table 1: Descriptive statistics

Variable	Observation	Mean	Std. Dev.	Min	Max
ln(Tax evasion) (Value)	27539	1.004857	1.309743	0	12.94642
ln(Tax evasion) (quantity)	21604	1.358641	1.630536	0	14.8952
ln(tariff)	41021	0.1539199	0.1398413	0	2.171337
ln(tariff) ²	41021	0.0432465	0.0751793	0	4.714704

Table 2 : Baseline results

	Value measure- 1988 HS classification		
	Pre-Crisis	Crisis	Post crisis
ln(tariff)	0.23 (0.431)	-0.044 (0.387)	0.93 ^{***} (0.307)
Constant	-0.26 [*] (0.150)	-0.13 [*] (0.075)	-0.27 ^{***} (0.061)
<i>N</i>	1667	1687	1665
<i>R</i> 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

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 ^{**} (0.718)	-0.87 (0.684)	-0.39 (1.987)	0.96 [*] (0.548)	0.78 (0.923)	-2.52 ^{**} (1.273)	15.5 (24.924)	0.85 [*] (0.450)	0.65 (0.929)	0.99 (0.811)
Constant	-0.72 ^{**} (0.292)	0.096 (0.222)	-0.21 (0.573)	-0.41 ^{***} (0.140)	-0.19 [*] (0.104)	0.38 (0.260)	-0.27 (0.993)	-0.23 ^{**} (0.114)	-0.27 ^{***} (0.093)	-0.26 (0.165)
<i>N</i>	601	903	158	584	868	234	3	566	850	246
<i>R</i> ²	0.007	0.002	0.000	0.005	0.001	0.017	0.279	0.006	0.001	0.006

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

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 (1.030)	-0.97 (1.460)	-3.20 (4.859)	0.44 (0.833)	1.78 [*] (1.019)	-3.87 (2.614)	0.82 (0.756)	-0.042 (1.010)	3.53 (2.521)
Constant	-0.47 (0.384)	0.060 (0.463)	1.36 (1.531)	-0.16 (0.189)	-0.33 [*] (0.196)	-0.16 (0.582)	-0.35 ^{**} (0.160)	-0.069 (0.196)	-0.53 (0.489)
<i>N</i>	217	185	26	226	198	48	222	205	53
<i>R</i> ²	0.001	0.002	0.018	0.001	0.015	0.046	0.005	0.000	0.037

Table 5 : Value and Quantity results

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

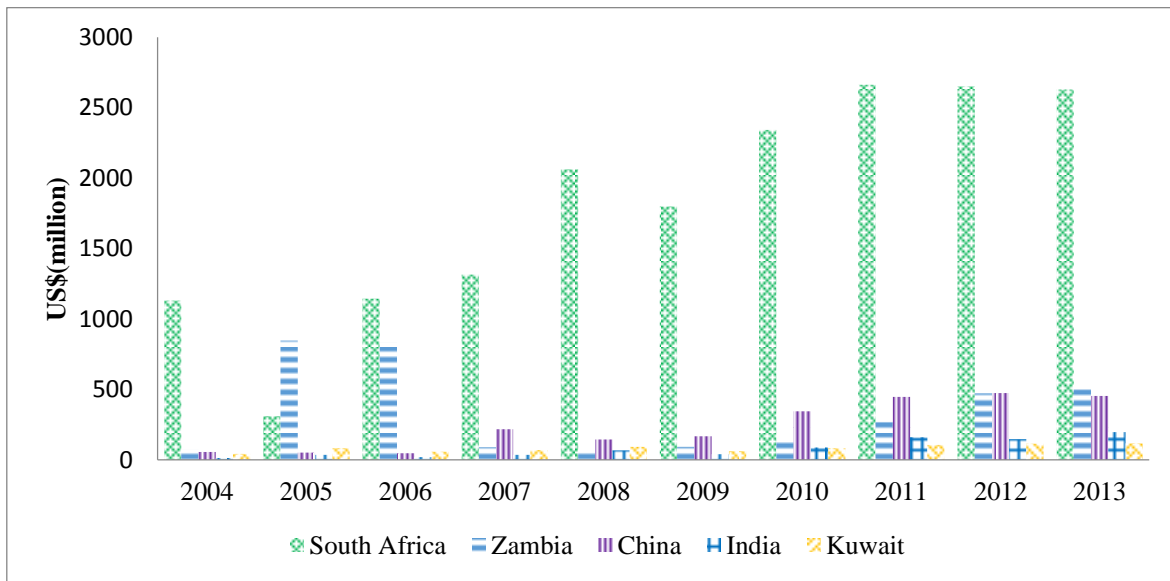
Standard errors in parentheses, ^{*} $p < 0.10$, ^{**} $p < 0.05$, ^{***} $p < 0.01$

Table 6 : Pooled regression results

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

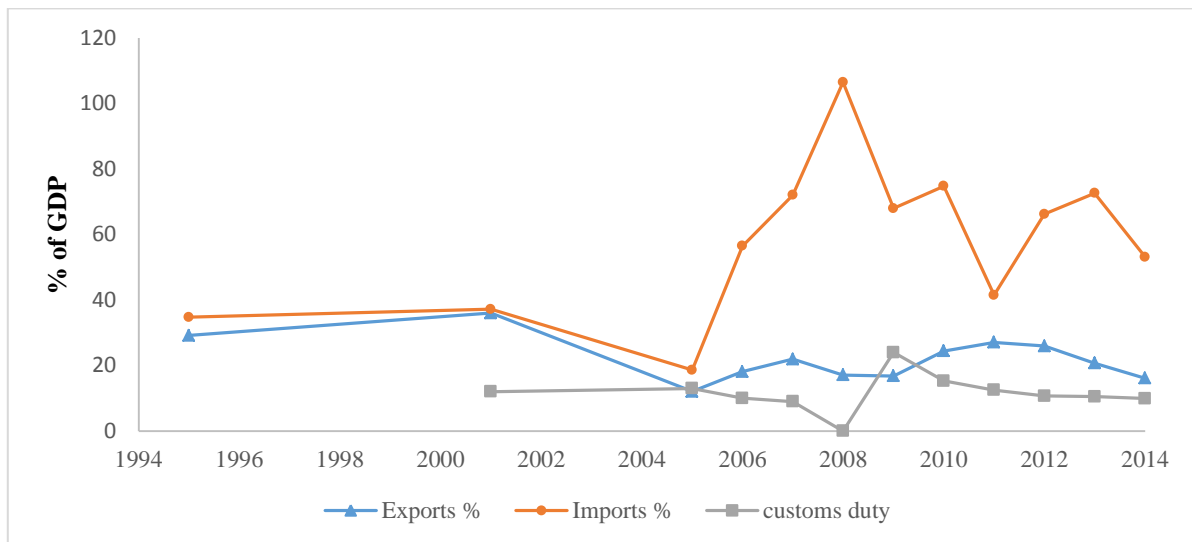
Standard errors in parentheses, ^{*} $p < 0.10$, ^{**} $p < 0.05$, ^{***} $p < 0.01$

Figure 1: Zimbabwe's top five import destinations



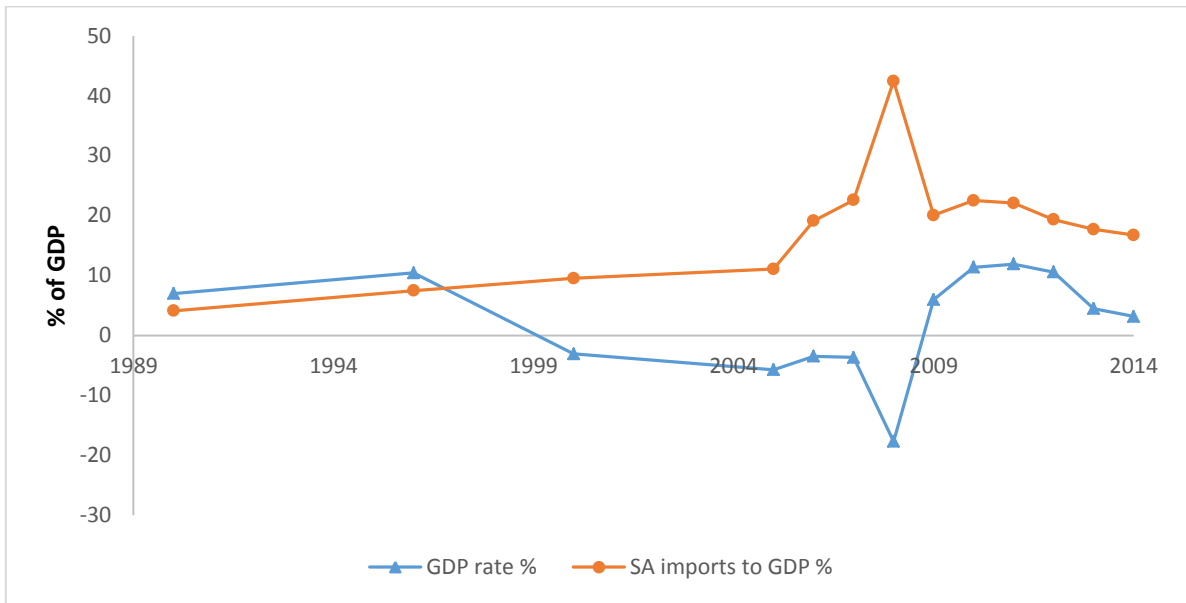
Data Source: IMF

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



Data Source: UNCOMTRADE 2015

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



Data Source: World Bank, 2015

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

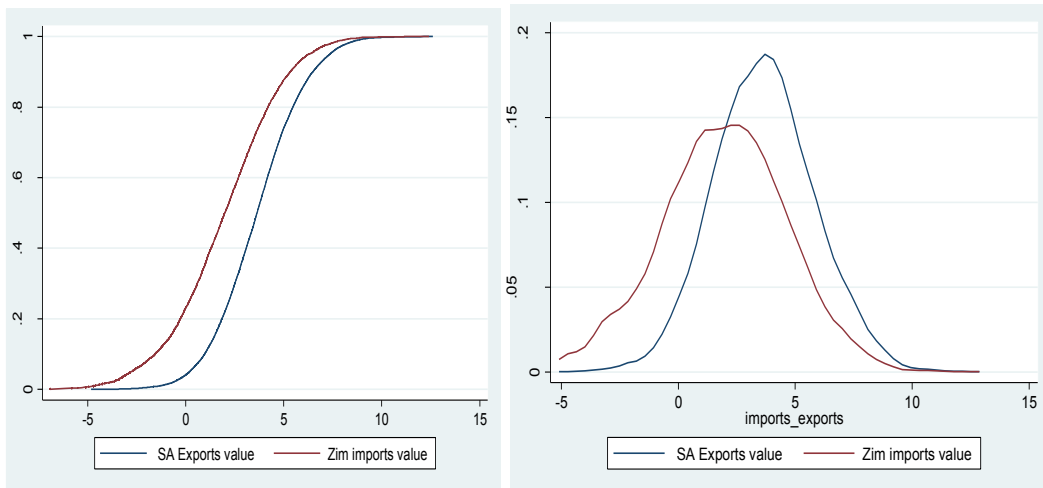


Figure 5 : CDF and KD for the pre-crisis period: year 1995

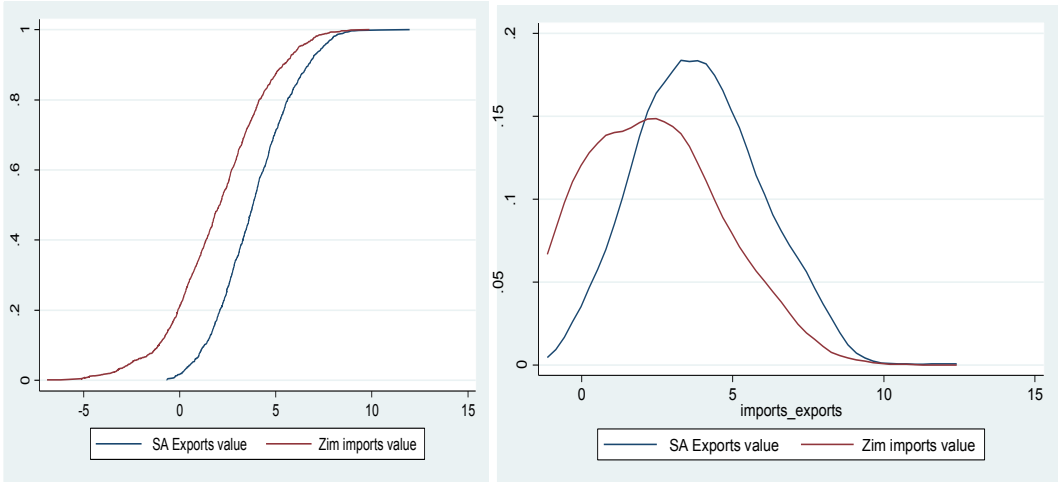


Figure 6 : CDF and KD for the crisis period: year 2007

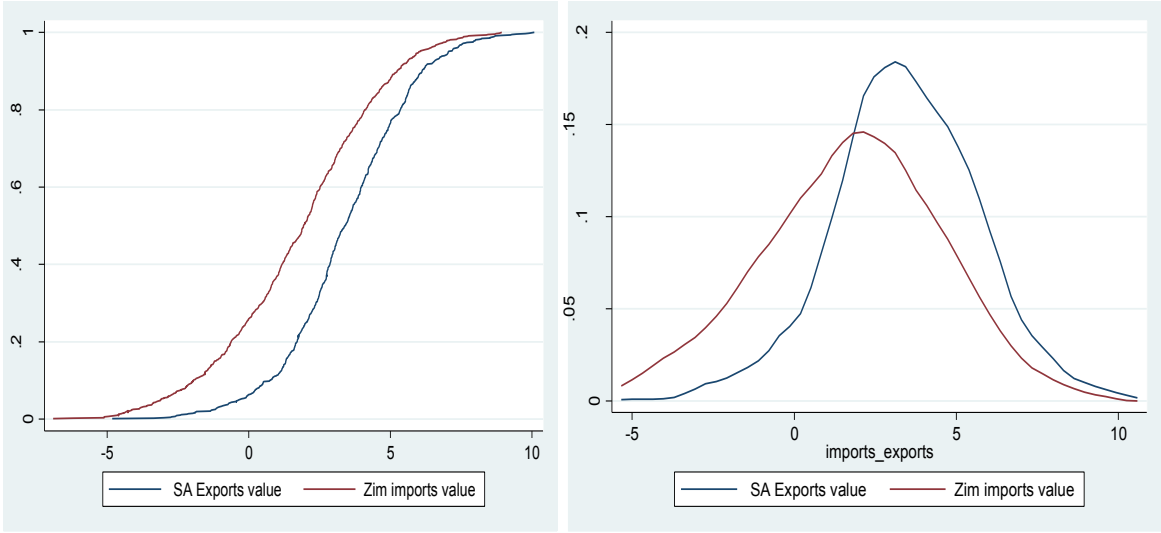


Figure 7 : CDF and KD post-crisis period: year 2012

