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Confronting the elasticity of customs evasion in Mozambique: An empirical study

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Chapter 12

Confronting the elasticity of customs evasion in Mozambique: An empirical study

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Abstract

This study examines the causal relationship between border tax rates and evasion in a representative Sub-Saharan African country, Mozambique. By nature, evasion is not easy to measure. The methodology employed here follows an approach used by Fisman and Wei (2004). The approach aligns and compares (at the product level) bilateral trade flow data between Mozambique and its largest trading partner, South Africa. Results indicate that high tax levels are associated with high levels of underreporting of import values and that tax rates have a strong and positive effect on tax evasion. The empirical evidence also strongly confirms the presence of fraudulent classification of merchandise into lower taxed product categories. In addition, the estimates permit one to infer overall levels of evasion. At the average border tax rate, for each three units of imports that enter the country officially, slightly more than one unit is smuggled. For more highly taxed products, the evasion rate is higher. Lastly, the estimates permit analysis of the revenue implications of lower trade taxes. The revenue curve is quite flat but remains upward sloping with respect to the tax rate in Mozambique when only evasion is considered.

1. Introduction

The present paper focuses on the causal relationship between trade tax rates and evasion in Mozambique. In so doing, it also investigates distinctive forms of tax evasion. Clearly, the empirical problem presented when studying tax evasion is that, by its very nature, evasion is not easy to measure. The methodology employed, originally pioneered by Fisman and Wei (2004), permits the measurement of evasion with some precision by aligning and comparing (at the product level) bilateral trade flow data between Mozambique and its largest trading partner, South Africa.

The paper is organized as follows. Section 2 provides a brief review of the public finance literature related to tax evasion in developing countries. In section 3, the regression framework adopted to understand the empirical link between evasion and tax rates is outlined. Section 4 is consigned to describing general aspects of the data used in the regression models, highlighting idiosyncrasies of Mozambique trade flow data which may directly influence the methodology explored. Section 5 discusses results and section 6 simulates economic implications of alternative tax rates for tax evasion and customs revenue using the estimated results. Section 7 concludes.

The paper tackles three central questions. *First, to what extent is there a connection between tax evasion at the border and trade tax rates in a typical Sub-Saharan African country?* The results suggest a positive impact of tax rates on tax evasion, albeit half of that found lately by Fisman and Wei for an Asian country like China. Every increase in

trade taxes by one percentage point prompts an upward response in tax evasion of 1.4%. *Second, given that higher tax rates seemingly induce higher levels of tax evasion, how does that evasion manifest itself?* The empirical results simply provide evidence in favor of two forms of evasion: under-reporting in prices and fraudulent misclassification of imports. *Finally, third, what practical lessons for evasion and customs revenue can be offered from our results?* The paper makes the case - based on preceding results - that the average level of evasion in Mozambique is appreciably large and near to 36% of total recorded imports. The evasion rate for a typical consumer good, however, slightly exceeds half of total consumer product imports. The paper also raises awareness about the impact of current reductions in trade tax rates in Mozambique which are most likely to be accompanied by losses in customs tax revenue.

2. Literature Review

The prominent role of tax evasion as part of the fiscal difficulties of developing countries is widely documented.* While reviewing the theory and practice of taxation in developing countries, Burgess and Stern (1993) bluntly characterize tax evasion in developing countries as “rife”, leveling the argument that evasion hinges on cultural factors as much as on economic incentives and deficient tax collecting agencies. According to Burgess and Stern, “differences in the tradition of compliance probably explain as much of the worldwide pattern of taxation as do under-resourced or poorly organized tax administrations”. Two compounding factors, rent seeking and corruption, are explicitly

* For instance, Gauthier and Gersovitz (1993) along with Gauthier and Reinikka (2001), provide surveys of widespread tax evasion among businesses in two African countries, Cameroon and Uganda, respectively.

mentioned as largely responsible for the significant levels of tax evasion. In somewhat related but more specific work, McLaren (1996) surveys the burgeoning public finance literature on tax evasion and makes the case for a distinction in the relevant theory between two divergent strands of research. At one level, tax evasion related to fiscal corruption[†], and at a different one, evasion simply as an undeclared transaction. In the process, McLaren reviews a number of studies which attempted to estimate evasion and reports, overall, that the degree of revenue erosion due to evasion seems to be not very far from actual tax receipts.

The connection between tax rates and evasion, from a theoretical point of view, was first formally explored more than three decades ago by Allingham and Sandmo (1972). The latter assert the existence of a positive association linking these two variables, on condition that precise assumptions concerning risk aversion and the punishment for evasion were established. This finding in taxation theory was, however, short-lived. As time moved on, we began to witness a remarkably common feature of newly-developed models, in particular their failure to be conclusive when ascertaining predictions of the impact of tax rates on evasion. This fact is best acknowledged by Slemrod and Yitzhaki (2000) while reviewing the rich body of modern literature on the economics of taxation: predictions ultimately end up relying, they suggest, on the assumptions that are made in those models.

[†] Tirole (1986) constitutes one of the first attempts to formalize hierarchical collusion using a principal agent framework.

Now, from an empirical angle, the work of Pritchett and Sethi (1994) has addressed the thorny question of “gaps” in revenue collections. The authors examine the relation between collected tariff rates and the official, statutory rates of the tariff code for a sample of three developing countries. They report an increase in collected rates of less than one-for-one following an increase in the official rates, due to a growing ratio of exempted imports as the tariff rate increases. A central weakness in this approach has, in fact, to be recognized. Unfortunately, there is a failure to deal effectively with tariff revenue losses due to smuggling, under-invoicing and misdeclaration of items, as it only contemplates reported official statistics. Consequently, the gap between actual tax receipts and potential tax collections (i.e. if all imports were properly reported and paid the official tax rate) is understated.

In spite of this methodological drawback, it is thought that a typical symptom of prevalent evasion activity in developing countries is the important wedge between statutory and effective tax levels. Mozambique is clearly no exception to the rule, even if a tax reform program to modernize and strengthen its tax system has been ongoing since 1998. In a recent survey of the business community, tax evasion was perceived as a major factor in explaining “the large sums of money which remain outside the tax system” (Bolnick 2004). A separate survey of perceptions of governance and corruption found that tax collection agencies are viewed by the overwhelming majority of Mozambicans as among the most corrupt institutions in the country.[‡] The popular sentiment expressed in that survey is that “only the weak and poor cannot escape the law”.

[‡] *Savana Notícias*, local independent newspaper (05/08/2005).

The perception of significant corruption associated with border tax evasion often explains why the customs authorities of Mozambique, locally known as *Alfandegas*, get bad press. Yet, a great deal is still undocumented or even unknown in relation to the full extent of evasion, its motivations, its characteristics, and its linkages with tax policy. Macamo (1998) and later Arndt and Tarp (2004) constitute rare exceptions. Macamo, employing a marvelously simple study design, recorded easily observable but still illicit trade crossing relevant border posts with neighboring countries. The study, in addition to assessing the impact of this type of trade on national and regional food security, found an amount of illegal trade close to 10% of the total value of imports in 1996. This estimate is clearly a lower bound. More recently, Arndt and Tarp (2004) consider the implications of trade policy reform in developing countries by exploring a trade model (with Mozambique as case study) where special attention is paid to evasion and the tariff revenue not paid. This paper seeks to address these gaps in the literature by searching, primarily, for an empirical estimate of the elasticity of tax evasion with respect to tax rates in Mozambique. It then uses the point estimation to infer on economic implications of tax policy, with special reference to evasion and revenue collections.

3. Model specifications

3.1. Baseline model specification

A central challenge when studying tax evasion concerns the issue of measurement. Evasion, due to its very nature, does not generate any statistical data which implicitly means that an appropriate methodology for estimation is required. In this paper,

following the approach explored by Fisman and Wei, the measure of evasion is determined by the ratio of South African declared exports to Mozambique - defined hereafter as X - to Mozambique's recorded imports from South Africa - defined hereafter as M. In principle, to the extent that both errors of measurement or evasion are entirely obviated, the numerator and denominator should be precisely equivalent.[§] Put differently, a ratio X/M of unity is supposed to characterize a state with no evasion.

As a first step towards examining the causality between customs tax rates and tax evasion, a baseline model must be specified. This model posits a linear relationship between the logarithm of our evasion measure (X/M) and the "Taxes" variable, a vitally important variable consisting of the sum of all applicable taxes levied at the border for any particular product. The model, thus, is defined by:

$$\text{Log}\left(\frac{X}{M}\right) = \alpha + \beta.Taxes + \varepsilon \quad (1)$$

At this stage, given equation (1), a word of caution is in order. First, a positive β clearly indicates that tax evasion is positively related to overall tax rates. Because of the specification itself, the coefficient β indicates indeed the responsiveness of tax evasion to tax rates, so that a marginal increase in the tax rate would have an impact in evasion of β percent. Alternatively, with a positive β we could simply make the case that higher levels

[§] In fairness, an actual source of discrepancy can be found in the existing "simplified regime" of imports (small imports cleared at border points and of value inferior to 500 USD). This type of trade flow is not captured by the Mozambican trade statistics database. Due to its insignificance as a proportion of total imports, this aspect is overlooked.

of taxation are associated with higher levels of evasion. The baseline model can be used, furthermore, to suggest an expression for the growth rate of evasion:

$$\left(\frac{\partial X}{X}\right) - \left(\frac{\partial M}{M}\right) = \beta \cdot (\partial Taxes)$$

Second, direct imports M cannot always be directly observed. In contrast, what is in reality observable is M*, a measure that encompasses both direct imports from South Africa and transshipments misreported as imports from South Africa. Taken together, the baseline model will need to account for the current difficulties in accurately filtering total imports sourced directly from South Africa. Let us first, through equation (2), define observable M* for any given product i:

$$M^*_i = M_i + \text{MisclassifiedTransshipments}_i \quad (2)$$

At the moment, the Mozambican customs tax system provides presumably insufficient tax advantages (i.e. incentives) for a deliberate misclassification of a product as South African - rather than any other third country. Under the SADC Trade Protocol Agreement, a preferential tax treatment covering the SADC countries is indeed being fully implemented since 2001.** From a Mozambican perspective, though, the protocol establishes that by 2003 only the wide majority of raw materials of SADC origin are expected to be subject to full liberalization. So the upshot of this shift in the tariff

** Even though the envisaged speed in tariff dismantling of merchandise coming from RSA is slower when compared with merchandise originating from the remaining SADC countries.

structure is merely a modest tariff reduction for nearly all SADC raw materials from a duty rate originally at 2.5% to a zero rate. Albeit very few exceptional cases, other types of tradable goods maintain in practice the MFN status.

Misclassified imports can be assumed, therefore, to be proportionally related to the size of the genuine amount of imports from South Africa. Allowing for a slight adjustment in the assumption made by Fisman and Wei in the Chinese case study,^{††} misclassified indirect imports in the Mozambican case can be expressed as follows:

$$\text{Misclassified Indirect Imports}_i = \theta_i M_i \quad (3)$$

Where θ_i is an independent and identical random variable and $0 \leq \theta_i \leq 1$

The operational functioning of the Trade Information and Management Systems (TIMS) software^{‡‡} determines, to a large measure, the role of θ_i in equation (3). This random variable θ_i reflects the propensity for human error from data processing. Surely, increased vigilance and countervailing checks in terms of import declaration verifications should contribute to reduce θ_i to very low error rates. But even so, a meaningful assumption is that incorrectly-classified indirect imports should ultimately represent a proportion of total imports for any single product. Given (2) and (3), one can hence write:

^{††} In Fisman and Wei, the magnitude of misclassified imports depends on a constant and the import value of the product (subject to some random error).

^{‡‡} TIMS is a computerised system developed by Crown agents in Mozambique to support commercial processing of goods by customs.

$$M^*_i = (1 + \theta_i)M_i \quad (4)$$

Equation (4) leaves us now in a more suitable position to specify a transformed baseline model, which can be expressed as follows:

$$\text{Log}\left(\frac{X}{M^*}\right) = \alpha^* + \beta \text{ Taxes} + v \quad (5)$$

$$\alpha^* \equiv \alpha + E(\varepsilon_i - \log(1 + \theta_i))$$

and

$$v = \varepsilon_i - \log(1 + \theta_i) - E(\varepsilon_i - \log(1 + \theta_i)) : N(0, \sigma^2)$$

It can easily be noticed that the transformed model in (5) has now a new constant term, α^* , and a new error term, v . The error term, v , is assumed to be identically and independently distributed. In the remainder of the analysis, model (5) will take on great importance as it describes a new baseline specification used to evaluate the sensitivity of evasion to tax rates.

3.2. Augmented model specification

Evasion, of course, can occur in a host of forms. One distinct form of evasion is misclassification of merchandise. But detecting whether or not higher taxed goods are being mislabeled as lower taxed ones requires an extension to our baseline model. In this sub-section, then, the purpose is to introduce an augmented model to investigate for product misclassification.

The augmented model explicitly adds a new variable, *Av_Tax_Sim*, defined as the average tax of similar products for a certain product. Notice here that the error term should maintain the properties specified earlier in equation (5). The augmented model hence yields:

$$\text{Log}\left(\frac{X}{M^*}\right) = \alpha^* + \beta_1 \cdot \text{Taxes} + \beta_2 \cdot \text{Av_Tax_Sim} + v \quad (6)$$

Product mislabeling in *Alfandegas* may be captured by a negative and statistically significant β_2 . By holding the tax of a given product constant, lowering the tax of similar products enhances the incentives to misclassify our given product as a similar one.

In addition to this, the augmented model can be further extended. For example, equation (7) includes a squared “Taxes” variable as regressor to ascertain whether the relationship between tax rates and evasion is of a non-linear nature. Test results will be reviewed in section 5.

$$\text{Log}\left(\frac{X}{M^*}\right) = \alpha^* + \beta_1 \cdot \text{Taxes} + \beta_2 \cdot \text{Taxes}^2 + \beta_3 \cdot \text{Av_Tax_Sim} + u \quad (7)$$

4. Data and empirical application

Cross-border trade data between South Africa and Mozambique has been obtained from the South African National Statistics Agency and the Mozambican Customs Service. Data of 2003 has been structured at the tariff code item level (conforming to the Harmonized System). The adoption of a more detailed classification system for tradable goods (i.e. eight digits) by the two Southern African countries bolsters markedly the analysis by shifting the approach to a more disaggregated level of individual products which, in turn, improves the precision by which evasion is measured.

During 2003, according to available figures from *Alfandegas*, total recorded imports from South Africa reached approximately 538 million USD. In light of the previous discussion, it should be pointed that this total figure must not only comprise genuine imports from South Africa, but it might also contain transshipments originating from third countries. Nevertheless, from a South African perspective, the circumstances are somewhat dissimilar as the country is able to accurately report separate data on transshipments versus direct exports destined to Mozambique. The argument that may be set up here, then, is that differences between X and M can reflect the influence of human judgment errors in the form of misreported merchandise.^{§§}

Data on trade taxes, just like data on M*, were taken from the *Alfandegas* central database. Essentially, a measure of taxation designed to capture the total tax burden at the

^{§§} This argument seems compelling in view of the 995 (out of 5538) observations with available statistics for M but missing data for X.

border has been created by adding up, for every single listed product, the taxes that respectively apply. Over the 2003 period, the (ad-valorem) tariff schedule in Mozambique ranges from 0 to 25%. The tariff structure prescribes, *grosso modo*, the following rates: (i) 0% tariff rates for medicines and SADC raw-materials; (ii) 2.5% for non-SADC raw materials and for cereals; (iii) 5% for equipment goods and most oil products; (iv) 7.5% for rice, sugar and intermediate goods (e.g. pieces for machinery) and (v) 25% for consumer goods. Further, a 17% VAT tax is levied on the quasi-totality of imports whereas excise and surcharge taxes are imposed on selected products.***

The dataset is supplemented by CIF value data on X and M^* for each tariff heading, with respective flows in quantities and related units of measurement. Units of measurement are critically important in view of the necessity of estimating evasion in quantities coherently. For the regressions with quantities (see Annex B), every time it was not possible to match up units of measurement on either side, it was deemed necessary to discard the product in question from the regression.

In total, after purging and reorganizing the dataset, the full sample contains 5538 different products. The UN has left countries extra room for discretion in choosing the levels of disaggregation beyond the six digit coding. Obviously, by itself this represented another difficulty that needed to be dealt with. Within a context of tariff heading mismatch, 995 observations on the X side were missing coupled with 2057 observations

*** Sugar and one class of cement are two of very few products in Mozambique enjoying protection from surcharge taxes in 2003.

on the M side^{†††}. Such fact contributed to further data elimination leading to a final sample of 2486 observations. Restrictions applying to samples or missing observations on regressors other than *Taxes* have lead to regressions involving fewer observations.

5. Regression results

5.1. Baseline and augmented model results

In this sub-section, the focus is simply on results for the baseline and augmented models. Table 1 presents a first set of results for equation (5). According to Table 1, the estimate of β is positive and statistically significant. An estimate value of 1.38 would suggest that if the tax rate increases by one percentage point, the ratio quantifying evasion X/M will increase by nearly 1.4%. Alternatively, the result shows that a higher fiscal burden on trade in Mozambique unambiguously leads to a larger amount of relative tax evasion. These results pass equally the robustness test as once variations in the tested sample are introduced the estimate for the elasticity of evasion seems to be insulated from influence^{†††}.

It is certainly important to draw attention to the poor fit of the regressions. In spite of the significance of the β coefficient, the tax rate cannot explain more than one percent of the variation in evasion across the different results, owing to the noise resulting from

^{†††} In truth, it is not a completely false idea to admit that in the process we may be successfully eliminating a few existing “ghost” exports from South Africa, designation to describe goods allegedly exported to Mozambique (with VAT reclaimed) but then diverted back into the home market.

^{†††} After excluding observations with no average tax for similar products, the estimated coefficient is also close to 1.4%.

misclassified imports from South Africa. This empirical outcome corroborates with the study of “missing” imports in China conducted by Fisman and Wei. The “noise” argument seems, in fact, to find some support with the method of aggregation (i.e. using, for example, the mean of X/M) that enhances the R² statistic to a value close to 13%, while the estimate of β slightly rises to 1.9.

This first set of results reveals an impressively positive impact of tax rates on tax evasion in Mozambique, that is to say, high tax levels are strongly associated with high levels of underreporting of import values. A different proposition now is to attempt to detect the presence of misclassification of goods for tax advantage purposes. Table 2 displays results for the augmented model. The introduction of new variables into the baseline model boosts the magnitude of the evasion sensitivity coefficient, which takes now values of 2.72 and 4.24. Similarly, results uncover the presence of fraudulent classification of merchandise with the coefficient on the “Av_Tax_Sim” variable being both negative and statistically significant (at the 5 percent level for the regression omitting the “Taxes²” variable and at the 10 percent level for the full regression).

More generally, the existing empirical literature seems to give endorsement to these findings. A heterogeneous trade tariff menu seems to nourish corruption among customs officials as the standard deviation of trade tariffs across goods is robustly correlated with measured corruption across countries (see, for instance, Gatti 1999). Clearly, the findings here can be of some significance for purposes of future tax policy prescriptions in Mozambique: they offer, primarily, the possibility of working out ways to reduce opportunities for tax evasion. There is a sense, purely based on perceptions, that

improved headway in the internal control and verification of merchandise in *Alfandegas* is desirable. From the angle of the ongoing customs tax policy reform efforts, results can also be useful to make a strong case for the harmonization of trade tariffs within classes of similar products (i.e. with high degree of homogeneity). One shall argue, in addition, that a tax policy implementation of this nature must take into serious consideration proper safeguarding against overly adverse costs for revenue mobilization. The same argument is explored for the broader context by Gatti (1999) who believes that setting trade tariff rates at a uniform level limits public official's bribe taking behavior, allowing countries to obtain efficiency gains as well as delivering higher revenue levels. Winters (2004) uses Chile as an illustration of simpler, more transparent and non-discretionary trade policies. This Latin American country, which incidentally is regarded among the best in the developing world in terms of tax administration performance, has adopted, even so, a more "gradualist" approach to tax reform (Taliercio, 2004).

5.2. Functional form

Throughout section 4, it has been assumed that the responsiveness of evasion to tax rates is constant, so that the elasticity of evasion is continuously equal to 1.4. Still, a question that we might want to ask is: What if the actual elasticity varies across the tax scale? This sub-section intends to provide a clear-cut answer to this legitimate question by looking at two tests that can be performed when dealing with this sort of problem.

Table 2 offers the first result that can be used to test for nonlinearity in the relation between tax rates and tax evasion. By introducing the "Taxes²" variable into the

augmented model in equation (7), the first testing method consists simply in evaluating the sign and statistical significance of its coefficient. The possibility of a nonlinear relationship between tax rates and evasion seems, initially, to receive some empirical backing when the full sample is used. Results show, in fact, a surprisingly decreasing nonlinear relation. Nonetheless, if we exclude the first and last 5% quantiles (i.e. perhaps removing the effect of outliers), results end up failing to demonstrate evidence in favour of a non-linear association between tax rates and evasion.

For confirmation purposes, an alternative testing method can be conducted. In essence, the test consists of making use of a specification with quartile dummy variables to measure differential coefficients, by reference to the coefficient on the tax variable. Such specification could possibly be given by:

$$\text{Log}\left(\frac{X}{M^*}\right) = \alpha^* + \beta_1 \text{Taxes} + \beta_2 (Q_2 \text{Taxes}) + \beta_3 (Q_3 \text{Taxes}) + \beta_4 (Q_4 \text{Taxes}) + v \quad (10)$$

Where Q_n refers to the variable “Taxes” quartile n and $n = 1, \dots, 4$.

With this type of specification, β_2 , β_3 and β_4 are differential coefficients by reference to β_1 . The test, in this case, aims at evaluating potential shifts in the elasticity of evasion across the different quartiles, by looking both at the magnitude and significance of those differentials.

Table 4 shows the results. It indicates, in a very evident way, that the estimates of β_2 , β_3 and β_4 are not statistically significant. The findings here uphold then the previously encountered evidence (as long as outliers are dropped) of no nonlinear evasion elasticity: in sum, even allowing for differences in the slope across quartiles, the effect of tax rates at the border on tax evasion seems to exhibit some degree of stability.

6. Implications of regression estimates for evasion and customs tax revenue

In this section of the paper, the interest switches to the economic repercussions of the regression estimates for tax evasion and revenue. The point estimates obtained from the augmented model allow establishing the empirical link between specific variables. But the usefulness of the augmented model extends even further to the possibility of deriving estimations for evasion in *Alfandegas* for 2003.

Suppose we consider the average value of “Taxes”, that is 30%. Let us assume for the present purpose that the probability of error in merchandise country of origin classification is insignificant, which translates to θ equal to zero. For the mean customs tax rate, the model gives a predicted X/M ratio of 1.357. This explicitly implies that for every import transaction recorded the genuine import value is 1.357, meaning that the gap between reported exports and recorded imports attains, on average, 35.7% of reported imports. Given a predominance of smuggling in highly taxed products, the

consequences for revenue must certainly be stronger than the consequences for import volumes^{§§§}.

Consider now the more specific case of a typical consumer good, subject to the top tariff rate. For this kind of product, the statutory trade tariff is 25% and VAT applies at a rate of 17%. Thus the aggregate tax, “Taxes”, equals 42%. With a value for “Taxes” of 42%, the augmented model predicts, in turn, an X/M ratio of 1.57 which also implies a proportion of import evasion of 57%^{****}. In short, these results indicate that smuggling of consumer goods into the country in 2003 ran to more than half of reported imports, though these figures exceed the current basic perception of customs evasion rates in Mozambique (see Macamo 1998 and Van Dunem, 2005).^{††††}

In 2006, Mozambique is expected to reduce the top tariff rate from 25 to 20%. Within that perspective, the model provides a prediction of an evasion rate for consumer products (i.e. with an aggregate tax of 37%) of approximately 49%. Equally important, the regression framework point estimates also allow, from a revenue point of view, to examine the behavior of tax receipts across the tax scale. In such context, this paper suggests consideration as well of the economic implications of tax policy through the use of a simple simulation analysis.

^{§§§} Arndt and Tarp (2004) find a level of foregone revenue due to smuggling and legal tax avoidance equal to about 60% of the total statutory tariff revenue.

^{****} It has been assumed here that the average tax of similar products for consumer goods is equal to 42% (see table 5).

^{††††} If θ equals 0.1 (i.e. 10% of South African recorded imports were misclassified), the evasion rate increases by approximately fifteen percentage points.

The graph 1 below puts on display the Laffer Curve, based on a virtual value of registered imports for a given initial tax rate. For an initial tax rate of 0%, the corresponding value of imports is, hypothetically, 1000 units. Note that, for that reason, the revenue axis is merely a revenue indicator. Underlying this curve are two essential elements: a) the previously seen result that a marginal increase in the tax level generates a decrease in the total value of reported imports of 1.4%; b) an inelastic price elasticity of demand of imports. Graph 1 displays an indicator of tax revenue collections which increases as we move along the tax scale and reaches its maximum point when the tax rate is slightly less than 72%. At that level of aggregate tax, revenue is maximized. What this basic simulation shows (to the extent that we deal with an unresponsive import demand to price changes) is that beyond a value for “Taxes” of 72%, any increase in the tax rate would necessarily lead to a decrease in the revenue collected. Conversely, when the tax rate is below 72%, falling “Taxes” are connected to slumps in revenue.

Graph 1. The relationship between revenue and tax rates: the Laffer Curve

GRAPH 1 in graph1.xls file [ABOUT HERE](#)

Now consider, instead, the case of a responsive import demand. The current average tax rate on imports in Mozambique is approximately equal to 30% (see Table 5). What this simulation equally demonstrates is that for an import demand price elasticity of 1.92 or

less, the average tax rate in Mozambique would have to be on the left hand side of the Laffer Curve. For a price elasticity higher than 1.92, any marginal reduction in the Mozambican tax rate is likely to produce an increase in revenue. The empirical literature generally documents low price elasticity estimates for developing countries, rarely exceeding three and generally between one and two. Reinhart (1995), for example, provides a set of outstanding regional results: Africa registers a price elasticity of 1.36, about one percentage point greater than the price elasticities recorded by Latin America (0.36) and Asia (0.40). Consequently, any present reduction in import tariffs for a Sub-Saharan country with low import substitution possibilities like Mozambique is likely to engender trade revenue losses for the Mozambican Customs authorities^{****}.

7. Conclusion

The basic conclusion emanating from the present paper is that tax rates have a strong and positive effect on tax evasion in Mozambique. For every percentage point increase in the customs tax rates, evasion increases by 1.4%. In comparative terms, the degree of responsiveness portrayed for this representative Sub-Saharan country corresponds to half of the sensitivity found in recent times for an Asian country like China.

Another central upshot of these findings is that customs tax evasion acts in Mozambique through two different channels: under-invoicing and fraudulent misclassification of

^{****} Mozambique is expected to reduce its top tariff rate of 25% (mainly applied to consumer goods) to 20% in January 2006. This study indicates, all else being equal, clear consequences for trade revenue as a result of the envisaged change in the maximum duty rate.

merchandise. In either case, tangible evidence to characterize evasion has been found. Results seem to indicate too a lack of evidence of the practice of under-declaration of quantities, suggesting that under-reporting in the value of imports is associated with under-reporting in unit values. Because of flawed data on quantities though, this discussion is consigned to Annex B.

The analysis in this case study has been empirically extended by building on regression results to infer overall levels of evasion in the country as well as for specific products. The general evasion rate based on regression estimates is estimated to be approximately equal to 36% of recorded imports. Still, if one considers a classic consumer product (e.g. television or vegetable oil), for whom the top tariff rate is applicable, the evasion rate nearly equals 57% of genuine imports. This observable tendency of increasing concentration of unrecorded trade for higher protection rates echoes qualitatively the Macamo (1998) and Arndt and Tarp (2004) estimation outcomes.

Globalization and the opening of frontiers to freer trade tend increasingly to put downward pressures on the level of taxation. This empirical study ultimately exposes the current policy implications of trade liberalization for the revenue yield, in view of imminent declines in trade taxes. More to the point, the ongoing program of trade liberalization creates, at the actual stage, revenue losses that deserve cautious consideration, in light of the government's broader tax policy goals of ensuring an effective mobilization of resources, fiscal sustainability and, indeed, reducing aid dependency.

The fiscal challenge posed is considerable in magnitude. This is not a trivial point and one is led to believe that the government shall succeed in overcoming this acute challenge by responding proactively. One perfectly sound tax policy option would be, for example, to confront the ubiquitous problem of growing foregone revenue due to official tax exemptions. Van Dunem (2005) has previously expressed heightened concerns over the soaring fiscal cost of duty exemptions in Mozambique from 2002 to 2004. This can be, to a large measure, justified by spectacular increases in the volume of discretionary official exemptions. In many occasions, one could argue that the fundamental issue (and a practical one too) is how to effectively offset, at best, rising exemption schemes. Very illustrative of this thought is the description offered by Ebrill et al. (1999) who claim that “when exemptions become more prevalent, the incentive to classify taxable products as exempt also grows, further contributing to a lower rate of tax compliance”. On similar lines, then, those authors seriously believe that tax revenue will be mostly preserved when trade liberalization coincides with revenue-positive policy changes (e.g. drastic elimination of exemptions) or/and improvements in customs and tax administrations to the point of limiting incentives for tax evasion.^{§§§§} In somewhat akin work, Tanzi and Zee (2000) have vigorously encouraged policy reforms. Their contention is that the appropriate tax policy strategy to reverse the short-term revenue shortfall from reduced tariffs might have to rely on a three-dimensional menu of policy prescriptions: “(1) reducing the scope of tariff exemptions in the existing system; (2) compensating for the tariff reductions on excisable imports by a commensurate increase in their excise rates;

^{§§§§} This argument is also emphasized by Pritchett and Sethi (1994)

and, finally (3) adjusting the rate of the general consumption tax (such as VAT) to meet remaining revenue needs”.

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Tables

7.1. Table 1. Results for the transformed baseline model

	Constant	Taxes	R ²	No of observations
	Coef. (α^*)	Coef. (β)		
Total sample	-0.12 (.11)	1.38 (.32)	.0074	2486
Excluding first and last percentile	-0.12 (.09)	1.43 (.29)	.01	2437
Excluding first and last 0.05 quantile	.02 (.08)	.99 (.23)	.0082	2237

Note: standard deviations in brackets

7.2. Table 2. Results for the augmented model

	Constant	Taxes	Taxes ²	Av_Tax_Sim	R ²	No of observations
	Coef.(α^*)	Coef. (β_1)	Coef. (β_2)	Coef. (β_3)		
Omitting Taxes ²	-.07 (.12)	2.72 (.75)	-	-1.61 (.80)	.0094	2219
Full regression	-.32 (.17)	4.24 (1.05)	-2.08 (1.00)	-1.53 (.80)	.0113	2219
Excluding first and last 0.05 quantile	-.08 (.12)	1.95 (.77)	-.63 (.74)	-.46 (.59)	.0109	2003

Note: standard deviations in brackets

7.3. Table 3. Results for the quantity model

	Constant	Taxes	Av_Tax_Sim	R ²	No of observations
	Coef.(α^*)	Coef.(β_1)	Coef. (β_2)		
Omitting Av_Tax_Sim (7)	.19 (.16)	.30 (.50)	-	.0002	2201
Full regression (8)	.22 (.18)	1.49 (1.10)	-1.48 (1.17)	.0009	1965
Excluding first and last 0.05 quantile (8)	.34 (.14)	1.76 (.85)	-1.93 (.91)	.0026	1784

Note: standard deviations in brackets

Regressions with the same units of measurement; when the units of measurement are not the same, the observations were dropped.

7.4. Table 4. Results for the nonlinearity test with quartile dummies

	Coefficient	Standard Error
Constant	-.05	.21
Taxes	1.30	1.15
Q2 * Taxes	-.61	.60
Q3* Taxes	.04	.74
Q4* Taxes	-.15	.99

Note: Dependent variable is Log (X/M*)

No of observations = 2486

R-squared = .0084

7.5. Table 5. Summary statistics

	mean	median	min	max	st. dev.	n° of obs.
Log (X)	18.91	19.097	7.98	27.74	2.728	4543
Log (M)	19.08	19.312	9.44	26.80	2.567	3481
Log (X/M)	.29	.282	-11.28	11.71	2.246	2486
Log (Qx)	7.11	7.139	0	20.58	3.393	4536
Log (QM)	7.27	7.203	-3.51	19.40	3.661	3434
Log(Qx/QM)	.29	.288	-12.28	14.26	3.109	2460
Taxes	.30	.245	0	1.07	.141	3481
Av_Tax_Sim	.30	.245	0	1.07	.134	3095

Note: Not surprisingly, because of misclassified indirect imports, the minimum value for Log (X/M) and Log (Qx/QM) is negative.

Annex A: Further data details

A preliminary effort has been carried out to clean the original trade information and eliminate inconsistencies detected in the data. Chapter 87 of the tariff book, covering motor vehicles and its spare parts, includes a substantial amount of indirect trade. A finest example, obviously, is imported cars from Japan. To limit the noise introduced in the regression equations by indirect trade, the full chapter has been eliminated.

The lack of available data for Mozal (Mozambique's first aluminium smelter and fourth largest in the world) and energy^{*****} imports in the Mozambican Customs database contributed to further data exclusion. Selected products imported by Mozal were identified and subsequently removed from the original database, as per the indications provided by the Mozal border agency and the Customs terminal post^{††††}.

Additionally, the tariff book reform that took place in mid-January 2003 caused changes in duty rates for few products. The logic, in the face of duplication of tariff rates for a single product, seemed to systematically consider the prevailing rate after the reform, since it virtually covers the full year (so in choosing, for example, between a pre-reform tariff rate of 0% and a post-reform rate of 2.5%, the latter has been selected).

Moreover, tariff headings displaying six-digits were not included in the database. As such cases involve invariably errors in the registration of the trade information in TIMS and identifying the correct tariff heading is a delicate task, these tariff headings were scrapped along with related eight-digit positions. Finally, to correct for the volatility in the sugar surcharge^{†††††}, a simple average has been calculated for each variety of sugar.

^{*****} The export value for energy declared by RSA substantially underestimates the official import figure reported by Motraco (private company operating under a concession contract that authorizes the import of energy into Mozambique).

^{†††††} I am grateful to Mike Wilkin, Head of Mozal operations in Ressano Garcia, for providing a valuable indication of the list of products (e.g. furnace bricks) exported to Mozal from RSA. In terms of import value, the most important product found is alumina.

^{†††††} In 2003, the variable surcharge tax applicable to raw sugar cane (with tariff book position 17.01.11.00) ranged from 62 to 105%.

Annex B: Quantity model specification and results

The discussion of results has highlighted the presence of under-invoicing and product fraudulent misclassification in Mozambique. Yet under-invoicing can potentially act through two different ways: under-pricing, on the one hand, and under-reporting of quantities, on the other.

To split and investigate for these two, we need to reformulate the basic regression framework. More specifically, a “quantity model” specification is now introduced to inspect the prevalence of under-reporting of quantities. Let us define Q_x and Q_M as new variables that capture the quantities exported and imported respectively for each product. The model takes now the following forms:

$$\text{Log}\left(\frac{Q_x}{Q_M}\right) = \alpha + \beta_1.Taxes + v \quad (8)$$

$$\text{Log}\left(\frac{Q_x}{Q_M}\right) = \alpha + \beta_1.Taxes + \beta_2.Av_Tax_Sim + v \quad (9)$$

Results for the quantity model are presented in Table 3. Under-reporting of quantities would simply require the estimated coefficient for β_1 to be positive and significant. When the full sample is used, the estimated coefficients for either (8) or (9) suggest that there is no evidence of under-reporting of quantities. This result should be accepted, though, with relative caution in view of the current distrust (primarily acknowledged by Mozambican Customs officials) concerning the quality of data on quantities in the TIMS trade database. In spite of quantity regressions with consistent units of measurement on

Mozambican and South African sides, very often data on quantities lacks credibility, especially on the Mozambican side, due to tariff-book inconsistent data entry.^{§§§§§}

Likewise, we can also confirm from Table 3 the existence of merchandise misclassification, conditional on the exclusion of outliers. The estimate of β_2 (-2.12) turns out to be negative and significant once the first and last 5% quantiles are excluded from the regressions.

^{§§§§§} One could think of the anecdotal case where rather than inserting the number of kilos (as envisaged in the tariff book), the number of boxes is computed.