Determinants and pervasiveness of the evasion of custom duties

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Tariff receipts represent a significant share of many developing countries public finance receipts, and they can be though of as more easily collected than many other taxes. Still, custom duties can be evaded through a number of ways, from bribery to smuggling and fallacious declarations. Such possible tax evasion is likely to depend both on the institutional framework, on the quality of law enforcement, but also on the level and distribution of tariffs. This raises questions about the effectiveness of custom duties collection, and about its change with tariff liberalisation. Should tariff revenue losses associated with tariff changes be computed "at face value", i.e. based on statutory protection, or may the relationship be more complex? Would specific reforms be likely to improve custom duty collection?

The double declaration of trade flows, by both the importer and the exporter, offers an opportunity to gauge the importance of these unlawful practices: while evading custom duties requires the importer to sidestep due registration upon importing, the same does not apply to the exporter. Using the discrepancy between mirror declarations at the product level to reveal custom duties evasion was pioneered by Baghwati (1964, 1967), whose results hinted about underinvoicing of imports in Turkey, in particular for manufactured products. More recently, Fisman and Wei (2004) focused on Chinese imports from Hong-Kong. They show that higher tariffs are statistically associated with a lower declaration by the importing country, in comparison to the mirror declaration by the exporter. The relationship is not negligible, since they find that that a one-percentage-point increase in the tax rate is associated with a 3 percent increase in evasion.

Arndt and van Dunem (2005) find comparable results in the case of Mozambique, based on the same approach, with an elasticity half as a large as in the Chinese case. Applying the same approach to trade between Germany and ten Eastern European countries during 1992-2003, Javorcik and Narciso (2007) also find support for the hypothesis that higher product-level tariffs spur stronger tariff evasion, although their estimated elasticities tend to be weaker than the ones found by Fisman and Wei. They show that the relationship between reporting discrepancy and tariffs is stronger for differentiated than for homogenous products, which they explain by the greater ease to conceal the real value of goods when they are differentiated, as already suggested by Baghwati (1967). Mishra et al. (2007) show that a comparable relationship between tariffs and trade reporting discrepancies held in India during the nineties; they find its magnitude (which they dub evasion elasticity) to be lesser than the one found by Fisman and Wei for China, although the gap appears to be declining across time, as a result of the weakening of the relationship in China, which they interpret as a sign of improving customs enforcement efficiency. Bouet and Roy (2008) study in a comparable framework Nigeria, Kenya and Mauritius. While they find a positive

and significant elasticity of substitution in the three countries, they also show that the size of this elasticity is decreasing with the quality of institutions, across these countries.

Although these case studies suggest that the phenomenon is not specific to a few countries, it is difficult to evaluate how pervasive it is. A further interesting question is how it compares across countries: while Mishra et al. (2007) and Bouet and Roy (2008) hint at the quality of institutions being a likely determinant, this issue deserves further scrutiny. This paper addresses these questions by applying the methodology to all countries for which relevant data were available in 2004. It also endeavours understanding what the determinants of custom duties evasion may be, trying to relate it not only to economic, but also to institutional variables.

Empirical approach

Stasavage and Daubrée (1998) emphasize that a correct declaration of imports' value does not prevent fraud from occurring, since the assessment of tax liabilities by customs officers can be purportedly wrong; when taxes are correctly assessed, the goods can also be released without the importer actually paying these taxes. In most cases, however, custom duties evasion is rendered possible by false import declarations, through four types of methods (see for instance Fisman and Wei, 2004, and Javorcik and Narciso, 2007): underreporting of unit value; underreporting of taxable quantities; misclassification, by shifting toward a product classification for which the tariff duty is lower; and smuggling, generally defined as imports crossing the border without being registered by custom officers. Smuggling may not be registered even in the exporter's statistics, in which case official statistics are of little help (as emphasized for instance by Deardorff and Stolper, 1990); in many cases, however, exports are duly registered by the exporter.

While different practices are involved in each case, each of these means of evading custom duties should lead to shipments registered by the importer being lower than those registered by the exporter, for high-tariff products. The link with tariffs may arise from the higher pay-off of escaping normal taxation in that case; it may also reflect the fact that finding a comparable product with substantially lower tariff is easier for products facing high tariffs (and that, on the opposite, low tariff product imports may include missclassified imports composed in fact of high tariff products).

This link between tax evasion, registered trade by partners and tariff duties is the motivation for Fisman and Wei (2004) analysis. Their method for revealing tax evasion is valid insofar as no alternative reason is likely to make the gap between mirror declarations depend upon tariff duties. A possibility, however, is that some products would be intrinsically more prone to tax evasion than other; for example because they are less voluminous for a given value (diamonds are an extreme example), or because their value can be more easily concealed, as argued by Javorcik and Narciso (2004) about differentiated goods. If this is the case, policy makers would likely tend to set higher tariffs on those goods least prone to tax evasion, thus originating a negative, rather than positive correlation between tariffs and mirror declarations discrepancies. The opposite cannot be ruled out, however: if officials are corrupt, they may set higher tariffs on goods more prone to custom duty evasion, in order to increase bribery opportunities. This is consistent with Gatti's (1999) argumentation, and her remark that "a robust association between the standard deviation of trade tariffs - a measure of the diversification of tariff menus - and

corruption emerges across countries". The possibility that some products are more prone to fraud should thus be taken into account in the empirical analysis.

This relationship between custom duty evasion and level of tariff duties may in addition exhibit heterogeneity across country, linked to differences in both quality of statistical reporting and pervasiveness of fraud. Since the exporter's declarations are also used in measuring duties evasion, the quality of its statistical reporting may also be a source of heterogeneity. The relationship between tax evasion and tariff duties can accordingly be modeled as:

$$(1) \qquad evasion_{ijk} = \alpha_k + \beta_i + \delta_j + \gamma_i \, tariff_{ijk} + u_{ik}$$

Where subscript k refers to a product, i to the importing country and j the exporting country. *evasion* stands for a proxy of tax evasion, and tariff for the ad-valorem equivalent tariff duty. U is an error term. γ, the coefficient of interest, is the slope of relationship between duty evasion and AVE tariff, expected to be positive as a result of tax-induced evasion. This coefficient may vary across importers, reflecting differences in fraud pervasiveness.

Fisman and Wei (2004) and subsequent studies use the log-difference between reported exports and of imports (logX – logM, where X and M respectively refer to reported exports and imports) as a proxy of tariff evasion. In addition to being standard, this practice is convenient: any constant margin between the valuation of exports and imports (such as the CIF-FOB margin, see below, or a constant proportion of missclassified imports, as in Fisman and Wei) would show up as a constant. The pitfall is that such dependent variable is not defined as soon as one in the two mirror declaration is zero, even when the second one is non zero. This is why we consider as an alternative definition of the proxy for tax evasion the ratio $RMI = {}^{(X-M)}\!/\!_{((X+M))}$. This relative mismatch index is defined as soon as one of the two mirror flows is not zero, and it is bounded between -1 and 1. Both specifications will be used in the empirical analysis.

In practice, statistical records use to report exports free-on-board (FOB), while import value includes cost-insurance and freight (CIF). In other words, the observed value of exports does not refers to the value X at custom clearance (CIF), but rather to the value X^*, measured FOB. This difference may drive a systematic difference between reported and exports and imports, unrelated to tax-induced evasion. Getting rid of this source of difference is not straightforward, since the magnitude of this margin is very difficult to assess (see e.g. Hummels and Lugovskyy, 2006; or Gaulier et al., 2008, and the references therein).

A useful first-order approximation is that the CIF-FOB margin is constant over products and countries: $X = (1 + \mu) X^*$, where the CIF-FOB margin μ is assumed constant. As mentioned above, the log-difference between reported exports and imports is conveniently changed across the board by the same constant ($- \ln(1 + \mu)$) when X^* is used instead of X. The transformation is less straightforward when the relative mismatch index is used. However, assuming that μ M is small in comparison to (X + M), it can be shown easily that

$$(2) \qquad RMI = \frac{RMI^* + \mu}{1 + \mu}, \quad where \;\; RMI^* \equiv \frac{X^* - M}{X^* + M}$$

Using RMI^* instead of RMI thus approximately involves a mere linear transformation of the dependent variable. Up to a multiplicative constant, related to the CIF-FOB margin, computing the RMI base on FOB exports and CIF imports is thus compatible with a meaningful estimation of equation (1).

This difference pricing rule between imports and exports can also be sidestep by focusing on trade volumes. The interpretation of equation (1) is a bit different in that case, however, since differences in unit values (and possible underreporting thereof) are not detected based on volume data. As emphasized by Javorcik and Narciso (2007), this may pave the way for disentangling the different ways of evading custom duties.

A potentially overwhelming problem with using mirror declarations is the rather bad quality of trade statistics. This has been emphasized repeatedly, and illustrated on a large scale by Hummels and Lugovskyy (2006). In order to limit these quality problems to the extent possible, the data are filtered out by retaining only data from those countries following UN's recommendations on the following points (unless otherwise specified, the recommended answer is yes):

- Do you classify imports *by country of origin* or production? (Question 58;[1] UN's recommendation italicized)
- Do you classify exports by country of last known destination? (Question 62)
- Do you use customs declarations as a source? (Question 106)
- For coding commodities in the basic transactions, do you use HS? (Question 95)
- Is conversion of foreign currencies into national currency based on the prevailing market or on the official rate? (Question 112)

This filter results in significant downsizing of the sample, but it is likely to result in substantial improvement in data quality (see Gaulier et al., 2008). Due to both quality issues and the fact that mismatches in trade declarations are actually used as proxy of tax evasion, the dependent variable is clearly measured here with potentially large measurement error. To the extent that this measurement error can be assumed to be unrelated with tax evasion, though, it should only make the estimation noisier, without introducing any bias. The large number of observations may thus, to some extent compensate for this noisy information.

When trade volume data are used, the sample must be further limited to trade flows for which both partners report volume and use the same physical unit. In addition to this, the sample only retains countries following UN's recommendations on the following two points:

[1] Questions' numbers refer to UN's National Compilation of Reporting Practices (see http://unstats.un.org/unsd/tradereport/countryform.asp?cid=250).

- Do you use a standard unit of weight for quantity measurement of all commodities where applicable? (Question 143); Do you use a standard unit of weight for quantity measurement of most commodities? (Question 144) (follows at least one of these two recommendations–only used for filtering data in volume)

- Do you use units of weight on a net basis (e.g. excluding packing)? (Question 148 –only used for filtering data in volume))

Data and descriptive statistics

Tariff data are obtained from MAcMap 2001 and MAcMap 2004 databases.[2] The MAcMap database is a comprehensive information system providing detailed protection data at the HS6 level. It includes ad valorem equivalents of MFN tariffs for 166 importing countries, as well as bilateral applied protection, together with preferential provisions (e.g. GSP, FTAs, etc.) for more than 208 partners. Specific and compound tariffs and TRQ data (in and out of-quota tariffs, quota levels, quota primes and imports under TRQs) are also provided at the same level of detail.

Trade data, from the United Nations' Comtrade database, are collected at the HS-6 level. Only those flows between two countries originally declaring are taken into account. To measure institutionnal quality, we use the Corruption Perception Index (CPI) of Transparency International,[3] which is also available for years 2001 and 2004. This index ranks 180 countries according to their perceived level of corruption of public officials and politician. It draws on expert surveys, which are asked to answer on a scale of 0 (corruption is common) to 10 (corruption never occurs).

When comparing partner-country trade data one would normally expects an excess of import values over corresponding reported export values (concerning the same trade flows), since the value of imports are expressed free on board (f.o.b) while imports are recorded including cost insurance and freight (c.i.f.). In addition, countries are usually considered to monitor much better imports than exports. Accordingly, following the words of Baghwati (1964), a flow for which reported imports are inferior to the value reported by the exporter can be considered as exhibiting a discrepancy in the "*perverse direction*", which may be interpreted as a *prima facie* evidence of imports under-invoicing.[4]

The general pattern uncovered by Table 1 is consistent with these priors: on average across all countries and products, reported imports indeed exceed reported exports, although by a mere 1.5 percent of the total (mismatch index equal to -0.015, column 1, row 1). Meanwhile, the

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[2] MAcMap is developed by ITC (WTO-UNCTAD) and CEPII. See http://www.cepii.fr/anglaisgraph/bdd/macmap.htm and Bouët et al. (2008).

[3] See http://www.transparency.org/policy_research/survey_indeces/cpi .

[4] Over-reporting of exports is not excluded, in particular when a form of subsidy is attached to exporting, but there are far less incentives to bias invoicing in this respect than to cheat with imports value.

discrepancy takes the "perverse direction" when low-income countries are considered separately, and even more clearly for high-corruption countries (according to the CPI index). The same qualitative result shows up, on average across all countries, for products with a MFN duty rate above 20 percent.

Table 1 - Trade mismatch index and MFN applied tariff rates

Country/Tariff	**Total**	**MFN=0**	**0<MFN<20**	**MFN>20**	**Below country's median MFN**	**Above country's median MFN**
	(1)	(2)	(3)	(4)	(5)	(6)
All countries	-0.015	-0.03	-0.007	**0.018**	-0.008	0
By Income Level						
High and upper-middle income countries	-0.016	-0.003	-0.066	-0.018	-0.004	-0.006
Lower middle-income countries	-0.010	-0.04	-0.007	**0.059**	-0.032	**0.045**
Low-income countries	**0.004**	-0.01	-0.014	**0.135**	**0.032**	**0.09**
By corruption level						
High	**0.034**	-0.019	**0.044**	**0.128**	**0.005**	**0.090**
Medium	-0.026	-0.047	-0.026	**0.033**	-0.037	**0.009**
Low	-0.010	-0.026	**0.001**	-0.05	**0.007**	-0.007

Source: Authors' calculations based on MAcMap HS6 (ITC and CEPII), Comtrade (UN) and Transparency International.

Strikingly, the whole table exhibits a clear pattern of increasingly "perverse" average discrepancy between reported imports and exports, as countries get poorer or more corrupted, and as MFN duties get larger. This preliminary evidence is consistent with the assumption that mismatches in trade declarations to some extent reflect tax evasion, which is easier the lesser the quality of the importers' institution, and the larger the tariff rate.

Estimating custom duties evasion by country

We investigate further this relationship through econometric analysis based on equation (1). While equation (1) refers to bilateral trade flows, however, we first aggregate trade flows across exporters. This means that the relative mismatch index is computed comparing, for each

product and each importer, the sum of reported imports, from all declaring partners, to the corresponding sum of exports reported by these partners.[5]

The estimates reported in Table 2 show a robust, positive relationship between mismatch in trade reporting and MFN tariff duties, when all countries and products are considered together. On average, a 10 percent higher MFN duty is associated to a 1.7 percent higher relative mismatch index. This relationship is found to be concave (estimate 2), while the gap with the average duty for the HS4 position the product belongs to is not found to have a significant effect.

Table 2: Estimating the link between mismatch in trade reporting and tariff duties based on multilateral trade flows

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
AVE MFN custom duty	0.17 ***	0.30 ***	0.29 ***	-0.05 **	-0.24 ***	0.60 ***	0.39 ***	0.58 ***
	(12.58)	(13.44)	(13.23)	(-2.42)	(-6.64)	(21.74)	(20.17)	(16.77)
Squared AVE MFN custom duty		-0.13 ***	-0.13 ***		0.17 ***			
		(-6.47)	(-6.47)		(6.16)			
MFN gap between product and HS4 average			0.03					
			(1.09)					
MFN x upper middle income country				0.24 ***	0.47 ***			
				(9.33)	(9.41)			
MFN x lower middle income country				0.45 ***	0.80 ***			
				(16.48)	(17.53)			
MFN x low-income country				0.49 ***	0.85 ***			
				(12.18)	(11.58)			
Squared MFN x upper middle income country					-0.23 ***			
					(-3.93)			
Squared MFN x lower middle income country					-0.40 ***			
					(-9.07)			
Squared MFN x low-income country					-0.49 ***			
					(-4.91)			
CPI x MFN duty						-0.08 ***		-0.06 ***
						(-16.64)		(-5.22)
PPP GDP per capita x MFN duty							-0.01 ***	0.00
							(-15.01)	(-1.09)
R-squared	0.087	0.088	0.088	0.090	0.091	0.079	0.090	0.079
N	223,127	223,127	223,127	223,127	223,127	145,120	223,127	145,120

Splitting countries according to income level shows that the evasion elasticity is strongly increasing with income level, whether or not the quadratic term is taken into account. While the elasticity is slightly negative for high-income countries alone, it amounts to 0.44 (0.49-0.05) for low-income countries, a level suggesting widespread custom tax evasion.

This cross-country pattern is confirmed when introducing interaction terms, whereby increasing GDP per capita is found to weaken the link between trade mismatch and custom duties. Interestingly, the corruption index performs better than the GDP per capita in explaining cross-country differences.

<< To be completed >>

[5] Note that this does not correspond to total imports of the country considered, since imports from partners not originally declaring their trade flows in Comext are disregarded.

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