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ORGANIZATION AND TARIFF
EVASION**

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ABSTRACT

Accession to the World Trade Organization and Tariff Evasion*

This study documents some unintended consequences of the WTO membership by providing evidence on displacement of tariff evasion driven by the WTO accession process. We argue that implementation of Article VII of the GATT resulted in limiting discretion of customs officials in terms of assessing unit values of goods. While prior to the WTO accession, officials were free to use minimum or reference prices, after their country joined the WTO they were mandated to accept the invoice issued by the exporter. This limited the scope for negotiation between importers and customs officials and their ability to misrepresent import prices. This institutional reform has effectively shut down one channel of import duty evasion. Dishonest importers have responded by relying more heavily on alternative evasion channels, such as undercounting quantities and product misclassification. We formally test these hypotheses using data on 15 countries which joined the WTO between 1996 and 2008. We calculate the discrepancy in the unit values of imports as reported by the exporter and the importer and find that there is a positive relationship between the tariff rate and misrepresentation of import prices prior to the accession. This relationship disappears after the country joins the WTO. However, at the same time we find that removing the opportunity to underreport unit values has induced importers to underreport quantities. We find that in the post-accession period there is a positive and statistically significant relationship between underreporting of import quantities and the tariff rate. Further, we find that the relationship between the tariff on similar products and underreporting quantities becomes stronger after the accession, which is suggestive of product misclassification becoming more widespread.

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1. Introduction

The World Trade Organization (WTO) with its 158 member countries is one of the most prominent international bodies.¹ Although it has formally existed for less than two decades, there is a fast growing literature aiming to assess the benefits it brings to member countries. This literature (reviewed later in the text) has examined whether the WTO membership boosts international trade, raises incomes of its members, eliminates the terms-of-trade-driven restrictions in trade that arise when policies are set unilaterally or can be used by governments as a commitment device vis-à-vis domestic lobbies.

This paper contributes to this literature by documenting an unintended consequence of the WTO membership. It argues that an institutional reform required as a condition of the WTO accession shuts down one channel through which import duties can be evaded in new member states. While the evidence suggests virtual elimination of tax evasion through the affected channel, it also indicates greater evasion through alternative channels. The overall level of the evasion appears to be unchanged by the accession process.

The analysis focuses on the WTO Customs Valuation Agreement (Agreement on Implementation of Article VII of the GATT) which countries joining the WTO are expected to implement. Article VII sets the international rules on the methodology that countries must use to value imported goods in order to collect duty. Customs value should be based on “actual value”, which is the price of the imported merchandise, or like merchandise, in sales in the ordinary course of trade under fully competitive conditions. Customs value should not be based on value of merchandise of national origin, or arbitrary or fictitious values. Countries joining the WTO are under pressure to comply with the agreement as failure to do so may result in being brought to the WTO Dispute Settlement Mechanism.^{2,3}

By essentially mandating the use of invoices issued by the exporter as the basis for import valuation, Article VII limits the discretion of customs officials. The intended purpose of Article VII is to prevent member countries from eroding tariff concessions granted to other WTO members by *overvaluing*

¹ For comparison, the United Nations has 193 member states.

² The *Report of the Working Party on the Accession of China to the WTO* (1 October 2001, emphasis added) reads: “Some members of the Working Party expressed concern regarding the methods used by China to determine the customs value of goods, in particular regarding the practice of using minimum or reference prices for certain goods, which would be inconsistent with the Agreement on Implementation of Article VII of the GATT 1994 (“Customs Valuation Agreement”).” In response, “The representative of China confirmed that, upon accession, China would apply fully the Customs Valuation Agreement (. . .)”.

³ In January 2008 the European Community (EC) requested consultations with Thailand with respect to the way the Thai customs authorities value alcoholic beverages and other products from the EC. The EC disputed the application by the Thai customs authorities of an “assessed value”, which is considered to be arbitrary. In February 2008, the Philippines and the US requested to join the consultations.

Source: http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds370_e.htm

import flows.⁴ However, many developing countries are concerned about implementing the valuation methods set out in Article VII because they fear that importers may use fake invoices to evade duties by *undervaluing* import flows.⁵

Our study builds on the literature originating with the work of Fisman and Wei (2004). This literature shows that the missing trade, defined as the discrepancy in the product-specific trade flow reported by the exporting country and the figures reported by the importer, is positively correlated with the tariff rate. While the finding of Fisman and Wei is based on trade flows between Hong Kong and China, subsequent studies have documented similar patterns in ten transition economies (Javorcik and Narciso 2008), India (Mishra, Topalova and Subramanian 2008), Chinese imports from multiple exporters (Rotunno and Vézina 2011) and Cameroon (Raballand et al. 2013).

We focus on misrepresentation of the import price and its sensitivity to the tariff rate before and after the WTO accession. To capture the misrepresentation of the import price, we follow Javorcik and Narciso (2008) and calculate the difference between the unit value of exports reported by the exporting country and the unit value of imports recorded by the importer (hereafter referred to as the unit value gap). Unit values are measured at the 6-digit level of the Harmonized System (HS) classification. We focus on differentiated products, as defined by Rauch (1999). It is more difficult for honest customs officials to accurately assess the true price of differentiated products due to their intrinsic features and different qualities, which may give corrupt customs officers a plausible explanation for why they did not detect the problem with the invoice.⁶ We focus on three major exporting countries, all of which are developed and relatively uncorrupt economies: Germany, US and France.⁷ We consider 15 importing countries which joined the WTO between 1996 and 2008. We use trade figures from the UN COMTRADE database and tariff data from the World Bank's WITS database.

Our empirical analysis proceeds in several steps. First, we show that there exists a positive and statistically significant relationship between the unit value gap and the tariff rate. When estimating this

⁴ For example, if the tariff rate on widgets is 10 percent, then a firm importing \$100 worth of widgets should pay \$10 in import duties. If, however, customs officials at the border valued the shipment at \$200, the resulting duty payment would increase to \$20 which would be equivalent to a 20% tariff rate. As many developing countries rely heavily on tariff revenue, customs officials are under pressure to meet revenue targets and hence may want to engage in this type of practices.

⁵ Though there are provisions for situations when customs administrations have reason to doubt the accuracy of the declared value of imported goods.

⁶ Javorcik and Narciso (2008) find no evidence of price misrepresentation (i.e., reporting unit values of imports as being lower than what they really are) being responsive to the tariff rate in general. However, they do find evidence suggesting that price misrepresentation is positively correlated with the tariff rate in the case of differentiated products. Their results suggest that a one-percentage-point increase in the tariff rate is associated with a 0.9 to 1.2% increase in the unit value gap of differentiated products in Eastern European transition countries. Our results are robust to including non-differentiated products.

⁷ All three countries are in the top quantile of the least corrupt countries in the world according to the Transparency International Corruption Perception Index.

relationship we control for country pair, 6-digit HS product and year fixed effects. Our results are consistent with the underreporting of import prices being greater when the tariff rate is higher. This finding is intuitive as importers wanting to evade paying import duties will have a greater incentive to underreport the price of the imported product if the tariff rate is higher.⁸

Then, we examine whether the relationship between the unit value gap and the tariff rate changes after the WTO accession. This appears to be the case. Our results suggest that the positive link between misrepresentation of the import price and the tariff level disappears after the importing country joins the WTO. A 10 percentage point increase in the tariff rate is associated with a 6.3% larger unit value gap prior to the WTO membership and a two percent lower unit value gap in the post accession period.⁹ Our findings are consistent with the WTO Customs Valuation Agreement limiting the discretion of customs officials in terms of assessing the price of imported goods, which makes it much more difficult for corrupt officials to cooperate with dishonest importers to evade duty payments. Thus fears of developing countries that underpricing would increase after implementation of Article VII appear to be unfounded.

In a series of robustness checks, we show that our results hold when we restrict our sample to products whose tariff did not change around the accession time, when we control for unobservable importer-year or importer-exporter-year heterogeneity, or include non-WTO members in the control group. Our smoking gun is the case of Ecuador which asked for a 5-year transition period to implement the Customs Valuation Agreement. We find that the positive relationship between the unit value gap and the tariff rate is unaffected by the WTO membership during the transition period, but it disappears once the transition period is over.

So far our analysis suggests that the institutional change resulted in shutting down one of the tariff evasion channels. Next we examine whether changes to customs valuation procedures induce importers to seek alternative ways of tariff evasion. We do so by focusing on underreporting of quantities. We find a positive and statistically significant relationship between underreporting of quantities and the tariff rate in the post-accession period. The magnitude of the estimated effect is quite large as it suggests that a 10 percentage point increase in the tariff rate is associated with a 10.2% increase in the quantity

⁸ An anthropological study of the Cameroonian customs administration concludes that the recorded details of an import transaction are a result of negotiations between customs officials (who need to meet their revenue targets) and importers (who would like to limit their duty payments).

“With ‘large undertakings’, often subsidiaries of international groups, officers do not negotiate; they apply the ‘transactional value’, the value shown on the invoice. . . .Negotiation is used for ‘informals’, ‘central market traders’. It is even strongly recommended and organized for agreement on three points: quantity per unit of measurement (bundle, container), value of that unit of measurement and tax category (generally the highest of three or four categories). . . . Customs officers apply, or indeed set, ‘administrative values’, ‘approved values’ or ‘reference values’. These differ from the invoice value, which is considered to be incorrect.” Cantens (2012, p. 5)

⁹ A negative relationship suggests a lesser extent of underpricing in higher tariff categories, which is suggestive of high tariff products being more closely scrutinized.

gap. No statistically significant relationship is detected prior to the membership in our most stringent specification.¹⁰ We also explore tariff evasion through misclassification of imports. We do so by controlling for tariffs on similar products. More specifically, we follow Fisman and Wei (2004) and include in our regression the average weighted tariff in the same 4-digit HS category. We find a negative and statistically significant coefficient on the new variable, which suggest that lower tariffs on similar products are associated with a higher quantity gap. This is in line with the argument that lower tariffs on similar products make misclassification of products more attractive. More interestingly, the relationship between the tariff on similar products and the quantity gap becomes stronger after the WTO accession. Again, this is suggestive of the importers switching to an alternative channel of tariff evasion.

What is the overall effect? To examine this question, the third part of our analysis focuses on the trade value gap, or discrepancy in total value of trade (i.e, price x quantity) as reported by the exporting country and the importing country. We find no evidence of an impact of WTO accession on the trade value gap, indicating that the decrease in undervaluing is offset by the increase in underreporting quantities and product misclassification.

Our study documents two opposing effects of WTO accession. We argue that on the one hand taking away discretion of customs officials with respect to assessing prices of imported goods has resulted in lesser underreporting of prices (or more precisely, a lower semi-elasticity of the unit value gap with respect to the tariff rate). On the other hand, we find evidence consistent with greater evasion of import duties through underreporting quantities and product misclassification following entry into the WTO.¹¹ Our results suggest that the institutional reform mandated by WTO accession resulted in shutting down one channel of tariff evasion, but at the same time has led to greater evasion through alternative channels. Thus our evidence is consistent with strong displacement of an illicit activity.¹²

The issues addressed in our paper are highly salient in the light of the recent 2013 G8 meeting in Northern Ireland which posed the issues of transparency, tax evasion and trade as the main items in the agenda.

¹⁰ In other specifications, the pre-WTO relationship is positive but the estimated magnitudes are much smaller than those found for the unit value gap.

¹¹ One can speculate that reforming one aspect of functioning of the customs administration was so effective precisely because officers retained discretion in other areas. Cantens (2012, p. 10) argues that officers are very well aware of politician's objectives:

“All Customs officers are familiar with the *Doing Business* reports, the *Logistics Performance Index* and the *Transparency International* classifications. Some Customs officers even know where their country is ranked directly from the cross-border trade indicator, one of the indicators summarized for the general classification in *Doing Business*. They describe what the minister wants following those classifications and the relative pressure that results.”

¹² The observed pattern is consistent with the finding of Yang (2008) who found that introduction of pre-shipment inspections in the Philippines led to increased usage of alternative methods of duty avoidance. Alternative methods included splitting shipments into smaller shipments with values below the threshold where pre-shipment inspection was required, as well as routing shipments through duty-exempt export-processing zones.

Our study is related to the literature assessing the implications of WTO membership. Increased trade as the potential gain from the membership has received the most attention from researchers. In a widely cited study, Rose (2004) failed to find a statistically significant relationship between the GATT/WTO membership status of a pair of countries and their bilateral trade. This finding was partially reversed by Tomz, Goldstein and Rivers (2007) who updated Rose's data to include both de jure and de facto WTO membership and then found a positive effect of the WTO. Subramanian and Wei (2007) allowed for a differential effect on different country groupings and showed that a positive WTO trade effects exists for industrialized but not for developing nations. Eicher and Henn (2011) focused on improvements to the estimation technique and found that once they control for three sources of omitted variable bias, namely multilateral resistance, unobserved bilateral heterogeneity and trade effects of preferential trade agreements, there was no evidence of a positive WTO trade effect. This contrasts with the most recent results of Chang and Lee (2011) who used nonparametric methods and showed large GATT/WTO trade-promoting effects.

The literature additionally suggests that the WTO eliminates the terms-of-trade-driven restrictions in trade that arise when policies are set unilaterally (Broda et al. 2008, Bagwell and Staiger 2011) or can be used by governments as a commitment device vis-à-vis domestic lobbies (Maggi and Rodriguez-Clare 1998 and 2007). There is also evidence consistent with WTO accession raising income, but only for those countries that were subject to rigorous accession procedures (Tang and Wei 2009).¹³

Our work is also related to the tax literature. Tax evasion is by its very nature difficult to measure and reaction of tax evasion to policy changes even more so. Our analysis allows exploring the impact of a policy shock on tax evasion. Our results suggest that regulatory changes, which could potentially limit tax evasion, change the type of evasion but not its extent. They support the view of Slemrod and Kopczuk (2002) that the behavioral response to a tax rate change depends on the environment in which individuals operate and may be manipulated by instruments controlled by the government. Our study also add to the literature pointing out the limited choice of possible tax collection mechanisms in developing countries where business environment tends to be less transparent (Gordon and Li 2009).

Finally, our study contributes to the literature studying displacement of illegal activities (Chaiken et al. 1974, McPheters et al. 1984, Ayres and Levitt 1998, Levitt 1998, and Di Tella and Schargrodsky 2004).¹⁴ This body of work concludes that displacement effects tend to be small in magnitude. Our study, together with an earlier work by Yang (2008), leads to the opposite conclusion.

¹³ Article XXVI 5(c)-eligible countries were able to join the GATT by 1994 without making extensive reform commitments. These were former colonies whose former colonizers were GATT members by the time of their colonies' independence.

¹⁴ See a literature review by Hesselting (1994).

Our paper is structured as follows. The next section describes the data. Section 3 explores the relationship between underreporting of prices and the WTO membership. Section 4 focuses on underreporting quantities and product misclassification, while Section 5 examines the effect on the overall trade value. The last section presents the conclusions.

2. Data

Our main data source is the World Bank's World Integrated Trade Solution (WITS) database that contains information on most favored nation (MFN) and preferential tariff rates specific to pairs of countries and years, derived from the UNCTAD's Trade Analysis and Information System (TRAINS). The information is available at the 6-digit level in the HS classification. We consider 15 importing countries which joined the WTO between 1996 and 2008. These are: Albania, Armenia, China, Cape Verde, Ecuador, Georgia, Lithuania, Latvia, Moldova, Macedonia, Nepal, Oman, Saudi Arabia, Ukraine and Vietnam. Table 1 lists their accession dates. Due to data constraints, we exclude from the sample six other WTO members that joined the organization during the same period.¹⁵ In our analysis, we consider the actual year of accession if the country became a WTO member between January and June, and the following year if the accession happened between July and December. We consider three exporters: Germany, US and France. We chose these particular exporters to cover the major source of exports in all regions of the world. We also decided to focus on developed and relatively uncorrupt countries in order to avoid confounding the effects of corruption in the exporting nation with the effects of corruption in the importing country.

Our second data source is the United Nations' COMTRADE database which contains information on trade flows, also at the 6-digit HS level. The data on tariffs and trade flows are available for the period 1992-2009, though the coverage differs by country.

We consider only differentiated products because as argued by Javorcik and Narciso (2008) it may be easier to conceal the true value of such products, thus creating more opportunities for tariff evasion. We use Rauch's (1999) definition of differentiated products. He classified goods into three categories: (i) homogeneous which are products whose price is set on organized exchanges; (ii) reference priced, which are goods not traded on organized exchanges, but which possess a benchmark price; and (iii) differentiated which are products whose price is not set on organized exchanges and which lack a reference price because of their intrinsic features. Rauch suggested two definitions, a conservative and a liberal one, in order to account for the ambiguities arising in the classification. The conservative definition minimizes the number of commodities that are classified as homogeneous goods, while the

¹⁵ Table 2 lists their names and the reasons why they have been excluded.

liberal definition maximizes this number. We employ the conservative classification, but our results are robust to using the liberal definition.

3. Implementation of the WTO Customs Valuation Agreement

Summary statistics

Our variable of interest is the unit value gap defined as the difference in unit values of exports of product p at time t reported by the exporter k and the importer c :

$$\text{Unit value gap}_{kcpt} = \ln\left(\frac{\text{Export value}_{kcpt}}{\text{Export quantity}_{kcpt}}\right) - \ln\left(\frac{\text{Import value}_{kcpt}}{\text{Import quantity}_{kcpt}}\right) \quad (1)$$

The gap is calculated at the level of 6-digit HS product for each exporter-importer combination and each year.¹⁶ A discrepancy between the value of exports recorded by the exporting country and the value of imports recorded by the importer is to be expected. The first reason is that export prices are expressed in f.o.b. terms while imports are recorded including the cost of insurance and freight (c.i.f.). The second reason is that countries tend to monitor imports more carefully than exports. In the absence of tariff evasion one would expect the discrepancy to be negative. Yet, as illustrated in Table 3 presenting the summary statistics, both the average and the median gap in our sample are positive reaching 11.4% and 6.3%, respectively.¹⁷

More interestingly from the perspective of our study, there is a sharp decline in the value of the gap from the average value of 24.4% before the WTO accession to -0.6% after the accession. The difference between the two figures is statistically significant (see Table 4).

The existence of the unit value gap is suggestive of tariff evasion, but it does not constitute conclusive evidence. A systematic relationship between the tariff level and the gap would be much stronger evidence of improper customs practices. Thus in Table 5, we check whether there is a difference in the average unit value gap for the high and low tariff levels. Looking at the pre-accession period, we find a much higher gap for the above median tariffs than for the below median tariffs (35.5% vs 19.2%).¹⁸ The difference between the two is statistically significant. In contrast, in the post-accession period, the average gaps are very small and negative, almost identical, and the difference between them is not

¹⁶ We drop from the sample the top and bottom 1% of observations for each country to avoid including possible coding mistakes in the data set.

¹⁷ $\text{Exp}(.108) - 1 = .114$

¹⁸ The median tariff is calculated by the importing country and year.

statistically significant. This pattern is in line with our hypothesis that the WTO accession is associated with limiting discretion of customs officials in terms of assessing the price of imported goods.

Econometric specification

To formally test the relationship between WTO accession and tariff evasion, we will examine whether the elasticity of the unit value gap with respect to the tariff rate changes around the accession time. More specifically, we will estimate the following model:

$$unit_value_gap_{kcpt} = \beta_0 + \beta_1 tariff_{kcpt} + \beta_2 WTO_{ct} * tariff_{kcpt} + \beta_3 WTO_{ct} + \alpha_{kc} (+\alpha_k + \alpha_c)(+\alpha_p) + \alpha_t + \varepsilon_{kcpt} \quad (2)$$

where the unit value gap is defined as above, tariff is the applied tariff on imports of product p from country k to country c at time t , WTO is the dummy variable taking on the value of 1 if country c was a member of the organization at time t , and zero otherwise. The full specification of the model also includes importer and exporter fixed effects (or importer-exporter pair fixed effects), product fixed effects and time fixed effects. We do, however, show the results with various combinations of fixed effects. In all specifications, standard errors are clustered at the country-pair level.

Following the literature outlined earlier, we will interpret a positive semi-elasticity of the unit value gap with respect to the tariff rate ($\beta_1 > 0$) as evidence of tariff evasion. The question of interest is whether this semi-elasticity changes after the WTO accession. If the WTO membership improves functioning of the customs service, we would expect to observe a negative coefficient on the interaction term ($\beta_2 < 0$).

Before we proceed to testing the question of interest, we check for evidence of tariff evasion in our sample regardless of the WTO membership. In other words, we drop the terms involving the WTO from the estimation and show the results in the top panel of Table 6. We present four specifications with different combinations of fixed effects: (i) importer, exporter and year fixed effects; (ii) country-pair and year fixed effects; (iii) importer, exporter, product and year fixed effects; and (iv) country-pair, product and year fixed effects. In all four specifications, we find a positive and statistically significant (at the 1% level) relationship between the tariff rate and the unit value gap. In the first specification, a 10 percentage point increase in the tariff rate is associated with a 7% larger unit value gap. In other words, if the tariff rate is 10 percentage points, on average the importing country reports a 7% lower unit price than the exporter. In the most stringent specification (column 4), the magnitude of the effect declines to 5% but the coefficient remains statistically significant at the 1% level.

Baseline results

The results from our baseline specification, outlined in equation 2, support our hypothesis that institutional reforms mandated by the WTO accession affect tariff evasion through underreporting of prices. As evident from the bottom panel of Table 6, we find a positive and statistically significant semi-elasticity of the unit value gap with respect to the tariff rate in the pre-accession period. In the post-accession period, this semi-elasticity becomes either much smaller in magnitude or even negative.¹⁹ Looking at column 1, a 10 percentage point increase in the tariff rate is associated with an 8.5% larger unit value gap prior to the WTO membership and a 2.6% larger gap in the post-accession period. The corresponding figures for column 4 are a 6.3% increase pre-accession and a 2% percent decline in the post accession period. These results are consistent with the WTO Customs Valuation Agreement limiting the discretion of customs officials and thus the scope for underreporting of unit values of imports.

One may wonder why importers do not simply present counterfeited import documents stating a lower price of imported products. While Article VII means that the customs officers are expected to accept the invoice price, the burden of proof lies with the importer. In cases where customs authorities have reasonable doubts as to the truth or accuracy of the transaction value declared by the importer, they are allowed to ask importers to provide explanations, documents or other evidence to establish that “the declared value represents the total amount actually paid or payable for the imported goods.” It is not up to customs to prove that the invoice is inaccurate. If the customs authorities are not satisfied and have “reasonable doubts” about the truth or accuracy of the declared value, they may use alternative valuation methods specified in the agreement. The discretion available to customs in deciding on the dutiable value is, however, limited as they must follow five valuation methods applying them in a pre-specified order (Rege 2002).

Robustness checks

WTO accession is often associated with changes in trade policy. To make sure that our results are driven by changes in tariff evasion rather than other trade policy changes, we perform two checks. First, it could be the case that incentives to evade tariffs decline as the average tariff decreases. To take this into account we estimate our baseline specification on a subsample of products whose tariffs are the same in the year of the WTO accession (or any subsequent year) as in the previous year. While the sample size drops to about a third, the results are virtually unchanged (see Table 7).

¹⁹ A negative semi-elasticity is consistent with customs service performing more vigorous checks on imports of high tariff products, thus leading to lower evasion at higher tariff levels. This argument has found some empirical support in the context of pre-shipment inspection examined by Anson et al. (2006).

Second, we change our baseline specification to include different sets of fixed effects. In the left panel of Table 8, we control for all importer-specific changes taking place in each year by including importer-year fixed effects in addition to exporter and product fixed effects. As before we find a positive and statistically significant sign on the import tariff and a negative, and statistically significant coefficient on the interaction between the tariff rate and the WTO membership in the specification which includes product fixed effects. In the right panel of Table 8, we include importer-exporter-year fixed effects. In this way, we account for shocks specific to a pair of trading partners in a particular year. All the coefficients of interest follow the expected sign pattern and are statistically significant in the most stringent specification which includes product fixed effects. As anticipated, the results suggest that the relationship between underreporting of prices and the tariff level pretty much disappears after the WTO accession.

In Appendix A Table A1, we present another robustness check. Rather than comparing tariff evasion in the pre- and post-accession period in WTO members alone, we also include non-member countries in our control group. The non-members include: Algeria, Azerbaijan, Belarus, Bhutan, Bosnia Herzegovina, Kazakhstan, Lebanon, Russian Federation, Serbia, Syria and Yemen. Changing the comparison group does not affect our findings.

Finally, as illustrated in Appendix B, the pattern we document cannot be explained by computerization of the customs procedures.

Additional evidence

Ecuador, which is included in our sample, is an interesting case. The country joined the WTO in January 1996 and asked for a 5-year transition period for implementing the Customs Valuations Agreement. To take the transition period into account we estimate an augmented model for Ecuador, in which we allow for a different coefficient on the tariff rate in the 1996-2000 period (i.e., the time when Ecuador was already member of the WTO but was not obliged to implement Article VII) and in the 2001-2009 period (when Ecuador was a member obliged to have implemented Article VII). The results, presented in Appendix A Table A2 show a positive and statistically significant coefficient on the tariff rate. As we would expect, the interaction term between the tariff rate and the 1996-2000 period dummy is not statistically significant, while the interaction with the 2001-2009 period is negative and statistically significant. In other words, we find a positive relationship between underpricing of imports and the tariff rate in years prior to 2001. This relationship disappears in 2001, the year when Ecuador was expected to implement the Customs Valuation Agreement.²⁰

²⁰ Given the small number of clusters, heteroskedasticity-robust standard errors are included in Table A2.

4. Is there evidence of displacement?

Closing one avenue of tariff evasion may lead to importers exploring alternative means of duty evasion. To explore this possibility we first examine the patterns of underreporting quantities pre- and post-WTO accession. We define quantity gap as difference between quantities of exports of product p reported at time t by the exporting country k and quantities of imports reported by the importing country c :

$$\text{Quantity gap}_{kcpt} = \ln(\text{Export quantity}_{kcp,t}) - \ln(\text{Import quantity}_{kcp,t}) \quad (3)$$

Unlike the unit value gap, the quantity gap will not be affected by exports being reported on f.o.b. basis and imports including the costs of insurance and freight. However, a mismatch in statistics may arise due to transit time (e.g., exporting country may report goods as being shipped in December of year t , while goods may arrive at their destination only in January of year $t+1$) or to countries recording their imports more carefully than their exports. As indicated by the summary statistics, presented in Table 9, the average quantity gap prior to the WTO accession was equal to -12.4 percent (i.e., on average importing countries reported larger quantities of goods arriving relative to the exporting countries' records). This sign pattern reversed after the WTO accession with the average quantity gap reaching positive 15.7 percent, which is consistent with underreporting of quantities by importing countries. The difference between the two means is statistically significant.

Table 10 breaks down these averages by the tariff level. After the WTO accession, a large positive quantity gap is observed in products with the above median tariff rate and a small positive quantity gap in products where tariffs are below the median. The difference between the two figures is statistically significant. Before the WTO accession, the gap is positive only in high tariff products. The summary statistics presented so far are quite suggestive of tariff evasion through underreporting of quantities (or outright smuggling) intensifying after the WTO accession.

Now we turn to the econometric evidence. We estimate a specification analogous to equation (2) with the quantity gap as the dependent variable and present results in Table 11. In our most stringent specifications including product fixed effects, we do not find a statistically significant relationship between the quantity gap and the tariff rate in the pre-WTO period. In other specifications, the relationship is positive, though the coefficient is small in magnitude. The most intriguing is, however, the finding of a positive and statistically significant relationship between underreporting of quantities and the tariff rate in the post-accession period. The magnitude of the estimated effect is quite large as it suggests that a 10 percentage point increase in the tariff rate is associated with a 10.2% larger quantity gap.

Next we look for evidence of evasion through misclassification of goods. We do so by adding an additional variable, tariff on similar products, to our model. More specifically, we control for the average weighted tariff in the same 4-digit HS category. The rationale for this exercise is that lower tariffs on similar products make it more attractive for dishonest importers to misclassify their products into a lower tariff category. We allow for the effect of the new variable to vary with the WTO accession. As can be seen in Table 12, we find the expected sign on the variable of interest. The estimated coefficient is statistically significant in all regressions in the pre-accession period and in the two most stringent specifications in the post-accession period. Strikingly, the magnitude of the effect more than doubles with the WTO accession.

The results presented in this section are consistent with tariff evasion through underreporting of quantities (or outright smuggling) and product misclassification worsening after the WTO accession. A simple model following Yang (2008), presented in Appendix C, illustrates that an increase in the costs of evasion through one method may induce importers to switch to another method of evasion. Thus some of the effect we find may be accounted by dishonest importers switching to outright smuggling. A complementary explanation is that corrupt customs officials who see their discretion taken away in one area (decisions about import prices) find alternative means for corrupt activities.

5. The overall effect

So far our study has documented two opposing effects of WTO accession. We have argued that on the one hand taking away discretion of customs officials with respect to assessing prices of imported goods has resulted in lesser underreporting of prices. On the other hand, we have found evidence consistent with greater evasion of import duties following entry into the WTO through underreporting of quantities (or outright smuggling) and product misclassification. But what is the overall effect?

To examine this question, we focus on the trade value gap, or discrepancy in total value of trade (i.e., price \times quantity), as reported by the exporting country c and the importing country k pertaining to product p at time t . In other words, we ask whether “more trade goes missing” in higher tariff categories in the aftermath of the WTO accession.

We estimate our baseline specification from equation 2, but we replace the dependent variable with the trade value gap. The results, presented in Table 13, confirm the offsetting power of the two channels of tariff evasion. While the estimated coefficient of tariff is positive and statistically significant at the one percent level, the coefficient of interest is not statistically significant in the most stringent specifications which control for product fixed effects (columns 3 and 4).

6. Conclusions

Our study focuses on displacement of illicit activities in the context of institutional reforms mandated by the WTO accession process. We argue that implementation of Article VII resulted in limiting discretion of customs officials in terms of assessing unit values of goods. While prior to the WTO accession, they were free to use minimum or reference prices, after their country joined the WTO they were mandated to accept the invoice issued by the exporter. This limited the scope for negotiation between importers and customs officials and the ability to misrepresent import prices. This institutional reform has thus effectively shut down one channel of import duty evasion. Dishonest importers have responded by more heavily relying on alternative evasion channels, such as undercounting quantities and product misclassification.

To formally test our hypotheses we use data on 15 countries which joined the WTO between 1996 and 2008. We calculate the discrepancy in the unit values of imports as reported by the exporter and the importer and find that there is a positive relationship between the tariff rate and misrepresentation of import prices prior to the accession. This relationship disappears after the country joins the WTO. However, at the same time we find that removing the opportunity to underreport prices has induced importers to underreport quantities. More specifically, we find that in the post-accession period there is a positive and statistically significant relationship between underreporting of import quantities and the tariff rates. Further, we find that the relationship between tariff on similar products and underreporting quantities becomes stronger after the accession. Thus our evidence is consistent with closing one avenue for tariff evasion leading importers to find alternative ways of avoiding duty payments.

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Table 1. Recent WTO members included in the analysis

Accession countries	Date of WTO accession
Albania	8 September 2000
Armenia	5 February 2003
China	11 December 2001
Cape Verde	23 July 2008
Ecuador	21 January 1996
Georgia	14 June 2000
Lithuania	31 May 2001
Latvia	10 February 1999
Moldova	26 July 2001
Macedonia	4 April 2003
Nepal	23 April 2004
Oman	9 November 2000
Saudi Arabia	11 December 2005
Ukraine	16 May 2008
Vietnam	11 January 2007

Table 2. List of recent WTO members not included in the analysis

Countries not included	Year of WTO accession	Trade data availability (comments)
Croatia	2000	2001-2009 (no trade figures available prior to accession)
Jordan	2000	2000-2007 (no trade figures available prior to accession)
Panama	1997	1997-2008 (no trade figures available prior to accession)
Estonia	1999	Uniform tariff (no variation in tariff rates)
Cambodia	2004	No tariff data
Kyrgyz Republic	1998	Large gaps in tariff data

Table 3: Summary statistics

	Mean	Median	Min	Max	No. observations
Tariff	9.830	8	0	220	246,009
Unit Value Gap	0.108	0.061	-5.021	4.860	246,009
Quantity Gap	0.004	-0.040	-12.218	12.207	246,009
WTO	0.491	0	0	1	246,009

Table 4: Summary statistics by WTO accession. Unit value gap

Sample	Before WTO accession (1)	After WTO accession (2)	Difference (1)-(2)
Mean Unit Value Gap			
All importers	0.218 (125,118 obs.)	-0.006 (120,891 obs.)	0.224***

Table 5: Summary statistics by tariff rate and WTO accession. Unit value gap

Sample	Tariff above the median (1)	Tariff below the median (2)	Difference (1)-(2)
Mean Unit Value Gap			
Before WTO accession	0.304 (40,844 obs.)	0.176 (84,274 obs.)	0.128***
After WTO accession	-0.008 (38,836 obs.)	-0.005 (82,055)	-0.003

Table 6. Unit value gap in WTO accession countries

	(1)	(2)	(3)	(4)
Unit value gap during the whole period				
Tariff	0.0071*** [0.001]	0.0070*** [0.001]	0.0050*** [0.001]	0.0050*** [0.001]
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.030	0.033	0.108	0.111
Unit value gap pre and post WTO accession				
Tariff	0.0085*** [0.002]	0.0085*** [0.002]	0.0062*** [0.001]	0.0063*** [0.001]
Tariff x WTO	-0.0059** [0.002]	-0.0065*** [0.002]	-0.0077*** [0.002]	-0.0082*** [0.002]
WTO	-0.0053 [0.038]	0.0008 [0.038]	0.0021 [0.037]	0.0071 [0.037]
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.030	0.034	0.109	0.112
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes

Notes: The dependent variable is the unit value gap as defined in equation 1 in the text. The specifications in the top panel mirror the bottom panel in terms of fixed effects. Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table 7. Unit value gap pre- and post-WTO accession. Subsample with unchanged tariff rates

	(1)	(2)	(3)	(4)
Tariff	0.0087*** [0.003]	0.0085** [0.003]	0.0058*** [0.002]	0.0057** [0.002]
Tariff x WTO	-0.0054* [0.003]	-0.0059* [0.003]	-0.0072** [0.003]	-0.0075** [0.003]
WTO	0.0436 [0.041]	0.0455 [0.041]	0.0655 [0.040]	0.0661 [0.041]
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes
Observations	87,751	87,751	87,751	87,751
Adjusted R-squared	0.031	0.034	0.134	0.138

Notes: The dependent variable is the unit value gap as defined in equation 1 in the text. Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table 8. Unit value gap pre- and post-WTO accession. Further robustness checks

	Controlling for			
	importer-year fixed effects		country-pair-year fixed effects	
	(1)	(2)	(3)	(4)
Tariff	0.0055*** [0.002]	0.0027* [0.001]	0.0058*** [0.002]	0.0027* [0.001]
Tariff x WTO	-0.0015 [0.002]	-0.0046* [0.002]	-0.0024 [0.002]	-0.0050* [0.003]
WTO			0.2490 [0.168]	0.1672 [0.131]
6-digit HS product fixed effect	no	yes	no	yes
Exporter fixed effects	yes	yes	no	no
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.043	0.121	0.050	0.128

Notes: The dependent variable is the unit value gap as defined in equation 1 in the text. Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table 9: Summary statistics by WTO accession. Quantity gap

Sample	Before WTO accession (1)	After WTO accession (2)	Difference (1)-(2)
Mean Quantity Gap			
All importers	-0.132 (125,118 obs.)	0.146 (120,891 obs.)	-0.278***

Table 10: Summary statistics by tariff rate and WTO accession. Quantity gap

Sample	Tariff above the median (1)	Tariff below the median (2)	Difference (1)-(2)
Mean Quantity Gap			
Before WTO accession	0.043 (40,844 obs.)	-0.217 (842,74 obs.)	0.260***
After WTO accession	0.353 (38,836 obs.)	0.048 (82,055 obs.)	0.305***

Table 11. Quantity gap pre- and post-WTO accession

	(1)	(2)	(3)	(4)
Tariff	0.0047* [0.003]	0.0046* [0.003]	0.0012 [0.003]	0.0011 [0.003]
Tariff x WTO	0.0170** [0.008]	0.0181** [0.007]	0.0090* [0.005]	0.0102** [0.005]
WTO	-0.1149* [0.067]	-0.1434** [0.066]	-0.0655 [0.055]	-0.0955* [0.053]
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.020	0.023	0.104	0.108

Notes: Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table 12: Misclassification and underreporting of quantities

	(1)	(2)	(3)	(4)
Tariff	0.0067** [0.003]	0.0066** [0.003]	0.0040 [0.003]	0.0039 [0.003]
Tariff x WTO	0.0166** [0.007]	0.0171** [0.007]	0.0131** [0.005]	0.0139*** [0.005]
Tariff on similar products	-0.0034* [0.002]	-0.0033* [0.002]	-0.0053* [0.003]	-0.0053* [0.003]
WTO x Tariff on similar products	0.0003 [0.004]	0.0012 [0.004]	-0.0079* [0.004]	-0.0071* [0.004]
WTO	-0.1160 [0.073]	-0.1465** [0.071]	-0.0467 [0.057]	-0.0782 [0.055]
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.020	0.023	0.105	0.108

Notes: The dependent variable is the quantity gap. Tariff on similar products is defined as the weighted average tariff on all products within the same 4-digit HS code. Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table 13. Trade gap pre- and post-WTO accession

	(1)	(2)	(3)	(4)
Tariff	0.0131*** [0.003]	0.0131*** [0.003]	0.0074*** [0.003]	0.0073*** [0.003]
Tariff x WTO	0.0110* [0.007]	0.0116* [0.006]	0.0012 [0.005]	0.0020 [0.005]
WTO	-0.1203** [0.052]	-0.1427*** [0.052]	-0.0634 [0.038]	-0.0885** [0.036]
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.018	0.023	0.109	0.114

Notes: Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Appendix A. Robustness Checks

Table A1. Unit value gap pre- and post-WTO accession. Including non-WTO members in the control group

	(1)	(2)	(3)	(4)
Tariff	0.0091*** [0.002]	0.0086*** [0.002]	0.0050*** [0.001]	0.0045*** [0.001]
Tariff x WTO	-0.0065*** [0.002]	-0.0066*** [0.002]	-0.0095*** [0.003]	-0.0094*** [0.002]
WTO	-0.0656 [0.043]	-0.0672 [0.043]	-0.0538 [0.040]	-0.0563 [0.040]
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes
Observations	396,565	396,565	396,565	396,565
Adjusted R-squared	0.035	0.041	0.103	0.108

Notes: Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Table A2. Ecuador

	Unit value gap
Tariff	0.0199*** [0.004]
Tariff x WTO transition period	-0.0036 [0.004]
Tariff x WTO post-transition period	-0.0196*** [0.004]
Exporter FE	yes
Year FE	yes
Observations	26,630
Adjusted R-squared	0.015
Test Tariff x WTO transition period= Tariff x WTO post-transition period p-value	0.000

Notes: Heteroskedasticity-robust standard errors are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

Appendix B. Controlling for Computerization

Table B1. Introduction of ASYCUDA

	(1)	(2)	(3)	(4)
	Unit value gap			
Tariff	0.0086*** [0.002]	0.0085*** [0.002]	0.0061*** [0.001]	0.0061*** [0.001]
Tariff x WTO	-0.0057** [0.002]	-0.0063** [0.002]	-0.0080*** [0.002]	-0.0084*** [0.002]
Tariff x ASYCUDA	-0.0010 [0.002]	-0.0008 [0.002]	0.0015 [0.002]	0.0019 [0.002]
WTO	-0.0067 [0.038]	-0.0020 [0.037]	0.0034 [0.039]	0.0072 [0.039]
ASYCUDA	0.0030 [0.050]	0.0133 [0.051]	0.0013 [0.056]	0.0117 [0.056]
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.030	0.034	0.109	0.112
	Quantity gap			
Tariff	0.0047* [0.003]	0.0046* [0.003]	0.0019 [0.002]	0.0018 [0.002]
Tariff x WTO	0.0177** [0.008]	0.0186** [0.008]	0.0115** [0.006]	0.0127** [0.005]
Tariff x ASYCUDA	-0.0024 [0.005]	-0.0019 [0.005]	-0.0123** [0.006]	-0.0123** [0.006]
WTO	-0.1261* [0.067]	-0.1517** [0.066]	-0.0887 [0.058]	-0.1164** [0.056]
ASYCUDA	0.0575 [0.089]	0.0432 [0.090]	0.0688 [0.084]	0.0554 [0.084]
Observations	246,009	246,009	246,009	246,009
Adjusted R-squared	0.020	0.023	0.105	0.108
Exporter fixed effect	yes	no	yes	no
Importer fixed effect	yes	no	yes	no
Country-pair fixed effect	no	yes	no	yes
6-digit HS product fixed effect	no	no	yes	yes
Year fixed effect	yes	yes	yes	yes

Notes: Standard errors, clustered by importer-exporter pair, are listed in brackets. ***, **, * denotes significance at the 1%, 5% and 10% level, respectively.

In this appendix, we address the possibility that our findings are capturing computerization of customs services, which may have taken place around the time of the WTO accession. We do so by controlling for countries adopting the ASYCUDA system and examining whether the effect of the tariff rate changed in the post-adoption period.

ASYCUDA is a computerized customs management system which covers most foreign trade procedures. It handles manifests and customs declarations, accounting procedures, transit and suspense procedures. The software was developed by UNCTAD and is often offered to developing countries as part of an aid package, where it may be co-financed by international organizations such as the World Bank or the IMF. ASYCUDA takes into account the international codes and standards developed by ISO (International Organisation for Standardisation), WCO (World Customs Organization) and the United Nations. It can also be configured to suit the national characteristics of individual customs administrations. We collected information on the year of ASYCUDA adoption from the www.asycuda.org webpage, IMF documents, European Commission documents, and books.

Our baseline results are not affected by this augmentation to the model. We find that introduction of ASYCUDA lowers the responsiveness of the quantity gap to the tariff rate, as we would expect, but it does not have a similar effect on the unit value gap.

Appendix C. A Simple Framework

Here we present a simple framework following Yang (2008). A firm intending to import a fixed amount M chooses to misreport a fraction of imports δ in order to evade import duties. A firm may choose evasion through underreporting of prices or underreporting of quantities (smuggling). Both methods require a fixed cost F and a variable cost c . The variable cost varies for the two evasion methods (it equals c_p for the former, and c_q for the latter method). The variable cost is convex in the square of the import value being underreported (δM), as authorities are likely to devote more effort to fighting large-scale underreporting, or perhaps because it is more difficult to hide evidence of large scale underreporting.

The importer's maximization problem is

$$\max \tau(\delta M) - c(\delta M)^2 - F$$

The optimal rate of evasion is thus

$$\delta^* = \tau/2cM$$

The importer will choose the evasion method with a lower cost. Assume that initially, $c_p < c_q$ and hence import duties are evaded through underreporting of prices.

The WTO accession increases the cost of evasion through underreporting of prices from c_p to c_p^{wto} . The importer will switch to evasion through underreporting quantities if $c_p^{\text{wto}} > c_q$ and continue using the original method if $c_p^{\text{wto}} < c_q$.