Trade Misreporting: Evidence from Pakistani Importers[*]

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Abstract

This is the first paper providing direct evidence of attempted tariff evasion in response to the tariff rates in a small open economy. We use transaction level customs data for Pakistani importers to show that there exists a systematic relationship between the difference in declared and assessed import values of the shipment, and the actual duty rates charged to the importer. We demonstrate that higher duty rates lead to higher misdeclaration of import value. In particular, one-percentage point increase in duty rates, on average, results in a 0.4 percent increase in under-invoicing of import value by Pakistani firms. There also exists a significant heterogeneity in within firm misdeclaration behavior in response to changes in duty rates, based on the origin of imports and the processing mechanism employed at the border.

Keywords: Misdeclaration; Tax avoidance; Small open economy

JEL classification: F1; F14; H26; K42

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1. Introduction

Misdeclaration of economic activities is a widespread phenomenon. Officially recorded economic and business activities may be misreported for several reasons but the primary motive for misdeclaration has been linked with tax evasion. Johannesen et al. (2020) highlight that the problem appears to be more acute in developing nations, although a substantial amount of false reporting also takes place in advanced economies. One such instance of misdeclaration occurs at the border where cross-border trade transactions are recorded. Bhagwati (1964) pointed out that the understatement of imports will be profitable for an importer only if the tariff rate exceeds the premium that must be paid to access illegal foreign exchange. Both exporting and importing firms face an incentive to forge data entries in official documents in order to either reduce the payment of customs duties, or to benefit from export subsidies (Yang 2008; Nitsch 2016). As a result, the quantity and/or value of a shipment is either under- or over-invoiced, and consequently, the precision of global trade statistics is compromised.

With the mounting significance of international trade as a model of economic development for developing countries, there has been a growing interest in accuracy of measurement of trade activities (Nitsch 2016).[1] According to Kar and Spanjers (2015), the sum of total trade mis-invoicing in developing countries in 2013 was approximately $1.1 trillion, and the total over 2004-13 for 55 developing countries was estimated to be roughly $7.8 trillion. The magnitude of trade mis-invoicing in Pakistan during 1972–2013 exceeded $92.7 billion, and the revenue loss borne by the national exchequer due to trade mis-invoicing was estimated at $21.2 billion (Qureshi and Mahmood 2016). Figure 1 highlights that Pakistani imports have almost doubled from about $31.6 billion in 2009 to nearly $60 billion in 2019, whereas the exports have hovered between $20-$24 billion during this period. In the fiscal year 2019-20, custom duties directly contributed more than 15% of the tax revenue to the government. In addition to the loss of state revenue, tariff evasion results in unduly favoring well-connected firms, whilst penalizing importers that report honestly.[2]

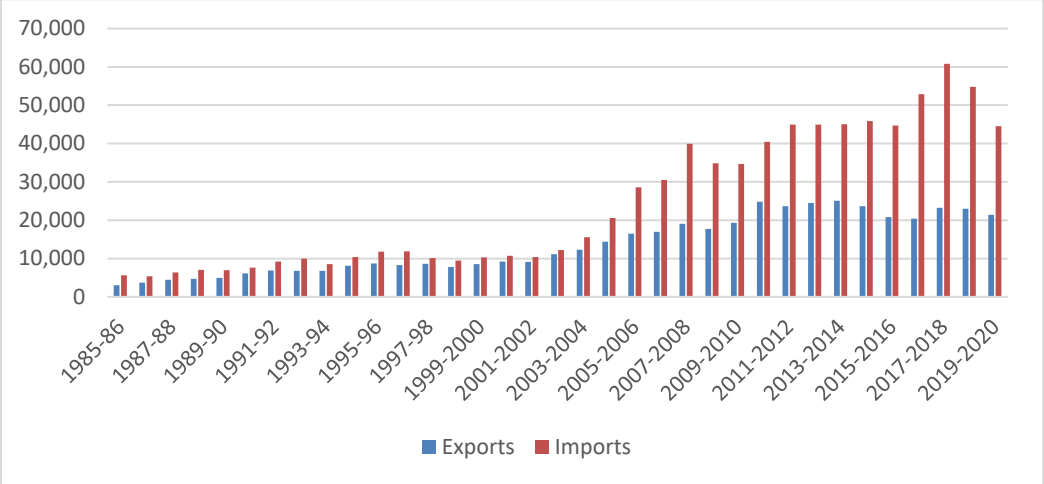
We use a newly constructed administrative customs dataset comprising of all import transactions for Pakistan in 2016 and 2017 to document the level of *attempted* tax evasion. Our study examines the micro-foundations of evasion elasticities by directly observing transaction-level import prices. Highly disaggregated data allows us to precisely estimate the discrepancy between the *assessed* and *declared* unit values of imports and show that estimated deviation from assessed value of imports is systematically linked with the import duty rates charged to the importer. We interpret this result as strong evidence of firms engaging in tax evasion practices. Our key findings hold at various levels of aggregation of the dataset, such as, at product and product-by-country levels. The subsequent transaction level analysis reveals several interesting findings. The positive and

[1] Several studies investigate evasion gaps in developing countries, such as, Kenya, Mauritius, and Nigeria (Bouët and Roy 2012), Tanzania (Epaphra 2015), Pakistan, Jamaica, and Kenya (Pritchett and Sethi 1994), and Tunisia (Baghdadi and Raballand 2017), amongst others.

[2] For example, Baghdadi and Raballand (2017) use Tunisian data to suggest that politically connected firms, i.e., firms owned by President Ben Ali and his family, were more prone to evade import tariffs.

significant relationship between misdeclaration and duty rates is reversed and does not remain significant once we control for the firm fixed effects, suggesting that much of this tax evasion behavior is driven by a subset of Pakistani importers. We also notice that there exists a significant degree of heterogeneity in within firm responses to duty rates depending on the origin of imports as well as the mechanism through which imports are processed at the port of entry. If imports are processed manually, importing firms, on average, still respond to higher duty rates by increased underreporting of import value. However, if the shipment is processed electronically, this relationship is inverted. Similarly, if the product is imported from outside Asia, higher duty rates result in increase in under-reporting of import value, and vice versa when shipment is imported from one of the Asian countries.[3]

Fig. 1 Annual trade statistics for Pakistan (current USD millions)



Source: Pakistan Bureau of Statistics

Our paper makes several important contributions. First, we study the response of tariff evasions at the border in a small open economy and compare the results with bigger economies, such as, China and India.[4] Second, we use transactional trade data to study this relationship, in contrast to the earlier literature which mostly relies on annual statistics.[5] This helps us to refine the estimates obtained in the existing studies substantiating the positive association between tariff rates and the incentive to evade taxes. Our dataset does not suffer from missing trade statistics or misreporting of quantities or product classification. We advance the findings obtained by Fisman and Wei (2004) and Mishra et al. (2008) by relying on detailed transaction-level panel data. Our results

[3] It should be noted that in our analysis, we focus on the transactions for which the declared import value is less than or equal to the corresponding assessed value.

[4] For studies based on Chinese and Indian data, see Fisman and Wei (2004), Mishra et al. (2008), Ferrantino et al. (2012), and Rotunno and Vezina (2012).

[5] Theoretical studies hypothesizing the relationship between tax rates and tax evasion include Sequeira (2016), Allingham and Sandmo (1972), and Slemrod and Yitzhaki (2002).

suggest that, on average, a one-percentage point increase in the effective duty rate leads to 0.4% greater under-declaration of the import value at transaction level.

Thirdly, our study also makes a methodological contribution to the empirical trade literature attempting to evaluate trade misreporting. We develop a simple methodology to study the degree of mis-invoicing practices amongst importing firms. The most widely applied approach uses the trade gap, i.e., the discrepancy between trade statistics reported by the exporting and importing countries, as an indirect measure of tariff evasion (Javorcik and Narcisko (2008); Jean and Mitaritonna (2010); Zitzewitz (2012); Stoyanov (2012)). This paper, on the other hand, exercises a direct approach to quantify misdeclaration related to the movement of goods across borders. We analyze the *declared* unit value reported by the importer, and the *assessed* unit value reported by the customs officer about the shipment at the same point in time at the port of entry into Pakistan. Furthermore, we account for the potential endogeneity of firm-level duty rates by using alternative measures of tariffs. Our results are not sensitive to various measures of duty rates, including, trade-weighted average tariffs and effective tariff rates, i.e., the sum of simple duty rates, regulatory duty rates, sales tax, and income tax. Our baseline estimates use the actual effective duties paid by the importer, and not just the standard duty rates reported for the respective product category. This is crucial because many importers receive tariff exemptions for different reasons which is expected to affect firm's behavior.[6]

Lastly, owing to the nature of our dataset, we can exploit additional sources of variation to isolate the effect of tariffs on evasion compared to those highlighted in the literature. This approach offers several additional advantages if misdeclaration is systematically correlated with other aspects of the firm that may potentially affect evasion, such as, the frequency of importing, political connections, or past (mis)declaration behavior of the firm. By controlling for firm fixed effects, our identification scheme allows us to capture the unobserved heterogeneity across importers, and control for such firm-specific characteristics. Once we control for the firm fixed effects, the relationship between tariff rates and misdeclaration is reversed, i.e., higher tariff rates lead to lower misdeclaration. Interestingly, this reduction in misdeclaration with higher effective duty rates is more pronounced once we isolate the transactions that are processed electronically.[7] We show that the relationship between tariff rates and misdeclaration continues to remain negative and significant if we focus on the transactions processed manually, even after controlling for the firm fixed effects. This reversal of relationship after controlling for the firm fixed effects suggests that a subset of importers is driving the aggregate results.

Our paper utilizes the customs database for understanding trade patterns of firms in Pakistan, and to address the crucial topic of misreporting trade statistics using the universe of import transactions. To our knowledge, this is the first study to control for variation across firms along

[6] More than 90% of the transactions have applied for some type of Statutory Regulatory Order.
[7] The relationship is still positive i.e., higher duty rates lead to increase in under-reporting, for the transactions processed electronically without firm fixed effects.

with exploiting variation across products and time using transactional data. It is of great policy relevance because such data is generally unavailable for low-income countries and is specifically of great interest to Pakistan to formulate future policies for firms to incentivize accurate reporting of international trade transactions.

The remainder of the paper is organized as follows. Section 2 describes our dataset and presents descriptive evidence on misdeclaration behavior of Pakistani importing firms. Section 3 discusses the identification methodology used, and our baseline results based on the aggregated data. The estimation results for transaction-level import data are presented and discussed in Section 4. Section 5 highlights the policy implications of our findings, and potential areas for future research. The final section concludes.

2. The FBRP Data

2.1 Description of data

The Federal Board of Revenue Pakistan (FBRP) collects data for all export and import activities in Pakistan. In this paper, we use the data for imports collected by FBRP from January 1st, 2016 to December 31st, 2017. The dataset contains comprehensive information about the date of the transaction, product imported, country of origin, unit value of imports, and the total value and quantity imported. For each transaction, we observe an identification code for the importer. A novel feature of our dataset is that it lists two different measures of unit values of the imported product. Firstly, the data provides the unit value declared by the importing firm for each transaction, and the corresponding currency in which it is measured. Secondly, next to the unit value declared, we observe the unit value assessed by the customs officer, and the currency of measurement. All unit values are converted into Pakistani rupees. Since we directly observe the unit value, total value, and total quantity of imports, we are able to confirm that there are no major inconsistencies in quantifying one or more of these variables. Since the focus of this paper is on under-invoicing of imports in Pakistan, we exclude the observations for which the declared value of the shipment is bigger than the assessed value.[8] This leaves us with more than five million transactions over the two-year period.

Table 1 reports that there are over 27000 Pakistani firms importing from over 200 countries. Our dataset covers more than 6000 varieties of 8-digit standard industrial classification system (SITC) products imported into Pakistan during this period. The mean declared value is less than the mean assessed value for each year.[9] There is a significant variation in the misdeclaration of imports as well as the duty rates for these transactions. For nearly 20% of transactions, the declared value of

[8] About 2.9% of the observations in the raw data have a declared value that is bigger than the assessed value. For detailed information about data cleaning, please refer to the Appendix.

[9] Although we have cut-off the measure of misdeclaration to be less than or equal to zero, the average for the raw data is also less than zero for each year, i.e., the average of the log of declared value is less than the average of the log of assessed value.

imported variety is less than the value assessed by the customs officer, and the extent of under-invoicing varies substantially. In 2011, the FBRP started rolling out an electronic system, WeBOC (Web Based One Customs), to process the cross-border transactions at the point of entry into the country. During 2016 and 2017, on average, a fifth of the import transactions were still processed manually, i.e., non-WeBOC, across all ports of entry.

Table 1: Summary statistics across Pakistani importers

	2016		2017	
	Mean	Std. dev	Mean	Std. dev
Log (Declared value)	10.86	3.02	10.96	2.86
Log (Assessed value)	11.15	2.79	11.19	2.78
Customs duty rate per transaction (%)	12.84	10.19	13.01	10.26
Misdeclaration (m_{ipct})	-0.29	0.87	-0.22	0.71
# Importing firms	27515	-	28364	-
# SITC-8 products	6052	-	6199	-
# Import origins	249	-	242	-
Transactions processed through WeBOC (%)	80.03	-	82.96	-
No misdeclaration (%)	73.14	-	79.36	-

Notes: Pakistan's importing firms active over 2016-2017. Based on authors' calculations using transaction-level import data obtained from the Federal Board of Revenue Pakistan (FBRP).

2.2 Misreporting by Pakistani importers

To fully understand the process of recording an import activity, let us consider a typical import transaction. Usually when the shipment arrives at the Pakistani border, the importing firm must declare the unit price of the product for calculation of duties to be paid to the customs office. The quantity (or volume) of shipment is easily verifiable at the port and the importer will report its true value. In most cases, there is no disagreement between the importer and the customs officer about the quantity of the imported shipment. However, there can be a disagreement about the unit value of the product which can affect the total value of the shipment. If the customs officer does not agree with the value declared by the importer, further documentary evidence that can help in gauging the value of the shipment may be requested. The customs officer can also use the data available from FBRP to assess the value of the imported product by checking the assessed value of the same (or similar) product imported recently from the given country of origin. The customs officer at the port of entry has the authority to determine the unit value for the shipment, and the value assessed is then used for the calculation of customs duties and applicable taxes. If the importer is not satisfied with the value assessed, she can appeal to the customs directorate. If the directorate decides in favor of the importer, a refund for the extra duties paid may be requested at the time of clearance of the shipment.

Fig. 2 Distribution of assessed unit price

Figure 2a: Rubber ring (40169320) imported from UK in Dec 2017

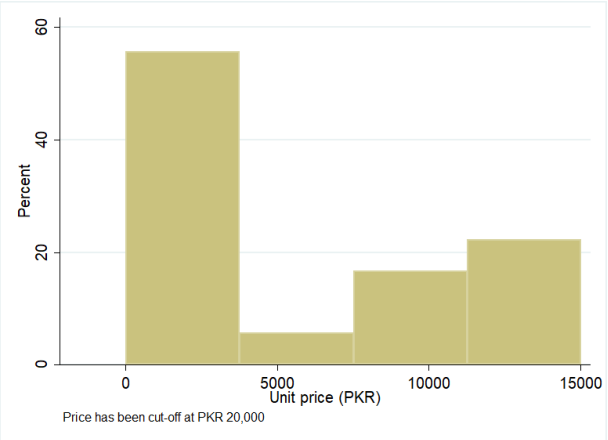


Figure 2b: Submersible Pumps (84137010) imported from China in April 2017

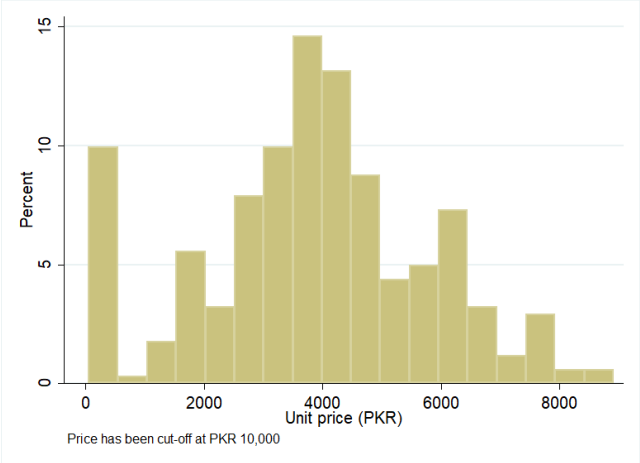


Figure 2c: Static converters (85044090) imported from Thailand In Nov 2017

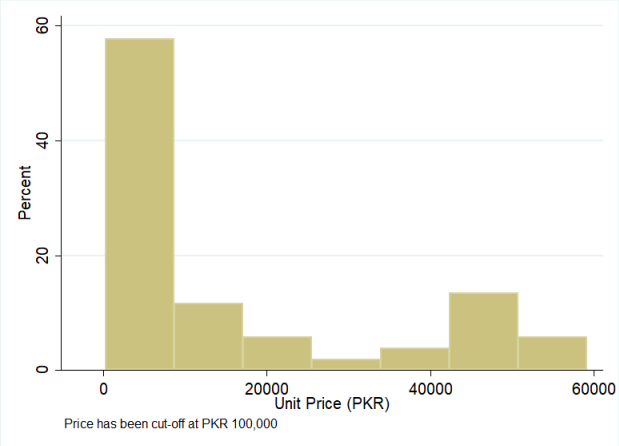
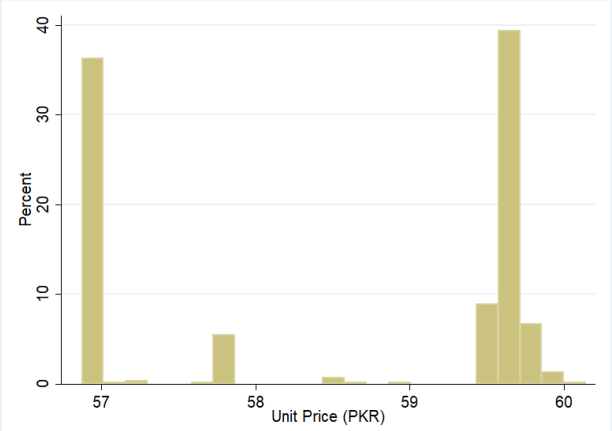


Figure 2d: Iron steel remeltable scrap (72044940) imported from the U.S in Dec 2017



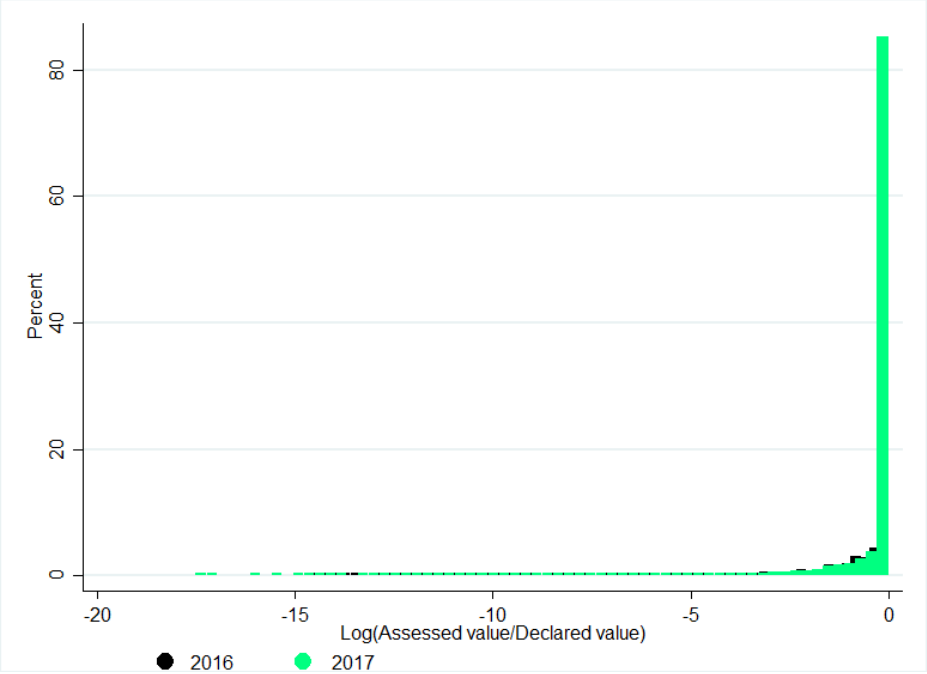
Notes: Based on authors' calculations using transaction-level import data obtained from the Federal Board of Revenue Pakistan (FBRP). This figure plots the distribution of the assessed unit price for product *X* imported from country *Y* in month *Z*. The period of analysis is 2016-2017.

We observe significant variation in assessed unit values for a majority of imported products sourced from the same country of origin within specific duration. Figure 2 reports the distribution of assessed unit values for four different narrowly defined product categories imported from a specific country within the same month. Each graph indicates the product code, product description, country of origin, and the time period considered. Even though the duties charged, and tax revenue collected is based on the assessed price of imports, there is a substantial variation in price quoted by the FBRP to the customs officer. Consequently, the importer faces a strong incentive to under-invoice imports and save the tax paid. Once the assessed value of the import transaction is finalized, all types of duties and taxes, including customs duty, additional regulatory customs duty, sales tax, and income tax, are based on the import value assessed.

As described in the subsequent section, our principal strategy is to first compute the divergence, if any, between the value of imported shipment declared by the firm, and its value assessed by customs officials. In other words, for each import transaction, our measure of misdeclaration is given by:

$$m_{ipct} = \log\left(\frac{\text{Declared imports}_{ipct}}{\text{Assessed imports}_{ipct}}\right) \quad (1)$$

Fig. 3 Distribution of attempted misdeclaration



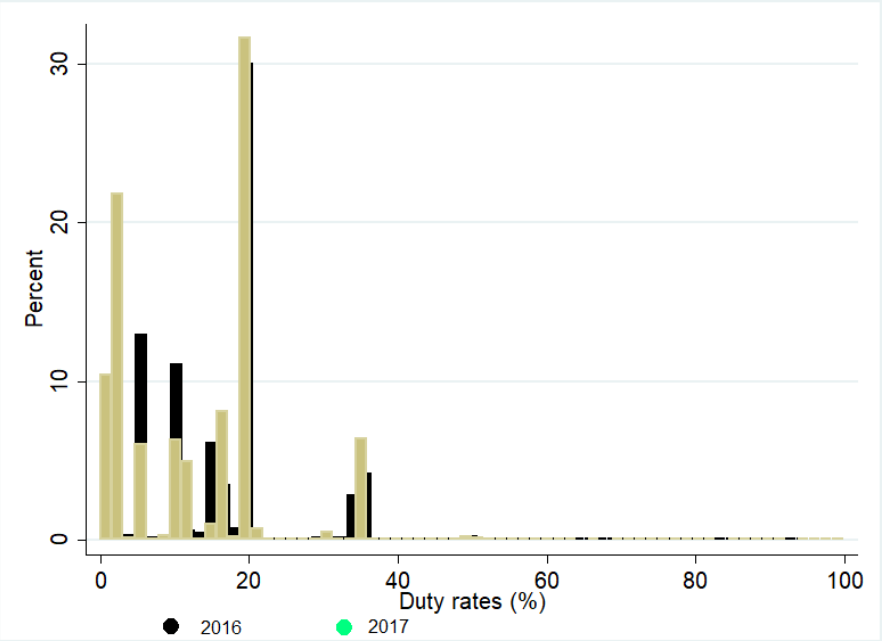
Notes: Based on authors' calculations using transaction-level import data obtained from the Federal Board of Revenue Pakistan (FBRP). This figure plots the distribution of attempted misdeclaration according to Eq. (1). The period of analysis is 2016-2017.

where m_{ipct} represents the wedge between the declared and assessed import value for firm *i* for product *p* imported from country *c* on the date of the transaction *t*. Ideally, one would expect the ratio, $\frac{\text{Declared imports}_{ipct}}{\text{Assessed imports}_{ipct}}$, to be equal to one, i.e., the importing firm declares the actual imported value, and no misdeclaration takes place. The corresponding value of our measure of misdeclaration would then be equal to zero. However, there exists a strong incentive for importers to under-invoice their import bills. If mis-invoicing does indeed take place, $\frac{\text{Declared imports}_{ipct}}{\text{Assessed imports}_{ipct}}$ would be equal to less than one, causing the value of m_{ipct} to be negative. As indicated in Table 1, the average value of m_{ipct} is -0.29 for the year 2016, and -0.22 for 2017.

It should be noted that given the nature of our dataset, we can only comment on the *attempted* tax evasion by the importer by declaring a lower unit price for the product; eventually, the duties

charged, and taxes paid are based on the *assessed* price, and not the *declared* price of the import transaction[10]. Figure 3 plots the distribution of our measure of misdeclaration for each of the two years. We notice that for nearly 80% of the transactions, the declared value is equal to the value assessed by the customs officer.

Fig. 4 Distribution of duty rates



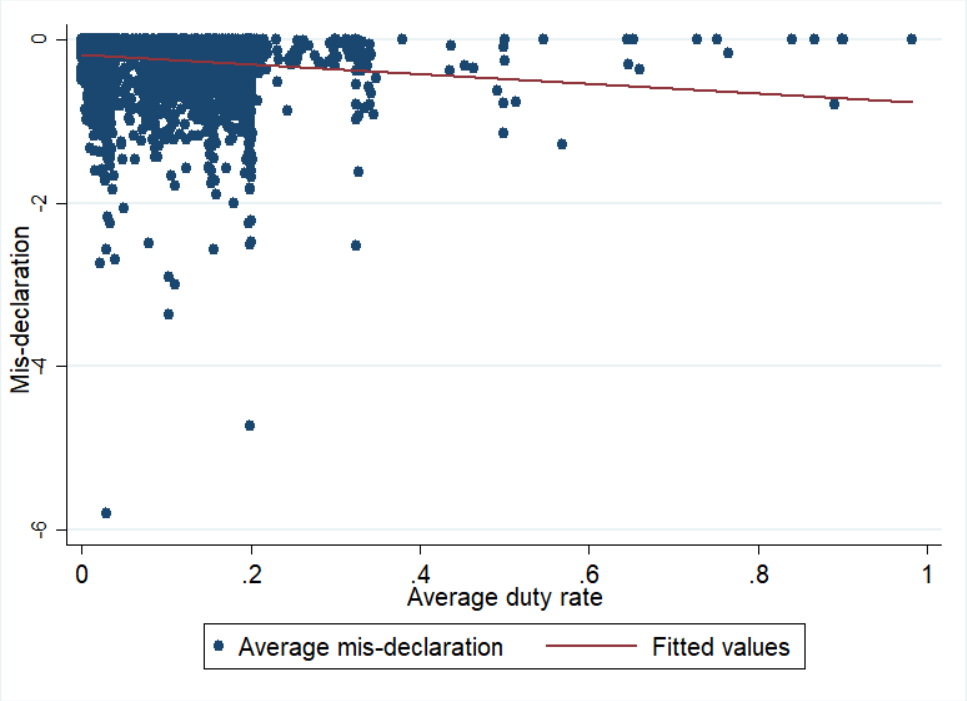
Notes: Based on authors' calculations using transaction-level import data obtained from the Federal Board of Revenue Pakistan (FBRP). This figure plots the distribution of duty rates. The period of analysis is 2016-2017.

To demonstrate the variation in duty rates charged across import transactions, we plot the distribution of duty rates for each year in Figure 4. For most of the transactions, the duty rate charged is below 20 percent. Table 1 indicates that the average duty rate is approximately 13% for both years. It should be noted that these are the actual duty rates, i.e., the duties paid by the importer after considering the applicable Statutory Regulatory Orders (SROs). In addition, the duty rates depicted do not include the sales tax (roughly 17% on average) or the income tax (5% on average) paid on imports.[11] The importer is usually aware about any applicable SROs before customs clearance, and thus, it is more appropriate to use the actual duty paid rather than the standard duty rate for each product. Many importers under special circumstances will get SROs which results in lowering (or even exempting) the duty rates for the shipment. As noted above, sales tax as well as income tax are also based on the assessed value of the shipment and the import duties paid on it. This creates a strong incentive for importer to try to lower the import value as much as possible, particularly when custom duties are higher.

[10] We cannot comment on other corrupt practices (such as, Chalendard et al. (2020) do using Madagascar data) given the data limitation.

[11] For our analysis, we also later use the effective duty rates, i.e., the rates incorporating the corresponding sales tax and income tax paid for each transaction.

Fig. 5 Misdeclaration and duty rates (SITC-6 product level)



Notes: Based on authors' calculations using transaction-level import data obtained from the Federal Board of Revenue Pakistan (FBRP). This figure plots the relationship between misdeclaration defined in Eq. (1), and duty rates. The period of analysis is 2016-2017.

In the following two sections, we provide empirical evidence substantiating the findings of the studies highlighted above by examining the relationship between mis-invoicing of a foreign trade transaction and the import duties charged. Figure 5 plots the average duty rates against the average misdeclaration for 8-digit SITC product codes available in the Pakistani import dataset, indicating the relationship between under-invoicing of imports and the corresponding duty rates. The linear fitted line suggests that, for a given import transaction, product categories having higher average duty rates tend to have bigger differences in the assessed versus declared value of imported commodity. Motivated by the descriptive evidence presented in this section, we now turn to our empirical estimation. We first present quantitative evidence at the aggregated level, namely product and product-by-country levels of aggregation, followed by transaction-level estimation to offer greater granularity to our baseline findings.

3. Misdeclaration in aggregated data

Our primary interest is to emphasize on the variation in *declared* versus *assessed* import values across Pakistani importers, and the extent to which these differences relate to duty rates charged to the importing firms. We test currently established empirical regularities based on aggregate product-level trade data and relate the systematic variation in the unit value of imports misreported across firms. This is achievable with the use of transaction-level customs database compiled by

the FBRP. Our dataset records all of Pakistan's imports from January 1st, 2016, to December 31st, 2017, and corresponding to each transaction, we observe the import value declared by the firm along with the value assessed by the customs officers.

3.1 Product level analysis

In order to assess the relationship between misdeclaration and the duty rates, we start by estimating the following specification aggregated at the product-by-month level:

$$m_{pt} = \beta_0 + \beta_1(\text{duty rate}_{pt}) + \gamma_p + \gamma_t + \epsilon_{pt}, \quad (2)$$

where m_{pt} is the average value of misdeclaration for 8-digit product *p* during a month *t*, as defined in Eq. (1). Note that the dependent variable would assume a negative value if there was under-invoicing. The independent variables include the mean duty rates charged to the importer for the transaction, averaged by product and month, duty rate_{pt}. The product and time fixed effects are denoted by γ_p and φ_t, respectively.[12]

Table 2: Product-level estimation results

	(1)	(2)	(3)	(4)
Average duty rate	-0.375***			
	(0.089)			
Weighted average duty rate		-0.501***		
		(0.079)		
Average effective duty rate			-0.285***	
			(0.036)	
Weighted average effective duty rate				-0.349***
				(0.032)
Observations	110,273	110,273	110,273	110,273
R-squared	0.330	0.291	0.330	0.292
Adjusted R-squared	0.290	0.249	0.291	0.250
No. of products	6145	6145	6145	6145
Product effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes

Notes: The outcome variable in columns (1) and (3) is the average misdeclaration by the firm, while the dependent variable in columns (2) and (4) is the weighted average of misdeclaration. The estimates are obtained at the product level. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

[12] It is important to note that the duty rates for each product can vary at the transaction-level depending on the SROs being applied for each transaction.

Table 2 provides the estimated coefficients for Eq. (2) at the product level. Columns (1)-(2) are based on customs duty rates, whereas in columns (3)-(4), we use an alternative measure of duties paid which adds up all taxes paid by the importing firm for the transaction, or an effective duty rate which also includes sales tax and income tax paid by the firm. Since the value of shipment varies significantly within a given 8-digit product-by-time subgroup, in columns (2) and (4) we use weighted averages for the duty rates, weighted by the share of each transaction in the total value of imports within a given product category.[13] Similarly, to adjust for the value of the shipment, the dependent variable is also measured as the weighted average of misdeclaration over product by time groups. All estimates reported in Table 2 control for the time and product fixed effects.

Column (1) of Table 2 estimates the baseline specification, capturing the statistically significant negative association between the average duty rates and misdeclaration by importing firms in Pakistan. It suggests that a one percentage point increase in average tariff rate leads to 0.375 percent higher misdeclaration, after controlling for product and time fixed effects. Column (2) reports the association between our second measure of misdeclaration, i.e., a weighted average of misdeclaration and duty rates. We find that the estimated coefficient associated with weighted average duty rate is also statistically significant, and higher compared to that for the simple average duty rate indicated in column (1), implying that higher duty rates result in a greater incentive for the importer to under-declare the unit price of their imports. The results in column (2) can be compared with the earlier literature where annual trade statistics are used at the product level to estimate tax evasion by importers. Our estimate lies in between the evasion elasticities estimated by Mishra et al. (2008) using Indian data, roughly equal to 0.1, and that found by Wei and Fisman (2004) based on Chinese data, i.e., approximately equal to 3.

Columns (3) and (4) use the effective duty rates and weighted averages of effective duty rates, respectively, as explanatory variables, and their associations with two measures of misdeclaration. Although the relationship is once again negative and significant, the estimate values are lowered compared to those reported in the first two columns. The evasion elasticity reduces by about a quarter if we incorporate all the applicable taxes to be paid by the importer. We expect a rational importer to incorporate all applicable duties while responding to change in the tariff rates. These findings suggest a robust negative relationship between duty rates and level of misdeclaration by importers for the aggregated data at the product level, and the consistency of our estimates with the earlier literature.

3.2 Product-by-country level analysis

Before we conduct the transaction-level analysis, we also disaggregate our data at the product-by-country level to check the consistency of our estimates at a different level of aggregation. Eq. (2)

[13] We use the assessed values of imports to calculate the weighted average.

is re-estimated, computing average misdeclaration and duty rates over product-country-time subgroups:

$$m_{pct} = \beta_0 + \beta_1(\text{duty rate}_{pct}) + \gamma_p + \gamma_t + \gamma_c + \epsilon_{ipct}. \quad (3)$$

The above specification allows us to also control for country-of-origin fixed effects, γ_c, along with product and time fixed effects. Table 3 reports the regression results, averaging the duty rates as well as the misdeclaration measure at the source country-product-time level of aggregation. Like our illustration in Table 2, we present the results for both measures of misdeclaration. The dependent variable in columns (1) and (3) is the simple average of misdeclaration by time, product, and country of origin, while in columns (2) and (4), once again we define both variables as weighted averages, this time by month, product, and country of origin, where the weights are computed by total assessed import values.

Table 3: Product-by-country level estimation results

	(1)	(2)	(3)	(4)
Average duty rate	-0.846***			
	(0.047)			
Weighted average duty rate		-0.838***		
		(0.046)		
Average effective duty rate			-0.434***	
			(0.018)	
Weighted average effective duty rate				-0.442***
				(0.018)
Observations	552,190	552,190	552,190	552,190
R-squared	0.153	0.143	0.153	0.144
Adjusted R-squared	0.143	0.133	0.143	0.134
No. of products	6160	6160	6160	6160
Product effects	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes

Notes: The outcome variable in columns (1) and (3) is the average misdeclaration by the firm, while the dependent variable in columns (2) and (4) is the weighted average of misdeclaration. The estimates are obtained at the product-country-month level. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Column (1) reports that after controlling for origin country, product, and time fixed effects, a one-percentage point increase in the average duty rate levied by the Pakistani customs is associated with a 0.846 percent rise in under-reporting by importers. Column (2) reports the association between the alternative measure of misdeclaration, i.e., weighted averages of misdeclaration and duty rates. The estimate for the weighted average duty rate is statistically significant and similar in direction to that for the simple average duty rate of column (1). Column (3) and (4) replace customs duty with the effective duty rates and the coefficient is reduced by half for the evasion

elasticity. Table 3 reports higher coefficient for each column as compared to Table 2. The fact that the inclusion of country-of-origin fixed effects increases the magnitude of estimated elasticity suggests that there is a systematic correlation between duty rates and country characteristics relevant to misdeclaration, confirming the possibility of unobserved heterogeneity at the country level affecting the elasticity of misdeclaration with respect to duty rates. Additionally, we also notice that this desegregation from product-month to product-country-month improves the robustness of the results for the coefficient of duty rates when we compare simple average with the weighted average of duty rates in Table 3.

4. Transaction-level estimation

Our results based on aggregated data, at product-month as well as product-country-month level, confirm the findings of the existing literature on the mis-reporting behavior by importing firms. Despite the interest in detecting and correcting for misreporting of international trade transactions, due to the unavailability of transaction-level trade data for most countries, the existing literature has made modest progress in identifying the extent, magnitude, and consequences of misreporting trade transactions. To exploit the richness of our dataset, we now turn to a more detailed analysis at the transaction-level and compare these results with the evasion elasticity calculated at aggregate level. Our study is the first to unlock the customs trade database for understanding mis-invoicing behavior of importing firms, focusing on the magnitude and persistence of misdeclaration over time and across trade partners.[14] We estimate the following specification:

$$m_{ipct} = \beta_0 + \beta_1(\text{duty rate}_{ipct}) + \gamma_p + \gamma_t + \gamma_c + \gamma_i + \gamma_e + \epsilon_{ipct}, \quad (4)$$

where m_{ipct} is the value of misdeclaration defined in Eq. (1). The independent variables now include the actual transaction-level duty rate charged to the importer. Eq. (4) also includes the product, month, country of origin, and firm fixed effects. Lastly, the port of entry fixed effects, γ_e, allow us to control for the mode of transportation as well as differentiate between whether the transaction was processed manually (non-WeBOC) or electronically (WeBOC) at the port of entry.[15]

4.1 Baseline results

Table 4 reports the results for the estimation of Eq. (4) where each observation is now at the transaction level. Column (1) regresses our measure of attempted misdeclaration on customs duty rate for each transaction, controlling for product and monthly fixed effects. Interestingly, the relationship observed above between misdeclaration and duty rates averaged at the product-by-time subgroups, also holds at transaction level. Although, the coefficient is relatively smaller in

[14] This statement is true to the best of our knowledge.
[15] Effectively, there are twice as many port fixed effects as the number of ports of entry into Pakistan depending on whether the transaction was processed manually or electronically.

magnitude, it is still negative and highly significant. The magnitude of the coefficient increases upon the inclusion of country of origin and port fixed effects. Column (3) highlights that a one percentage point increase in tariff rate leads to nearly 0.41 percent increase in misdeclaration of the value of imported shipment. The results of these three columns confirm the robustness of the relationship between tariff rates and misdeclaration at the transaction level.

Table 4: Transaction-level estimation results

	(1)	(2)	(3)	(4)
Duty rate	-0.246**	-0.348***	-0.413***	0.190***
	(0.101)	(0.088)	(0.096)	(0.062)
Observations	5,078,011	5,077,995	5,077,994	5,074,669
R-squared	0.125	0.144	0.212	0.440
Adjusted R-squared	0.124	0.143	0.211	0.436
No. of products	6186	6186	6186	6181
Product effects	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes
Country effects	No	Yes	Yes	Yes
Shipping port effects	No	No	Yes	Yes
Firm effects	No	No	No	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Column (4) reports estimates for specifications similar to those estimated in the first three columns but also control for the firm fixed effects. We find that the relationship is reversed when we introduce firm fixed effects in our estimation. Column (4) highlights that there is an inverse relationship between duty rates and misdeclaration if we control for firm fixed effects i.e., one percentage point increase in duty rates, on average, results in 0.21 percent reduction in the extent of misdeclaration within a given firm. It confirms that this inverse relationship between misdeclaration and tariff rates is robust to the inclusion of country of origin as well as port fixed effects.[16] This is somewhat surprising as it suggests that within a given firm-product-country of origin and month subgroup, an increase in tariff rate lowers attempted misdeclaration. This finding contrasts with our earlier results as well as those reported by the existing literature based on aggregated trade data. However, none of the existing empirical studies analyzing the association between tariff rates and misreporting of international trade transactions capture the within-firm variation in the estimates. This study, to our knowledge, is the first one to control for the firm fixed

[16] As shown later in the paper, the relationship between misdeclaration and duty rates within the firm has significant heterogeneity.

effects in the context of misdeclaration. The reversal of sign of evasion elasticity suggests that the tax evasion behavior observed in the aggregated results might be driven by the behavior of a subset of importing firms engaged in international trade.

Table 5: Transaction-level estimation results: Alternative measure of duty rates

	(1)	(2)	(3)
Effective duty rate	-0.360***	-0.404***	0.037
	(0.042)	(0.047)	(0.038)
Observations	5,077,995	5,077,994	5,074,669
R-squared	0.145	0.214	0.440
Adjusted R-squared	0.144	0.212	0.436
No. of products	6186	6186	6181
Product effects	Yes	Yes	Yes
Month effects	Yes	Yes	Yes
Country effects	Yes	Yes	Yes
Shipping port effects	No	Yes	Yes
Firm effects	No	No	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 5 uses an alternate measure for duty rates, i.e., the effective duty rates as defined above, calculated at the product-country-month level. We find similar results to those highlighted in Table 4, although in this case, the coefficient for duty rates is insignificant but positive when we control for the firm fixed effects. The coefficients for the columns in Tables 4 and 5, including the shipping port fixed effect but not the firm fixed effects, are relatively robust irrespective of the measure of duty rates used in the analysis. It reports the evasion elasticity to be about 0.4, i.e., a one-percentage point increase in the duty rate leads to 0.4 percent increase in under-reporting of value of imports. The positive but insignificant coefficient for the effective duty rates further strengthens the idea that the increase in duty rates causes an increase in misdeclaration in aggregated results might be caused by a subset of firms amongst the Pakistani importers.

In order to analyze the evidently positive association between duty rates and our measure of import misdeclaration by firms in the presence of firm fixed effects, we turn our attention to identifying the possible causes of this relationship. In the next section, we will focus on the different subsets of the transaction level data incorporating the firm fixed effects and analyze the source of this counter-intuitive relationship between the effective duty rates and the misreporting of trade activities[17].

[17] Please see the appendix for the elasticity coefficients based on customs duty with firm fixed effects.

4.2 Heterogeneity in misdeclaration by firms

4.2.1 Use of technology

We make use of the available information contained in the FBRP customs data and the import documentation accessible by importing firms in Pakistan. FBRP introduced an electronic system of recording import transactions in 2011, referred to as the Web-Based One Customs (WeBOC), for clearance of imported goods arriving at various ports of entry. The major changes in the WeBOC clearance system involved proper checking of imported goods and classifying an imported shipment to be considered through either a "Green", "Yellow" or "Red" channel. The newly automated system could only operate effectively upon incorporation of the Valuation Module in the system. After this policy change, a new valuation module was developed to apply the valuation rulings in WeBOC for the detection of potential misdeclaration of imported consignments. We note that the implementation of proposed policy change varies across the dataset. In 2016 and 2017, about eighty percent of transactions were processed through WeBOC, and around a fifth of the transactions were processed manually. Using the implementation information available in our data in the form of each import consignment transaction classified as either WeBOC or non-WeBOC, we estimate Eq. (4) for the sub-samples of WeBOC and non-WeBOC transactions. The results are shown in Table 6.

Table 6: Transaction-level estimation results (effective duty rate): WeBOC vs non-WeBOC

	(1) All transactions	(2) WeBOC	(3) Non-WeBOC
Effective duty rate	0.037	0.101***	-0.161**
	(0.038)	(0.031)	(0.073)
Observations	5,074,669	4,138,963	933,084
R-squared	0.440	0.461	0.560
Adjusted R-squared	0.436	0.46	0.554
Number of Products	6181	6015	3948
Product effects	Yes	Yes	Yes
Month effects	Yes	Yes	Yes
Country effects	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) presents estimates for all transactions processed through customs in 2016 and 2017. Columns (2) and (3) are for transactions processed through WeBOC and manually, respectively. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Column (1) reports transaction level estimates for the complete data as reported earlier in Table 4. Column (2) states the estimates of coefficients of effective duty rate for the transactions processed through WeBOC, whereas column (3) reports the estimation results for transactions processed manually through customs. The results in Table 6 suggest that the processing mechanism affects the behavior of Pakistani importers. We notice that estimates for the transactions processed electronically through WeBOC reveal results similar to those for all transactions and significant, i.e., firms reduce their misdeclaration of imports in response to an increase in effective duty rates. On the other hand, if an import transaction is processed manually, the intuitive relationship between misdeclaration and effective duty rate holds. Column (3) shows that a one-percentage point increase in effective duty rate is associated with a 0.16 percent increase in misdeclaration of value of the shipment. Thus, Table 6 suggests that the within firm misdeclaration behavior largely depends on the import transaction processing mechanism. On average, if the transaction is processed manually, even within firm, a higher duty rate is associated with an increase in misdeclaration of imports, and vice versa for the transactions processed electronically.

4.2.2 Regional disparities

The next two tables explore the regional variation in evasion elasticities for Pakistani importers. Table 7 highlights that the import transactions from East Asia and ASEAN economies contribute toward the inverse relationship between under-reporting of import value and effective duty rates. All regions in Asia, except South Asia, are associated with having a positive relationship between our measure of misdeclaration of imports and the effective duty rates. It should also be noted that nearly two-thirds of all import transactions originated from Asian economies. The transactions from regions outside of Asia exhibit the negative (and somewhat significant in case of North America and European Union) association between misdeclaration and effective duty rates found earlier, i.e., higher duty rates incentivize the importer to further under-report the shipment value.

Lastly, Table 8 focuses on the top five import origins of Pakistan during the two years. China, being the biggest importing source for Pakistani importers, accounts for nearly a third of the transactions in 2016 and 2017. The coefficient for evasion elasticity is highly significant and is more than eight times in magnitude compared to the results for all transactions in the data. Imports from Thailand and the United States, among top five importers, exhibit that importers tend to increase misdeclaration of the import value in response to an increase in the effective duty rates. To summarize, Tables 7 and 8 highlight that the unexpected positive relationship between misdeclaration and the duty rates observed in transaction level data is primarily driven by imports sourced from East Asian region in general, and from China in particular. Tables A1-A3 in the appendix report similar regression estimates as those shown in Tables 6-8, replacing the effective duty rates with customs duty rates, and indicate the same qualitative results as found here.

Table 7: Transaction-level estimation results using effective duty rates: Regional analysis

	(1) All transactions	(2) North America	(3) European Union	(4) ASEAN	(5) Arabian Gulf	(6) South Asia	(7) East Asia	(8) Rest of the World
Effective duty rate	0.037	-0.067*	-0.198*	0.077**	0.149	-0.028	0.225***	-0.009
	(0.038)	(0.039)	(0.101)	(0.035)	(0.137)	(0.023)	(0.040)	(0.0355)
Observations	5,074,669	326,911	929,449	522,562	664,068	263,950	2,001,120	351,054
R-squared	0.440	0.508	0.673	0.526	0.387	0.571	0.469	0.436
Adjusted R-squared	0.436	0.493	0.67	0.517	0.38	0.559	0.462	0.416
Number of Products	6181	3159	4623	3295	3258	2203	5194	3536
Product effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) presents estimates for the complete data. Arabian Gulf includes UAE, Qatar, Kuwait, Saudi Arabia, and Oman. East Asia includes China, Japan, Korea and Hong Kong. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table 8: Transaction-level estimation results using effective duty rates: Top 5 import origins (by transaction)

	(1) All transactions	(2) China	(3) UAE	(4) United States	(5) Thailand	(6) Japan
Effective duty rate	0.037	0.274***	0.183	-0.069*	-0.029*	0.112***
	(0.038)	(0.048)	(0.142)	(0.038)	(0.019)	(0.040)
Observations	5,074,669	1,569,578	613,919	295,181	270,461	244,105
R-squared	0.440	0.453	0.386	0.512	0.585	0.466
Adjusted R-squared	0.436	0.444	0.38	0.5	0.578	0.454
Number of Products	6181	4973	3176	3048	2189	2066
Product effects	Yes	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) presents estimates for the complete data. East Asia included China, Japan, Korea and Hong Kong. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

5. Discussion and policy implications

An empirical examination of the effect of duty rates on misdeclaration has proved to be challenging due to the difficulties in quantifying evasion which is often not directly observed. A number of recent studies have used discrepancies between trade flows reported by trade partners to demonstrate how tariff evasion varies with duty rates (Fisman and Wei 2004), product attributes (Javorcik and Narcisko 2008), the level of enforcement (Mishra et al. 2008), or importing country characteristics (Jean and Mitaritonna 2010). Kellenberg and Levinson (2018) set up a model in which firms or countries choose how much imports or exports to misreport as functions of country characteristics such as tariffs, corruption, and the strength of auditing and accounting standards using annual trade data for 126 countries from 2002 to 2012. A country-level analysis, nonetheless, is expected to suffer from aggregation bias since tariffs are measured by an average rate applied to all products for a given country.

In this study, we try to address the issue of aggregation bias by analyzing transactional trade data and provide evidence for misdeclaration of economic activities in a small open economy. Tariff evasion can take place in the form of one or more of the following three ways: mis-declaring the unit value of imported products, undercounting quantities of imports, and misclassification of high tariff commodities as a lower tariff product. The processes at the border, even in developing economies, have been significantly modernized and it is relatively difficult to misreport the quantity of the import or mis-classify the product by the importer. However, the unit price of the product varies significantly even within a short span of time, depending on the supply and demand of the product in the global economy as well as fluctuations in the currency market, as evident from Figure 1. We use the universe of import transactions for two years to investigate this relationship between the duty rates and under-reporting of unit value of imports. Our estimate for attempted tax evasion elasticity for Pakistan lies in between the one found for India by Mishra et al. (2008), and the one for China found by Wei and Fisman (2004) when we analyze the aggregate data at the product-country-month level, or the transaction level data without accounting for within firm heterogeneity. It should be noted that this is the lower bound on the attempted tax evasion at the border as we cannot monitor the systemic misdeclaration resulting from collusion between the customs staff and the importer.

This paper offers several policy implications. While we do not explore the effects of corrupt behavior and customs reform, our results imply that absence of audits and ineffective inspections are more prone to misdeclaration of import values. Similarly, excessive discretion at the hands of custom officials also encourages the importer to under-report the shipment value. Our findings indicate that a greater use of technology and computerization, although might not eliminate the misdeclaration of imports, will surely discourage some importers from under-invoicing. The electronic processing of imports will not only increase efficiency but can also provide the data to the custom officer in charge. Customs authorities could use historic inclination toward misdeclaration by individual firms to implement an automated digital flagging system, like the one

proposed by Wier (2020). FBRP has introduced the Green, Yellow and Red channels in WeBOC to rate the importer behavior. Firms with a historical trend of systematically divergent misdeclaration behavior can be audited more frequently and thoroughly. FBRP need to further strengthen the WeBOC system as nearly a fifth of the transactions are still processed manually at various Pakistani ports.[18]

We also provide a relatively better measure for the duty rates to analyze the misdeclaration of imports as compared to the earlier literature. As suggested earlier, it is common to get special tax exemptions by the importers in developing economies, and hence, the transaction level analysis improves the estimation of coefficient of evasion elasticity. We have used the actual duties paid by the importer to calculate the duty rate, rather than using a standard duty rate reported for the product. We also notice that the estimate for evasion elasticity varies significantly by the type of duties used in the analysis. Sales tax as well as the income tax paid by the importer also depends on the value of the imported product. Therefore, effective duty rate, inclusive of sales tax and income tax, seems to be a better measure to assess the tax evasion elasticity of imports.

We also find a significant variation in under-reporting of imports by Pakistani firms, if any, in response to an increase in the duty rates, across origin country of imports. It would be useful to empirically relate the discussion of tariff evasion to the related issues of corruption, capital controls, and regulatory enforcement, and to measure the extent to which trade misreporting takes place across a broader set of products, and for countries belonging to different income levels or having particular institutional characteristics (Kellenberg and Levinson 2018). The availability of transaction-level trade data for many countries in recent years can be used to test the generality of our results beyond the specific case of one country analyzed in this paper.

Another potential topic for future research is to further analyze the various motives for misdeclaration of trade activities by linking trade data issued by FBRP with firm-level balance sheet data. It would be worthwhile to relate firm characteristics to the observed misreporting behavior and tariff evasion to shed light on specific attributes of firms which are expected to be correlated with misdeclaration of import activities to assess the evasion propensities of different types of firms. Furthermore, as each cross-border shipment is recorded separately by two different customs administrators, i.e., at the time of leaving the country of origin as well as at the time of arriving at the destination country, mis-invoicing of international trade transactions appears to be easy to detect if comparable datasets are available for foreign countries. We aim to expand our work into exploring some of these areas building on the findings of this paper, and by complementing our dataset with additional data sources.

[18] Kellenberg and Levinson (2018) find robust evidence for stronger auditing and accounting standards to decrease the underreporting of exports.

6. Conclusion

This paper offers empirical evidence quantifying the scale of under-invoicing of imports in the context of a developing country. We use a comprehensive customs database encompassing the universe of import transactions in Pakistan over 2016-2017 and find that higher tariff rates lead to increase in misdeclaration of imports especially when the transactions are processed manually. The impact of tariff rates on misreporting trade statistics has been studied extensively. Much of the earlier literature uses the aggregate data for exports and imports at year-product level from two different countries to detect these disparities. Our paper, on the other hand, focusses on misdeclaration at transaction level to understand the microeconomic underpinnings of tariff evasion. The use of large administrative datasets is common in the international trade literature for developed countries. However, such highly detailed data have mostly been unavailable for research on developing economies. To our knowledge, this is the first paper that uses transaction-level trade data to directly test for misreporting activities of firms in a developing country at disaggregated level. Our dataset allows us to perform numerous empirical exercises to hypothesize that importing firms have a strong incentive to declare lower values of imported commodities to lessen the taxes paid.

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Appendix

Table A.1: Transaction-level estimation results: WeBOC vs non-WeBOC

	(1) All transactions	(2) WeBOC	(3) Non-WeBOC
Duty rate	0.190***	0.234***	-0.120**
	(0.062)	(0.071)	(0.058)
Observations	5,074,669	4,138,963	933,084
R-squared	0.440	0.461	0.560
Adjusted R-squared	0.436	0.46	0.554
Number of Products	6181	6015	3948
Product effects	Yes	Yes	Yes
Month effects	Yes	Yes	Yes
Country effects	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) presents estimates for all transactions processed through customs in 2016 and 2017. Columns (2) and (3) are for the transactions processed through WeBOC and manually, respectively. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.2: Transaction-level estimation results: Regional analysis

	(1) All transactions	(2) North America	(3) European Union	(4) ASEAN	(5) Arabian Gulf	(6) South Asia	(7) East Asia	(8) Rest of the World
Duty rate	0.190***	-0.007	-0.071	0.078*	0.197	-0.011	0.359***	-0.069*
	(0.062)	(0.025)	(0.079)	(0.040)	(0.243)	(0.075)	(0.089)	(0.040)
Observations	5,074,669	326,911	929,449	522,562	664,068	263,950	2,001,120	351,054
R-squared	0.440	0.508	0.673	0.526	0.387	0.571	0.469	0.436
Adjusted R-squared	0.436	0.493	0.67	0.517	0.38	0.559	0.462	0.416
Number of Products	6181	3159	4623	3295	3258	2203	5194	3536
Product effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) is for the complete data. Arabian Gulf includes UAE, Qatar, Kuwait, Saudi Arabia and Oman. East Asia includes China, Japan, Korea and Hong Kong. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.

Table A.3: Transaction-level estimation results: Top 5 import origins (by transaction)

	(1) All transactions	(2) China	(3) UAE	(4) United States	(5) Thailand	(6) Japan
Duty rate	0.190***	0.612***	0.227	-0.014	-0.059*	0.058*
	(0.062)	(0.134)	(0.263)	(0.027)	(0.035)	(0.030)
Observations	5,074,669	1,569,578	613,919	295,181	270,461	244,105
R-squared	0.440	0.453	0.386	0.512	0.585	0.466
Adjusted R-squared	0.436	0.444	0.38	0.5	0.578	0.454
Number of Products	6181	4973	3176	3048	2189	2066
Product effects	Yes	Yes	Yes	Yes	Yes	Yes
Month effects	Yes	Yes	Yes	Yes	Yes	Yes
Country effects	Yes	Yes	Yes	Yes	Yes	Yes
Shipping port effects	Yes	Yes	Yes	Yes	Yes	Yes
Firm effects	Yes	Yes	Yes	Yes	Yes	Yes

Notes: The outcome variable is misdeclaration by the firm. The estimates are obtained at the transaction level. Column (1) presents estimates for the aggregate data. Arabian Gulf includes UAE, Qatar, Kuwait, Saudi Arabia and Oman. East Asia includes China, Japan, Korea and Hong Kong. All regressions include a constant term. Robust standard errors clustered by product are given in parentheses. Asterisks denote significance levels: * significant at 10%; ** significant at 5%; *** significant at 1%.