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Policies, Enforcement, and Customs Evasion: Evidence from India

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I. Introduction

The effect of policies, specifically tax policies, on evasion is a subject of considerable policy interest and has therefore been studied extensively. An early theoretical treatment is due to Allingham and Sandmo (1972), who show that the sign of the elasticity of tax evasion with respect to tax rates is ambiguous, depending on taxpayers' risk aversion and the punishment for evasion: increases in tax rates make evasion more attractive (substitution effect) but also reduce taxpayers' wealth (income effect).[1] Empirical results have also varied considerably because of the difficulty in measuring evasion and the difficulty of disentangling substitution and income effects. A noteworthy and innovative recent empirical effort is Fisman and Wei (2004), who examine the impact of tariff rates on duty evasion at the border that takes the form of undervaluing or misclassifying imports in order to reduce the tariff burden.

Relatively less attention, however, has been paid to the effect of, what might be called enforcement, on evasion.[2][3] This is not surprising because it is much more difficult to quantify and isolate the enforcement effect. An outcome such as evasion or corruption can be thought of as resulting from the interaction of demand and supply factors. The demand for evasion is linked to tax policies: higher the tax rate, larger is the benefit that economic agents can derive from evasion and hence greater the demand for it. But agents' willingness to engage in evasion also depends on how likely it is that evasion will be detected and/or the ease with which customs officials can be bribed. These latter can be thought of as the supply or enforcement side, which too have a bearing on evasion.[4] Slemrod and Kopczuk (2002) also argue that the enforcement regime can shape the behavioral response of agents to tax rates and thus may be an important policy tool.[5] But isolating the enforcement effect and measuring its contribution to evasion and the elasticity of evasion with respect to taxes is a challenge.

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[1] See Allingham and Sandmo (1972) for the workhorse model of income tax evasion. See also Slemrod and Yitzhaki (2000) for a review of the literature on income tax evasion. Yitzhaki (1974) show that if the fine is imposed on the evaded tax (instead of the undeclared income as in Allingham and Sandmo (1972)), then under assumptions of decreasing absolute risk aversion, increases in tax rates reduce evasion.

[2] The term "enforcement" can be understood more broadly as reflecting the quality of institutions, in this case of customs.

[3] To the best of our knowledge, only one paper in the literature on tax evasion has addressed this question. Slemrod (2003) examines the effect of a change in enforcement regime (due to introduction of a cigarette stamping program) on the elasticity of cigarette sales wrt tax rates in Michigan.

[4] The supply factors that affect evasion also include the magnitude of punishment and how it is designed. However, we do not focus on these factors in this paper and leave it for further research.

[5] For example, the Tax Reform Act in 1986 in the U.S. which broadened the tax base and restricted the use of tax shelters has been pointed as a reason for the substantially lower elasticity of taxable income with respect to tax rates in the U.S. in the 1990s relative to the 1980s (Giertz, 2005).

This paper is a modest and preliminary attempt at taking on this challenge. Specifically, it makes three contributions. First, it builds on the existing literature in testing the impact of tariff *policies* on evasion and, arguably, refining the estimated effects. Fisman and Wei (2004) quantify this effect for trade between China and Hong Kong by checking whether variation in tariffs across 1600 imported goods at 6-digit level was systematically correlated with the evasion across these products. Their main finding is that there is such a correlation, with a one percentage point increase in the tax (sum of the tariff and VAT on imports) rate associated with a two-three percent increase in evasion.

In this paper, we exploit two sources of variation to identify the effect of tariffs on evasion: variation across products (as in Fisman and Wei, 2004) but also across time.[6] The Indian trade reforms of the 1990s, which involved broadly exogenous changes in tariffs over time and across products, offers an excellent policy experiment to identify the effect of policies and enforcement on import evasion (Topalova, 2004). Using both sources of variation confers some important advantages over a strategy that exploits across-product variation alone. If tariffs are systematically correlated with some other aspect of the product (say ease of enforcement) that also affects evasion, as we show to be the case below, then the latter approach would conflate both these effects. Because we exploit variation over time , we are able to control for such product-specific or other characteristics, and hence isolate better the impact of tariffs on evasion. Indeed, our identification will rely on exploiting the variation within 6-digit tariffs over time and is hence a very demanding and general specification.

Fisman and Wei (2004) suggest that the elasticity of evasion with respect to tariff policies (hereafter referred to as the evasion elasticity) can be seen as a more objective measure of the "laxity of rule of law" and hence of potential use in cross-country comparisons of institutional quality. [7] But if this elasticity is identified for each country on a cross-product basis (as in Fisman and Wei, 2004), cross-country comparisons, are less defensible: if Singapore's imports are predominantly differentiated goods while Burkina Faso's are homogenous goods, would the evasion elasticity simply reflect enforcement quality or also the different import composition? On the other hand, we are able to control for the product specific factors that might possibly affect evasion—our identification strategy relies on exploiting the variation within 6-digit products across time.

Our second and main contribution is to show that a number of enforcement-related characteristics do indeed affect the evasion elasticity. For example, this elasticity is affected

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[6] With one exception, nearly all the results in Fisman and Wei (2004) rely on exploiting the variation across products (defined at the HS 6-digit level).

[7] Strictly speaking, it is a semi-elasticity because our left hand side variable is in log terms while the tariff variable is not.

by certain product-related characteristics that determine how easy it is to detect evasion and by the mode of entry (via sea or air ports). In addition, we find little evidence that the elasticity is determined significantly by other factors e.g. tax rates or by salaries of customs officials: the latter is a very surprising finding and we offer some clues as to the possible reasons. Since the estimated evasion elasticity predominantly reflects enforcement-related factors, we can interpret it as a measure of enforcement quality in customs.

The third contribution is to provide an illustration of and a methodology for—which could in principle be replicated in other countries—quantifying institutional quality over time. The well-known problems with perception-based measures has led to the search for more objective or quantifiable measures of institutional quality. If the evasion elasticity is a reasonable reflection of customs quality, then its evolution over time could be interpreted as tracking the evolution in the quality of customs enforcement—one of the key bureaucratic institutions--over time. We track the evolution of this measure since the late 1980s for India, which also helps shed light on a debate within India on the quality of public institutions and how they have evolved over time. We also compare our estimates for India with those of Fisman and Wei (2004) for China and identify the source of the differences between them. This allows us to compare the quality of customs enforcement in the two countries, a comparison that is of some interest because of their impressive and contrasting growth performances as well as their growing importance in the world economy.

Our main findings can be summarized as follows. First, we find a significant and robust impact of tariffs on evasion. Specifically, a one percentage point increase in tariffs increases evasion by about 0.1 percent.

Second, we find strong and robust evidence that the evasion elasticity is affected by a product-related characteristic that potentially capture the ease of enforcement. For differentiated products and products that exhibit a high variance of unit price, we find that the elasticity of evasion is substantially higher. In other words, a unit increase in tariffs leads to higher evasion the more difficult it is for customs officials to discern the true worth of the product. We also find that the evasion elasticity varies by the mode of entry of goods. Goods that come through air have a significantly lower evasion elasticity compared with those that come through sea ports.

Third, and significantly for Indian policy makers, we find that the evasion elasticity has not improved over time: indeed, this measure or proxy for enforcement either shows a decline that is statistically insignificant, or in some cases, a statistically significant decline. This finding is consistent with other subjective and perceptions-based measures of bureaucratic quality identified by other sources.

Finally, we are able to reconcile the large difference (nearly thirty-fold) between our evasion elasticity estimate for India and that of FW for China. We find that their higher estimate reflects in large part their product sample which is biased in favor of more differentiated goods and hence higher evasion elasticity. Once we control for this and other factors, the difference between the two estimates is a factor of two, suggesting that India's customs enforcement is potentially twice as effective as that of China's. Other macro measures of customs enforcement for the two countries e.g. the difference between statutory and effective tariff rates are consistent with this estimate.[8]

An overall assessment that should be of interest to Indian policy makers is that while India's customs may have been more efficient than China's around 1998, the disparity is being reduced over time because of lack of improvements, perhaps even a deterioration--in India's customs enforcement over time.

II. Defining Evasion

Before we describe the setting, we need to define our key variable—evasion. Throughout this paper, we will report results for four different measures of evasion: two for evasion in import values and two for evasion in import quantities. The first follows Fisman and Wei (2004). Take the evasion in values, which we define as:

$$EvV_{ptc} = \log(1 + XV_{ptc}) - \log(1 + MV_{ptc}) \qquad (1)$$

Where EvV refers to evasion values, XV to export value as recorded by the partner country, MV to import value as recorded by the Indian authorities. The sub-scripts p, t, and c refer respectively to product (at the HS-6 digit level), t to year (varying between 1988 and 2003), and c to the partner country with which Indian trade is carried out. It should be noted that for this measure of evasion, the sample is restricted to those transactions for which there are matched exports and imports—that is, for every export transaction there is a corresponding import one--at 6-digit level.

For our second measure of evasion, described below, we make an extreme assumption of complete smuggling. We assume that, if at 6-digit level an export transaction is recorded by the partner country but not by the Indian authorities, these exports are smuggled into the country, and we code the imports as zero. Thus we define our second measure of evasion,

$$EvV2_{ptc} = \log(1 + XV2_{ptc}) - \log(1 + MV2_{ptc}) \qquad (2)$$

The 2 in all the variables denotes that this is our second measure of evasion, for which imports take on a value of zero for those cases where there is no match for exports. For obvious reasons, this measure requires the one plus log transformation. Thus, our sample includes those items for which exports are recorded but for which no counterpart import

[8] Pritchett and Sethi (1994) and Zee (2005) have used similar measures.

transaction is recorded. Thus, the sample for this second measure is substantially larger (by over 100,000 observations relative to the first).[9] In the paper, we provide evidence that is consistent with making this extreme smuggling assumption; we find that tariffs for those exports for which there are no corresponding imports, are indeed higher on average, which could in principle create the incentive for smuggling.

Corresponding to these two value-based evasion measures are corresponding quantity-based measures, yielding in all four measures of evasion.

III. Indian tariff reform as crucible

In August 1991, in the aftermath of the balance-of-payments crisis, India launched a dramatic unilateral trade liberalization as part of an IMF adjustment program. As Panels A and B in Figure 1 show, there was a decline in the level and the variation of tariffs beginning in the late 1980s, a process that was accelerated after the macroeconomic crisis of 1991 (see Topalova, 2004 for details). Average tariffs declined from nearly 100 percent in 1987 to 80 percent in 1991 followed by a further decline to about 25 percent at the turn of the century. Similarly, the standard deviation of tariffs declined from 50 percent to 40 percent and to about 10 percent over the same period. This rich variation across time and across product groups offers a crucible for evaluating the impact on evasion.

That these changes may have had a role to play in evasion is graphically illustrated in Figure 2, which plots four measures of evasion over the same period. The left hand side panels plot evasion in import values while the right hand side panels plot evasion in import quantities. There seems to be a clear correspondence between the trends in Figures 1 and 2. For example, in Figure 2c, evasion hovers around 120 percent for the late 1980s and early 1990s, but starts declining dramatically and consistently, reaching about 85 percent in 2002-2003.

Whether the developments in Figures 1 and 2 can be formally shown to be related and how forms the core of the paper to which we turn after describing the data.

IV. Data

Our mains sources of data are twofold. The World Trade Solution (WITS) database, derived from UN COMTRADE data, provides us with data on the value and quantity of exports to India from partner countries as recorded by the latter (hereafter referred to as "exports") as well as on the value and quantity of imports in India from partner countries as recorded by the Indian authorities (referred to as "imports"). These data are available on an annual basis from 1987-2003. The data are at HS 6-digit level, yielding information on about 5000 products. In addition, data are available for about 120-150 of India's trading partners, but the

[9] The sample size in Fisman and Wei (1994) is at most about 1700 observations compared with our sample of between 222,000 and 3330,000 observations stemming from our exploiting the variation across time and partner countries.

partner coverage varies with time. The match rate between exports and imports—i.e. the number of cases for any particular year for which the data on exports at HS-6 digit level has a counterpart entry at the import end—varies by partner country and time. Appendix Table 1 provides summary indicators of match rates for the top 40 trading partners. In general, match rates are higher for the more advanced trading partners. In the empirical analysis, we restrict the data to India's 40 top trading partners, accounting for about 92 percent of total trade, and for which the match rate varies between 15 and 65 percent.

Even after applying these filters, the sample in our "extreme smuggling" specification exceeds 325,000 observations. In the alternative specification, the sample size reduces to about 222,000 observations.

Data on disaggregated tariffs have been compiled in Topalova (2004). In the robustness checks and alternative formulations, we will also use data on: excise tariffs on imports (which we obtained from the annual publications of the Customs department); on the distribution of imports across different ports in India from Tips Software services, and on salaries of customs inspectors and the number of computers used in different customs destinations.

V. Empirical Strategy

Our main specification takes the following form:

$$EvV_{ptc} = \beta T_{pt} + D_p + D_t + D_c + D_{pc} + D_{tc} + \varepsilon_{ptc} \qquad (3)$$

where the left hand side variable was described earlier; T refers to the tariff and varies by product and time, the D's are vectors of fixed effects.[10] The key parameter that we are interested in is, of course β, the semi-elasticity of evasion with respect to tariffs. It is important to note that given the fixed effects, our identification will rely on within-product (at the 6-digit level) across-time variation alone and will thus not be affected by product or partner country characteristics. In all our specifications, we cluster the standard errors at the 6-digit product level, further adding to the generality of our estimation.[11]

While equation 3, allows us to identify the effects of tariff policies on evasion, how do we isolate or identify the effects of enforcement? In a framework such as that represented in equation 3 above, this is not easy. In order to identify the direct effect of enforcement quality on the level of evasion, we need measures or proxies that vary by product and time. But it is

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[10] T is the Most Favored Nation (MFN) tariff and hence does not vary by partner country. India did not have any major Free Trade Agreements during the period under this study.

[11] Time-related fixed effects also address problems that might arise because of the differences in timing in data recording between exports and imports, as well as common shocks such as technological changes, generalized improvements in enforcement etc.

unlikely that there are significant differences in customs administration of different products over time. It is relatively easier to find measures of enforcement quality that vary either by time *or* by product characteristic. The most obvious measures of enforcement such as the number of staff, their quality, their salaries etc. vary by time. Other measures affecting enforcement can vary by product. If the variation is only along one dimension, it is difficult to identify the average effect of enforcement on evasion because it gets absorbed in the time/product fixed effects.

We therefore focus our attention on trying to measure how various proxies of enforcement affect the evasion elasticity, a potentially important parameter for policy makers (Slemrod and Kopczuk, 2002). Equation 4 illustrates our strategy for doing so.

$$EvV_{ptc} = \beta T_{pt} + \gamma (Tpt * E_X) + D_p + D_t + D_c + D_{pc} + D_{tc} + \varepsilon_{ptc} \qquad (4)$$

In this specification, Ex refers to some characteristic x relating to enforcement, varies by product, by country-product, or by time. Here we will be interested in the coefficient γ and interpret this as the marginal impact of some broad measure of enforcement quality on the evasion elasticity. This can be seen clearly if we examine the derivative of evasion with respect to tariffs:

$$\partial(EvV_{ptc}) / \partial T_{pt} = \beta + \gamma E_X \qquad (5)$$

Take the case, where E is just a time dummy. In this case, β and γ can be used to measure how the evasion elasticity has changed over time. If we were to compare the elasticity across time, we would be measuring the effect of unit changes in tariffs on evasion, controlling for product and other characteristics that conceivably affect evasion.

The elasticity could change over time due to changes in tariff policies or due to enforcement quality (or both). Now, assuming that the effect of tariffs on the elasticity is a function of importers' preferences, that are similar across time—i.e. that importers behave similarly in response to a unit change in tariff—then the outcome is affected largely by enforcement quality, allowing us to claim that comparisons of elasticities across time reflect changes in enforcement quality rather than tariff policies.

In what follows, we try and get at this impact of enforcement in a number of independent, if indirect, ways.

VI. Results

Elasticity of evasion with respect to tariff rates

Table 1 provides summary statistics of all the variables used in the paper. A first point of note is that the evasion gap in values has a mean of 12 percent in the first definition and a mean of over 100 percent under the assumption of extreme smuggling. A second point to note is that the average evasion gap is smaller for basic, capital and intermediate goods than for consumer and consumer durables, which have faced consistently higher trade restrictions than the former.

Table 2 presents our first set of core results. We estimate equation 3 above, but with increasing level of generality of specification as we move across the five columns. And we present the results for the four measures of evasion that we have already described. Taking the top 2 panels, we introduce different types of fixed effects as we move from columns 1 to 7. In column 1, we include just country fixed effects. Column 2 controls for product fixed effects, while column 3 controls for year fixed effects. In column 4, we introduce both year and product fixed effects and find that the effect of tariffs on evasion drops by about half from 0.17 to about 0.1. Columns 5-7 include the possible two-way interactions of fixed effects. Column 7 is the most general specification because it has both country-product and country-year fixed effects. The coefficient on the tariff terms remains broadly unchanged from Column 4. This suggests that there is a systematic correlation between tariffs and product characteristics relevant to evasion so that identifying the evasion elasticity based on exploiting product level variation alone can lead to inconsistent estimates. Column 7 will be our core specification in the rest of the paper. The magnitude of the coefficient suggests that a one percentage point increase in tariffs increases evasion by about 0.1 percent—this effect is about one-thirtieth the magnitude obtained by Fisman and Wei (2004).[12] We get strong and robust results also for evasion in quantities (see the third and fourth panels in Table 2).[13] Surprisingly, and unlike in Fisman and Wei (2004), we did not find any non-linear effects of tariffs on evasion (Appendix Tables 4 and 5).

How valid is our assumption underlying our second measure of evasion? Recall that in this case, we recorded all imports that did not have matching exports as essentially having been smuggled; that is, the value of these imports was coded as zero. One way of checking this is to see if imports recorded as zero faced substantially higher tariffs after controlling for country and product characteristics. The results are shown in the panel E of Table 2. Here the dependent variable is a dummy that takes on a value of one if there are exports for which

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[12] In Appendix Tables 2 and 3, we establish the robustness of this basic result in two other ways. First, given that measurement error can to some extent be mitigated by aggregation, we collapsed the country and product dimensions into just a product dimension (i.e. we measured evasion as the average across partner countries for any given product) and estimated the equation by weighting the regressions by the number of countries from which a product is imported. In Appendix Table 3, we estimated the core equation by making the sample balanced in terms of the products included. The core results remain broadly unchanged.

[13] Endogeneity is not a serious concern for reasons discussed earlier. But if tariff changes across products could have been determined by evasion, one way to address this would be to introduce product-time fixed effects. Obviously, we cannot introduce such fixed effects at 6-digit level because that is the basis for our identification, but we can do so for higher levels of product aggregation. When we add such fixed effects at the HS 1-digit level, our results remain unchanged (available from the authors upon request).

there are no corresponding imports. The coefficient on tariffs is consistently positive and significant across all specifications. The magnitude of the coefficient (column 7) suggests that a ten percentage point increase in tariffs is associated with a 0.23 higher likelihood that there is no corresponding import for an export. This finding at least partially validates our assumption that these products were smuggled.[14]

Evasion can take place through under recording of import values but also by misclassifying products, and specifically by classifying high-tariff products as lower-tariff ones. To examine if there is evidence in favor of misclassification, we added to the core specification a variable representing the average tariff rate on similar products, where similarity is defined at the 4-digit level. The expectation is that, holding the tariff on a product constant, the lower the tariff on similar products, the greater is the incentive to misclassify imports.

The results of adding this misclassification effect is reported in Table 3. As expected, the coefficient on the "tariff-on-similar-products" is negative and significant. A one percentage increase in the tariff on similar products leads to about a 0.26 percent (column 2) increase in evasion (again this is lower than the magnitudes obtained by Fisman and Wei (2004)).[15] Interestingly, with the inclusion of this extra tariff term, the coefficient on the "own tariff" term increases by nearly two and a half times, from about 0.11 to 0.38.[16]

Tariffs are not the only tax levied on imports in India. The other taxes include the surcharge, additional duty of customs (ADCs), special additional duty, anti-dumping duties, and safeguard duties (the latter two being contingent actions). However, by far the most important of these is the ADCs, which is the counterpart on imports of the equivalent excise duty that is imposed on goods produced or manufactured in India. This duty is also sometimes known as the countervailing duty. In order to check that our core results are robust if we include other duties, we collected data on the ADCs for seven selected years—1988, 1990, 1995, 1996, 1999, 2000, and 2001. We estimated equation 3, this time using a measure of taxes that is the sum of the customs duty and the additional customs duty. The

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[14] We estimated our core equations for a third measure of evasion. In this measure, if exports at 6-digit did not have a counterpart import recorded, we aggregated these products upto 4-digit level and then matched them with imports at the 4-digit level. And if there were no matches at the 4-digit level, we aggregated upto 2-digit to match exports and imports. Thus, only unmatched exports at 2-digit were excluded from the analysis. For this measure of evasion too, the results remained unchanged (available from the authors upon request).

[15] We should note that when we estimate the equation with the extra tariff term, our fixed effects are at the 4-digit rather than at the 6-digit level that we used in the core specification because of serious multicollinearity between own tariffs and the tariffs of similar products at the 6 digit level.

[16] We would note that our tariff data are coded in a way that takes into account exemptions: that is, wherever for a product for any given year, there was a partial or total tariff exemption, we coded that tariff as zero.

results, reported in Table 4, indicate that the tariff coefficient continues to be positive and statistically significant, and roughly the same magnitude as in the core specification.

There is one reason to believe that our estimate of the evasion elasticity might be biased downward. Recall that the policy measure that we use is tariffs. Yet, as Figure 1, Panel D shows, imports during the period of our analysis were subject not just to tariffs but also to quantitative restrictions (QRS). QRs were largely eliminated for basic, capital and intermediate goods early on in the liberalization process (early 1990s) but were removed on consumer and consumer durables relatively late, beginning in 1999, when the WTO ruled that India's import restrictions were not justified on balance-of-payments grounds and had to be eliminated. Thus, our measure of trade restrictions—tariffs—could be mismeasured, especially for consumer and consumer durables, creating attenuation bias for the tariff coefficient (assuming that the measurement error is random).

To check if this is indeed the case, we carried out two exercises. We classified products into two broad industry types—based on the extent to which these groups would be plagued by measurement error. The two groups were: basic, intermediate and capital on the one hand and consumer and consumer durables on the other. In the first exercise, in addition to the tariff variable, we interacted the tariff with a dummy for the second group. The results are reported in Table 5. We see that the coefficient on the first category increases by roughly 50 percent, from 0.11 to 0.17 (Table 2, panel B, column 7). We also see that the coefficient on the second category is not statistically different from zero (for evasion2, it is the sum of 0.166 and -0.152). The latter result is indeed what we would expect if there were measurement error in the trade restriction variable. In a second exercise, we re-estimate equation 3, restricting the sample to basic, capital and intermediate goods instead of interacting tariffs with a dummy for the type of good (Table 4, columns 3 and 4). Once again, we find that the point estimates on the effect of tariffs are more than 60 percent higher than the specification that uses all products (Table 2, Panel B, column 7), confirming that measurement error might be a problem. For these reasons, throughout the paper we report results both for the full sample as well as for the category of basic, capital and intermediate goods.[17]

Enforcement and the elasticity of evasion with respect to tariff rates

Having estimated the elasticity of evasion with respect to tariff rates, we can now proceed to examine the effects of enforcement based on estimating variants of equation 4.

Ease of enforcement: Product characteristics

First, there are some intrinsic characteristics of products that may affect the ease of enforcement. The most obvious case relates to commodities whose prices are widely known

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[17] For presentational simplicity, for Tables 5 and later we report only the value measures for evasion (results on the quantity measures area available from the authors upon request).

and publicized. In this case, it is more difficult for an importer to under-value or misclassify the product; and in case, the customs inspector is colluding with the importer, it is more likely that his superiors can in turn detect that he is engaging in such collusion. There are many ways in which this intrinsic characteristic of products can be proxied. We identify three such proxies. First, we use the Rauch classification, which distinguishes goods by whether they are homogenous goods (whose prices are widely known or quoted in exchanges) or differentiated goods (whose prices are less well known and determined more by specific transactions). So we create a dummy that takes on a value of 1 when goods are characterized by Rauch as differentiated goods.

For our second proxy, we calculate the standard deviation of the log of unit values at the 6-digit level, where the variation is calculated across partner countries as well as across products within each 6-digit category (to do this, we used data from Indian customs which is at the HS8-digit level). We then create a dummy which takes on a value of 1 for products whose standard deviation is above the median and zero otherwise. Again, the logic is that the more dispersion there is, the easier for an importer to "fool" customs authorities, or customs officers in turn to "fool" their superiors.

Our third measure relates to bulkiness. This measure is calculated as the cost-insurance-freight as a share of the value of a product (Giuliano, Spilimbergo and Tonon, 2006).[18] Goods like oil, wheat and coal will be classified as very bulky. Being a differentiated good (according to the Rauch classification or our second measure) is negatively correlated with bulkiness (Appendix Table 6).

So, to test the importance of such innate "ease-of-enforcement" characteristics, we estimated equation 4 above, interacting successively each of these proxies with the tariff term. The results are reported in Table 6. Again, the results are pretty strong and robust. In every case, the sign of the coefficient on the interaction is as expected and significant. For example, in the second row, which uses the standard deviation of the log of the unit price as the enforcement characteristic, we find that products which have above median variation have much higher evasion elasticities: that is, a 1 percentage increase in tariffs is more likely to increase evasion, the more the variation in unit prices. Indeed, the estimates in column 2 suggest that, for products where there is below median variation, there is no statistical impact of tariffs on evasion; whereas for products with above median variation, the effect is strong, with a coefficient value of between 0.24 and 0.26, twice as large as in the core specification.

If we can interpret these intrinsic product characteristics as capturing the ease of enforcement, these results suggest that the better the enforcement or greater is the likelihood

[18] We thank Antonio Spilimbergo for providing us with this data.

of detection, a given increase in tariffs has a lower impact on evasion. This evidence suggests, albeit indirectly, that enforcement has an important effect on evasion.

Enforcement: Institutional quality at destination (mode of entry)
Does institutional quality systematically affect the elasticity of evasion? We obtained data, from a private vendor (Tips Software services), for the period 2003-2004 on the imports entering 12 different customs destinations within India. We calculated the share of transactions for a country-product going through each of these destinations. We assume that this share is representative for the entire period of our analysis. We then estimated equation 4, with the interaction between the tariff and the share of transactions going through the different ports, representing the additional term. Note that the share of transactions is a time-invariant country-product characteristic. The aim was to see if the coefficient on the interaction term varies across destinations. There did not seem to be differences between the different geographic locations.

However, there did seem to be differences between whether the destination was an airport or seaport. In Table 7, we report these regressions, where the additional interaction term represents the tariff times the share of transactions (in numbers) going through airports. The coefficient on this term is negative, suggesting that enforcement is better at airports than at sea-ports; that is, the response of evasion to tariff increases is lower, the more the transactions go through airports. Indeed, the evasion elasticity is not significantly different from zero for transactions that go through airports (-0.276+0.208 in column 2 of Table 7).[19]

Enforcement: Effect of salaries of customs inspectors
There is an extensive literature that has examined the effects of public sector wages on corruption. More recently, a number of micro-studies based on randomized evaluations have also addressed the related question of the effects of monetary incentives on some measure of public sector delivery. For example, Muralidharan and Sundararaman (2006) show that such incentives have a significant effect on educational and learning outcomes in primary schools.

Our framework also allows us to examine this question of whether the remuneration of customs staff has an effect on the evasion elasticity. It turns out that there was a "natural" experiment that we can exploit to look into this question. In 199x, the Government of India set up the Fifth Pay Commission, to recommend the revised pay scales for the civil service. In 1995, the commission recommended an increase in salaries, which were implemented beginning in 1997 for national (federal) civil servants while the different states implemented them later. The customs department in India is part of the national bureaucracy, so that

[19] In Appendix Table 7, we confirm that this result holds when transactions are measured in terms of values, while in Appendix Table 8 we show that there is a differential elasticity of evasion depending on mode of entry within the set of differentiated goods.

beginning in 1997 customs inspectors received a wage hike, retroactively from 1995. This experiment can be construed as a random one because the wage increases were awarded on a national basis rather than from the perspective of customs administration, which constitutes only a miniscule portion of the overall bureaucracy.

Simple theory would suggest that increases in pay should reduce the incentives for corruption, so that in our framework this should manifest itself as having an effect on the elasticity of tax evasion. To analyze this question, we took the data on wages of customs inspectors and customs officers and then calculated a series of relative wages which involved deflating these wages by a measure of salaries in comparable occupations. From the Freeman database, we chose semi-skilled occupations like clerical jobs as the appropriate comparator group for inspectors and relatively skilled occupations as the comparator group for officers.[20] We then interacted this relative wage series with the tariff term. Results are presented in Table 8.

In columns 1 and 2, we present results for inspectors and for officers in columns 3 and 4. The interactions between salaries and tariffs are generally not significant. We tested a number of alternative formulations—using different measures for comparable occupations, using real wages (without deflating for comparable occupations etc.), and were unable to obtain any significant results. Our negative results could either be a result of just not having the right experiment, the right estimation framework, or the right data, or all of the above. Or, the negative results could in fact be revealing. One piece of evidence suggests that it could be the latter, namely that there are no effects of salaries on evasion elasticity. In Appendix Table 9, we present data on the average value of customs transactions handled by the typical customs officer in India. Based on our data, this amounts to about Rs. 29 million per month. The monthly salary, on the other hand, for a customs inspector is Rs. 9000 per month.[21] In other words, even if, on average, corruption amounted to 0.1 percent of the value of transactions (this is a gross under-estimate because our data suggests an average evasion of about 20 percent), the customs official would make an amount that is more than thrice his monthly salary. In other words, what we are suggesting is that, at the margin, salaries seem to have little effect on corruption, because they are very low relative to the “opportunity costs.” One policy implication is that, salaries have to rise significantly if there is to be any effect on customs officials’ behavior.

Enforcement: Variation across partner countries

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[20] Customs inspectors in India typically have an undergraduate degree and their grading is below the ‘officer” class, who comprise the cream of the bureaucracy. Officers (or commissioners), typically have graduate education and more. Table A14 shows the comparator groups we have used from the Freeman occupational database to construct relative wages of inspectors and commissioners.

[21] This is the average salary of customs inspectors in 2003.

We also investigated whether there was systematic variation in the evasion elasticities depending upon the provenance of the goods. In the core specification, we added terms representing interactions between the tariff and region dummies, depending on where the goods were imported from. The results are reported in Table 9 and in Appendix Tables 10 and 11. As Table 9 indicates, the evasion elasticity is significantly higher for products originating from Europe (especially the U.K. and Germany) than from Asia. The interactions with the Europe dummy are uniformly positive and significant.

There are two possible explanations for this result. First, it could be that variation in evasion across partners is simply due to the geographic pattern of trade so that goods from the U.K. and Germany tend to go to customs destination within India that have poorer enforcement. However, when we compared the pattern of trade between origin and destination there were not any significant differences: for example, it was not the case that goods from Europe went predominantly to seaports (which we showed earlier had less effective enforcement). Moreover, Appendix Table 11 confirms that the evasion elasticity is higher for even those European-origin goods that come to airports in India (the triple interaction between tariffs, Europe dummy and the share of transactions going through air is positive and significant.)

A second explanation could relate to institutional quality in the originating country. The better (worse) these institutions the better (worse) is the quality of exports data that are reported. In other words, our left hand side variable will be more prone to measurement error the worse the institutions in the originating country of the goods. If this is indeed true, and assuming that such error is random, we should expect to see coefficients that are more (less) tightly estimated for higher (lower) institutional quality countries.

To test this, we re-estimated our core equation first for the sample restricted to India's trade with the 15 partner countries with the best institutional quality (on the composite ICRGE measure of institutions) and then for the sample comprising India's trade with the remaining 25 partner countries. In both cases, the coefficient estimates for the evasion elasticities are similar, but the standard error is higher for the second sample (Appendix Table 12).

VII. Enforcement quality over time

The burgeoning interest in institutions has led to different approaches to measuring institutional quality. First, there are perception-based measures of institutions such as the indices compiled by the ICRGE and Kaufmann, Kraay, and Zoido-Lobaton (2006). Both of these have measures of bureaucratic quality/government effectiveness/corruption, which are based on investors' perceptions of how effective certain governmental institutions, including customs, are in discharging their functions.

The well-known problems with perception-based measures has led to the search for more objective or quantifiable measures of institutional quality. The World Bank's cost of doing business survey is one recent and notable example. In fact, in relation to measuring the efficiency of customs, this survey compiles cross-country data on the number of signatures required for import and export, the time and costs involved in exporting etc.

As discussed earlier, the evasion elasticity can, under certain assumptions, be interpreted as a measure of enforcement quality. Thus, our framework offers a way of evaluating and quantifying how enforcement has evolved over time. In contrast to the perception-based measures of the World Bank, we can calculate more objective measures of the evolution in institutional quality over time. In Tables 10A and 10B, we report the results of interacting the tariffs with period dummies. In Table 10A, the core specification is augmented by interacting the tariff term with two time dummies, respectively for the period, 1993-1997 and 1998-2001 respectively. And in Table 10B, there are additional interactions, in this case between the "tariff-on-similar-products" term with the time dummies. The results are illustrated in Figure 3. In effect, the two evasion elasticities (with respect to the own and similar tariffs) are two measures of enforcement. The magnitude of the elasticity with respect to the similar tariff increases sharply in the latter two periods compared to the initial period (1988-92) as the bottom panels in the Figure show, and this decline is statistically significant (see Table 10B).

The interpretation is that the same change in tariffs on similar products is associated with a larger change in evasion in the latter half of the 1990s (after a number of reforms in customs administration) than in the earlier period. Even the own tariff evasion shows some signs of deterioration over time (top panels in Figure 3). This elasticity increases in 1993-1997 relative to 1988-1992 and then remains generally flat. That is, in response to a reduction in tariffs, the decline in evasion is less well into the reform period than before. All of these results point to enforcement not improving, but actually declining over time. This is indeed a surprising finding.

Is this trend corroborated or contradicted by other indicators? We compute an alternative measure of customs reform suggested by Zee (2005) and Pritchett and Sethi (1994). This measure (call it collection efficiency) is the ratio of the average duty collection rate (or the effective tariff rate) to the average statutory rate. If there are no leakages through evasion, misclassification and outright corruption, the ratio should be one: what is collected in duties is equal to what ought to be. Since evasion and misclassification tend to rise with tariffs (as our results suggest), the collection efficiency measure tends to decline as tariffs increase and tends to increase as enforcement quality improves.

In column 6 of Table 11, we show this measure for India for the period 1990-2001. The collection efficiency measure rises sharply in the early part of the 1990s and then declines sharply in the late 1990s, and in 2001 the collection efficiency is lower than at the start of the reform process. What is especially noteworthy is the decline in this measure since 1997: over this period, average tariffs were declining, which should have tended to raise the collection efficiency ratio. The fact that this ratio actually declined despite declining tariffs is consistent with a decline in enforcement quality: it is difficult to see what else could have explained this decline.

Is this stagnation/decline in customs enforcement borne out by other indicators of institutional quality in India. We plot two such measures for the period 1988-2004 in Figure 4. These are: the ICRGE measure of bureaucratic quality and the World Bank's measures of government effectiveness and corruption. All these measures broadly portray a picture of institutional stagnation which is consistent with our measure of evasion elasticity.

The fact that enforcement quality may not have improved despite reforms is consistent with a broader tendency for institutional stagnation discussed in Subramanian (2006) and should give pause to policy makers whose ambitions for future performance need to be checked against potential bottlenecks, especially those arising from institutional quality.

VIII. Babu versus Mandarin: Comparing Chinese and Indian customs enforcement

As noted earlier, our estimates of the evasion elasticity of tariffs for India are significantly lower (in fact about one-thirtieth) the estimates that FW obtain for China. Can these estimates be reconciled?

There are three differences between the FW estimates and ours: FW consider trade with one partner while we consider trade with all partners; FW adopt a cross-sectional framework while ours is a panel one; and finally, the FW sample includes only a subset of commodities while our sample includes all commodities. To locate the source of the difference, we re-do our estimates trying to conform as far as possible to the FW choices on the above three scores. The results are presented in Table 12 with the pure cross-section results presented in Panel A, and the first difference variant in Panel B. In the first column, we re-estimate the FW evasion elasticity for the FW sample and obtain a coefficient of 2.637 which is close to their estimate.[22] Next we re-estimate our core result for the same year as FW (1998) and eliminating the partner dimension to conform to FW. These results are presented in columns 2 and 4, respectively for our two measures of evasion. The coefficients are 0.886 and 0.53, respectively. Note that these estimates are higher than our core estimate of about 0.1 (in table 2, panel B, column 7) for two reasons: it is for a different time period and it is a cross-section estimate without controlling for product fixed effects. Thus, our own estimates increase about 4-10 times compared to Table 2. Even so, the FW estimates for China remain 3-5 times as large.

Next, in columns 3 and 5, we restrict the sample of commodities to that in FW. Our coefficients, go up, and by nearly one and a half times, for our second measure of evasion, which now reaches about 1.2. This coefficient is comparable to the FW estimate of 2.6. The

[22] The FW sample is slightly different, comprising 1663 observations but the results are close enough.

reason for this jump in the coefficient is because the FW sample of goods is biased toward differentiated goods (this is shown more formally in Appendix Table 13, where the FW sample is related to a number of product characteristics—capital goods, differentiated, bulkiness etc.). And we know from the results in Section VI above, that such goods are more difficult to enforce and hence have a higher evasion elasticity.

Having eliminated all the differences between the FW estimates and ours, we are left with the finding that India's evasion elasticity is less than half of China's.[23] With all the caveats, this suggests that in 1998, India's customs was more than twice as effective in combating evasion than China's.[24] To check whether this difference was plausible, we computed the alternative collection efficiency measure also for China for the period 1996-2001 (see Table 11). For the year 1998, this efficiency ratio was five times higher for India than China. Although the actual numbers might be fragile, qualitatively this measure portrays the same picture as our evasion elasticity estimates. Note that the efficiency ratio is higher for India despite a higher average level of tariffs (30 percent for India versus 18 percent for China), lending greater confidence that the better collection efficiency is reflecting administration-related factors rather than tariff policy.

The second interesting point to note is that since 1998, India's customs performance relative to China is worsening, from a factor of 5 to a factor of 2 in 2001. This relative performance is more due to India's performance deteriorating sharply, a point noted in the previous section. The babu might have been more efficient and less corruptible than the mandarin, but the mandarin is catching up fast.

IX. Concluding Remarks

In this paper, we used the Indian tariff reform of the 1980s and 1990s, to examine the effect of tariff policies and enforcement on evasion. The three contributions of the paper were to better identify the effect of tariffs on evasion, to show how enforcement-related factors could affect evasion at the margin, and to illustrate the computation of objective and quantitative indicators of enforcement over time.

Our main finds are as follows. First, we find a significant and robust impact of tariffs on evasion. We find strong and robust evidence that the evasion elasticity is affected by a product-related characteristic that potentially captures the ease of enforcement. For differentiated products and products that exhibit a high variance of unit price, we find that the

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[23] Ideally, given the more general specification that we use, we should compare the evasion elasticities by using our methodology on the Chinese data, but this is more difficult to do given the problem of compiling time-series data and purging these of the "re-export" problem that is acute for China.

[24] Of course, some of the differences could also be due to differences in risk aversion between Chinese and Indian importers.

elasticity of evasion is substantially higher. We also find that the evasion elasticity varies by the mode of entry of goods. Goods that come through air have a significantly lower evasion elasticity compared with those that come through sea ports.

Third, and significantly for Indian policy makers, we find that the evasion elasticity has not improved over time: indeed, this measure or proxy for enforcement either shows a decline that is statistically insignificant, or in some cases, a statistically significant decline. This finding is consistent with other subjective and perceptions-based measures of bureaucratic quality identified by other sources.

Finally, we compare India and China and find that that India's customs enforcement is potentially twice as effective as that of China's.

An overall assessment that should be of interest to Indian policy makers is that while India's customs may have been more efficient than China's around 1998, the disparity is being reduced over time because of lack of improvements, perhaps even a deterioration--in India's customs enforcement over time. Significantly, we find no effect of remuneration of customs' officials on enforcement, a finding we suggest could be related to the fact that salaries are very low compared to the "opportunity costs" from corruption. These findings could have implications for future public sector reform in India.

References

Allingham, Michael G. and Agnar Sandmo (1972). "Income Tax Evasion: A Theoretical Analysis," *Journal of Public Economic*s 1, pp. 323-338.

Fisman, Raymond and Shang-Jin Wei (2004). "Tax Rates and Tax Evasion: Evidence from "Missing Imports" in China," *Journal of Political Economy* 112(2), pp. 471-496.

Giertz, Seth H. (2005). "A Sensitivity Analysis of the Elasticity of Taxable Income." CBO Working Paper 2005-01.

Giuliano, Paola, Antonio Spilimbergo and Giovanni Tonon (2006). "Genetic, Geographical, and Cultural Distances" CEPR Discussion paper No. 5807. September 2006.

Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi (2006). "Governance Matters V: Aggregate and Individual Governance Indicators for 1996-2005. " Mimeo, September 2006.

Kaufmann, Daniel, Aart Kraay and Pablo Zoido-Lobatón (1999). "Aggregating Governance Indicators." World Bank Policy Research Working Paper No. 2195, Washington, D.C.

Muralidharan, Karthik and Venkatesh Sundararaman (2006). "Teacher and Non-Teacher Inputs in the Education Production Function: Experimental Evidence from India." Mimeo, Harvard University.

Pritchett, Lant and Geeta Sethi (1994). "Tariff Rates, Tariff Revenue, and Tariff Reform: Some New Facts," *World Bank Economic Review* 8, pp. 1-16.

Muralidharan, K, and V. Sundararaman (2006). "Teacher Incentives in Developing Countries: Experimental Evidence from India," mimeo, Harvard University.

Rauch, James E. (1999). "Networks Versus Markets in International Trade." *Journal of International Economics* 48, pp. 7-35.

Slemrod, Joel (2003). "The System-Dependent Tax responsiveness of Cigarette Purchases: Evidence from Michigan." Mimeo, University of Michigan.

Slemrod, Joel and Shlomo Yitzhaki (2000). "Tax Avoidance, Evasion, and Administration." *Handbook of Public Economics* 3, pp 1423-1470.

Slemrod, Joel and Wojciech Kopczuk (2002). "The Optimal Elasticity of Taxable Income." *Journal of Public Economics* 84, pp. 91-112.

Subramanian, Arvind (2006). “The Intriguing Relationship Between Growth and Institutions in India,” *Oxford Review of Economic Policy*, forthcoming.

Topalova, Petia (2004). “Trade Liberalization and Firm Productivity: the Case of India” IMF WP No. 04/28.

Topalova, Petia (2005). “Factor Immobility and Regional Impact of Trade Liberalization: Evidence from India” Mimeo, MIT.

Zee, Howell H (2005), "A Summary Score of Tax Performance for Comparing Tax Systems Across Countries and Over Time," mimeo, Fiscal Affairs Department, International Monetary Fund.

Figure 1. Evolution of Tariffs in India

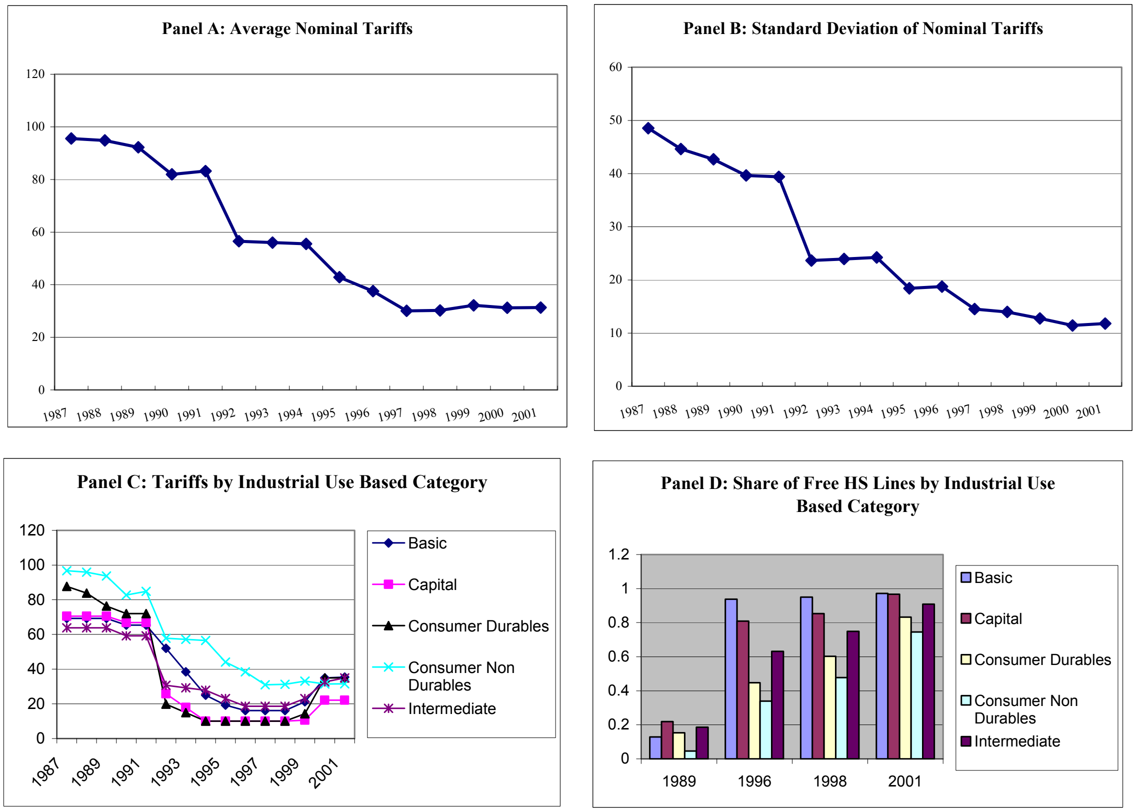


Figure 2. Mean Evasion Gap Over Time

Figure 2a. Log export value - Log import value

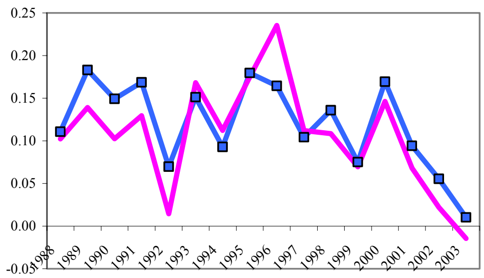


Figure 2b. Log export quantity - Log import quantity

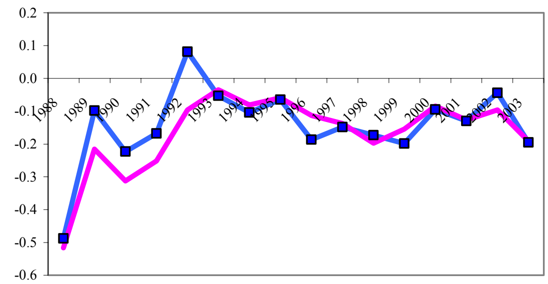


Figure2c. Extreme Smuggling,
log (1+export value) - log (1+ log import value)

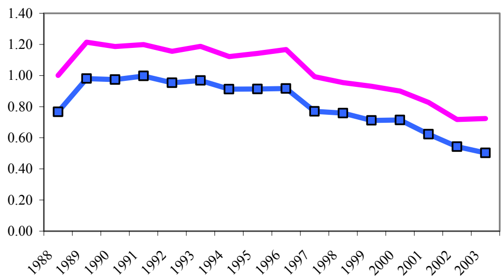
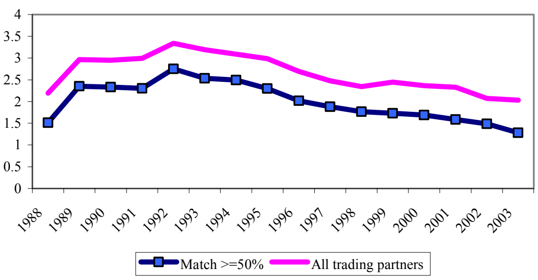
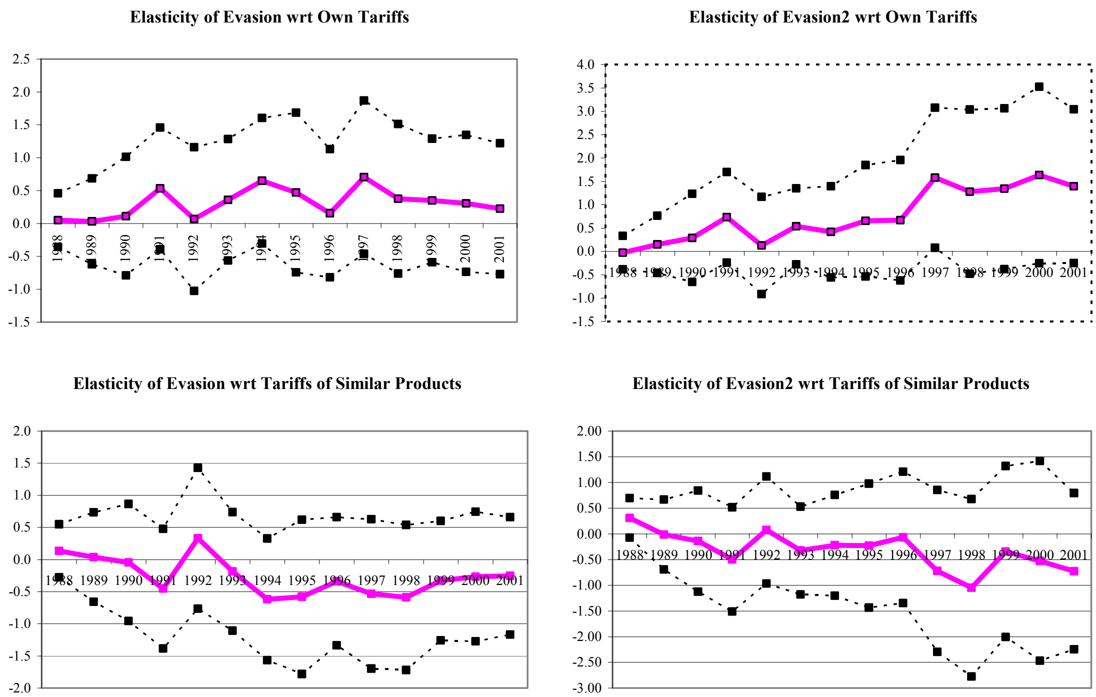


Figure 2d. Extreme Smuggling,
log (1+export quantity) - log (1+import quantity)



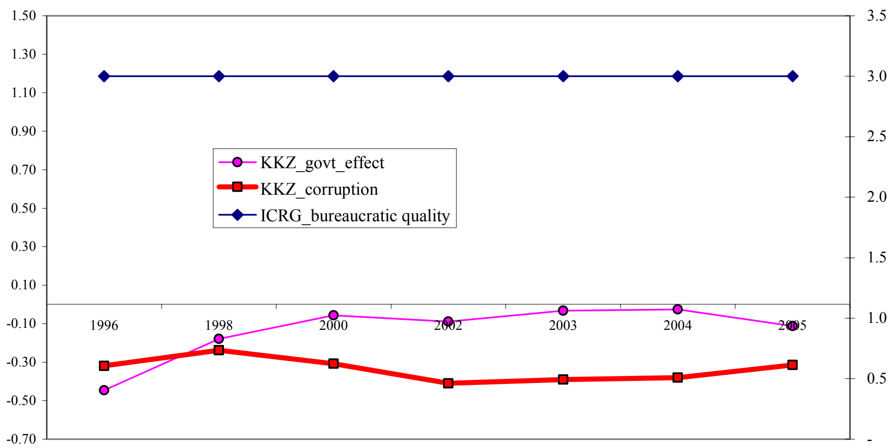
Source: In Figures2c and 2d, we assume that products reported by exporting countries but missing in Indian imports are smuggled completely

Figure 3. Elasticity of Evasion wrt Tariffs Over Time, 1988-2001 - 95 Percent Confidence Bands



Notes: The figures shows the estimated elasticities in a regression where own tariffs and tariffs of similar products are interacted with years.

Figure 4. Alternative Indices of Institutions, India



Notes.
ICRG index measures the quality of the bureaucracy (maximum 4 points). High points are given to countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services. KKZ Control of corruption index measures the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. KKZ government effectiveness measures the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The scores of KKZ indices lie between -2.5 and 2.5, with higher scores corresponding to better outcomes.

Table 1. Summary Statistics

	Entire Sample			Capital, Intermediate and Basic Goods			Consumer and Consumer Durable Goods		
	Mean	Std Dev	Obs	Mean	Std Dev	Obs	Mean	Std Dev	Obs
Log(Value of Exports)	4.43	2.26	224347	4.54	2.25	136486	4.25	2.24	70196
Log(Value of Imports)	4.31	2.20	224347	4.45	2.17	136486	4.02	2.22	70196
Evasion Gap (Value)	0.12	1.93	224347	0.09	1.92	136486	0.23	1.97	70196
Log(Quantity of Exports)	8.91	3.40	154425	8.93	3.39	96781	8.40	3.32	41644
Log(Quantity of Imports)	9.05	3.16	154425	9.11	3.15	96781	8.46	3.11	41644
Evasion Gap (Quantity)	-0.14	2.43	154425	-0.18	2.42	96781	-0.06	2.47	41644
Log(Value of Exports)-Extreme Smuggling	4.00	2.17	331746	4.20	2.18	188180	3.73	2.12	112904
Log(Value of Imports)-Extreme Smuggling	2.97	2.68	331746	3.28	2.68	188180	2.56	2.59	112904
Evasion Gap (Value)-Extreme Smuggling	1.03	2.24	331746	0.92	2.27	188180	1.17	2.16	112904
Log(Quantity of Exports)-Extreme Smuggling	8.25	3.41	249569	8.39	3.45	143279	7.62	3.22	78785
Log(Quantity of Imports)-Extreme Smuggling	5.61	5.05	249569	6.16	4.98	143279	4.48	4.79	78785
Evasion Gap (Quantity)-Extreme Smuggling	2.65	4.47	249569	2.23	4.43	143279	3.14	4.31	78785
Share of Products reported only by Exporting country	0.32	0.47	331746	0.27	0.45	188180	0.38	0.48	112904

Table 2. Evasion and Tariffs

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: Dependent variable: evasion							
Tariff	0.123***	0.172***	0.170***	0.099***	0.084**	0.097***	0.082**
	[0.034]	[0.024]	[0.052]	[0.037]	[0.041]	[0.013]	[0.041]
N	221502	221502	221502	221502	221502	221502	221502
Panel B: Dependent variable: evasion2							
Tariff	0.438***	0.551***	0.195***	0.118***	0.118***	0.109***	0.112**
	[0.034]	[0.025]	[0.056]	[0.038]	[0.045]	[0.038]	[0.045]
N	326312	326312	326312	326312	326312	326312	326312
Panel C: Dependent variable: evq							
Tariff	0.200***	0.221***	0.237***	0.133**	0.108*	0.113***	0.083
	[0.048]	[0.034]	[0.076]	[0.054]	[0.058]	[0.018]	[0.057]
N	152149	152149	152149	152149	152149	152149	152149
Panel D: Dependent variable: evq2							
Tariff	1.095***	1.294***	0.451***	0.239***	0.168*	0.211***	0.142*
	[0.089]	[0.059]	[0.127]	[0.076]	[0.086]	[0.075]	[0.086]
N	245103	245103	245103	245103	245103	245103	245103
Panel E: Dependent variable: exportsonly							
Tariff	0.148***	0.161***	0.099***	0.020***	0.024***	0.018**	0.023***
	[0.009]	[0.006]	[0.013]	[0.007]	[0.008]	[0.007]	[0.008]
N	326312	326312	326312	326312	326312	326312	326312
Year FE			Y	Y	Y		
Country FE	Y	Y	Y	Y			
Product FE		Y		Y		Y	
Country X Year FE						Y	Y
Country X Product FE					Y		Y

Note: Standard errors are clustered at the product level.
Evasion = log(export value) - log (import value)
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table 3. Evasion, Tariffs and Tariffs on Similar Products

	evasion	evasion2	evq	evq2	exportsonly
	(1)	(2)	(3)	(4)	(5)
Tariff	0.255***	0.382***	0.232**	0.719***	0.060***
	[0.078]	[0.081]	[0.113]	[0.171]	[0.016]
Average tariff on similar products	-0.167**	-0.256***	-0.193*	-0.559***	-0.037**
	[0.076]	[0.077]	[0.107]	[0.161]	[0.016]
N	184279	252777	123148	184703	252777

Note: Standard errors are clustered at the product level. All regressions include country X product (HS4) fixed effects, and country X year fixed effects. Similar products are defined as the products in the same 4-digit category excluding the own product.
Evasion = log(export value) - log (import value)
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table 4. Evasion, Customs and Excise Tariffs

	evasion	evasion2	evq	evq2	exportsonly
	(1)	(2)	(3)	(4)	(5)
Customs+Excise Tariff	0.106*	0.200***	0.123	0.401***	0.056***
	[0.058]	[0.065]	[0.092]	[0.124]	[0.011]
N	110793	154163	76942	116217	154163

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed
Evasion = log(export value) - log (import value)
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting

Table 5. Evasion, Tariffs and Industry Use-Type

			Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
Tariff	0.128***	0.166***	0.134***	0.185***
	[0.047]	[0.051]	[0.043]	[0.049]
Tariff X Consumer Goods	-0.136**	-0.152**		
	[0.069]	[0.066]		
N	206586	300959	136455	188135

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.
Evasion = log(export value) - log (import value)
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 6. Evasion, Tariffs and Differentiated Goods

	evasion			evasion2		
Panel A. All Goods	(1)	(2)	(3)	(4)	(5)	(6)
Tariff	0.163***	-0.042	0.142***	0.249***	-0.07	0.201***
	[0.046]	[0.044]	[0.052]	[0.049]	[0.046]	[0.054]
Tariff X Non-Differentiated	-0.173***			-0.262***		
	[0.056]			[0.057]		
Tariff X Above Median in StDevLogPrice		0.264***			0.393***	
		[0.055]			[0.054]	
Tariff X Bulkiness			-2.865**			-4.025***
			[1.427]			[1.394]
N	181544	193288	193211	270304	287033	286931
Panel B. Capital, Intermediate and Basic goods						
Tariff	0.189***	-0.006	0.202***	0.298***	-0.04	0.328***
	[0.053]	[0.057]	[0.069]	[0.058]	[0.060]	[0.074]
Tariff X Non-Differentiated	-0.139**			-0.229***		
	[0.067]			[0.069]		
Tariff X Above Median in StDevLogPrice		0.236***			0.393***	
		[0.065]			[0.067]	
Tariff X Bulkiness			-4.012*			-7.791***
			[2.249]			[2.388]
N	113128	119973	119942	156512	166278	166236

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.
Evasion = log(export value) - log (import value)
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 7. Evasion and Tariffs: Share of Transactions, Sea vs Air

	All products		**Basic, capital and intermediate**	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
tariff	0.101**	0.208***	0.114**	0.247***
	[0.041]	[0.045]	[0.045]	[0.054]
Tariff*Air	-0.137**	-0.276***	-0.027	-0.186**
	[0.067]	[0.067]	[0.091]	[0.095]
N	180273	228792	113530	139372

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Tariffs are interacted with the share of transactions for a country-product going via air or sea. Excluded category is share of trasnactions through sea.

Evasion = log(export value) - log (import value).

Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 8. Evasion, Tariffs and Wages of Customs Inspectors and Commissioners

	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
tariff	0.278	0.131	-1.372**	-0.556
	[0.409]	[0.374]	[0.676]	[0.670]
tariff*ln(salaries of inspectors)	-0.039	-0.005		
	[0.079]	[0.072]		
tariff*ln(salaries of commissioners)			0.326**	0.149
			[0.152]	[0.150]
N	221073	325861	221073	325861
Country X Product FE	Y	Y	Y	Y
Country X Year FE	Y	Y	Y	Y

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects. Columns (1) and (2) country X year fixed effects.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 9. Evasion and Tariffs: Region Interactions

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
Tariff*Asia	0.042	0.037	0.078	0.105
	[0.048]	[0.053]	[0.059]	[0.068]
Tariff*Europe	0.097*	0.140**	0.115*	0.148*
	[0.056]	[0.060]	[0.067]	[0.077]
Tariff*Other	0.01	0.088	0.051	0.095
	[0.074]	[0.075]	[0.089]	[0.097]
N	221073	325861	136236	187901

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.

Evasion = log(export value) - log (import value)

Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 10a. Evasion and Tariffs: Period Interactions

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
Tariff	0.090**	0.122***	0.124***	0.164***
	[0.037]	[0.040]	[0.044]	[0.049]
Tariff*Period2	-0.046	-0.057	0.064	0.118
	[0.065]	[0.062]	[0.083]	[0.085]
Tariff*period 3	0.010	-0.158	0.067	0.194
	[0.189]	[0.159]	[0.194]	[0.204]
N	221073	325861	136236	187901

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Period 1= 1988-1992, 2= 1993-1997, 3 = 1998-2001.

Evasion = log(export value) - log (import value)

Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 10b. Evasion and Tariffs, Controlling for Tariffs of Similar Products: Period Interactions

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
Tariff	0.147	0.214**	0.142	0.217*
	[0.100]	[0.099]	[0.116]	[0.121]
Tariff*Period2	0.269*	0.364**	0.238	0.380**
	[0.142]	[0.146]	[0.180]	[0.186]
Tariff*period 3	0.135	0.151	0.782	1.050*
	[0.183]	[0.201]	[0.501]	[0.583]
Average tariff of similar products	-0.04	-0.072	-0.009	-0.027
(excl own)	[0.096]	[0.098]	[0.110]	[0.123]
Average tariff of similar * period 2	-0.365***	-0.470***	-0.234	-0.292
	[0.137]	[0.136]	[0.172]	[0.186]
Average tariff of similar * period 3	-0.302**	-0.430**	-0.601	-0.697
	[0.154]	[0.186]	[0.433]	[0.558]
N	183820	252295	114781	149454

Note: Standard errors are clustered at the product (HS4) level. All regressions include country X product (HS4) fixed effects, and country X year fixed effects. Period 1= 1988-1992, 2= 1993-1997, 3 = 1998-2001. Similar products are defined as the products in the same 4-digit category excluding the own product.

Evasion = log(export value) - log (import value)

Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table 11. Average Statutory and Effective Tariff Rates (China and India), 1990-2001

	Effective tariff rate (in percent)		**Avg statutory tariff rate (in percent)**		**Effective / Statutory**		**Relative effectiveness of customs**
	China	India	China	India	China	India	India/China
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1990	6.3	49		82		60	
1991	5.7	50		83		60	
1992	4.8	39		56		69	
1993	4.4	34		56		60	
1994	2.7	33		56		59	
1995	2.6	31		43		73	
1996	2.6	33	24	38	11	89	8
1997	2.7	27	18	30	15	89	6
1998	2.7	23	18	30	15	77	5
1999	4.1	23	17	32	24	72	3
2000	4.0	21	17	31	24	67	3
2001	4.2	14	16	31	26	46	2

Source: Government Finance Statistics, Direction of Trade Statistics IMF; WITS

Table 12. Evasion and Tariffs: China and India

	CHINA	INDIA			
	Evasion	Evasion		Evasion2	
	FW	All	FW	All	FW
	(1)	(2)	(3)	(4)	(5)
Panel A: Cross Section 1998					
Tariff	2.637***	0.886***	0.975***	0.530**	1.217**
	[0.658]	[0.172]	[0.356]	[0.214]	[0.492]
N	1837	3464	1478	4308	1735
Panel B: First Difference 1997, 1998					
Change in Tariff	1.71**	0.378	0.840*	0.392	0.842
	[0.85]	[0.336]	[0.483]	[0.395]	[0.608]
N	1617	3149	1360	4065	1679

Note: Standard errors are clustered at the product (HS4) level. All regressions in Panel B include product (HS6) fixed effects and year fixed effects. In Column (1), we replicate the main specifications in Fisman Wei (2004). Columns (2) and (4) replicate their specification with data from India from 1997 and 1998. Column (3) and (5) replicate Fisman and Wei's specification with data from India from 1997 and 1998 restricting the sample to the same products used in the Fisman and Wei study of China.

Evasion = log(export value) - log (import value).

Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A1. Match Rates of Products and Values Across Different Trading Partners

Countryname	Share of HS6 codes that were in both datasets	Number of HS 6 products	Share of Value represented by HS6 in both datasets	N Years Data available for Partner
United States	64.2%	3211	80.2%	14
United Kingdom	62.8%	3128	79.2%	12
Germany	61.9%	3051	83.6%	17
Italy	59.0%	2600	86.8%	11
Singapore	54.1%	2587	83.3%	15
Japan	62.4%	2550	87.4%	16
China	50.1%	2518	76.2%	13
France	53.5%	2399	73.2%	11
Taiwan, China	54.4%	2250	87.5%	5
Netherlands	43.0%	1888	62.9%	13
Hong Kong, China	41.4%	1844	83.5%	12
Switzerland	47.8%	1800	35.8%	17
Belgium	43.6%	1768	95.0%	10
Korea, Rep.	44.9%	1763	68.1%	17
Australia	32.7%	1313	27.7%	17
Sweden	41.4%	1284	70.0%	13
Malaysia	34.7%	1208	82.8%	15
Thailand	33.4%	1174	71.0%	12
Spain	37.4%	1152	52.0%	16
Austria	37.6%	1090	53.2%	11
Russian Federation	25.7%	989	39.9%	8
Canada	34.0%	966	70.4%	16
Indonesia	25.2%	883	68.3%	16
Denmark	30.4%	857	56.5%	15
South Africa	**25.1%**	**742**	**26.9%**	**12**
Nepal	16.3%	677	46.2%	5
Israel	27.9%	628	78.0%	10
Finland	32.2%	582	67.5%	17
Brazil	32.9%	579	66.8%	15
Czech Republic	30.8%	555	52.1%	11
Philippines	26.4%	519	65.8%	4
Ukraine	20.9%	472	36.4%	4
Ireland	24.5%	465	52.8%	13
Norway	27.1%	463	34.9%	12
Sri Lanka	25.9%	425	54.1%	10
Pakistan	18.9%	410	36.4%	2
Turkey	26.5%	370	59.2%	16
Saudi Arabia	**14.3%**	**337**	**20.1%**	**6**
United Arab Emirates	**3.7%**	**326**	**1.4%**	**3**
New Zealand	22.8%	313	44.9%	16

Table A2. Evasion and Tariffs at the Product Level

	Evasion	Evasion 2	Evq	Evq2	Exportsonly
	(1)	(2)	(3)	(4)	(5)
Tariff	0.099**	0.135***	0.143**	0.248***	0.019***
	[0.041]	[0.040]	[0.069]	[0.085]	[0.007]
N	41527	54902	35835	51551	54902

Note: Standard errors are clustered at the product level. All regressions include product (HS6) fixed effects, and year fixed effects. All regressions are weighted by the number of countries from which a product is imported.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table A3. Evasion and Tariffs: Same Set of Products Over Time

	Evasion	Evasion 2	Evq	Evq2	Exportsonly
	(1)	(2)	(3)	(4)	(5)
Tariff	0.089**	0.126***	0.074	0.103	0.013*
	[0.042]	[0.048]	[0.057]	[0.088]	[0.007]
N	142351	158707	96435	110970	158707

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table A4. Evasion, Tariff and Squared Tariff

	Evasion	Evasion 2	Evq	Evq2	Exportsonly
	(1)	(2)	(3)	(4)	(5)
Tariff	0.061	0.105	0.112	0.492***	0.065***
	(0.091)	(0.089)	(0.129)	(0.165)	(0.015)
Tariff^2	0.009	0.005	-0.012	-0.136**	-0.016***
	(0.031)	(0.031)	(0.043)	(0.063)	(0.006)
N	221,502	326,312	152,149	245,103	326,312

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table A5. Evasion and Tariffs: Flexible Functional Form

	Evasion	Evasion 2	Evq	Evq2	Exportsonly
	(1)	(2)	(3)	(4)	(5)
Tariff in first quartile (0<=tariff rate<25)	-0.076	-0.246	-0.338	-0.287	-0.137***
	[0.146]	[0.153]	[0.217]	[0.306]	[0.028]
Tariff in second quartile (25<=tariff rate<35)	-0.041	-0.179*	-0.175	-0.807***	-0.117***
	[0.088]	[0.092]	[0.123]	[0.180]	[0.017]
Tariff in third quartile (35<=tariff rate<50)	-0.014	-0.047	-0.126	-0.469***	-0.073***
	[0.071]	[0.073]	[0.095]	[0.140]	[0.014]
Tariff in fourth quartile (50<tariff rate)	0.064*	0.071*	0.05	0.039	0.005
	[0.038]	[0.042]	[0.051]	[0.076]	[0.007]
N	221073	325861	151960	244899	325861

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.
Evq stands for evasion in quantities, and evq2 assumes extreme smuggling for missing imports.

Table A6. Correlation Between Bulkiness and Differentiation

DepVar: Bulkiness	(1)	(2)
Above Median in StDevLogPrice	-0.007***	
	[0.001]	
Non-Differentiated		0.018***
		[0.001]
N	4879	4655

Note: Robust standard errors in parentheses.

Table A7. Evasion and Tariffs, Share of Values, Sea vs Air

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
tariff	0.092**	0.184***	0.116***	0.231***
	[0.039]	[0.043]	[0.042]	[0.050]
Tariff*air	-0.144**	-0.264***	-0.048	-0.178*
	[0.067]	[0.065]	[0.096]	[0.096]
N	180273	228792	113530	139372

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Tariffs are interacted with the share of value for a country-product going via air or sea.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A8. Evasion and Tariffs: Share of Transactions, Sea vs Air, Differentiated Goods

	evasion	evasion2
	(1)	(2)
tariff	0.224***	0.386***
	[0.053]	[0.055]
Tariff*Air	-0.231***	-0.404***
	[0.081]	[0.077]
N	126000	161000

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Tariffs are interacted with the share of transactions for a country-product going via air or sea. Excluded category is share of transactions through sea.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A9. Value of Imports per Staff, 2002/03

Port	tal Value of Imports, 2002/03 (in mn Rs.)	Working Staff	alue per staff per month (in millions of Rs.)
CALCUTTA (AIR)	49,270	536	8
CALCUTTA (SEA)	222,100	1106	17
CHENNAI (AIR)	178,200	459	32
CHENNAI (SEA)	432,000	894	40
COCHIN (AIR)	2,090	186.5	1
COCHIN (SEA)	75,190	186.5	34
DELHI TUGLAKABAD ICD	102,100	187	45
JNPT	457,700	762	50
MUMBAI (AIR)	277,700	614	38
MUMBAI (SEA)	353,700	1723	17
VISAKHAPATNAM (AIR)	55,080	81	57
VISAKHAPATNAM (SEA)	146,600	81	152
TOTAL	2,351,730	6815	29

Table A10. Evasion and Tariffs, Main Trading Partners

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
USA	0.03	0.09	0.11	0.175
	[0.100]	[0.108]	[0.115]	[0.134]
N	21324	25787	13349	15291
UK	0.258**	0.338***	0.442**	0.530**
	[0.124]	[0.127]	[0.214]	[0.221]
N	16949	22201	10711	12901
Japan	0.046	0.077	0.05	0.137
	[0.060]	[0.071]	[0.068]	[0.085]
N	19978	24231	13577	15761
Germany	0.124**	0.193***	0.170***	0.253***
	[0.050]	[0.057]	[0.058]	[0.068]
N	24997	30889	16248	18556
Italy	0.036	0.039	0.746**	0.481
	[0.199]	[0.192]	[0.369]	[0.372]
N	11342	15192	6769	8415
France	-0.103	0.001	0.074	0.223
	[0.192]	[0.190]	[0.399]	[0.409]
N	9633	13216	5977	7647
Singapore	-0.051	-0.05	0.005	0.046
	[0.098]	[0.080]	[0.133]	[0.108]
N	15714	24861	9143	13317
China	0.035	0.281	0.134	0.671*
	[0.267]	[0.269]	[0.365]	[0.353]
N	10426	14762	6206	8155

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and year fixed effects.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A11. Evasion and Tariffs - Region and Sea-vs Air

	All products		Basic, capital and intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
tariff	-0.117	-0.185**	0.048	-0.016
	[0.079]	[0.086]	[0.106]	[0.121]
Tariffs*Asia*Sea	0.140*	0.264***	-0.024	0.143
	[0.078]	[0.081]	[0.104]	[0.114]
Tariffs*Europe*Air	0.248***	0.268***	0.247**	0.241*
	[0.089]	[0.095]	[0.117]	[0.136]
Tariffs*Europe*Sea	0.288***	0.461***	0.151	0.324**
	[0.090]	[0.097]	[0.116]	[0.130]
Tariffs*Other*Air	0.005	0.210*	-0.124	0.121
	[0.108]	[0.114]	[0.143]	[0.157]
Tariffs*Other*Sea	0.174	0.423***	0.075	0.305**
	[0.114]	[0.113]	[0.144]	[0.151]
N	180273	228792	113530	139372

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Tariffs are interacted with the share of transactions for a country-product going via air or sea. Excluded category in Table A7 share of transactions through sea. Excluded category in Table A8 share of transactions through air in Asia.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A12. Evasion and Tariffs- Sample Split by Institutional Quality of Partner

	All goods		Basic, capital, intermediate	
	evasion	evasion2	evasion	evasion2
	(1)	(2)	(3)	(4)
Panel A: Top 15 countries - ICRG				
tariff	0.084**	0.105***	0.128***	0.171***
	[0.037]	[0.039]	[0.042]	[0.048]
N	138704	191634	88413	114369
Panel B: Other countries				
tariff	0.069	0.119*	0.166	0.214**
	[0.073]	[0.070]	[0.106]	[0.094]
N	82369	134227	47823	73532

Note: Standard errors are clustered at the product level. All regressions include country X product (HS6) fixed effects, and country X year fixed effects. Countries are selected based on the composite ICRG index.
Evasion = log(export value) - log (import value).
Evasion2 = log (1+ export value) - log (1+ import value), evasion2 assumes that products reported by exporting countries but missing in Indian imports are smuggled completely.

Table A13. Characteristics of Products Included in Fisman-Wei Sample

Dependent Variable:	Capital, Basic & Intermediate	Non-Differentiated	StdLog Price	Above Median in StdLogPrice	Bulkiness
	(1)	(2)	(3)	(4)	(5)
fwsample	-0.132***	-0.319***	0.120***	0.048***	-0.011***
	[0.016]	[0.014]	[0.012]	[0.015]	[0.001]
N	4062	4661	4710	4888	4881
Sample of Capital, Basic and Intermediate Goods					
fwsample		-0.323***	0.104***	0.02	-0.009***
		[0.021]	[0.017]	[0.022]	[0.001]
N		2093	2206	2210	2207

Note: Robust standard errors in parentheses.

Table A14. Freeman's Occupational Database, Comparator Groups

Customs inspectors		Customs commissioners	
code	occupation	code	occupation
3	Plantation supervisor	11	Coalmining engineer
5	Forest supervisor	14	Petroleum and natural gas engineer
15	Petroleum and natural gas extraction technician	44	Journalist
16	Supervisor or general foreman	52	Chemical engineer
22	Dairy product processor	61	Occupational health nurse
45	Stenographer-typist	76	Power distribution and transmission engineer
46	Office clerk	114	Ship's chief engineer
53	Chemistry technician	129	Accountant
54	Supervisor or general foreman	133	Computer programmer
72	Electronics engineering technician	138	Computer programmer
91	Stenographer-typist	145	Mathematics teacher (third level)
92	Stock records clerk	146	Teacher in languages and literature (third level)
93	Salesperson	147	Teacher in languages and literature (second level)
94	Book-keeper	148	Mathematics teacher (second level)
95	Cash desk cashier	149	Technical education teacher (second level)
96	Salesperson	150	First-level education teacher
97	Hotel receptionist	151	Kindergarten teacher
101	Ticket seller (cash desk cashier)	152	General physician
102	Railway services supervisor	153	Dentist (general)
108	Road transport services supervisor	154	Professional nurse (general)
118	Air transport pilot	155	Auxiliary nurse
119	Flight operations officer	156	Physiotherapist
120	Airline ground receptionist		
124	Air traffic controller		
130	Stenographer-typist		
131	Bank teller		
132	Book-keeping machine operator		
134	Stenographer-typist		
136	Insurance agent		
137	Clerk of works		
140	Stenographer-typist		
142	Office clerk		
157	Medical X-ray technician		