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## **Close Eye or Closed Eye**

The Case of Export Misinvoicing in Bangladesh

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## **INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE**

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## Contents

|  |    |
|--|----|
| Abstract                                 | v  |
| 1. Introduction                          | 1  |
| 2. A Simple Model of Export Misinvoicing | 4  |
| 3. Data and Descriptive Statistics       | 9  |
| 4. Results                               | 19 |
| 5. Concluding Remarks                    | 23 |
| Appendix: Supplementary Tables           | 24 |
| References                               | 25 |

## Tables

|  |    |
|--|----|
| 3.1—Rate of cash subsidy on exports of different products                          | 10 |
| 3.2—Recent profile of subsidy disbursements in Bangladesh (in millions of dollars) | 12 |
| 3.3—Classifications used from Comtrade dataset                                     | 16 |
| 3.4—Variation in misinvoicing before and after the subsidy                         | 17 |
| 3.5—Misinvoicing across commodities with identical trading partners                | 18 |
| 3.6—Complete smuggling pre- and postsubsidy and in new and old markets             | 18 |
| 4.1—Misinvoicing of value of exports and introduction of a subsidy                 | 19 |
| 4.2—Misinvoicing of quantity of exports and introduction of a subsidy              | 19 |
| 4.3—New trade and misinvoicing in export values                                    | 20 |
| 4.4—New trade and misinvoicing in export quantities                                | 20 |
| 4.5—Misinvoicing at the product level  | 21 |
| 4.6—Products and the average level of subsidy                                      | 22 |
| 4.7—Effect of level of subsidies on misinvoicing                                   | 22 |
| A.1—Summary statistics on misinvoicing of exports pre and post subsidy             | 24 |

## Figures

|   |    |
|---|----|
| 2.1—Expected penalty and misinvoicing                                       | 5  |
| 3.1—Sample Central Bank circular on export subsidy (translated from Bangla) | 11 |
| 3.2—Number of years new markets accessed after subsidy, shrimp              | 13 |
| 3.3—Number of years the prior market accessed postsubsidy, shrimp           | 14 |
| 3.4—Number of years in new markets, postsubsidy, jute                       | 14 |
| 3.5—Number of years old markets accessed, jute                              | 14 |
| 3.6—Persistence in new markets in textiles after introduction of subsidy    | 15 |

## ABSTRACT

Export subsidies can generate or curb many perverse incentives for exporters, their expansionary effects on exports notwithstanding. These include expansion into *soft* markets or even deflection of domestic production into markets with similar taste and product specifications. Also, if there is under-invoicing, in principle it should decline with export subsidies since the government makes cash transfers based on the invoice presented to the authorities. In this paper, we study the effect of export subsidies on the under-invoicing of exports in Bangladesh. In a framework that allows for unobserved heterogeneity among importing countries and product specificities, we find evidence for under-invoicing in Bangladesh. The evidence at first seems counterintuitive, with a statistically significant increase in under-invoicing after introduction of a subsidy. After a more careful analysis, however, the positive incentives for under-invoicing can be explained by reasons such as black market premium (BMP) in foreign exchange markets or domestic tax evasion (among other factors). Even though BMP has been declining in Bangladesh over time, the incentives to evade domestic taxes (particularly with a nonlinear tax schedule and inclusion of subsidies on the inflow side of a firm's balance sheet) remain strong, bolstered by weak enforcement.

**Keywords:** export subsidies, under-invoicing, over-invoicing, domestic taxes



## 1. INTRODUCTION

The government should waive all taxes from the export subsidies. We are facing another problem in receiving the cash subsidies, as tax offices calculate the amount directly as profit, and cut corporate tax on it.—Former president of Bangladesh Knitwear Manufacturers and Exporters Association (BKMEA) Fazlul Huq

With import substitution policies having failed and now being discredited, there has been a shift in favor of interventions on behalf of export interests (Panagariya 2000), their possible detrimental effects notwithstanding. Many countries have opted for some form of heterodox opening, liberalizing exports while keeping import barriers high. Bangladesh is one such country that has relied heavily on subsidies to promote exports across a wide array of products including agriculture as well as manufacturing.<sup>1</sup> Currently the most important exports for Bangladesh are textiles and apparel, followed by primary products such as fisheries and jute products. Across all leading products, the export subsidies are ubiquitous. Importantly, even for products that are not among the leading exports (for example light engineering products, bicycles, and bone meal) the government has relied on subsidies to expand exports (both extensively—encouraging new markets—as well as intensively—deepening exports in existing markets).

Bangladesh introduced a cash incentive (export subsidy) program back in July 1994. Initially it was for export of jute goods produced by government and nongovernment mills, and export-oriented local textiles. Since then, the scope and extent of the cash incentive program have expanded. For example, a cash incentive for leather goods (a 100 percent export-oriented industry) was introduced in April 2000 (Deb and Bairagi 2009). In case of agricultural products, a cash incentive was introduced in 2002. Over time several new products have been added to the list.

Leaving aside fiscal or efficiency costs, such subsidies are rationalized to meet several objectives including export diversification for Bangladesh. Apart from distortionary effects of trade policies in terms of resource misallocation, interventions on both the import and the export side create perverse incentives on reporting of trade. A high tariff barrier, for example, creates incentives to underreport values or volumes so that trade tax can be avoided.

Bhagwati (1964) pointed to this possibility during the heyday of import substitution policies in many parts of the world. In particular, Bhagwati (1964) suggested that the discrepancies between a country's reported imports and the corresponding exports reported by its trading partners may be explained by the undervaluation or misclassification of imports at the border in order to reduce the tariff burden. More recently, there has been a spate of papers in the literature that empirically investigate the effect of the level of trade taxes on misreporting of imports to evade tariffs, beginning with Fisman and Wei (2004). Other studies on this topic include Levin and Widell (2007) for Kenya and Tanzania; Mishra, Subramanian, and Topalova (2008) for India; Javorcik and Narciso (2008) for eastern European countries; Bouët and Roy (forthcoming) for three African countries; and Van Dunem and Arndt (2006) for Mozambique.

Similar to those for misreporting of imports, incentives exist among exporters to misreport their values or volumes for a variety of reasons. The potential for misinvoicing of exports has long been analyzed theoretically, mostly in relation to the presence of black market premium (BMP) in the foreign exchange market or capital controls (see, for example, Biswas and Marjit 2005, Buehn and Eichler 2011, and Patnaik and Deepa 2000). Note that the policy (capital control) and the outcome (BMP) both relate to the context of the external sector. In a situation of weak enforcement (low expected penalty) where misinvoicing as a strategy can be implemented, *ceteris paribus*, export subsidies are expected to result in over-invoicing to claim the subsidy that is based on revealed exports.

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<sup>1</sup> Bangladesh liberalized its food grain imports for wheat and rice in 1993 and 1994, respectively, but in general tariffs and other barriers continue to be high for most products in Bangladesh.

At the same time, domestic policies could also motivate misinvoicing of exports. Profits earned (that are revealed) are generally subject to domestic taxes (on net earnings), based usually on nonlinear tax schedules. In such a scenario, incentives would exist to under-invoice exports. The nonlinearity in tax schedules implies that returns from under-invoicing would rise with the level of exports (assuming that higher exports correlate with higher profits or earnings). Now if exports rise with the introduction of an export subsidy, it is possible that incentives for under-invoicing (to avoid domestic taxes) would prevail over those for over-invoicing that would most likely result from export subsidization per se. Further, the propensity to under-invoice exports would get stronger if the subsidy itself is treated as taxable, that is, as an income flow to the firms involved.<sup>2</sup>

Over-invoicing of exports to take advantage of export subsidies and under-invoicing to evade domestic taxes in many countries, including Bangladesh, have been covered extensively in the media and elsewhere. Pak and Zdanowicz (2002) estimated a federal income tax loss in 2001 of more than US\$37 billion<sup>3</sup> to the US government from under-invoicing of exports. Beja (2008) assessed Chinese trade between 2000 and 2005, finding net trade misinvoicing of US\$287.6 billion. In the case of smaller exporters as well, misinvoicing of exports is quite prevalent. In Pakistan, for example, textile exporters were alleged to have over-invoiced to get \$150 million in transfers 2003, while the opposite was put forth as a possibility for marble exporters (*Dawn News* 2003). According to All Pakistan Marble Mining Processing Industry and Exporters Association (APMMPIEA), under-invoicing to the extent of 300 percent was done in order to avoid domestic taxes (*Daily Times* 2010). In Bangladesh as well, many cases of possible misinvoicing have been reported. In 2007, for example, a probe was ordered in Bangladesh on under-invoicing of jute exports.

The opposite, over-invoicing happened in the case of jamdani sari exports from Bangladesh to India. The Bangladesh government first introduced an export subsidy on jamdani saris in 1997. Subsequently, the volume of reported exports was found to be many times higher than the total capacity of the country. Bangladesh has a very strong hundi system (informal system of foreign exchange) with India. After several investigations, the government had to stop the subsidy through gradual reduction.

At the outset, if these are the channels, with the advent of an export subsidy, positive incentives to under-invoice would be expected to be more likely for larger exports vis-à-vis the smaller ones (since benefits from tax evasion would be higher). Hence, once exports expand upon allotment of a subsidy, irrespective of the source of expansion (extensive—across destination markets—or intensive—within existing markets), we would likely see under-invoicing of exports; conversely, the tendency would be for over-invoicing (or reduced under-invoicing) if exports did not change significantly. The effect on invoicing of introducing an export subsidy would ultimately depend on the rate of the subsidy in relation to the tax rate for earnings, on the strength of enforcement, and on the level of exports that emerges after the policy is put in place.

In spite of widespread evidence of large-scale misinvoicing of exports, the issue remains under researched, especially in comparison with the literature on tariff evasion. There are several reasons for this. First, unlike tariffs, export subsidies apply to only a few commodities. Moreover, in general, there also tends to be small variation in the level of export subsidies across products and over time. These facts result in limited variation in the data that can be used for rigorous empirical analysis.

In this paper, we study the effect of the introduction of a cash subsidy on the invoicing of exports in Bangladesh.<sup>4</sup> This issue is important for several reasons. First, the fiscal effects of misinvoicing are important, running into billions of Bangladeshi takas (BDT). From this perspective, the effects are similar for domestic or border tax evasion and for subsidy retrieval through misreporting. When there is misreporting, the government's payables or receivables are different than those projected. In the specific

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<sup>2</sup> Support to the exporting sector is disbursed in the form of a direct cash transfer conditional on presentation of the proof for exporting that, in principle, could be audited.

<sup>3</sup> All dollar amounts are in US dollars.

<sup>4</sup> Beyond cash subsidy, the exporting sector usually enjoys other incentives, such as duty-free imports of capital machinery and raw materials, income tax rebates, fast customs clearance, and credit subsidy. We concentrate our focus on export subsidy.



case of export subsidy, misinvoicing can have several unwanted effects and can in principle undermine the rationale for the subsidy. If subsidies are motivated from infant-industry arguments with a target to expand or diversify exports, misinvoicing can result in a distorted picture of policy effects on these fronts. In particular, some new and soft markets (in terms of stringency of product standards for example) could be opened up, wherein exporters could easily recoup the costs of market entry and more through over-invoicing.

Bangladesh is a small open economy lacking market power, so export subsidies used for retaliation against a trading partner or as a means for rent shifting cannot be optimal. Subsidies could still be proposed to implement heterodox opening. The heterodox opening idea is loosely related to the Lerner symmetry theorem, wherein an import tax is treated as an export tax. This export tax emanating from import protection could be offset by an export subsidy to neutralize the anti-export bias in import protection. In countries with weak institutions, such as in Bangladesh, misinvoicing of imports as well as exports can occur, implying that the preconditions for Lerner symmetry to work do not remain. One of the preconditions is that misinvoicing involving real costs does not occur (see Panagariya 2000).

In the paper, we first show theoretically our conjecture discussed above, that even though under-invoicing should go down with export subsidies, the incentives could reverse (even more so) if a nonlinear tax schedule is applied to earnings from exports. Two points are important here. First, it is possible that the extent of under-invoicing could be lower for a given level of exports with an export subsidy than without. It is just that the true level of exports rises post-subsidy (in some cases it could even emerge for the first time). Thus, under-invoicing would be affected positively by an export subsidy primarily because the net effect of increased exports leads to under-invoicing, rather than the over-invoicing that would be expected with status quo exports. Second, carrying out misinvoicing would most likely require some collaboration between exporters and importers. Entry into new markets with small exports would face weaker incentives for under-invoicing (and stronger for over-invoicing), but since these markets are characterized by small tenure of presence of the Bangladeshi exporters and weak institutional quality of the importers, the net effect on misinvoicing could be ambiguous. Some markets could be targeted specifically to claim subsidy and therefore the over-invoicing motive would dominate, particularly with low levels of exports. A priori, the pattern of misinvoicing across products and trading partners remains an empirical question.

With this background, empirically, in a specification that controls for unobserved characteristics of products and trading partners, we find that upon the introduction of an export subsidy, there is a significant effect on under-invoicing of exports. Our results also indicate that trading partner characteristics have an even more significant bearing on the effect of export subsidy on under-invoicing than do product characteristics. Considering both sets of characteristics together, the analysis here also serves as an identification of under-invoicing of exports in Bangladesh. If introduction of an export subsidy increases under-invoicing across trading partners and products, this finding would help establish the incidence of under-invoicing, since if it exists with a subsidy, it most likely exists without it. Stratifying by high (greater than or equal to 15 percent) medium (10 to 15 percent) and low (less than 10 percent) rates of export subsidy, we find that high levels of export subsidy result in over-invoicing while the converse holds for low levels.

The paper is organized as follows. Section 2 presents a simple theoretical model that outlines the channels linking export subsidies and invoicing of exports. Section 3 presents the data description and summary statistics. Section 4 discusses the empirical results. Section 5 concludes.

## 2. A SIMPLE MODEL OF EXPORT MISINVOICING

The simple model here builds upon the canonical model of misinvoicing described by Biswas and Marjit (2005). At any given point in time, an exporter has three reporting choices. She can report the true value of exports, or she can either under-invoice (report a value lower than the true value) or over-invoice (report a value higher than the true value). According to Biswas and Marjit (2005), two factors determine misinvoicing: a black market premium (BMP) in the foreign exchange market and an export subsidy. Obviously, the former encourages under-invoicing while the latter creates incentives for over-invoicing. Either kind of misreporting is illegal, and we assume that there is a penalty (pecuniary) that is stochastic, occurring with a known nonzero subjective probability. Deviating from Biswas and Marjit (2005), we also incorporate a role for domestic taxes, which in terms of anecdotal evidence seem to be one of the principal drivers of under-invoicing. Following the notation used by Biswas and Marjit (2005), we build additional factors into the model to analyze misinvoicing.

### Model with Exogenous Exports

Following are the variables used in the model:

$X_0$ : Reported or official dollar value of exports

$X$ : Actual dollar value of exports

$e$ : Official exchange rate

$E$ : Unofficial (market) exchange rate

$s$ : Per-unit subsidy on the dollar value of official exports

$T$ : Total tax payments imposed on the exporter

$t$ : Unit tax rate, assumed to be a nonlinear function of earnings

Let  $\alpha$  denote the rate of misinvoicing. Then, by definition,

$$X_0 = (1 - \alpha)X \tag{1}$$

As discussed above, misinvoicing can potentially result in penalties for the exporter. Penalty  $F$  is assumed to be a convex function of the amount misinvoiced. This penalty for misreporting is assumed to occur with a nonzero probability  $\rho$ .

With these variables, the objective function for a misinvoicing exporter maximizing profits is given as

$$\text{Max } \pi = e(1 - \alpha)(1 - t)X + E\alpha X + es(1 - t)(1 - \alpha)X - \rho F(\alpha X e) \tag{2}$$

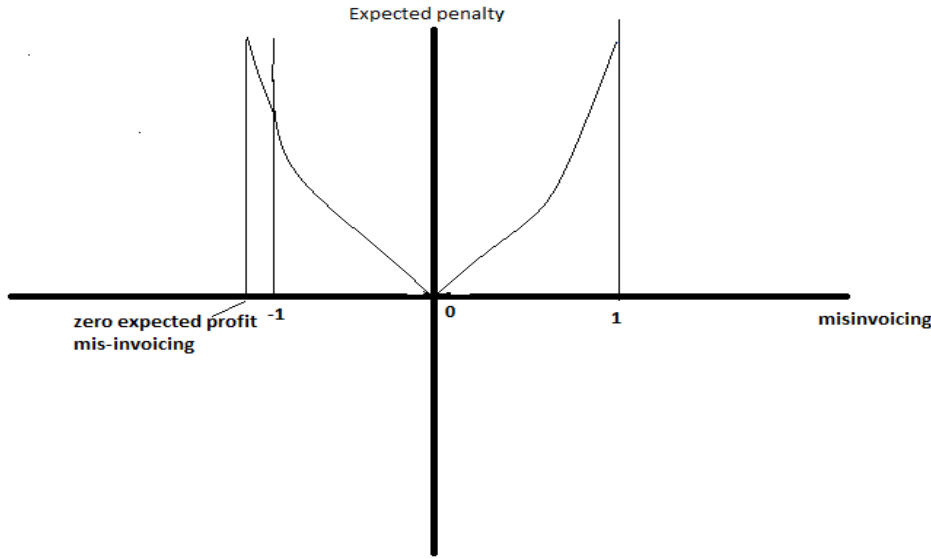
In equation 2, the first Right Hand Side (RHS) term represents the revenues (net of taxes) in domestic currency evaluated at the official exchange rate. Even though the BMP factor in misinvoicing is not the focus of this paper, its role in the context of exchange rate controls needs to be recognized. The second term in Equation (2) is the return that accrues from selling the dollars earned from concealed exports on the black market for foreign exchange. If BMP exists, then  $E > e$ . Since the earnings from this market are underground, they are untaxed. The black market usually offers a better exchange rate for larger dollar amounts and therefore  $E$  could be a function of  $\alpha X$  and could at the margin have different effects on the incentives to misinvoice. For simplicity and also to focus on other channels (subsidy, domestic taxes) we refrain from including differential pricing of foreign exchange based on amounts exchanged.

The third term in Equation (2), the subsidy retrieval, forms the core of this paper. It includes both  $s$  and  $t$ : export subsidy and domestic tax, respectively. Note that the subsidy is paid out based on revealed exports valued at the official exchange rate. Further, the formulation treats subsidy earnings as taxable.

This structure is adopted to match the context of Bangladesh, where subsidies are counted as part of net earnings for tax purposes.

The final term in Equation (2) represents the expected penalty from misinvoicing, where the fines are assumed to be a nonlinear function of the amount concealed or over-invoiced (that could possibly be unearthed). The penalty function is thus indiscriminate toward the direction of misinvoicing and depends only on the size of misreporting. With this structure, it follows that the expected marginal loss from penalty equals zero only when there is truthful revelation. The expected penalty is assumed to be convex in under-invoicing and over-invoicing separately. Since  $\alpha$  is bounded at one for under-invoicing, the symmetry between penalties for under- and over invoicing exists until either type is complete. On the side of over-invoicing  $\alpha$  can extend up to the level such that expected profits drop to zero (Figure 2.1).

**Figure 2.1—Expected penalty and misinvoicing**



Source: Author's creation.

For a given level of  $e$ ,  $E$ ,  $t$ ,  $s$ , and  $X$ , the choice problem for an exporter is to choose  $\alpha$  to maximize  $\pi$ . Recall that  $\alpha > 0$  implies under-invoicing while negative values of  $\alpha$  imply over-invoicing.  $\alpha$  thus can be negative and is only bounded by the condition that not more than the total amount of exports can be concealed—that is,  $\alpha \leq 1$ . The first-order condition for maximization is given as

$$\frac{\partial \pi}{\partial \alpha} = -e(1-t)X + EX - es(1-t)X - \rho X e F'(\alpha X e) = 0^5.$$

Grouping terms and canceling out the common factor  $X$ , we have

$$-e(1-t)(1+s) + E - \rho e F'(e\alpha X) = 0. \quad (3)$$

Equation (3) equates the marginal benefit of misinvoicing with the marginal cost, which in this simple framework is just the expected penalty. Note the opposite effects from the subsidy rate and the marginal tax rate (here assumed to be equal to the average tax rate). If there is neither tax nor subsidy, then BMP would determine misinvoicing. Equation (3) shows, in that case, whenever BMP exists there will be under-invoicing unless the effect is outweighed by the penalty, which could be the case when the size of the penalty  $F(\alpha X)$  is sufficiently large, the enforcement is stricter (high values of  $\rho$ ), or both.<sup>6</sup>

<sup>5</sup> With a convex penalty function, the second-order condition is satisfied.

<sup>6</sup> The simplifying assumption is that the only cost of cheating is a possible fine. However, there could be other costs such

Given the symmetry of the penalty function (with regard to direction of misinvoicing), truthful revelation of exports will occur if there is neither tax nor subsidy and there is no BMP as well. The fact that the penalty is assessed in domestic currency does not play any role in this specific case.

In absence of BMP and domestic taxes, Equation (3) implies that there will be over-invoicing to the extent that the marginal benefit from over-invoicing (the subsidy) equals the marginal loss in terms of expected penalty.

*Proposition 1. If subsidy accruals are not taxed, then the marginal benefit of misinvoicing depends on the BMP and on the difference between the tax rate and the rate at which subsidy is applied. Without BMP and without a wedge between tax and subsidy rate, a corner solution is obtained—truthful revelation.*

*Proof.* Proof of Proposition 1 follows directly by putting  $t = 0$  in the subsidy accrual term. The first-order condition in Equation (3) converts to

$$E - e + e(t - s) + \text{expected marginal loss from penalty} = 0.$$

As a corollary, when subsidy accruals are taxed, the marginal benefit of under-invoicing goes up by the amount of tax savings on a unit of subsidy.

The discussion above has focused on a case wherein the level of exports is fixed. In reality, every time an export subsidy is introduced, there is in general an increase in exports. Across all commodities this has been the case in Bangladesh (assuming of course that the stated figures represent increased trade above over-invoicing if any). This concern is mitigated to some extent by looking at the changes using the data from the importing country. The increase in exports can be expected for various reasons. First, the cash subsidy provides some insurance against the risk of exporting to a new market. It can also cover costs that are usually associated with exporting (along the extensive as well as the intensive margin in trade).

If there is change in exports (in actual terms), incentives for misinvoicing can get altered. The variation in export subsidy would, for example, take into account the fact that payoffs from misinvoicing have to be assessed at new levels of true exports. With respect to domestic taxes also, if marginal tax rates vary nonlinearly with the level of earnings, as is usually the case, the incentives to misinvoice could be significantly different. With linear subsidy, tax schedules, or both, the effect of the level of exports on the incentives to misinvoice is ambiguous. Consider, for example, an exogenous change in the level of exports. From Equation (3),

$$\frac{\partial^2 \pi}{\partial \alpha \partial X} = -e(1 - t)(1 + s) + E - \rho e F' - \rho e^2 \alpha X F''.$$

Thus, the sign of the effect of the level of exports on the net marginal benefit of misinvoicing in general would be ambiguous. Even if taxes and subsidies were zero and there existed a BMP, the marginal gain from under-invoicing (assuming that to be the optimal choice) would depend on the size of BMP relative to the expected increase in penalty. Clearly, for sufficiently low enforcement (small values of  $\rho$ ), the marginal benefit of under-invoicing will decrease with the level of subsidy, increase with the level of tax, and also increase with the size of BMP.

Formally, for low levels of enforcement ( $\rho \approx 0$ ), the effect of increased exports on net marginal benefit of under-invoicing equals

$$\text{BMP} + \text{Tax} - \text{subsidy wedge evaluated at official exchange rate } e(t - s) + \text{tax on a unit of subsidy in domestic currency evaluated at official exchange rate } (ets)$$

Hence, as exports increase, the tendency to under-invoice will go up if the tax rate is higher than the subsidy rate. Note that even if the two rates are equal, there could still be a positive push toward under-invoicing as long as subsidies that accrue are taxed. The effects of taxes and subsidies, respectively, on net marginal benefit of invoicing are unambiguous, as shown in Equations (4) and (5):

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need to pay bribes, loss of reputation etc. The expression in equation 3 represents the monetary equivalent of such costs.

$$\frac{\partial^2 \pi}{\partial \alpha \partial t} = e(1 + s) > 0 \quad (4)$$

$$\frac{\partial^2 \pi}{\partial \alpha \partial s} = -e(1 - t) < 0 \quad (5)$$

### Exports Varying with Subsidies and Taxes Varying with Exports

In the characterization of misinvoicing above, introduction of an export subsidy should lead to over-invoicing, and that result holds for a given level of exports. However, if the level of exports changes and tax burdens accompany this change, a different prediction is possible. For identifying the effects of introducing an export subsidy on invoicing in a more realistic framework, we need to incorporate the following fact. Subsidies could expand exports, and if export earnings are taxed (especially nonlinearly), incentives to under-invoice could even overwhelm those for over-invoicing. Thus, modifications need to be made in the model such that exports vary with subsidies and taxes vary with exports. Below we extend the model, making those two modifications. We make the level of true exports a function of the level of  $s$ :

$$X = X(s) \text{ and } \frac{\partial X}{\partial s} > 0. \quad (6)$$

We also make the tax schedule a nonlinear function of the level of declared exports in domestic currency:

$$t = t(eX_0) = t[e(1 - \alpha)X], t' > 0 \text{ and } t'' > 0. \quad (7)$$

With these changes, the modified objective function is given as

$$Max \pi = e(1 - \alpha)(1 - t(eX_0))X + E\alpha X + es(1 - t(eX_0))(1 - \alpha)X - \rho F(\alpha X e) \quad (8)$$

In this modified objective function, the documented trade enters as an argument in the per-unit tax rate, presenting the most basic channel for linking invoicing behavior to the level of exports. It will become clear that without this dependence, the choices in invoicing would be independent of the level of true exports. There are other ways through which this linkage could be obtained, for example by introducing variation in BMP based on amounts exchanged or by making the level of exports contingent on subsidy or the subsidy rate dependent on the level of exports. Here we focus on the tax channel.

For the modified objective function in Equation (8), the first-order condition for the choice of  $\alpha$  is given as  $-eX + EX - eXs + teX + t'(ex)^2(1 - \alpha) - \rho F'eX = 0$ . Rearranging, we get

$$(E - e) + e(t - s) + t'Xe^2(1 - \alpha)(1 + s) + ets - \rho F'e = 0. \quad (9)$$

The first term in Equation (9) represents the BMP. The second term is the marginal net gain in terms of the tax subsidy wedge. The third term captures the changes in marginal tax burden through changes in the tax rate, which is affected through levels of documented trade. The final term is how the expected penalty changes as under-invoicing goes up at the margin.

Let  $\alpha^*$  denote the optimal level of under-invoicing;  $(1 - \alpha^*)$  is then the proportion revealed. Equation (9) implies

$$(1 - \alpha^*) = \frac{-[(\frac{E}{e}-1)+(t-s)+ets-\rho F']}{t'eX(1+s)} \quad (10)$$

Since  $t' > 0$ , from Equation (9), the proportion revealed decreases with BMP and with the tax–subsidy wedge, and goes up with greater probability of enforcement. The effect is ambiguous with respect to the level of subsidy. Similarly, the sign with respect to the level of exports is ambiguous. Note that on the right hand side (RHS) of Equation (10),  $t, F'$ , and  $t'$  all include  $\alpha$  as an argument, so it is not a closed-form solution for  $(1 - \alpha^*)$ .

The effect of a linear tax rate such that the slope of the tax schedule is constant, and of a nonlinear unit tax schedule, relates to Proposition 2 below.

*Proposition 2. With a linear tax schedule, ceteris paribus under-invoicing increases with the level of exports. With a nonlinear tax schedule, the marginal gain from under-invoicing rises with exports for a sufficiently small probability of punishment.*

*Proof.* The proof follows straightforwardly from Equation (10) when  $t'$  does not depend on level of documented trade. If  $t' > 0$  but is not a constant—that is, if  $t'' \neq 0, t'' \neq 0$ —then the sign of the effect of higher exports on under-invoicing would be ambiguous.

Consider first the case in which unit tax rate is independent of the level of documented exports. Then change in the marginal gain from invoicing with the level of exports is given as

$$\frac{\partial^2 \pi}{\partial \alpha \partial X} = (E - e) + et + ets - es -$$

*Changes in marginal damage from invoicing with increase in exports.* (11)

In this simple case, ignoring the last term (assuming weak enforcement), the change in the marginal benefit from a unit change in exports is simply the BMP, the tax savings, and the subsidy retrieval (all evaluated at the official exchange rate). We will see below that several new effects come into play when the unit tax rate is made conditional on the level of documented trade.

The term  $(E - e) + et + ets - es$  is the marginal gain from under-invoicing when the unit tax rate is fixed. With tax rate as a function of the level of documented exports—that is,  $t = t[(1 - \alpha)eX]$ —Equation (11) becomes

$$\frac{\partial^2 \pi}{\partial \alpha \partial X} = (E - e) + et + ets - es + [3e^2X(1 - \alpha)t' + e^3X^2(1 - \alpha)^2t''] -$$

*Changes in marginal damage from invoicing with increase in exports* (12)

With unit tax rate varying by the level of documented exports, both the slope of the tax schedule and its curvature have a bearing on the marginal benefits from under-invoicing. With a convex tax schedule, under-invoicing would become more likely with an increase in exports. Now if the optimal response to a subsidy is to expand exports (not modeled here) then post subsidy, we could get under-invoicing as opposed to the over invoicing or less under-invoicing that would be expected based on status quo exports.

With this backdrop, the next section describes the data and presents some motivating descriptive statistics for the empirical analysis following it. The treatment variable in our analysis is the initiation of an export subsidy as opposed to the level of the subsidy, since there is small variation along the latter dimension.

### **3. DATA AND DESCRIPTIVE STATISTICS**

To examine the effect of an export subsidy and identify misinvoicing, we combine data on Bangladesh's exports by industry (the ones that were allocated a subsidy at some time during the period from 1990 to 2007). This section describes the data we use and provides a first glance at trade patterns and misinvoicing before and after introduction of an export subsidy.

#### **Data on Trade Flows and Profile of Export Subsidies in Bangladesh**

We obtained data from UN Comtrade on all export flows of Bangladesh in the industries that at some point were allotted an export subsidy. We matched the data from three-digit Standard Industrial Classification (SIC) codes to the list of products that were allotted subsidy, as outlined in Table 3.1. Prior to introduction of the subsidy, the products are assumed not to have received any export incentives. For some products subsidies were removed and sometimes reinstated. The level of export subsidies has mostly varied in the 10- to 20-percent range (except for agroproducts for a limited period of time—see Table 3.1), implying little variation across time, products, or both. This limited variation dictated our empirical strategy for identifying the effects of export subsidy. Instead of using variation in subsidy rates across products and time, we will use the introduction of a subsidy as our variable of interest, and the variation is observed before and after introduction of the subsidy. An indicator variable equal to one for periods under subsidy and zero otherwise is our main variable of interest in the empirical analysis.

**Table 3.1—Rate of cash subsidy on exports of different products**

| Product  | Year of subsidy introduction | Rate of cash subsidy on exports (% , by fiscal year) |         |         |                    |                    |         |                                |         |         |         |
|--|------------------------------|--|---------|---------|--------------------|--------------------|---------|--------------------------------|---------|---------|---------|
|  |                              | 2002/03  | 2003/04 | 2004/05 | 2005/06            | 2006/07            | 2007/08 | 2008/09                        | 2009/10 | 2010/11 | 2011/12 |
| Frozen shrimp and other fish                             | 2002                         | 10   | 10      | 10      | 10                 | 10                 | 10      | 10 (Jul-Mar)<br>12.5 (Apr-Jun) | 12.5    | 10      | 10      |
| Agroproducts (vegetables and fruits)                     | 2002                         | 15   | 25      | 25      | 30                 | 20                 | 20      | 20                             | 20      | 20      | 20      |
| Jute goods   | 1994                         |  |         |         |                    |                    | 7.5     | 7.5                            | 10      | 10      | 10      |
| Export-oriented local textiles                           | 1994                         |  |         |         |                    |                    | 5       | 5                              | 5       | 5       | 5       |
| Potatoes   | 2004                         |  | 15      | 15      | 20                 | 10                 | 10      | 10                             | 10      | 10      | 20      |
| Processed agroproducts                                   | 2002                         | 15   | 25      | 25      | 20–30 <sup>#</sup> | 20–30 <sup>#</sup> | 20      | 20                             | 20      | 20      | 20      |
| Leather goods  | 2000                         |  |         |         |                    |                    | 15      | 15                             | 17.5    | 15      | 12.5    |
| Tobacco  | 2003                         |  |         |         |                    | 10                 | 10      |                                |         |         |         |
| Hatching eggs and day-old chicks of poultry industries   | 2005                         |  |         |         |                    |                    | 15      | 15                             | 15      | 15      | 15      |
| Halal meat   | 2006                         |  |         |         |                    | 20                 | 20      | 20                             | 20      | 20      | 20      |
| Bicycles   | 2002                         |  |         |         |                    |                    | 15      | 15                             | 15      | 15      | 15      |
| Light engineering products                               | 2007                         |  |         |         |                    |                    | 10      | 10                             | 10      | 10      | 10      |
| Light glucose produced at Iswardi Export Processing Zone | 2008                         |  |         |         |                    |                    |         | 20                             | 20      | 20      | 20      |
| Bone meal  | 2007                         |  |         |         |                    |                    | 15      | 15                             | 15      | 15      | 15      |
| Products made of Hogla, hay, and sugarcane chhobra       | 2007                         |  |         |         |                    |                    | 15–20   | 15–20*                         | 15–20*  | 5–20*   | 15–20*  |
| Plastic pet bottles                                      | 2010                         |  |         |         |                    |                    |         |                                |         | 10      | 10      |
| Finished leather   | 2010                         |  |         |         |                    |                    |         |                                |         | 4       | 4       |
| Crust leather  | 2010                         |  |         |         |                    |                    |         |                                |         | 3       | 3       |
| New market textiles (except US, Canada, EU)              | 2011                         |  |         |         |                    |                    |         |                                |         |         | 2       |
| Small- and medium-based textile industry                 | 2011                         |  |         |         |                    |                    |         |                                |         |         | 5       |
| Trade on ships   | 2010                         |  |         |         |                    |                    |         |                                |         | 5       | 5       |

Source: Bangladesh Central Bank circulars (various years).

Notes: <sup>#</sup> 20% if local input use requirement minimum is 70% and 30% if local input use requirement minimum is 80%.

\*20% if domestically produced raw material exceeds 80% and 15% if domestically produced raw material exceeds 50%.



The subsidy data were obtained as follows. Through the Bangladesh Central Bank, the government of Bangladesh issues periodic circulars in every fiscal year addressed to the authorized dealers of foreign currency in the country. The circular lists all the products for which export subsidies will be active for that year and the levels of subsidy, along with qualifications, if any. The subsidy level is specified as a percentage of net free on board (f.o.b.) value of declared exports. The circulars are in Bangla. A sample circular for 2007 that we had translated into English is reproduced in Figure 3.1.

**Figure 3.1—Sample Central Bank circular on export subsidy (translated from Bangla)**

|  |
|--|
| <p><b>Authority: Foreign Exchange Policy Division / Bangladesh Bank / Head Office, Dhaka</b></p> <ul style="list-style-type: none"> <li>• Date: August 16, 2007</li> <li>• To: Authorized dealers of foreign currency</li> <li>• Subject: Export subsidy/cash support for the fiscal year 2007–2008</li> <li>• Declaration: To encourage export trade, the export subsidy/cash support on the net f.o.b. price of the following commodities for the fiscal year 2007–2008 (i.e., from July 01, 2007 to June 30, 2008) are:</li> <li>• Domestic garments: 5%</li> <li>• Frozen shrimp and other fish: 10%</li> <li>• Leather goods: 15%</li> <li>• Products made of Hogla, hay, and sugarcane chhobra: 15–20%. If domestically produced raw materials exceed 80% then the reimbursement rate is 20% of the net f.o.b. price and if domestically produced raw material exceeds 50% then at the rate of 15% of the net f.o.b. price.</li> <li>• Agricultural produce (fruits and vegetables) processed agricultural products: 20%.</li> <li>• Tobacco: 10%.</li> <li>• Potato: 10%. All the other instructions in circulars dated January 28, 2004, June 06, 2005, and August 14, 2006, remain unchanged.</li> <li>• Bicycle: 15%.</li> <li>• Bone powder: 15%.</li> <li>• Jute product: 7.5%.</li> <li>• Hatching eggs and day-old chicks: 15%.</li> <li>• Light engineering products: 10%.</li> <li>• Liquid glucose (to attract agro-industry investment at the Ishwardi EPZ)</li> <li>• Halal meat: 20%.</li> </ul> |
|--|

Source: Circular from Bangladesh Bank (<http://www.bangladesh-bank.org>).

An exporter has to follow several steps to get the subsidy. Normally, an exporter receives foreign exchange in his bank after exporting a commodity. If the commodity is listed as one that receives a cash incentive, the respective bank gives a certificate to the exporter that it received money from the importer, which is known as a proceed realization certificate (PRC). Then the exporter applies through the respective bank to the Bangladesh Central Bank for his export cash subsidy. The Bangladesh Central Bank carries out an inspection through its nominated audit firm, and the firm gives a no objection certificate (NOC) to the respective commercial bank after inspection. The commercial bank then applies to the Central Bank with this NOC, and the Bangladesh Central Bank releases money for the exporter. The Bangladesh Central Bank now provides money in advance to the commercial banks so that the exporter can get the cash incentive quickly. The cash incentive is received by the exporter in Bangladeshi taka (BDT). However, the value is determined on the existing official rate of exchange on the day of receiving money from the importer. These channels mean that BMP would not play a role in receiving the subsidy.

Note that in general, the subsidy is allotted for exporting per se and not for exporting to any particular destination. For some items, however, exporters get a subsidy for exporting to a broad category of countries. For instance, local textiles get a subsidy when they are exported to markets outside Europe and North America.

Table 3.1 above presented the list of products that have been allotted a subsidy at some point in time in Bangladesh. The list includes products that have long-standing external market links and a high proportional share in total exports (for example textiles) as well as some that have limited markets and a

very small share of total exports (for example lungis and jamdani saris). Table 3.2 shows the allotment of subsidy to different sectors over time in Bangladesh. It is striking that export assistance is generally higher than food subsidy per se, and compared with the food and input subsidies in agriculture, it is nearly 45 percent of the total allotment. This number—export assistance as a percentage of agricultural and food subsidy—has fallen over time (from 72 percent in 2004/05), but it continues to be sizable.

**Table 3.2—Recent profile of subsidy disbursements in Bangladesh (in millions of dollars)**

| Sector   | 2004/05 | 2005/06 | 2006/07 | 2007/08 | 2008/09 | 2009/10 | 2010/11 |
|--|---------|---------|---------|---------|---------|---------|---------|
| <b>A. Subsidy allocation for food, agriculture, export, and others</b> |         |         |         |         |         |         |         |
| Food   | 58.3    | 65.6    | 92.5    |         |         |         |         |
| Agriculture—fertilizer and electricity                                 | 105.9   | 79.4    | 137.8   |         |         |         |         |
| Export—cash assistance   | 119.4   | 79.7    | 105.9   |         |         |         |         |
| Jute   | 13.2    | 13.2    | 13.27   |         |         |         |         |
| Others   | 106.1   | 66.4    | 92.6    |         |         |         |         |
| Total (A)  | 283.6   | 224.8   | 336.2   |         |         |         |         |
| <b>B. Subsidy allocation for BPC, PDB, and Petrobangla<sup>7</sup></b> |         |         |         |         |         |         |         |
| BPC  | 0       | 0       | 79.4    |         |         |         |         |
| PDB and others   | 0       | 0       | 0       |         |         |         |         |
| Total (B)  | 0       | 0       | 79.4    |         |         |         |         |
| Total subsidy (A + B)  | 283.6   | 224.8   | 415.7   |         |         |         |         |
| <b>Export sector detailed distribution</b>                             |         |         |         |         |         |         |         |
| Local garments   | 55.6    | 33      | 44.5    | 69.6    | 88.33   | 96.9    | 116.1   |
| Frozen shrimp and other fish   | 22.9    | 18.5    | 29.8    | 47.7    | 38.7    | 42.4    | 40.6    |
| Leather goods  | 4.8     | 4.2     | 6       | 13.3    | 19.4    | 18.8    | 22.4    |
| Agricultural goods (vegetables, fruits)                                | 0       | 0       | 5.4     | 8.5     | 6.3     | 5.4     | 5.9     |
| Agroprocessing   | 1.3     | 3.8     | 1.8     | 3.6     | 5.6     | 7.8     | 9.6     |
| Tobacco  | 1.3     | 1       | 1.1     | 1.9     | 0.6     | 0.07    | 0       |
| Handicrafts made of sea grass, straw, and sugarcane fiber              | 0.1     | 0.1     | 0.3     | 0.3     | 0.5     | 1.21    | 1.8     |
| Bone meal  | 0.1     | 0.03    | 0.05    | 0.1     | 0.1     | 0.3     | 0.3     |
| Potatoes   | 0.06    | 0.03    | 0.1     | 0.1     | 0.07    | 0.1     | 0.3     |
| Halal meat   |         |         |         |         | 0.07    | 0.01    | 0.01    |
| Poultry industry (hatching eggs, chicken eggs, and chickens)           |         |         | 0.03    | 0.001   | 0.001   |         |         |
| Light engineering goods  |         |         |         |         |         | 0.001   |         |
| Liquid glucose   |         |         |         |         |         |         |         |
| Jute goods (public and private)  | 13.2    | 11.2    | 16.6    | 22.5    | 38.4    | 36.4    | 39.7    |
| Total  | 99.5    | 72.1    | 105.8   | 168.1   | 198.6   | 209.7   | 237.1   |

Source: Bangladesh Central Bank circulars (various years).

<sup>7</sup> BPC Bangladesh Petroleum Corporation and PDB-Power Development Board

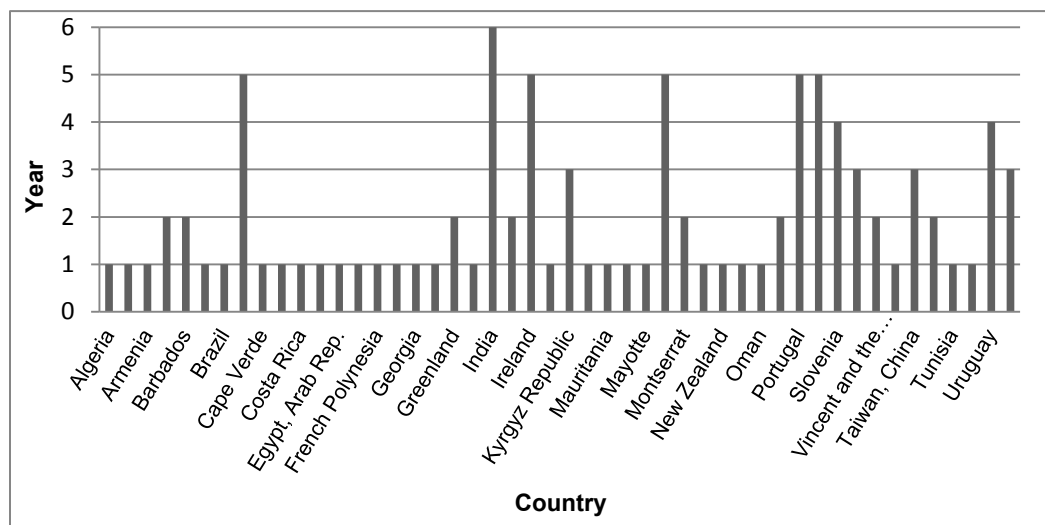
When an export subsidy is introduced, there could be an effect on trade on both the extensive and intensive margins. New markets could crop up, and deepening of exports in existing markets could occur. These two types of effects, however, could be associated with very different effects on the incentives to misinvoice exports. If new markets come up with low levels of exports and occur in countries that have weaker institutional quality, the possibilities to misinvoice could be different. The tax evasion–subsidy retrieval trade-off could thus be very different across the two types of postsubsidy market expansion.

Data suggest that both kinds of changes in exports have occurred, but nonuniformly across products. In general, the attrition in markets that were already accessed is much lower vis-à-vis the attrition in greenfield markets. In the case of shrimp, for example, after the introduction of a subsidy, exports to 28 countries occurred for only a year. In contrast, for the same number of countries there was an uninterrupted trading relationship postsubsidy with the erstwhile partners, for an average survival time of 3.26 years. Overall, after the introduction of a subsidy, significant increases in exports have occurred (mainly along the intensive margin). In other words, new markets with low volumes and limited longevity came up after introduction of a subsidy. There could be several reasons for this. Following Melitz (2003), where there are fixed costs of exporting, subsidies could incentivize exporters to try out new markets, since some portion of sunk costs could become retrievable. The profile of market entry described here could result from many failed trials and few successes with entry costs recouped through subsidy. Otherwise, markets could be accessed purely for the motive of subsidy retrieval, and it is in these cases that the incentives for misinvoicing would be stronger.

Overall, the effect of introducing a subsidy on the level of exports has been uniformly positive across all products. Looking at a few commodities, exports of shrimp increased from 30.21 thousand metric tons in 2001/02 (the last year before the introduction of a cash incentive) to 53.36 thousand metric tons in 2006/07 (Deb and Bairagi 2009). Recall that a cash incentive on the export of shrimp and other frozen foods was introduced in 2002/03. In value terms, exports increased from \$252.07 million in 2001/02 to \$433.47 million in 2006/07. In vegetables, within five years after the introduction of a cash incentive on exports, the exports went up by 2.3 times in terms of quantity, while in value terms they nearly quadrupled. Similar is the story, to a varying degree, across all products that were subsidized.

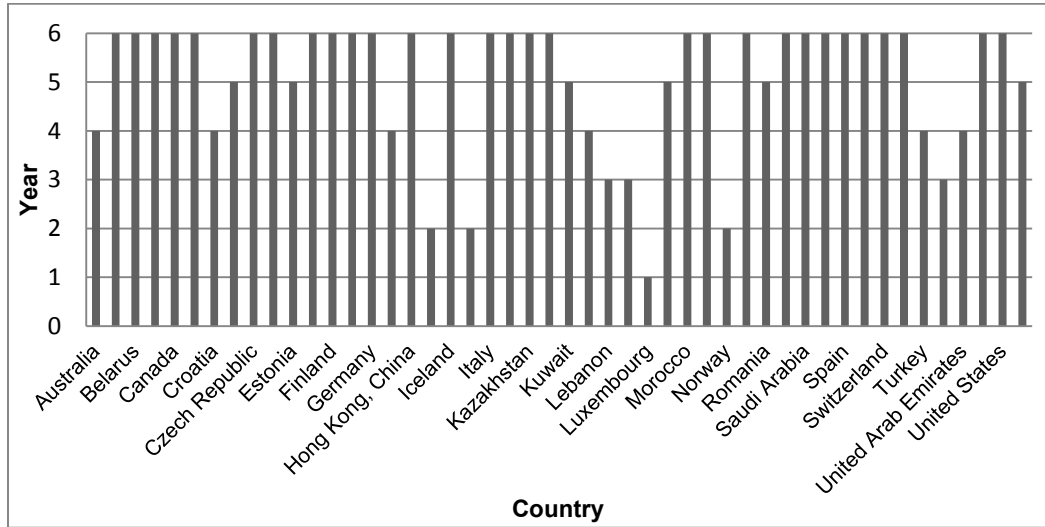
For illustration, Figures 3.2–3.6 compare the persistence in new and old markets upon the introduction of an export subsidy for three products: shrimp, jute, and textiles (matched for periods after subsidy). Only in textiles do the new markets that have emerged postsubsidy show some persistence (Figure 3.6). As discussed above, this pattern of market links could have different implications for the misinvoicing behavior, assuming that misinvoicing is feasible.

**Figure 3.2—Number of years new markets accessed after subsidy, shrimp**



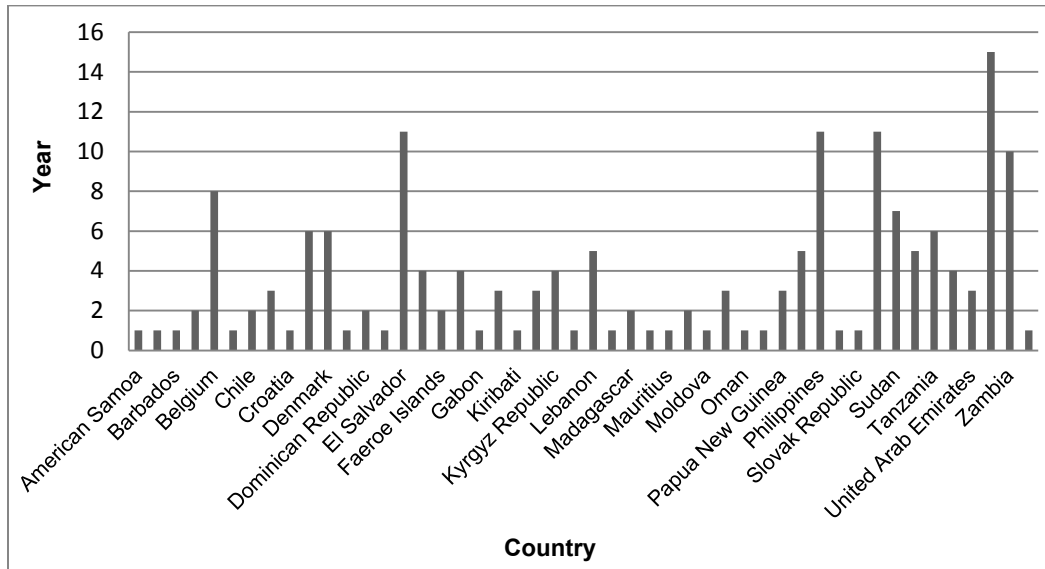
Source: Author's creation.

**Figure 3.3—Number of years the prior market accessed postsubsidy, shrimp**



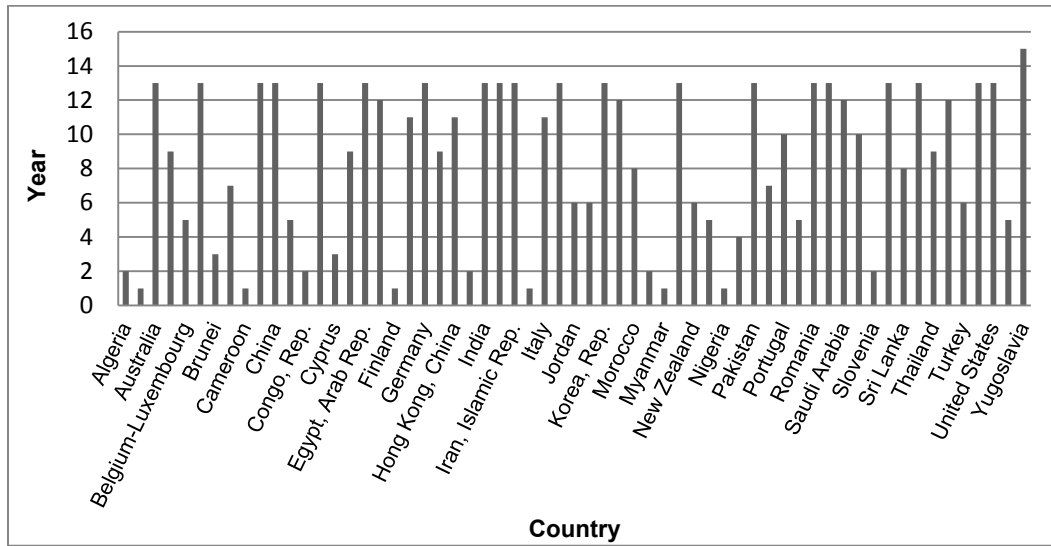
Source: Author's creation.

**Figure 3.4—Number of years in new markets, postsubsidy, jute**



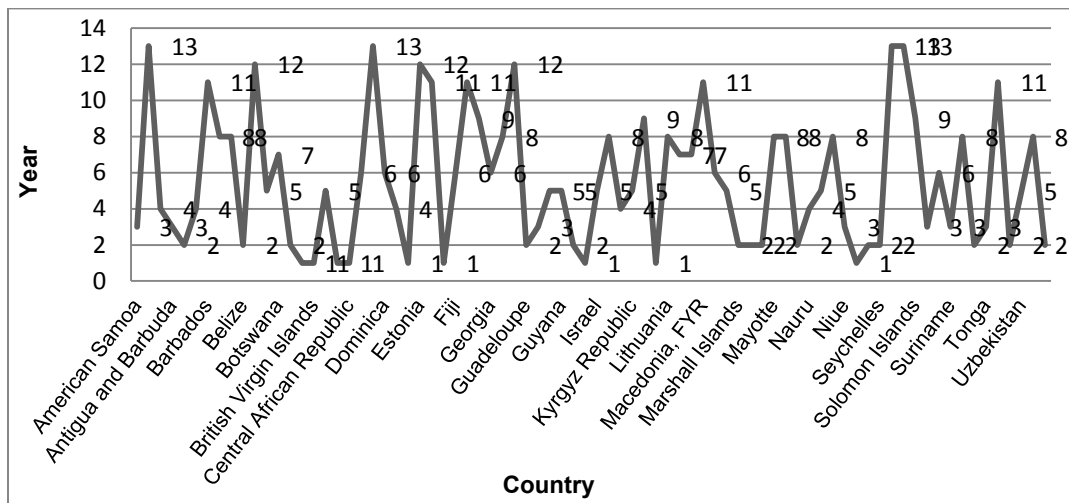
Source: Author's creation.

**Figure 3.5—Number of years old markets accessed, jute**



Source: Author's creation.

**Figure 3.6—Persistence in new markets in textiles after introduction of subsidy**



Source: Author's creation.

Consider the following thought experiment. If markets differ in their quality and other specifications that are costly to provide, exporters could enter into new soft markets and over-invoice just to avail themselves of the subsidy at hand. If, instead, high levels of exports are realized with persistence and export earnings are taxed, it is possible that the end result is under-invoicing. In what follows, we will use the terms *new markets* and *old markets* for the two types of market expansion, realizing that some misinvoicing objectives could be correlated with these choices made by the exporters.

### Measurement of Misinvoicing

Here we define how we measure our key variable, misinvoicing of exports in the data. Throughout this paper, we will report results for misinvoicing based on values, since that is what is related to exporters' benefit from BMP, from retrieval of subsidies, or from evasion of domestic taxes. The measure of

misinvoicing is as standard in the literature, using the differences in reports between exporter and importer. Using Comtrade data, we calculate the measure of misinvoicing of exports as the difference between the value of exports from Bangladesh to each country in the sample as reported by Bangladesh and the value of imports from Bangladesh as reported by each partner country. The Comtrade data are available at disaggregated level as well as at product level. Table 3.3 presents the classifications used for the product categories on which subsidy is allotted.

**Table 3.3—Classifications used from Comtrade dataset**

| Product                              | Code(s)   | Classification used                       |
|--------------------------------------|---|---|
| Jute goods                           | 264—Jute  | SITC Revision 1 (selected classification) |
| Frozen shrimp and other fish         | 030613—Frozen shrimps and prawns  | HS 1988/92 (selected classification)      |
| Export-oriented local textiles       | 17— Manufacture of textiles   | ISIC Revision 3 (selected classification) |
| Potatoes                             | 0701—Potatoes, fresh or chilled   | HS 1988/92 (selected classification)      |
| Tobacco                              | 24—Tobacco and manufactured tobacco substitutes   | HS 1988/92 (selected classification)      |
| Agroproducts (vegetables and fruits) | 05—Fruit and vegetables   | SITC Revision 1 (selected classification) |
| Leather goods                        | 611—Leather   | SITC Revision 1 (selected classification) |
| Processed agroproducts               | 221—Processed liquid milk and cream; 2619—Other vegetable textile fibres, processed but not spun; tow and waste of these fibres | CPC (selected classification)             |

Source: UN Comtrade database.

Note that export prices are expressed in f.o.b. terms while imports are recorded including the cost of insurance and freight (c.i.f.). Hence, even if there were no wrongdoing, the misinvoicing measure would be negative. We use the standard c.i.f.–f.o.b. margin of 10 percent as suggested in International Monetary Fund statistics. Therefore we consider it to be a case of misinvoicing only when a gap exists between numbers reported by the importer and those reported by Bangladesh after enhancing the value of exports by 10 percent. Our measure of misinvoicing is thus represented as

$$U_{jkt} = 1.1X_{jkt}^{RB} - M_{Bkt}^{Rj} \quad (13)$$

In Equation (13),  $U_{jkt}$  equals the under-invoicing in exports of product  $k$  from Bangladesh to country  $j$  at time  $t$ .  $U_{jkt} > 0$  implies under-invoicing and  $U_{jkt} < 0$  is over-invoicing.  $X_{jkt}^{RB}$  is the declared (revealed) exports to country  $j$  of product  $k$  by Bangladesh at time  $t$ .  $M_{Bkt}^{Rj}$  is the reported imports from Bangladesh by country  $j$  of product  $k$  at time  $t$ .

Table 3.4 presents some summary statistics on  $U_{jkt}$ , comparing the outcomes on misinvoicing pre- and postsubsidy. Many important and striking statistics emerge in Table 3.4. First, on average there is under-invoicing postsubsidy, with much greater variance after introduction of the subsidy. Second, under-invoicing is much higher when the import values are high (above the median of the sample). With developed countries (and therefore bigger exports), on average there is under-invoicing, while there is over-invoicing in exports to developing countries, which have a lower average value. In effect, there are

likely to be competing effects in trade with developed countries. On the one hand, the trade values are higher, implying greater incentives to under-invoice, but at the same time, higher institutional quality in developed countries would make under-invoicing more difficult to implement (meaning a greater value of  $\rho$ ). Further, we expected the over-invoicing to be lower in new markets (due to the likely dominance of subsidy retrieval motives) but on average we find there is under-invoicing in these markets as well.

**Table 3.4—Variation in misinvoicing before and after the subsidy**

|  | Mean   | Presubsidy<br>Std.<br>deviation | Median | Mean  | Postsubsidy<br>Std.<br>deviation | Median  |
|--|--------|---------------------------------|--------|-------|----------------------------------|---------|
| Misinvoicing aggregate   | 0.69   | 6.25                            | 0.004  | -0.32 | 15.34                            | 0.001   |
| Misinvoicing aggregate (only persistent partners)                            | 0.69   | 6.25                            | 0.004  | -0.29 | 17.84                            | 0.005   |
| Misinvoicing aggregate (only partners that emerge after subsidy)             |        |                                 |        | -0.37 | 4.69                             | 0.00005 |
| Average misinvoicing with developed country partners                         | 0.0008 | 6.64                            | -0.006 | -2.51 | 15.92                            | -0.01   |
| Average misinvoicing with developing country partners                        | 1.14   | 5.94                            | 0.02   | 0.72  | 14.95                            | 0.01    |
| Misinvoicing for above-median import value (median for each year)            | -0.92  | 4.26                            | -0.07  | -0.93 | 18.5                             | -0.02   |
| Misinvoicing for below-median import value (median for each year)            | 2.31   | 7.4                             | 0.07   | 0.83  | 5.64                             | 0.01    |
| Misinvoicing for agricultural products                                       | -0.18  | 1.00                            | -0.007 | 0.59  | 2.82                             | 0.009   |
| Misinvoicing for nonagricultural products                                    | 0.69   | 6.25                            | 0.004  | -0.32 | 15.34                            | 0.001   |
| Misinvoicing in trade with countries that share a nonmaritime border (India) | -1.87  | 2.81                            | -0.78  | -0.78 | 13.14                            | -0.001  |

Source: Author's calculations based on UN Comtrade data.

At a disaggregated commodity level, there are significant variations. The characteristics of a product (whether or not it is bulky, whether or not it is differentiated, and so on) could be related to the ease with which misinvoicing can be implemented. Table 3.5 presents a summary of figures on misinvoicing computed over trade with identical partners (the number of observations differ across products since the number of years that trade took place is not identical across products). Across products, even with the same trading partners, there are significant differences. On average, for example, there is under-invoicing in textiles while in shrimp there is over-invoicing. There could thus be an effect over and above the trading partner characteristics that could be affecting misinvoicing. One of the product fixed effects is whether or not the product, on average, is a high-value export item. Though the list of products covered under export subsidy is not exhaustive in Table 3.5, overall the highest under-invoicing postsubsidy occurs for textiles and the highest over-invoicing occurs for shrimp.

**Table 3.5—Misinvoicing across commodities with identical trading partners**

| <b>Variable</b>          | <b>Number of observations for trading with common countries</b> | <b>Mean of export–import gap</b> | <b>Standard deviation of export–import gap</b> |
|--------------------------|---|----------------------------------|--|
| Misinvoicing in textiles | 97  | -1.62                            | 11.78  |
| Misinvoicing in jute     | 77  | 0.17                             | 1.52   |
| Misinvoicing in shrimp   | 98  | 0.57                             | 3.37   |
| Misinvoicing in leather  | 75  | .017                             | 1.93   |
| Misinvoicing in eggs     | 12  | -0.004                           | 0.01   |
| Misinvoicing in meat     | 53  | -0.23                            | 0.61   |

Source: Author’s calculations based on UN Comtrade data.

In addition to misinvoicing, there is a possibility that the products get completely smuggled—that is, they appear in the importing country data but do not figure in the export data from Bangladesh. Table 3.6 shows that with the introduction of an export subsidy, incidence of complete smuggling goes down. Strikingly, the cases of complete smuggling are much more common in new markets vis-à-vis old markets. Recall that new markets are those that emerged only after the export subsidy was introduced, and one would expect revelation of the act of exporting to increase. One cannot, however, rule out the possibility of a greater measurement error in new markets.

**Table 3.6—Complete smuggling pre- and postsubsidy and in new and old markets**

|             | <b>Total number of observations</b> | <b>Percentage</b> | <b>Complete smuggling from exporter</b> | <b>Total number of observations</b> | <b>Percentage</b> |
|-------------|-------------------------------------|-------------------|---|-------------------------------------|-------------------|
| Presubsidy  | 1,173                               | 23.2%             | New markets                             | 1,203                               | 37%               |
| Postsubsidy | 4,303                               | 19.6%             | Old markets                             | 4,273                               | 15.7%             |

Source: Author’s calculations based on UN Comtrade data.

Further, Table A.1 in the appendix gives the misinvoicing pre- and postsubsidy across products, stratified by high and low levels of trade (based on the importing country’s reported values). Broadly, cases of higher trade (greater than mean) tend to result in under-invoicing while a lower level of trade tends toward over-invoicing. There are cases of reduced under-invoicing and increased over-invoicing, but this pattern is far from general.



## 4. RESULTS

### Misinvoicing and Introduction of an Export Subsidy

The basic regression equation that we estimate is given as

$$U_{jkt} = \alpha_j + \beta_k + \gamma S_t + \varepsilon_{jkt}, \quad (14)$$

where  $U_{jkt}$  is as defined above and  $\alpha_j, \beta_k$  denote the trading partner and product fixed effects, respectively. Our coefficient of interest is  $\gamma$ . A priori we take the sign of  $\gamma$  to be ambiguous owing to the different factors that become active with the introduction of an export subsidy. Note that in Equation (14), the products are pooled. Below we do implement product-specific regressions separately. We do find evidence for significant misinvoicing in individual product-level regressions, but since we cannot control for product fixed effects in these regressions, Equation (14) is our preferred specification. We also implement a variant of Equation (14) specified in terms of a quantity gap, though the results on misinvoicing there are not robust.

**Table 4.1—Misinvoicing of value of exports and introduction of a subsidy**

| Regression on value misinvoicing                       |                    |                    |                    |                    | For persistent exporters |
|--|--------------------|--------------------|--------------------|--------------------|--------------------------|
| Subsidy dummy = 1 when subsidy in place, = 0 otherwise | -1.02***<br>(3.28) | -1.17***<br>(0.32) | -1.08***<br>(0.28) | -1.14***<br>(0.32) | -0.89***<br>(0.34)       |
| Product fixed effects                                  | N                  | N                  | Y                  | Y                  | Y                        |
| Country fixed effects                                  | N                  | Y                  | N                  | Y                  | Y                        |
| Number of observations                                 | 5,476              | 5,476              | 5,476              | 5,476              | 3,473                    |

Source: Author's calculations based on UN Comtrade data.

Notes: \*\*\* significant at 1% level. Terms in parentheses denote robust standard errors. Sample containing only importers and product groups that existed both before and after introduction of the subsidy.

**Table 4.2—Misinvoicing of quantity of exports and introduction of a subsidy**

| Coefficient            |                 |                 |                 |
|------------------------|-----------------|-----------------|-----------------|
| Subsidy dummy          | -3.77<br>(4.12) | -4.92<br>(4.56) | -4.03<br>(4.23) |
| Product fixed effects  | N               | Y               | Y               |
| Country fixed effects  | Y               | N               | Y               |
| Number of observations | 5,476           | 5,476           | 5,476           |

Source: Author's calculations based on UN Comtrade data.

Note: Terms in parentheses denote robust standard errors.

Table 4.1 presents the results for estimation of Equation (14) in value, while Table 4.2 presents the results for estimation in quantities. Results indicate that with the introduction of an export subsidy, on average (across products and trading partners) there is a significant effect on under-invoicing of value of exports. With the introduction of a subsidy, the under-invoicing at all levels will increase by nearly \$1.2 million (a shift in the intercept). This result might seem counterintuitive but following the discussion above, with the expansion in exports and the possible links to tax evasion, this finding can be easily rationalized. Further, it is common practice that the promised funds are released by the government with a lag. In 2001, the trade associations, especially in the textile sector, claimed that according to the cash incentive policy, the total amount payable to exporters was BDT 8 billion. In that year, the government

released only BDT 2 billion—just 25 percent of the promised amount. Delays in disbursement could reduce the benefits of an export subsidy (if the future is being discounted).

That the coefficient is averaged over products would be revealed below as important, since across products we would find differences, with some products validating the expected over-invoicing as subsidy is introduced. Table 4.2 shows that results on trade gaps in quantities are unaffected by the introduction of an export subsidy.

As discussed above, we expect under-invoicing to be lower in the following cases:

1. New and transient partners with low value of exports as compared to the old and persistent partners, since over-invoicing to retrieve subsidies could be more important in the former case
2. Partners with better institutional quality, since to implement misinvoicing would possibly require collaboration between Bangladeshi exporter and importer

Based on points (1) and (2), in principle the net effect of these channels could be ambiguous. Data show that new trade, and particularly trade that is transitory, across all products is with partners that have lower institutional quality. The more permanent trade and the higher value of exports are realized with developed countries. Further, with high value of exports, at the margin, under-invoicing could be more important (if nonlinear taxes outweigh subsidies). At lower value of exports, subsidy retrieval could dominate. Recall that the extensive margin following a subsidy is much smaller than the intensive margin in all products. To compare under-invoicing between new and old trading partners, we run the following regression:

$$U_{jkt} = \alpha_j + \beta_k + \rho T_{it} + \epsilon_{jkt} \quad (15)$$

where  $T_{it}$  is the subsidy-induced trade initiation dummy (SITD) and equals one if trade observed is after introduction of subsidy, zero otherwise. Tables 4.3 and 4.4 present the results for misinvoicing in quantities and values, respectively. In values, the export–import gap is significantly lower for new traders than for persistent ones. The under-invoicing is higher by about \$2.3 million in the case of new trading partners vis-à-vis old partners. As before, there is no robust evidence for misinvoicing in quantities.

Overall, the results above help us identify under-invoicing in Bangladesh’s exports. If there is evidence for under-invoicing after the introduction of an export subsidy, for the same level of exports there most likely would be under-invoicing.

**Table 4.3—New trade and misinvoicing in export values**

| <b>Coefficients (with robust standard errors)</b>          |                    |                   |                    |
|--|--------------------|-------------------|--------------------|
| SITD = 1 if trade originated postsubsidy and = 0 otherwise | -1.18***<br>(0.36) | -0.53**<br>(0.26) | -2.23***<br>(0.35) |
| Product fixed effects                                      | N                  | Y                 | Y                  |
| Country fixed effects                                      | Y                  | N                 | Y                  |
| Number of observations                                     | 5,476              | 5,476             | 5,476              |

Source: Author’s calculations based on UN Comtrade data.

Notes: \*\* significant at 5 percent level and \*\*\* significant at 1 percent level. Terms in parentheses denote robust standard errors.

**Table 4.4—New trade and misinvoicing in export quantities**

| <b>Coefficients (with robust standard errors)</b>          |                  |                   |                 |
|--|------------------|-------------------|-----------------|
| SITD = 1 if trade originated postsubsidy and = 0 otherwise | -2.25*<br>(1.36) | -2.82**<br>(1.37) | -0.05<br>(1.17) |
| Product fixed effects                                      | N                | Y                 | Y               |
| Country fixed effects                                      | Y                | N                 | Y               |
| Number of observations                                     | 4,244            | 4,244             | 4,244           |

Source: Author’s calculations based on UN Comtrade data.

Notes: \* significant at 10 percent level and \*\* significant at 5 percent level. Terms in parentheses denote robust standard errors.

## Product-Level Analysis

The analysis above captures the average level effect of the introduction of an export subsidy across partners and products. It is quite possible that even though there is under-invoicing averaged across products, for individual products we could have the standard over-invoicing effect with the introduction of a subsidy. Table 4.5 presents the results of regressions similar to those in Equation (14) for each product entitled to subsidy separately (excluding the product fixed effects). Indeed, there are significant commodity-level variations both in the types and in the level of misinvoicing following the introduction of an export subsidy.

**Table 4.5—Misinvoicing at the product level**

| Product                   | Coefficient<br>(standard error) | Type of<br>misinvoicing | Number of<br>observations | Partner fixed effects        |
|---------------------------|---------------------------------|-------------------------|---------------------------|------------------------------|
| Agroproducts <sup>#</sup> | 1.78***<br>(0.43)               | Over-invoicing          | 418                       | Y                            |
| Bicycles                  | 1.66***<br>(0.77)               | Over-invoicing          | 193                       | N<br>(No degrees of freedom) |
| Jute                      | 0.19<br>(0.62)                  | -                       | 886                       | Y                            |
| Leather                   | -0.66*<br>(0.4)                 | Under-invoicing         | 606                       | Y                            |
| Meat                      | -0.11<br>(0.11)                 | -                       | 198                       | N<br>(No degrees of freedom) |
| Potatoes                  | 0.07***<br>(0.02)               | Over-invoicing          | 52                        | N<br>(No degrees of freedom) |
| Shrimp                    | 0.56<br>(0.83)                  | -                       | 426                       | Y                            |
| Textiles                  | -2.71***<br>(1.08)              | Under-invoicing         | 2,335                     | Y                            |
| Tobacco                   | 0.06<br>(0.09)                  | -                       | 276                       | Y                            |

Source: Author's calculations based on UN Comtrade data.

Notes: \* significant at 10 percent level, \*\* significant at 5 percent level, and \*\*\* significant at 1 percent level.

<sup>#</sup> The agroproducts category includes fruits, vegetables, betel, betel nut, and processed food products. It excludes potatoes, which were under a different level of subsidy.

In leather and textiles, the introduction of an export subsidy raises under-invoicing, while in agroproducts, bicycles, and potatoes there is a move toward over-invoicing with the advent of an export subsidy.

Until now we have used the binary variable of presence or absence of a subsidy as our main variable of interest. As argued above, though the case of export misinvoicing is akin to the case of import misinvoicing, in practice there are significant differences in empirical analysis. The main policy instrument whose effect is analyzed in import misinvoicing is tariffs. Tariffs are more generally applied than export subsidies, and there usually is more variation in tariffs across products and trading partners than there is for export subsidy. In the case of Bangladesh, there is also little variation in the rate of export subsidy across products or even over time, and barring an exception in textiles (because of new market exploration assistance) there tends to be no variation across trading partners. *Ceteris paribus*—that is, given an unchanging tax rate—higher levels of export subsidy should result in reduced incentives to under-invoice. Since 1994, only five levels of subsidy have not changed over time—that is, once introduced there has been very little change in the subsidy rate.

**Table 4.6—Products and the average level of subsidy**

|              | <b>Average rate of subsidy (in percentage)</b> |
|--------------|--|
| Jute         | 7.5  |
| Textiles     | 5  |
| Bicycles     | 15   |
| Eggs         | 15   |
| Leather      | 15   |
| Potatoes     | 10   |
| Shrimp       | 10   |
| Tobacco      | 10   |
| Agroproducts | 20   |
| Meat         | 20   |

Source: Bangladesh Central Bank circulars (various years).

Given this structure of applied subsidy, we create three bins for rate of subsidy: greater than 10 percent (Bin 1), 10–15 percent (Bin 2), and greater than 15 percent (Bin 3). We then repeat the analysis for the three bins separately. We expect the effect on under-invoicing to be the lowest (or the effect on over-invoicing to be the highest) in the third bin. Also, we expect the lowest incentive to over-invoice and the greatest incentive to under-invoice in Bin 3. The results of regressions by bin are presented in Table 4.7. Though the effect of introduction of subsidy in Bin 2 is statistically insignificant, there does emerge an interesting pattern (a U shape), where for low levels of subsidy we find evidence for under-invoicing that gets reverted at high rates.

**Table 4.7—Effect of level of subsidies on misinvoicing**

|                        | <b>Bin 1</b>       | <b>Bin 2</b>    | <b>Bin 3</b>      |
|------------------------|--------------------|-----------------|-------------------|
| Subsidy dummy          | -1.87***<br>(0.62) | 0.036<br>(0.33) | 0.82***<br>(0.25) |
| Number of observations | 3,221              | 1,553           | 616               |

Source: Regression results.

Notes: \*\*\* significant at 1 percent level. All regressions include relevant product and trading partner fixed effects.

## 5. CONCLUDING REMARKS

In this paper, we use data on Bangladesh's exports to examine the effect of introduction of an export subsidy on misinvoicing of exports. The two main contributions of the paper are these: (1) We use the event of introduction of an export subsidy to show that there is misinvoicing of exports from Bangladesh, and (2) we show that the average effect of introduction of an export subsidy is toward under-invoicing even though the expectation would be the opposite, toward over-invoicing. This happens because if the level of exports changes and there are domestic taxes that exporters want to evade, the incentives to misinvoice could work opposite to what subsidy retrieval motives would dictate. The second result helps us to establish the first one. If there is under-invoicing with subsidy, it is likely that it is there without a subsidy as well.

Our empirical strategy follows a simple model of misinvoicing, whereby the channels of tax evasion with expanded exports are outlined. Our empirical findings are robust to controls for different observed and unobserved trading partner and product characteristics. Across different estimations we find that, comparatively, the importance of trading partner fixed effects is high. Misinvoicing can be expected to require inputs from both exporter and importer, thereby making trading partner characteristics important (in terms of institutional quality, for example).

We also find preliminary evidence that the tendency to under-invoice is associated with lower levels of export subsidy and declines with higher levels. Also, we find that there are significant differences in the nature and level of misinvoicing with new trading partners (those that emerge after introduction of a subsidy). It is possible that softer markets with weaker institutional quality are accessed conditionally on the relative ease of misinvoicing in such markets.

A vast literature exists on import misinvoicing, but empirical literature on misinvoicing of exports in the face of export subsidy is rare. Consequently, it is not possible to assess the extent of export misinvoicing in Bangladesh compared with that of other countries. From the disaggregated analysis, we find that both forms of misinvoicing are active in Bangladesh. That we have under-invoicing overall could be a result of it being present in two items with large exports—textiles and leather—while the expected over-invoicing occurs in other commodities.

While our study does not explicitly focus on the effects of institutional reform, its findings suggest that the problem of misinvoicing encompasses multiple instruments and multiple agencies. Systems such as a credible system of verification of documents and introduction of effective audits would make misinvoicing costly for exporters; however, the incentives for illegal practices in trade might well be guided by other policies (such as high taxes).

Finally, some limitations of the study are worth pointing out. First, the lack of variation in the rate of subsidy or of domestic taxation at the product-partner-year level means that the domestic tax channel is only suggestive and needs more detailed data to quantify it. Second, as in the literature on tariff evasion, the trading partner figures taken as the benchmark to estimate misinvoicing could be problematic. In reality misinvoicing occurs in both exports and imports. Yet to the extent there is a systematic relationship between the trade gap and introduction of a subsidy, it addresses the research question we are interested in: whether the export-import gap is systematically related to export subsidization.

## APPENDIX: SUPPLEMENTARY TABLES

**Table A.1—Summary statistics on misinvoicing of exports pre and post subsidy**

| Category     | Overall mean | Presubsidy   |  | Postsubsidy  |  |
|--------------|--------------|--|--|--|--|
|              |              | Mean of evasion<br>for countries<br>having trade ><br>mean trade | Mean of evasion<br>for countries<br>having trade <<br>mean trade | Mean of evasion<br>for countries<br>having trade ><br>mean trade | Mean of evasion<br>for countries<br>having trade <<br>mean trade |
| Textiles     | -0.58        | -12.84   | 2.40   | -16.52   | 1.10   |
| Jute         | 0.15         | -3.31  | 1.09   | -0.76  | 0.30   |
| Shrimp       | 0.93         | 2.86   | -0.006   | 7.53   | 0.03   |
| Leather      | 0.01         | -5.60  | 1.41   | -1.55  | 0.13   |
| Agroproducts | 0.54         | -3.69  | -0.20  | 11.51  | 0.45   |
| Meat         | -0.39        | -1.88  | -0.04  | -1.80  | -0.02  |
| Bicycles     | 0.45         | -2.96  | -0.001   | 4.52   | 0.06   |

Source: Author's calculations based on secondary data.

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