# Information Cost: A Prior Hurdle to Exporting

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**Abstract**

This paper empirically investigates how information cost, as part of trade costs, affects the decision of an individual firm to export. We use cross section firm-level data to examine how the difficulty of obtaining information on technical regulations in the European Union (EU) and the United States actually reduces firm incentives to export to these two destinations. Results suggest that increased information cost significantly reduces the probability of exporting for an individual firm, beyond tariff and other nontariff barriers.

## I. Introduction

As tariff rates have been reduced through multiple bilateral and multilateral agreements, there is growing trade concerns regarding substitution of nontariff trade barriers (NTBs). A previous categorization of NTBs divided policies into five broad groups: quantitative restrictions, nontariff charges including antidumping, government participation in trade, customs procedures, and technical barriers to trade.[1] Among these categories, technical barriers to trade (TBT) have attracted increasing analytical attention in both policy and academia arenas as their use proliferated with often ambiguous impacts on trade (Thornsbury, Roberts and Orden 2004). Compared with more traditional NTBs such as

[1] Hillman (1996) has detailed explanation on nontariff trade barriers in agriculture and the evolution of the terminology.

quotas, the complexity and multi-dimensional characters of technical barriers make direct measurement difficult and at times infeasible (Deardorff and Stern 1998; Gallagher 1998). In particular, due to the constraint of data availability, "*it is remarkable how little is known about the trade impact of technical barriers based on empirical data and analysis. Economists cannot say with confidence whether such restrictions tend to reduce trade by virtue of raising compliance costs or expand trade by increasing consumer confidence in the safety and quality of imported goods" (Maskus and Wilson 2001, preface, page 1).*

Recent research has developed models to quantify the trade impact of technical barriers, largely limited to either country case studies or aggregate analysis in both theoretical framework and empirical data (see for example, Paarlberg and Lee 1998; Yue, Beghin, and Jensen 2006; Peterson and Orden 2008; Disdier, Fontagne and Mimouni 2008). Analysis of impact is mainly focused on how compliance cost imposed by importing countries alters a production function or cost function, thus affecting the decision of an individual representative firm to export. Increased cost, specified as "one-time" compliance cost involved in setting up new processes or procedures, and "recurring" compliance costs, involved in implementing requirements upon exporting may be the most significant and obvious consequences from technical barriers (Popper et al. 2004).

However, prior to implementation of any nontariff barrier, including technical standards and regulations, firms face an additional hurdle of collecting information on what these regulations are, how these regulations are relevant to the products to be exported, and where to obtain the necessary information in order to export the products to a particular

country. Anderson and Wincoop (2004) use a broad definition for trade costs to quantify hurdles facing a firm to export. The broadly defined trade costs include all costs involved in getting a good delivered to the final user, including tariff and nontariff barriers, information costs, transportation costs and distribution costs, etc. According to their calculation, trade costs for industrialized countries, reported in terms of ad-valorem tax equivalent, are 170 percent. Among them, an overall rough estimate of tariff (less than five percent) and nontariff barriers is eight percent, information cost counts for six percent, which implies tariff and nontariff barriers and information cost are almost equally prohibiting. The complication of exporting procedures and accessing information about regulations and compliance may further limit a firm's interest and/or ability to export beyond the regulation and standards per se.

In practice, we only observe whether or not a firm is involved in exporting. We cannot observe in what stage the decision is made not to export unless a firm reveals such specific information. Whether it is high tariff rates that make exporting not profitable, or whether it is the high cost of meeting technical standards is hard to empirically identify and has rarely been investigated. Some firms, especially small and medium-size firms may not be involved in exporting simply because they don't have access to the relevant information for compliance, it is too costly for them to collect, and potential penalties for unintentional non-compliance are likewise unclear or prohibitory.

In this paper, we use firm-level data to empirically investigate how information cost affects the decision of whether an individual firm will export. In particular, we examine how

difficulty of obtaining information on technical regulations in the EU and the United States affects export decisions. To our knowledge, this is the first paper attempting to separate the effect of information cost from that of regulatory compliance cost of technical barriers and other trade costs. Our empirical results do show that *ceteris paribus*, information costs significantly reduce the probability of a firm exporting to EU, but the evidence for the United States is mixed.

The rest of the paper is organized as follows. Section II provides a review of previous research. A simple conceptual model is introduced in Section III. Section IV introduces data and explains the reason why we focus only on the EU and the United States. An empirical model is described in Section V. We present our estimation results in Section VI and discuss some limitations of the model. In Section VII we conclude and propose some possible extension of this research.

## II. Literature Review

In late 1980's, there is a series of theoretical papers (Dixit 1989, Baldwin and Krugman 1989) from the perspective of entry and exit costs, attempting to explain that some firms are not exporting due to the sunk cost incurred in order to enter into foreign markets. Later, using a nine-year (1981-1989) firm-level panel data from the Colombian manufacturing sector, Roberts and Tybout (1997) provide empirical evidence that a firm exporting in the prior year is up to 60 percent more likely to export than a firm that has never exported. Employing a similar dynamic discrete choice model developed by Roberts and

Tybout (2001), Bernard and Jenson (2001) found that entry costs are substantial for U.S. manufacturing firms, and firms are more likely to export in consecutive years.

Other work has focused particularly on identifying and estimating the fixed and implementation cost incurred specifically from nontariff barriers. In the book "Quantifying the Impact of Technical Barriers to Trade" (2001) edited by Maskus and Wilson, four main empirical approaches to model and measure the effect of technical regulations and standards are delineated; surveys, macro-level econometric analysis, partial equilibrium (PE) models, and computable general equilibrium (CGE) models. Following this characterization, Maskus, Otsuki and Wilson describe (in Chapter 2) the scope of a survey conducted by the World Bank for a better understanding of the technical barriers. As an extension of Moenius (1999), variables measuring technical regulations and standards are incorporated into the standard gravity model. Further, a simple theoretical model estimating firm-level cost and production functions is proposed. Information obtained from data analysis and parameters estimated in the structural form are adapted to a partial equilibrium model for a simulation analysis. Lastly, information can be further used for a CGE analysis to fully assess the impact of technical regulations across all sectors on all economic elements.

A 2001 OECD report based on survey results from 55 firms in three industries (terminal telecommunications equipment, dairy products, and automotive components) found many firms had difficulty in assessing *ex ante* the costs of compliance, and that small firms relied more on external information sources than large firms. Small firms were less able to spread compliance costs over their limited export volumes. Analogous to the one-time

compliance costs, information cost is a part of the fixed cost for exporting. For small and medium-size firms with expectation of exporting limited amount of products, information cost is potentially a large burden and their willingness to pay is much lower.

In Popper et al. (2004), a partial equilibrium model is developed to assess the costs of technical barriers faced by U.S. exporters in the pharmaceutical and automotive industries. An upper bound estimate of the losses to U.S. exporters, defined as the lesser of total cost of compliance with technical regulations and standards and net loss if exporters choose to exit or never enter the market (value of market) is provided. Results indicate the estimated net welfare loss faced by U.S. automotive sector exporters caused by the imposition of a technical regulation in the aftermarket by the Mexican government is approximately 9 million dollars.[2]

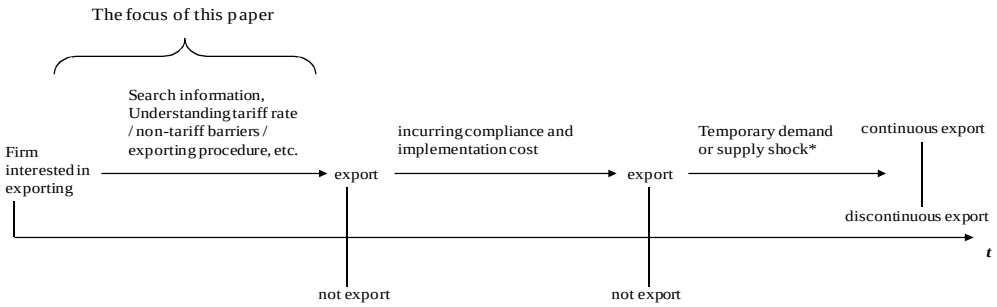
## III. A Simple Static Conceptual Model

As mentioned above, the focus of this paper is to detach the information cost faced by a firm from all other trade cost, especially from compliance costs for technical barriers imposed by importing countries. Suppose there is a representative firm *i* interested in exporting. Following the theoretical framework by Dixit and Krugman, we assume information cost is part of the fixed cost incurred by a firm in order to participate in foreign markets. If we can observe how a firm makes decisions on whether or not to export to a particular country, we might be able to separate the firm's decisions into several stages

[2] Assuming a five percent discount rate within a 3-year period.

(Figure 1).

**Figure 1. Firm export decision process**




*: e.g., increasing transportation costs (due to increased fuel price), thin harvest season in produce, H1N1 disease etc. may induce some firms to stop exporting for a while.

The firm chooses to export if the expected net profit of exporting ($\pi_e$) is no less than the sum of domestic profit ($\pi_d$) and a certain amount of fixed cost (*FIC*) needed for collecting relevant information on exporting, i.e.,

$$y_i = \begin{cases} 1 & if \ \pi_e > \pi_d + FIC \\ 0 & otherwise \end{cases}$$

Assume after collecting information, a firm can perfectly predict *ex ante* how much profit can be earned from export. In other words, $\pi_e$ is calculated to take into consideration all potential costs occurred in export, such as exchange rate, tariff rates, compliance and implementation costs for technical barriers, transportation costs, etc. Then a firm's maximum willingness to pay (WTP) for information cost can be defined as $WTP_i = \pi_e - \pi_d$. Therefore,

the firm's export decision is transformed to

$$y_i = \begin{cases} 1 & if \ \ WTP_i - FIC > 0 \\ 0 & otherwise \end{cases}.$$

In other words, a firm is observed to be exporting if willingness to pay for information cost is larger than the actual fixed information cost. This basic idea provides the foundation for our empirical estimation in Section V.

**IV. Data**

A brief introduction of our data is necessary before entering into empirical estimation. The primary dataset utilized for this study is the World Bank Technical Barriers to Trade survey results. The dataset was not initially collected for the purpose of identifying information cost, but it is the only dataset most relevant and it contains information that we could use to empirically test the impact of information cost. The data, collected between 2001 and 2002, covers 689 firms over 25 industries in 17 developing countries from five different regions. Detailed industrial and geographical distributions of surveyed firms are presented in Table 1. For the purpose of comparison, both currently exporting firms and non-exporting firms are included. Nonetheless, the sample is skewed; the number of firms currently involved in exporting to at least one destination is 628 (91 percent of the sample) while only 47 firms (about 6.8 percent) are not exporting to any of the included destinations. Since the original purpose of the survey was to investigate the impact of technical regulations and standards in major markets, such as the EU, the United States, Canada, Japan and Australia, availability of information regarding whether or not a firm is exporting to a specific market

allows empirical testing. Although there is additional information on whether or not a firm is exporting to countries other than the above-mentioned five major markets, the way the data recorded makes us unable to identify any other specific market.[3] Detailed information on firm characteristics, financial status experience in compliance with regulations is included. However, most of them are count data and this further makes our analysis difficult.

We focus our analysis on the two largest export markets included in the survey. In addition to the general limitation of the dataset the EU and the United States are the most important trade partners for all countries included in the survey. The share of export to the EU is the greatest trading partners in all 17 countries in our sample except Jordan and Panama. Among the 14 countries (excluding Bulgaria, Czech Republic and Poland, which are EU member states now), EU is listed as one of the top five trading partners for both agricultural and non-agricultural products. Meanwhile, the share of export to the United States is also large. The United States is a major trading partner in both agricultural and non-agricultural sectors, for Argentina, Chile, Honduras, India, Kenya, South Africa and Uganda; a major trading partner in agricultural sectors for Senegal and Panama; and a major trading partner in non-agricultural sectors for Pakistan, Nigeria and Jordan. Secondly, there is a missing data problem in terms of firm-level response to some of the key questions regarding exports to Canada, Japan and Australia. This may come from the fact that not all firms exporting enter into all five markets, even though the majority of the sampled firms export to at least one major market.

3 Countries other than the major five markets are recorded as other exporting destinations 1, 2, 3, etc. without the names of the country being specified.

## V. Empirical Model and Variable Description

Based on our simple static framework, there are two possible ways to estimate firm's decision to export. Ideally, we would specify the firm's profit function as a function of foreign price, domestic price, exchange rate, tariff rate, compliance cost, transportation cost, etc. and estimate a structural form of the firm's willingness to pay, as an approximization of the upper bound of fixed information cost. We forgo the structural estimation because we don't have any price and quantity information in our dataset. Instead, we estimate a reduced form of firm's export decision. To parameterize it, we define $y_i^* = WTP_i - FIC = X_i\beta + \varepsilon_i$, then firm's choice of export decision becomes

$$y_i = \begin{cases} 1 & if \;\; y_i^* = X_i\beta + \varepsilon_i > 0 \\ 0 & otherwise \end{cases}$$

To test the hypothesis that it is actually information cost that imposes the first hurdle on the decision of an individual firm to export, we estimate the following probit model.

$$dest\_\exp\_Y_i = 1[\beta_0 + \beta_1 \cdot dreg\_\inf o\_Y_i + X_i\delta + \varepsilon_i > 0], \qquad \varepsilon_i \sim \text{normal}(0,1),$$

Where, $dest\_\exp\_Y_i$ is a dummy variable and corresponds to two exporting destinations: EU and the United States. For instance, $dest\_\exp\_EU_i$ =1 if individual firm *i* exports to EU and 0 otherwise. Similarly, $dest\_\exp\_USA_i$ =1 if individual firm *i* exports to the United States and 0 otherwise. The key independent variable we are interested in is the dummy variable $dreg\_\inf o\_Y_i$, indicating whether or not it is difficult for individual firm *i* to obtain information about trade regulations in EU or the United States. *X* is a vector of control

variables, including firm characteristics, tariff rate, trade restriction index[4], etc. A measure of distance is also included. To control for the overall trade relationship between each pair of the exporting countries and their destinations, an average share exporting for each exporting country is included. The average share exporting is defined as the ratio of the number of firms exporting to EU/US and the total number of firms sampled in the country.

To capture the feature that experience in exporting to other destinations may affect firm's probability of exporting to EU or the United States, we use the share exported to other destinations as an independent variable. Ideally specific product tariff rates between each exporting firm's home country and the specific export destination would be used to capture tariff restrictiveness; however such data is not readily available for the period of interest. Therefore a simple average tariff rate on product aggregated to agricultural and non-agricultural for each pair-wise country is included as an independent variable.[5] Distance between exporting country and its destination is measured by the surface distance from exporting firm's capital city to the nearest ports of the destination country. Whether or not a firm feels difficulty in obtaining regulation information is potentially endogenous. As one of possible candidates of instrumental variables, we calculate the average difficulty level of information obtaining for each country, using the number of firms that indicated difficulties in the survey, divided by the total number of firms sampled. The average

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[4] The index calculated in "Global Monitoring Report 2008---Overall Restriction Indices" by Alessandro Nicita *et al*, World Bank is used to approximate a certain level of nontariff measures. An alternative measure of tariff is rates aggregated across product groups but without country variations. Using this measure doesn't change the significance level and magnitude of our key variables. Regression results are available upon request.

[5] "Preferential Tariffs of Major sectors in OECD Markets by Exporter in 2005" by Francis K. T. Ng, World Bank. Since country specific tariff rates for three East European Countries, Bulgaria, Czech Republic and Poland are not included, we use an average tariff rate of EU and USA for these three countries obtained in "Global Monitoring Report 2008---Overall Restriction Indices" as approximation.

difficulty level certainly affects whether or not ease of an individual firm obtaining information in EU or the United States, but it does not measure an individual firm's decision to export.

## VI. Results and Discussion

In cross-section data analysis, an inevitable problem is the endogeneity issue. For the key independent information variable in our empirical analysis, one can always argue that there is unobserved heterogeneity of firm characteristics affecting both difficulty in obtaining information and probability of exporting at firm level. For instance, a manager's ability in market exploration may ease the firm obtaining information, but also increases the probability of exporting. Failing to account for endogeneity may cause an over-estimation of the impact of information cost on probability of exporting. Because discreteness of the information variable makes the test of endogeneity technically difficult, we conduct our regression analysis by treating the information variable as both exogenous and endogenous for the purpose of comparison.

### A. Treat the Information Variable as Exogenous

Table 3 summarizes results from a separate linear probability model and probit model for each export destination. Since we have no information on when a firm enters into a foreign market, for an individual firm which exports to both the EU and the United States markets, the underlying assumption is that decisions to export to each location are independent, i.e. the decision to export to the EU is not related to the decision to export to the

United States and vice versa. Coefficients of the information variable in both linear probability model and probit model are significant at at least the 10% confidence level. In probit model[6], average partial effect[7] of the difficulty of obtaining information on technical regulations significantly reduces the probability of a firm exporting to both EU (by 5 percentage points) and the United States (by 11.7 percentage points), which is very close to the linear probability model. Consistent with previous empirical results, types of ownership matters in terms of exporting. However caution is needed for interpretation. In our case, a count variable (scaled from 1-8) is included as a general control for owner type, therefore standard interpretation of regression coefficients cannot be applied here.[8]

While the results provide some evidence of a negative relationship between information cost and a firm's decision to export, the assumption of independence is a potential limitation. In reality, a developing country firm will be more likely to export to a second country after undertaking exporting to a first country. To take into consideration the interaction between exporting decisions of a single firm among different countries, we relax the assumption of independence and estimate the following bivariate probit model.

$$\begin{aligned} dest\_\exp\_EU_i &= 1[\beta_0 + \beta_1 \cdot dreg\_\inf o\_EU_i + X_i\delta + u_i > 0] \\ dest\_\exp\_USA_i &= 1[\beta_0 + \beta_1 \cdot dreg\_\inf o\_USA_i + X_i\delta + v_i > 0] \end{aligned} \quad ,$$

where $(u_i, v_i)$ is independent of all control variables and

$$\begin{pmatrix} u \\ v \end{pmatrix} \sim Normal\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right].$$

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[6] Heteroskedasticity is assumed. Results allowing correlations among firms within a country is reported. Allowing correlations among firms within a industry slightly improves the significance level.

[7] We calculate the marginal effect for each individual firm and then average across sample size.

[8] A full set of dummies were generated, but too many binary variables in the estimation equation causes perfect collinearity and dummies of interests are automatically dropped.

Results are presented in Table 4 (column 3 and 4). The coefficient on difficulty in obtaining information in EU remains significant at the 10% confidence level, but not for the United States. The hull hypothesis that export decisions are independent is rejected at 10% significance level. The average partial effects indicate the difficulty of obtaining information on technical regulations significantly reduces the probability of a firm exporting to EU by 5 percentage points and to the United States by 9 percentage points. Comparing with the SUR results (5 percentage points and 12 percentage points correspondingly), the magnitudes are quite close. However, in the SUR results, the effect of information cost is significant at 5% confidence level for the United States, but is not significant for EU[9].

**B. Treat the Information Variable as Endogenous**

The problem of estimating systems of equations is the effect of misspecification spills over the entire system and causes bias. If we believe the information variable is not exogenous based on the argument that firms wish to export are more willing to collect information and thus may feel less difficult in obtaining information, then we should estimate the following bivariate probit model to control for endogeneity.

$$dest\_\exp\_Y_i = 1[\beta_1 \cdot dreg\_\inf o\_Y_i + Z_{1i}\delta_1 + u_i > 0]$$
$$dreg\_\inf o\_Y_i = 1[Z_{2_i}\delta_2 + v_i > 0]$$

Where $(u_i, v_i)$ is independent of $Z_1$ and $Z_2$[10] and

$$\begin{pmatrix} u \\ v \end{pmatrix} \sim Normal\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix}\right].$$

[9] SUR regression does not allow correction for any kind of heteroskedasticity. Violation of homoskedasticity assumption may potentially cause SUR estimated inefficient .

[10] Constant is included in both $Z_1, Z_2$ .

The average difficulty level of information obtaining for each exporting country, as a potential instrumental variable, is included in $Z_2$. Results, reported in Table 5, are mixed. After controlling for endogeneity, the coefficients in front of difficulty in obtaining information in EU remains significant at the 10% level, indicating a 3.5 percentage reduction in the probability of exporting to the EU if it is difficult for a firm to obtain information. On the other hand, we don't find significant evidence in the United States case.

In contrast to empirical results of trade patterns where information costs are not included, in most of our specifications, our results don't find a significant negative relationship between a firm's decision to export and the trade restrictiveness of more traditional measures. Neither the estimated coefficients for tariff rate and nontariff index nor the joint tests for a joint significance of both are significant. This is consistent with our hypothesis that in fact it is the information cost rather than tariff and traditional nontariff barriers that initially hinder the decision of exporting.

Potential problem of bivariate probit model is the joint normality assumption for error terms, which is too restrictive and may be violated in both cases. In addition, using the binary variable as a proxy may not be able to fully capture the information cost faced by firms, nonetheless a significant relationship on export decisions is clearly reflected, at least for firms exporting to the EU. Our results do not identify a clear pattern of how firm characteristics affect the decision of exporting, firm's sales, as an indicator of firm size is not economically significant in all specifications. This may be attributable to the fact that little variation is observed in firm size since the data set was originally designed by the World

Bank to focus on small and median-sized firms: more than 67 percent of the sampled firms have less than 150 employees.[11]

## VII. Conclusion

Using firm level data, we provide empirical evidence of how information cost could hinder an individual firm's participation in export markets. Although the results are mixed for the United States, they are consistently shown to have a significant negative impact of export participation to the EU. Our empirical work highlights a theoretical framework that explains trading decisions from the viewpoint of firm strategic behavior under the industrial organization framework rather than conventional trade theory. Our results also highlight an important contribution towards tangible empirical estimation of trade costs, technical barriers in particular, by breaking down technical barriers into different pieces. Meanwhile, with increasing availability of micro level data, more and deeper empirical analysis is likely to be done in this area, which can provide insights and foundations for future development of theoretical framework in this field.

[11] Rather than the number of employees, only a scale of the employee numbers is reported, e.g., 1=1-4 employees,…,6=150 or more employees. Frequent use of scale number makes further exploitation of the dataset difficult.

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**Table 1. Industrial and Geographical Distribution of Sampled Firms**

| Industry | Exporting Region | | | | | Total |
|---|---|---|---|---|---|---|
| | East Europe | Latin America | Middle East | South Asia | Sub-Saharan Africa | |
| | Number of firms | | | | | |
| Raw Agricultural Products | 5 | 19 | 2 | 6 | 52 | 84 |
| Meat Products | 2 | 12 | 0 | 1 | 10 | 25 |
| Electrical and electrical equipment | 20 | 1 | 1 | 11 | 2 | 35 |
| Fabricated metal | 4 | 1 | 1 | 7 | 10 | 23 |
| Industrial machinery and equipment | 2 | 2 | 0 | 8 | 5 | 17 |
| Industrial or agricultural chemical | 19 | 7 | 7 | 2 | 8 | 43 |
| Instruments, photographic, optical | 1 | 1 | 0 | 2 | 0 | 4 |
| Leather and leather products | 2 | 0 | 1 | 18 | 2 | 23 |
| Paper and allied products | 0 | 2 | 0 | 0 | 3 | 5 |
| Printing and publishing products | 0 | 1 | 0 | 1 | 1 | 3 |
| Processed food and tobacco | 13 | 23 | 13 | 11 | 22 | 82 |
| Rubber and plastic products | 0 | 10 | 6 | 3 | 9 | 28 |
| Telecommunications and terminal equip | 4 | 0 | 0 | 1 | 1 | 6 |
| Textiles and apparel | 26 | 7 | 14 | 110 | 12 | 169 |
| Transportation equipment, auto parts | 15 | 4 | 1 | 6 | 8 | 34 |
| Lumber, wood and furniture | 4 | 5 | 1 | 0 | 4 | 14 |
| Construction and construction relate | 0 | 1 | 0 | 1 | 2 | 4 |
| Primary metal and metallic ores | 1 | 1 | 2 | 0 | 8 | 12 |
| Petroleum and other nonmetallic mine | 0 | 0 | 6 | 0 | 8 | 14 |
| Miscellaneous manufactured commodity | 0 | 0 | 2 | 30 | 7 | 39 |
| Drug and liquor | 1 | 6 | 0 | 0 | 4 | 11 |
| Material | 2 | 1 | 0 | 1 | 0 | 4 |
| Transportation and mailing service | 0 | 0 | 0 | 1 | 2 | 3 |
| Other services | 0 | 2 | 0 | 0 | 2 | 4 |
| Other | 0 | 0 | 1 | 0 | 2 | 3 |
| Total | 121 | 106 | 58 | 220 | 184 | 689 |

**Table 2. Descriptive Statistics of Variables**

| Variable Name | Definition | No. of Observations | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|---|
| dest_exp_eu | 1 if firm exports to EU, 0 otherwise. | 630 | 0.727 | 0.446 | 0 | 1 |
| dest_exp_usa | 1 if firm exports to USA, 0 otherwise. | 630 | 0.449 | 0.498 | 0 | 1 |
| dreg_info_eu | Difficulty in obtaining regulation information in EU,1=yes, 0 otherwise | 475 | 0.204 | 0.404 | 0 | 1 |
| dreg_info_usa | Difficulty in obtaining regulation information in USA, 1=yes, 0 otherwise | 331 | 0.208 | 0.407 | 0 | 1 |
| desteu | exporting ratio =No. of firms exporting to EU/No. of sampled firms in country *j* | 674 | 0.723 | 0.149 | 0.2 | 0.902 |
| destusa | exporting ratio =No. of firms exporting to USA/No. of sampled firms in country *j* | 674 | 0.451 | 0.176 | 0 | 0.75 |
| infoeu | Average difficulty in obtaining regulation information in EU | 674 | 0.219 | 0.112 | 0 | 0.75 |
| infousa | Average difficulty in obtaining regulation information in USA | 674 | 0.225 | 0.175 | 0 | 1 |
| Industry | Industry code | 689 | 10.546 | 6.167 | 1 | 25 |
| Hist | years since the firm is established | 646 | 24.180 | 24.328 | 1 | 305 |
| expother (%) | Share exported to other countries | 689 | 41.760 | 39.920 | 0 | 100 |
| tar_eu (%) | EU tariff rate | 672 | 0.578 | 1.250 | 0 | 6.87 |
| tar_usa (%) | USA tariff rate | 643 | 0.689 | 1.133 | 0 | 8.97 |
| nontar_eu (%) | EU nontariff index | 671 | 11.140 | 17.596 | 0 | 42.8 |
| nontar_usa (%) | USA nontariff index | 674 | 6.962 | 4.596 | 4.2 | 14.6 |
| owner_type | Type of ownership | 590 | 1.888 | 1.678 | 1 | 8 |
| sales | sales (in 2001 US $1,000) | 634 | 11763.62 | 35324.3 | 8.269 | 336215.7 |

| | | | | | | |
|---|---|---|---|---|---|---|
| inp_lab_full | Number of full-time monthly workers | 603 | 257.116 | 749.962 | 1 | 9500 |
| leu_dis | Logarithm of distance between EU and exporting country | 689 | 8.501 | 0.774 | 6.564 | 9.393 |
| leu_dissq | Square of logarithm of distance between EU and exporting country | 689 | 72.856 | 12.413 | 43.086 | 88.231 |
| lusa_dis | Logarithm of distance between USA and exporting country | 689 | 9.113 | 0.417 | 7.487 | 9.487 |
| lusa_dissq | Square of logarithm of distance between USA and exporting country | 689 | 83.221 | 7.201 | 56.060 | 90.006 |
| loc_frn | 1 if the firm has facilities abroad , 0 otherwise | 670 | 0.073 | 0.261 | 0 | 1 |
| dreg_info_oth1 | Difficulty in obtaining regulation information in 1st other country,1=yes, 0 otherwise | 374 | 0.233 | 0.423 | 0 | 1 |

**Table 3: Coefficients of Effects of Information Costs on Firm's Exporting Decision Linear Probability Model v.s. Probit Model**

| | Linear Probability Model | | Probit Model | |
|---|---|---|---|---|
| Independent Variables | EU | USA | EU | USA |
| Constant | -2.26** | -1.27 | 1.13 | -7.39 |
| | (1.03) | (7.60) | (76.34) | (47.64) |
| dreg_info_Y | -0.05* | -0.12* | -1.16** | -0.55* |
| | (0.03) | (0.06) | (0.50) | (0.31) |
| dest_Y | 0.21 | 0.18 | 1.94 | 1.06 |
| | (0.15) | (0.20) | (2.32) | (1.35) |
| industry | 0.002 | 0.005 | 0.03 | 0.03 |
| | (0.002) | (0.005) | (0.04) | (0.02) |
| hist | 0.0004 | 0.001 | 0.02 | 0.005 |
| | (0.003) | (0.001) | (0.02) | (0.003) |
| expother (%) | -0.002*** | -0.004*** | -0.05*** | -0.02*** |
| | (0.000) | (0.001) | (0.01) | (0.004) |
| tariff rate | -0.02* | -0.01 | -0.31* | -0.01 |
| | (0.01) | (0.05) | (0.17) | (0.17) |
| nontariff | 0.001 | 0.001 | 0.02 | -0.01 |
| measure | (0.001) | (0.006) | (0.015) | (0.03) |
| owner-type | 0.004 | -0.03 | 0.53*** | -0.11** |
| | (0.004) | (0.02) | (0.08) | (0.05) |
| sales | 0.000*** | 0.000 | 0.000* | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| ldis_Y | 0.83*** | 0.46 | 2.75 | 1.86 |
| | (0.26) | (1.79) | (17.44) | (11.15) |
| ldissq_Y | -0.05*** | -0.02 | -0.29 | -0.10 |
| | (0.02) | (-1.27) | (1.13) | (0.66) |

Notes: 1. robust standard errors are reported in parentheses below the estimates.
2. "*", "**" and "***" represent significance level at 10%, 5% and 1% respectively.

**Table 4: Estimates of Effect of Information Costs on Firm's Exporting Decision**
**Bivariate Probit v.s. SUR regression**

| | SUR regression | | Bivariate Probit Model | |
|---|---|---|---|---|
| Independent Variables | EU | USA | EU | USA |
| Constant | -0.27 | -0.03 | 3.55 | -24.16 |
| | (1.73) | (7.28) | (81.20) | (42.25) |
| dreg_info_Y | -0.05 | -0.12** | -1.02* | -0.40 |
| | (0.04) | (0.06) | (0.59) | (0.35) |
| dest_Y | 0.24 | 0.21 | 2.96** | 1.53 |
| | (0.20) | (0.25) | (1.46) | (1.25) |
| industry | 0.002 | 0.01* | 0.02 | 0.03 |
| | (0.003) | (0.004) | (0.04) | (0.02) |
| hist | 0.001 | 0.001 | 0.02 | 0.01* |
| | (0.001) | (0.001) | (0.02) | (0.004) |
| expother (%) | -0.004*** | -0.005*** | -0.04*** | -0.02*** |
| | (0.001) | (0.001) | (0.006) | (0.004) |
| tariff rate | -0.01 | -0.01 | -0.25** | -0.02 |
| | (0.01) | (0.03) | (0.10) | (0.16) |
| nontariff | 0.001 | 0.004 | 0.02 | -0.01 |
| measure | (0.001) | (0.006) | (0.01) | (0.03) |
| owner-type | 0.016 | -0.02 | 0.64*** | -0.04 |
| | (0.01) | (0.02) | (0.09) | (0.07) |
| sales | 0.000** | 0.000 | 0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) |
| ldis_Y | 0.31 | 0.11 | 0.87 | 5.50 |
| | (0.43) | (1.72) | (18.23) | (9.92) |
| ldissq_Y | -0.02 | -0.003 | -0.13 | -0.30 |
| | (0.03) | (0.10) | (1.03) | (0.58) |

Notes: 1. robust standard errors are reported in parentheses below the estimates.
2. "*", "**" and "***" represent significance level at 10%, 5% and 1% respectively.
3. Wald test of the correlation between EU and US equations ($\rho=0$) are rejected at 10% significance level.

**Table 5: Estimates of Effect of Information Costs on Firm's Exporting Decision (Endogenous Information Variable)**

| | Bivariate Probit Model | | | |
|---|---|---|---|---|
| Independent Variables | EU | | USA | |
| Constant | -9.97 | (32.32) | 7.64 | (43.87) |
| dreg_info_Y | -0.88* | (0.46) | -0.21 | (0.44) |
| dest_Y | 2.90 | (2.55) | -0.64 | (1.09) |
| industry | 0.02 | (0.04) | 0.04* | (0.02) |
| hist | 0.02 | (0.02) | -0.001 | (0.003) |
| expother (%) | -0.04*** | (0.005) | -0.02** | (0.01) |
| tariff rate | -0.31 | (0.19) | 0.37 | (0.32) |
| nontariff measure | 0.02 | (0.01) | -0.06 | (0.03) |
| owner-type | 0.48*** | (0.06) | -0.15** | (0.07) |
| sales | 0.000 | (0.000) | 0.000 | (0.000) |
| ldis_Y | 4.67 | (7.68) | -1.56 | (10.31) |
| ldissq_Y | -0.38 | (0.46) | 0.11 | (0.61) |
| | dreg_info_EU | | dreg_info_USA | |
| constant | 22.52** | (9.97) | -9.96 | (21.08) |
| info_Y | 3.77*** | (1.20) | 5.88*** | (1.44) |
| dreg_info_oth1 | 1.99*** | (0.49) | 1.82*** | (0.42) |
| desteu | -2.04 | (1.51) | -0.06 | (0.48) |
| industry | 0.01 | (0.02) | -0.02 | (0.01) |
| hist | 0.003 | (0.004) | -0.001 | (0.004) |
| owner_type | -0.01 | (0.08) | 0.15 | (0.14) |
| loc_frn | -0.47 | (0.41) | -6.97*** | (2.43) |
| inp_lab_full | 0.000* | (0.000) | -0.00 | (0.00) |
| sales | 0.000 | (0.00) | -0.00 | (0.00) |
| ldis_Y | -5.98** | (2.62) | 1.37 | (4.90) |
| ldissq_Y | 0.37** | (0.17) | -0.06 | (0.28) |

Notes: 1. robust standard errors are reported in parentheses below the estimates.
2. "*", "**" and "***" represent significance level at 10%, 5% and 1% respectively.