Information Cost As A Prior Hurdle to Exporting

Xuan Wei*

and

Suzanne Thornsbury**

* Graduate Student, Department of Agricultural, Food and Resource Economics, Michigan State University (e-mail: weixuan@msu.edu).

** Associate Professor, Department of Agricultural, Food and Resource Economics, Michigan State University (e-mail: thornsbu@msu.edu).

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Abstract

In this paper, we empirically assess how information cost, as one component of trade costs, impacts the decision of an individual firm to export. Firm-level data measuring the difficulty of obtaining information about technical regulations in the European Union (EU) and the United States is used as a proxy for information cost to evaluate reduction in firm incentives to export. Results suggest that information cost significantly reduces the likelihood of exporting to these two destinations. Negative impacts are relatively larger for a firm exporting to the United States than to the EU.

Key words: information cost, trade costs, non-tariff, technical barriers to trade, probit

JEL classification: F14, L25

1. Introduction

Trade costs are broadly defined to include items that limit firm exports based on all costs associated with product delivery to the final user. They include both tariff and non-tariff barriers. As tariffs are reduced through bilateral and multilateral agreements, concern over the substitution of non-tariff trade barriers (NTBs) has increased. NTBs contribute both a growing amount and a growing share to the aggregate trade costs facing potential exporters. While a multitude of policies and regulations are included within the broad category of non-tariff barriers, an important - and often overlooked - category is information costs and its impact on exports.

For example, some literature has been developed to identify and estimate compliance and implementation costs associated with technical barriers to trade (TBT), a particularly challenging category in NTBs. However, results are largely limited to country case studies given the disparate nature of these barriers and often ambiguous economic impacts (see for example, Paarlberg and Lee, 1998; Yue, Beghin, and Jensen, 2004; Peterson and Orden, 2008; Disdier, Fontagne and Mimouni,2006; Maskus, Otsuki and Wilson, 2001).Increased compliance costs are obvious consequences from technical barriers but information costs, associated with information collection and research on relevant regulations and standards, the application of regulations and standards to the products under consideration of export, and even where to obtain the necessary information, are not considered and excluded from this line of research. Compliance costs are assumed to be known and certain without collecting information; they are normally specified as fixed cost to establish new processes or procedures and/or recurring expenses to implement requirements upon exporting.

Yet clearly there is some learning, or information gathering, that occurs. Using nine-year (1981-1989) firm-level panel data from the Colombian manufacturing sector, Roberts and Tybout (1997) provide empirical evidence that a firm with prior experience is up to 60 percent more likely to export than a firm that has never exported. Employing a similar dynamic discrete choice model, Bernard and Jenson (2001) found that entry costs to foreign markets are substantial for U.S. manufacturing firms, and firms are increasingly likely to export in consecutive years. Recently Das, Roberts and Tybout (2007) go beyond previous reduced-form analysis and are able to quantify fixed entry

costs for three Colombian manufacturing industries (basic chemicals, leather products, and knitted fabrics) by estimating a structural model. Results indicate average entry costs to foreign markets are similar across the three sectors between 1981 and 1991, but are lower for large producers (e.g. $402,000 for knitting mills) relative to small producers (e.g. $412,000 for knitting mills).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 small firms relied more on external information sources than did large firms. For small and medium-sized firms with an expectation of limited export volume, information cost is potentially an insurmountable burden.

Information costs are the monetary equivalent of firm efforts and investments to research and understand regulations and standards imposed by a potential foreign market. These costs must be undertaken by a firm to evaluate potential competitiveness and assess their own ability to enter a given market. Difficulties in accessing information about regulations, exporting procedures, or compliance could limit a firm's export competitiveness well beyond the content of regulation and standards themselves. Even though trade policies are sometimes publically accessible through official web sites, it is not an easy or costless task for firms to go through the tedious, and often obscure, documentation to extract the specific information they need. The problem is exacerbated for smaller and mid-sized firms.

In 2004, ad-valorem tax equivalent trade costs for industrialized countries were estimated to be 170 percent of producer price (Anderson and van Wincoop, 2004).

Included are impacts from tariffs (less than five percent), nontariff barriers (eight percent), and information costs (six percent), which implies these three sources were almost equal impediments to trade on an aggregated basis. Once information costs are undertaken, they are considered sunk costs whether or not the tariff or other non-tariff barriers are prohibitive.

In response to empirical evidence, Melitz (2003) developed a dynamic trade model with heterogeneous firms to examine the effect of export market entry costs on different types of firms. Only more productive firms enter export markets while less productive firms are confined to domestic market. Wei and Thornsbury (2011) extended the Melitz model to analyze how individual firms may reduce or eliminate the uncertainty of compliance costs by paying for the information cost prior to making decisions to export. Our model indicates that in the presence of uncertain compliance costs and non-zero information cost, i) the number of exporting firms may be reduced since some firms capable of exporting are trapped within the domestic market; ii) average profits and productivity differences between exporting and non-exporting firms are smaller.

In this paper, we focus on empirically testing the impacts of information cost on exporter decisions using a firm-level data set collected by the World Bank. In particular, we assess the relationship between difficulty in obtaining information about EU and U.S. technical regulations and firm-level exports to those destinations. We separate, and empirically test, the effect of information cost from regulatory compliance cost and other trade costs. Specific markets are considered independently while previous

firm-level empirical studies on export decisions do not distinguish exporting destinations (Roberts and Tybout, 1997; Bernard and Jenson, 2001; Das, Roberts, and Tybout, 2007; Blanes-Cristóbal et al., 2008; Özler, Taymaz, Yılmaz, 2008). Differences by market are of particular interest with respect to technical regulations which are formulated given conditions in specific exporting and importing countries (Thornsbury, Roberts, and Orden, 2004).

The remainder of the paper is organized as follows. The next section describes the data set used in our empirical estimation and explains our focus on the EU and the United States. The empirical model is described in Section 3 and we present our estimation results in Section 4. In Section 5 we conclude.

2. Data

The primary dataset utilized for this study is the World Bank Technical Barriers to Trade (TBT) survey results. While the survey was not initially designed to identify information cost, it allows empirical testing of information cost impacts. The original purpose was to investigate the impact of technical regulations and standards in major markets (EU, U.S., Canada, Japan, and Australia), therefore firms included in this survey are either firms currently involved in exporting, or non-exporting firms with potential interest in exporting. Although there is some information on whether or not a firm is exporting to countries other than these five markets, separate identification is not possible.[1]

[1] 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 or consistent categorization applied.

The data, collected between 2001 and 2002, covers 689 firms over 25 industries in 17 developing countries from five different world regions. Detailed industrial and geographical distributions of the surveyed firms are presented in Table 1. Information on firm characteristics, financial status, and experience in compliance with regulations is reported primarily as count data. Although the survey was intended to cover both currently exporting and non-exporting firms, the number of firms involved in exporting to at least one destination is 628 (91 percent of the sample) while only 47 firms (about 7 percent) are not exporting. Separation of observations by export destination allows empirical testing. We focus our analysis on the two largest export markets, the EU and the United States, as they are the most important trade partners for all countries included in the survey. Among all surveyed firms 231 firms out of 630 (37 percent) are exporting only to the EU, 56 firms (9 percent) are exporting only to the United States, 227 firms (36 percent) export to both destinations, and the remaining 116 firms (18 percent) export to neither of these two destinations.

The share of exports to the EU is the greatest from countries in our sample except from Latin America and Caribbean countries. Among the other non-East European countries, the EU is listed as one of the top five trading partners for both agricultural and non-agricultural products. Meanwhile, the share of exports 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. Missing data in terms of firm-level response to some of the key questions regarding exports to Canada, Japan and Australia prohibit modeling these export destinations separately.

The number of firms responding to the key question regarding whether it is difficult or not to obtain information on standards and regulations for the EU and United States is 475 and 331 respectively, but drops to around 180 (less than 27 percent of the total sampled firms) for the other three major markets. Among 281 respondents who answered the question for both the EU and the United States, 206 firms (more than 73 percent) reported obtaining information without difficulty for both destinations and 46 firms (16 percent) reported obtaining information with difficulty for both destinations.

3. Empirical Model and Variable Description

Following the approach of Melitz, a firm will export to a particular destination as long as productivity is greater than a cut-off productivity level. Profit typically serves as an empirical measure of productivity.[2] We use a reduced form approach to test for impact of information cost on firm level export decisions since our data set lacks price and quantity information. The firms in our data set represent an underlying population that is interested in exporting (either currently exporting or wishing to export but not able to). To parameterize the model, we define $y_i^* = X_i\beta + \varepsilon_i$ where y_i^* is a latent variable representing the expected future profit from exporting, X_i is a vector of

[2] Ideally with firm-level price and quantity data available, we would specify a firm's profit as a function of foreign price, domestic price, exchange rate, tariff rate, compliance cost, transportation cost, etc. Then we could estimate a structural form of the firm's willingness to pay, as an approximization of the upper bound on fixed information cost (e.g. Das, Roberts, and Tybout, 2007).

observable firm characteristics, and ε_i is the error term. The firm export decision can be modeled as a binary-choice decision,

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

To test the hypothesis that information cost imposes an initial barrier to the decision of an individual firm to export, we estimate the probit model

$$EXP\_Y_i = 1[\beta_0 + \beta_1 \cdot INFO\_Y_i + X_i\delta + \varepsilon_i > 0], \qquad \varepsilon_i \sim \text{normal}(0,1),$$

where, EXP_Y_i is a dummy variable corresponding to two exporting destinations: EU and the United States. For instance, EXP_EU_i=1 if individual firm *i* exports to EU and 0 otherwise. Similarly, EXP_USA_i=1 if individual firm *i* exports to the United States and 0 otherwise. The key independent variable is the dummy variable $INFO\_Y_i$, indicating whether or not it is difficult for an individual firm *i* to obtain information about trade regulations in the EU or the U.S.

The vector of control variables, *X*, includes firm characteristics, compliance cost, tariff rate, trade restriction index and distance measures. Variables such as years of establishment (*HISTORY*), firm ownership (*OWNER_TYPE*) and industry (*INDUSTRY*) are used to control for basic firm characteristics. Number of full-time employees (*LABOR*) is used to measure firm size. Firm profit (*PROFIT*) is calculated as the sales value minus two production costs; input expenditure on raw materials and total payroll. Three dummy variables, whether a firm invested in additional plant or equipment (*EQP*), in one-time product redesign (*REDESIGN*), and in product re-design for each export destination (*MKT_REDESIGN*), are included to partition the effect of compliance and

implementation costs.

A simple average tariff rate (*TARIFF*) on products aggregated to agricultural and non-agricultural sectors for each pair-wise country is included as an independent variable.[3] As a measure of non-tariff barriers, an overall trade restriction index (*OTRI*)[4] is included. The index is an ad-valorem price equivalent of NTBs, including price and quantity control measures, technical measures, as well as monopolistic measures and agricultural domestic support. Distance between exporting country and destination market controls for transportation cost, measured by the surface distance from exporting firm's capital city to the nearest ports in the destination country.

In cross-section data analysis, an inevitable problem is endogeneity. For the key independent information variables in our empirical analysis (*INFO_EU, INFO_USA*), there may be unobserved heterogeneity in the error term affecting both the difficulty in obtaining information and the probability of exporting at firm level. For instance, profitable firms are willing to pay more to collect information and thus are more likely to be involved in export markets. Failing to account for endogeneity of the information variable may cause an upward bias of the impact of information cost on probability of exporting. With only cross section data and no valid instrument variable

[3] "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 an approximation. Accession date for Bulgaria, Czech Republic and Poland are January 2007, May 2004 and May 2004 respectively. Therefore, these countries were non-EU member states when the data was collected.

[4] "Global Monitoring Report 2008---Overall Restriction Indices" by Kee, Nicita and Olarreaga, World Bank. While the non-tariff measure (*OTRI*) is an estimated index that bundles multiple forms of trade restrictions into one measure, it does capture the numerous forms of non-tariff barriers that are imposed.

available, we select independent variables to control.[5] If unobserved heterogeneity is coming systematically from region or country level the distance variable, computed at country level, will control for this effect. The more usual case is unobserved heterogeneity in firm characteristics. As firms with higher productivity self-select into export markets, then measures of profit and other firm characteristics, potentially affecting willingness-to-pay for information, are used as controls.

4. Results and Discussion

Estimation results from three specifications of the empirical probit model are summarized in Table 3. Columns EU(1) and US(1) summarize results for the baseline specification with independent export decisions. The probit model is run separately for EU and the United States where information costs for only that destination are included. The underlying assumption (later relaxed in two alternative estimation methods) is that the decision to export to the EU, as well as the difficulty in obtaining relevant information on EU export market is not related to the decision to export to the United States and vice versa. Coefficients on the information variable for both the EU and U.S. are statistically significant at ten-percent and five-percent level respectively. Average partial effects[6] indicate that difficulty of obtaining information about technical regulations significantly reduces the probability of a firm exporting to EU by 5.4 percentage points and to the United States by 12 percentage points. Information cost imposes relatively larger negative impact on firms exporting to the United States.

[5] Ideally, we would deal with this problem by fixed effect or first difference methods if we have panel data and if we are willing to assume unobserved heterogeneity is time invariant. We believe this is better than a weak instrument or a slightly endogenous instrument variable.
[6] We calculate the marginal effect for each individual firm and then average across sample size.

Provided that the EU and the United States are either competing or complimentary export destinations, a firm's decision to export to the EU will inevitably be affected by difficulty in obtaining relevant information about U.S. export regulations. Likewise, a firm's decision to export to the United States will be affected by difficulty in obtaining information on EU export regulations. Hence we relax the assumption of independence by first including both information cost variables in the right hand side and estimate the following specification separately for EU and the United States.

$$EXP\_Y_i = 1[\beta_0 + \beta_1 \cdot INFO\_EU_i + \beta_2 \cdot INFO\_USA_i + X_i\delta + u_i > 0], \quad \varepsilon_i \sim \text{normal}(0,1),$$

where Y_i corresponds to the EU and the United States.

Results are presented in columns EU(2) and US(2). For the EU equation, after controlling for *INFO_USA*, difficulty of obtaining information on technical regulations in the EU reduces the probability of a firm exporting to EU by 10 percentage points, almost double the effect without controlling for *INFO_USA*. In contrast, in the U.S. equation coefficients of *INFO_EU* and *INFO_USA* are not individually statistically significant, but jointly significant at 10 percent level (with χ^2=5.38). Average partial effects indicate that difficulty of obtaining information on technical regulations in the U.S. only reduces the probability of a firm exporting to the United States by 0.1 percentage points, while difficulty of obtaining information on technical regulations in the EU reduces the probability of a firm exporting to the United States by 14.7 percentage points. The overwhelmed negative effect of *INFO_EU* in the U.S. equation is somehow contradicting to what we expect to observe: if EU and the U.S. are two competing markets, as the difficulty of obtaining information on technical regulations in

EU increases, the probability of a firm exporting to the U.S. should be increased rather than decreased if everything else are the same. On the other hand, if EU and the U.S. are two complimentary markets, the negative effects of *INFO_EU* and *INFO_USA* should be quite similar.

To understand why the U.S. export decision equation behaves so differently from the EU equation, we decompose firms in the U.S. equation by cross tabulating *EXP_USA* and *INFO_USA*, *EXP_USA* and *INFO_EU*, *INFO_USA* and *INFO_EU*. Approximately 84% of the firms exporting to the United States which report difficulty of obtaining information about the USA also report difficulty of obtaining information about EU. Due to this multi-collinearity problem,[7] the effect of *INFO_USA* vanishes when *INFO_EU* is included in the U.S. equation. On the other hand, we are able to identify and partition out the effect of *INFO_EU* in the EU case after controlling for *INFO_USA* because there is enough variation in firms exporting to EU.

A second method to relax the assumption that export decisions to individual countries are independent is to estimate the following bivariate probit model and test the null hypothesis that $\rho = 0$.

$$\begin{aligned} EXP\_EU_i &= 1[\beta_0 + \beta_1 \cdot INFO\_EU_i + X_i\delta + u_i > 0] \\ EXP\_USA_i &= 1[\beta_0 + \beta_1 \cdot INFO\_USA_i + X_i\delta + v_i > 0] \end{aligned} \quad ,$$

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

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

[7] Estimation results from US equation exhibit symptoms of multi-collinearity: individual coefficient of *INFO_EU* and *INFO_USA* is not significant, but the joint test is significant at 10% level.

Under this specification (results reported in columns EU(3) and US(3)), the estimated coefficient on *INFO_EU* is not statistically significant, but the estimated coefficient on *INFO_USA* remains significant at 10%. The null hypothesis of independence ($\rho = 0$) is rejected at 1% significance level, again indicating that export decisions to different destinations are related. Average partial affect shows difficulty of obtaining information about technical regulations reduces the probability of a firm exporting to the United States by 11.5 percentage points.

In contrast to information cost, it seems compliance costs are not as important in reducing the probability that a firm will export. The coefficients of compliance costs are not individually statistically significant across all three probit specifications for either the EU or the United States.[8] This result supports the assumption that an individual firm makes export decisions after collecting information, but prior to pay the compliance costs. Once the uncertainty of the compliance costs is eliminated by paying the information cost, compliance costs will be no longer a hurdle for firms capable to export (see Wei and Thornsbury, 2011 for theoretical development of this assumption).

In contrast to empirical results from earlier studies of trade patterns where information cost is not considered, our results find lower relative impacts from tariffs, when considered separately, as a major determinant of firm decisions to restrict exports. The largest average partial effect of tariff rate (in EU(2)) reduces the probability of a firm exporting to the EU by approximately four percentage points, which is smaller than

[8] Neither the joint test for the three compliance cost variables (*EQP, REDESIGN,* and *MKT_DESIGN*) is significant at 10% level. See Table 3 notes.

the impact caused by information cost. The coefficient on the non-tariff measure (*OTRI*) for the EU is positive and statistically significant with a small percentage impact. In case of the United States, neither the estimated coefficients for tariff rate, nontariff index, nor the joint tests are significant in the probit specifications.

These results are not surprising and are consistent with our hypothesis that in fact it is the information cost rather than tariff and nontariff barriers (such as compliance and implementation costs) that creates the initial hurdle and hinders the decision to export. Regulations and standards in a foreign market might be less restrictive than expected once firms pay the information costs. The existence of certain regulations and standards such as labeling or content requirements may actually increase the probability of export if a firm realizes these requirements are already met after the information costs are undertaken, like the EU results we observe in our sample.

We also report results from linear probability models (LPM) and seemingly unrelated regression (SUR) which we treat as benchmark cases and use for the purpose of comparison (Table 3). Average partial effects of *INFO_EU* and *INFO_USA* from each probit specification are directly comparable with coefficients from its corresponding linear probability model specifications (from EU(4) to US(6)), where coefficients per se indicate partial effects. Another reason for us to compare the partial average effects of different probit specifications with linear probability model specifications is due to the restrictiveness of the standard normal distribution assumption for the error term of the probit model. In addition, the linear probability model specifications can always serve as the benchmark cases for a robustness check.

In the LPM results EU(4) and USA(4), estimated coefficients indicate the difficulty of obtaining information on standards and regulations causes 5.7 percentage points and 12.1 percentage points reduction in probability of exporting to EU and the United States respectively. In SUR regression (EU(6) and US(6)), difficulty of obtaining information on standards and regulations causes 5.7 percentage points and 13.2 percentage points reduction in probability of exporting to EU and the United States respectively. These effects are quite close to the average partial effects calculated from the probit model with single information variable (EU(1) and US(1)) and the biprobit model (EU(3) and US(3)). Although the binary variable for information cost is only a proxy and thus not able to fully capture the entire information cost faced by a firm, a significant relationship with export decisions is clearly reflected for firms exporting to both destinations.[9]

In addition, regression results illustrate differences between firms exporting to EU and the United States in terms of trade pattern. Distance matters for firms exporting to the EU, but not to the United States.[10] Results for firm characteristics do not identify a clear relationship with export decisions. In contrast to Blanes-Cristóbal et al. (2008) which found no significant effect of firms' years of establishment (*HISTORY*) on export decision, we find mixed results. Firm age matters for firms exporting to the EU, but not to the United States. Although firm profit is found to be statistically significant for firms

[9] Since we have information on share exported to the EU and the United State, we tried fractional response logit model using export share as dependent variable. However, we are not able to extract more useful information because of a large fraction of zeros in the information cost variable (around 75% of firms report no difficulty in obtaining information for either country).

[10] Although individual coefficients of distance variables are not significant for the individual destinations, the joint test is significant for the EU but not for the United States.

exporting to the EU, it is not economically significant across specifications for both EU and the United States. In addition, number of employees, as another key indicator of firm size is neither statistically nor economically significant in both cases across different 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 mid-sized firms: more than 67 percent of the sampled firms have less than 150 employees. This result is supported by the finding in Özler et al (2008) that the probability of exporting increases as size of plants moving from small plants (25-49 employees) to large plants (250+ employees) irrespective of past export experience. In other words, plant sizes matters more when the plant is large enough.

5. Conclusion

Using firm level data, we provide empirical evidence on how information cost limits individual firms from participating in two separate export markets. Although the magnitudes of information cost are different for EU and the United States, they are consistently shown to have a significant negative impact on individual firm decisions to export to both destinations. Our empirical results show that *ceteris paribus*, rising information costs significantly reduce the probability that a firm will export either to the EU or to the United States, creating an initial hurdle to trade beyond compliance costs associated with tariff and other non-tariff barriers. Our results contribute to tangible empirical estimation of impacts from trade costs by disentangling relative information cost impacts from the multiple barriers facing exporting firms.

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Table 1. Industrial and Geographical Distribution of Sampled Firms

Industry	Exporting Region (No. of firms)					Total
	East Europe	Latin America	Middle East	South Asia	Sub-Saharan Africa	
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
EXP_EU	1 if firm exports to EU, 0 otherwise.	630	0.727	0.446	0	1
EXP_USA	1 if firm exports to US, 0 otherwise.	630	0.449	0.498	0	1
INFO_EU	Difficulty in obtaining regulation information in EU,1=yes, 0 otherwise	475	0.204	0.404	0	1
INFO_USA	Difficulty in obtaining regulation information in US, 1=yes, 0 otherwise	331	0.208	0.407	0	1
INDUSTRY	Industry code	689	10.546	6.167	1	25
HISTORY	years since the firm is established	646	24.180	24.328	1	305
TARIFF_EU (%)	EU tariff rate	672	0.578	1.250	0	6.87
TARIFF_USA (%)	US tariff rate	643	0.689	1.133	0	8.97
OTRI_EU (%)	EU overall trade restriction index	671	11.140	17.596	0	42.8
OTRI_USA (%)	US overall trade restriction index	674	6.962	4.596	4.2	14.6
OWNER_TYPE	Type of ownership	590	1.888	1.678	1	8
PROFIT	Sales net input expenditure on raw materials and total payroll (in 2001 US million dollars)	552	4.424	14.662	-32.319	145.061
LABOR	Number of full-time monthly workers	603	257.12	749.96	1	9500
EQP	investment in additional plant or equipment	624	0.423	0.494	0	1
REDESIGN	Investment in product re-design for each export market	623	0.283	0.451	0	1
MKT_REDESIGN	Investment in one-time product re-design	623	0.340	0.474	0	1
LOG(DIS_EU)	Logarithm of distance between EU and exporting country	689	8.501	0.774	6.564	9.393
$LOG^2(DIS\_EU)$	Squared logarithm of distance between EU and exporting country	689	72.856	12.413	43.086	88.231
LOG(DIS_USA)	Logarithm of distance between US and exporting country	689	9.113	0.417	7.487	9.487
$LOG^2(DIS\_USA)$	Squared logarithm of distance between US and exporting country	689	83.221	7.201	56.060	90.006

Table 3: Coefficients of Effects of Information Cost on Firm Export Decisions

Control Variables	Independent Export Decisions		Interacted Export Decision				Independent Export Decisions		Interacted Export Decision			
	Probit Model		Probit Model		Biprobit Model		LPM		LPM		SUR	
	EU(1)	US(1)	EU(2)	US(2)	EU(3)	US(3)	EU(4)	US(4)	EU(5)	US(5)	EU(6)	US(6)
INFO_EU	-0.822 *	---	-0.941*	-0.603	-0.436	---	-0.057*	---	-0.130	-0.146	-0.057	---
	(0.456)		(0.566)	(0.386)	(0.512)		(0.032)		(0.096)	(0.109)	(0.042)	
INFO_USA	---	-0.523**	0.646	-0.006	---	-0.462*	---	-0.121*	0.093	-0.000	---	-0.132**
		(0.267)	(0.660)	(0.414)		(0.261)		(0.069)	(0.088)	(0.111)		(0.062)
INDUSTRY	0.061 **	0.029	0.066**	0.039	0.052	0.031	0.003	0.006	0.003	0.008	0.002	0.008
	(0.025)	(0.024)	(0.028)	(0.025)	(0.023)	(0.026)	(0.002)	(0.005)	(0.004)	(0.006)	(0.004)	(0.005)
HISTORY	0.016**	-0.002	0.015*	-0.002	0.012	-0.002	0.000	-0.000	0.001	-0.000	0.000	-0.000
	(0.008)	(0.004)	(0.009)	(0.005)	(0.011)	(0.005)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)
TARIFF	-0.496 ***	-0.097	-0.486***	-0.109	-0.428***	-0.104	-0.031**	-0.033	-0.041**	-0.038	-0.027**	-0.028
	(0.165)	(0.119)	(0.157)	(0.137)	(0.161)	(0.127)	(0.012)	(0.039)	(0.017)	(0.046)	(0.012)	(0.033)
OTRI	0.040**	-0.010	0.045***	-0.010	0.037**	-0.019	0.001*	-0.001	0.002*	-0.001	0.001	-0.002
	(0.017)	(0.030)	(0.016)	(0.033)	(0.018)	(0.031)	(0.001)	(0.007)	(0.001)	(0.009)	(0.001)	(0.007)
OWNER_TYPE	-0.193*	-0.048	-0.233*	0.031	-0.175	0.016	-0.002	-0.013	-0.001	0.006	0.012	-0.009
	(0.101)	(0.074)	(0.137)	(0.084)	(0.133)	(0.082)	(0.003)	(0.020)	(0.006)	(0.020)	(0.012)	(0.019)
PROFIT	0.000*	0.000	0.000*	0.000	0.000**	0.000	0.000	0.000	0.000	0.000	0.000	0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
LABOR	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000**	-0.000	0.000	-0.000	0.000	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(-0.000)
EQP	-0.284	0.032	-0.260	0.149	-0.343	0.066	-0.005	0.008	-0.005	0.021	-0.025	-0.021
	(0.360)	(0.261)	(0.379)	(0.262)	(0.347)	(0.270)	(0.027)	(0.060)	(0.042)	(0.066)	(0.040)	(0.057)
REDESIGN	0.107	-0.027	-0.008	-0.076	-0.063	-0.107	-0.004	-0.014	-0.002	-0.021	-0.015	0.009
	(0.387)	(0.290)	(0.395)	(0.303)	(0.367)	(0.285)	(0.029)	(0.063)	(0.043)	(0.069)	(0.043)	(0.061)
MKT_DESIGN	0.165	0.329	0.193	0.428	0.034	0.401	0.005	0.065	0.009	0.087	0.029	0.059
	(0.382)	(0.294)	(0.401)	(0.309)	(0.376)	(0.303)	(0.030)	(0.063)	(0.047)	(0.069)	(0.043)	(0.062)
LOG(DIS_EU)	11.030	---	5.433	---	3.554	---	1.138***	---	1.479***	---	0.727	---
	(13.169)		(28.183)		(13.207)		(0.022)		(0.519)		(0.472)	
$LOG^2(DIS\_EU)$	-0.805	---	-0.482	---	-0.329	---	-0.076***	---	-0.098***	---	-0.050*	---
	(0.763)		(1.590)		(0.768)		(0.022)		(0.033)		(0.029)	
LOG(DIS_USA)	---	-6.320	---	-2.866	---	-2.989	---	-1.458	---	-0.515	---	0.105
		(7.500)		(8.157)		(8.490)		(1.830)		(2.284)		(1.758)
$LOG^2(DIS\_USA)$	---	0.385	---	0.199	---	0.195	---	0.089	---	0.039	---	-0.002
		(0.439)		(0.478)		(0.495)		(0.107)		(0.132)		(0.103)
No. of Observations	308	208	178	175	174	174	308	208	178	175	190	190

Notes: 1. Constant is suppressed in all specifications.

2. Robust standard errors are reported in parentheses except for SUR regression results (built-in STATA command only reports non-robust standard error).

3. "*", "**" and "***" represent significance level at 10%, 5% and 1% respectively.

4. All joint test results reported here are concerning probit model specifications. Linear probability model results are reported in the table as benchmark cases for comparison (all joint test results for linear probability models are available from authors upon request).

F-static for the joint significance of *INFO_EU* and *INFO_USA* is significant at 10% in specification US(2) with chi2=5.38.

F-static for the joint significance of *INFO_EU* and *INFO_USA* is not significant at 10% in the specification of EU(3) and US(3).

F-static for the joint significance of *LOG(DIS_EU)* , $LOG^2(DIS\_EU)$ is significant at 1% for specification EU(1), EU (2) and EU(3).

F-static for the joint significance of *LOG(DIS_USA)* , $LOG^2(DIS\_USA)$ is not significant at 10% for specification USA(1), USA(2) and USA(3).

F-static for the joint significant of three compliance cost variables (*EQP, REDESIGN,* and *MKT_DESIGN)* is not significant at 10% across all probit specifications for both EU and the United States.

F-static for the joint significance of *TARIFF* and *OTRI* is not significant at 10% for specification USA(1),USA(2) and USA(3).