ENTRY COSTS AND HETEROGENEOUS CHARACTERISTICS OF FIRMS IN THE DECISION TO EXPORT: EMPIRICAL EVIDENCE FROM FIRM-LEVEL DATA IN VIETNAM

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Abstract

This paper contributes to the examination of factors that affect the decision to export of firms. Using a panel of firm-level data in Vietnam's manufacturing sector, we test for the role of sunk cost and heterogeneous characteristics of firms in determining firms' probability of exporting. Under a framework that controls for unobserved heterogeneity among firms, we find that the sunk entry costs are a significant factor that makes export status highly persistent in Vietnam. Firm size, firm age and foreign ownership are positively related to export probability of firms, while total factor productivity has no statistically significant effect. Besides, firms with labor-intensive technology, more skilled labors or competitive labor service are more likely to export.

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I. INTRODUCTION

International trade is considered a significant channel for growth by almost every country. Even those such as Russia or Vietnam that used to follow centralized economic regime have started to rush for the membership of the World Trade Organization in order to take benefit from trading with others for the sake of their own economic growth. Slow improvement in productivity is known as the main force that caused the collapse of non-market economies in the 1990s. There are many sources for productivity growth, and economic relationship with foreign countries has proved an important channel for activating these sources. The positive relationship between openness and growth has been confirmed by many empirical studies using aggregate economy-wide data [see Baldwin (2003) or Rodriguez (2006) for related literature review]. Among the channels that connect a country with others, exporting is probably the one that attracts the most attention in the literature studying the sources for a country's productivity growth. Martin (1992) finds a causal link from exports to higher productivity growth for four industrialized countries (United States, Japan, Germany, and United Kingdom). In a review of many empirical macro-data studies on whether export-led growth hypothesis is valid for developing countries, Medina-Smith (2001) finds that the empirical results suggest exports have a positive effect on the overall rate of economic growth and could be considered an "engine of growth" for developing countries, though the levels of impact are case-dependent. Such a causal relationship on the aggregate level can work through some channels. Exporting may induce reallocation of scarce resources toward industries that are more productive, in other words, toward industries that have comparative advantage. This is usually referred to as trade-induced cross-industry reallocation. This channel is successfully explained by standard trade models. However, there are other channels that can not be explained by the traditional models that assume a representative firm or identical firms. A possible one is trade-induced within-firm productivity improvement: firms become more productive as they export. Another channel is trade-induced within-industry reallocation in favor of exporting firms that are more productive than non-exporters. These are subject matters of heterogeneous-firm trade models, the strand that recently accounts for the huge majority in trade-related literature. Trade is no longer considered as a "black box". The interactions between heterogeneous firms that actually drive trade between countries are examined properly in these models.

In fact, firms are different in many aspects, even when they face the same macroeconomic conditions or operate in the same narrowly-defined industry. In export activities, firms also behave differently. Firm-level data from many countries show that just a small fraction of firms are involved in international trade, not to mention foreign investment activities, while the majority choose to solely serve domestic markets. For example, of 5.5 million firms in the U.S. economy in 2000, just 4 per cent were exporters [Bernard et al. (2007b)]. Not only does heterogeneity exist between trading and non-trading firms, it also exists between firms that sell to foreign markets. Also cited in Bernard et al. (2007b), 96 per cent of total U.S. exports in 2000 was shipped by 10 per cent of exporting firms. It is reasonable to think that there must be firm-specific characteristics that significantly influence a firm's behavior and capability to perform in foreign markets. Therefore, it is more appropriate to examine trade and related issues under the framework of firm heterogeneity. The need for integrating firms' behaviors into trade models is also necessitated by at least two more pieces of facts. The first is, in models at country- or industry-level, factors such as technological innovation or human capital are considered as those shaping comparative advantage. However, many activities related to these factors such as R&D process or human capital development are carried out by individual firms or plants. These activities are

certainly different among firms. Therefore, when firm heterogeneity is integrated into trade models, it helps not only solve those issues intact by old trade theories but also interpret the findings of standard trade models more properly. And the second is, firm-level analysis is more implicative to trade policy makers. It is misguided if policies ignore differences not only between industries but also between firms, or even between types of behaviors of firms.

Although this need was spotted out long time ago, studies of trade with firm heterogeneity did not develop until the mid-1990s. At that time, firm-level data became more accessible to researchers in some countries, giving more chances for doing related empirical work. A path-breaking paper is Bernard and Jensen's (1995). Since then, empirical and theoretical studies in this field have flourished and contributed great insights into the literature, with intensive focus on the investigation of the relationship between characteristics of firms, especially productivity, and exporting behaviors of firms. Firms that export are found in empirical studies to be better than firms that serve only domestic markets. The term "exceptional export performance" first used by Bernard and Jensen (1999) to describe their findings of the superiority of exporters in the U.S. manufacturing sector is now widely employed by many other researchers in different countries, implying the fact that exporters are superior to non-exporters almost everywhere. Exporters in the U.S. have higher productivity, more workers, proportionally more white collar workers, higher wages, greater capital intensity, higher technology intensity, and more likely to be part of a multi-plant firm [Bernard and Jensen (1995, 1997, 1999, 2004)]. According to Wagner's (2007) survey of related studies published by the year 2005, the superiority of exporters can also be seen in almost other industrialized countries such as UK, Canada, Germany, or Italy; in newly emerging and developing countries in Asia such as China, Korea, Taiwan, or Indonesia; in transition countries in Latin America or Eastern Europe and even in some least developed countries in Sub-Saharan Africa.

However, the differences between exporters and non-exporters at a given moment do not tell us anything about the direction of causality. Two hypotheses that are frequently tested in the analysis of the relationship between firm's performance, especially productivity, and exporting behaviors are: (i) better firms self-select into export markets and (ii) learning-by-exporting makes exporting firms better. Most studies that find more productive firms become exporters accrue the fact to the existence of additional costs in serving foreign markets, majority of them are sunk. These costs hinder less productive firms from entering export markets, only the most productive firms can gain enough profits to compensate for the costs and export. Besides, better firms export because they are forward-looking in exporting decision. Firms who desire to export in the future try to improve themselves now to enhance their competitiveness in the foreign markets. Roberts and Tybout (1997) are known as the first who consider the interaction between entry costs and firm characteristics in examining firms' export behavior. Using an empirical dynamic framework that takes into account sunk entry costs and the heterogeneity of firm characteristics, they find that sunk entry costs are large and a significant source of export persistence in Colombia in the period of 1981-1989. Controlling for the presence of these sunk costs, they also find that observed characteristics such as firm size, age and corporation ownership as well as unobserved ones significantly contribute to the probability of a firm to become an exporter. This framework has been used intensively by other studies. Using the same framework but different testing specifications, Bernard and Jensen (2004) examine the roles of entry costs, firm characteristics, industrial and sectoral spillovers and trade promotion on the probability of entry into exporting of firms in the U.S. manufacturing sector in the period of 1984 to 1992. They find that exporting today raises the probability

of exporting tomorrow by 39 percent, implying the significance of entry costs as a determinant of exporting. They also find that firm heterogeneity is substantial and important in export decision: firms that have larger size, higher labor quality, or product innovation are more likely to self-select to become exporters. However, productivity is found to have no statistically significant effect on probability of exporting in the specification preferred by the authors. For exogenous factors, favorable exchange rate shocks do increase participation in exporting, but there are no statistically significant effects of industrial and sectoral spillovers and trade promotion at the state levels. Arnold and Hussinger (2005) find in their study of German manufacturing firms between 1992 and 2000 that there is a causal relationship from high productivity to entering foreign markets, besides other findings that confirm the positive effects of some other characteristics such as past export status, size, R&D intensity, product innovation, or skills. However, findings in Greenaway and Kneller (2004) show that the effect of productivity is not statistically significant, though positive, in U.K. manufacturing sector in the period between 1989 and 2002 when the whole population of firms examined, though effects of other characteristics such as size, past export participation or industrial and geographical spillovers are significantly positive. In Clerides et al. (1998), there is evidence about the self-selection of more productive firms into exporting in Colombia and Morocco, but not in Mexico. This study also finds in Colombia a positive externality of exporting: The presence of other exporters in a region or a sector might make it easier for domestically oriented firms to break into foreign markets, showing exporting externality a source for export entry. In other studies, the positive effect of productivity on a firm's probability of being an exporter can also be seen in Chile [data of 1990-1996 period, Alvarez and Lopez (2005)]; Taiwan [1981-1991, Aw et al. (1997, 2000)]; Spain [1991-1996, Delgado et al. (2002)] or Estonia [1994-1999, Sinami and Hobdari (2007)]; while no significant effect is observed in Indonesia [1990-1996, Blalock and Gertler (2004)], Korea [1983-1993, Aw et al. (2000); 1990-1998, Hahn (2004)]; Italia [1991-1994, Castellani et al. (2002)]; Sweden [1990-1999, Hansson and Lundin (2004)] or Cameroon, Ghana, Kenya and Zimbabwe [1992-1994, Bigsten et al. (2004)]. Especially, Damijan et al. (2004) find from the 1994-2002 data of Slovenian firms that the effect of productivity on self-selection into different foreign markets is different: higher productivity level is required for firms starting to export to advanced economies as apposed starting to export to developing countries.

The above-mentioned evidences are accompanied by theoretical breakthroughs in the same area of interest. New trade theory has been said to turn interest from a trading world with the representative firm or with identical firms to the one in which firms are heterogeneous in the underlying characteristics. The basic argument of trade theory in this literature is that the presence of sunk costs of entry into foreign markets together with that of firm heterogeneity can explain why some firms export but others do not. In an effort to support their empirical framework, Roberts and Tybout (1997) model sunk trade costs and firm heterogeneity in a partial equilibrium analysis with discrete choice. Using this framework, they state that among firms that have low marginal costs, only those that are sufficiently productive enough to cover sunk entry costs from their profits can export. Melitz (2003) is considered a pioneer in the theoretical analysis of trade with firm heterogeneity under general equilibrium framework. His paper can explain theoretically not only the exporting behaviors of firms but also the productivity structure of industries in a more general dynamic model with continuous choice, sunk entry costs and heterogeneous firms under monopolistic competition. The paper concludes that exposure to trade will induce only the most productive firms to enter the export market while some less productive firms continue to produce only for the domestic customers, and the least productive firms will be forced to exit. Besides, more exposure to trade will lead to additional inter-firm reallocations

towards more productive firms. Firms with higher productivity will therefore be possible exporters, be able to have higher sales, market share and profit. Trade liberalization will not only favor the more productive firms but also help improve industry aggregate productivity via the above-mentioned self-selection and reallocation process. Although this core model is now being extended in various ways [such as in Helpman et al. (2007), Melitz and Ottaviano (2005), Falvey et al. (2006), or Bernard et al. (2007a) etc.], the main arguments related to the relationship between firm heterogeneity and firms' exporting behaviors are the same.

All these established theoretical backgrounds emphasize the importance of the combination of firm heterogeneity and sunk costs in determining behaviors of firms in doing business abroad. This also implies a good reason for the explanation of the mixed findings in related standard empirical works across countries and time, as reviewed in previous paragraphs in this section. Roberts and Tybout (1997) argue that because of this combination, there are forces that are likely to be idiosyncratic with respect to country and time. Firms have different behaviors due to their characteristics and the sunk costs. However, the magnitude of their response depends on the availability of information they have about foreign markets, the type of market they are likely to enter, the type of products being exported, the number and type of existing firms in exporting markets, or the policy regime. Given the number of idiosyncratic forces at work, it is not surprising that standard empirical export supply functions have exhibited marked instability across countries and time.

The purpose of the analysis in this paper is to examine possible determinants, especially those from characteristics of firms, on their probability of being an exporter in the case of Vietnam. Vietnam is known as a successful newly-emerging country with high and stable economic growth rates and fast track of trade liberalization. Under a comprehensive but prudent reform since 1986, Vietnam is moving forward to a market economy. The number of firms in this country has been increasing rapidly with more and more contribution from non-state owned enterprises. The number of firms in 2004 is about 92 thousands, more than twice as many as that in 2000, and non-state owned firms account for over 90 per cent of this number [GSO (2005)]. Exports have been increasing much faster than GDP, with annual growth rates of about 20 per cent from 1990. The government is striving more intensively to encourage exports for enhancing the country's economic growth. Besides substantially reducing both tariff and non-tariff barriers to trade and making great efforts to open up foreign markets via bilateral and multilateral trade liberalization negotiations, the country has also had a wide range of export promotion measures to foster exports. The measures aim at promoting both export participation and export intensity. They include financial incentives such as reduction of land rent, corporate income tax, or material import tax for exporters; or establishment of export support fund and export award fund to provide financial support and rewards to exporters, especially to those who succeed in exporting new products, to new markets or in large volume. However, export performance of Vietnam does not reach what expected or targeted for. Vietnam's exports are still small with export revenue per capita of about USD 300 in 2005; export products are mainly traditional ones with low value; or export prices are below world market prices. Even though the export volume increases, the "quality" of the export sector such as export structure or competitiveness does not improve much. This fact implies that more efforts should be paid to the setting of export strategies and export promotion in Vietnam. Therefore, understanding the determinants of export behaviors of firms via the evidence from firm-level data must be necessary and implicative. Up to now, there are not many studies using firm-level panel data in this research area in Vietnam. This paper is therefore expected to be among the first to contribute. Furthermore, an empirical test of determinants of exporting using firm-level data in a developing country under a fast track of trade liberalization like Vietnam must be a sound

contribution to the literature that still shows controversy due to mixed empirical results.

In this paper, an export decision model will be used for examining possible effects of entry costs and firm characteristics on the probability of exporting. The model will be tested in a framework that controls for unobserved heterogeneity among firms, using panel data of 1150 Vietnam's manufacturing firms surveyed by the World Bank Group. One of the important characteristics of firms employed in this analysis is total factor productivity used as a measure of productivity of firms. It is estimated in a more accurate way by employing semi-parametric model that controls for the phenomenon of possible simultaneity usually faced in productivity calculation. Among the specifications employed in this paper, a dynamic random effects probit model is chosen as the preferred measure to test for the relationship of interest. We expect to have proper explanation of the decision to export of firms in Vietnam, especially the role of sunk costs, productivity, input intensity, firm size and firm age.

The paper is outlined as follows. The next section, Section II, specifies theoretical background and empirical framework of the model. Section III describes the data used while Section IV argues for the choice of estimation specifications and variables. The estimation results are interpreted and discussed in Section V. Section VI raises concluding remarks.

II. THEORETICAL BACKGROUND AND EMPIRICAL FRAMEWORK

II.1 Theoretical background

It is usually assumed in models of the type that the decision to export of a rational and profit-maximizing firm is endogenous to its decision to market a new product. Roberts and Tybout (1997) develop a dynamic model of exporting with entry costs. The model is applied by almost all the parametrically empirical studies of the exporting behavior because it takes into account the entry costs so that the heterogeneity in productivity between firms becomes relevant in the decision to export or not to export of firms. We will also follow this framework in this study. A firm will export if the expected profit from doing so net any fixed entry costs is non-negative. Before getting to the expected value of profits in a multiple period framework with entry costs, we consider first the single period case of maximization with no entry costs. Assume that at the period t, if the firm i produces and sells to foreign markets, it will always be able to produce at q_{it}^*, the profit-maximizing level of exports. The profit the firm can yield is

$$\pi_{it}(X_t, Z_{it}) = p_{it}q_{it}^* - c_{it}(X_t, Z_{it} \mid q_{it}^*) \quad (1)$$

where p_{it} is the price of the goods sold abroad and $c_{it}(.)$ is the variable cost of producing q_{it}^*; X_t and Z_{it} are vectors of exogenous factors and firm-specific factors affecting profitability of the firm, respectively. The firm will export if this profit is non-negative. Denote the export status of the firm i at the period t by Y_{it}, we have

$$Y_{it} = \begin{cases} 1 \text{ if } \pi_{it} \geq 0 \\ 0 \text{ otherwise} \end{cases} \quad (2)$$

In the framework of multiple periods without sunk entry costs, the expected profit of the firm becomes

$$\pi_{it}(X_t, Z_{it}) = E_t\left(\sum_{s=t}^{\infty} \delta^{s-t}[p_{is}q_{is}^* - c_{is}(X_s, Z_{is} \mid q_{is}^*)]\right) \tag{3}$$

where δ is the one-period discount rate. If there is any effect of today's production on the costs tomorrow, such as learning-by-doing in the production of exports, the current export status of the firm will have some effects on the decision to export the next period. This is because the cost function in the function of expected profit now is $c_{it} = c_{it}(X_t, Z_t, q_{it-1}^* \mid q_{it}^*)$ with $\partial c_{it} / \partial q_{it-1} \neq 0$. The value function of the firm is

$$V_{it}(.) = \max_{q_{it}^*}\left(\pi_{it}Y_{it} + \delta E_t[V_{it+1}(.) \mid q_{it}^*]\right). \tag{4}$$

Therefore, the exporting behavior of the firm will be

$$Y_{it} = \begin{cases} 1 \text{ if } \pi_{it} + \delta E_t[V_{it+1}(.) \mid q_{it}^* > 0] - \delta E_t[V_{it+1}(.) \mid q_{it}^* = 0] \geq 0 \\ 0 \text{ otherwise} \end{cases} \tag{5}$$

Now consider the case with sunk entry costs. As stated in the introduction, entry costs are an important factor in the decision to export of firms. Costs associated with entering foreign market may include those in acquiring information about the markets, in adjusting the production process and products to satisfy foreign customers, or in setting up distribution network abroad. Most of these costs are by nature sunk. It is usually assumed that firms will not have to pay the entry cost if they exported in the previous period. If there are sunk costs involved in taking up export activities, a forward-looking firm will look beyond the present period in its decision to export or not to export. The presence of sunk costs makes the decision rule dynamic, because exporting today carries an additional option value of being able to export tomorrow without paying the sunk costs of exporting. If we denote N be the entry cost for a firm, in the single period maximization problem, its profit is as follows:

$$\tilde{\pi}_{it}(X_t, Z_{it}, q_{it-1}^*) = p_{it}q_{it}^* - c_{it}(X_t, Z_{it}, q_{it-1}^* \mid q_{it}^*) - N(1 - Y_{it-1}) \tag{6}$$

The firm will export if this profit is non-negative, that is, $Y_{it} = 1$ if $\tilde{\pi}_{it} \geq 0$ and $Y_{it} = 0$ otherwise. In the dynamic maximization problem, the firm will maximize the expected value of profits by choosing a sequence of export quantities $\{q_{is}^*\}_{s=t}^{\infty}$. In other words, the firm will maximize the following:

$$\Pi_{it}(X_t, Z_{it}) = E_t\left(\sum_{s=t}^{\infty} \delta^{s-t}(\tilde{\pi}_{is}Y_{is})\right) \tag{7}$$

The form of the value function is the same as that in the case of without entry cost:

$$V_{it}(.) = \max_{q_{it}^*}\left(\tilde{\pi}_{it}Y_{it} + \delta E_t[V_{it+1}(.) \mid q_{it}^*]\right) \tag{8}$$

And the condition of exporting decision is

$$Y_{it} = \begin{cases} 1 \text{ if } \tilde{\pi}_{it} + \delta E_t[V_{it+1}(.) \mid q_{it}^* > 0] - \delta E_t[V_{it+1}(.) \mid q_{it}^* = 0] \geq 0 \\ 0 \text{ otherwise} \end{cases} \tag{9}$$

or

$$Y_{it} = \begin{cases} 1 \text{ if } p_{it}q_{it}^{*} + \delta E_t[V_{it+1}(.) \mid q_{it}^{*} > 0] - \delta E_t[V_{it+1}(.) \mid q_{it}^{*} = 0] \geq c_{it}(X_t, Z_{it}, q_{it-1}^{*} \mid q_{it}^{*}) + N(1 - Y_{it-1}) \\ 0 \text{ otherwise} \end{cases} \quad (10)$$

All the above-mentioned details are theoretical backgrounds for the choice of empirical framework that follows.

II.2. Empirical framework

Equation (10) is the basis for choosing our empirical framework. There are two ways we may proceed to estimate it. We could either develop a structural representation of this condition by making specific assumptions of the cost function, or choose to employ a non-structural model in testing hypotheses about the role of exogenous factors and firm-specific characteristics that may affect the decision to export of firms. As stated in Roberts and Tybout (1997), although it is advantageous to use the first approach when it can provide a complete description of the dynamic process, it is difficult to do so because of the dynamic dependence of variables, especially that of sunk costs. Therefore, we follow herewith the second approach, as many others do. Instead of specifying parameters of the cost function to determine the function of profits, we will identify and quantify the factors that may increase the probability with which a firm is an exporter. The approach employed in this paper is a binary-choice non-structural one, as stated below:

$$Y_{it} = \begin{cases} 1 \text{if } \gamma X_t + \beta Z_{it} - N(1 - Y_{it-1}) + u_{it} \geq 0 \\ 0 \text{ otherwise} \end{cases} \quad (11)$$

where Z_{it} is the vector of firm-specific characteristics, X_t is the vector of exogenous factors, and u_{it} is the error term. Depending on the purpose of each specification as well as the characteristics and availability of data, different elements of Z_{it}, X_t and u_{it} will be chosen.

III. DATA DESCRIPTION

Data used in this paper is from Productivity and the Investment Climate Enterprise Survey of Vietnam (Vietnam PICS), conducted by the World Bank with the coordination of Asian Development Bank (ADB) in 2005. The source of this data is from Enterprise Surveys, the World Bank Group. Vietnam PICS surveyed 1,150 firms in the manufacturing sector of the country, following random sampling methodology. The sample size is generated with the aim to conduct statistically robust analyses of main estimates with levels of precision at a minimum 7.5 per cent precision for 90 per cent confidence intervals. This survey involves face-to-face interviews with managing directors, accountants, human resource managers and other company staff, giving a reliable and comprehensive coverage of firm's characteristics. Although the majority of the questions in the questionnaire ask for information in 2004, there are questions that are structured on the retrospective basis. This makes it possible for us to construct a panel of data of main variables for the years from 2002 to 2004. The survey gives us a good data set for doing analysis in this paper, including general information of firms (ownership, establishment year, industry, or location); sales and supplies (direct export share, year first exported); labor relations (number of employees or employees' compensation); or production,

expenses and assets.

Table 1: SAMPLE NUMBERS OF EXPORTERS AND NON-EXPORTERS IN INDUSTRIES

Industries	Total Number of firms	Non-exporters	Exporters	Exporter share (%)
Food and Beverage	182	103	79	43.41
Textiles	69	25	44	63.77
Garments	70	18	52	74.28
Leather Products	22	4	18	81.82
Wood and Wood Products	134	79	55	41.04
Paper	59	51	8	13.56
Chemical & Chemical Products	58	47	11	18.97
Rubber, Plastic and Non-metallic Products	64	46	18	28.12
Metals and Metal Products	116	102	14	12.07
Machinery, Equipment and Electrical Products	58	44	14	24.14
Electronics	19	13	6	31.57
Construction Materials	87	72	15	17.24
Others	119	96	23	19.33
Total	1057	700	357	33.77

Source: Author's calculation from the data set.

The sample is about 5.6 per cent of 20.5 thousands manufacturing firms in Vietnam in 2004 [GSO (2005)]. After controlling for missing data and outliers, the remaining size of the sample is about 90 per cent of the original one. This is a reasonable drop rate in a micro survey data. In this data set, exporters (defined as firms that directly export at least 10 per cent of their sales) account for about 34 per cent of the firms in 2004. There are exporting firms in all the industries, in which industries of food and beverage, textiles, garments, leather products, and wood and wood products show high shares of number of exporters (see Table 1). Although export status is not a criterion for choosing the sample, this is close to the real state of the population of firms in Vietnam. According to a complete survey of enterprises in Vietnam in 1998, the number of manufacturing firms that exported in 1998 is 32.3 per cent of the total firms in the sector, with very high shares of industries of food and beverage, textiles, garments, leather and wood [GSO (1998)]. In the survey of firms in 30 Northern provinces in 2005, 40.8 per cent of firms who responded to the survey report having exporting potentials [SME TAC (2005)]. It is not always possible to realize these potentials. Hence, the share of exporters must be somewhat below this figure. Therefore, it is also appropriate to use this sample for analyzing exporting behaviors of firms in Vietnam.

IV. ESTIMATION SPECIFICATIONS AND VARIABLE DISCRIPTION

IV.1. Estimation specifications:

Our purpose is to examine determinants of the decision to export of firms via testing the causal effects of sunk costs and firm characteristics, especially productivity, on the probability of a firm to be an exporter. We first find the difference between exporters and non-exporters in some main characteristics at a given moment of time, then test the causality running from the sunk costs and firm characteristics to export probability.

In models having binary dependent variables, logit, probit or linear probability models are usually employed. However, there are some issues in the model of export decision that should be taken into consideration when choosing estimation strategies. First, it is likely that there are unobserved characteristics that have significant effects on the decision to export by the firm. Second, exporting is highly persistent due to the presence of sunk entry costs, leading to the necessity to include the lagged dependent variable in the right hand side of estimation equations. And third, as discussed in the previous section, there may exist two-way relationship between exporting behaviors and characteristics of firms, possibly causing problem of simultaneity. We will discuss one by one, noting that it is not always able to do so separately due to the interaction among them.

It is reasonable to believe that there are many factors that are influential to firms' decision to export or not to export but unobservable. They are either firm-specific or exogenous, and in the dynamic framework, time variant or invariant. The observed and unobserved exogenous factors can be controlled for to some extent by using industry, location or time dummies or first-difference framework in panel analysis. However, the presence of unobserved firm-specific characteristics (usually termed as unobserved firm heterogeneity) in the model may raise some problems, especially when lagged dependent variables are included as explanatory variables. In practice, the error term u_{it} is a composite error representing all unobserved firm-specific characteristics. It can be thought of as comprising two components: a time-invariant firm-specific component ε_i and a transitory component η_{it} (usually termed as idiosyncratic error). If ε_i is not properly controlled for, estimates are inconsistent and biased [Wooldridge (2003)]. In addition, some unobserved characteristics such as product attributes, managerial skills, or strategic management are potentially permanent or highly serially correlated. These characteristics can induce persistence in the decision to export or not to export by firm, and then may lead us to overestimate the parameter of the lagged dependent variable in the model. To deal with unobserved firm heterogeneity, researchers usually use techniques in panel analysis such as random- or fixed-effects. In random-effects models, the core assumption that the firm's unobserved characteristics must be uncorrelated with other explanatory variables is likely to be violated in models of export decision. In export decision models like ours, unobserved characteristics such as those listed above apt to be correlated with other independent variables such as productivity, size, or factor intensity in the model. On the other hand, most fixed-effects models produce biased and inconsistent parameter estimates [Bernard and Jensen (2004)]. These issues require more econometric techniques that are not always possible, especially in logit or probit models with lagged dependent variables.

The above-mentioned issues are those specifically related to unobserved firm heterogeneity. There are also problems specifically associated with the inclusion of lagged dependent variables in the right hand side of estimation equations. In econometric theories, a lagged dependent variable is used as an explanatory

variable when there is the phenomenon of "state dependence". This dependence may be either a true or a spurious one. The true state dependence means that the lagged choice enters the model in a structural way as an explanatory variable. The sunk cost variable in export decision models is an example. The spurious state dependence implies the presence of serial correlation in unobserved transitory errors that underlie the threshold-crossing econometric individual specification of a model [Heckman (1981b)]. The case of considerable attention of spurious state dependence is the presence of unobserved time-invariant individual specific heterogeneity [Honore and Kyriazidou (2000)], such as the presence of unobserved firm effects in our models. This may cause a problem that we have discussed before, that is, if the persistence in the error term is unmodeled, this persistence would be picked up by the lagged variable, and the upward bias in the estimated parameter of the lagged variable can be expected. In export decision models, this phenomenon implies the overestimation of the importance of sunk entry costs. There are also two other important problems related to lagged dependent variables. The first one is endogeneity. Because the dependent variable is a function of the error term, the lagged dependent variable is also a function of the error term. The link may be from the existence of unobserved time-invariant firm effects (ε_i) or from the transitory component (η_{it}) that is correlated across time [$\text{cov}(\eta_{it}, \eta_{it-s}) \neq 0$]. Therefore, the normal OLS estimators are biased and inconsistent.

Fixed-effects models with first-differences can solve some, but not all. The consistency of fixed-effects estimators depends on the number of periods being lagged, needing longer panel. However, the bias on the coefficients other than that of the lagged dependent variable may be small for fixed-effects estimators [Helmers and Trofimenko (2007)]. Generalized methods of moments (GMM) with suitable instrumental variables (IV) in first-differences usually a choice to solve this problem. However, the validity of this approach depends crucially on the assumption that the lagged differences of the endogenous explanatory variable are uncorrelated to the residuals, necessitating the test of this assumption. The second one is multicollinearity: lagged dependent variables may be correlated to other explanatory variables, such as to the variable of productivity via possible learning-by-exporting effects. However, this issue is not so serious, because it just induces larger variances of estimates but not biasness or inconsistency [Helmers and Trofimenko (2007)].

To treat unobserved firm heterogeneity in fixed-effects model properly with the presence of lagged dependent variables, linear probability framework is usually preferred, compromising the drawbacks inherent in this type of models (fitted probability out of [0,1], or constant partial effect). Bernard and Jensen (2004) use this framework, arguing that it allows them to model the unobserved firm effects as fixed. To find the upper bound of sunk cost parameter estimates, they ignore the firm effects and estimate in levels, accepting the usual heterogeneity bias caused from omitting time-invariant variables. They also estimate the specification with fixed effects in which the error term is decomposed into two components as described above to find the lower bound, accepting some level of inconsistency. To avoid inconsistency in this fixed-effects estimation, a specification in first differences with Arellano-Bond (1991) GMM estimator using lagged levels of the right-hand-side variables as instruments is also employed. The problem usually observed in the first-differences specification is that effects of firm characteristics are found insignificant because they are primarily level effects and indistinguishable from firm fixed effects. Those who do not accept drawbacks of linear probability framework prefer logit or probit. Logit can be used well with fixed effects, but not with

lagged dependent variables. Probit with fixed effects is difficult to compute and may render estimated coefficients and statistics inconsistent, especially in the case when large panel is not available. Probit with random effects fits better to specification with lagged dependent variables, if the problems caused by the assumption of uncorrelated relation between error term and independent variables are acceptable [Helmers and Trofimenko (2007)]. Roberts and Tybout (1997) use Heckman's (1981a) dynamic random-effects probit estimator with binary-choice model. Although this approach has a drawback due to the assumption usually seen in random effects models, it is plausible in models of short panel with lagged dependent variables and the proper treatment of dynamic decision process with initial conditions controlled. In many other papers, in order to avoid the treatment of lagged dependent variables, researchers try to alleviate sunk cost variable out of their model, by simply ignoring it or using no-status-switcher subsample. Arnold and Hussinger (2004) use a probit model in a subsample of firms with persistent export behavior, arguing that it helps exclude the lagged dependent variable from the set of explanatory variables, enable them to abstract from the effect of entry costs to check for the robustness of the effects of the remaining explanatory variables.

Concerning the potential simultaneity problems caused by the existence of two-way relationship between exporting behaviors and characteristics of firms, econometric theories suggest the use of simultaneous equation models. However, the difficulty in facing with the identification condition hinders the use of this approach. Actually, it is not easy to find sufficient instrumental variables to estimate the simultaneous equation system in a firm-level data. One approach frequently used by almost all the research in this literature is to lag all firm characteristics by one period. This eliminates the possible effect of export status to firm characteristics, helping to analyze the other direction of effects, i.e., the determinants of exporting behavior.

Taking the above-mentioned discussion, our purpose and data characteristics into consideration, we choose estimation specifications as follows. In order to illustrate differences between exporters and non-exporters, we derive exporter premium across a range of characteristics: revenue, productivity, size, input intensity, labor skill and age. First, we do that by running simple regression of each of these characteristics on export status of firms to find and test simple exporter premium at the mean in the pooled data set as follows:

$$\ln Z^{*}{}_{it} = \alpha_1 Y_{it} + u_{it} \tag{12}$$

where i indexes firms and t indexes time; $Z^{*}{}_{it}$ is value level of the characteristic in consideration; Y_{it} is the export status; α_1 is the parameter; and u_{it} is the error term. After doing that, we condition this premium on other characteristics that may affect the characteristic in consideration and may bias the result derived by the simple regression. Specifically, we will estimate the following multivariate regression in the pooled data set:

$$\ln Z^{*}{}_{it} = \beta_1 Y_{it} + \beta_2 Z_{it} + \beta_3 T + \beta_4 D + v_{it} \tag{13}$$

where Z_{it} is the vector of firm characteristics, including productivity, size, input intensity, labor skill and age; T is the vector of time dummies; D is the vector of industry and location dummies; $\beta_1; \beta_2; \beta_3$ and β_4

are vectors of parameters; and v_{it} is the error term. The exporter premium is defined as $[(Z_{it}^{*\text{exporter}} - Z_{it}^{*non-\text{exporter}}) / Z_{it}^{*non-\text{exporter}}]*100$. After all the parameters are estimated, the simple exporter premium is calculated as $(e^{\alpha_1} - 1)*100$ and conditional exporter premium as $(e^{\beta_1} - 1)*100$. These values will be reported with the standard errors and t-values of the two parameters α_1 and β_1 to describe the difference between exporters and non-exporters.

Next, the significance of determinants of the decision to export or not to export will be tested with the closer look on the role of past export status, representing the sunk entry costs. The equation for estimation is

$$Y_{it} = \lambda_1 \mathrm{Y}_{\text{it-1}} + \lambda_2 Z_{it-1} + \lambda_3 T + \lambda_4 D + \varepsilon_i + \eta_{it} \quad (14)$$

where $\lambda_1, \lambda_2, \lambda_3$ and λ_4 are vectors of parameters; ε_i the time-invariant firm-specific unobservable characteristics and η_{it} idiosyncratic error. This equation includes one-year lagged export status. All observable firm-specific time-variant characteristics are also lagged one year period to control for any possible reverse causation. We prefer to use dynamic probit model with random effects in this paper. One reason for this choice is that the data used in this analysis is a quite short panel, rendering the ease in employing models with both lags and fixed effects. As we have mentioned, fixed effects models produced biased and inconsistent parameter estimates. One way to avoid these problems is to fit in first-differences specifications with suitable estimators such as that of Arellano-Bond' (1991). However, first-differences specification with lagged explanatory variables makes the sample size shrink considerably, rendering the dynamics of the model. Furthermore, fixed effects models with lagged dependent variable usually make firm-specific observable effects less important because these effects are possibly indistinguishable from fixed effects. The dynamic random effects model will not only allow us to deal with unobserved firm-specific effects but also help model the dynamics properly with the control of initial condition. We test equation (14) in three specifications. First, we fit the following short version of equation (14):

$$Y_{it} = \lambda_1 \mathrm{Y}_{\text{it-1}} + \lambda_2 Z_{it-1} + \lambda_3 T + \lambda_4 D + u_{it} \quad (15)$$

by using probit model in the pooled data set, ignoring any unobserved effects, i.e. assume that $u_{it} = \varepsilon_i + \eta_{it}$ is normally distributed and uncorrelated to other explanatory variables. As stated before, this estimation is more likely to give biased and inconsistent estimates. However, we can yield the upper bound of the effect of past export status via this test. Next, we use the Heckman's (1981a) random effects dynamic probit framework that is also used by Roberts and Tybout (1997) to fit equation (14) in full. Because this model controls for unobserved effects, dynamic process as well as initial conditions, it is expected to give the best estimates under the availability and structure of data used in this analysis. It is therefore the most preferred model in this paper. In this regression, for the fitting to be eligible in a dynamic random effects format, the

composite error u_{it} is assumed to be uncorrelated with explanatory variables other than the lagged dependent variable, the time-invariant component ε_i to be uncorrelated across firms, i.e., $\text{cov}(\varepsilon_i, \varepsilon_j) = 0$, the transitory component η_{it} to be uncorrelated across time [$\text{cov}(\eta_{it}, \eta_{it-s}) = 0$], and these errors normally distributed. The variance of ε_i ($\sigma^2_{\varepsilon_i}$) is used as a single parameter to parameterize the distribution of the firm effect. The initial status is also controlled for by using specific information available in the dynamic process. We use the program "redprob" written in Stata® by Steward (2006) to run this regression.

In the third specification, to avoid the possibility that the lagged dependent variable may excessively pick up effects of firm characteristics making these estimated effects less important, we employ a random-effects probit model in fitting equation (14) using the sub-sample of firms that do not switch their exporter or non-exporter status from a period to the next. This will alleviate the presence of lagged dependent variable in the right hand side of equation (14). The equation to be estimated is:

$$Y_{it} = \lambda_2 Z_{it-1} + \lambda_3 T + \lambda_4 D + \varepsilon_i + \eta_{it} \qquad (16)$$

Although this is somewhat arbitrary selection of sub-sample, it enables us to abstract from the effect of sunk cost to check for the robustness of the effects of the remaining explanatory variables in the model.

IV.2 Variable construction

The dependent variable in this analysis is export status. Export status of a firm is the firm's observed probability of exporting. A firm is defined as an exporter at a given period of time if its direct exports account for at least 10 per cent of its sales in this period. The threshold value of 10 per cent is used in many other papers in the literature, even by the World Bank itself, to classify exporters and non-exporters. This definition is adequate for identifying the firms as exporters that have a minimum interest in serving foreign markets, abstracting from minimal trade relationships due to sample shipments or border proximity. Because the information of direct exports is not available for the year 2002 (the first year of the panel), we assign export status of firms in 2002 by using information of the year that firm started to export. Those firms having started exporting by the year 2002 is reported as exporters in 2002. In any analysis related to this information, we interpret firms assigned as exporters in 2002 as those having exporting experience by 2002.

According to the theoretical background discussed earlier and the characteristics of the data set we use, we will include in the right hand side of estimation equations firm-specific and exogenous characteristics that affect the profitability of firms, besides the lagged dependent variable. Variables of firm characteristics are productivity, size, input intensity, age, labor skill and ownership. All the values of firm-specific time-variant variables will be calculated as the level relative to industry mean to alleviate any industrial heterogeneity. Other industry-specific effects will be captured via industry dummies. Effects of time-specific factors such as macroeconomic conditions that affect all the firms, will be estimated by using time dummies. Region dummies are also included to capture region-specific characteristics. We describe each variable as follows, and summarize them in Table 2.

As suggested by most of theoretical and empirical studies, productivity is the most important factor

that determines export status and performance of firms. More productive firms are more likely to become exporters because of the sunk entry costs that pave the way to foreign markets for only firms of higher profitability. Furthermore, it is common to think that competition in export markets is more intense than that in the home market, giving fewer opportunities to export for inefficient firms. In this paper, we use total factor productivity (TFP) as a key indicator to represent productivity levels of firms. Besides, labor productivity, defined as value added per worker, is also used as a measure of productivity, as usually done so by many other studies of the same interest. However, we use it with caution when understanding that this measure is not desirable to present productivity levels of firms because it depends on the structure of the input factors. In a developing economy like Vietnam's, processing industries are the main source of value added from exports. Therefore, labor productivity should be considered as the characteristics of exporting industries rather than productivity. TFP is usually preferred in most studies in the research area of productivity. There are several approaches to estimate the production function to measure TFP of firms. It is either parametric estimation of the production function (such as the normal OLS); semi-parametric estimation [such as Levinsohn and Petrin's (2003) approach or Olley and Pakes' (1996) approach]; or non-parametric estimations (Data Envelopment Analysis approach). OLS estimation is criticized that it is more likely to give biased estimates. While the TFP to be estimated is unobservable to econometricians, at least a part of this TFP will be observed by the firm. Therefore, this knowledge may influence the choice of inputs of the firm. If it is, we face the problem of simultaneity. This may cause biased estimates in the OLS estimation because the possible correlation between the regressors and the error term, the so-called "transmission bias". There are some techniques of estimation that are robust to this bias. Olley and Pakes (1996) propose an estimator that uses investment as a proxy for productivity. Levinsohn and Petrin (2003) suggest a technique in which intermediate inputs are used as proxies for productivity. Olley and Pakes's (1996) approach is less preferred because data on investment are not so available as that of intermediates. Besides, intermediate inputs are probably good proxies because they may respond more smoothly to productivity shocks, while investment may not fully respond to such shocks due to the adjustment costs. We use Levinsohn and Petrin's (2003) approach to calculate the TFP. The basic framework and estimated results are reported in the appendix to this paper. In the calculation of TFP and labor productivity, we use value added of firms. Value added of a firm in a year is derived by subtracting the sum of total purchases of raw materials and intermediate goods and energy cost from its total sales. The values of total sales of firms in each industry have been adjusted to be expressed in real 2002 terms, using industry-level producer price indices (PPI) obtained from the General Statistics Office of Vietnam [GSO (2007)]. Labor productivity is the value added divided by the number of total employees. The number of total employees is the sum of total permanent workers and the adjusted temporary workers. The number of adjusted temporary workers is the total number of paid short-term workers multiplied by average length of employment for each of these workers and then divided by the average length of employment of permanent employees. Due to the unavailability of the levels of average length of employment of temporary workers in the years 2002 and 2003, we use that of 2004 to derive the adjusted temporary workers for the years 2002 and 2003.

Firm size is the next characteristic that is used in most empirical analysis in this literature. It is universally regarded to be positively related to export status of firms. Firm size is usually proxied by capital, employment or total output scale. Larger firms are believed to be able to gain benefits from their size via economies of scale in production and larger demand. Besides, selling products in remote markets requires

more resources that only firms of a certain size can afford. Larger firms also have higher advantage in mobilizing resources and more ability to absorb risks, hence, can adapt more easily to the conditions of foreign markets. In this paper, we use a firm's capital, defined as the net-book value of machinery and equipment, as a proxy for size of the firm. This may present more accurately the size of firms in Vietnam other than the number of employees or total output because employment or production are not as stable as capital level in a developing country like Vietnam. Values of this variable are also expressed in real 2002 terms, using the PPI of the industry of Machinery and Equipment.

The Vietnam PICS also surveys on structure of ownership of firms. We define a firm having foreign ownership when foreign capital of the firm accounts for at least 10 per cent of its total capital. In the literature of business management, foreign-owned firms are more likely to be exporters, thanks to their experience and knowledge about foreign markets as well as their relationship with headquarters or branches of the same firms and with foreign customers. Foreign-owned firms are usually thought of as more powerful than their domestic counterparts. This increases their likelihood to export. However, the opposite can also be possible when some foreign firms are said host-country-market oriented and FDI is considered as a good measure to penetrate into host-country markets.

The foundation year of firms is also available in the survey data, allowing us to calculate age of each firm. It is usually argued that the older firms are more likely to export, because the longer a firm has been in business, the more likely it is to look for foreign markets to grow further. In addition, firm age is sometimes related to firm experience, performance and size. All of these favor their exporting activities. However, the opposite has also been suggested. This is explained by the argument that young managers now have stronger global orientation and capability. These firms are called "born globals", and start to export after a short time of start-up [Moen (2002)]. We include both age and age squared to examine the effect of firms' experience, with an aim to test the effect of firms' experience and its deterioration with time.

In this paper, we are also interested in relative intensity of factors used by firms. We define capital intensity as the ratio of net-book value of machinery and equipment over the total number of employees. Firms in developed countries are believed to export capital-intensive products, while their counterparts in developing countries export labor-intensive ones. Labor-intensive firms in a developing country are thought to be more likely to export.

We also consider the effect of workforce quality. In the related literature, this factor is usually proxied by either the ratio of skilled workers to total employees or the average wage. The former is preferred to the latter. Although the survey has data on the structure of workforce of each firm, this information is available only for the year 2004. Therefore, in order for us to construct the panel, we choose the average wage rate as a proxy for the quality of workforce. The average wage rate is defined as the total labor payments divided by total employees. The labor payments are also in real 2002 terms, adjusted by using Consumer Price Indices (PPI) obtained from World Economic Outlook Database 2007 of IMF.

As suggested by the theoretical backgrounds, lagged export status will be used to estimate the role of sunk costs. Because of the short panel, we can only use lags of one year period. Industry dummies, region dummies and time dummies will be included in the right hand side of estimation equations, to proxy for industrial characteristics, regional characteristics and time-specific macroeconomic conditions that firms are facing. Although the manufacturing sector in Vietnam is classified into 17 industries in the Vietnam PICS, we

combine Rubber and Plastic Products Industry and Non-metallic Mineral Products Industry into Rubber, Plastic and Non-metallic Products Industry, Basic Metals Industry and Metal Products Industry into Metals and Metal Products Industry, Machinery and Equipment Industry and Electrical Machinery Industry into Machinery, Equipment and Electrics Industry; and Vehicles and Other Transport Equipment Industry and Others into Others, making a new classification of 13 industries. Because of the limited sizes of these

Table 2: ***VARIABLE DESCRIPTION***

Variables	Definition
Exporter	=1 if exporter (directly exporting at least 10% of total sales), 0 otherwise
Revenue	Total sales
TFP	Total factor productivity
Labor	Total number of permanent and adjusted temporary employees
Labor Productivity	Value added/Labor
Capital	Total net-book value of machinery and equipment
Wage	Total labor payment/Labor
Age	Number of years in business, (equal 2004-foundation year)
Age Squared	Age squared
Capital Intensity	Ratio of total net-book value of machinery and equipment to total employees
Foreign	Foreign-owned firm, with at least 10% of total capital owned by foreigners
Industry 1	=1 if Food and Beverage Industry, 0 otherwise
Industry 2	=1 if Textiles Industry, 0 otherwise
Industry 3	=1 if Garments Industry, 0 otherwise
Industry 4	=1 if Leather Products Industry, 0 otherwise
Industry 5	=1 if Wood and Wood Products Industry, 0 otherwise
Industry 6	=1 if Paper Industry, 0 otherwise
Industry 7	=1 if Chemical & Chemical Products Industry, 0 otherwise
Industry 8	=1 if Rubber, Plastic & Non-metallic Products Industry, 0 otherwise
Industry 9	=1 if Metals & Metal Products Industry, 0 otherwise
Industry 10	=1 if Machinery, Equipment and Electrical Products Industry, 0 otherwise
Industry 11	=1 if Electronics Industry, 0 otherwise
Industry 12	=1 if Construction Materials Industry, 0 otherwise
Region 1	=1 if Red River Delta, 0 otherwise
Region 2	=1 if Southern Central Costal, 0 otherwise
Region 3	=1 if South East, 0 otherwise
Region 4	=1 if Mekong River Delta, 0 otherwise
Year 2004	=1 if the year 2004, 0 otherwise

Note: *Other Industries and Northern Central are taken as reference groups for industry and region dummies, respectively. Year 2003 is a reference group for time dummy.*

industries, we make the combination to satisfy the confidentiality requirement by the data provider (Enterprise Surveys, The World Bank Group) as well as to make it more efficient in estimating some variables used in

this analysis, especially the estimation of TFP. In setting the region dummies, we use the classification of regions used in the survey. In this survey, there are five regions into which firms are classified: Red River Delta, Southern Central Costal, South East, Mekong River Delta and Northern Central. All these dummies are also summarized in Table 2.

V. RESULTS AND DISCUSSION

Table 3 describes differences between exporters and non-exporters in a range of characteristics. The first column lists the characteristics in which the differences are examined. The second and fourth columns report the simple exporter premium and the conditional exporter premium, respectively. The simple exporter premium is the percentage difference between exporters and non-exporters in the mean level of the characteristic in consideration, without controlling for differences in other characteristics, industry or location of firms. The conditional exporter premium is also the difference in the mean level but is calculated with other characteristics, location and industry type of firms being controlled for. The third and fifth columns list the corresponding standard errors and t-statistics of these differences. At the unconditional mean, revenue and employment levels in exporting firms are about 300 per cent greater than those in non-exporters. Exporters' capital scale is also larger, around 230 per cent. The positive premium of exporters in the conditional mean levels of these characteristics remain the same, although the magnitudes are smaller. All these differences are statistically significant at 1 percent level, implying that exporters are significantly larger than non-exporters. Exporters also have high premium in total factor productivity over non-exporters, about 28.7 and 16.4 per cent for the simple and the conditional, respectively. However, the table shows that exporters have lower value added per worker. This difference in labor productivity is not large, and even statistically insignificant for the level in simple mean. Exporters appear to use labor-intensive technology. The ratio of capital per worker of exporters is 20 and 45 per cent lower than that of non-exporters when comparing in the simple and conditional means, respectively. Exporters appear to pay higher wage. However, this difference is not statistically significant in both premium criteria. Related to years of experience in business, exporters are older than non-exporters. In summary, the data of the Vietnam PICS in 2005 hint that exporters in manufacturing sector of Vietnam are "superior" to non-exporters in terms of size (employment, capital and revenue), age and TFP. Besides, exporters appear to be involved in more labor-intensive production with lower value added per worker than their counterparts who solely serve the domestic market. There is no statistically significant evidence for the difference in skills of workers employed by exporters and non-exporters when skill is proxied by average wages.

As argued in the previous sections, this superiority of exporters, especially in TFP, at a given moment in time may be attributed to the self-selection into markets of superior firms or to the positive effect of learning-by-exporting process. By examining the results of the estimation of equation (14) which we report in Table 4, we will be able to elaborate the determinants of the former when the latter is controlled for. In six columns that go after the column of variables, we report estimated coefficients that represent the marginal effects of each explanatory variable on the value of the link function in probit models, i.e., on the value of the inverse of the standard normal cumulative distribution function (usually termed as the Z score) of the probability to be an exporter. As it is well-known in probit models, it is complicated to interpret the marginal effect directly on the probability of becoming an exporter. Besides, it is not much important to report this effect when we use the data of a sample, not the whole population, of the firms. Therefore, we choose to focus

on the analysis of the direction of this effect, in other words, the sign of parameter estimates. This sign is also that of the marginal effects on the Z score that we report in Table 4.

Table 3: ***DIFFERENCES BETWEEN EXPORTERS AND NON-EXPORTERS***

Variables	Simple Exporter Premium (%)	Standard errors	Conditional Exporter Premium (%)	Standard errors
Revenue	285.38	0.0669***	51.55	0.0384***
TFP	28.66	0.0613***	16.39	0.0408***
Labor Productivity	-1.91	0.0418	-11.52	0.036***
Employment	313.80	0.0496***	158.56	0.0521***
Average Wage	3.29	0.0281	4.50	0.0283
Capital	227.52	0.0736***	150.58	0.0726***
Capital Intensity	-20.05	0.0556***	-44.68	0.0405***
Age	33.17	0.0466***	14.57	0.0527**

Note: ***, **, and * *indicate significance at 1%, 5%, and 10% levels, respectively.*

The first three columns of Table 4 list the estimated parameters in estimations that include the natural logarithm of TFP in the vector of explanatory variables, and the last three present the results of regressions that use the natural logarithm of labor productivity in the place of the logarithm of TFP. The models (1) and (4) are probit in pooled data; (2) and (5) the Heckman's random-effects dynamic probit; and (3) and (6) the random-effects probit in the sample of non-status-switchers. We do not list the parameter estimates of industry and region dummies in Table 4 and refer readers to the full results in Table A.2 in the Appendix.

We are now first to interpret the estimation results described in Table 4, and then to raise some comments on important points of these results. It shows in Table 4 that the most important determinant is the exporting experience. Exporting last year is a good predictor of exporting this year. Being an exporter in the previous period raises the Z score by more than 320 per cent in the pooled probit specifications. As explained in the empirical background, this level is the upper bound of the parameter estimate due to the upward bias of the estimations using pooled data without controlling for unobserved firm effects. However, the positive relation is still seen in our preferred estimation in Heckman's random-effects dynamic probit specifications. The marginal effect on the Z score remains high at about 200 per cent, two thirds of the upper bound. This important effect of past behavior in exporting is usually interpreted as the evidence of sunk entry costs, as hinted in the theoretical background.

However, there is no statistically significant evidence that firms in Vietnam with higher TFP level self-select into serving foreign markets. In the regression using the pooled data set, the effect of the logarithm of TFP last year on the Z score this year is negative at the significance level of 10 per cent. This implies there is a negative relationship between TFP level in the previous year and the likelihood to be an exporter this year. This effect becomes statistically insignificant, though still negative, in the dynamic random-effects specification whose results are reported in column (2). When we exclude the lagged dependent variable from

the set of independent variables and run the estimation of equation (16) in random-effects probit specification for only those firms with persistent export status, we also have no evidence at standard significance levels to reject the null hypothesis that there is no effect of TFP on the probability to export of firms. TFP seems to be an insignificant factor in the self-selection into foreign markets of firms in this sample.

Table 4: ***PROBABILITY MODEL OF EXPORTING***

(Dependent variable: $Exporter_t$**)**

Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$Exporter_{t-1}$	3.2613	1.9915		3.2339	1.8659	
	(0.1377)***	(0.2362)***		(0.1348)***	(0.2491)***	
$Ln(TFP^a_{t-1})$	-0.1313	-0.1189	0.1071			
	(0.0678)*	(0.1189)	(0.1226)			
$Ln(Labor\ Productivity^a_{t-1})$				-0.1801	-0.6498	-0.1800
				(0.0748)**	(0.1660)***	(0.1317)
$Ln(Capital^a_{t-1})$	0.1235	0.3810	0.7995	0.1401	0.7936	0.8485
	(0.0417)***	(0.0855)***	(0.0863)***	(0.0413)***	(0.1663)***	(0.0862)***
Age^a_{t-1}	0.0840	-0.0624	0.4016	0.0657	0.3684	0.4294
	(0.0957)	(0.1661)	(0.1973)**	(0.0954)	(0.1983)*	(0.1972)**
$Age\ Squared^a_{t-1}$	-0.0629	-0.0128	-0.1963	-0.0577	-0.2265	-0.2095
	(0.0427)	(0.0781)	(0.1016)*	(0.0427)	(0.0981)**	(0.1025)**
$Capital\ Intensity^a_{t-1}$	-0.1171	-0.3083	-0.7567	-0.0929	-0.3569	-0.7565
	(0.0514)**	(0.0956)***	(0.1171)***	(0.0413)**	(0.0807)***	(0.1173)***
$Wage^a_{t-1}$	0.0459	0.1177	0.1433	0.0658	0.3158	0.2046
	(0.0593)	(0.1017)	(0.0868)*	(0.0658)	(0.1255)**	(0.0985)**
Foreign	0.2375	1.7035	2.3851	0.2785	2.3878	2.6000
	(0.2174)	(0.4338)***	(0.4264)***	(0.2148)	(0.5614)***	(0.4196)***
Industry dummies	included	included	included	included	included	included
Region dummies	included	included	included	included	included	included
Year 2004	0.4516	0.4966	-0.1624	0.4619	0.5692	-0.1555
	(0.1265)***	(0.1731)***	(0.1440)	(0.1258)***	(0.1851)***	(0.1431)
Constants	-1.9556	-2.0403	-0.6115	-2.0015	-2.5153	-0.8243
	(0.2980)***	(0.4560)***	(0.5163)	(0.2969)***	(0.5710)***	(0.5249)
Observations	1601	3051	1526	1635	3051	1558
Log likelihood	-261.93	-551.69	-484.48	-267.33	-567.84	-491.70
Chi2	1536.15	271.16	253.30	1570.81	203.94	261.76

Note: ***, **, and * *indicate significance at 1%, 5%, and 10% levels, respectively; Standard errors in parentheses; (1) and (4): Probit in pooled data; (2) and (5): Heckman's random-effects dynamic probit; (3) and (6): Random-effects probit in the sample of non-status-switchers; Number of observations in (2) and (5) includes those with missing data due to lagging of dependent variable; Superscript (^{a}) indicates a level relative to industry mean.*

Besides TFP, we also use labor productivity as a measure of productivity of firms in finding the effect of productivity on their exporting behavior. In the pooled probit model whose results are reported in column (4), labor productivity shows itself as a determinant with a negative effect on the probability of exporting with the significance level of 5 per cent. The level of the marginal effect of this factor is even larger when we estimate in the Heckman's dynamic random-effects probit model and the evidence is even stronger when it is statistically significant at 1 per cent. The effect derived in the estimation for the sub-sample of no-status-switchers also shows a negative sign. However, it is not statistically significant.

Firm size and capital intensity are factors that have strong evidence as good predictors for export status of firms. A firm having larger capital scale in a year is more likely to be an exporter the next year. This evidence can be confirmed by the results of all the estimation specifications we run and at 1 per cent of significance level. However, the relation between past capital intensity and recent export status is negative. This effect is highly significant. This implies those firms that use labor-intensive technology have higher probability to export.

It is also shown in the estimation results, especially those in estimations with value added per worker being used as a measure of productivity, that firm age is a predictor of export probability. The signs of coefficients of age and age squared in column (5) are positive and negative, respectively. This fact implies that firms with more years of experience in business are more likely to serve foreign markets via exporting, and the marginal value of this experience deteriorates over time. This is also supported by the results in column (6). However, when TFP is included in the set of independent variables in the place of labor productivity, this evidence can be seen only in the estimation in the sub-sample of no-status-switchers.

We also have evidence to argue that firms with more skilled labors are more likely to export. The effect of average wage, which we use to proxy for labor skill, is positive in all estimation specifications, and statistically significant at standard levels in our preferred specification that includes labor productivity variable, as well as in the sub-sample of firms with persistent export status. Firms with foreign capital are also more likely to be exporters. This evidence is significant in all of our preferred specifications at 1 per cent level.

The estimation results also give hints about firms in which industries having more chances to export. As compared to firms in "other industries" which we take as reference industry, firms in Garments, Leather, Textiles, Food and Beverage, and Wood and Wood Products industries have higher probability of exporting. The coefficients of these industry dummies are positive and statistically significant at standard significance levels. There are also significant evidence about the difference in exporting probability of firms in Paper and Paper Products, Chemical and Chemical Products, and Metals and Metal Products industries as compared to that of the reference industry. The coefficients of dummy variables of these industries are negative. Other industries show no statistically significant difference. Regarding to regional difference, we have no statistically significant evidence. Besides, when we deal with time dummies, we see that there are more chances for firms to export in the year 2004, with the significance level of 1 per cent for the coefficient of the dummy for the year 2004 when the year 2003 being taken as reference year. Effects of interaction variables are also estimated to elaborate further effect details. However, there are no substantial changes in the results. Therefore, we choose not to report them.

We now turn to the discussion of these findings. About the important role of lagged export status in

predicting the probability of exporting of firms, we find this fact is in line with findings in almost all other countries being tested. This effect is significant not only in the simple probit specification in the pooled data but also in the dynamic random-effects specification in which we control for unobserved firm-specific time-invariant effect in the dynamic process. Therefore, the finding supports the argument that there are substantial sunk costs involving in entering export markets that firms in Vietnam are incurring. This is what most people expect to have in the case of Vietnam. Firms in the country are just offsprings in the world markets, produce just those traditional products that face fierce competition, and face many obstacles not only outside but also inside the country in their effort to reach foreign markets. Except those firms that have some luck when foreign customers pay the cost to find their doors, other firms face high entry cost. This also leads to the phenomenon of high persistence in export status, especially in those firms with dynamic management.

Besides the positive effect of lagged export status, we also find the same effect direction of firm size and age. The existence of substantial entry costs is one possible reason. Because of these substantial entry costs in Vietnam, those firms that have more resources and experience are more able to overcome these hurdles and therefore more likely to become exporters or remain as exporters. In addition, in an emerging country like Vietnam, a firm with relatively larger size and more experienced will have advantage because their status assures foreign partners a reliable and feasible trading partnership. Moreover, most large and aged firms in Vietnam's manufacturing sector are state-owned or used to be so before being privatized. They have acquired sustainable establishment, significant market power and good export status due to the privileges they have had up to now.

The interpretation of the estimation results gives another interesting fact about the characteristics of exporting firms in Vietnam: Firms that are more likely to be exporters in Vietnam are producing labor-intensive products or using labor-intensive technology. These firms use more skilled labors. However, they have lower value added per worker. This reflects the actual state of the manufacturing sector of the developing economy of Vietnam. As we can also see from the estimation results, garments, leather products, textiles, foods and beverages, and wood and wood products are those products in the manufacturing sector that have more chances to be exported. Actually, main sources of value added from abroad in these industries are from selling their processing services. In other words, they are mainly exporting labor services. These industries, by nature, are labor- as well as skill-intensive. Cheap labor and labor skills are usually considered as competitive advantage of Vietnam as a whole. High worker skills and low processing service price are also used as important tools in competing for foreign contracts. The finding about the positive effect of foreign ownership and exporting probability can support this argument. Foreign firms invest in Vietnam to take advantage of cheap labor and skill for their export-oriented production. Of course, financial and managerial strengths, market experience and market links can also be possible explanations for higher exporting probability of foreign-owned firms.

The insignificant effect of TFP on exporting probability needs more insights. Although it seems contrary to theoretical background, this finding is actually not new in this literature. As we have stated in the Introduction section, no significant effect of productivity can also be observed in the case of Indonesia [Blalock and Gertler (2004)], Korea [Aw et al. (2000)], Italia [Castellani et al. (2002)], Sweden [Hansson and Lundin (2004)], Turkey [Yasar and Rejesus (2005)], the U.K. [Greenaway and Kneller (2004)], Mexico [Clerides et al. (1998)], some developing countries in Africa [Bigsten et al. (2004)] or even in the United States [Bernard and Jensen (2004)]. There are some possible interpretations. It may be that TFP is actually not

an important factor that guides firms to sell to foreign markets, as compared to other observed and unobserved factors. For example, it is possible that owing to forward-looking managerial strategy or other unobserved firm-specific factors, certain firm-specific observable advantages such as size, age or skilled labor sources, or even to some positive exogenous shock, some firms can become exporter regardless of their TFP disadvantage. Furthermore, because of the high persistence in exporting status, this firm may continue exporting. If there are considerable numbers of firms with low TFP that can export in that way, our estimate of productivity effect is more likely to be insignificant. If it is the case, the learning-by-exporting may be a good determinant for the superiority of exporters that we find at the beginning of this section. Another possible explanation for the finding of the insignificance in TFP effect is that TFP is actually important but the magnitude of the importance varies across foreign markets or across commodities, even across commodities within a narrowly-defined industry. Therefore, when we estimate the coefficient for TFP variable without controlling for the heterogeneity among foreign markets or commodities, the effect of TFP may be rendered insignificant. Damijan et al. (2004) do examine this matter. They find in the case of Slovenian firms that while it is obvious that higher productivity level is required to start exporting to advanced countries, this is not the case for firms that start exporting to less-developed countries. They also find that different foreign markets require different entry costs. The heterogeneous entry costs also generate a positive relationship between the number of foreign markets served by firms and their productivity levels. If this is the case, in order for our model to be more relevant in finding the effect of productivity, we need more information about firms' exporting markets and products. However, this information is not available in the data we use, hindering us from examining this possibility.

VI. CONCLUDING REMARKS

This paper contributes an empirical analysis to the examination of the role of sunk cost and heterogeneous characteristics of firms in the explanation of behavioral difference among firms in their exporting decisions. Given the panel of firm-level data, appropriate microeconometric methods are made possible for use to test for determinants of firms' export behaviors in the dynamic format that properly controls for unobserved firm effects and simultaneity, two important hurdles usually seen in the related literature. Therefore, the estimation results are expected to give more accurate interpretation of the real situation in Vietnam.

Most of the main findings in this paper are in line with theoretical prediction or empirical findings in other countries, such as the superiority of exporters over non-exporters in a range of characteristics including total factor productivity, firm size, firm age, or labor skill; the persistence of export status due to sunk entry costs; or the important role of firm size, firm age or foreign ownership in predicting the probability of exporting of firms. Besides, the paper also provides proper empirical firm-level evidence about export decision determinants that are idiosyncratic to a developing country under a fast track of reform like Vietnam. Firms that use labor-intensive technology, employ more skilled labors, or offer competitive labor service are more likely to be involved in serving foreign markets; and such labor-intensive and skill-intensive industries as garments, textiles, leather products, wood and wood products, and foods and beverages seem possess comparative advantage in the world market. The insignificant effect of total factor productivity may also reflect the real situation of Vietnam as a country in reform with unstable and diversified structure of export markets and commodities. Besides, higher probability of exporting for firms in the year 2004 as compared to that in 2003 can also be interpreted as a general improvement in the country's economy in its process of

integration into the world trading system, at least between the two years.

Besides the contribution to the literature in examining the relationship between firm heterogeneity and export decision, some implications for trade policy makers can be expected from the analysis of this paper. It is obvious from findings in this paper that entry costs are a huge barrier for firms in going abroad. Helping firms in getting over this barrier will not only create room for more firms to export but also pave a easy way for the entry-exit process, that in turn boosts the process of resource reallocation according to the country's advantage, not to mention the reallocation of resource towards more successful firms. Together with the evidence about the reserve effect of exporting on firm characteristics or the determinants of export intensity, the findings in this paper can give proper suggestions on which firms should be supported in exporting for the purpose of economic growth, on the measures used in intervening the labor market or on trade-related industrialization policies.

This paper deals only with the determinants of the decision to export or not to export of firms. However, we all know that exporting behavior is not only to decide whether to export or not. It also involves the decision on which level of export involvement (i.e., the decision on the export share in total sales), or on which products to produce for exports and which markets to export to. Besides, the findings of this paper also give a hint on the existence of the learning-by-exporting effect in the case of Vietnam. All of these ideas are possible for further examination in future studies.

APPENDIX

(1) Estimation of total factor productivity.

The basic framework of the approach is as follows. The production function to be estimated is assumed to have the form of Cobb- Douglas type, with labor and capital as input factors and value-added as output. The estimation will be run across industries. The estimation equation of firm i at time t (in logarithmic form) is

$$v_t = \beta_o + \beta_l l_t + \beta_k k_t + \varepsilon_t \qquad \text{(A.1)}$$

where v_t, l_t and k_t are log of value-added, labor (the freely variable input) and capital (state variable input) at time t, respectively, and ε_t is the error term whose explanation will come soon later. We drop the subscript i for ease of expression. To produce, the firm uses also intermediate input, which is subtracted out of the total production to calculate the value-added. The predicted productivity is the exponent of the sum of constant coefficient and the error term. Stating differently, it is calculated as:

$$\hat{TFP}_t = \exp(v_t - \hat{\beta}_l l_t - \hat{\beta}_k k_t)\,. \qquad \text{(A.2)}$$

The key point that is different from OLS estimation is that the error term has two components, ω_t and η_t, where ω_t is the transmitted productivity component that may be correlated with input choices and η_t the independently and identically distributed (iid) one that is uncorrelated with the choice of inputs. ω_t is not observable to econometricians, which leads to the problem of simultaneity stated in the main text. Those estimators that ignore this problem (like OLS) will have inconsistent results.

In the framework of Levinsohn and Petrin (2003), the demand for intermediate input m_t is assumed to depend on the firm's state variable k_t and ω_t:

$$m_t = m_t(k_t, \omega_t) \qquad \text{(A.3)}$$

With the assumption that this demand function is monotonically increasing in ω_t, we have ω_t as a function of k_t and m_t:

$$\omega_t = \omega_t(k_t, m_t) \qquad \text{(A.4)}$$

Now, the estimation equation can be rewritten as

$$v_t = \beta_l l_t + \phi_t(k_t, m_t) + \eta_t \qquad \text{(A.5)}$$

where

$$\phi_t(k_t, m_t) = \beta_0 + \beta_k k_t + \omega_t(k_t, m_t) \qquad \text{(A.6)}$$

This new form of estimation equation will be estimated in two stages, as proposed by Levinsohn and Petrin (2003) and Petrin et al. (2004). The coefficient β_l will be consistently estimated in the first stage using the OLS method after substituting a third-order polynomial approximation in k_t and ω_t in place of $\phi_t(k_t, m_t)$. The second stage identifies the coefficient β_k, after making a consistent non-parametric approximation to the expectation of ω_t and using GMM approach.

We use the program "levpet" written in Stata® by Petrin et al. (2004). Value added of a firm used to estimate production of the firm is the total sales subtracted by total purchases of raw materials and intermediate goods and energy cost. The values of total sales of firms in each industry have been adjusted to be expressed in real 2002 terms, using industry-level producer price indices (PPI) obtained from the website of General Statistics Office of Vietnam [GSO (2007)]. Total purchases of raw materials and intermediate goods are adjusted to real 2002 term, using the general PPI of industrial products. Energy consumption is adjusted to real 2002 term by the PPI of electricity. We accept this because no information about energy price is available. The freely variable input is labor. The level of labor input is the number of total employees. It is the sum of total permanent workers and the adjusted temporary workers. The number of adjusted temporary workers is the total number of paid short-term workers multiplied by average length of employment for each of these workers and then divided by the average length of employment of permanent employees. Due to the unavailability of the levels of average length of employment of temporary workers in the years 2002 and 2003, we use that of 2004 to derive the adjusted temporary workers for the years 2002 and 2003. The capital variable is the net-book value of machinery and equipment, expressed in real 2002 term by using PPI of Machinery and Equipment Industry. Proxies for unobservable shocks are energy expenditure and total purchases of raw materials and intermediate goods. All the variables in this estimation are in logarithmic forms. The number of bootstrap replications is 200. Coefficients of the production function (i.e. β_l and β_k) are reported in Table A.1, together with their p-values. There are no convergence problems in estimating except that for Metals and Metal Products Industry and Electronics Industry. We can solve the problem for the industry of Metals and Metal Products by dividing the industry into 2 sub-samples: one of firms that have over 50 adjusted employees and the other not larger than 50 employees, before estimating. This is reasonable due to the reasoning that firms with size of over 50 workers have very different production functions as compared to those firms having smaller size, especially in the metals-related production. We give up the estimation of production function of Electronics Industry, because it is impossible to solve the problem in such a small sample (19 firms).

After having all the coefficients, we calculate TFP levels for firms by using (A.2).

Table A.1: COEFFICIENTS OF PRODUCTION FUNCTION

Industries	**Labor**	**Capital**	**Observations**
Food and Beverage	0.399	0.243	489
	(0.000)***	(0.072)*	
Textiles	0.513	0.518	185
	(0.000)***	(0.010)**	
Garments	0.679	0.322	183
	(0.000)***	(0.014)**	
Leather	0.396	0.738	64
	(0.025)**	(0.034)**	
Wood & Wood Products	0.453	0.299	348
	(0.000)***	(0.082)*	
Paper	0.324	0.508	164
	(0.034)**	(0.035)**	
Chemical & Chemical Products	0.794	0.536	175
	(0.000)***	(0.045)**	
Rubber, Plastic and Non-metallic Products	0.479	0.392	183
	(0.001)***	(0.131)	
Metals and Metal Products (50 employees or less)	0.482	0.463	119
	(0.008)***	(0.118)	
Metals and Metal Products (over 50 employees)	0.564	0.256	176
	(0.000)***	(0.098)*	
Machinery and Equipment	0.424	0.541	175
	(0.003)***	(0.089)*	
Construction Materials	0.475	0.3	248
	(0.000)***	(0.006)***	
Others	0.494	0.383	322
	(0.000)***	(0.003)***	

*Note: Estimated by using Levinsohn and Petrin (2003) method, with value-added as output and raw materials and consumption of energy as proxies for observed productivity; p-values in parentheses; ***, **, * indicate significance at 1%, 5%, and 10% levels, respectively.*

(2) Table of estimation results with coefficients of dummies included

Table A.2: ***PROBABILITY MODEL OF EXPORTING***

(Dependent variable: Exporter)

Independent Variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
$Exporter_{t-1}$	3.2613	1.9915		3.2339	1.8659	
	(0.1377)***	(0.2362)***		(0.1348)***	(0.2491)***	
$Ln(TFP^{a}_{t-1})$	-0.1313	-0.1189	0.1071			
	(0.0678)*	(0.1189)	(0.1226)			
$Ln(Labor\ Productivity^{a}_{t-1})$				-0.1801	-0.6498	-0.1800
				(0.0748)**	(0.1660)***	(0.1317)
$Ln(Capital^{a}_{t-1})$	0.1235	0.3810	0.7995	0.1401	0.7936	0.8485
	(0.0417)***	(0.0855)***	(0.0863)***	(0.0413)***	(0.1663)***	(0.0862)***
Age^{a}_{t-1}	0.0840	-0.0624	0.4016	0.0657	0.3684	0.4294
	(0.0957)	(0.1661)	(0.1973)**	(0.0954)	(0.1983)*	(0.1972)**
$Age\ Squared^{a}_{t-1}$	-0.0629	-0.0128	-0.1963	-0.0577	-0.2265	-0.2095
	(0.0427)	(0.0781)	(0.1016)*	(0.0427)	(0.0981)**	(0.1025)**
$Capital\ Intensity^{a}_{t-1}$	-0.1171	-0.3083	-0.7567	-0.0929	-0.3569	-0.7565
	(0.0514)**	(0.0956)***	(0.1171)***	(0.0413)**	(0.0807)***	(0.1173)***
$Wage^{a}_{t-1}$	0.0459	0.1177	0.1433	0.0658	0.3158	0.2046
	(0.0593)	(0.1017)	(0.0868)*	(0.0658)	(0.1255)**	(0.0985)**
Foreign	0.2375	1.7035	2.3851	0.2785	2.3878	2.6000
	(0.2174)	(0.4338)***	(0.4264)***	(0.2148)	(0.5614)***	(0.4196)***
Industry 1	0.1415	1.3817	1.8770	0.1547	1.4603	1.8099
	(0.2505)	(0.4562)***	(0.4684)***	(0.2498)	(0.5004)***	(0.4657)***
Industry 2	0.5686	2.3144	2.8170	0.5655	3.0934	2.7327
	(0.2955)*	(0.5604)***	(0.5882)***	(0.2955)*	(0.7182)***	(0.5893)***
Industry 3	0.5802	3.0011	4.1246	0.6043	3.4353	4.1280
	(0.3298)*	(0.6697)***	(0.6095)***	(0.3272)*	(0.7857)***	(0.6068)***
Industry 4	0.4209	2.4296	4.2674	0.4514	3.2677	4.2477
	(0.4663)	(0.7490)***	(0.9977)***	(0.4562)	(0.8853)***	(1.0027)***
Industry 5	0.3397	1.2613	1.7664	0.3460	2.3900	1.6701
	(0.2598)	(0.4160)***	(0.4905)***	(0.2605)	(0.6241)***	(0.4891)***
Industry 6	-0.0981	-0.5406	-1.2450	-0.1255	-1.8013	-1.3340
	(0.3240)	(0.5074)	(0.6623)*	(0.3256)	(0.7295)**	(0.6654)**
Industry 7	-0.9088	-1.5743	-1.2559	-0.8718	-1.9250	-1.3524
	(0.3389)***	(0.4936)***	(0.6215)**	(0.3356)***	(0.5882)***	(0.6203)**
Industry 8	0.0784	0.2188	-0.1247	0.0705	-0.0254	-0.1823
	(0.2979)	(0.4571)	(0.5774)	(0.2989)	(0.4849)	(0.5767)
Industry 9	-0.2493	-0.8929	-1.2056	-0.2420	-1.3014	-1.2899
	(0.2944)	(0.6182)	(0.5727)**	(0.2940)	(0.6476)**	(0.5683)**
Industry 10	-0.2590	0.0267	-0.6462	-0.2513	0.0855	-0.7389

	(0.3254)	(0.4484)	(0.6159)	(0.3229)	(0.4925)	(0.6150)
Industry 11				0.0025	-0.7624	0.5754
				(0.4814)	(0.7946)	(0.9752)
Industry 12	-0.2493	-0.5279	0.5428	-0.2348	-0.4110	0.5173
	(0.3224)	(0.4966)	(0.5677)	(0.3185)	(0.6251)	(0.5656)
Year 2004	0.4516	0.4966	-0.1624	0.4619	0.5692	-0.1555
	(0.1265)***	(0.1731)***	(0.1440)	(0.1258)***	(0.1851)***	(0.1431)
Region 1	-0.0072	-0.0973	-0.3651	0.0144	-0.1068	-0.1952
	0.2309	0.3683	0.4296	0.2290	0.4053	0.4235
Region 2	-0.0690	-0.3944	-0.0663	-0.0857	-0.7134	0.0171
	0.2718	0.4519	0.4940	0.2707	0.5347	0.4894
Region 3	-0.0008	0.0717	0.6811	0.0069	0.7226	0.7880
	(0.2308)	(0.3623)	(0.4217)	(0.2287)	(0.4317)*	(0.4170)*
Region 4	0.0055	-0.4092	-0.2427	0.0267	-0.1753	-0.0682
	(0.2778)	(0.4510)	(0.5305)	(0.2769)	(0.4877)	(0.5234)
Constants	-1.9556	-2.0403	-0.6115	-2.0015	-2.5153	-0.8243
	(0.2980)***	(0.4560)***	(0.5163)	(0.2969)***	(0.5710)***	(0.5249)
Observations	1601	3051	1526	1635	3051	1558
Log likelihood	-261.93	-551.69	-484.48	-267.33	-567.84	-491.70
Chi2	1536.15	271.16	253.30	1570.81	203.94	261.76

Note: ***, **, and * *indicate significance at 1%, 5%, and 10% levels, respectively; Standard errors in parentheses; (1) and (4): Probit in pooled data; (2) and (5): Heckman's random-effects dynamic probit; (3) and (6): Random-effects probit in the sample of non-status-switchers; Number of observations in (2) and (5) includes those with missing data due to lagging of dependent variable; Superscript(^{a}) indicates a level relative to industry mean*

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