SUPERIORITY OF EXPORTERS AND THE CAUSALITY BETWEEN EXPORTING AND FIRM CHARACTERISTICS IN VIETNAM

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Abstract

The study in this paper is on the causal relationship between export activities of firms and their characteristics in a transition country that is pursuing export-led growth strategies and experiencing a fast track of trade liberalization. For this purpose, we examine the superiority of exporters using a panel of firm-level data of manufacturing firms in Vietnam. We observe that exceptional performance of exporters, especially in TFP, does prevail in this country. Via testing self-selection hypothesis using a random-effects dynamic probit model to examine the causality from firm characteristics to export probability, we find significantly positive impacts of factors such as firm size, age or foreign ownership but not that of TFP. However, TFP superiority of exporters is satisfactorily explained by the existence of learning-by-exporting effects that are tested in a multivariate analysis using matching technique in combination with difference-in-differences approach. Besides contributing an empirical analysis to heterogeneous-firm trade theories, this study gives us some insights into the interpretation of mixed findings in macro-analysis of the effects of exports on growth in Vietnam.

JEL Classification Codes: F10, F14, F43, D21, D24, L20, L60.

Keywords: Exporter superiority; self-selection; learning-by-exporting; Vietnam

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I. INTRODUCTION

Facing the same stagnation in productivity growth as in other former centrally planned economies, Vietnam started to pursue a comprehensive renovation process, known as "doi moi", in 1986 to turn the country to a market economy. Targeting an industrialized country by 2020, the country is taking a strategic approach of proactive engagement in international economic integration to take advantage of foreign resources for development. Besides foreign investment and imports, exports are considered an engine for growth by the country[1]. Exports have therefore been extensively fostered via various measures, especially after industrialization strategies in the country turned focus from import-substitution policy to export-oriented policy under the export-led growth model in late-1990s. Export revenue has hence extraordinarily expanded since then. From 1986 to 2005, Vietnam's export sales increased at an annual average rate of over 21 percent. In the same period, the country's GDP also grew rapidly with an annual rate of over 7 percent. The proportion of exports in GDP increased steadily, from around 20 percent in the period of 1986-1990 to 54 percent in 2001-2005 (GSO, 2006). The parallel increases of exports and GDP and the greatest share of exports in the country's GDP between 1989 and 2003 hint Thang and Ngoc (2004) to argue that exports are a significant channel for economic growth in Vietnam. However, it is not what some recent studies found. In examining the impacts of exports on long-run growth in Vietnam using macroeconomic data from 1975 to 2001, Ngoc et al. (2003) find that there is no econometric evidence to suggest that exports are a growth engine in Vietnam. Anh (2008) also finds very small impact of exports on Vietnam's growth during 1986-2007 period. In testing whether economic growth in Vietnam is led by exports or investments using vector auto-regression approach, she finds significant supporting evidence for investment-led growth model but not for export-led growth model. In addition, her study shows that industrial labor productivity is not a channel that transmits impacts of exports to growth. The mixed findings of the effects of exports in the context of Vietnam are not uncommon. We can frequently observe the same incidence in many studies in the literature of export-led growth analysis[2]. One main reason must be that aggregate data are irrelevant in the analysis of this issue[3]. It is possible that the magnitudes of exporting effects are different because exports may affect the economy via different channels whose magnitudes are different. Besides some possible problems in econometrical techniques employed for macroeconomic data, aggregate analysis itself cannot clearly clarify the mechanisms of the effects and therefore cannot thoroughly catch all the possible effect channels. Exporting activities may induce reallocation of scarce resources toward industries that are more productive, in other words, toward industries that have comparative advantage. This channel, usually known as trade-induced cross-industry reallocation, is successfully explained by standard trade models that assume a representative firm or identical firms. However, there are also other channels that cannot be explained by these traditional models. 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

[1] This can be found in the country's Socio-Economic Development Strategies for the period of 1991-2000 as well as in those of the period of 2001-2010.
[2] See, for example, Marin (1992), Medina-Smith (2001), Baldwin (2003) or Rodriguez (2006) for more details in export-led growth analysis.
[3] See, for example, Isgut (2001) for more details on this argument.

are more productive than non-exporters. Furthermore, there may be spillover effects of exporters' behaviors to surrounding firms. These are subject matters of heterogeneous-firm trade models, a new strand that recently accounts for the huge majority in trade-related literature. In reality, the interactions between heterogeneous firms are those actual forces that drive trade between countries and hence determine the effects of exports. Therefore, micro-data analysis using firm- or establishment-level data is more appropriate for examining the relationship between exports and growth. The study in this paper is one of the studies of this type. Via examining the relationship between characteristics of firms and their exporting behavior in Vietnam's manufacturing sector, this study aims at contributing a firm-level analysis of the role of exports in Vietnam's economy.

Firms in the real world are different in many aspects, even when they face the same macroeconomic conditions or operate in the same narrowly-defined industry. Firm-level data from many countries show that just a small fraction of firms is involved in international trade, while the majority chooses to serve only domestic markets[4]. Furthermore, the term "exceptional export performance" first used by Bernard and Jensen (1999) to describe their findings of the superiority of exporters in terms of performance such as productivity or size 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. Besides the U.S., Wagner (2007a) finds in his survey of related studies published by the year 2005 that the superiority of exporters can also be observed in other industrialized countries such as the UK, Canada, Germany, or Italy; in some 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. Two hypotheses that are usually tested for the explanation of this superiority, especially in productivity, are: (i) better firms self-select into export markets (self-selection hypothesis) and (ii) exporting makes firms better (learning-by-exporting hypothesis). The first hypothesis has its background in the heterogeneous-firm trade theories, whose argument is that firms are different and only the most productive firms can become exporters due to additional costs in serving foreign markets. The second hypothesis is supported by growth theories that argue for the existence of learning by exporting. These two hypotheses are not necessarily exclusive to each other. Findings in testing these hypotheses can hint us of which channels of exporting effects are in operation in a country. There are many empirical studies testing these hypotheses in different contexts. However, findings are diverse in different countries. As far as the causality from productivity to the probability of exporting is concerned, the self-selection hypothesis is found holding in Germany (Arnold and Hussinger, 2004), Colombia and Morocco (Clerides et al., 1998), Chile (Alvarez and Lopez, 2005), Taiwan (Aw et al., 2000), Spain (Delgado et al., 2002) or Estonia (Sinani and Hobdari, 2007). In contrast, no significant effect is observed in the U.S. (Bernard and Jensen, 2004), the UK (Greenaway and Kneller, 2004), Korea (Aw et al., 2000), Italy (Castellani, 2002), Turkey (Yasar and Rejesus, 2005), Sweden (Hansson and Lundin, 2004) or Cameroon, Ghana, Kenya and Zimbabwe (Bigsten et al., 2004). As for the learning-by-exporting hypothesis, significant evidence of positive effects of exports on productivity can be observed in some industrialized countries such as the UK (Girma et al., 2003, 2004; Greenaway and Kneller, 2007; Greenaway and Yu, 2004), Japan (Kimura and Kiyota, 2006), France (Bellone et al.,

[4] See, for instance, Bernard et al. (2007b) for some related factual details.

2006), Canada (Baldwin and Gu, 2003); and in some developing countries such as Chile (Alvarex and Lopez, 2005), China (Kraay, 1999; Park et al., 2006), Indonesia (Blalock and Gertler, 2004), Slovenia (De Loecker, 2007), Taiwan (Aw et al., 2007), Turkey (Yasar and Rejesus, 2005; Yasar et al., 2007) and Sub-Saharan countries (Mengistae and Pattillo, 2004; Van Biesebroeck, 2005). However, we also observe no evidence that supports the existence of learning-by-exporting effects in two major exporting countries: the U.S. (Bernard and Jensen, 1995, 1999; Jensen and Musick, 1996) and Germany (Bernard and Wagner, 1997; Wagner, 2002, 2007b; Arnold and Hussinger, 2005), as well as in others such as Spain (Delgado et al., 2002; Farinas and Martin-Marcos, 2007), Ireland (Ruane and Sutherland, 2005), Sweden (Greenaway et al., 2005), Morocco (Fafchamps et al., 2007) or Russia (Kozlow and Wilhelmsson, 2005). Different empirical findings observed across countries and time can accrue to the fact that exporting behaviors of firms are affected by a combination of many different characteristics of firms and distinct features of business environment. In export activities, firms behave differently according to the characteristics such as productivity level, size or product lines they own, the market entry costs they face, the availability of information they have about foreign markets, the type of markets they are likely to enter, existing firms in exporting markets they are competing with, or the macroeconomic environments, especially trade policy regime, they are operating in. Given these idiosyncratic forces at work, each country at a given period of time can observe different pattern of firms' export behaviors and effects of exports on its economy. It is therefore inappropriate to apply findings in other countries to explain export behaviors of firms in Vietnam or the impacts of exports on the country's growth. To have better insight into the related incidence in this country, it is worth examining the puzzle of export determinants and effects via looking into firm-level data of its own. In addition, an interesting evidence to the existing literature of mixed empirical findings about exports-productivity causality can be expected from a context of a country where exports are now considered as a vital source for growth and trade liberalization is on a considerably fast track.

This paper is to use a panel data set constructed from "Productivity and the Investment Climate Enterprise Survey of Vietnam" (Vietnam PICS) conducted by the World Bank in 2005 to examine differences between exporters and non-exporters in Vietnam's manufacturing sector and then to test hypotheses of self-selection and learning-by-exporting in this country's context. By testing these two hypotheses, we examine the causality between firm characteristics, with a focus on total factor productivity (TFP), and export behaviors. Via this analysis, we expect to have some micro-backgrounds to elaborate possible channels via which exports affect economic growth in this country. The first hypothesis will be tested via estimating an export supply equation to find the determinants of the probability of being exporters, controlling for the sunk entry costs and unobserved firm characteristics. The test of the second hypothesis will be conducted via a multivariate analysis using matching technique in combination with difference-in-differences approach. There are very few firm-level studies related to export behaviors of firms in Vietnam. In addition, all of them are only concerned with some relationships other than that between total factor productivity (TFP) and export behaviors of firms. Nguyen et al. (2007) estimate an export equation of small- and medium-sized enterprises (SMEs) to examine the effect of innovation on export propensity. Using a cross-sectional data from a SME survey in 2005, they find that innovation causes exports for the sample they use. However, productivity variables are not treated in this study. Nguyen (2008) also estimates an export equation using firm-level

data in Vietnam but his interest is in spillover effects of foreign direct investment on exporting behaviors. Effects of productivity or other characteristics of firms are not controlled for. As per the learning-by-exporting effects, there are no studies on this matter, as far as we know. Hence, the study in this paper must be the first in this strand for the case of Vietnam. In addition, it is also expected that the analysis in this paper is more plausible due to the use of firm-level panel data that allows us to employ econometric specifications that can better control problems frequently observed in existing studies that use cross-sectional data such as the presence of endogeneity or the persistence of exporting behavior.

This paper is outlined as follows. Via examining the data of the sample from Vietnam PICS, the next section, Section II, will elaborate differences between exporters and non-exporters in Vietnam to check whether there is the phenomenon of exporter's superiority in Vietnam's manufacturing sector. The two sections that follow will examine the causes behind this. Specifically, Section III will test the self-selection hypothesis while Section IV tests that of learning by exporting. The analysis of the two sections will help explain the causality between productivity cum other firm characteristics and export behaviors of firms in Vietnam. Further discussion will be made in Section V, and Section VI concludes.

II. EXCEPTIONAL EXPORT PERFORMANCE: ARE EXPORTERS SUPERIOR TO NON-EXPORTERS IN VIETNAM'S MANUFACTURING SECTOR?

Data Description

Productivity and the Investment Climate Enterprise Survey of Vietnam (Vietnam PICS) was conducted by the World Bank with the coordination of Asian Development Bank in 2005. It 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 percent for 90 percent 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; sales and supplies; labor relations; expenses and assets.

The sample is about 5.6 percent 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 percent 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 percent of their sales) account for about 34 percent 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 percent 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

percent of firms who responded to the survey report having exporting potentials (SME TAC, 2005). It is not always possible to realize potentials and therefore the share of exporters must be somewhat below this figure, supporting us to use this sample for analyzing exporting behaviors of firms in Vietnam.

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 and 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.*

Differences between Exporters and Non-Exporters

In order to illustrate differences between export statuses (exporters versus non-exporters), we derive exporter premium across a range of characteristics: revenue, TFP, labor productivity, size, input intensity, labor skill and age[5]. First, we regress each of these characteristics on export status of firms to find and test simple exporter premium at the mean in the data set pooled across 2002-2004 as follows:

$$\ln Z^*_{it} = \alpha_Y Y_{it} + u_{it} \quad (1)$$

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_Y is the parameter; and u_{it} is the error term. The simple exporter premium is the percentage difference between exporters and non-exporters in the mean level of the characteristic of interest, without controlling for differences in other characteristics, industry or location of firms. We also calculate exporter premium conditioned on other characteristics that may affect the characteristic in consideration and therefore bias the result derived by the simple regression. This is termed as the conditional exporter premium, defined as the difference in the mean level calculated with other characteristics, location and industry type of firms being controlled for. Specifically, we will estimate the following multivariate regression in the data set pooled over the years:

$$\ln Z^*_{it} = \beta_Y Y_{it} + \beta_Z Z_{it} + \beta_T T + \beta_D D + v_{it} \quad (2)$$

[5] See the Appendix for definition and construction of all the variables used in this paper.

where Z_{it} is the vector of firm characteristics listed above, excluding the one used as dependent variable; T is the vector of time dummies; D is the vector of industry and location dummies; $\beta_Y; \beta_Z; \beta_T$ and β_D are vectors of parameters; and v_{it} is the error term. The exporter premium is defined as $[(Z_{it}^{*exporter} - Z_{it}^{*non-exporter}) / Z_{it}^{*non-exporter}]*100$. After all the parameters are estimated, the simple exporter premium is calculated as $(e^{\alpha_Y} - 1)*100$ and conditional exporter premium as $(e^{\beta_Y} - 1)*100$. These values are reported with the standard errors of the two parameters α_Y and β_Y to describe the difference between exporters and non-exporters.

Table 2 describes these differences. 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 third and fifth columns list the corresponding standard errors of these differences. At the unconditional mean, revenue and employment levels in exporting firms are about 300 percent greater than those in non-exporters. Exporters' capital scale is also larger. The positive premiums 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 TFP over non-exporters. However, 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 when looking at the difference between capital intensity. As for wages, exporters appear to pay higher average 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. All of these findings show that exporters in manufacturing sector of Vietnam are "superior" to non-exporters in terms of size, 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.

Table 2: **EXPORTER PREMIUM**

Variables	Simple E.P. (%)	Standard errors	Conditional E.P. (%)	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; E.P. :export premium

III. SELF-SELECTION INTO EXPORTING: WHAT CHARACTERISTICS MATTER?

Empirical Framework

The theoretical background for the analysis in this section is from heterogeneous-firm trade theories.

The basic argument of these theories is that the presence of sunk costs of entry into foreign markets and firm heterogeneity can explain why some firms export but others do not. Roberts and Tybout (1997) develop a dynamic model of exporting with entry costs. The model is employed by almost all the parametrically empirical studies of exporting behaviors 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 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. Entering foreign markets may incur some costs 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 costs 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 *i*, in the single period maximization problem, its profit is as follows:

$$\pi_{it}(X_t, Z_{it}, q^*_{it-1}) = p_{it}q^*_{it} - c_{it}(X_t, Z_{it}, q^*_{it-1} \mid q^*_{it}) - N(1-Y_{it-1})$$

where p_{it} is the price of the goods sold abroad and $c_{it}(.)$ is the cost of producing optimal export quantity q^*_{it}; X_t and Z_{it} are vectors of exogenous factors and firm-specific factors affecting profitability of the firm, respectively; and Y_{it-1} denote the export status of the firm i at the period $t-1$ (equal 1 if exporter and 0 otherwise). The firm will export if this profit is non-negative, that is, $Y_{it}=1$ if $\pi_{it} \geq 0$ 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:

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

where δ is the one-period discount rate. The value function is $V_{it}(.) = \max_{q^*_{it}}\left(\pi_{it}Y_{it} + \delta E_t[V_{it+1}(.) \mid q^*_{it}]\right)$, and hence the condition of exporting decision is

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

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

This equation 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, with u_{it} being the error term:

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

Estimation Specifications

Based on the above-mentioned framework, we will test the binary-choice non-structural model of export decision using the following equation

$$Y_{it} = \gamma_Y Y_{\text{it-1}} + \gamma_P P_{it-1} + \gamma_C C_{it-1} + \gamma_T T + \gamma_D D + \varepsilon_i + \eta_{it} \qquad (3)$$

where $\gamma_Y, \gamma_P, \gamma_C, \gamma_T$ and γ_D are vectors of parameters. In this equation, the dependent variable Y_{it} is a binary-choice variable of exporter status and the lagged dependent variable $Y_{\text{it-1}}$ is included as an explanatory variable in the right hand side to control for the presence of sunk entry costs. It enters the model in a structural way as hinted by the theoretical background. In other words, its presence in the estimation equation is due to the phenomenon of true state dependence, in the sense defined by Heckman (1981a). P_{it} and C_{it} are variables of firm-specific characteristics at time t (i.e. Z_{it} mentioned above). P_{it} is productivity (either labor productivity or TFP) and C_{it} is the vector of other observable characteristics. Other variables are time dummies T as well as industry and location dummies D. All firm characteristics are lagged by one period to control for any possible reserve causation to firm characteristics from export activities[6]. This problem is usually known as endogeneity, due to possible two-way relationship between exporting behaviors and characteristics of firms. As far as the error term is concerned, we treat it as comprising of two components: a time-invariant firm-specific component ε_i and a transitory component η_{it}. This is due to our belief that there are many factors 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 and 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 heterogeneity in the model may raise some problems, especially when the lagged dependent variable is included as the explanatory variable. Many of unobserved characteristics such as product attributes, managerial skills, or strategic management are potentially permanent or highly serially correlated. If these characteristics are not properly controlled for, estimates are inconsistent and biased. In addition, they can induce persistence in the exporting decision of firms, and then may lead us to overestimating the parameter of the lagged dependent variable, i.e., the importance of sunk entry costs.

There are some approaches frequently used in fitting equation (3) using panel data. Random- and fixed-effects models are usually used to properly treat unobserved firm heterogeneity. In fixed-effects model with the presence of lagged dependent variables, linear probability framework is usually preferred for the ease of fixed-effects estimation techniques, compromising the drawbacks of linear probability framework (fitted probability out of [0,1], constant partial effect, etc.). Those who do not accept these drawbacks 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

[6] Because of the short panel, we can only use lags of one-year period.

coefficients and statistics inconsistent, especially in the case when large panel is not available. Probit with random effects fits better to specifications with lagged dependent variables. Roberts and Tybout (1997) use Heckman's (1981b) dynamic random-effects probit estimator with binary-choice model. We also prefer using the dynamic probit model with random effects in this paper. One reason for this choice is that the data used in this analysis is quite a short panel, rendering the ease in employing models with both lags and fixed effects. Although first-differences specifications with suitable estimators such as that of Arellano-Bond' (1991) are preferred in fixed-effects models to avoid biasness and inconsistency, this approach 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 allows us not only to deal with unobserved firm-specific effects but also to model the dynamics properly with the control of initial condition. We estimate equation (3) in three specifications. First, we fit the equation (3) ignoring any unobserved effects, i.e. assuming that $u_{it} \equiv \varepsilon_i + \eta_{it}$ is normally distributed and uncorrelated to other explanatory variables, using probit model in the pooled data set. Although this estimation is more likely to give biased and inconsistent estimates, it yields us the upper bound of the effect of past export status. Next, we use the Heckman's (1981b) random effects dynamic probit framework to fit equation (3) in full. Because this model controls for unobserved effects and the dynamic process, it is expected to give the best estimates under the availability and structure of data used in this analysis. The conditions for the fitting to be eligible in a dynamic random effects format can be found in Roberts and Tybout (1997). We use the program "redprob" written in Stata® by Steward (2006) to run this regression, with the initial status controlled for by using specific information available in the dynamic process. 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 use a 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 (3), i.e., the estimation equation has no lagged dependent variable. This equation is fitted by using random-effects probit model. 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.

The variable of the most interest in this section is productivity, an important factor that determines the propensity of being an exporter, as suggested by theoretical studies. Firms that are more productive are more likely to become exporters because of the sunk entry costs that pave the way to foreign markets for only firms of higher productivity. 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 TFP as a key indicator to represent productivity levels of firms. Besides, labor productivity is also used as a measure of productivity. 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.

Other observable characteristics are firm size, ownership, age, capital intensity, and labor skill.

Firm size is believed to be positively related to export status of firms. Larger firms are able to gain benefits from their size via economies of scale in production owing to 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 as a proxy for size of the firm because it is stable and therefore may present more accurately the size of firms in Vietnam other than employment or total output.

We also believe that whether firms are owned by foreigners or not has some effect of export behavior of firms. 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 host-country-market oriented and aim foreign direct investment as a measure of market penetration. Besides ownership, firms' age is also believed to be a proper determinant. 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 is also suggested as "born globals" have stronger global orientation and capability. These firms are more likely to start exporting after a short time of start-up (Moen, 2002). We include both age and age squared to control the deterioration of this effect with time.

In this paper, we use the variable of capital intensity in the estimation equation to proxy for the use of technology of firms. 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 more likely to export. We also control for effects of workforce quality using average wage rate. Industry dummies, region dummies and time dummies are 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, respectively.

Estimation Results

As discussed in the preceding sections, the observed superiority of exporters in Vietnam, 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 effects of learning-by-exporting process. The results from estimating equation (3) which we report in Table 3 can help elaborate 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. The signs of these parameter estimates show the direction of related effect. The first three columns of Table 3 list the estimated parameters in estimations with natural logarithm of TFP used as productivity variable. The last three present the results of regressions that use natural logarithm of labor productivity as productivity. 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 due to space limitation.

Table 3: **DETERMINANTS OF EXPORT PROPAPILITY**

(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)***	
$Ln(TFP_{t-1})$	-0.1313	-0.1189	0.1071			
	(0.0678)*	(0.1189)	(0.1226)			
$Ln(Labor\ Productivity_{t-1})$				-0.1801	-0.6498	-0.1800
				(0.0748)**	(0.1660)***	(0.1317)
$Ln(Capital_{t-1})$	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_{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)**
$Age\ Squared_{t-1}$	-0.0629	-0.0128	-0.1963	-0.0577	-0.2265	-0.2095
	(0.0427)	(0.0781)	(0.1016)*	(0.0427)	(0.0981)**	(0.1025)**
$Capital\ Intensity_{t-1}$	-0.1171	-0.3083	-0.7567	-0.0929	-0.3569	-0.7565
	(0.0514)**	(0.0956)***	(0.1171)***	(0.0413)**	(0.0807)***	(0.1173)***
$Wage_{t-1}$	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)
Constant	-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

***Notes**:(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; All continuous variables are in level relative to industry mean;. (***), (**), and(*) indicate significance at 1%, 5%, and 10% levels, respectively; Standard errors in parentheses.*

We can see from Table 3 that when sunk costs and other observed and unobserved characteristics of firms are controlled for, 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 even negative at the significance level of 10 percent. 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 (3) 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 shows to be an insignificant factor in the self-selection into foreign markets of firms in this sample.

As far as labor productivity is concerned, the pooled probit model whose results are reported in column (4) shows that labor productivity has a negative effect on the probability of exporting with the significance level of 5 percent. 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 at the significant level of 1 percent. 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.

As for other observable variables, we can see that firms that exported last year are more likely to export this year, showing a significant role of sunk costs in exporting. It may be that firms in Vietnam are just offsprings in the world markets and produce traditional products that face fierce competition from many other developing countries. They 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 costs. This also leads to the phenomenon of high persistence in export status, especially in those firms with dynamic management. Firm size and capital intensity are also 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. The relation between capital intensity and export status is negative, implying that those firms that use labor-intensive technology have higher probability to export. 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 percent level. Firm age is also a predictor of export probability. Firms with more years of experience in business are more likely to export with marginal effect deteriorating over time. The estimation results also give hints about firms in which industries having more chances to export (not reported in Table 3). 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 percent for the coefficient of the dummy for the year 2004 when the year 2003 being taken as reference year.

As a summary of this section, we can conclude that although the self-selection hypothesis has some significant evidence to explain the superiority of exporters in labor productivity, size, technology type or experience, it does not hold in the case of TFP. This hints us to expect a positive effect of exporting on TFP, a subject matter of the next section.

IV. LEARNING-BY-EXPORTING EFFECTS: DO THEY ACCOUNT FOR EXPORTER SUPERIORITY?

Conceptual Framework

As we have argued in the Introduction section, exporting can induce within-firm improvements. There are many benefits to firms that can be attributed to exporting. These benefits include gains for their workers in the forms of higher wages and better employment prospects, or gains for the firms in the forms of faster revenue growth, larger employment size, risk diversification, increased innovation, improved survival chances and especially higher productivity. Firms can improve their performance by exploiting the knowledge they learn in doing business in foreign markets, or by utilizing more efficiently their capacity to take advantage of economies of scale. In other words, exporting can have learning effects and capacity utilization effects on firms. Both trade and growth theorists argue that there may be plenty of sources for firms to learn from when trading with foreign customers. These may be diffusion of technology, flows of knowledge and experience, or even pressure from competition in the overseas markets. These are also known as sources of export-led growth which has been tested widely with the use of macroeconomic data so far and recently attracted more studies using microeconomic data. Via exporting, firms can have access to new technologies of production or new designs of products from their international counterparts. Exporters can also learn advanced management skills or marketing techniques that help them operate more efficiently and raise the possibility of survival. In addition, pressure from competition in international markets which is widely believed fiercer than that at home and from highly demanding customers abroad would force firms to innovate in order to survive and grow. Doing business in the global markets also demands greater entrepreneurial efforts and skills of managers, encouraging them to become better. Besides offering knowledge sources, larger foreign markets also allow firms to increase their capacity utilization and exploit economies of scale, helping them to increase productivity. Theoretical supports for these arguments can be easily found in various studies of endogenous growth. Besides, the direct evidence that firms with international activities can learn from worldwide knowledge sources more than domestic firms do can be found in Criscuolo et al. (2005). The authors show that knowledge from sources such as international suppliers, customers, universities, and intra-firm worldwide information pool can help firms generate more innovative outputs. To capture the effects of learning from past exporting on productivity, Roberts and Tybout (1997) insert past exporting quantity as a variable into the variable cost function and analyze the behavior of profit-maximizing firms. Of course, firms can learn to improve themselves first before entering into export markets. However, the possibility of learning from past exports is plausible, i.e. it is reasonable to believe that firms learn from their export experience and

improve themselves while they are exporting. Fernandes and Isgut (2005) cite two characteristics of learning suggested by Arrow (1962) to argue for the rationality of this possibility in the context of exporting. Arrow (1962) believes that learning is the product of experience and therefore can only take place through the attempt to solve a problem. He also argues that because learning is associated with repetition of essentially the same problem, it is subject to sharply diminishing returns. In order for performance to increase steadily, stimulus situations must themselves be steadily evolving rather than merely repeating. Like Fernandes and Isgut (2005), many researchers in this literature, including us, believe that Arrow (1962)'s general characterization of learning applies to firms that serve export markets. Because it is impossible to examine these sources separately in this study, we follow others in referring all of them as the learning-by-exporting effects for the sake of expression, except the case that explicitly states the purpose of separation.

In addition, although it is reasonable to believe that exporting activity is beneficial to firms, the extents of effects may be different among firms. These extents may depend not only on the quality of the knowledge sources abroad but also on the ability of firms to absorb and exploit these sources over time. Therefore, learning effects of exporting must vary according to various factors such as how long firms have experienced in exporting, to which extent they involve in serving foreign markets or in which sectors they are operating in, besides the characteristics of their own.

Empirical Specifications

There are two broad methods frequently used to test for the existence and extents of learning-by-exporting effects. The first one is to consider exporting as one of the factors in the equation of firms' performance. The other is the treatment evaluation technique where exporting is considered as a treatment that classifies firms into two separate groups: exporters (treatment group) and non-exporters (control group). Average difference in performance between firms in these two groups is the effects of exporting (treatment effect). The latter is recently preferred to the former because it offers a better way to deal with possible technical problems inherent in the estimation procedure using firm-level panel data, especially the problem of endogeneity that arises when there is possible existence of bi-directional causality between exporting and performance. We employ this method in this paper. Specifically, matching combined with difference-in-differences analysis will be applied. We know from treatment evaluation theories that matching helps find a good control group and therefore eliminate endogeneity bias, especially the one that is caused by observable firm characteristics. Difference-in-differences approach will further reduce bias associated with unobservable characteristics. Furthermore, this approach is a good resort when the data panel we use is short. Merits of this approach can be found in Blundell and Costa Dias (2000), and its application in dealing with exporting effects can be found in Girma et al. (2004), Greenaway et al. (2005) or Yasar and Rejesus (2005).

We use average treatment effect on the treated (ATT) to measure causal effects of exporting. In this paper, ATT is the average effect of exporting on exporters, defined as

$$E(\Delta A^1_{it+s} - \Delta A^0_{it+s} \mid Y_{it} = 1) = E(\Delta A^1_{it+s} \mid Y_{it} = 1) - E(\Delta A^0_{it+s} \mid Y_{it} = 1) \qquad (4)$$

where ΔA_{it+s} is a measure of a performance outcome of firm *i* at period *t+s* (*s>0*) that is causally affected by exporting activity of the firm at *t*; Y_{it} is a binary indicator of export status of firm *i* at period *t* ($Y_{it} = 1$ if the firm *i* is an exporter and $Y_{it} = 0$ otherwise); ΔA^1_{it+s} is the outcome at time *t + s*

of firm *i* that exported at *t* ($Y_{it} = 1$), and ΔA^0_{it+s} the outcome of firm *i* had it not exported. In this section, outcomes of primary interest include growth rates of total factor productivity and labor productivity. However, we also consider effects of exporting on employment, revenue and average wage in order for us to have a better insight in explaining the superiority of exporters found in Section II. The value of ATT in (4) can be calculated if we know two terms in the right hand side. Though it is possible for us to calculate the first term from the data of exporting firms, we can not do that for the second term because it is counterfactual. The matching technique is employed for the construction of this counterfactual via finding a valid control group out of the firms that remain non-exporters. The counterfactual is estimated by the corresponding average value of the outcome of firms that remain non-exporters, i.e. $E(\Delta A^0_{it+s} \mid Y_{it} = 0)$ within the control group chosen. The basic principle of matching is to select from the group of non-exporters in the sample a subgroup of firms in which the distribution of the variables affecting the outcome is as similar as possible to the distribution of the exporter group, assuming that the difference in the outcome at a point in time, except the part that is caused by exporting, between these groups is captured by these variables. Following others in this literature, we use the propensity-score matching technique introduced by Rosenbaum and Rubin (1983) in this paper. After the control group is constructed via matching, causal effects of exporting on the outcomes of interest are estimated in various specifications using the new sample comprising of just exporter group and matched control group, hereafter referred to as the matched sample. Effects of both export-market participation (export status) and exporting involvement (export intensity) will be examined. Specifically, the equation explaining a performance measure A of firm *i* at time $s > 0$ (with the base year $t = 0$) is:

$$\ln A_{is} = \lambda_0 + \lambda_{0Y} Y_{i0} + \lambda_{0Z} Z_{i0} + \lambda_S s + \lambda_{YS} Y_{i0} s + \lambda_{ZS} Z_{i0} s + \mu_i + \tau_{is}$$

where Y_{i0} is a vector of dummy variables representing different exporter statuses; Z_{i0} is the vector of observed firm characteristics in the base year that need controlling for; μ_i is unobserved and time-invariant firm effect; τ_{is} is the i.i.d. error term; and $\lambda_0, \lambda_{1Y}, \lambda_{1Z}, \lambda_{0S}, \lambda_{1YS}$, and λ_{1ZS} are vectors of parameters. Taking annual average differences between $t = 0$ and $s > 0$, we yield

$$\frac{1}{s}(\ln A_{is} - \ln A_{i0}) = \lambda_S + \lambda_{YS} Y_{i0} + \lambda_{ZS} Z_{i0} + \zeta_{is} \qquad (5)$$

where $\zeta_{is} \equiv \tau_{is} - \tau_{i0}$. The term in the left hand side of (5) is log of annual growth rate of the performance *A* in *s* years after the base year, what denoted by ΔA_{it+s} above where $t = 0$. This is actually a difference-in-differences analysis. In this approach, time trend, unobserved firm effects and observed firm characteristics in the base year are accounted for. λ_{YS} represents ATT in term of log of growth rates of a performance measure under consideration. Equation (5) is estimated both without and with controlling for observed firm characteristics Z_{i0}. Estimation with Z_{i0} included using the matched sample is known as multivariate analysis after matching. In examining the effects of export-market participation, Y_{i0} will be either dummy variable of exporters where non-exporters are taken as reference group, or a vector of dummies that classifying firms into more specific types according to their behaviors in entering or exiting export markets, including export starters, continuers, quitters vs. not-ever-exporters. As for effects of export involvement on firm performance, equation (5) is adjusted by replacing Y_{i0} with its interaction with export intensity of the firm. This helps identify casual effects of export involvement on different firm types.

Estimation Results

In this section, effects of export participation in the year 2003 on changes in firms' performance measures between 2004 and 2003 will be examined. TFP and labor productivity, together with employment, revenue and average wage rate are performance outcomes of interest. The data in 2002 are used as pre-treatment conditions to estimate the selection decision, i.e., the propensity scores for matching. After controlling for missing data and outliers, the remaining size of the sample is around 737 firms. Around 35 percent of these firms had at least 10 percent of their sales from directly selling to customers abroad in 2003.

We first estimate propensity scores to find matches of exporters to construct the matched sample. A propensity score is the conditional probability of receiving the treatment at time *t* (i.e., being exporting) given the pre-treatment characteristics Z_{it-1}. To identify the propensity score for each firm, we estimate the probit model $P(Y_{it}=1)=G(Z_{it-1})$, where *G* is the normal cumulative distribution function. In order to have good propensity scores for matching as well as a reliable matching given the estimated propensity scores, it is important that one can be able to correctly identify determinants Z_{it-1} of the selection into exporting and that the selection is random within Z_{it-1}. The preceding section gives a good hint for choosing Z_{it-1}. In addition to industrial and regional dummies, these variables include logs of labor productivity, firm size in terms of capital, average wage and capital intensity. They are all the variables that have significant effects on the decision to export of firms in the sample. One-period lags are used because they are the pre-treatment characteristics, as well as because using lags can help avoid the reserve effects in estimating the probability of exporting. Besides, it is required to check the balancing of pre-treatment characteristics, i.e., the condition whether the selection into exporting is random given the estimated propensity scores. If this condition is satisfied, it is reasonable to argue that firms with the same propensity score must have the same distribution of characteristics independently of export status. Hence, exporter group and control group should be on average observationally identical (Becker and Ichino, 2002), and the difference in average outcomes between the two groups can be inferred as causal effects of exporting. To check for the balancing hypothesis, we employ the program PSCORE written by Becker and Ichino (2002). The balancing condition in the matching for all performance outcomes is satisfied at significance level of one percent. After having the predicted propensity scores, we use the one-to-one nearest neighbor matching technique to find matched controls via employing the program PSMATCH2 written by Leuven and Sianesi (2003) for Stata®. This then gives us a matched sample for the estimation of equation (5).

Table 4 describes results from estimations of equation (5). We first look at the outcome of the estimation in specifications where a firm's status of export-market participation is either exporter or non-exporter. Estimates of λ_{YS} represent estimated average differences in logs of outcome growth rates (i.e., ATTs) between these two types of participation. Without controls, we have statistically significant estimates of coefficients of three out of five performance outcomes of interest. Growth rates of TFP, labor productivity and revenue of exporters are higher than those of the matched controls. Effects on TFP and revenue remain significantly positive when main characteristics of firms in the base year are controlled for. Together with matching, further controlling heterogeneity makes the estimation more reliable. The effect on labor productivity becomes statistically insignificant at conventional significance levels.

Table 4 **EFFECTS OF EXPORT PARTICIPATION ON PERFORMANCE OF FIRMS**

Firm Characteristics [ln(growth rate)]	TFP	Labor Productivity	Employment	Average Wage	Revenue
Exporters vs. non-exporters(1), without controls					
Exporter	0.1063	0.1052	0.0016	0.0758	0.0513
	(1.86)*	(1.69)*	(0.06)	(1.27)	(1.79)*
Observations	506	516	520	520	518
Exporters vs. non-exporters(1), with controls(2)					
Exporter	0.1041	0.0948	0.0157	0.0405	0.0592
	(1.74)*	(1.52)	(0.56)	(0.67)	(1.87)*
Observations	504	504	507	507	505
Starters, continuers and quitters vs. not-ever-exporters (3), with controls(2)					
Starter	0.1362	0.0853	0.1637	0.0381	0.3408
	(0.67)	(0.44)	(2.66)**	(0.40)	(3.80)***
Continuer	0.1182	0.0995	0.0212	0.0447	0.0590
	(1.87)*	(1.51)	(0.69)	(0.68)	(1.75)*
Quitter	0.1531	0.1056	0.0642	-0.0051	0.0610
	(0.74)	(0.52)	(1.53)	(-0.68)	(1.13)
Prob>F of H_0(4)	0.93	0.94	0.02	0.95	0.00
Observations	504	504	507	507	505

Notes: *(1): Coefficients reported are estimated values of λ_{YS} in equation (5) with Exporter as dummy and non-exporters as reference group. This is the estimated ATT; (2): Control variables include log of TFP, log of capital size, average wage, capital intensity and firm age in the base year; (3): Coefficients reported are values of λ_{YS} (i.e. ATTs) for dummies of Starter, Continuer and Quitter in equation (5) with not-ever-exporters as reference group; (4): H_0 is the null hypothesis that coefficients of Starter and Continuer are the same; (***),(**), and(*) indicate significance at 1%, 5%, and 10% levels, respectively. Robust t-values are in parentheses .*

With this evidence, it is reasonable to state that selling to foreign markets is good for firms. Exporting helps exporters grow faster in terms of TFP and revenue. However, we are also interested in the effects of export-market participation on different types of exporters in terms of experience in export business. Although firm age is controlled for in the above-mentioned estimation, doing so can just only account for experience in business in general, not in export business. Exporters may include those firms that just started exporting, besides those that have long export experience. Even among non-exporters, there are also some firms that have just quit from serving foreign markets. Because extents of the learning-by-exporting effects may depend on many factors including experience in export business, it is possible that firms just started to export have many things to learn and hence their performance will be improved right after entrance. After a while, the marginal knowledge source gets diminishing, as well as the knowledge learned so far becomes obsolete. If so, we can expect to see growth rates of performance of export starters are higher than those of export continuers. However, it is

also possible to argue that for new knowledge and techniques, firms need some time to absorb and then to adapt their capacity to exploit. In other words, there may be a gap between the time of getting involved in exporting and the time for the benefit of this involvement to be activated. Therefore, there may be a situation that continuers have higher growth rates than starters and non-exporters, if the effects of learning by exporting are prevalent. Difference in export experience seems to be a considerable factor making firms different. In deriving these effects, we estimate equation (5) where Y_{i0} is replaced by three dummies for new types of firms (starters, continuers and quitters), with not-ever-exporters taken as reference group. The specification with controls is employed using the matched sample. Results of this estimation are reported in the lower part of Table 4. To account for possible heteroscedasticity, robust statistics are reported. When TFP is the outcome of interest, all estimates for starters, continuers and quitters are positive. However, only the estimated coefficient of export continuers is statistically significant. This implies that those firms having longer export experience can improve their TFP. This evidence is a possible support for the argument of time gap stated above. Export continuers may have enough time to turn what they can learn from exporting into improvement in TFP while starters may not. Besides, no difference between average TFP growth rate of export quitters and that of not-ever-exporters is observed, implying that learning effects may still last for some time after the firms stopped exporting. The experience may deteriorate some time later and TFP growth rates of these firms may decline, ceteris paribus. Unfortunately, no longer panel is available for testing this hypothesis. For other outcomes, as in the preceding estimation, we see no statistically significant effects of exporting on labor productivity and average wage for any types of firms. However, a new result is observed for the case of employment size. The ATT on the number of employees of export starters is positive and statistically significant at 5 percent level while there is no significant evidence for export continuers or quitters. Besides, exporting-induced increase in revenue growth rate of starters is also considerably large in magnitude and significant in statistical sense. New export entrants may have taken advantage of larger foreign markets to increase their sales and therefore their size. Experienced exporters are also able to raise their sales, but with a growth rate far below those of new entrants. The test for this difference is statistically significant.

Besides export-market participation and experience, we are also concerned about the extent of involvement or commitment that firms have in export business, because this extent must be an important factor that makes the magnitude of effects different among exporters. Firms that devote more to export activities may have more chances to learn and better capability to take advantage of foreign markets. Their performance outcomes may therefore be better. To find the evidence for this argument, we test equation (5) in two specifications where different export statuses are interacted with export intensity used as a measure of involvement extent, and results are reported in Table 5.

We can see from Table 5 that when exporters as a whole are concerned, only the effect of export intensity on revenue is statistically significant. The larger is the share of exports in total sales, the higher the growth rate of revenue is. This implies that if exporters involve more intensively in export business, they would have more chances to raise their sales. The same evidence is not clear in the other performance outcomes. Although the coefficient of TFP is positive and the t-value is quite high as compared to those of other outcomes, it is not high enough to make the estimation statistically significant at conventional levels. This may hint us that the effect on TFP growth may prevail, but in

some group of exporting firms, not all the exporters. Results reported in the lower part of Table 5 clarify this argument: TFP growth of export continuers is in fact positively and significantly affected by the extent of export involvement. Besides, revenue growth rates of both export starters and continuers also increase along with the export extent. The difference is tested to be statistically significant.

Table 5 **EFFECTS OF EXPORT INTENSITY ON PERFORMANCE OF FIRMS**

Firm Characteristics [ln(growth rate)]	**TFP**	**Labor Productivity**	**Employment**	**Average Wage**	**Revenue**
Exporters vs. non-exporters(1)					
Export Intensity*Exporter	0.0011	0.001	0.0002	-0.0002	0.0008
	(1.54)	(1.41)	(0.53)	(-0.25)	(2.12)**
Observations	504	504	507	507	505
Starters and continuers vs. non-exporters(2)					
Export Intensity*Starter	-0.0015	-0.0017	0.002	0.0005	0.0052
	(-0.4)	(-0.47)	(1.65)	(0.37)	(3.03)***
Export Intensity*Continuer	0.0013	0.0011	0.0002	-0.0002	0.0008
	(1.80)*	(1.56)	(0.57)	(-0.23)	(1.99)*
Prob>F of H_0 (3)	0.46	0.43	0.15	0.63	0.01
Observations	504	504	507	507	505

Notes: *(1): Coefficients reported are values of λ_{YS} in equation (5) estimated with Exporter as dummy interacted with export intensity, non-exporters as reference group (2) Coefficients reported are values of λ_{YS} in equation (5) estimated with Starter and Continuer as dummies interacted with export intensity, non-exporters as reference group. Control variables are log of TFP, log of capital size, average wage, capital intensity and firm age in the base year; (3): H_0 is the null hypothesis that coefficients of interaction variables Export Intensity*Starter and Export Intensity* Continuer are the same. (*),(**) and (***) denote significance at 10%, 5% and 1% level, respectively. Robust t-statistics are in parentheses.*

All the analyses so far show that exporting is good for firms, specifically for their TFP and revenue growth rates. However, the magnitude of benefits that firms can yield varies according to export experience and export commitment. Exporting is a good source for export continuers to improve their TFP growth. These firms can raise the rate of TFP growth further by increasing the extent of their involvement in serving foreign markets. It seems that benefits of exporting are not absorbed into TFP improvement at the time firms start to export. However, trading with foreign customers offers them opportunities to increase their size in terms of employment and total sales. Although exporting induces higher growth rate of revenue for both export entrants and continuers, new entrants seem to enjoy faster growth than others do. These facts support the theoretical concepts raised in the preceding section for the existence of the learning-by-exporting effects. Exporting may have offered firms with access to larger customer base, helping them to increase their total revenue. This, in turn, helps firms utilize more efficiently their capacity. Besides, foreign markets are also a good source of knowledge for firms to learn as well as pressure for them to improve. Capital utilization and learning are therefore two possible

channels via which exporting brings benefits to exporting firms, not to mention the spillover to other firms in the country. It is beyond the scope of this study to argue for which channel is actually present and more dominant. However, the two channels are more likely to be activated in Vietnam in the period under consideration. It is likely that export continuers can have raised their capacity utilization when we refer to the fact that exporting induces increase in their revenue but not in employment size, when capital intensity is already controlled for. Furthermore, the fact that productivity of export continuers improves significantly via exporting while export quitters does not suffer any decline in their productivity may reflect the domination of learning effects. Firms may have learned from exporting before and are still able to continue exploiting the knowledge for some time while the chance for increasing capacity usage is less likely upon foreign market exit.

V. FURTHER DISCUSION

We go further to link the findings in the two preceding sections to explain the presence of export performance superiority in Vietnam's manufacturing sector observed in Section II. We can immediately recognize that one phenomenon widely observed in almost all other countries does also prevail in Vietnam: the superiority of exporters in size and the causes coming from both positive self-selection and exporting effects. Findings in this study show that exporter group in Vietnam has larger average size not only because larger firms have higher probability to be exporters due to their size advantage but also because foreign demand allows them to have their revenue and employment grow faster than non-exporters. It is worth relating this fact to findings of impacts of firm age and export entry costs in this country. Based on the evidence that substantial entry costs hinder firms in Vietnam from entering export markets, it is reasonable for us to argue that those firms that own more resources and experience have more ability to overcome these hurdles and therefore are more likely to become exporters or remain as exporters. In addition, in the eyes of foreign partners, in a small emerging country like Vietnam, a firm with relatively larger size and more experienced would have advantage because its status assures 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 so far.

One point that we find interesting is the superiority of exporters in total factor productivity. Although we find significant evidence from testing learning-by-exporting hypothesis to explain the observed higher average TFP level of exporters relative to that of non-exporters, we can not derive the cause from the examination of self-selection effects. Although it seems contrary the theoretical background from heterogeneous-firm trade theories, this finding can actually be observed in some other countries that we have introduced in Section I. There are some possible interpretations. It may be that among many possible observed and unobserved factors that determine the propensity of firms to export, TFP is actually not a dominant one. With certain firm-specific observable advantages such as size, age or skilled labor sources, or some positive exogenous shock, firms can become exporter regardless of their TFP disadvantage. Furthermore, because of the high persistence in exporting status, those firms who exported before may continue exporting regardless of their efficiency. If there are considerable

numbers of firms with low TFP that can export in that way, our estimate of productivity effects on export probability is more likely to be insignificant. This argument sounds more appropriate for the case of Vietnam's manufacturing sector. Although the country determined to open its economy in 1986, the right to free entry into export activities of the private sector was observed just from 1998 when the country demolished the export license regime. Up to then, large state-owned enterprises (SOEs) must have established dominant positions in export activities. SOEs in the country are notorious for low efficiency and slow innovation. Besides, these firms might have been pursuing targets other than profitability, a criteria most closely related to productivity. 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.

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. 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.

The interpretation of the estimation results gives another fact inherent in a developing country like Vietnam: Exporters have lower value added per worker as well as capital intensity. This fact reflects the comparative advantage of a labor-abundant Vietnam. It can be observed from the estimation results that garments, leather products, textiles, foods and beverages, and wood and wood products are those that have more chances to be exported. Main sources of value added in these industries are from selling their processing services. In other words, what they export are labor services. These industries, by nature, are labor- as well as skill-intensive. High worker skills and low processing service prices are also used as important tools in competing for foreign contracts. The finding about the positive correlation between foreign ownership and exporting probability may support this argument. Cheap labor and skill may be advantageous sources for export-oriented foreign firms to invest in Vietnam. Of course, financial and managerial strengths, market experience and market links can also be possible explanations for higher exporting probability of foreign-owned firms. Related to labor productivity and wage rate, we have no strong evidence that exports help improve them.

With the findings discussed above, we can now have some micro backgrounds that help disaggregate the channels via which exports relate to growth in Vietnam. As we have introduced in Section I, exports may induce more efficient use of national resources via three channels: inter-industry resource reallocation, intra-industry resource reallocation and intra-firm improvement. Although we can base on the fact that exporters are superior to non-exporters in TFP to argue that resources are better

used by exporters, we cannot accrue this to all of these three channels. Evidence for the analysis of learning-by-exporting effects shows that exporting helps increase TFP and revenue growth rates of firms, though the magnitude of benefits varies according to export experience and export commitment. It is therefore straightforward for us to assert that the country does benefit from trade-induced intra-firm improvement. However, trade-induced intra-industry reallocation does not show any efficiency effects. This argument is supported by the finding in the self-selection effect analysis, that is, TFP is not a significant determinant that selects firms within an industry into exporting. There are still less productive firms that are exporting. These firms even use more resources when their sizes get larger due to their access to foreign markets. Resources are used less efficiently than they would be if they are reallocated to non-exporters who are more productive. As for the inter-industry resource reallocation channel, we need more details on which industries are using resources more efficiently to say something about it. However, if we follow others in arguing that garments, leather products, textiles, foods and beverages, and wood and wood products are those that Vietnam has comparative advantage, in the sense that it can produce more efficiently, the benefit from trade-induced inter-industry reallocation can be said to be present due to the finding that these industries more export-oriented.

VI. CONCLUDING REMARKS

This study is among the first efforts of using micro data to examine the dual relationship between export activities and productivity and other characteristics of firms in Vietnam. We find the phenomenon of "exceptional exporter performance" prevailing in Vietnam, implying that exporters in the manufacturing sector are superior to those who purely produce for the domestic market. Exporters on average have not only larger size or more experience but also higher total factor productivity. To explain this phenomenon, we test two hypotheses widely known in this literature: better firms self-select to be exporters (self-selection hypothesis) and exporting makes firms better (learning-by-exporting hypothesis). Taking into account different problems that may arise in panel analysis using firm-level data, we use a separate framework for each test. What we find in testing the self-selection hypothesis is that firm size, experience or foreign ownership are positively related to export probability of firms, while TFP has no statistically significant effect. This finding implies that self-selection hypothesis holds true only with some characteristics but not with total factor productivity. Labor productivity and capital intensity are negatively related to the export propensity of firms, showing a factual feature of a labor-abundant country. These findings are reliably resulted from estimating the decision to export of firms in the Heckman's random-effects dynamic probit model, controlling for entry costs and unobserved firm heterogeneity. By using matching technique in combination with differences-in-differences approach under multivariate analysis to control for endogeneity that may arise from possible simultaneity and unobserved effects, we find the explanation for the TFP superiority of exporters in the significant existence learning-by-exporting effects. Exporting is good for the firms in the sense that exporting can induce higher growth of TFP and revenue of exporting firms. We can also observe that the magnitude of this benefit varies according to the extent of involvement that firms have in export business. Besides contributing to the literature of heterogeneous-firm trade theories empirical evidence from a country in transition with fast track of

trade liberalization, this study also offers us some micro backgrounds for the understanding of the channels via which exports contribute to economic growth in Vietnam. It must be that the country is benefiting from two important channels of export effects: trade-induced inter-industry resource reallocation and trade-induced intra-firm improvement. However, the process of self-selection of firms into exporting so far seems not operate in a favorable way for the country to yield from intra-industry reallocation of national resources. These three forces might have acted in such different magnitudes that the recent contribution of exports to the country's growth could not be found significant as some macro studies have raised.

In the recent context that Vietnam is accelerating its trade reform efforts for the sake of rapid growth, the findings in this study may be of some policy implications. Besides industrial and trade policies that help change the export structure in the way that can catch up with changes in comparative advantages of the country, it must be proper if the country can enhance the benefit of learning-by-exporting effects while correcting the process of self-selection of exporters. In addition to measures that help existing exporters improve their productivity, more steps that enhance active participation of the private sector in export business should be one of the urgent needs. Because the private sector is believed to have higher motivation for efficiency improvement and therefore is more likely to have higher productivity, these steps would help adjust the process of resource reallocation within industries smoothly in a manner of market mechanism. However, entry into exporting is evidently hindered by large entry costs while private firms are usually lack of resources, they should be supported in the start of exporting to overcome this obstacle. Further enhancement in entrance assistance such as support in foreign market information service or export administrative procedures should be a sound measure. The assistance must also last for some time long enough for firms to take full benefit of exports because we have evidence that firms may need some time to absorb experience from exporting, to adjust or to build up capability in order to make good use of what they have learnt from entering export markets. In addition, the fact that not only export-market participation but also export intensity has positive effects on productivity growth suggests that the policies facilitating more intensive integration of firms into the global market should be considered.

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APPENDIX

Variable Definition and Construction

Exporter: A dummy equal to 1 if a firm is an exporter and 0 otherwise. A firm is defined as an ***exporter*** at a given period of time if its direct exports account for at least 10 percent of its sales in this period, and ***non-exporter*** otherwise. The 10 percent threshold 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 exporting. 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.

Starter, continuer and Quitter: Also dummies, equal 1 if a firm is a starter/continuer/quitter and 0 otherwise. A firm is defined as export ***starter*** if it is an exporter in 2003 for the first time. A firm who has exported before and in 2003 is an export ***continuer***. An export ***quitter*** is the one that exported

before but quitted exporting in 2003. Not one of the above-mentioned is ***not-ever-exporter***.

Export intensity: The ratio of total direct exports over total sales.

Revenue: Total sales, adjusted to real 2002 terms by industry-level producer price indices (PPI) obtained from the website of General Statistics Office of Vietnam (GSO, 2007).

Employment: 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.

Total factor productivity: We estimate the production function to measure TFP of firms. To avoid possible transmission bias caused by correlation between the regressors and the error term in OLS estimation, we use Levinsohn and Petrin's (2003) approach to calculate the TFP. Levinsohn and Petrin (2003) suggest a technique in which intermediate inputs are used as proxies for productivity. This approach is more applicable to the study in this paper than the approach suggested by Olley and Pakes (1996) who use investment as the proxy, because there is too much missing data of investment data in the sample. Furthermore, it is good to use Levinsohn and Petrin's approach because intermediate inputs are probably good proxies due to their smoother response to productivity shocks. Investment may not fully respond to such shocks due to the adjustment costs. The basic framework can be referred to Levinsohn and Petrin (2003). We use the program "levpet" written in Stata® by Petrin et al. (2004). In the estimation, the outcome in the production function is value added, defined as the total sales subtracted by total purchases of raw materials and intermediate goods and energy cost. 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 employment. 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. There are no convergence problems in estimating except that for Metals and Metal Products Industry and Electronics Industry. We 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).

Labor productivity: Value added divided by total employees. Although labor productivity is also used as a measure of productivity, as usually done so by many other studies of the same interest, 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.

Capital size: Net-book value of machinery and equipment. Firm size is usually proxied by capital, employment or total output scale. However, capital size may present more accurately the actual 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.

Foreign: A dummy, equal 1 if a firm has foreign ownership and 0 otherwise. A firm is defined having foreign ownership when its foreign capital accounts for at least 10 percent of its total capital.

Age: Number of years in business, calculated by 2004 minus the foundation year.

Capital intensity: Capital size per total employees, representing relative intensity of factors used.

Average wage: Total labor payments divided by total employees. The labor payments are also in real 2002 terms, adjusted by using Consumer Price Indices (CPI) obtained from World Economic Outlook Database 2007 of IMF.

Industry dummies: 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. We make the combination because limited sizes of some original industries do not allow to use them separately while still satisfying the confidentiality requirement by the data provider (Enterprise Surveys, The World Bank Group). Besides, we do so to seek the efficiency in the estimation of TFP. With this new classification, we have 12 industry dummies with Others as the reference group.

Region dummies: We use the classification of regions used in PICS Vietnam. There are four region dummies including Red River Delta, Southern Central Costal, South East, Mekong River Delta, with Northern Central as the reference group.

Time dummy: Year 2004 is the dummy for the year 2004 with year 2003 as the reference.