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Does exporting spur firm productivity? Evidence from Vietnam

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Abstract

This study uses data of Vietnamese manufacturing firms from the World Bank Enterprise Surveys for the period 2002 – 2008 to examine the causality between export participation and firm productivity. The analysis focuses on the three hypotheses related to the relationship between exporting and firm productivity that have received attention in the literature, namely the self-section, learning by exporting and core competence hypotheses. In this case study, evidence is found in support each of these hypotheses, which often are portrayed as competing with each other but are in fact complementary. It is found that comparative advantage, which in the case of Vietnam , a labor-abundant, low-wage country, is in labor-intensive products, is central to understanding each of the three hypotheses. The firms' whose productivity was relatively high ex ante and accordingly self-select to export are firms that produce in line with Vietnam's comparative advantage (i.e. firms that are relatively labor intensive). Firms that experienced a relatively large increase in export intensity are found to have experienced higher total factor productivity, supporting the learning by exporting hypothesis, and a relatively large increase in labor intensity, supporting the core competence hypothesis and the central role of comparative advantage.

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1. Introduction

It is a well-established fact for many countries that exporting firms perform better (are more profitable and have higher levels of productivity) than firms that only serve the domestic market. What explains the superior performance of exporting firms is, however, a matter of debate in the literature. Several hypotheses have been offered to explain the superior performance of exporting firms, but no consensus has been reached in the literature as to the relative explanatory power of each hypothesis, which is a matter of some importance since each hypothesis has different policy implications. This study aims to contribute to this unresolved issue with a case study of whether, and if so how, exporting spurs productivity in Vietnam, one of the more dynamic emerging market countries in the world.

Why do exporting firms perform better--exhibit higher productivity and hence are presumably more profitable—than firms that serve only the domestic market? Two hypotheses that have been the focus of most of the empirical work and are often incorrectly portrayed as competing rather than complementary hypotheses, the self-selection hypothesis and the learning by exporting hypothesis. The self-selection hypothesis argues that because of entry costs to exporting, only the most profitable (i.e. efficient or productive) firms in an industry are able to enter and succeed in export markets. Essentially this hypothesis argues that causation runs from firm productivity to the decision to enter the export market. The learning by exporting hypothesis, on the other hand, argues that the activity of exporting itself makes firms more productive, which suggest that the causation run from exporting to firm productivity. Of course, there is no reason to presume that causation cannot run in both directions, and indeed in testing these hypotheses one must adopt an empirical strategy that does not preclude two-way causation.

In addition to the self-selection and learning by exporting hypotheses, which theretofore have been the focus of empirical work on the relation between firm productivity and exporting, a third hypothesis has only recently been introduced. The basic idea is that the relatively high intensity of competition in export markets forces exporting forms to shed products and activities that are not in line with their core competence. In the context of a labor-abundant, low-wage economy like China, for example, the "core competence hypothesis" suggests that competitive pressures will force firms to produce and export ever more labor-intensive products, which in fact is just what exporting firms in China have done according to a recent study (Ma, Tang and Zhang, 2011). The core competence hypothesis, which is grounded in the theory of comparative advantage, should also be seen as a complementary rather than competitive hypothesis to the two more established hypotheses.

This study considers all three of these potentially complementary hypotheses, none of which has established a pre-eminence in explaining the relationship between exporting and firm performance. Here the relative explanatory power of these hypotheses is examined in the case of

Vietnam, which like other countries, as we show, exhibits the by now well-estabished fact of export-firm superiority.

The remainder of this paper proceeds as follows: Section 2 provides a brief review of the related literature, both theoretical and empirical. Section 3 discusses the sample data, followed by a descriptive analysis of the export participation vis-à-vis firm characteristics from the sample. Section 4 compares exporters vs. non-exporters as a first step in examining the relationship between exporting and firm productivity. Section 5 presents an empirical analysis of testing whether more productive firms choose to export. Section 6 examines the reserved causality whereby export participation may contribute to improving firms' productivity and to induce firms to focus on the core competence of their production. Finally, section 7 offers a summary of the preliminary findings and discusses some policy implications of the study.

2. Exporting and firm productivity: a brief review of the literature

The linkage between exporting and firm productivity is nested under the extensive literature on trade and growth. This framework provides three explanations for the superiority of exporting firms. First, the *self-selection* hypothesis, based on the heterogeneous firm theory, argues that only more productive firms self-select into exporting (Clerides, Lach, and Tybout, 1998; Bernard et. al 2003, Melitz, 2003). Reasons for self-selection include the presence of sunk entry costs which less productive firms to from entering foreign markets. If firms with higher productivity go into exporting and firms with lower productivity do not, then it follows it is the reallocation of activity across firms raises the average level of productivity of an industry.

The *learning-by-exporting* hypothesis suggests that exporting firms become more efficient and profitable via the knowledge and expertise they gain from participating in world market (Van Biesebroeck, 2005; De Loecker, 2007). Competitive pressures in the world market may also induce firms to become more efficient than those serving a protected domestic market. The learning by exporting hypothesis is rooted in endogenous growth theory (Grossman and Helpman 1991, Rivera-Batiz and Romer 1991), which points to the role of technology diffusion through exposure to exporting in driving firm productivity. In addition, it is likely that exporting firms can achieve economies of scale and thereby raise productivity, as suggested by the conventional export-led growth perspective (Dixon and Thirlwall 1975).

The *core competence* hypothesis, grounded in the logic of comparative advantage principle, emphasizes that exporting firms optimize by specializing in their core competence (Feenstra and Ma, 2008; Nocke and Yeaple, 2008; Carsten and Neary, 2010, Ma, Tang and Zhang, 2011). In other words, competition in in the world market induces firms to concentrateon what they do best, while in a protected market with government support firms are more likely to diversify out of core

business. According to this theory, the reallocation of activity within-firm, and not across-firm, as reflected by concentration and specialization after exporting, raises productivity.

A large number of empirical studies have attempted to text empirically the self-selection and learning by exporting hypotheses, though they differ substantially with respect to empirical methodology and measurement of firm productivity. The self-selection argument has received a mixed empirical support Some have found evidence of self-selection (Arnold and Hussinger, 2004 for Germany; Clerides et al., 1998 for Columbia and Morocco; Alvarez and Lopez, 2005 for Chile; and Delgado et al., 2002 for Spain), while other studies have found no significant effect regarding the causality from firm productivity to the decision to export(Bernard and Jensen, 2004 for the U.S.; Aw et al., 2000 for Korea; and Bigsten et al., 2004 for sub-Saharan Africa).

Similarly, a mixed picture also emerges regarding empirical findings of the learning by exporting hypothesis. Studies that offer evidence of a significant post-productivity gain associated with exporting include, Girma et al. (2004) and Greenaway and Kneller (2008) for the UK; Baldwin and Gu (2003, 2004) for Canada; Castellani (2002) for Italy; Loecker (2007) for Slovenia; Biesebroek (2005) and Bigsten et al (2004) for sub-Saharan Africa, Aw et al. (2000) for Taiwan, Kraay (2002) and Park et al. (2010) for China. On the other hand, a number of studies find no evidence of the learning by exporting effect, even for major exporting countries (Bernard and Jensen (1999) and Hung et al. (2004) for the US, Wagner (2002), and Arnold and Hussinger (2004) for Germany.

The mixed evidence observed across countries and time may simply reflect diverse patterns of firm export behavior conditional not only on firm-specific characteristics but also on many other underlying forces that are associated with the macroeconomic environment and the degree of competition and entry costs in the export markets that firms are likely to face.

3. Data

3.1 Sample data

This study uses two rounds of firm-level data from the World Bank Enterprise Surveys (ES *hereafter*) for Vietnam. The first survey covers information of year 2004 for 1150 manufacturing firms (ES2004); while the second survey reports data for year 2008 for 775 manufacturing firms (ES2008). The ESs provide firm-level information on a wide range of indicators of firm characteristics and performance, including age, labour, capital, assets, revenues, wage, main lines of business, export activities and access to finance. Information on exports includes export participation, export turnover (both direct and indirect), years engaged in exporting and the reliance on imported intermediate inputs for exports. Firms are classified in 16 industries in accordance with the ISIC at 2 digit level of aggregation. For the ES 2008, unfortunately the number of industries surveyed is only limited to 8 industries. In the ES2004, several questions were asked on the retrospective basis, which allows us to construct a panel of data of some main variables

such as revenues, capital, employment, export participation for the years 2002, 2003, and 2004. Unfortunately, this feature is not available for the ES2008. Importantly, it is possible to link the ESs 2004 and 2008 as a panel of 333 manufacturing firms, using the firm identification code provided by the dataset. Within this panel, however, some firms that have the same identification code appear to differ according to other time-invariant characteristics such as age, first year of exporting, industry etc. This raises some concerns about the reliability of the mentioned panel and hence we should use this panel with caution. In short, we have a three-year panel 2002, 2003, 2004 of 1150 firms with extensive information on firm characteristics and a four-year panel with gaps 2002, 2003, 2004 and 2008 of 333 firms with limited information on firm characteristics.

3.2. Firm characteristics and export participation: a descriptive analysis

Table 1 presents a descriptive analysis of export participation by the sample firms, classified into 13 different manufacturing branches in three selected years, namely 2003, 2004 and 2008. Given our research objectives, we use the available information for the export share in total firm revenues to construct a number of measures of export participation. The first measure is a dichotomous dummy variable, so-called *exporter* (or *export status,* interchangeably), which indicates whether the firm exports a share of greater than 10 (or alternatively 50) percent of its revenues. Although this measure remains arbitrary, it has been widely used in empirical studies on exporting (see for example Hiep and Ohta, 2009). The second measure is a continuous measure, so-called *export intensity*, denoting the firm's export share as percentage of revenue in each year. Since information for export share is not available for the year 2002, we define the export status of firms in this particular year as firms reported to have engaged in exporting business prior to 2002.

Amongst the sample firms, there are exporting firms in all surveyed industries. On average one-third of the sample firms is engaged in export activities over years, although the proportion of exporters varies substantially across industries. In the leading export-oriented labour-intensive industries, notably textiles, apparel, leather products and furniture, about 50 to *75* per cent of firms are exporters. The proportion of exporters is substantially lower in other less export-oriented industries, such as chemical and chemical products, plastic products and metal products, generally less than 20 percent of firms. In addition, exporting firms in the leading export-oriented industries appear to export more intensively; with 50 up to 90 of their revenues earned from exporting. In less export-oriented industries, export intensity is of course lower. Over the time span 2002 – 2004, the numbers of exporters in the leading export industries does not change, nor does the average share of export. Firms operating in the less export-oriented industries, one the other hand, have become somewhat more export-intensive, the average share of export rising slightly from 30 to 40 per cent for machinery and electronics.

Table 1. Distribution of exporters and share of export as percentage of revenue

Sector	2003			2004			2008		
	No. of firms	Percent of exporters (%)	Export share of revenue (%)	No. of firms	Percent of exporters (%)	Export share of revenue (%)	No. of firms	Percent of exporters (%)	Export share of revenue (%)
Food & Beverage	178	43	68	191	44	64	119	34	61
Textiles	75	56	72	77	66	73	100	35	59
Apparel	74	74	87	77	75	89	122	54	88
Leather products	24	79	86	25	80	86			
Wood & wood prod, incl. furniture	130	45	72	145	43	73			
Paper	60	12	54	62	15	60			
Chemical & Chemical products	64	16	25	67	16	23	18	6	6
Rubber & plastic products, non-metallic mineral products	68	22	41	71	28	40	145	22	43
Basic metals & metal products	104	12	37	119	13	46	121	18	44
Machinery & equipment, electrical machines & Electronics	78	24	30	90	23	34	48	35	42
Construction materials	86	20	47	95	17	43			
Vehicles and other transport equipment	27	15	40	29	24	34			
Other manufacturing	87	22	66	94	19	67	101	27	60
Total	**1,055**	**34**	**64**	**1,142**	**34**	**63**	**774**	**31**	**60**

In addition to export participation and export intensity, our analysis concerns with the change in these variables over time. Table 2 below provides a broad overview of the dynamics of exporting by manufacturing firms in Vietnam.

Over the period of study, the export status of firms appears to be rather stable, with about one-third of the sample firms engaged in export business across years. Once firms begin to export, very few firms cease exporting, only about 2.5 percent of firms for the period 2002 – 2004. In the 2004 -2008, the proportion of firms that quit exporting increased to 25%. Likewise, the proportion of new exporters is also modest, 7.8 percent of the 2004 exporters and 22 percent of the 2008 exporters as new. Not surprisingly, the proportion of switching in the export status intensifies over the later period 2004 – 2008 due to a longer time span. Overall, the export profile of the period 2003 – 2004 includes 379 firms that engaged in exporting in either year, of which 342 firms (approximately 90 percent) participated in both years. The export profile of the period 2004 – 2008 includes 156 firms that engaged in exporting in either year, though only 97 firms (approximately 62 percent) participated in both years.

The lack of change in export status as observed could be attributed to a number of possible reasons. First, it is perhaps due a short time span of the studied period. Second, it may well be that entry barriers, so-called entry costs, to export are especially high especially for firms in emerging markets. Once established, having invested in entry, exporting firms are likely to be reticent to exit from the world market as is implied by the heterogeneous firm models (Melitz, 2003). On the other hand, the change in export intensity is slightly more evident than that of export participation. Amongst the exporter group some 20 per cent and 32 per cent of the firms have increased their export intensity between 2004 and 2003; and between 2008 and 2004 respectively. The lack of dynamics in export participation may challenge the identification purpose required to assessing the causal impact of exporting, as we will analyse in section 6.

Table 2 - Changes in export status and export intensity

	2003 - 2004	**2004 - 2008**
Exporter in both years (Export share greater than 10%)	342	97
of which, number of exporters increase their export intensity	72	31
Switching from exporter to non-exporter between two years	9	32
Switching from non-exporter to exporter between two years	28	27
Non-exporters in both years	669	177
Total	**1048***	**333**

*Note: *the number of firms linked as panel between 2004 and 2003 is 1142, of which 94 firms have unknown export status in 2003 due to data unavailability. Therefore, the number of firms included in the analysis of changes in the export status is reduced to 1048 firms.*

4. Export premium: Do exporters outperform non-exporters in Vietnam?

The first step in discerning the causality between exporting and firm performance is to compare exporters to non-exporters along different firm characteristics: Total factor productivity (TFP *hereafter*), labour productivity, capital productivity, capital intensity, revenues, value added, size, employment, average wage rate using the cross-section sample of the two surveys. This analysis, as commonly done in the literature (Ma, Tang and Zhang, 2011; Mukim, 2011; Hiep and Ohta, 2009), aims to derive export premium along the basic patterns of firm characteristics and firm productivity. Export premium is defined as the percentage difference in the mean level of firm characteristics, controlling for differences associated with other firm characteristics, time, sector, ownership and the location of firms. Export premium measures are used to distinguish whether exporting firms are more labour intensive and have higher capital productivity than their non-exporting counterparts. We derive export premium by first regressing each of the relevant firm characteristics and firm productivity indicators on export status (E_i), controlling for time, industry, ownership and location.

$$\ln Z_i = \beta E_i + \alpha_0 + F_{\text{sec}tor} + F_{year} + F_{location} + F_{ownership} + \varepsilon_i \qquad (1)$$

where Z_i is firm *i*'s characteristics or productivity indicators (such as total factor productivity, labor productivity and capital productivity) and E_i is a dichotomous variable indicating whether the firm has an export share of either 10 or 50 percent of the total revenues. F_{sector}, $F_{location}$, F_{year} and $F_{ownership}$ indicate industry, region, time and ownership fixed effects, respectively. The coefficient β will capture the premium of export conditional on other fixed effects. Accordingly, the percentage of export premium is derived as $(e^{\beta} - 1) \times 100$ for each firm characteristic.

An estimation of total factor productivity (TFP) is done using the Levisohn and Petrin (2003) approach, whereby intermediate inputs are used as a proxy for unobservable productivity shocks, using the procedure ***levpet*** developed by Petrin et al. (2004) for Stata®. As the Levisohn and Petrin (2003) procedure requires panel data, we can estimate the Levisohn and Petrin TFP only for the years 2002 -2004 and have to resort to the standard approach OLS to derive the TFP for the remaining year 2008[1].

Table 3 below reports the export premium of the sample firms measured in percentages, differentiated into across- and within-sector premium panels for the period 2002 – 2004 and

[1] In order to estimate TFP one must assume or estimate the weights used to measure total factor input (a weighted average of labor and capital inputs), but the conventional methods are likely to be inappropriate in an surplus labor economy where the social marginal product of labor is close to zero or at least far below the market wage.

the year 2008 alone. The across sector export premium is estimated on the basis of comparing firms between sectors, whereas the estimate of within-sector premium controls for the sectoral fixed effects and thus exclusively compares exporter vs. non-exporter within the same sector. Columns (1) and (5) present the export premium associated with the export status of 10 percent or higher of total revenues; whereas columns (2) and (6) refer to the export premium associated with the export status of 50 percent of total revenues.

For the period 2002-2004, the results of both across- and within-sector export premium indicate that exporters considerably outperform non-exporters in many ways, regardless of which dichotomous measure of export status is used. In this period, exporting firms are larger in terms of size (defined as logarithm of total assets) and capital than their non-exporters. Exporters also have higher revenues, generate higher value added and employ more people. Regarding performance, exporters on average are more productive in terms of TFP than their counterparts. Interestingly, when considered across sectors, exporting firms have lower capital intensity, higher capital productivity and lower labour productivity. This means that exporters use more labour-intensive techniques of production and therefore generate higher value added per unit of capital invested, but lower value added per worker. This finding is consistent with our previous analysis, based on sectoral level data, that export-oriented sectors exhibit higher value added and higher rates of employment per unit capital than more capital-intensive, import-competing sectors. We may conclude, therefore, that the export premium as revealed in the across-sector effect derives from the different factor intensities of production in export-oriented and import-competing sectors.

Regarding the within-sector comparison, the difference in factor intensity between exporters and non-exporters is not significant. In other words, exporters do not necessarily exhibit a lower capital intensity compared to their non-exporter counterparts. On the other hand, within the same sector exporting firms appear to use their resources more efficiently, illustrated by higher productivity in all measures of productivity, including TFP, labour and capital productivity.

As for the year 2008, a similar pattern of the export premium emerges for the same firm characteristics and factor intensity, though to a lesser extent. In addition, results do not reveal that exporters are superior to non-exporters regarding firm productivity, except for the capital productivity, as the export premium associated with both measures of TFP and labour productivity appear to be statically insignificant.

Table 3. Export Premium of the sample firms (in percentage)

Note: Export premium defined as the difference in percentage in the mean level of the characteristic of interest; ***, **, and * denote significance at 1%, 5% and 10%, respectively.

VARIABLES	*1150 manufacturing firms 2002 – 2004*				*775 manufacturing firms 2008*			
	Export status 1 (Share > 10%)	Standard Errors	Export status 2 (Share > 50%)	Standard Errors	Export status 1 (Share > 10%)	Standard Errors	Export status 2 (Share > 50%)	Standard Errors
Across sectors								
Revenues	213.40	0.065***	146.11	0.083***	328.75	0.104***	210.71	0.156***
Value added	249.87	0.064***	194.47	0.081***	297.37	0.149***	244.32	0.160***
Firm size	193.44	0.060**	129.91	0.076***	265.61	0.154***	171.72	0.174***
Employment	294.76	0.049***	298.13	0.064***	317.91	0.076***	337.98	0.124***
Average wage	-1.67	0.033	-9.86	0.045**	5.58	0.092	-8.51	0.091
Capital	209.60	0.069***	145.69	0.086***	297.41	0.165***	166.26	0.189***
Capital intensity	-21.21	0.056***	-38.41	0.070***	-1.24	0.140	-41.78	0.154***
Labour productivity	-10.88	0.042***	-26.07	0.053***	8.42	0.103	-15.76	0.107
Capital productivity	13.60	0.050**	24.21	0.067***	6.49	0.133	39.56	0.153**
TFP (LP, value added)	63.04	0.045***	39.25	0.057***				
TFP (LP, revenue)	40.21	0.028***	28.16	0.037***				
TF (OLS, value added)					-1.23	0.097	-11.17	0.105
Within Sector								
Revenues	312.80	0.068***	258.37	0.091***	396.34	0.102***	318.58	0.154***
Value added	304.35	0.070***	264.44	0.095***	344.06	0.151***	323.72	0.163***
Firm size	261.65	0.063***	208.24	0.083***	343.80	0.160***	274.87	0.190***
Employment	247.19	0.053***	247.02	0.073***	290.83	0.076***	312.06	0.128***
Average wage rate	11.90	0.035***	6.06	0.053	12.24	0.099	-3.20	0.093
Capital	264.84	0.074***	206.88	0.096***	393.03	0.169***	279.28	0.205***
Capital intensity	6.65	0.059	-10.68	0.080	30.03	0.133**	-9.59	0.160
Labour productivity	17.50	0.043***	4.90	0.059	25.67	0.100**	8.55	0.110
Capital productivity	12.11	0.053**	22.26	0.075***	-2.72	0.133	19.55	0.162
TFP (LP, value added)	100.51	0.049***	81.45	0.066***				
TFP (LP, revenue)	53.45	0.029***	43.59	0.041***				
TFP (OLS, value added)					7.04	0.096	1.30	0.109

5. Do more productive firms self-select to export?

We now turn to the question of whether more productive firms tend to self-select into exporting, and to what extent firm characteristics such as firm size, factor intensity, age, ownership, and industry sectors explain the firm's decision to become an exporter.

Our empirical framework for this analysis is grounded on the heterogeneous-firm trade theories (Melitz 2003 and Bernard et. al 2003) which emphasizes that the existence of entry costs associated with exporting in conjunction with firm heterogeneity as an explanation of a firm's export decision. Roberts and Tybout (1997) develop an econometric framework to model the changes in the export decision of firms, which has been widely adopted in most econometric studies of firm's decision to enter into exporting. The essence of the Robert and Tybout (1997) framework is that firm *i* would export in the current period *t* if its expected profitability is non-negative. A firm's export behavior is modeled as a discrete choice equation:

$$Y_{it} = \begin{cases} 1 \; if \; p_{it}q^*_{it-1} \geq c_{it}\left(X_t, Z_{it}, \frac{q^*_{it-1}}{q^*_{it}}\right) + S(1 - Y_{it-1}) \\ \\ 0 \; otherwise \end{cases} \qquad (2)$$

where Y_{it} is the current export status, p_{it} denotes the price of goods sold abroad, C_{it} denotes the cost of producing optimal export quantity q^*_{it}. S indicates the sunk entry costs; X_t indicates vectors of exogenous factors affecting the firms' profitability; Z_{it} indicates vectors of firm-specific factors affecting the firms' profitability; and finally Y_{t-1} denotes the export status of firm *i* at time *t-1.* According to this specification, the firm will not have to incur the entry cost again in time *t* once it has exported in the period time *t-1*. The firm exports in time t when its revenues exceed its cost. The reduced-form of the above binary choice model is therefore written as

$$Y_{it} = \begin{cases} 1 \; if \; \lambda_z X_{it} + \lambda_z Z_{it} \quad - S(1 - Y_{it-1}) + \; u_{it} \geq 0 \\ \\ 0 \; otherwise \end{cases} \qquad (3)$$

Following this framework, we specify the following model to estimate the export status of firms conditional on the previous export status and observed characteristics that potentially affect firm profitability at both the firm and sector levels. This framework assumes that firms have to decide every year whether or not to export, conditional on their past export status and other lagged value of firm attributes. Decision of export participation is thus made every year as follow:

$$E_{it} = \beta_Y E_{t-1} + \beta_P \Pr oductivity_{it-1} + \beta_C Chacteristics_{it-1} + F_{year} + F_{\sec tor} + F_{location} + \varepsilon_i + \eta_{it} \qquad (4)$$

where E_i is a dichotomous dummy variable indicating the firm's export status, namely *exporter*. E_{t-1} denotes the previous export status, which aims to identify sunk cost effects. The key variable of interest is the lagged productivity, which is believed to have an impact on the current export status of firms as only firms that are more efficient (i.e. more productive) are willing to pay the additional costs to enter the foreign markets. Firm-specific characteristics such as firm size, age, wage, capital intensity, and ownership etc., are also included. Since larger firms are more able to exploit the economies of scale, they are more inclined to enter the export market. A firm's production technology, represented by its capital intensity, also determines the firm's incentive to become an exporter, which in the Vietnam context (a labor-abundant, low-wage country) would suggest that firms producing relatively labor-intensive goods would be more likely to select to export. Lagged values of firm productivity and firm characteristics are used to control for reverse causation running from exporting to firm performance. As government and overall economic conditions in support of export activities are often region and sector specific, which argues for the inclusion of region and sector dummies in the empirical model. Also included is a year dummy to capture the possible influence of the business cycle on a firm's export status.

A different specification of the self-selection model is warranted if firms' decision to export is made not every year but only once when they enter the export market for the first time. To test this formulation of the self-selection hypothesis, we confine our sample to observations of firms that had not previously exported and subsequently either chose to export or to remain as a non-exporter. In other words, we eliminate from the sample those observations of firms that exported in the past. The decision to become an exporter or remain as a non-exporter is specified as follows:

$$D_{it} = \beta_P \Pr oductivity_{it-1} + \beta_C Chacteristics_{it-1} + F_{year} + F_{\sec tor} + F_{location} + \varepsilon_i + \eta_{it} \qquad (5)$$

Where D_{it} is a dichotomous dummy variable indicating whether a firm is a new exporter in the year of consideration or it has decided to remain as non-exporter. The past export status is not present in the equation as it is already incorporated in the decision to export. Lagged values of various firm characteristics are included as potential determinants of the decision to export decision.

In short, specification (4) estimates the determinants of the firm decision to export each year, conditional on past export participation, while specification (5) estimates the decision to become an exporter in the first instance. Both are estimated for the unbalanced panel 2002, 2003, 2004, and 2008 using a random logit model for specification (4) and a pooled logit model for specification (5). It is worth noting that random logit model estimates (as used for equation (4)) do not control for the presence of unobserved firm heterogeneity, which are likely to be serially correlated with the lagged dependent variable, namely the past export status. As a

result, the effect of this variable on the firm's current export participation may be overestimated. Nevertheless, these specifications allow the causal relationship between past firm productivity and current export status to be identified, which is the principal objective of this analysis. Under specification (5), the potential problem of serial correlation between is controlled for as the focus is the change in export status, the so-called decision to become an exporter or to stay as a non-exporter.

Estimates of the self-selection model are presented in table 4. The estimation results for equation (4) are presented in columns (1) to (4), and reveal that the past export status is a strong determinant of the current export status, evident from the highly significant coefficient associated with the lagged variable of export status. Controlling for observed firm characteristics such as size, age, sector, location and ownership, once firms begin to export they remain exporters in the subsequent years. Other empirical studies on exporting behaviours in Vietnam also find the persistence of export status of firms (Hiep and Ohta, 2009; Huong et al., 2012). Our finding further confirms this result. Many firm characteristics also appear to be statistically significant determinants of a firm's export status as hypothesized. Not surprisingly, firms that are more mature and have a higher share of foreign ownership exhibit a higher probability to export.

The key question in regard to the self-selection hypothesis is whether more productive firms are more likely to self-select to export, controlling for their past export status. In the context of Vietnam, more productive firms can be interpreted as firms that better align with the country's comparative advantage and those large enough to exploit economies of scale that may exist. Our results highlight a number of interesting observations in support of this argument. The significant negative coefficient on lagged capital-intensity suggests that firms with a relatively low capital-labour ratio are more like to engage in exporting. Consistent with that observation, firms with lower labour productivity, i.e. firms characterized with less value added per unit of labour and hence lower labor per unit capital, tend to have a higher likelihood to export, indicated by the significant negative coefficient associated with the lagged value of labour productivity. Firms with higher capital productivity are more inclined to export, but this relationship is not statistically significant. Past total factor productivity is not found to significantly influence firm's current exporting status, but this finding does not necessarily invalidate the self-selection hypothesis since the measure of total factor productivity in the Vietnam context is highly problematic, as noted in section 4.

Estimates of the self-selection model as specified in equation (5) are present in columns (5) to (8) of table 4. The dependent variable represents the decision to enter (or not to enter) into exporting, not the firms status as an exporter as specified in equation (4) and presented in columns (1) to (4). Interestingly, the results confirm that firms producing labor-intensive

products (low capital intensity) and accordingly exhibiting relatively low labor productivity and high capital productivity are more likely to enter into exporting.

The results presented here provide some support for self-selection hypothesis. Low labour productivity and high capital productivity are characteristics of firms operating in export-oriented sectors in a labour-abundant country. Firms operating in sectors in which the country has a comparative advantage either “self-select” or are selected by the market to participate in exporting.

Table 4. Estimates of the determinants of export participation and decision to export 2002 - 2008

The dependent variables take the form of a dichotomous dummy variable. Columns (1) – (4) are estimates from a random logit model, columns (5) - (8) present logit estimates of decision to enter the export market. Robust coefficients are reported with t-statistics in brackets; ***, **, and * denote significance at 1%, 5% and 10%, respectively.

Dependent variable	Current Export Participation (1/0) (1 if export share > 10%)				Decision to enter the export market (1/0) (1 if new exporter and 0 if remain as non-exporter)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter$_{t-1}$ (share > 10%)	4.613***	4.602***	4.599***	4.601***				
	[24.990]	[25.049]	[24.852]	[25.123]				
Ln(TFP$_{t-1}$) (LP, value added)	-0.0228				-0.0023			
	[-0.177]				[-0.012]			
Ln(Labour product$_{t-1}$)		-0.301**				-0.533***		
		[-2.443]				[-2.670]		
Ln(Capital product$_{t-1}$)			0.0499				0.204*	
			[0.645]				[1.850]	
Ln(Capital intensity$_{t-1}$)				-0.147**				-0.354***
				[-1.966]				[-3.363]
Firm size$_{t-1}$	0.153*	0.201***	0.148**	0.179**	0.198*	0.302***	0.243***	0.330***
	[1.696]	[2.731]	[2.162]	[2.477]	[1.650]	[3.044]	[2.613]	[3.367]
Ln(Average wage $_{t-1}$)	-0.0146	0.153	-0.0339	0.0235	0.182	0.613**	0.0685	0.251
	[-0.110]	[1.154]	[-0.278]	[0.206]	[0.703]	[2.141]	[0.303]	[1.204]
Firm age (years)	0.0625**	0.0576**	0.0612**	0.0563**	0.0844**	0.0839**	0.0836**	0.0703*
	[2.452]	[2.270]	[2.403]	[2.230]	[2.211]	[2.214]	[2.181]	[1.872]
Firm age squared	-0.00138**	-0.00132**	-0.00136**	-0.00127**	-0.00213**	-0.00217**	-0.00213**	-0.00188**
	[-2.477]	[-2.361]	[-2.441]	[-2.295]	[-2.369]	[-2.442]	[-2.354]	[-2.141]
State ownership (%)	0.0034	0.00282	0.00341	0.00344	0.0101**	0.00851*	0.00946**	0.00987**
	[1.025]	[0.845]	[1.031]	[1.051]	[2.270]	[1.897]	[2.114]	[2.214]

Foreign ownership (%)	0.00728**	0.00802**	0.00729**	0.0112***	0.00484	0.00742	0.00514	0.0122**
	[1.995]	[2.141]	[1.988]	[3.163]	[0.860]	[1.299]	[0.911]	[2.399]
Year 2003		0.0553		0.00144	-1.174***	-1.277***	-1.147***	-1.277***
		[0.189]		[0.005]	[-3.217]	[-3.494]	[-3.121]	[-3.468]
Year 2004	0.208	0.268	0.206	0.244	-1.641***	-1.737***	-1.614***	-1.677***
	[1.088]	[0.934]	[1.082]	[0.856]	[-4.397]	[-4.642]	[-4.299]	[-4.497]
Year 2008	-0.0707		-0.0783					
	[-0.241]		[-0.267]					
Sector dummies	Included	included	included	included	included	included	included	Included
Region dummies	Included	included	included	included	included	included	included	Included
Constant	-4.269***	-4.187***	-4.316***	-4.300***	-4.385***	-4.350***	-4.664***	-4.701***
	[-6.552]	[-5.871]	[-6.568]	[-6.105]	[-4.777]	[-4.686]	[-4.969]	[-5.141]
lnsig2u	-13.34	-13.36	-13.33	-12.85				
	[-0.375]	[-0.382]	[-0.373]	[-0.627]				
N	2085	2107	2080	2168	1340	1357	1340	1395
chi2	750.6	754.7	748.6	769.5	86.62	94.32	90.01	102

6. Does exporting lead to higher firm productivity?

Contrary to the self-selection hypothesis, the learning by exporting and core competence hypotheses suggest that the direction of causation underlying the positive relation between firm productivity and exporting runs from exporting to high productivity. The *learning by exporting* hypothesis argues that exporting firms benefit from participation in international trade via the knowledge and expertise they gain from participating in world market, which in turn improves their productivity. The *core competence* hypothesis, on the other hand, argues that exporting firms become more productive by specializing in the products closer to their core competence, which are products in which the country's comparative advantage is relatively strong.

In testing these two hypotheses (learning by exporting and core competence) it is important to recognize that a firm's decision whether to export and how much to export (measured as the export share of total revenue) is likely not random. Non-randomness in this case may arises from three possible biases, namely the endogeneity bias, selection bias and attrition bias. Many firm and sectoral attributes are unobservable, but could nonetheless be relevant determinants of the firm productivity and the firm's export behaviour. This unobserved heterogeneity is likely embedded in firms' and sector's history and hence may be assumed to be time-invariant. On the other hand, other unobserved attributes associated with managerial skills, firms' relationship with their business communities and relevant authorities, may differ across firms and vary over time. The second source of bias arises when firms' decision to participate in export activities in a given year is not random, such as would occur if firms self-select to export in anticipation of higher productivity in the future. This argument received some support from the empirical findings reported in the preceding section. Finally, firms may choose to continue or quit exporting after some time, causing a possible attrition bias.

An appropriate empirical strategy should therefore be adopted to address these possible biases in order to derive clean estimates of the causal effect of exporting on the outcome variables. The empirical framework used here is an augmented version of Bernard and Jensen (1995 and 1999), where firm productivity is determined at the firm level to be conditional on firm observed characteristics (size, labour skill and age etc.) and the firm export participation, which is captured by both a dichotomous participation dummy and export intensity. The empirical model is specified as follows.

$$\ln(S_{it}) = \alpha_i + \beta_E E_{it} + \beta_C Chacteristics_{it} + F_{sector} + F_{location} + F_{year} + \eta_{it} \qquad (6)$$

where S_{it} is the outcome variable, which indicate either the productivity or the core competence of firm *i* in year *t;* α is an unobserved fixed firm effect and E_{it} is the treatment variables – export dummy and export intensity. In addition to export, firm characteristics may jointly determine firm productivity and firm core competency. Firms of larger size and with more experience in business tend to perform better. Further, average wage can proxy for the quality of human resource, which is highly relevant to explaining the change in productivity and core competence (Ranjan & Raychaudhuri, 2011; Tsou et al., 2008). Type of ownership measured in percentage is also included in the model as a control variable. Finally, F denotes a vector of fixed-sector, location, year effects.

The first outcome variable includes various measures of productivity: labour productivity (measured as the logarithm of value added per labour), capital productivity (measured as the logarithm of value added per unit of capital); and TFP estimated from both Levinsohn and Petrin approach and the conventional OLS approach, also in the logarithm form. The second outcome variable is the firm's technology of production, which reflects the firm's core competency, and is measured by the firm's capital intensity expressed in logarithms. The coefficient β_E captures the effect of a one percentage point higher of export intensity on the outcome variables.

Equation (6) is estimated in a fixed effect framework, with and without instrumental variables (IV). Although the fixed-effects estimator controls for time-invariant unobserved heterogeneity, it cannot entirely solve the endogeneity bias since it is unable to control for time-variant unobserved firm heterogeneity that affect both a firm's decision whether and how much to export and the outcome variables (various measures of productivity and capital intensity). The fixed-effects model therefore may provide a consistent but biased estimate of the causal effect of exporting. It is therefore appropriate to use an IV within fixed-effects to derive an unbiased estimate of the causal effect of exporting on productivity and capital intensity, respectively. It should be noted that in the context of panel data, the IV application can also correct for the problem of possible attrition bias, whereby an individual firm's decision to continue or quit exporting is determined by unobserved heterogeneity (Miller and Hollist, 2007).

A major challenge inherent to the IV strategy is, however, to select good instruments for exporting, and to ensure the appropriateness of the selected instruments. In the current framework, the average share of imported intermediate inputs at the sectoral level is used as an instrument for a firm's export behaviour, expressed as either export participation dummy or export intensity. The sector share of imported intermediate inputs reflects the embedded nature of Vietnamese manufacturing firms' participation in the global production sharing process. As in other low-wage labour-abundant countries, Vietnamese manufacturing firms concentrate at the final stage of the manufacturing production process, which for the most part

involves assembling imported intermediate inputs into final products for export, which means the amount of inputs imported is positively correlated with the degree of export. While this variable may not be exogenous at the sectoral level and country level, it is assumed to be exogenous to firms that operate in any particular sectors. To control for the non-linearity of this possible effect on individual firms' export behaviour, we extend our set of instruments to include the interaction between the sectoral share of imported inputs and firms characteristics (size, age, the wage rate etc.). To justify the use of the IV method within a fixed-effects model, several tests of the instruments were conducted. First, a test of the endogeneity of the regressor indicates whether the IV method is required. Second, a weak identification test, with the Angrist-Pischke F statistic, was employed to examine the relevance of our instruments and confirm that they correlate with the treatment variable. A weak identification indicates the weak explanatory power that causes an increased bias in the estimated IV coefficients (Hahn and Hausman, 2002). Third, we use a test of over-identifying restrictions, that is, the Hansen J, to test the validity of the instruments (i.e., if the instruments are orthogonal to the error distribution of productivity outcomes of firms).

Table 5 presents the estimation results for two periods, the 2003 – 2004 period presented in columns (1) to (5) and the 2004 – 2008 period in columns (6) to (9). Section (a) refers to the results of the fixed-effects estimates while section (b) includes the estimates from the fixed-effects with IV. Since we only include the continuous treatment variable – export intensity in our fixed-effects analysis[2], we in fact discern the time variation of the outcome variable (either firm productivity or firm core competence) given the change in the export intensity of firms over time. Note that in this setting, the fixed-effects estimator drops off all variables such as firm age, type of ownership, sector, region and year dummies for they perfectly collinear with the fixed-effects. For both periods, we only included in our sample those firms that exported in the latter year of the period, indicated by the positive value of the firms' export share.

[2] As a matter of fact, we first attempted to apply the fixed-effects framework using two full panel samples, notably the 2002-2004 panel of 1150 firms, and the 2002 – 2008 panel of 333 firms with respect to both variables of export participation, export status as a treatment dummy and export intensity as a continuous treatment variable. However, the fixed-effects estimator fitted in both panels with respect to the export status appears to suffer from a serious problem of identification due to the lack of the change in export status between the years. We therefore confined our fixed-effects analysis to only export intensity, and in-so-doing limits our first sample to the two-year 2003 – 2004 panel. For compatibility, we also use the two-year 2004-2008 panel as the second sample for the fixed-effects analysis.

Table 5: Estimates of the impact of exporting on firm productivity and capital intensity: Fixed effects (FE) and Instrument Variables within Fixed effects (FE – IV)

The dependent variable takes various forms of productivity and capital intensity, all in logarithm.
The FE estimates appear in section (a), FE - IV in section (b). Robust coefficients reported with t-statistics in bracket; ***, **, and * denote significance at 1%, 5% and 10%, respectively. Results presented in columns (1) to (5) for the panel 2003-2004; and columns (6) to (9) for the panel 2004-2008.

	(a) Fixed effects estimates of the impact of exporting								
	2003 – 2004					**2004 – 2008**			
	TFP (LP, value added)	TFP (OLS, value added)	Labor product.	Capital product.	Capital intensity	TFP (OLS, value added)	Labor product.	Capital product.	Capital intensity
	(1)	(2)	(3)	(3)	(5)	(6)	(7)	(8)	(9)
Export intensity (%)	0.0018	0.0022	0.0006	0.0020	-0.00200	0.00791*	0.00675	0.00522	-0.00204
	[0.884]	[1.117]	[0.284]	[1.039]	[-1.628]	[1.844]	[1.632]	[1.017]	[-0.359]
Firm size	0.263***	0.179***	0.224***	0.0911	0.0667	-0.418***	-0.107	-0.574***	0.455***
	[3.602]	[2.926]	[3.564]	[0.764]	[0.596]	[-4.871]	[-1.264]	[-7.581]	[5.974]
Average wage	0.152***	0.172***	0.162***	0.180	-0.0434	0.535***	0.532***	0.291	0.274**
	[3.160]	[3.211]	[2.996]	[1.499]	[-0.380]	[3.189]	[3.435]	[1.374]	[2.539]
Constant	2.429***	-0.330	0.856	-0.920	2.514*	4.497***	2.969***	5.094***	-1.973**
	[3.097]	[-0.467]	[1.190]	[-0.667]	[1.956]	[5.214]	[3.458]	[6.048]	[-2.432]
N	1389	1389	1409	1389	1449	1195	1216	1195	1239
No of id	1013	1013	1027	1013	1048	1090	1102	1090	1122
R^2	0.0976	0.0805	0.0808	0.0548	0.0172	0.340	0.268	0.325	0.284
F	5.384	4.154	4.441	1.206	1.278	12.74	6.954	19.91	13.42

	(b) Instrumental variable within fixed effects estimates of the impact of exporting								
	2003 – 2004					2004 – 2008			
	TFP (LP, value added)	TFP (OLS, value added)	Labor product.	Capital product.	Capital intensity	TFP (OLS, value added)	Labor product.	Capital product.	Capital intensity
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Export intensity (%)	0.0083*	0.0200***	0.0012	0.0088	-0.0116**	0.00621	-0.00632	-0.00194	-0.00574
	[1.742]	[3.093]	[0.246]	[1.377]	[-1.979]	[0.169]	[-0.192]	[-0.066]	[-0.458]
Firm size	0.234***	0.102	0.220***	0.0597	0.109	-0.417***	-0.0928	-0.571***	0.462***
	[3.648]	[1.482]	[3.736]	[0.468]	[0.907]	[-4.520]	[-0.948]	[-7.550]	[5.757]
Average wage	0.146***	0.156***	0.160***	0.174	-0.0350	0.539***	0.572***	0.311	0.278**
	[3.220]	[3.068]	[2.994]	[1.446]	[-0.305]	[2.928]	[3.059]	[1.517]	[2.514]
N	738	738	748	738	786	210	228	210	234
N of id	369	369	374	369	393	105	114	105	
P-val endogeneity C test[1]	0.0041	0.0003	0.9028	0.4709	0.1465	0.2027	0.3622	0.8350	0.8388
P-val Hansen J test[2]	0.8887	0.1647	0.9490	0.1414	0.1042	0.1634	0.3418	0.6366	0.3950
P-val Angrist-Pischke F test[3]	0.0050	0.0050	0.0050	0.0050	0.0050	0.2642	0.2109	0.2642	0.1649

1) Tests the null hypothesis that the regressor can be treated as exogenous.

2) Tests for the over-identifying restrictions with a null hypothesis stated as follows: The endogenous regressor is orthogonal to the error term

3) Weak identification test of the excluded instruments.

The fixed effects estimates presented in section (a) of table 5 indicate that only one measure of firm TFP changes in a response to a change in the export intensity of firms for the 2004-2008 period. The estimated coefficient on export intensity suggests that one percentage point increase in export intensity, other things equal, leads to an increase in TFP (calculated using the Levinsohn and Petrin approach on a value added basis) of nearly 1 percent (β_E = 0.00791). No effects were found on other productivity outcomes and capital intensity using the fixed effects method without the IV.

Turning to the estimation results using the IV within fixed-effects, as noted earlier, the fixed-effects estimates with IV correct for both time-invariant and –variant unobserved heterogeneity and thereby yield a true estimate of the causal effect of exporting on the firm outcomes. For the 2003-2004 period, results presented in the first five columns of section (b) reveal a number of significant effects of firms' export intensity on the outcome variables. Both measures of TFP productivity appear to respond to a rise firm's export intensity, controlling for other observed and unobserved attributes. Specifically, an increase in export share by one percentage point leads to a rise in TFP. In line with the core competence hypothesis, a rise of one percentage point in export intensity *ceteris paribus* is associated with a decline in the firm's capital intensity by 1.2 percent. As predicted, this result suggests that firms with higher export intensity adjust their product scope to include more labor-intensive products. In other words, the more firms export, the more they become specialized in their core activities that align with the country's comparative advantage.

The last three rows of section (b) of table 6 present the result of various tests of the IV within fixed-effects. Most of the tests indicate satisfactory outcomes with respect to the performance of the instrumental variables. First, the endogeneity tests' result confirms that the endogenous regressor - export intensity is indeed endogenous in most of specifications, as indicated by a P_{value} smaller than 0.1. This result provides empirical justification for the use of the IV approach. Secondly, the test of the validity of the instrument using the Hansen J test of overidentifying restrictions indicatesthat the endogenous regressor is orthogonal to the error term in the productivity equation (P_{value} > 0.1), or equivalently the selected instrument appear to be valid. Much attention should be paid to the weak instrument test, for which the tests' result of the Angrist-Pischke multivariate F test indicates rejection of the weak identification hypothesis in most of the equations. This result provides further econometric support for the choice of instruments – the sectoral level of imported inputs and its interaction with other firm characteristics as they are strong instruments for export intensity.

For the 2004-2008 period, the IV fixed effects estimates cannot identify any effects of exporting on either firm productivity or firm core competence, as evident from the insignificant coefficients included in the last four columns of section (b). The last three rows of the same columns show

that the performance of instruments in the sample 2004 - 2008 is not desirable. The endogeneity test in most equations fails to validate the use of the IV method. In addition, although the Hansen J test indicates that the selected instruments are valid, they are weakly related to export intensity, as evident from the Angrist-Pischke F test ($P_{value} > 0.1$). As such, the use of the IV within fixed-effects is not well justified for this panel. Further observations regarding the results reported for the 2004-2008 period merit our attention. First, the negative effect of firm size on the productivity outcome seems to be at odds with our expectation and the result found in the 2003-2004 period. Second, there remains some uncertainty regarding the reliability of the panel of 333 firms between 2004 and 2008 as we discussed previously in section 3. These concerns do not lend strong credence to our IV fixed-effects estimates of the impact of exporting on firm productivity over the 2004-2008 period.

Overall, controlling for both time-invariant and time-variant unobserved firm and sectoral heterogeneity, we find, for the 2003-2004 period, evidence of a productivity gain of exporting under the estimates with IV within fixed-effects for both measures of TFP. Our results offer some evidence in support of the learning by exporting hypothesis for the case of Vietnam, which has not been revealed by previous studies (Huong et at., 2012 and Hiep and Ohta, 2009). More importantly, for the same period, our result validates the core competence hypothesis as firms with higher export intensity tend to shift to focus on their core activities, i.e. producing more labor-intensive products.

7. Concluding remarks

The decade 2000 – 2008 has witnessed rapid economic growth in Vietnam and much of it is attributed to exporting. In this paper we study the impact on firm productivity of engaging in exporting, using data from the World Bank Surveys 2004 and 2008 of Vietnamese manufacturing firms. Our descriptive analysis of the sample firms finds, both within and across sectors, that the export premium is positively associated with capital-intensity, size, revenue, employment, value added and TFP. Across sectors, exporters tend to be less capital-intensive and so exhibit lower labour productivity than their non-exporters counterparts. However, exporters appear to have higher labour productivity within sectors perhaps due to their superior efficiency. The export premium as measured does not, however, indicate whether more productive firms chose to export or whether firms that export become more productive, which is the central question address in this study. Empirical analysis conducted in this study has focused on the three theoretical arguments related to the relationship between exporting and firm productivity, namely self-section, learning by exporting and core competence. Are exporting firms superior because only superior firms choose to become exporters, or do they become superior by virtue of being exporters and having to face greater competition and having to specialize in core activities?

Our estimates of the determinants of export participation for the entire period 2002-2008 reveal that at the firm level, a decision to export in the past predicts current export behaviour of exporting firms. Controlling for ownership, age, sector and location, firms with bigger size, lower labor productivity, high capital productivity and low capital intensity tend to self-select to export. These results provide some support the validity of the self-selection hypothesis.

Our estimates of the learning by exporting effect aimed to identify the within sector causal effect running from exporting to productivity and firm activities. The average share of imported inputs at the sectoral level and the interaction of this variable with other firm characteristics were used to instrument for the export intensity of firms. The intuition behind this choice of instrument is that sectors that have a higher share of imported inputs sector tend to be more export-intensive. Our instrumental variable fixed-effects estimates reveal a positive significant effect of export intensity on firm productivity, indicated by TFP, and a negative effect of export intensity on firm core competency, captured by the firm capital intensity. This holds only for the 2003-2004 period, but not the latter 2004 – 2008 period. Although the performance of our instruments appears to be less than perfect in a few specifications, our findings provide some evidence of the learning by exporting effect that occurs within a firm. More interestingly perhaps, our findings offer some new evidence that exporting firms become more specialized over the course of exporting, i.e. they focus on their core activities.

Our findings, in particular with respect to the support of the core competence hypothesis, offer an important policy implication. As Vietnamese manufacturing firms intensify their core activities of producing labor-intensive products for export, the ability to generate productive employment of the export-oriented sectors is enhanced and the role of labor-intensive exports as a driver of inclusive growth is reinforced. Entry of Vietnamese firms into the world market can therefore spur economic growth, especially *inclusive* economic growth of the country. On the basis of our findings at the firm level data, policy options for promoting inclusive growth through greater focus on labour-intensive manufacturing are warranted.

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ANNEXES

Annex 1. Variable definition

All variables in monetary terms adjusted for the constant price of year 2004

Variable	Definition
EXPORT PARTICIPATION	
Exporter	A dummy (1/0) receiving 1 if a firm is an exporter. A firm is defined as exporter if its direct export holds at least 10 or 50 percent of total revenue.
Export intensity	The share of direct export share over total revenue
Decision to export	A dummy (1/0) receiving 1 if a firm is a new exporter in the year of consideration; 0 if the firm remains as non-exporter
Experience of exporting	Number of years since the firm started to export
Age	The number of years since establishment
Revenue	Total sales
Capital	Net book value of machinery and equipment
Employment	The sum of permanent employees and the temporary employees adjusted for the average length of employment of these temporary workers.
Firm size	Logarithm of total assets
Value-added	Total revenue subtracted by total purchases of raw materials, intermediate inputs and energy costs.
Imported inputs	The share of imported intermediate inputs
Capital intensity	Ratio of capital over total employment
Average wage	Total labour cost divided by total employment
FIRM PRODUCTIVITY	
Capital productivity (Value-added per unit of capital)	Ratio of value-added over capital

Labour productivity (Value-added per employee)	Ratio of value-added over total employment
Total factor productivity (TFP) *which includes*	We use information of output, capital and employment to estimate the production function to measure the TFP of firms. Output takes the form of both revenue and value-added. Estimation methods include the Levisohn and Petrin (2003) and the conventional OLS regression approach.
TFP(LP, value added)	TFP estimated based on the Levisohn and Petrin approach, using value added as output.
TFP(LP, revenue)	TFP estimated based on the Levisohn and Petrin approach, using revenue as output.
TFP(OLS, value added)	TFP estimated based on the conventional OLS approach, using value added as output.
TFP(OLS, revenue)	TFP estimated based on the conventional OLS approach, using revenue as output.
State ownership	Share of state ownership (in percentage)
Foreign ownership	Share of foreign ownership (in percentage)
FIXED-EFFECT DUMMIES	
Sector dummies	The ES 2005 classifies the manufacturing sector into 16 branches. We combine Rubber & Plastic Products and Non-metallic Mineral Products into Rubber, Plastic Products & Non-metallic Mineral Products; Basic metals and Metal Products into Basic metals and Metal Products; and finally Machinery and Equipment, Electrical Machinery and Electronics all together. The ES 2009 does not cover a number of branches including Leather products, Wood & Wood Products and Furniture, Paper, Construction Materials; Vehicles and other transport equipment.
Region dummies	There are four region dummies including Southern Central Coast, South East, Mekong River Delta and Northern Central with Red River Delta as the reference group.
Export-oriented sector dummy	The export-oriented sector refers to the following: Food and Beverage, Textiles, Apparel, Leather products, Wood & Wood Products and Furniture, and Paper.