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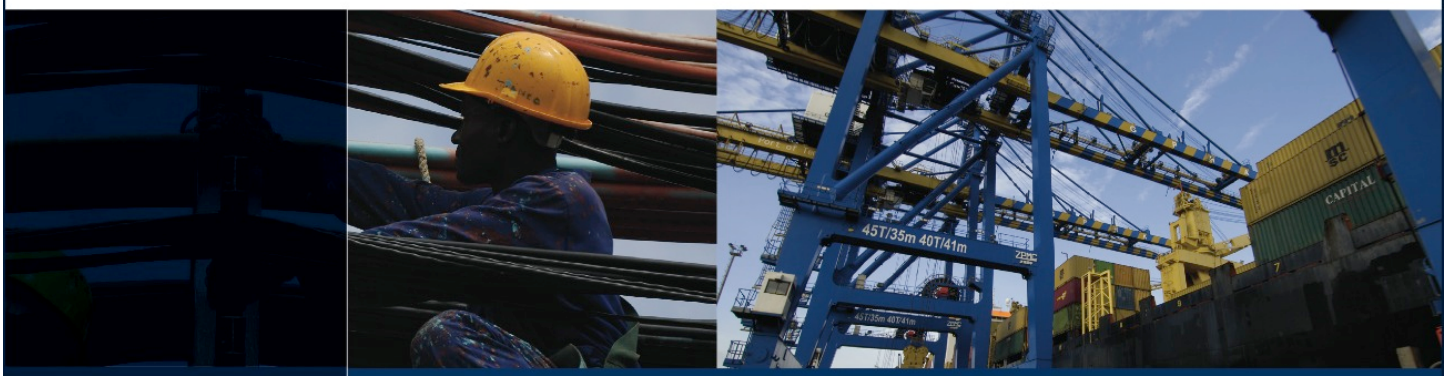

Exporting and Productivity: The Role of Ownership and Innovation in the Case of Vietnam

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Abstract

In this paper, we investigate the relationship between exporting and productivity in the case of Vietnam using an extensive firm level panel dataset for the period 2005-11. We separate out productivity effects of exporting due to self-selection allowing us to identify the extent to which firms learn-by-exporting. We examine the relationship between exporting and productivity in foreign-owned firms and private domestic firms separately and find the former benefit more from exporting, particularly wholly foreign-owned firms. Our analysis suggests that these effects are likely to be attributed to initial productivity improvements due to entry into export markets suggesting that the productivity gains are associated with the removal of local market constraints. We also find some evidence of productivity improvement for domestic firms associated with exporting. These effects can be attributed to within-firm innovations in production processes and product quality.

Keywords: Learning by exporting, self-selection, productivity, Vietnam, firm ownership, innovation
JEL classification: D22, F14, O14

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1 Introduction

The role of trade liberalization for growth and development has been widely studied in the literature but considerable debate still remains on the extent to which engaging in exporting impacts on productivity at the firm level. The empirical evidence on whether firms learn-by-exporting is mixed. This can partly be attributed to the difficulties in separating out self-selection of productive firms into export markets from the impact that exporting has on firm performance. Much of the recent literature exploring the impact of trade on firm performance has focused on the extent to which self-selection or learning explains why export firms are generally more productive than non-exporters. While this is an important policy question, particularly for developing countries, understanding the mechanisms underlying the learning process is important for the effective design of industrial policy aimed at linking domestic producers with global value chains. The extent of learning is likely to be related to the characteristics of firms or their capacity to adapt and change in order to benefit from export possibilities.

In this paper we explore the relationship between exporting and productivity and the impact that the characteristics and behaviour of firms has on this relationship using firm level panel data from Vietnam for the period 2005-11. Vietnam represents an illustrative case of economies in transition. Wide-ranging reforms to enterprise, commercial, and investment laws in the lead up to WTO accession in 2007 have changed the landscape for industrial development and increased trading opportunities. Given that trade reform took place gradually in Vietnam, with a series of export promotion policies and bilateral trade agreements dating back to the 1990s this period represents an ideal backdrop against which to uncover some of the constraints to, and mechanisms through which, firms learn-by-exporting.

The evidence on the nature of the relationship between exporting and productivity is inconclusive, particularly for developing countries. For example, Clerides et al. (1998) find that efficient firms self-select to become exporters but do not experience any efficiency gains as a result of doing so in Columbia, Mexico, and Morocco.[1] Bigsten et al. (2004) find the opposite to be the case in four African countries and find significant efficiency gains from exporting. Bigsten and Gebreeyesus (2008) find some evidence of learning by exporting in Ethiopia, though efficiency gains are highly correlated with firm size and state-ownership. Similarly, Van Biesebroeck (2005) finds productivity improvements for exporting firms in a number of African countries post-participation in foreign markets as do Fernandes and Isgut (2005) in the case of Colombia and Blalock and Gertler (2004) in the case of Indonesia.

Recent empirical studies have shed more light on this debate by exploring how differences in both the characteristics of firms and their behaviour impact on the decision of firms to enter export markets and the relationship between exporting and productivity gains. For example, Aw et al. (2007; 2011) find a role for firm investments in R&D in explaining export patterns in Taiwan as well as interactive effects between such investments and exporting on productivity. Lileeva and Trefler (2010) explore the link between investments in innovation, exporting, and productivity in the case of the Canadian manufacturing sector finding that trade liberalization

[1] Bernard and Jensen (1999), Girma et al. (2004), and Delgado et al. (2002) also find that the relationship between exporting and productivity is largely due to self-selection but in developed country contexts.

induces firms to begin exporting, export more, and engage in more innovation and technology adoption.

This paper adds to this body of literature by examining the evidence for learning effects associated with exporting in the Vietnamese case, exploring some of the underlying mechanisms at work. We first examine the extent to which selection or learning by exporting effects explain why exporting firms are more productive. Exporting firms account for a large and growing proportion of employment and output over the last decade in Vietnam, particularly following trade liberalization toward the latter part of the last decade. We use the framework proposed by Clerides et al. (1998) and applied by many others to identify and distinguish self-selection and learning by exporting effects. If firms self-select into export markets there should be evidence of positive (negative) productivity shocks in the period prior to entry (exit). Moreover, if firms learn-by-exporting they should experience continuous increases in productivity after entry into export markets. We use a combination of descriptive and more formal econometric approaches to test these relationships.

Our results show that a positive relationship does exist between exporting and productivity, even when selection is controlled for. This relationship is most notable for foreign-owned firms but cannot be attributed to learning effects given that it does not persist with years of experience on export markets. We also find some evidence of a positive relationship between exporting and productivity for private domestic firms and consider some of the underlying mechanisms at work. We find that the positive relationship between exporting and productivity can be explained by process and quality innovations undertaken by firms. We find no evidence to suggest that technology transfers or investments in technology and R&D play a role.

The remainder of the paper is structured as follows. Section 2 presents our empirical approach to testing for self-selection and identifying learning by exporting effects. Section 3 presents and describes the data used in our analysis while Section 4 provides evidence on self-selection and learning by exporting in the Vietnamese case. Section 5 concludes.

2 Empirical approach

We follow the standard methodology applied in the literature for separating self-selection of productive firms into export markets from learning by exporting effects.

2.1 Detecting self-selection

Clerides et al. (1998) propose two testable hypotheses that are consistent with the self-selection of productive firms into export markets: (i) entry exporters should experience positive productivity shocks in the period prior to entry into foreign markets and (ii) firms experiencing negative productivity shocks should cease exporting in the subsequent period.

To test these hypotheses we compute a firm-specific measure of labour productivity which is computed as value added divided by the numbers employed. We use this measure to compute binary indicators of whether a firm experienced a positive (negative) productivity shock between two periods relative to other firms in the same 4-digit sector in the same years. We use a fixed effects model to determine whether productivity shocks impact on the decision to enter or exit export markets. The model is described in Equation (1).

$$export_{ijt} = \alpha_1 lprodshock_{ijt-1} + \alpha_2 l_{ijt-1} + \alpha_3 lprod_{ijt-1} + \alpha_4 kl_{ijt-1} + c_{it} + \eta_i + s_j + e_{ijt} \quad (1)$$

where export_{ijt} refers to the decision of the firm to enter (exit) the export market; $lprodshock_{ijt-1}$ is an indicator for whether the firm experienced a positive (negative) productivity shock; l_{ijt-1} is the size of the firm; $lprod_{ijt-1}$ is labour productivity; kl_{ijt-1} the capital-labour ratio; c_{it} are other control variables including, for example, firm ownership; η_i are firm fixed effects; δ_j sector fixed effects; and e_{ijt} a statistical noise term.

The size of the firm is included to proxy for the sunk cost element of entering export markets (Bigsten et al. 2004). Labour productivity and the firm's capital-labour ratio are included to control for underlying efficiency differences between firms so that the effect of shocks to productivity can be isolated (Clerides et al., 1998). The coefficient of interest for testing whether there is self-selection into exporting is α_1, which we expect to be positive if self-selection is present.

2.2 Detecting learning by exporting

We use a one-step approach to estimate learning by exporting effects where we estimate production function parameters and the impact of exporting on productivity simultaneously, while controlling for self-selection. This is similar to the approach used in Bigsten et al. (2004), Fernandes and Isgut (2005) and Van Biesebroeck (2005). Using this approach has the advantage of reducing the bias associated with the correlation between the export status of the firm and unobserved productivity.

Our core empirical model is given by Equation (2).

$$q_{it} = \beta_0 q_{it-1} + \beta_1 y_{it-1} + \boldsymbol{\varphi}_1 \mathbf{Z}_{1it} + \boldsymbol{\varphi}_2 \mathbf{Z}_{2it} + \eta_i + \tau_t + s_j + \pi_p + e_{it} \quad (2)$$

where q_{it} and q_{it-1} are the output levels of the firm (measured as the log of value added) in periods t and $t-1$, respectively; y_{it-1} is an indicator for whether the firm exported in the previous period, $\mathbf{Z}_{1it}$ is a vector of inputs which assuming a Cobb-Douglas functional form include labour (measured as the log of the number of employees) and capital (measured as the log of the capital stock); $\mathbf{Z}_{2it}$ is a vector of control variables for selection into exporting including the variables from Equation (1) above but at two lags along with an additional lag of previous export participation to capture the fixed costs associated with entering into the export market (see Roberts and Tybout (1997) and Bigsten et al. (2004)); η_i are firm fixed effects; τ_t are year dummies; s_j are 4-digit sector dummies; π_p are province dummies; and e_{it} is a random error term.

The inclusion of the lagged dependent variable as a regressor in this model allows for a dynamic adjustment process to changes in the factors of production. However, it complicates the econometric estimation of Equation (2) given that the strict exogeneity assumption underlying the standard fixed effects estimator will no longer hold leading to biased results. We employ two alternative estimators to ensure that our results are robust to any potential bias induced by the inclusion of the lagged dependent variable. We estimate the model using a random effects estimator with a Mundlak adjustment to control for heterogeneity and we also use Blundell and Bond's (1998) system generalized method of moments (GMM) estimator which uses internal

instruments for the endogenous lagged dependent variable.[2] In addition, we present the results of a model that excludes the lag of the dependent variable to ensure that its inclusion is not driving our main results.

An additional concern when using this approach to identify impacts on productivity is that we only have data on the value of inputs and outputs and so cannot estimate physical productivity. This implies that using our measure, productivity changes will embody both within-firm efficiency gains and changes in prices and/or mark-ups that cannot be easily disentangled. As a robustness check we also consider whether the effects of exporting are different in competitive and concentrated sectors to eliminate the possibility that the observed productivity effects are due to changes in mark-ups as opposed to real technical efficiency improvements (Amiti and Konings 2007). Sector level concentration (at the 4-digit level) is measured using the standard Hershman-Herfhindal index (HHI) as follows

$$HHI_{jt} = \sum_{i=1}^{n} s_{ijt}^2 \tag{3}$$

where s_{ijt} is the revenue share of firm *i* in sector *j* at time *t*. The higher the value of this measure the more concentrated the sector. By including an interaction term between the index and the lag of exports indicator we will ensure that the level effect of the lag of exports isolates the impact of exporting on productivity in competitive sectors where observed improvements are more likely to be attributed to productivity gains. In other words, it measures the effect of exporting on productivity as the HHI measure tends to zero. We revise our empirical model to take account of this as follows

$$\begin{aligned} q_{it} &= \beta_0 q_{it-1} + \beta_1 y_{it-1} + \boldsymbol{\varphi}_1 \mathbf{Z}_{1it} + \boldsymbol{\varphi}_2 \mathbf{Z}_{2it} + \delta_0 HHI_{jt} + \delta_1 HHI_{jt} * y_{it-1} \\ &+ \eta_i + \tau_t + s_j + \pi_p + e_{it} \end{aligned} \tag{4}$$

Our core parameter of interest is β_1 which if found to be positive provides evidence of learning by exporting even when selection effects are netted out and the competitiveness of the sector is controlled for. The idea underlying this is that there is heterogeneity in a firm's underlying productivity and this is related to the export status of the firm; if firms learn-by-exporting then past export status should influence future productivity.

Finally, if the impact of exporting on productivity is due to learning we would expect the effect to increase with years of experience on export markets. To examine whether this is the case we estimate a model which includes the years of experience on export markets and its interaction with whether the firm exported in the previous period. This specification is given in Equation (5).

$$\begin{aligned} q_{it} &= \beta_0 q_{it-1} + \beta_1 y_{it-1} + \beta_2 yrsy_{it-1} + \beta_3 y_{it-1} * yrsy_{it-1} \\ &+ \boldsymbol{\varphi}_1 \mathbf{Z}_{1it} + \boldsymbol{\varphi}_2 \mathbf{Z}_{2it} + \eta_i + \tau_t + s_j + \pi_p + e_{it} \end{aligned} \tag{5}$$

[2] The latter is only estimated for a core baseline model as a robustness check on the results given the complications that arise in satisfying the assumptions regarding the validity of the instruments.

where $yrsy_{it-1}$ is the years of experience of the firm on export markets in the previous period. If learning effects are present we would expect both β_1 and β_3 to be positive with the latter signalling that the impact of exporting on productivity increases with years of experience on export markets.

3 Data and descriptive statistics

We use data from the 2005-11 Enterprise Surveys collected annually by the General Statistics Office (GSO) of Vietnam which includes the population of all registered manufacturing enterprises with 30 employees or more and a representative sample of smaller firms. We only consider a balanced panel of firms to abstract from reallocation effects due to the exit of inefficient firms. This will assist in the identification of within-firm productivity effects that can be attributed to learning by exporting.

To explore the mechanisms underlying learning by exporting we supplement our analysis with data gathered in the Technology and Competitiveness Survey (TCS), a specially designed module that was included in the 2009, 2010, and 2011 rounds of the Enterprise Survey. The survey gathered information on technology, investment, and innovation which we link to export status and productivity in our analysis. The sample covered is a representative sub-sample of manufacturing firms in Vietnam from which a balanced panel sub-sample of 3,820 private domestic firms is extracted for the purpose of our analysis.[3]

The exporting status of firms is determined from the Enterprise Survey using an indicator of whether firms report that they export goods or services. Since this information is not gathered in all waves we combine this with information on whether the firm paid export tax during the previous year. For most years the output produced by export firms classified in this way corresponds quite well to the aggregate trade statistics produced by the General Statistics office of Vietnam with the exception of 2005 and 2009 where missing data make export firms under-represented in our sample. To overcome this we impute export status by classifying a firm as an export firm if they export in both the year before and the year after. Table 1 illustrates the extent and importance of exporting over the 2005-11 period for the full unbalanced and the balanced panel of firms.

Focusing on the balanced panel of firms, Column 2 shows an increase in the proportion of firms that export from around 14 per cent of the balanced panel sample in 2005 to over 30 per cent of the sample by 2011. Our data also shows (Column 6 of Table 1) that these exporting firms account for over 80 per cent of total output produced by the manufacturing sector in 2011, up from just over 40 per cent in 2005.[4] Approximately 33 per cent of firms are 'entry-exporters' (Column 2 of Table 1) in that they start exporting at some point over the sample period. This highlights the increasing openness of the Vietnamese economy during this period and the dynamic nature of manufacturing enterprises.

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[3] We use a balanced panel as we cannot tell from our data whether entry/exit is due to start-ups/firm closures or entry/exit into/out of the sample of firms.

[4] This does not mean that all of this output is exported but it represents the proportion of total output that export firms account for whether sold domestically or abroad.

We also disaggregate by ownership type and consider, in particular, private domestic firms. It is perhaps not surprising that a smaller proportion of private domestic firms export as compared with the entire sample which includes both foreign and state-owned firms. A lot of entry and exit into export markets is also evident among private domestic firms with 25 per cent of firms entering export markets over the period and a further 22 per cent exiting.

In Table 2 we explore the characteristics of exporting firms by estimating a linear probability model of the export status of firms. Our models control for firm, 4-digit sector, and time fixed effects. As for the selection model described in Section 2, we include measures of labour productivity (revenue divided by the number of employees), the size of the firm, the capital-labour ratio of the firm, and indicator variables for whether the firm is state- or foreign-owned. We also estimate the model separately for private domestic firms.

We find significant differences in the characteristics of firms that export and those that do not. They are more productive on average and are also larger in size. Both of these findings hold for the unbalanced and balanced panels and when we restrict the sample to private domestic firms. There is also evidence that export firms have a higher capital-labour ratio than non-export firms but this does not hold for the balanced panel and so may be a factor contributing generally to selection effects (i.e. firm survival) and not specifically export status. Private domestic exporters, however, have a higher capital-labour ratio, even when we restrict the sample to the balanced panel. Evidence also suggests that foreign-owned firms are more likely than private domestic firms to export, but this does not hold for the balanced panel. These observed differences in the types of firms that export, suggest that particular types of firms select into exporting, highlighting the need to control for selection effects in analysing the impact of exporting on productivity.

4 Empirical results

Table 3 illustrates the number of firms that begin to export over the timeframe of our analysis and the number of firms that continue to export in the years following initial entry. This is based on the balanced panel of firms. The number of firms entering export markets for the first time is much higher in the later years of the sample. Between a half and two-thirds of firms continue to export one year after their initial entry into export markets. This proportion remains relatively constant over time. The survival rate of private domestic firms in export markets is somewhat lower but is still around 50 per cent on average. We also observe a lot of re-entry into export markets in the later years, both for the full sample and for private domestic firms.

In Section 3, we showed that export firms are different than non-export firms on a number of characteristics, in particular in terms of productivity. As outlined in Section 2, we test for self-selection by exploring whether positive (negative) productivity shocks are associated with firms that enter into (exit from) export markets. We estimate the firm level fixed effects regression given in Equation (1) of the decision to enter/exit exporting. The results are presented in Table 4.

For the full sample, we find no evidence to suggest that firms that experience positive productivity shocks are more likely to enter export markets. In Column 2 we interact the productivity shocks with time dummies to see whether there is evidence of selection effects in different years of the sample but find no effect. When we restrict the analysis to private domestic firms (Column 5) we find some evidence (albeit weak) to suggest that higher productivity firms select into export markets but this does not vary across years. Of particular note is the selection

of foreign-owned firms into export markets. They are significantly more likely to start exporting compared with other types of firms.

The results for the impact of negative productivity shocks on the decision to exit export markets (Columns 3, 4, 7 to 6) lend some support to the self-selection hypothesis but only in 2010. In this year firms that experience negative productivity shocks are significantly more likely to exit export markets suggesting that only the best performing firms continue to export.

To explore whether firms learn-by-exporting we estimate the models given in Equations (2) and (4) in Section 2. Results are presented in Table 5. The model includes firm, sector, year, and province fixed effects and so the identification comes from within-firm variation in export status and productivity. We estimate the model for the balanced panel of firms. Column 1 presents the model excluding selection controls. In Column 2 controls for self-selection are included while in Column 3 the lag of output is also included as an additional control.[5] In Column 4 the correction for the sector level concentration is included. We find support for the learning by exporting hypothesis in all four models: the lag of exports is found to have a positive and well-determined impact on productivity.

In Column 5 of Table 5 we control for years of experience on export markets. The coefficient is positive and significant as expected; only the most productive firms will survive and so this can be thought of as an additional control for self-selection. The positive and significant impact of the lag of exports on productivity persists, even with the inclusion of this variable. In Column 6 we include the interaction term between the lag of exports and years of experience on export markets as described in Equation (5) in section 3. The coefficient on the interaction term is negative and statistically significant and its inclusion increases the magnitude of the impact of export status on productivity.

The above evidence suggests that the impact on productivity is greatest in the initial years of exporting but fades as time progresses. In other words, there is an initial boost in productivity for firms that enter export markets but as time goes on the effect on productivity dies out. This suggests that while there are gains to exporting these should maybe not be described as learning effects which we would expect to increase in magnitude the more time a firm spends supplying export markets.

In Table 6 we therefore explore the impact of exporting on productivity further by disaggregating by the ownership status of firms. Our sample includes foreign-owned, state-owned and private domestic firms. We investigate whether there are differences across these firms in the impact of exporting on productivity by separately including interaction terms between the lag of exports and indicators of the three ownership categories. In Column 1 we focus on private domestic firms and find the interaction term to be statistically insignificant. This suggests that private domestic firms are no different to other firms in the sample in the extent to which they experience productivity gains from exporting.

In Column 2 we consider state-owned firms and find a negative and statistically significant interaction term that is of a greater magnitude than the level effect of the lag of exports. This suggests that state-owned firms do not experience productivity gains from exporting. This is similar to Sun and Hong (2011) who find no evidence that state-owned firms learn from

[5] Our main result is robust to instrumenting for the endogenous dependent variable using system GMM. The results are presented in Table A1 of the Appendix.

exporting. One possible explanation is that state-owned firms focus more on the domestic market (29 per cent are exporters compared with 54 per cent of foreign-owned firms). Moreover, they may have less absorptive capacity when it comes to the types of knowledge and technology transfers that are thought to underlie learning by exporting effects.

In Column 3 we consider foreign-owned firms and find a positive and statistically significant interaction term that renders the level effect statistically insignificant. This suggests that the majority of the productivity gains associated with exporting are due to foreign-owned firms engaging in export markets. While this does not rule out learning effects by private domestic firms it suggests that they are much smaller than those experienced by foreign-owned firms. This is in contrast to other findings in the literature. For example, Sun and Hong (2011) find that foreign-owned firms benefit less from exporting than domestic firms in the case of China.

In Column 4 of Table 6 we disaggregate the foreign ownership indicator further and consider separately wholly foreign-owned firms and joint venture firms between foreign and domestic (private or state) owners. We find that the interaction effect is fully attributed to wholly foreign-owned firms. Taken with our finding that the greatest productivity gains to exporting are experienced in the initial years on export markets this may be explained by the fact that wholly foreign-owned firms are likely to face a greater set of constraints when supplying local markets as compared with joint venture firms who will have more local knowledge, connections and networks. As such, wholly foreign-owned firms have a lot more to gain from accessing export markets and so experience a productivity boost as a result of doing so. This effect, however, fades over time and so could not be described as a learning effect.[6]

Our analysis thus far is inconclusive as to whether private domestic firms learn from exporting. For the remainder of the paper we focus on this sub-group of firms. The results for the learning by exporting model estimated for private domestic firms are presented in Table 7. While we do observe a positive and statistically significant relationship between the lag of exports and productivity in Column 1 this effect is not robust to the inclusion of selection controls (Column 2) and the lag of output (Column 3). Moreover, including interaction terms with the years of experience on export markets does not lead to any well-determined findings (Column 4). However, when we include interaction terms between lagged export status and the year dummies (Column 5) we find some evidence of learning in 2011 and so we cannot rule out the possibility that private domestic firms benefit from engaging in export markets, even controlling for selection.[7]

As highlighted in the introduction, evidence from the literature suggests that firms differ in the extent to which they experience learning effects associated with exporting. In particular, a growing literature suggests that investment in R&D and innovation not only explains exporting patterns but also links with productivity improvements associated with exporting (Aw et al. 2011; Lileeva and Trefler 2010). While our analysis suggests that there may be some productivity gains associated with exporting for private domestic firms, the evidence is not overwhelming. We extend our analysis to consider some of the possible mechanisms through which learning may

[6] All of our results are robust to estimation using an unbalanced panel, clustering the standard errors at the 4-digit sector level, and to estimation using the random effects estimator with a Mundlak adjustment for unobserved heterogeneity. Details are provided in Table A2 of the Appendix.

[7] Using system GMM to estimate the model to correct for the endogenous dependent variable suggests that the impact of exporting on productivity is positive and statistically significant (see Table A1 of the Appendix). This is consistent with our finding of a positive relationship between exporting and productivity for private domestic firms.

occur to gain more insight into whether the positive effects that we do observe for private domestic firms could indeed be classed as learning effects and if so whether they vary depending on the behaviour of firms.

We use information contained in the TCS described in Section 3 for 2009, 2010, and 2011. The sample is a sub-set of the manufacturing firms covered by the Vietnam Enterprise Survey and so can be matched to the main dataset used in our analysis and allows for the inclusion of lags from periods prior to 2009 so all three years of the panel can be exploited. For comparability with our main analysis we estimate the learning by exporting model for the 2009-11 period only using the full dataset and find evidence of a statistically significant positive relationship between lagged export status and productivity, even when controlling for selection (Column 6 of Table 7). Moreover, in Column 7 when we consider years of experience on export markets we find the coefficient on the interaction term to be positive, although it is not well-determined. We conclude that we cannot rule out the possibility that the observed effects are learning effects.

We consider a number of variables contained in the TCS that capture firm behaviour in relation to investment, technology and innovation and could influence the productivity impacts of exporting. The list of variables with summary statistics is given in Table 8.

The first mechanism we consider is technology transfers. In the TCS, export firms are asked whether their relationship with customers on export markets results in technology transfers from the customer to the domestic supplier. These could, for example, take the form of training in new machinery, production processes, or support in reaching quality standards or other requirements of customers abroad. Very few firms report receiving technology transfers ranging from around 2 per cent in 2009 to between 3 and 4 per cent in 2010 and 2011.

Second, we consider investments in new machinery and information and communications technologies ICTSs). In the TCS module firms are asked to name the two most important production technologies (machines and equipment) and the two most important ICTs used by the firm. They are also asked to report when these technologies were acquired by the firm. For the purpose of our analysis, we consider firms that acquired the technologies during the previous year as having made an investment in new machinery or ICT. Between 8 and 20 per cent of firms invest in new machinery while between 10 and 25 per cent of firms invest in ICT between 2009 and 2011.

Third, we consider a range of indicators of innovations undertaken by the firm. The options given include: improvements in process organization (such as time saving procedures); improvements in product quality; and an expansion of product variety. A large number of firms report that they engage in process innovations (between 29 and 62 per cent) and quality innovations (between 77 and 80 per cent). Fewer firms, less than half in each year, report that they expand the variety of products that they produce.

Finally, we consider whether firms engage in adaptations to existing technologies and investments in R&D activities. In the case of the former, firms are asked whether they modify existing production or process technologies in order to, for example, adapt them to the specific needs of the firm, increase efficiency or make them work faster or better. Between, 7 and 23 per cent of firms report that they engage in technology adaptation of this kind in each year. Fewer firms, between 10 and 13 per cent, report that they engage in R&D activities. The proportion of firms engaging in either of these activities declined between 2009 and 2011.

We re-estimate the learning by exporting model for the sub-sample of 3,820 private domestic firms included in the TCS module.

The results are presented in Column 1 of Table 9. We find a positive and statistically significant relationship between the lag of exporting and productivity confirming our findings from Column 5 of Table 7 using the full sample but comparable years of data. We then interact each of the measures described in Table 8 in turn with the lag of export status to establish whether the effects observed can be attributed to technology transfers, investments and innovations. We find no evidence to suggest that technology transfers from customers are a mechanism through which firms learn from exporting (Column 2 of Table 9).

Similarly, we find no evidence to suggest that learning is associated with investments in new machinery or ICT (Columns (3) and (4)). We do, however, find that the positive relationship between the lag of exports and productivity can be attributed to process and quality innovations undertaken by firms with a positive and statistically significant interactive effect observed for each of these variables (Columns (5) and (6)). We do not find a similar effect for variety innovations. Finally, Columns (8) and (9) reveal that technology adaptations and R&D investments are not related to learning. This is in contrast to recent literature that suggests that simultaneous investment in R&D is important for learning effects from exporting (Aw et al. 2011).

Overall, our results suggest that there are learning effects associated with exporting for private domestic firms. These effects can be attributed to innovations made by firms to improve processes and the quality of the goods that they produce. We do not find any evidence that these improvements are linked to technology transfers or investments in machinery, technology adaptations, or R&D.

While we cannot rule out the possibility that innovations in processes and quality are diffused from customers abroad, the lack of significance of the other technology and investment indicators suggests that it is unlikely. The main source of productivity improvements associated with exporting for domestic firms is most likely attributed to within-firm innovations in processes or quality that lead to efficiency improvements.[8]

6 Conclusion

In this paper we explored the relationship between exporting and productivity using firm level data from Vietnam for the period 2005-11. During this period Vietnam became increasingly liberalized in terms of trade, financial markets, investment laws, and the regulatory framework. As such it represents an ideal case study for exploring the impact of exporting on productivity, particularly for the dynamic and growing domestic sector. There are two key focuses of our analysis: first, to distinguish between self-selection of more productive firms into export markets and productivity effects associated with exporting and second, to disentangle some of the mechanisms underlying the learning by exporting process.

We find very little evidence that productive firms self-select into export markets, while our analysis points to a positive association between exporting and productivity. This is particularly

[8] All of our results are robust to the same set of robustness checks provided for the analysis using the full sample. Details are provided in Table A2 of the Appendix.

the case for wholly foreign-owned firms. However, the fact that learning does not continue with years of experience exporting suggests that there is an initial productivity gain for wholly foreign-owned firms associated with accessing foreign markets rather than a cumulative learning effect. Given that we do not observe the same effect for joint venture foreign firms we hypothesize that it is due to local market constraints that are relieved upon accessing export markets, or a dearth in local knowledge that disadvantages wholly foreign-owned firms when supplying domestic markets that is no longer of importance once they begin to export.

We also find some evidence of a positive association between exporting and productivity for private domestic firms, although only in the later years of the sample. This is not surprising given that access to foreign markets was greatly eased with accession to the WTO in 2007. Our evidence is suggestive that these effects can be attributed to learning. We explore some of the mechanisms through which firms learn by exporting and find that learning is positively associated with within-firm efficiency improvements in the form of process and quality innovations.

Appendix Table A1: System GMM estimator of learning by exporting model

Dependent variable: lnva	(1)	(2)	(3)	(4)
L.lnva	0.024**	0.361**	0.017	0.471***
	(0.010)	(0.178)	(0.011)	(0.173)
L.export	0.034***	0.315***	0.019	0.461***
	(0.012)	(0.107)	(0.019)	(0.156)
Inputs				
lnlab	0.699***	0.824***	0.702***	0.783***
	(0.016)	(0.248)	(0.018)	(0.236)
lncap	0.173***	0.570***	0.171***	0.428***
	(0.013)	(0.125)	(0.013)	(0.107)
Selection				
L2.export	0.017	-0.088***	-0.008	-0.111***
	(0.013)	(0.034)	(0.020)	(0.039)
L2.lnlabprod	-0.097***	0.096***	-0.108***	0.115***
	(0.010)	(0.011)	(0.010)	(0.037)
L2.lnlab	-0.008	-0.745***	0.010	-0.601***
	(0.016)	(0.193)	(0.018)	(0.209)
L2.cap-lab	-0.026**	-0.432***	-0.014	-0.317***
	(0.011)	(0.077)	(0.011)	(0.071)
Controls				
Foreign-owned	-0.053	0.377***		
	(0.136)	(0.144)		
State-owned	-0.036	1.173***		
	(0.032)	(0.387)		
R^2	0.860		0.832	
Firms	4,649	4,649	3,106	3,106
Obs.	23,245	23,245	15,530	15,530
Arellano-Bond test for AR(2) in first differences (p-value)		0.088		0.338
Hansen test of over identification restrictions (p-value)		0.327		0.190

Note: A balanced panel of firms is used for each analysis. Each model includes firm fixed effects and time dummies. In each model L.lnva, L.export, lnlab, and lncap are treated as endogenous and are instrumented using the third lag of the difference and the fourth lag of the level of each variable. Selection controls and ownership dummies are treated as exogenous and are also used as instruments. Firms that change sector are excluded to avoid the need for the inclusion of sector fixed effects. This is the reason behind the reduced sample size as compared with the main analysis. For comparison purposes each model is estimated using a standard fixed effects approach for the same sample. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table A2: Robustness checks

Result	(1) Main model	(2) Unbalanced panel	(3) 4-digit clustering	(5) Random effects with Mundlak
Full sample				
n	37,405	83,974	37,405	37,405
L.export	+ ***	+ ***	+ **	+ ***
L.export	+ ***	+ ***	+ ***	+ ***
L.yrs_export	+ ***	+ ***	+ ***	+ ***
L.export*L.yrs_export	- **	- **	- **	- (p=0.137)
L.export	+ ***	+ ***	+ ***	+ ***
Private*L.export	- (p=0.141)	- (p=0.101)	- *	- (p=0.115)
L.export	+ ***	+ ***	+ **	+ ***
State*L.export	- **	- **	- **	- **
L.export	+ (p=0.263)	+ ***	+ (p=0.457)	+ **
Foreign*L.export	+ ***	+ ***	+ ***	+ ***
L.export	+ (p=0.262)	+ ***	+ (p=0.457)	+ **
For100*L.export	+ **	+ ***	+ **	+ ***
ForJV*L.export	+ (p=0.153)	+ (p=0.255)	+ (p=0.189)	+ (p=0.312)
Priv dom full sample 05-11				
n	26,050	66,654	26,050	26,050
L.export	+ (p=0.113)	+ ***	+ (p=0.253)	+ (0.109)
Priv dom full sample 09-11				
n	15,630	46,212	15,630	15,630
L.export	+ *	+ ***	+ (p=0.197)	+ (0.134)
Priv dom TCS sample 09-11				
n	10,944	15,453	10,944	10,944
L.export	+ ***	+ ***	+ **	+ ***
L.export	+ (p=0.443)	+ (p=0.416)	+ (p=0.470)	+ (p=0.297)
L.export * Process Innov.	+ **	+ *	+ **	+ *
L.export	+ (p=0.942)	+ (p=0.940)	+ (p=0.932)	+ (p=0.827)
L.export * Quality Innov.	+ *	+ (p=0.118)	+ **	+ *

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11 and Technology and Competitiveness Survey 2009-11.

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Table 1: Proportion of firms in Vietnam that export and proportion of output accounted for by exporting firms

	% firms All ownership types		% firms Private domestic firms		% revenue All ownership types	
Year	All firms	Balanced	All firms	Balanced	All firms	Balanced
2005	8.50	14.61	3.81	6.18	38.62	42.68
2006	13.99	23.20	7.51	12.15	58.59	61.15
2007	12.72	21.39	6.64	11.00	55.85	62.74
2008	10.19	20.56	4.71	10.08	54.45	63.39
2009	7.80	19.15	2.84	8.52	43.11	59.08
2010	15.01	30.81	7.24	17.27	58.44	71.89
2011	18.85	31.88	9.93	17.08	74.44	81.95
Non-export	74.10	52.55	84.31	68.44		
Entry-export	21.01	32.84	13.70	25.37		
Exit-export	13.42	27.95	9.23	21.88		
Cont-export	1.73	6.16	0.39	1.59		

Source: Authors' own calculations based on Vietnamese Enterprise Survey 2005-11.

Table 2: Characteristics of exporting firms

	All ownership types		Private domestic firms	
Dep var. export	All firms	Balanced	All firms	Balanced
Labour prod.	0.014***	0.017***	0.007***	0.011**
	(0.001)	(0.003)	(0.001)	(0.003)
Labour	0.036***	0.027***	0.029***	0.023***
	(0.002)	(0.004)	(0.002)	(0.004)
Cap-lab ratio	0.002***	-0.001	0.007**	0.008***
	(0.001)	(0.003)	(0.001)	(0.003)
Foreign-owned	0.137***	0.061		
	(0.031)	(0.060)		
State-owned	-0.009	-0.014		
	(0.014)	(0.018)		
R^2	0.273	0.166	0.122	0.087
Nr firms	71,697	7,481	65,164	5,210
Nr obs.	209,992	52,367	179,400	36,470

Note: Model includes firm fixed effects along with 4-digit industry and time dummies. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table 3**:** Export dynamics

	Balanced panel: all ownership types					
Year first export:	2006	2007	2008	2009	2010	2011
n	712	362	363	378	1,003	793
Continuing						
2007	475					
2008	422	190				
2009	223	157	219			
2010	254	196	211	313		
2011	494	234	251	239	501	
	Balanced panel: private domestic firms					
Year first export	2006	2007	2008	2009	2010	2011
n	349	184	166	164	521	445
Continuing						
2007	200					
2008	177	79				
2009	74	56	79			
2010	87	73	76	120		
2011	213	98	100	78	176	

Source: Authors' own calculations based on Vietnamese Enterprise Survey 2005-11.

Table 4: Selection into and out of export markets

	All ownership types				Private domestic firms			
Dependent var.:	Enter export		Exit export		Enter export		Exit Export	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Pos labprod shock	0.001	0.010			0.005*	0.009		
	(0.003)	(0.008)			(0.003)	(0.008)		
Pos shock *Y07		-0.011				-0.010		
		(0.010)				(0.010)		
Pos shock *Y08		-0.009				-0.008		
		(0.008)				(0.009)		
Pos shock *Y09		-0.016*				-0.002		
		(0.009)				(0.009)		
Pos shock *Y10		-0.001				0.001		
		(0.011)				(0.011)		
Pos shock *Y11		-0.015*				-0.008		
		(0.009)				(0.009)		
Neg labprod shock			0.001	-0.006			-0.001	-0.006*
			(0.003)	(0.004)			(0.003)	(0.004)
Neg shock *Y07				0.003				-0.002
				(0.007)				(0.007)
Neg shock *Y08				0.009				0.005
				(0.007)				(0.007)
Neg shock *Y09				0.011				0.012
				(0.007)				(0.007)
Neg shock *Y10				0.015***				0.015***
				(0.005)				(0.005)
Neg shock *Y11				0.003				0.005
				(0.008)				(0.009)
L.Labour prod	-0.005*	-0.005	0.003	0.003	0.002	0.002	0.004*	0.005*
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
L.Labour	-0.009**	-0.008**	0.003	0.003	-0.001	-0.001	0.003	0.003
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)
L.Cap-lab ratio	0.005*	0.005*	0.002	0.002	0.002	0.002	0.0002	0.0002
	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)
Foreign-owned	0.111***	0.110***	-0.052	-0.052				
	(0.041)	(0.041)	(0.038)	(0.038)				
State-owned	0.009	0.009	-0.014	-0.013				
	(0.015)	(0.015)	(0.015)	(0.015)				
R^2	0.011	0.011	0.004	0.004	0.009	0.009	0.008	0.008
Nr firms	7,481	7,481	7,481	7,481	5,210	5,210	5,210	5,210
Nr obs.	44,886	44,886	44,886	44,886	31,260	31,260	31,260	31,260

Note: A balanced panel is used for this analysis. Each model includes firm fixed effects along with 4-digit industry dummies. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table 5: Econometric analysis of learning by exporting effects – all ownership types

Dependent variable lnva	(1)	(2)	(3)	(4)	(5)	(6)
L.export	0.039***	0.034***	0.033***	0.029***	0.044***	0.065***
	(0.009)	(0.010)	(0.010)	(0.011)	(0.010)	(0.014)
L.yrs_export					0.017***	0.032***
					(0.006)	(0.009)
L.export*L.yrs_export						-0.018**
						(0.008)
Inputs						
lnlab	0.720***	0.715***	0.711***	0.711***	0.709***	0.710***
	(0.010)	(0.012)	(0.012)	(0.012)	(0.012)	(0.012)
lncap	0.162***	0.168***	0.167***	0.167***	0.168***	0.169***
	(0.008)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Selection						
L2.export		0.013	0.012	0.012	0.001	0.002
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
L2.lnlabprod		-0.094***	-0.095***	-0.094***	-0.095***	-0.095***
		(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
L2.lnlab		0.010	0.005	0.005	0.006	0.005
		(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
L2.cap-lab		-0.024***	-0.025***	-0.025***	-0.022***	-0.022***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Controls						
Foreign-owned		-0.067	-0.065	-0.064	-0.059	-0.064
		(0.125)	(0.125)	(0.012)	(0.125)	(0.124)
State-owned		-0.046*	-0.047*	-0.047*	-0.047*	-0.046*
		(0.028)	(0.028)	(0.028)	(0.028)	(0.028)
L.lnva			0.016**	0.016**	0.016**	0.016**
			(0.008)	(0.008)	(0.008)	(0.008)
Sector concentration						
HHI4				0.007		
				(0.073)		
HHI4*L.export				0.078		
				(0.112)		
R^2	0.869	0.839	0.843	0.843	0.845	0.846
Firms	7,481	7,481	7,481	7,481	7,481	7,481
Obs.	44,886	37,405	37,405	37,405	37,405	37,405

Note: A balanced panel of firms is used for this analysis. Each model includes firm fixed effects along with 4-digit industry dummies and time dummies. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table 6: Econometric analysis of learning by exporting effects – who is learning?

Dependent variable: lnva	(1)	(2)	(3)	(4)
L.export	0.048***	0.039***	0.013	0.013
	(0.014)	(0.010)	(0.012)	(0.012)
Ownership interactions				
Private*L.export	-0.028			
	(0.019)			
State*L.export		-0.052**		
		(0.025)		
Foreign*L.export			0.055***	
			(0.020)	
For 100%*L.export				0.053**
				(0.021)
For JV*L.export				0.068
				(0.047)
Ownership level effects				
Private-owned	0.057**			
	(0.029)			
State-owned		-0.030		
		(0.029)		
Foreign-owned			-0.077	
			(0.124)	
For 100%				-0.109
				(0.128)
For JV				-0.066
				(0.127)
R^2	0.844	0.844	0.844	0.844
Firms	7,481	7,481	7,481	7,481
Obs.	37,405	37,405	37,405	37,405

Note: A balanced panel of firms is used for this analysis. Each model includes firm fixed effects along with 4-digit industry dummies and time dummies. Inputs, controls for selection and the lag of value added are included in all models. The coefficients are almost identical to those reported in Table 5. They are available on request. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table 7: Econometric analysis of learning by exporting effects – private domestic firms

Dependent variable lnva	(1)	(2)	(3)	(4)	(5)	(6) 2009-11	(7) 2009-11
L.export	0.028**	0.022	0.022	0.030		0.032*	0.042*
	(0.013)	(0.014)	(0.014)	(0.020)		(0.019)	(0.026)
L.yrs_export				0.012			0.066***
				(0.012)			(0.021)
L.export*L.yrs_export				-0.002			0.016
				(0.012)			(0.014)
L.export*Y07					0.026		
					(0.025)		
L.export*Y08					0.018		
					(0.025)		
L.export*Y09					-0.040*		
					(0.021)		
L.export*Y10					-0.013		
					(0.024))		
L.export*Y11					0.061***		
					(0.023)		
Inputs							
lnlab	0.727***	0.719***	0.718***	0.718***	0.718***	0.699***	0.699***
	(0.011)	(0.013)	(0.013)	(0.013)	(0.013)	(0.018)	(0.018)
lncap	0.161***	0.164***	0.164***	0.164***	0.163***	0.156***	0.155***
	(0.008)	(0.010)	(0.010)	(0.010)	(0.010)	(0.013)	(0.013)
Selection							
L2.export		-0.010	-0.011	-0.017	-0.014	-0.029	-0.061***
		(0.015)	(0.015)	(0.016)	(0.016)	(0.020)	(0.022)
L2.lnlabprod		-0.103***	-0.103***	-0.103***	-0.102***	-0.030***	-0.031***
		(0.008)	(0.008)	(0.008)	(0.008)	(0.010)	(0.010)
L2.lnlab		0.027**	0.025**	0.025**	0.026**	0.003	0.005
		(0.012)	(0.012)	(0.013)	(0.012)	(0.020)	(0.020)
L2.cap-lab		-0.009	-0.010	-0.009	-0.009	-0.004	-0.0004
		(0.008)	(0.008)	(0.008)	(0.008)	(0.012)	(0.012)
L.lnva			0.006	0.006	0.006	-0.154***	-0.154***
			(0.009)	(0.009)	(0.009)	(0.011)	(0.011)
R^2	0.826	0.798	0.799	0.800	0.799	0.733	0.739
Firms	5,210	5.210	5,210	5,210	5,210	5,210	5,210
Obs.	31,260	26,050	26,050	26,050	26,050	15,630	15,630

Note: A balanced panel of firms is used for this analysis. Each model includes firm fixed effects along with 4-digit industry dummies and time dummies. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11.

Table 8: Descriptive statistics on technology and competitiveness variables

% of firms	2009	2010	2011
Tech transfer	1.44	3.93	3.53
New machine	19.16	12.12	8.53
New ICT	25.29	13.59	10.94
Process innovation	28.59	59.50	62.51
Quality innovation	79.00	77.12	80.16
Variety innovation	49.63	42.28	42.88
Technology adaption	23.17	8.69	6.86
R&D activities	12.64	11.10	10.47

Source: authors' own calculations based on Technology and Competitiveness Survey 2009-11. Means presented for balanced panel of 3,820 private domestic firms.

Table 9: Learning by exporting channels

Dependent variable lnq	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
L.export	0.062***	0.062***	0.054**	0.074***	0.023	0.003	0.057**	0.068***	0.070***
	(0.021)	(0.022)	(0.022)	(0.022)	(0.030)	(0.041)	(0.028)	(0.022)	(0.022)
Tech transfer		0.014							
		(0.049)							
L.export * tech transfer		-0.001							
		(0.064)							
New machine			-0.011						
			(0.019)						
L.export * new machine			0.058						
			(0.052)						
New ICT				0.015					
				(0.015)					
L.Export * new ICT				-0.068					
				(0.042)					
Process innovation					-0.029**				
					(0.014)				
L.Export * process innovation					0.071**				
					(0.035)				
Quality innovation						0.008			
						(0.017)			
L.Export * quality innovation						0.076*			
						(0.044)			
Variety innovation							-0.008		
							(0.014)		
L.Export * variety innovation							0.011		
							(0.037)		
Tech adaptation								0.011	
								(0.018)	
L.Export * Tech adaptation								-0.043	
								(0.050)	
R&D activities									0.046**
									(0.022)
L.Export * R&D activities									-0.055
									(0.046)
R^2	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.686	0.685

Note: The balanced panel of 3,820 private domestic firms is used for this analysis with a total of 10,996 observations in each regression. Each model includes firm fixed effects along with 4-digit industry dummies and time dummies. The lag of value added, inputs and selection controls are included in each model. Robust standard errors clustered at the firm level are included in parentheses. *** p<0.001, ** p<0.05, * p<0.10.

Source: Authors' own calculations using the Vietnamese Enterprise Surveys 2005-11 and Technology and Competitiveness Survey 2009-11.