PRODUCTIVITY AND WAGE PREMIUMS: EVIDENCE FROM VIETNAMESE ORDINARY AND PROCESSING EXPORTERS

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Productivity and wage premiums : evidence from Vietnamese ordinary and processing exporters

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Abstract

We propose some new stylized facts on Vietnamese exporters that emphasize firm heterogeneity in trade regimes and firm ownership. We show first that the distribution of firms export intensities is U-shaped with more than half of Vietnamese exporters exporting more than 50% of their output. This contrasts with the export patterns in industrialized countries but is similar to the export intensity distribution for other emerging economies with strong participation in global value chains. Second, we show that export premia, evaluated in terms of both productivity and wage indexes, are positive only for Vietnamese exporters involved primarily in ordinary trade, and that processing exporters exhibit lower productivity indexes and pay lower wages than their non-exporting counterparts. This pattern is more pronounced among the group of foreign-owned firms in Vietnam compared to the group of domestic firms and is in line with previous findings for China.

Keywords: Processing trade, wage, firm productivity, firm-level data, Vietnam

JEL code: F10, F14, L60

1 Introduction

In this paper, we provide preliminary evidence on the performance of Vietnamese exporters compared to non-exporters, based on a large-scale firm-level data set which allows us to differentiate firms according to their main trade activity and ownership. Some previous contributions on the relative performance of Vietnamese exporters [1] use small firm samples from the World Bank 2005 survey. The data used in this paper (only recently made available to researchers) are from the General Statistics Office (GSO) of

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[1] See in particular Hiep and Ohta (2007, 2009).

Vietnam Annual Survey of Enterprises (ASOE), and cover all firms registered in Vietnam during the period 2000 to 2013. These data have been used to investigate various firm dynamics and trade related topics [2] but to the best of our knowledge, the present paper is the first systematic investigation of the relationship between firms exports, productivity, and wages differentiating firms by trade regime and ownership.

In line with earlier work on firm exports and productivity for a range of different countries (See Wagner (2007) for a survey), we start by describing export participation rates and average firm export intensities at the detailed industry classification level. We then investigate the differences in those variables between foreign-owned and domestic-owned firms. We show that those variables change across firms depending on their location in specific economic zones[3].

Next, we estimate export premiums in terms of productivity indexes and wages per employee, and investigate the extent to which these premia are sensitive to the firms main trade regime. Specifically, we distinguish firms involved primarily in ordinary trade, from firms involved primarily in processing trade[4]. This distinction has been shown to be significant in the context of emerging economies, and especially those involved in global value chains (GVCs). An important issue that has been raised in this context is the extent to which local firms involved in processing activities within GVCs contribute to driving up productivity and wages in the local economy. For instance, Dai et al. (2016) provide the first micro economic evidence showing that processing firms exhibit particularly low productivity. Specifically, they show that Chinese firms with heavy involvement in processing trade under-perform both their ordinary exporter and non-exporter counterparts. Various explanations have been proposed for this puzzling finding, and continue to be debated [5]; however, it calls for more evidence on other emerging economies. This paper intends to contribute by investigating the case of Vietnam, another emerging economy with high participation in GVCs.

Our main results for Vietnam broadly support earlier findings in Dai et al. (2016) for China, and shed new light on the specificity of the relationship between firm exports, productivity, and wages in emerging economies compared to developed countries. We show first that the firm export intensity distribution presents a U-shaped pattern with more than half of Vietnamese firms exporting more than 50% of their output on average. This contrasts with the pattern of exporting typical of the industrialized

[2] On the topic of firm dynamics and growth, Ha and Kiyota (2014) use GSO data to investigate the contribution of resources reallocations across firms to aggregate productivity growth, while Bai et al. (2017) uses those data to study the relationship between firm growth and provincial State corruption. On trade related issues, Chu and Kalirajan (2011) investigate the impact of trade liberalization on the technical efficiency of Vietnamese manufacturing firms, Newman et al. (2017) investigate the effects of learning by exporting, and Ni et al. (2015), Ni (2016) and Pham (2016) investigate the spillovers and crowding out effects of foreign direct investment (FDI) to local Vietnamese firms.

[3] Vietnamese special economic zones include industrial parks, export processing zones, and other special economic zones. The first two focus on supporting specialized industries, while the third supports agglomerations of diversified activities within areas that offer good environments for business and investment (see Appendix A for more detail).

[4] Ordinary trade includes both trade in goods manufactured by the focal firm and "carry along trade" defined as trade in goods bought by the firm to be sold abroad (Bernard et al., 2012). Processing trade is trade in goods that have been processed but not manufactured by the focal firm. Processed products are supplied directly by the principal company, or imported from the principal company and re-exported under a specific trade regime which exempts the exporting firm from tariffs.

[5] See the literature review in Section 2 below.

countries[6] but is similar to the pattern in other emerging economies[7]. It exemplifies the specific role of internationalization in emerging economies where the activities of some local firms are dedicated to participation in GVCs.

As expected, we find that those firms focused mainly on serving international markets are more likely to be foreign-owned and to be heavily involved in processing trade. Our investigation of the relationship between those characteristics and export premiums confirm the basic finding in Dai et al. (2016) that processing exporters *under*-perform both their ordinary exporter and their non-exporter counterparts. This relatively "bad" performance of processing exporters extends to both productivity and wages, the former computed as either average labor productivity or total factor productivity (tfp) indexes, and the latter computed as the average wage per employee. Specifically, our baseline specification shows that processing exporters are about 18% less productive than non-exporters, and about 34% less productive than other exporters[8]. For wages, the gap is less pronounced: on average, processing firms pay 1.8% lower wages than non-exporters, and 15% lower wages than non-processing exporters.

Finally, we show that the productivity gap between processing exporters and non-exporters is larger among foreign-owned compared to domestic firms. This confirms the findings for China in Lu et al. (2010) that among affiliates of multinational US firms operating in China, pure processing exporters under-perform firms that also sell on the local market[9].

The rest of the paper is organized as follows. In section 2, we review the literature on firms exporting and productivity with a special focus on emerging economies that play a large part in GVCs. Section 3 describes the data set and provides some basic summary statistics for our firm sample. Section 4 provides evidence of firm export participation rates and firm export intensity distributions across various industries and firm categories, differentiated by their ownership and main trade activity. In section 5, we investigate the relative performance of exporters in terms of both productivity and wages in more depth, again distinguishing by their ownership and main trade activity. Section 6 presents some robustness checks, and Section 7 offers some concluding remarks.

[6]See for instance Bernard and Jensen (1995) for the US, Bernard and Wagner (1997) for Germany, Baldwin and Gu (2003) for Canada, Bellone et al. (2008) for France, Greenaway and Kneller (2004) for the UK and Hansson and Lundin (2004) for Sweden

[7]This configuration of export activity applies to various East-Asian countries (e.g. Malaysia, the Philippines, Thailand (Hallward-Driemeier et al., 2002), and China (Lu, 2010)), some Latin American countries surveyed by the World Bank Enterprise Survey (WBES)(Chang and Marrewijk, 2013), and a few industrialized countries such as Korea (Choi and Lee, 2013) and Austria (Pöschl et al., 2009).

[8]One qualification to this finding is that our productivity estimates, similar to those in Dai et al. (2016), may suffer from systematic under-estimation bias related to the productivity of processing firms in emerging economies, due to lack of firm-level information on prices. Li et al. (2016) argues that if industry-level prices are used to deflate firm output, and if processing firms systematically charge lower prices than other manufacturing firms, their relative physical productivity may be underestimated. We discuss this issue in more detail in the data section.

[9]Lu et al. (2010) justify their finding by demonstrating theoretically, that heterogeneous firms decide to offshore different segments of their production lines. In their model, the most productive firms tend to offshore both processing and commercial activities while less productive firms tend to offshore only processing activities.

2 Literature background

There is a substantial stream of work documenting the superior productive efficiency of exporting firms compared to non-exporters, for a large variety of countries (see Bernard and Jensen (1995, 1999), Clerides et al. (1998), Bernard and Wagner (1997) and Aw et al. (2000) for pioneering papers in this field). However, the finding that exporters outperform non-exporters has been challenged for China.

First, Lu (2010) shows that exporting Chinese manufacturing firms have a labor productivity about 10% lower than their non exporting counterparts. His accounts of this productivity gap emphasizes endowment-based comparative advantages. In a model a la Melitz (2003) extended to take account of Hesksher-Ohlin theory, Dan Lu shows that when firms in a labor abundant country such as China export to developed countries, their comparative advantage makes it easier to enter foreign markets for labor-intensive goods. Thus, in the case of China, these foreign markets are less competitive than the domestic market for Chinese labor intensive firms: less productive firms sell only to foreign markets while the survivors in the more competitive domestic market are more productive. In the case of capital intensive sectors the reverse applies: the foreign market is more competitive because rental costs are lower and foreign firms have lower costs, so, less productive Chinese firms sell in the domestic market and the more productive firms export. As a result, in the case of Chinese firms, relatively more productive companies export in capital intensive sectors while relatively less productive firms export in labor-intensive sectors.

Second, Dai et al. (2016) offers an alternative explanation, emphasizing that GVCs rather than comparative advantage and domestic market size are the main determinants of the absence of an export premium for Chinese manufacturing firms. Combining firm-level information with Chinese Customers information at the transaction level, they differentiate firms according to their degree of involvement in processing trade. They show that Chinese exporters involved mainly in processing trade significantly under-perform both Chinese firms involved mainly in ordinary trade and non exporting Chinese firms. Specifically, they found average tfp gaps of about 35% and 24% respectively with tfp estimated through the Olley and Pakes (1996) methodology. Moreover, they show that in all sectors, i.e. both labor intensive and capital intensive sectors, processing trade firms push down the average performance of exporters relative to that of non-exporters. Overall, they show that only processing trade firms have counter Melitz properties, and conclude that processing trade (rather than relative market size coupled with comparative advantage) is the main reason for the abnormal negative export premiums found for China[10].

The present paper contributes to this research stream by providing new evidence on the relative performance of processing exporters for another important emerging economy - Vietnam. Vietnam is an interesting case because like China, it plays a large part in GCVs but unlike China, its domestic

[10]Alongside these two alternative explanations, Li et al. (2016) provides a complementary insight on the productivity puzzle related to Chinese exporters. This paper points to a potential systematic under-estimation bias related to the productivity of processing firms in emerging economies due to lack of firm-level information on prices. Li et al. (2016) argues that if industry level prices are used to deflate firm output, and if processing firms systematically charge lower prices than other manufacturing firms, then their relative physical productivity is underestimated for instance in the estimates by Dai et al. (2016). We discuss this issue in more depth in the data section below; since we lack information on firm prices it is possible that the productivity computations in our paper could suffer from the same limitation.

market size is small compared to the world market. So far, very few firm-level studies focus on the export behavior of firms in Vietnam, and those that do use a limited data set taken from the Productivity and the Investment Climate Enterprise Survey of Vietnam (Vietnam PICS) conducted by the World Bank in 2005. The PICS database covers 1,150 firms in the manufacturing sector in Vietnam based on a random sampling methodology. It has been used to investigate various firm export related issues [11].

The papers in this literature strand that are most closely related to the present study are those by Hiep and Ohta (2007), Hiep and Ohta (2009) and Nguyen Hiep (2009). The first two papers emphasize the role of entry costs and the heterogeneous characteristics of firms in the decision to export, and the causality between exporting and firm characteristics. The third paper investigates the impact of firm characteristics, perceived competition intensity and domestic market constraints on the intensity of its exports. In these papers, Vietnamese exporters are shown to be larger on average, to be more experienced and to be more productive. However, when testing for self-selection, Nguyen Hiep (2009) show that productivity is not a relevant predictor of the firm beginning to export. Only firm size, experience and foreign ownership are significantly and positively related to the probability of starting to export.

Unlike these earlier studies, our analysis is based on the large scale ASOE data provided by GSO which covers all firms registered in Vietnam over the period 2000 to 2013. So far, very few researchers have used those data. Ha and Kiyota (2014) use GSO data to estimate the relationship between market liberalization and aggregate productivity growth in Vietnamese manufacturing, decomposing aggregate productivity growth into the effects of firm growth, resource reallocation, and entry and exit. Bai et al. (2017) uses GSO data to study the relationship between firm growth and provincial State corruption. Closer to the present paper, Chu and Kalirajan (2011) examine the impact of trade liberalization on the technical efficiency of Vietnamese manufacturing firms, Newman et al. (2017) consider learning by exporting, and Ni et al. (2015), Ni (2016) and Pham (2016) investigate the spillover and crowding out effects of (FDI) on local Vietnamese firms. While those previous papers are related to our research interest, none of them provides a systematic comparison of productivity and wages in Vietnamese processing exporters compared to ordinary exporters and non-exporters.

3 Data

The ASOE survey has been conducted annually by GSO since 2000. The data cover firms operating in all economic sectors including agriculture, manufacturing, construction and services. Firms included in the survey are all registered firms that were in operation on the December 31 of the previous year. The survey information includes: firm identifiers (tax registration number), assets and liabilities, number of employees, turnover, wages, capital stock, main industry (at the 5-digit level), obligation to government,

[11] Nguyen et al. (2008) use data from the 2004 World Bank survey to estimate an export equation for small and medium-sized enterprises (SMEs) to examine the effect of innovation on export propensity. They find that in their sample innovation causes exports. However, there is no treatment of productivity variables in this study. Anwar and Nguyen (2011) use the same data set to estimate an export equation using firm-level data for Vietnam to show the spillover effects of FDI on the exporting behavior of domestic firms. They do not control for the effects of productivity and other firm characteristics

exports, imports, debts, date of establishing, etc.

In the context of our analysis, ASOE data provide the following advantages. First, the survey is comprehensive (it includes all registered firms in Vietnam). Second, it includes relevant accounting information on outputs, inputs and exports, although with some limitations (see below). Third, it includes information that allows us to identify the firms ownership and type of trade.

In the case of ownership, the ASOE survey provides information on the participation of foreign capital in the firms corporate structure which allows us to identify domestic firms and foreign owned firms. In this paper, we follow the generally accepted definition of a foreign-owned firm as *"an enterprise resident in one economy and in which an investor resident in another economy owns, either directly or indirectly 10% or more of its voting power if it is incorporated or the equivalent for an unincorporated enterprise"* (OECD, 2008).

In the context of trade regime, while the ASOE data do not include information on the nature of firms transactions, they provide information that allows us to *indirectly* infer the likelihood that the firm is involved primarily in trade processing or in ordinary trade. First, ASOE survey data allow us to identify whether a firm declares export revenues higher than turnover values . As Vietnams accounting rules require export-processing firms to declare as turnover only the earnings from processing and as exports, the sale values of the processed goods [12], firms which report large export values as regards their turnover values are likely to be involved primarily into processing trade. Conversely, firms which declare export values significantly lower than turnover values are likely to be involved primarily in ordinary trade[13]. We then chose to use *firm export intensity* defined as exports over turnover ratio, as a key variable to discriminate ordinary versus processing exporters. Specifically, we set an export intensity threshold above 90% to discriminate firms more likely to be involved primarily in processing trade [14].

The ASOE dataset allows us also to identify export processing firms by the mean of information on the firm location in or outside of a special economic zone. Special economic zones in Vietnam include not only dedicated export processing zones but also industrial parks, and other special economic zones which can host export processing firms[15]. Indeed, according to the Vietnamese law, "*export processing firms are firms located and operating in an export processing zones or firms located and operating in any*

[12]According to article 8 of law no 14/2008/QH12 on Enterprise Income Tax,"*turnover is total sales, processing remuneration, service provision charges, subsidies and surcharges enjoyed by enterprises*". Also according to circular no 200/2014/TT-BTC guiding accounting policies for enterprises, "*in case units only process materials, goods, then turnovers are actual amount of money earned, not including values of materials, goods processed*". Note that these rules are consistent over our period of analysis. Specifically, decree N 30/1998 related to the implementation of the law for enterprise income tax, stipulates that "*the turnover to calculate taxable income shall be the value of sales for produced goods and the values of earnings of processing goods including labor wages, cost of fuel, power, auxiliary materials and other costs of services*."

[13]In most existing studies, firms with export values above turnover values are excluded from the sample to avoid export intensity values larger than 1 (see for instance the cleaning procedures implemented by (ISGEP, 2008) to compare export premiums across 14 different countries). However, in most countries, such firms represent a small percentage of the firms surveyed. In the case of Vietnam, discarding all the observations with export values higher than turnover values would lead to the exclusion of nearly 50% of exporting firms in our sample.

[14]We set the threshold export value at 90% of the firm turnover instead of 100% because in the ASEO data, export values are reported in U.S. dollar while turnover values are reported in Vietnam Dong. Taking account of exchange rates variations, slightly lower values of exports compared to turnover could be the result of mis-measurement. In any case, we tested the robustness of our results to changes in the export intensity threshold. Our results are robust to a change in the export intensity threshold from 90% to 100% (See the robustness check section).

[15]See detail in Appendix A.

special economic zone and exporting all their output" (see decree No. 29/2008/ND-CP).

According to this rule, we decided in our preferred specifications, on a conservative definition (hereafter baseline definition) of a processing firm as a firm that declares an export value higher than 90% of its turnover value and which is located in a special economic zone. For robustness checks purpose, we also consider two alternative definitions. Our first alternative definition (hereafter Alternative Definition 1) is less strict than our baseline definition: it identifies a processing exporter as a firm that declares export values higher than 90% of its turnover values whatever its location. Our second alternative definition (hereafter Alternative Definition 2) is stricter than our baseline definition: it identifies as processing exporters, only firms declaring export values higher than 90% of their turnover values and located in an export-processing zones.

In our analytical context the ASOE data set has also some limitations. The main shortcoming is that export values are reported for the first year 2000, and thereafter for each year over the 2010-2013. Thus, we are unable to fully exploit the panel dimension of our sample.

A second important limitation is related to the information on output and input. While we dispose from relevant information on firm turnover, number of employees, total labor cost, fixed capital, annual depreciation on fixed assets and taxes[16], we lack key information on firm material consumptions, on firm investment and on firm input and output prices. The absence of firm material consumptions and firm investment data precludes us to use semi-parametric methods, to estimate the firm tfp (see Wooldridge (2009) for a recent example and Ornaghi and Beveren (2011) for an overview.). We then follow Ha and Kiyota (2014) and compute tfp by means of a (non-parametric) relative index approach[17]. We also use labor productivity as a simple alternative measure.

In both cases, i.e. labor productivity and tfp index, we choose as output variable, the firm real value added that we compute by an additive method as the sum of total labor costs, annual depreciation of fixed assets, operating profits before tax and other taxes on production [18]. In the context of our present study, this choice has a specific advantage which is to ease the comparison of firm output across our different types of exporters. However, as we still lack firm-level information on prices, our tfp measures is not insulated from the potential bias of underestimation of the physical productivity of processing firms emphasised by Li et al. (2016).

A last limitation of the GSO data is that industry classifications changed during the period of observation. From 1993 to 2006, the Vietnam Standard Industrial Classification (VSIC) was based on the International Standard Industrial Classification revision 3 (ISIC Rev.3). From 2007, VSIC 2007 was applied and was based on ISIC Rev.4 and the ASEAN Common Industrial Classification (ACIC). To achieve consistent industry codes for the whole sample period (2000-2013), we converted the 2000-2006 data industry codes (VSIC 1993) to the new classification system (VSIC 2007) using a 4 digit level concordance

[16]See the detailed definition of our main variables in Appendix B.

[17]See the full description of the methodology in Appendix B.

[18]As Ha and Kiyota (2014), we have to use this additive method because value added is not directly observed in the GSO data.

table provided by GSO.

In order to build a workable data set using GSO data, we applied the following cleaning procedures. First, we restricted our sample to manufacturing firms and to firms above 10 employees. Applying these restrictions make our descriptive statistics more comparable to those for other countries since most firm-level databases available worldwide include size thresholds[19] and focus on manufacturing. Second, we retained only firms with no missing information for output, labor, capital and wages. Also, we dropped all observations for which our computed firm value added was larger than the reported firm turnover[20]. Finally, we assigned a single industry code to each firm based on the industry code that prevails for the majority of the surveyed years for that firm. All in all, after the cleaning process, this provides a sample of some 4,400 manufacturing firms for the initial year 2000, and some 24,000 for the final year 2013, which represents, about 45% of the firm number of the original sample, 85% of total turnover, 72% of total employment, and 60% of total export values, on average, per year.

Table 1 provides an overview by industry of our firm sample for the initial year 2000, and for the final year 2013. The first column presents the distribution of Vietnamese firms across 15 manufacturing sectors s. Columns 2, 3 and 4 aggregate the firm statistics to provide the relative weight in employment, turnover and exports of each industry.

Overall, Table 1 shows that the number of firms, total employment, total turnover and total exports strong increased from 2000 to 2013. Over this period, the number of firms increased four-fold while the values for labor,turnover, and exports increased respectively by a factor of 5, 18, and 100. Some sectors show much higher rates of growth compared to others especially for exports. While the largest exporting industries in 2000 were, by order of importance, the *Food, beverage & tobacco* industry, the *Clothing & leather* industry, and the *Machinary & apparatus* industries. In 2013, they are respectively the *Clothing & leather* industry, the *Wood & paper* industry and the *Chemicals & rubber plastics* industry.

Table 2 presents the sample broken down into exporters and non-exporters. Following the previous discussion, we further differentiate exporters according to their export intensity (hereafter EI). Specifically, we separate firms with EI lower than or equal to 90% from firms with EI higher than 90%. Table 2 shows that in 2000, exporters with $EI \leq 90\%$ accounted for 18% of total firms and 28% of total exports while exporters with $EI > 90\%$ represented only 14% of total firms but 72% of total exports. Compared to 2000, in 2013, the share of exporters in the total number of firms fell from 31% to 25% [21].

What is most striking in table 2 is that the share in total exports of exporters with $EI > 90\%$ rose to 96% in 2013. As for their share in employment, it rose from 33% in 2000 to 43 % in 2013. By contrast, the share of non-exporters in total employment fell from 34% to 26% while the share of exporters with $EI < 90\%$ remains stable over the period, around 30%. A last interesting feature is that, despite their

[19]For instance, ISGEP (2008) which provide comparisons of export premiums across 14 countries, report size thresholds for all countries. The papers by Lu (2010) and Dai et al. (2016) present evidence based on a sample of Chinese firms with a size threshold based on sales.

[20]This procedure leads to the exclusion of about 7% of our observations, mainly about non exporting firms of our sample.

[21]This is evidence of the rapid development of the manufacturing industries in Vietnam during 2000-2013. Many new domestic firms entered those industries which drove down export participation rates

Table 1: Our firm sample: breakdown by industry, 2000 and 2013

ID	multicolumn1c **Industry**	**2000**					**2013**				
		Firms		**Labor Value**	**Turnover Value**	**Exports Value**	**Firms**		**Labor Value**	**Turnover Value**	**Exports Value**
		Number	(% of total)	(% of total)	(% of total)	(% of total)	Number	(% of total)	(% of total)	(% of total)	(% of total)
1	Food, beverage & tobacco	1191	27%	19.2%	29.7%	28.5%	2833	11.7%	9.4%	19.2%	8.8%
2	Textile products	380	8.7%	26.2%	11.3%	26.7%	3220	13.3%	40.4%	9.1%	24.6%
3	Clothing & leather	752	11.92	34.32	11.99	33.12	3229	13.35	38.87	9.01	24.87
4	Wood & paper	575	13.1%	7.4%	4.9%	8.4%	2817	11.6%	4.2%	3.6%	24.4%
5	Printing. publishing & recording	198	4.5%	2.3%	2.2%	0.2%	1301	5.4%	1.3%	1.2%	0.6%
6	Chemicals, rubber plastics	473	10.8%	8.8%	11.4%	5.4%	2847	11.8%	6.9%	10.1%	17.4%
7	Pharmaceuticals	81	1.9%	1.8%	2.3%	0.4%	201	0.8%	0.6%	0.8%	0.0%
8	Mineral products	465	10.6%	10.1%	8.0%	1.1%	2127	8.8%	4.8%	4.1%	0.3%
9	Basic metal & metal products	301	6.9%	6.9%	7.5%	3.1%	3784	15.6%	5.7%	9.9%	3.2%
10	Computer & electronic products	62	1.4%	1.4%	3.4%	2.9%	379	1.6%	5.8%	6.8%	2.3%
11	Machinery & apparatus	62	1.4%	1.6%	5.2%	10.6%	1185	4.9%	5.1%	20.2%	8.2%
12	Motor vehicles	74	1.7%	1.3%	2.6%	0.4%	225	0.9%	2.0%	3.2%	0.8%
13	Transportation equipments	112	2.6%	2.2%	4.6%	1.5%	286	1.2%	1.8%	4.0%	0.8%
14	House equipments	172	3.9%	2.2%	0.9%	1.3%	1435	5.9%	5.8%	2.7%	2.2%
15	Manufacturing. n.e.c	40	0.9%	0.8%	0.5%	1.8%	501	2.1%	2.6%	1.2%	1.2%
	Total	4378	100%	100%	100%	100%	24225	100%	100%	100%	100%

Reported values for Labor, Turnover and Exports are respectively the shares of the sum of firms numbers of employees, firm turnover values, and firm export values, by industry, over the corresponding values for the total firm sample.
Source: own calculations.

Table 2: Our firm sample: breakdown by firm type, 2000 and 2013

	Firm number % of total	**Labor % of total**	**Turnover % of total**	**Exports % of total**
2000				
Non-exporters	69%	34%	31%	0%
Exporters with $EI \leq 90\%$	18%	33%	45%	28%
Exporters with $EI > 90\%$	14%	33%	24%	72%
2013				
Non-exporters	75%	26%	24%	0%
Exporters with $EI \leq 90\%$	15%	30%	41%	4%
Exporters with $EI > 90\%$	10%	43%	35%	96%

Reported values for Labor, Turnover and Exports are the shares of the sum of firms numbers of employees, firm turnover values, and firm export values, by firm type, over the corresponding values for the entire firm sample.
Source: own calculations.

very high contribution to total exports and their large share in employment, exporters with $EI > 90\%$ account for a relatively low share of total turnover, i.e. 35% as compared to 43 % for exporters with EI ¡ 90%. This feature is consistent with the idea that most of the firms with $EI > 90\%$ are firms primarily involved in processing trade that declare their earnings from processing as their turnover, but the value of the processed goods as exports.

Table 3 presents the sample based on firm ownership (domestic vs. foreign owned) and firm location (in or out special economic zones). Table 3 shows that, although the majority of firms are domestic firms foreign firms have increased in number more than domestic firms. In fact, the number of foreign firms in 2013 increased by a factor of 7,5 compared to 2000, while the increase in domestic firms is by a factor of 5,2. In addition, foreign firms are more likely than domestic firms to be located in a special economic zone. In 2013, 70% of foreign-owned firms were located in this type of zones compared to only 11% of domestic firms.

Table 3: Our firm sample: breakdown by ownership and location types, 2000 and 2013

Ownership	**2000**	**2013**		
	All firms	**All firms**	**Firms out SEZ**	**Firms in SEZ**
Domestic	3867	20367	18161	2206
Foreign	511	3858	1144	2714
All	4378	24225	19305	4920

SEZ means Special Economic Zones.
Source: own calculations.

As firm location and firm export intensity are our two main criteria to discriminate processing exporters, we are interested in the extent to which these two criteria overlap. Table 4 presents the frequencies of exporters with EI higher or lower than 90% by main type of locations. In this table, we further discriminate special economic zones into export processing zones and other special economic zones, to see whether this differentiation matters in terms of the frequencies of exporters with $EI > 90\%$.

Table 4 shows that export processing zones host, indeed, an abnormally high % of exporters with

Table 4: Our firm sample: breakdown by exporter and location types, 2013

	Exporters Total nb. of firms	Exporters with $EI \leq 90\%$ (in %)	Exporters with $EI > 90\%$ (in %)
Export processing zones	215	22%	78%
Other special zones	2559	60%	40%
Non special zones	3396	61%	39%

Source: own calculations.

$EI > 90\%$ compared to other zones. Specifically, exporters with $EI > 90\%$ represent 78% of all exporters located in export processing zones while they represent 40% and 39% of the exporters located in other special zones and non special zones, respectively. These figures show that export processing zones are primarily dedicated to welcome firms involved in processing trade. Other special zones are more diverse: they host a majority of exporters with $EI \leq 90\%$ as non special zones do.

In the next section, we present basic statistics on Vietnamese exporters, emphasising their likelihood by industry, their export intensity distribution, and presenting their main characteristics by discriminating ordinary exporters from processing exporters.

4 On Vietnamese exporters

Following the earlier empirical literature on firm heterogeneity and export, Table 5 presents the main characteristics of Vietnamese exporters in terms of their likelihood to export, their average size (relatively to non-exporting firms) and their average export intensity. Since Vietnamese exporters are unequally distributed across manufacturing industries, we present descriptive statistics for each of our 15 industries separately.

In accordance with the results presented in Table 2, between 2000 and 2013, 9 out of 15 sectors registered a drop in the export participation rate. However, among exporters, average firm export intensities increased strongly in each of these sectors. On average, in 2013, the sectors showing the highest export participation rates are the *Motor vehicles* industry (57%), the *Computer and electronics* industry (47%), and the *Manufacturing, n.e.c.* industry (40%), and highest average export intensities occurred in the *Chemical and rubber plastics* industry (1193%), the *Manufacturing, n.e.c.* (716%),and the *Clothing & leather* industry (671%). Note that in 2013, average firm export intensity was above 100% in most sectors compared to only 3 out of 15 in 2000. Those sectors are also characterized by high average relative firm size of exporters (in terms of number of workers). For instance, exporting firms are 8 to 10 times larger than their non-exporting counterparts, on average, in the *Clothing & leather* industry, the *Computer & electronics* industry, the *House equipments* industry, and the *Machinery & apparatus* industry.

Table 5: Firm participation rate, relative size & export intensity, by industry, 2000 and 2013

ID	Industry	2000			2013		
		PR[1]	RS[2]	EI[3]	PR	RS	EI
1	Food, beverage & tobacca	0,27	8,23	0,22	0,26	4,34	2,87
2	Textile products	0,45	4,41	0,30	0,33	4,91	2,35
3	Clothing & leather	0,78	4,39	1,41	0,40	9,75	6,71
4	Wood & paper	0,28	3,40	1,92	0,19	3,54	2,96
5	Printing, publishing & recording	0,06	1,95	0,03	0,06	4,25	1,98
6	Chemical, rubber plastics	0,36	2,76	0,21	0,30	4,31	11,93
7	Pharmaceuticals	0,26	1,91	0,05	0,29	4,08	0,05
8	Mineral products	0,15	1,12	0,09	0,11	3,63	0,08
9	Basic metal & metal products	0,22	3,88	0,15	0,15	5,94	1,47
10	Computer & electronic products	0,47	2,42	0,23	0,47	8,70	1,51
11	Machinery & apparatus	0,19	3,15	0,08	0,28	9,48	2,25
12	Motor vehicles	0,14	2,10	0,09	0,57	3,92	3,27
13	Transportation equipments	0,22	2,66	0,09	0,33	5,76	3,75
14	House equipments	0,40	4,95	0,42	0,33	8,26	1,31
15	Manufacturing, n.e.c	0,48	6,78	5,04	0,45	4,23	7,16

[1] PR is for Participation Rate computed as the number of exporters over the total number of firms by industry.
[2] RS is for Relative Size computed as the mean number of employees of exporters over the mean number of employees of non-exporters.
[3] EI is for Export Intensity computed as the mean ratio of firm export values over firm turnover values, for exporters only.
Source: own calculations

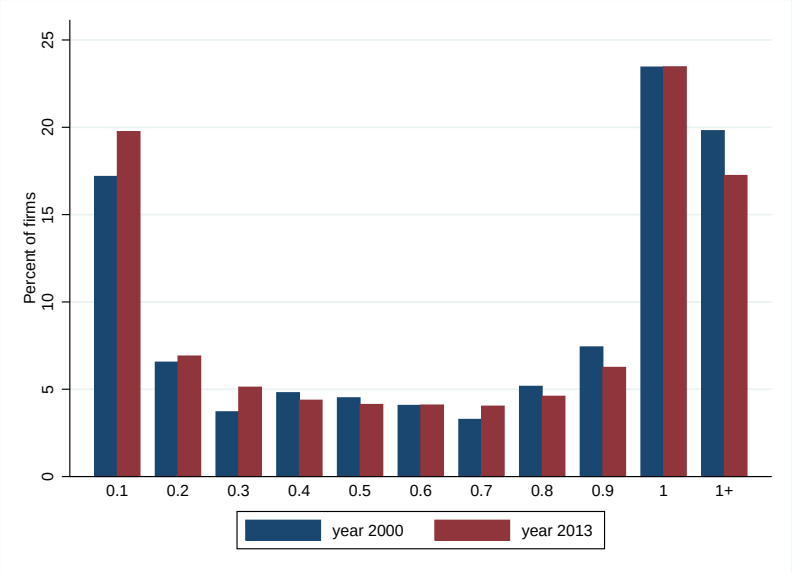
4.1 The U-shape pattern of firm export intensity

A major difference between industrialized and emerging countries is related to the distribution of firm export intensity. While in the industrialized countries this distribution is monotonically decreasing [22], the distribution is U-shaped in some emerging economies, especially those with large involvement in GVCs[23]. We investigate whether this U-shaped pattern holds also for Vietnam.

For the entire panel, figure 1 depicts the distribution of firms according to their export intensity at 10% intervals on the X axis, and the percentage of exporting firms belonging to each class of export intensity on the Y axis. According to this figure, in 2000 some 17% of exporting firms have export intensities of less than 10%, while the percentage with export intensities of higher than 90% is about 42. Among them, some 19% have export intensity above 100%. The pattern is very similar for the year 2013 with some 20% of exporting firms exhibiting an export intensity lower than 10% and some 40% of exporting firms showing an export intensity higher than 90%. Thus, in Vietnam there is a very large number of firms exporting most of their output, a pattern which contrasts to the case of industrialized countries. For instance, in the French case, firm export intensity shows a monotonic decreasing pattern (see Figure 2 in Bellone et al. (2006)) with about 47% of French exporters showing an export intensity lower than 10% and less than 5% showing export intensity higher than 90%. On the other hand, other emerging economies share the same pattern than the one we find for Vietnam. For instance, for China,

[22] See the references listed in footnote 6
[23] See the references listed in footnote 7.

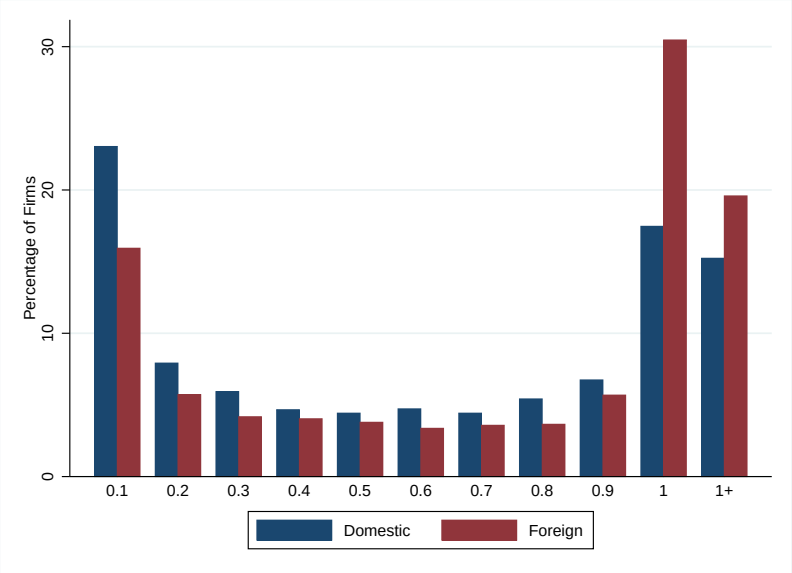
Figure 1: Histogram of Exporter's Export Intensity, 2000 and 2013



Lu (2010) shows that fewer than 20% of Chinese exporters sell less than 10% of their output abroad, while about 40% of them export more than 90% of their output[24].

This U-shaped distribution could be explained by the fact that many firms are foreign-owned and serve as exporting platforms for foreign countries. Therefore, they must sell a larger fraction of their output than domestic exporting firms. To test whether this argument might explain this pattern, figure 2 plots export intensities for the different groups of domestic and foreign owned firms for the year 2013.

Figure 2: Histogram of Exporter's Export Intensity, by ownership type, 2013

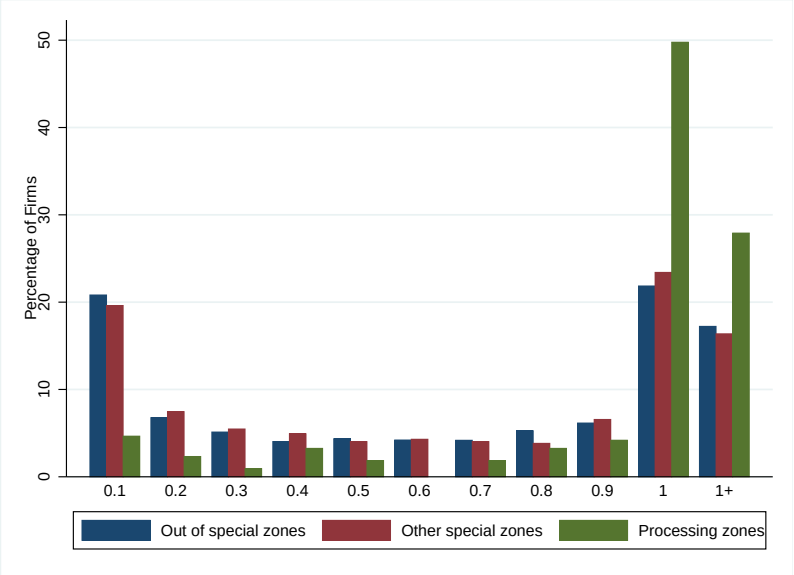


[24]For other references on emerging economies, see footnote 7.

Figure 2 indicates that foreign-owned firms export a larger fraction than domestic exporting firms; in fact, about 50% of foreign owned firms have export intensity higher than 90% while the same percentage for domestic firms is around 32. However, among domestic firms, the export intensity distribution is still U-shaped.

To further investigate the impact of processing trade, we plot the export intensity of firms by different location. Firms located in export processing zones are expected to export a larger fraction of their output than firms operating outside those zones. Also, we know that, according to the Vietnamese law, firms located in other special economic zones and exporting all their output can benefit from the status of export processing firms. We then discriminate further the other special economic zones from the non special zones.

Figure 3: Histogram of Exporter's Export Intensity, by location type, 2013



Certainly, as figure 3 indicates, the export intensity for the distribution of exporters operating in export processing zones is very skewed on the right, and almost unimodal, with about 78% of firms showing export intensity higher than 90% and less than 5% showing export intensity lower than 10% . Considering these distributions for the firms located in the other special zones and in the non special zones, separately, both distributions actually show a similar U shaped pattern with some 20% of firms with an export intensity lower than 10% and some 40 % of firms with an export intensity higher than 90%.

In sum, similar to other countries with strong involvement in GVCs, the distributions of export intensities of Vietnamese exporters exhibit a generally U-shaped pattern. This pattern prevails for global manufacturing in Vietnam but also within industry [25], and within our 3 main types of locations (export-

[25]More precisely, the pattern holds for each of the 15 manufacturing industries we considered except for the *Pharmaceuticals* industry (Distributions by industry are available upon request)

processing zones, other special zones and non special zones). Finally, the U-shape pattern holds for both foreign-owned firms and domestic-owned firms although it is more pronounced for foreign ones.

4.2 Comparative characteristics of ordinary and processing exporters

We now present some summary statistics on the main characteristics of exporters, differentiating them according to their (most likely) trade regime. As explained above, our data do not provide us with a direct information on the type of trade the firm is involved in, but provide us with two relevant information to indirectly infer the likelihood that a firm is primarily involved in export processing trade: the firm export intensity and the firm location[26].

Precisely, in our baseline definition, ordinary exporters are defined as exporters with export intensity equal of below 90% while processing exporters are defined as exporters with export intensity higher than 90% and located in a special economic zones[27]. In the paper, we also consider two alternative definitions for processing exporters. Alternative Definition 1 identifies as processing exporters all firms with export intensity higher than 90% whatever their location[28]. Alternative Definition 2 identifies as processing exporters only firms located in export-processing zones and declaring export values higher than 90% of their turnover values[29].

Table 6 presents some summary statistics of ordinary and processing firms, following our baseline definition while Table 7 below present the same summary statistics for our two alternative definitions of processing exporters.

Table 6 shows striking differences across ordinary exporters and processing exporters. While ordinary exporters are 3 times as large as non exporters on average[30], processing exporters are more than 9 times as large. Also, processing exporters are younger and more likely to be foreign-owned than ordinary exporters, on average. The most striking difference between export processing firms and ordinary exporters is the exports to turnover ratio, i.e. the firm export intensity. While ordinary exporters show an average export intensity of 34% [31], processing exporters shows an extraordinary high average export intensity of 3712%. This value is partly driven by outliers as shown by the median value which is much lower, of 100%. It can then be partly driven by measurement errors. However, it is also consistent with the accounting law in Vietnam which require export processing firms to report only the earnings from processing as turnover value and the sales value of the processed goods as export values.

Table 7 shows that the main relative characteristics of processing exporters are broadly consistent

[26] See the Data Section, page 6.

[27] The firms which have export intensity higher than 90% and are located outside special economic zones form a group of hybrid firms.

[28] According to this first alternative definition, the set of hybrid firms is empty.

[29] According to this second alternative definition, the set of hybrid firms is larger than in the baseline definition as it includes all firms that have export intensity higher than 90% and that are located outside export processing zones.

[30] This figure is very much in line with the earlier literature on firm heterogeneity and exports. For instance, Bellone et al. (2006) find that exporters were 3 times as large as non exporters on average in France in 2002.

[31] As for their average relative size, the average export intensity of ordinary exporters is in line with the earlier literature. For instance, ISGEP (2008) reports an average export intensity of manufacturing exporters ranging from 18 % in Colombia to 60% in China, for the early 2000's.

Table 6: Characteristics of firms by export type, 2013

	Obs	Mean	Median	Std. Dev.
Non-exporters				
Labor	18,055	61	23	187
Turnover	18,055	46136	7067	410791
Export	18,055	0	0	0
Export Intensity (EI)	18,055	0	0	0
Capital Intensity	18,055	114	61	288
Value Added	18,055	7116	978	116746
Labor Productivity	18,055	77.2	42.5	1712.1
Wage per employee	18,055	47.9	45.2	30.1
Age	18,055	7.6	6	5.9
Foreign	18,055	0.06	0	0.23
Ordinary exporters				
Labor	3658	346	114	944
Turnover	3658	380198	68844	1632842
Export	3658	93478	11262	372084
Export Intensity (EI)	3658	0.34	0.26	0.30
Capital Intensity	3658	199	89	456
Value Added	3658	57284	9868	272860
Labor Productivity	3658	163.1	70.58	362.3
Wage per employee	3658	70.7	60	51.5
Age	3658	10.5	9	7.6
Foreign	3658	0.39	0	0.49
Processing exporters (baseline definition)				
Labor	1185	915	237	2456
Turnover	1185	829462	104118	14900000
Export	1185	2821306	156729	22100000
Export Intensity (EI)	1185	37.12	0.997	484.54
Capital Intensity	1185	218.80	87.51	482.73
Value Added	1185	110396	18217	1500255
Labor Productivity	1185	112.24	64.43	151.26
Wage per employee	1185	66.55	61.38	34.61
Age	1185	8.4	7	5.3
Foreign	1185	0.85	1	0.36

Reported value for labor is the number of employees. The unit of the reported values for turnover, export, and value added is million VND (1 million VND is about 44 US dollar). Wage per employee is the average wage per employee and per year in million VND. Labor productivity is computed as real value added over labor (see details in Appendix B). Age is the difference between the current year and the year of establishment of the firm. Foreign is a dummy variable which takes the value 1 if the firm has at least 10% of foreign-owned capital. Our baseline definition of processing exporters identifies processing exporters as exporters with export intensity higher than 90% and located in an special economic zone.
Source: own calculations.

Table 7: Characteristics of processing exporters: alternative definitions

	Obs	Mean	Median	Std. Dev.
Processing exporters (alternative definition 1)				
Labor	2512	726	178	2487
Turnover	2512	469739	59273	10200000
Export	2512	3071177	89281	39900000
Export Intensity (EI)	2512	36.70	0.998	393.61
Capital Intensity	2512	137	45	351
Value Added	2512	66786	10970	1034725
Labor Productivity	2512	84.1	50.5	120.0
Wage per employee	2512	61.5	56.3	35.5
Age	2512	9.0	8	6.1
Foreign	2512	0.57	1	0.50
Processing exporters (alternative definition 2)				
Labor	167	950	315	2679
Turnover	167	347854	132167	753785
Export	167	2808611	194764.5	22000000
Export Intensity (EI)	167	33.51	0.995	343.43
Capital Intensity	167	158	80.82	203
Value Added	167	69112	22042	173815
Labor Productivity	167	97.15	64.48	111
Wage per employee	167	70.2	68.49	23
Age	167	12.1	12	5
Foreign	167	0.96	1	0.20

Reported values are defined as in the preceding table. Our alternative definition 1 of processing exporters identifies processing exporters as exporters with export intensity higher than 90%. Our alternative definition 2 identifies processing exporters as exporters with export intensity higher than 90% and located in an export processing zone.
Source: own calculations.

across our different definition of processing exporters. For instance, the size gap between processing exporters and non exporters in abnormally large whatever the definition. However, it is slightly smaller (seven fold instead of nine fold) with the less strict alternative definition 1 and slightly larger (9,5 fold instead of nine fold) with the stricter alternative definition 2. According to the likelihood of foreign ownership, our alternative definitions are also consistent with our baseline definition in the sense that processing exporters appear to be more likely to be foreign owned than ordinary exporters whatever the definition. Finally, the average and median firm export intensities are also consistent across our alternative definitions of processing exporters.

5 Export premia under processing trade

In this section, we investigate whether Vietnamese exporters out-perform their non-exporting counterparts, and the extent to which these premiums are sensitive to the firms trade regime. We proceed in two steps: first, we regress our firm performances indexes on firm export status and some common control variables. Second, we run the same specification but add an interaction term between firm export status and a variable identifying the firms involvement in processing trade.

Recall that in our baseline specifications, we identify processing exporters as having an export intensity higher than 90%, and location in a special economic zone. For our dependent variables, we consider labor productivity, capital productivity, total factor productivity, and average wage per worker alternatively. Finally, in relation to our control variables, we introduce industry, year, and cohort fixed effects. Cohort fixed effects correspond to the number of years of establishment of the firms in our sample. We also introduce some firm-level variables to control for firm characteristics that might be related to firm performance regardless of export status and/or trade regime. Finally, it should be noted that all our control variables are contemporaneous with our dependent variables which means that our results should be interpreted with some caution as correlations between firm efficiency, export status, and export processing regime, and not as causality[32].

Specifically, we estimate the following equations:

$$Y_{ijkt} = \alpha + \beta_1 Exporter_{it} + \gamma D_{j,t,k} + \delta X_{it} + e_{it} \tag{1}$$

and

$$Y_{it} = \alpha + \beta_1' Exporter_{it} + \beta_2' Exporter_{it} * Processing_{it} + +\gamma D_{j,t,k} + \delta X_{it} + e_{it} \tag{2}$$

where Y_{it} denotes the dependent variable of interest (in logs) for firm i at time t, $Exporters_{it}$ is a dummy

[32]The lack of time variability of our data prevented us from using firm-level fixed effects and studying the impact of changes over time, which would have been an alternative way to deal with issues of potential endogeneity. More specifically only 10% of firms change their export status and less than 2% of firms change their foreign ownership status which may lead to unreliable results.

which equals one if firm i declare positive export values in year t, and $Processing_{it}$ is a dummy which equals one if firm i is identified as being primarily involved in processing trade in year t. In Equation (1), $D_{j,t,k}$ stands for industry j, year t and cohort k fixed effects and X_{it} stands for the vector of firm-level control variables which include firm size, ownership status and capital intensity (in logs) at time t.

Table 8 presents the results of our baseline regressions. The first two columns present the regression results with labor productivity as the dependent variable for specification (1) and (2) respectively. The remaining six columns present the same exercise with capital productivity, tfp, and average wage per worker as the respective dependent variables.

Table 8: Baseline estimation of export premiums under processing trade regime

	lnalp		**lnakp**		**lntfp**		**lnwpe**	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Exporter	0.113***	0.148***	0.111***	0.145***	0.113***	0.148***	0.119***	0.135***
	(0.00843)	(0.00855)	(0.00808)	(0.00819)	(0.00844)	(0.00856)	(0.00575)	(0.00584)
Exporter*Processing		-0.343***		-0.334***		-0.344***		-0.153***
		(0.0152)		(0.0146)		(0.0153)		(0.0104)
Foreign ownership	0.383***	0.432***	0.381***	0.429***	0.383***	0.432***	0.258***	0.280***
	(0.00947)	(0.00969)	(0.00908)	(0.00928)	(0.00948)	(0.00970)	(0.00646)	(0.00661)
Size	0.0656***	0.0704***	0.0637***	0.0684***	1.066***	1.071***	0.0360***	0.0381***
	(0.00278)	(0.00278)	(0.00266)	(0.00266)	(0.00278)	(0.00278)	(0.00189)	(0.00190)
Capital intensity	0.215***	0.217***	-0.773***	-0.771***	0.215***	0.217***	0.0909***	0.0917***
	(0.00196)	(0.00195)	(0.00188)	(0.00187)	(0.00196)	(0.00196)	(0.00134)	(0.00133)
Constant	2.985	2.216***	2.967	2.218***	-4.576	-5.484***	3.054	2.910***
	(5,063)	(0.0295)	(4,852)	(0.0283)	(5,069)	(0.0296)	(3,452)	(0.0202)
Observations	90,590	90,590	90,590	90,590	90,590	90,590	90,590	90,590
R-squared	0.262	0.266	0.683	0.685	0.774	0.775	0.245	0.246

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1) All values are net of industry, year and cohort specific effects. *lnalp*, *lnakp*, *lntfp* and *lnwpe* are respectively the log of labor productivity, capital productivity, tfp and wage per employee. Labor and capital productivity are real value added over, respectively, the number of employees and the real stock of capital. The tfp is computed by using the index methodology by Caves et al. (1982). the wage per employee is the firm total wage bill over the number of employees. Among explanatory variables, exporter identifies whether the firm-year declares positive export values. Processing identifies whether the firm-year has an export intensity higher than 90% and is located in a special economic zone. Size is the firm number of employees. Foreign ownership identifies whether at least 10 % of the firm capital is owned by a foreign investor. Capital intensity is real capital stock over the number of employees.
Source: Own calculations.

Table 8 shows that unlike their Chinese counterparts, Vietnamese exporters behavior is consistent with Melitz's model. On average, they are more productive and pay higher wages than their non-exporter counterparts. Specifically, Vietnamese exporters are about 11% more productive on average than non-exporters. This productivity premium is of the same magnitude whether it is computed in terms of labor productivity (having controlled for the firms capital intensity) or in terms of tfp[33]. Also, Vietnamese exporters pay a 13.5% higher average wage per employee than is paid by their non-exporting counterparts[34].

However, Table 8 shows also that these favorable characteristics are not shared in the same way by all exporters. In particular, processing exporters characteristics are the reverse of those of the average exporter in Vietnam: instead of out-performing non-exporters, on average, processing exporters under-perform non-exporters. Specifically, processing exporters are nearly 19.3% less productive than non-exporters, and pay some 1.8% lower average wages per employee. The magnitude of the productivity gap is similar to that identified in Dai et al. (2016) for Chinese processing firms which under-perform their non-exporting counterpart by 23% to 26% in terms of tfp depending on the tfp estimation methodology[35].

In order to make a direct comparison of the performance of processing exporters and ordinary exporters we run a third variant of our export premiums estimations which allows us to consider each group of exporters separately. Specifically, we estimate the following equation:

$$Y_{it} = \alpha + \beta_1 Ordinary_{it} + \beta_2 Processing_{it} + \beta_3 Hybrid_{it} + \gamma D_{j,t,k} + \delta X_{it} + e_{it} \quad (3)$$

where Y_{it}, $D_{j,t,k}$ and X_{it} are defined as before (see specifications (1) and (2) above), and where $Ordinary_{it}$, $Processing_{it}$ and $Hybrid_{it}$ are dummy variables which identify the three possible groups of exporters in our sample, namely: firms whose export intensity is lower than 90% which constitute the group of ordinary exporters, firms located in a special economic zone whose export intensity is higher than 90% and which form the group of processing firms, and firms located outside a special economic zone whose export intensity is higher than 90% which form the group of hybrid firms.

Table 9 present the results of regression 3. It shows that ordinary exporters outperform their non-exporting counterparts by 22.5% on average in terms of tfp, and that they pay 15.3% higher wages, on average. This finding confirms that the criterion of export intensity higher than 90% is important to discriminate low productivity exporters whatever their location. Indeed, hybrid exporters, like processing exporters, under-perform non-exporters, although to a lesser extent.

Overall, the tfp gap between ordinary exporters and processing exporters is more than 40%. Although

[33] As Lileeva and Trefler (2010) emphasizes on purely empirical grounds, value added per worker is highly correlated with tfp, and the results using tfp typically carry over to labor productivity.

[34] The coefficients of the firm-level control variables are as expected based on the previous literature. Firm size, capital intensity, and foreign-ownership are all positively correlated to our firm productivity and wage indexes. In particular, foreign-owned firms appear to be 38% more productive than their domestic counterparts.

[35] Our specification is virtually the same as the one in Dai et al. (2016) although they do not control for firm age. However, our work shows two main differences: First, Dai et al. (2016) are better able to identify processing exporters since their study relies on transactions data where firms declare the trade regime under which they export. Second, Dai et al. (2016) estimate firm tfp using different parametric methods rather than an index which is the approach we adopted.

Table 9: Baseline estimation of export premiums by exporter type

	lnalp	**lnakp**	**lntfp**	**lnwpe**
	(1)	(2)	(3)	(4)
Ordinary Exporter	0.225***	0.221***	0.225***	0.153***
	(0.00928)	(0.00889)	(0.00929)	(0.00635)
Processing Exporter	-0.197***	-0.191***	-0.198***	-0.0186*
	(0.0160)	(0.0153)	(0.0160)	(0.0110)
Hybrid Exporter	-0.0835***	-0.0820***	-0.0835***	0.0802***
	(0.0139)	(0.0134)	(0.0140)	(0.00954)
Foreign ownership	0.431***	0.428***	0.431***	0.280***
	(0.00966)	(0.00926)	(0.00967)	(0.00661)
Size	0.0715***	0.0695***	1.072***	0.0384***
	(0.00277)	(0.00266)	(0.00278)	(0.00190)
Capital intensity	0.213***	-0.775***	0.213***	0.0909***
	(0.00196)	(0.00188)	(0.00196)	(0.00134)
Constant	2.982	2.965	-4.579	3.064
	(5,036)	(4,826)	(5,042)	(3,447)
Observations	90,590	90,590	90,590	90,590
R-squared	0.270	0.686	0.776	0.247

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
All values are net of industry, year and cohort specific effects.
Dependant variables, *lnalp*, *lnakp*, $lntfp$ and *lnwpe*, are defined as in Table 8. Among explanatory variables, ordinary exporter identifies whether the firm-year has an export intensity lower or equal to 90%. Processing exporter identifies whether the firm-year has an export intensity higher than 90% and is located in a special economic zone. Hybrid exporter identifies whether the firm-year has an export intensity higher than 90% and is located outside a special economic zone. Firm size, foreign ownership and capital intensity are defined as in Table 8.
Source: Own calculations.

large, this gap is in line with the 35% to 38% gap identified by Dai et al. (2016) in the case of Chinese manufacturers (depending on the methodology used to estimate tfp). This gap could be explained in part by price differences across processing and non-processing firms, rather than being a real physical efficiency gap.

We are interested also in the extent to which the productivity gap between exporters and non-exporters is as Lu (2010) suggest, sensitive to the capital intensity of the underlying production technology. At first sight, our findings for Vietnam give little support to Lu (2010)'s theory that in economies highly specialized in labor intensive manufacturing sectors, exporters will under-perform non-exporters, on average. However, we are interested in whether Vietnamese data support the view that exporter premiums are smaller for firms operating in labor intensive sectors. We follow Lu (2010) and in Figure 4 plot the mean level of log value-added per worker for ordinary and processing exporters on the one hand, and non-exporters on the other hand, across different capital labor ratio bins.

Figure 4: Ordinary and processing exporters versus non-exporters productivity across different K/L bins

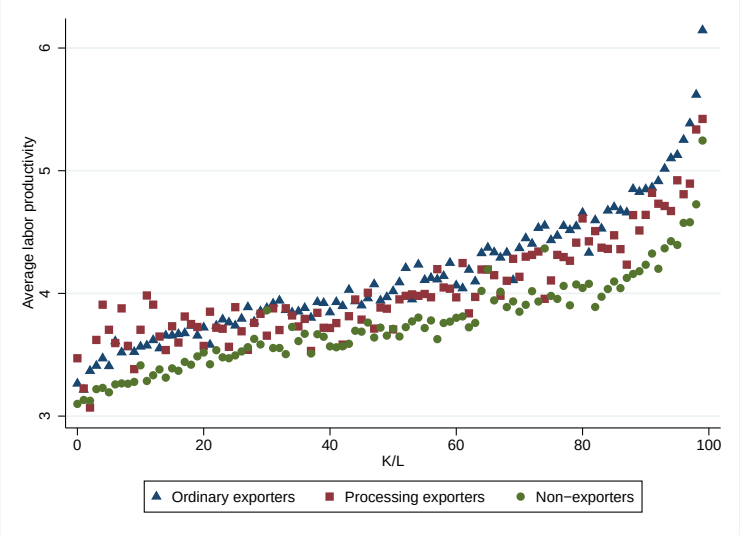


Figure 4 depicts a pattern that could be consistent with export premiums being smaller for labor intensive goods producers[36]. Moreover, Figure 4 shows that the apparent productivity advantage of ordinary exporters over processing exporters is larger among firms producing capital intensive goods. In short, although our findings do not fully support the findings in Lu (2010), they are in line with the idea of a systematic relationship between capital labor ratio and export premiums in emerging economies[37].

We propose a last exercise for export premiums, consisting of computing those premiums for the

[36]Note that in Figure 4; the average productivity of processing exporters is higher than the average productivity of non-exporters whatever the capital labor ratio bin. This finding might be seen as contradicting our previous econometric results; however, this is not the case. In fact, the pattern depicted in Figure 4 is purely descriptive. In particular, it does not control for the firms ownership status which is positively correlated to firm productivity. Since the proportion of foreign owned exporters that are processing exporters is much larger than the proportion of domestic firms that are export processing exporters, in Figure 4 composition effects are at play.

[37]To check that there is a systematic relationship between capital-labour ratios and differences in export premia, we re-estimate our baseline equations by including an interaction term between the export status and the capital-labor ratio. Results are always significant except for the wage per employee and available upon request.

separate sub-samples of domestic firms and foreign-owned firms.The previous findings for China showing that foreign-owned exporters are less productive than their non-exporting counterparts is due to the relatively low performance of purely exporting firms (Lu et al. (2010)). Table 10 and 11 present these export premiums in terms of relative tfp and average wage per employee for foreign-owned firms and domestic firms separately[38]. .

Table 10: Baseline estimations of export premiums for foreign-owned firms only

	lntfp		**lnwpe**	
	(1)	(2)	(3)	(4)
Exporter	-0.0307	0.0357*	0.0393***	0.0582***
	(0.0189)	(0.0196)	(0.0106)	(0.0111)
Exporter*Processing		-0.242***		-0.0689***
		(0.0199)		(0.0112)
Size	0.980***	0.990***	-0.0354***	-0.0326***
	(0.00648)	(0.00650)	(0.00364)	(0.00367)
Capital intensity	0.281***	0.287***	0.0951***	0.0967***
	(0.00586)	(0.00585)	(0.00330)	(0.00330)
Constant	-3.694***	-5.510***	3.535***	3.177***
	(0.242)	(0.0875)	(0.136)	(0.0494)
Observations	14,111	14,111	14,111	14,111
R-squared	0.710	0.714	0.254	0.256

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
All values are net of industry, year and cohort specific effects.
All variables are defined as in Table 8.
Source: Own calculations.

Overall, Tables 10 and 11 show that the productivity gap between processing exporter and their non-exporting counterparts in Vietnam is more pronounced for foreign affiliates[39]. Indeed, this productivity gap is around 24% for those firms and about 20% for the sub-sample of domestic firms. Another interesting finding is that, within the group of foreign firms, on average exporters do not outperform non-exporters. This is because the proportion of processing exporters is higher within the group of foreign-owned exporters than in the group of domestic exporters. This finding is in line with the findings in Lu et al. (2010).

[38]For reasons of space we do not report the results for labor and capital productivity. Note also, that our results are robust to the introduction of interaction terms rather than estimating two samples. These additional results are available upon request.

[39]We tested if this difference is statistically significant with a Chow test. Note that one important constraint of the traditional Chow test is that the null hypothesis allows for no differences between the groups. Thus, we reestimate the equation by including the group dummy and all interaction terms and then test joint significance of the interaction terms only. We strongly reject the hypothesis that the parameters are stable. Results are available upon request.

Table 11: Baseline estimations of export premiums for domestic firms only

	lntfp		**lnwpe**	
	(1)	(2)	(3)	(4)
Exporter	0.123***	0.134***	0.130***	0.134***
	(0.00937)	(0.00953)	(0.00667)	(0.00678)
Exporter*Processing		-0.209***		-0.0727***
		(0.0326)		(0.0232)
Size	1.107***	1.108***	0.0629***	0.0633***
	(0.00310)	(0.00310)	(0.00220)	(0.00220)
Capital intensity	0.204***	0.204***	0.0913***	0.0914***
	(0.00204)	(0.00204)	(0.00145)	(0.00145)
Constant	-4.680	-5.461***	3.085	2.893***
	(5,716)	(0.0310)	(4,065)	(0.0221)
Observations	76,479	76,479	76,479	76,479
R-squared	0.726	0.726	0.194	0.194

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
All values are net of industry, year and cohort specific effects.
All variables are defined as in Table 8.
Source: Own calculations.

6 Robustness Checks

In this section, we perform several robustness checks. First, we test whether our results are sensitive to changes in the definition of processing exporters. Second, by excluding firms with above 100% export intensity, we test whether our results are sensitive to potential measurement errors. Finally, we test the robustness of our econometric estimators.

Table 12 presents the results for the estimation of export premiums in terms of relative tfp and average wage per employee for our alternative definitions of processing exporters. Table 12 shows that our results for productivity premiums are robust to a change towards either a less strict definition (Alternative Definition 1) or a more strict definition of export processing firms (Alternative Definition 2). In both cases, processing exporters tfp appears even lower relative to non-exporters than in our baseline estimations. However, the largest productivity gap of 38% emerges if processing firms are defined strictly as firms located in export processing zones.

In relation to wages, the lower average wage paid by processing firms revealed by our baseline estimation is not robust to a change in the definition of processing firms. In the case of both of our alternative definitions, processing firms appear to pay wages which are 10% to 12% lower on average than those paid by their non-processing exporter counterparts. However they are almost identical to those paid by non-exporters.

The second robustness check tests whether our results are robust to measurement errors due to potential misreporting of export values in the GSO dataset[40]. We test for this potential measurement

[40]For instance, some misreporting could be due to the fact that export values are the only values in this database reported

Table 12: Robustness checks 1: Baseline estimations with alternative definitions of processing firms

	Alternative Definition 1			
	lntfp		**lnwpe**	
	(1)	(2)	(3)	(4)
Exporter	0.113***	0.230***	0.119***	0.157***
	(0.00844)	(0.00925)	(0.00575)	(0.00633)
Exporter*Processing		-0.361***		-0.118***
		(0.0120)		(0.00817)
Foreign ownership	0.383***	0.421***	0.258***	0.271***
	(0.00948)	(0.00951)	(0.00646)	(0.00650)
Size	1.066***	1.071***	0.0360***	0.0376***
	(0.00278)	(0.00277)	(0.00189)	(0.00190)
Capital intensity	0.215***	0.212***	0.0909***	0.0900***
	(0.00196)	(0.00195)	(0.00134)	(0.00134)
Constant	-4.576	-5.462***	3.054	2.920***
	(5,069)	(0.0295)	(3,452)	(0.0201)
Observations	90,590	90,590	90,590	90,590
R-squared	0.774	0.776	0.245	0.246
	Alternative Definition 2			
	lntfp		**lnwpe**	
	(5)	(6)	(7)	(8)
Exporter	0.113***	0.117***	0.119***	0.120***
	(0.00844)	(0.00844)	(0.00575)	(0.00575)
Exporter*Processing		-0.380***		-0.106***
		(0.0347)		(0.0236)
Foreign ownership	0.383***	0.394***	0.258***	0.261***
	(0.00948)	(0.00952)	(0.00646)	(0.00649)
Size	1.066***	1.066***	0.0360***	0.0361***
	(0.00278)	(0.00278)	(0.00189)	(0.00190)
Capital intensity	0.215***	0.215***	0.0909***	0.0909***
	(0.00196)	(0.00196)	(0.00134)	(0.00134)
Constant	-4.576	-5.466***	3.054	2.919***
	(5,069)	(0.0296)	(3,452)	(0.0202)
Observations	90,590	90,590	90,590	90,590
R-squared	0.774	0.774	0.245	0.245

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
All values are net of industry, year and cohort specific effects.
Alternative Definition 1 of processing exporter identifies whether the firm-year has an export intensity higher than 90% whatever its location. Alternative Definition 2 of processing exporter identifies whether the firm-year has an export intensity higher than 90% and is located in an export processing zone. Dependant variables, $lntfp$ and $lnwpe$, and other explanatory variables are defined as in Table 8.
Source: Own calculations.

error by checking whether our results hold if we exclude firm-year with export intensity higher than 100%. This exclusion leads to a reduction in our sub-sample of processing firms of about 50%. Table 13 presents the results of the export premiums reported in US dollars in terms of relative tfp and average wage per employee, for the sample restricted to observations with export intensity of less than or equal to 100%. Our results are robust to this restriction.

Table 13: Robustness checks 2: Baseline estimations excluding firms with $EI > 100\%$

	lntfp		**lnwpe**	
	(1)	(2)	(3)	(4)
Exporter	0.142***	0.168***	0.130***	0.141***
	((0.00880)	(0.00890)	(0.00602)	(0.00609)
Exporter*Processing		-0.343***		-0.145***
		(0.0188)		(0.0129)
Foreign ownership	0.414***	0.449***	0.270***	0.285***
	(0.00992)	(0.0101)	(0.00678)	(0.00690)
Size	1.074***	1.078***	0.0409***	0.0425***
	(0.00287)	(0.00287)	(0.00196)	(0.00197)
Capital intensity	0.215***	0.216***	0.0914***	0.0919***
	(0.00199)	(0.00199)	(0.00136)	(0.00136)
Constant	-3.900	-5.501***	3.560	2.902***
	(22,807)	(0.0300)	(15,589)	(0.0205)
Observations	87,070	87,070	87,070	87,070
R-squared	0.768	0.769	0.246	0.247

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
All values are net of industry, year and cohort specific effects.
All observations with export intensity higher than 100% has been excluded.
Dependant variables, $lntfp$ and $lnwpe$, and other explanatory variables are defined as in Table 8.
Source: Own calculations.

Finally, we run some robustness checks for our estimators. Since we cannot use firm-level fixed effects, we run the regressions using random effects to address potential omitted variables bias. We also use between effects and weighted least squares models. The former addresses the question of the effect of being a processing firm or not, between firms, while the latter handles potential heteroskedasticity.

The results of these alternative estimation methods are reported in Table 14 for export premiums computed in terms of relative tfp and average wage per employee. Columns (1)-(2), (3)-(4) and (5)-(6) respectively, present these results for the random effects model, the between effects model and the weighted least square models.

All estimation coefficients are broadly consistent with our baseline estimation. the largest productivity and wage gaps between processing exporters and non-exporting firms are found for the between effects model. According to this model, processing firms are about 30% less productive than their non-exporting counterparts and pay around 7% lower wages. The productivity disadvantage of processing firms is robust to all our estimations. The wage gap is confirmed with the weighted least square model but not

in US dollars; all other values are reported in millions of Vietnam DNG.

Table 14: Robustness checks 3: Alternative estimation models

	Random-effects		**Between-effects**		**Weighted least squares**	
	lntfp	lnwpe	lntfp	lnwpe	lntfp	lnwpe
	(1)	(2)	(3)	(4)	(5)	(6)
Exporter	0.101***	0.118***	0.175***	0.149***	0.152***	0.136***
	(0.00842)	(0.00594)	(0.0135)	(0.00906)	(0.00862)	(0.00562)
Exporter*Processing	-0.151***	-0.0639***	-0.478***	-0.227***	-0.324***	-0.148***
	(0.0155)	(0.0113)	(0.0232)	(0.0156)	(0.0159)	(0.00881)
Foreign ownership	0.398***	0.281***	0.428***	0.279***	0.412***	0.285***
	(0.0120)	(0.00828)	(0.0135)	(0.00908)	(0.0109)	(0.00640)
Size	1.033***	0.00972***	1.082***	0.0503***	1.075***	0.0402***
	(0.00345)	(0.00236)	(0.00386)	(0.00260)	(0.00280)	(0.00186)
Capital intensity	0.189***	0.0906***	0.230***	0.0911***	0.202***	0.0978***
	(0.00212)	(0.00145)	(0.00285)	(0.00191)	(0.00186)	(0.00139)
Constant	-5.265***	2.998***	-4.807	2.873	-4.928***	3.120***
	(0.0312)	(0.0212)	(12,794)	(8,603)	(0.819)	(0.543)
Observations	90,590	90,590	90,590	90,590	90,590	90,590
R-squared			0.827	0.270	0.764	0.261

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1) All values are net of industry, year and cohort specific effects. Dependant variables and explanatory variables are defined as in Table 8.
Source: Own calculations.

the random effects model.

7 Conclusion

In this paper, we presented evidence on the relative performance of Vietnamese manufacturing exporters discriminating between processing exporters and their non-processing counterparts. We showed that processing exporters in Vietnam usually exhibit low performance indexes relatively to both their non-processing counterparts and their non-exporting counterparts.

The performance gaps between processing exporters and non-processing exporters exist for both productivity and average wage per worker, and both gaps are confirmed by all our robustness checks. In our baseline estimations where firm size, capital intensity, ownership, and age are controlled for, these gaps are estimated at respectively 34% and 15% on average for the tfp gap and for the wage gap. We showed also that this gap is more pronounced for firms that use capital intensive technology compared to firms operating less intensive technology. Considering the performance gaps between processing exporters and non-exporting firms, in our baseline estimations processing exporters are shown to be 18% less productive than their non-exporting counterparts, and to 1.8% lower wages. However, only the productivity differential was robust to all our alternative specifications, while the wage differential turned from slightly negative to null or slightly positive depending on the specification. Finally, we showed that the productivity gap between processing and non-processing firms is more pronounced among the group of foreign-owned firms than among the group of domestic firms.

Overall, our findings confirm the idea that the relationship between firm productivity and exports is more complex in emerging economies than in industrialized countries. In particular, export premiums do not exist for all types of exporters. Also, firm export intensity is not monotonically (and positively) related to firm productivity. In that respect, our findings are in line with the previous literature which questions the role played by processing trade in economies strongly involved in GVCs.

Given these findings, a more detailed exploration of both the causes and the consequences of the low productivity of processing exporters in emerging economies would be beneficial. Possible alternative explanations for this low productivity might be related to differences in firms pricing strategies, differences in trade costs, or differences in physical efficiency between processing exporters and ordinary exporters. There might also be some strategies specific to foreign multinationals causing these performance gaps. In view of the consequences, it would be interesting to investigate how the establishment of processing firms in Vietnam has contributed to wage and productivity dynamics in Vietnam based on both selection effects and/or learning by processing mechanisms. However, such an investigation would require access to complementary data sources in Vietnam; more detailed information on the production and export activities of Vietnamese firms, their investment flows, and ideally, their pricing strategies is needed to complement the GSO firm-level information.

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Appendices

A Special economic zones in Vietnam

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There are three major types of special economic zones in Vietnam : *industrial parks* which are specialized in the production of industrial goods or provision of services for industrial production; *export processing zones* which are specialized in the production of export goods, provision of services for export goods production and export activities; *other special economic zones* which are zones that have a separate economic space with particularly favorable investment and business environments for investors. Economic zones are organized into functional areas: non-tariff area, bonded area, export processing area, industrial area, entertainment area, tourism area, urban area, residential area, administrative area and other functional areas suited to the characteristics of each economic zone.

GSO data provide information on whether the firm is located in an industrial park, an export processing zone, or another special economic zone. This information helps us to determine the likelihood that a firm is involved in trade processing. Indeed, according to decree no 29/2008/ND-CP of Vietnamese Law "*an export processing enterprise means an enterprise that is established and operates in an export processing zone or exports all its products and operates in an industrial zone or a special economic zone*. Also, according to this decree, "*All export processing enterprises may apply legal provisions applicable to non-tariff areas*". We use the information on firm location combined with information on firm export intensity (i.e. the ratio of firm export revenue to firm turnover) to categorize exporting firms as ordinary exporters or processing exporters (See the Data Section).

B Definition of our main variables

All nominal output and input variables are available at firm level. Industry level data are used for price indexes and depreciation rates.

Turnover. Nominal turnover is defined as total sales including sales of goods, and products and provision of services (such as providing transportation or travel services, leasing of fixed assets, construction contracts, etc.) plus remuneration from processing (not including materials and processed goods values) if the firm is a processing enterprise. Reported turnover is turnover excluding taxes. Real turnover is defined as nominal turnover deflated by the producer's price index (PPI) at the 2 digit industry level for the base year 2010.

Value added. Value added is not directly observable from GSO data, neither is intermediate goods consumption. We follow Ha and Kiyota (2014) and measure nominal value added by an additive method summing total labor costs, annual depreciation of fixed assets, operating profits before tax and other taxes on production. Real value added is then computed as nominal value added deflated by a by the producer's price index (PPI) at the 2 digit industry level for the base year 2010.

Total labor cost. Total labor cost includes wages and other income received by employees in the form of allowance and bonuses, and the employers contribution to social insurance, health insurance and trade union fees.

Annual depreciation of fixed assets. Annual depreciation of fixed assets is computed as the difference between the accumulated depreciation of fixed assets at the end and the beginning of each year. Following the circular no 45/2013/TT-BTC, accumulated depreciation of fixed assets is the total depreciation deducted from the production and business costs over the business cycles of fixed assets as of the reporting date. Accumulated depreciation of fixed assets is compiled directly from GSO data.

Other taxes on production. Other taxes on production consist of taxes that the enterprise is required to pay to the State to undertake production activities. They consist mainly of annual taxes on land ownership/land-use rights, buildings and other assets related to production. Since these taxes are not directly observable in GSO data, they are computed as the difference between total taxes and taxes on products including VAT (VAT on domestic selling goods/imported goods), tax on imported/exported goods, tax on income, and tax on special consumption.

Labor productivity. Labor productivity is computed as real value added over the number of employees. Real value added is value added deflated by PPIs at the 2 digit level of the industry classification.

Real capital stock. Following Ha and Kiyota, 2014, Real capital stock is measured as nominal tangible fixed assets divided by the manufacturing PPI. We cannot apply perpetual investment method here because we lack both information on firm investment and information on investment goods price deflator.

Capital productivity. Capital productivity is measured as real value added over real capital stock.

Capital intensity. Capital intensity is computed as real capital stock over the number of employees.

Input cost share. Input cost share is the sum of total labor cost and capital cost. For capital cost, we use nominal fixed tangible assets.

Labor input. Labor input is defined as total number of employees at the end of each year.

Wage per employee. the average wage per employee is defined as total labor cost over the number of employees.

Total Factor Productivity. We follow Ha and Kiyota (2014) and compute tfp by means of a (non-parametric) relative index approach first introduced by Caves et al. (1982) and extended by Good et al. (1997). This methodology was popularized in the firm trade and productivity literatures by Aw et al. (2001) and has been used in several papers (see in particular Bernard et al. (2006), Bernard et al. (2007), Kimura and Kiyota (2006), Bellone et al. (2008), Bellone et al. (2014)). This methodology is particularly suitable when we lack the information requires to apply more modern semi-parametric approaches such as the Levinsohn and Petrin (2003)'s methodology. In the case of GSO data, we unfortunately lack information on firm intermediate goods purchases and on firm investment.

Specifically, the relative index approach consists of computing the tfp index for firm i at time t as follows:

$$\ln TFP_{it} = \ln\ Y_{it} - \overline{\ln\ Y_t} + \sum_{\tau=2}^{t} \left(\overline{\ln\ Y_\tau} - \overline{\ln\ Y_{\tau-1}}\right) - \left[\begin{array}{l} \sum_{n=1}^{N} \frac{1}{2} \left(S_{nit} + \overline{S_{nt}}\right) \left(\ln\ X_{nit} - \overline{\ln\ X_{nt}}\right) \\ + \sum_{\tau=2}^{t} \sum_{n=1}^{N} \frac{1}{2} \left(\overline{S_{n\tau}} + \overline{S_{n\tau-1}}\right) \left(\overline{\ln\ X_{n\tau}} - \overline{\ln\ X_{n\tau-1}}\right) \end{array} \right] \quad \text{(A-1)}$$

where Y_{it} denotes output of firm i at time t using the set of n inputs X_{nit}.

Following Ha and Kiyota (2014), we use real value added (defined as explained above) as our firm output variable. In the context of our present study, this choice as a specific advantage as it eases the comparison of firm output across our different types of exporters. Indeed, as the firm turnover does not measure the same thing for producing firms and for processing firms (recall that turnover is primarily sales for the first type of firms and primarily earning from processing for the second types of firms), it is more appropriate to rely on a value added based measure of productivity to compare these two types of firms. In the case of inputs, input X is alternatively capital stocks (K) measured as explained above, and labor in terms of number of employees(L). S_{nit} is the cost share of input X_{nit} in the total cost (see the definition of capital and labor cost share above). Subscripts τ and n are indices for time and inputs, respectively. Symbols with upper bars correspond to measures for the reference point (the hypothetical firm), computed as the means of the corresponding firm level variables, over all firms in year t. Note that Eq.(A-1) implies that references points $\overline{\ln Y}$ and $\overline{\ln X}$ are the geometric means of the firm's output quantities and input quantities respectively, whereas the cost shares of inputs for representative firms $\overline{S}$ are computed as the arithmetic mean of the cost share of all firms in the dataset.

This multilateral productivity index measures the proportional difference in tfp for any firm i against the reference firm. It guarantees transitivity of any comparison between two firm-year observations in expressing each firms input and output as deviations from a single reference point. Finally, note that first-differencing the logarithmic values of our tfp index measures can be interpreted as gaps in percentage points if they remain small.

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