FOREIGN WORKERS AND INDIRECT EXPORTS: FIRM-LEVEL EVIDENCE FROM VIET NAM

Foreign workers and indirect exports:
Firm-level evidence from Viet Nam

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Acknowledgements

Abstract

This paper explores the link between the use of trade intermediaries and foreign employment and its implications for Vietnamese firms. The role of trade intermediaries – who "purchase from suppliers for resale to buyers or [...] help buyers and sellers to meet and transact" (Spulber, 1996) – is closely related to the export-enhancing role of foreign workers. We use a heterogeneous firm model to show that foreign employment favours the selection of firms into indirect exports as long as the gain realised by indirectly accessing all destinations is higher than the advantage to directly export to the destination of interest. We use a sample of foreign and domestic firms derived from the Viet Nam Industry Investor Survey 2010 by UNIDO. Using a two-stage Heckman selection model, we find evidence of a positive impact of foreign employment on the probability to export indirectly and – conditional on the export mode – on the export value. Our results suggest that the employment of foreign workers eases access to trade intermediaries.

Key words: Firm heterogeneity; Foreign employment; Trade intermediation; Viet Nam
JEL classification: F10, F12, F22, J61

1 Introduction

This paper explores the link of substitution between the use of trade intermediaries and foreign employment and its implications for Vietnamese firms' exports. Following Spulber (1996), a trade intermediary is defined as an economic agent who purchases products from suppliers for resale, or helps sellers and buyers meet and engage in transactions. International trade intermediaries allow manufacturers to set aside informational frictions that can prevent them from exporting directly by mitigating risks and by facilitating the matching between buyers and sellers. Schröder et al. (2005) distinguish between two types of intermediaries: *traders* who trade on their own account and *brokers* who work on commission for buyers and sellers.

A number of papers suggest that trade intermediaries account for a substantial share of trading activities. Intermediate trade represents about 10 per cent of U.S. exports in value (Bernard et al., 2007), 20 per cent of total French exports in value (Schröder et al., 2005; Crozet et al., 2013), 22 per cent of Chinese exports in value (Ahn et al., 2011), 17 per cent of Turkish exports in value (Abel-Koch, 2013) and 15 per cent of Swedish exports in volume (Akerman, forthcoming).[1]

Just like trade intermediaries, foreign workers – especially skilled individuals – increase exports at both trade margins (Rauch, 2001; Parsons and Winters, 2014). They convey information about their country of origin, they have general knowledge of foreign markets and are usually part of international business networks. They thus lower informational barriers and reduce both *ad valorem* and fixed export costs for their employing firm.

To the best of our knowledge, no bridge has so far connected the literature on trade intermediaries with that on foreign workers, although they seem to hold similar roles with respect to exporting firms. Based on this observation, one may wonder whether foreign workers could substitute trade intermediaries by helping firms export directly, or whether to foster the use of intermediaries by easing access to this mode of export thanks to their business network.

To address this research question, we use a simple heterogeneous firm model *à la* Melitz (2003) with an intermediation technology similarly to Ahn et al. (2011). In this framework, intermediary firms grant manufacturing firms indirect access to all export destinations. In line with Mitaritonna et al. (2016) and Marchal and Nedoncelle (2017), we assume that foreign employment reduces export costs and increases firm productivity. At the extensive margin, the model predicts that foreign employment favours indirect over direct exports, as long as the benefit to export directly to a given destination is lower than the gain realised by accessing all other destinations indirectly. At the intensive margin, foreign employment should foster more direct than indirect exports.

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[1]As noted by Bernard et al. (2015), the definition of an intermediary firm varies across empirical papers. While some papers identify wholesalers and/or retailers using information from the main activity of the firms contained in customs data (Akerman, forthcoming; Bernard et al., 2007, 2015; Blum et al., 2010; Crozet et al., 2013; Schröder et al., 2005), others derive information from firms' names (Ahn et al., 2011) or from surveys of firms (Abel-Koch, 2013; Grazzi and Tomasi, 2016; Fryges, 2007; McCann, 2013).

We test these theoretical predictions using a firm-level cross-section dataset for Viet Nam. Since the *Doi Moi* (Renovation) policy was introduced in 1986, the Vietnamese economy has been characterised by a high growth and a reduction of its poverty rate. This economic development has primarily been driven by the expansion of trade and investment (UNIDO, 2012). Incidentally, the country joined the World Trade Organization in December 2006. In 2010, Viet Nam was considered a lower middle-income country and its GDP *per capita* amounted to 1,333.6 constant US$ (World Bank data).

Specifically, we use a sample of foreign and domestic firms collected through the Viet Nam Industry Investor Survey 2010 by UNIDO. This dataset contains 1,493 firms across nine provinces and three main sectors of the Vietnamese economy (manufacturing, construction and utilities sectors). These firms account for about 70 per cent of total Vietnamese exports. In this dataset, indirect exports represent 3.18 per cent of total exports in value. Crucially, the dataset contains information on the labour force composition of firms in terms of skills and country of origin (native and foreign workers). We implement a two-stage Heckman selection model that allows us to correct a potential bias due to the endogenous nature of the selection process in direct or indirect exports. We find evidence of a positive impact of foreign employment on the probability to export indirectly and, conditional on the export mode, on export value. Our results suggest that foreign workers facilitate access to trade intermediaries. Our findings remain robust when we use an IV procedure to control for reverse causality and pass a number of robustness tests.

The contributions of this paper are the following. First, we analyse why some firms trade directly while others trade indirectly, by exploring how foreign employment determines this decision. Second, we extend the literature on the export-enhancing role of foreign workers by investigating their impact on their firm's export mode, considering that the literature focuses almost entirely on direct exports. Lastly, we focus our empirical analysis on Viet Nam. The welfare benefits of trade intermediation have been highlighted by Akerman (forthcoming). The analysis of indirect exports thus makes sense for a developing economy, the growth of which is mainly led by trade and investment.

The rest of the paper is organised as follows. We introduce the related literature in the following section. We present the UNIDO survey and a number of stylized facts in Section 3. In Section 4, we develop a number of theoretical predictions using a heterogeneous firm model that we then test with a two-stage Heckman selection model in Section 5. Finally, we conclude in Section 6.

2 Literature

2.1 The role of intermediaries in facilitating trade

Empirical evidence

The literature on trade intermediation is quite new and has been booming thanks to the increase in data availability. Schröder et al. (2005) were the first to study intermediation in foreign trade. Using French customs data for the years 1985, 1988 and 1990, they show that trade intermediaries are used to serve markets that are small and difficult to access. Intermediaries help firms manage export costs for these markets which are otherwise unreachable. The characteristics of export destinations have been studied in a number of empirical papers (Ahn et al., 2011; Akerman, forthcoming; Bernard et al., 2015; Crozet et al., 2013). These papers consistently show that the use of trade intermediation increases with the geographic and linguistic distance to the export destination and more generally with trade costs, and decreases with the market potential and the quality of institutions of the destination.

As regards the recent developments in the literature on firm heterogeneity, the majority of papers show that a firm's export mode is determined by its productivity or its size in terms of sales or employment. Fryges (2007) uses survey data of German and British firms in 1997 and 2003 to demonstrate that the size of a firm has a significantly positive effect on its probability to shift from indirect to direct exports. The authors interpret this result as evidence that large firms have sufficient resources to establish their own distribution network abroad. The majority of existing empirical papers find this sorting pattern: small firms sort in indirect exports and large firms in direct exports (Abel-Koch, 2013; Ahn et al., 2011; Akerman, forthcoming; Blum et al., 2010; Felbermayr and Jung, 2011; Grazzi and Tomasi, 2016).

Some papers also look at importers and how their import mode relates to their export mode. Using the BEEPS data, which consists of a cross-section of firm-level data for several countries in the 21st century, Grazzi and Tomasi (2016) find that when considering firms involved in both export and import activities, direct two-way traders are more productive on average than firms that trade indirectly on one of the two trading sides. The latter, in turn, are more efficient than indirect two-way traders.

Finally, some papers look at other firm-level or product-level determinants of trade intermediation. More specifically, McCann (2013) analyses whether multi-product firms tend to use more trade intermediaries than single-product firms. Using BEEPS data for Eastern Europe and Central Asia in the 21st century, they find that multi-product firms are more likely to export indirectly, although they tend to be more productive. Their results corroborate the idea that multi-product firms use mixed exporting strategies. They have smaller export sales per product, which makes the use of intermediation more attractive.

Crozet et al. (2013) examine how quality differentiation relates to the possibility of choosing intermediation as an alternative export mode. Using French firm-level data from 2007, they find that consistent with the fact that intermediary firms export the products of the least efficient firms, their prices are higher than those of direct exporters. Yet, this premium is lower for quality-sorting goods. Abel-Koch (2013), using a World Bank Survey conducted in Turkey in 2005, finds that product quality is on average negatively correlated with indirect as opposed to direct exports.

The theory

One of the first theoretical models of trade intermediation was proposed by Schröder et al. (2005). The authors use a model of monopolistic competition with intra-industry trade based upon the model of Krugman (1980), in which they explicitly distinguish between variable and fixed costs to trade to introduce a trade intermediary that can pool fixed export costs among exporting firms. They find that the use of intermediaries increases with the cost of accessing a market and decreases with the size of the export market.

The remaining literature rests upon a Melitz-type (2003) partial equilibrium model. Most papers are based on the assumption that intermediary firms are able to pool export costs across goods. More specifically, Felbermayr and Jung (2011) take the presence of contracting frictions between producers and intermediaries into account, which results in lower revenues from indirect than from direct exports. Consequently, large firms tend to incur higher fixed costs to build their own distribution network and to export directly, while small firms export indirectly, which allows them to save on fixed costs.

Ahn et al. (2011) consider that firms face a trade-off between paying high costs to export directly to a specific market, and low costs to export indirectly through an intermediary, which passes the distribution costs to the foreign consumer. Their model predicts that firms of intermediate levels of productivity export indirectly while the most productive firms export directly. The papers of Crozet et al. (2013) and Akerman (forthcoming) find the same sorting pattern. Crozet et al. (2013) assume that firms that offer high quality products face higher demand and thus follow a direct export mode to save on variable trade costs. Finally, Akerman (forthcoming) builds a general equilibrium model which allows him to derive that wholesalers increase welfare. In this model, wholesalers are able to spread fixed export costs across goods and charge an additional markup on the procurement price of the firm to cover these fixed costs. This markup generates the expected sorting pattern of firms into export modes.

2.2 Foreign workers and exports

Information

While a large number of studies looks at how immigration fosters trade at the aggregate level, the micro-level literature focusing on the impact of foreign employment on exports is rather scant.[2] A number of papers show that foreign workers reduce both *ad valorem* and fixed export costs by relaxing informational barriers thanks to their deeper knowledge of foreign markets. For a sample of Danish firms between 1995 and 2005, Hiller (2013) finds that both the regional immigration stock and the firm's foreign employment play a role in the composition of exports as well as for exported volume. The author concludes that firms should employ foreign workers to fully access the knowledge embedded in the foreign population of their country. Bastos and Silva (2012) match firm-destination data from Portugal with emigration stocks in each export destination country in 2005 to examine the effect of migrant networks on export participation and intensity across markets. Using a gravity framework and accounting for self-selection into the export markets, they find that migrant networks are important drivers of export participation and intensity. Finally, Hatzigeorgiou and Lodefalk (2016) use Swedish employer-employee data from 1998 to 2007 and find that foreign-born workers (in particular, skilled and recently arrived workers) increase exports at both trade margins, especially for small firms.

Productivity

In a recent paper, Mitaritonna et al. (2016) analyse the link between immigration and productivity gains. Using French firm-level data for the 1995-2005 period, they find that an increase in the local supply of immigrants increases the total factor productivity of firms located in that area. This effect is found to be stronger for firms with initially low productivity and a small size. In addition, the authors find that this positive productivity effect is associated with higher exports. Finally, using French firm-level data for the 1997-2008 period, Marchal and Nedoncelle (2017) show that the employment of foreign workers fosters exports at both margins of trade. This effect can be decomposed into a non-individual effect – to which any foreign worker contributes – and a destination-specific effect – to which only foreign workers who were born in the export destination contribute. For the intensive margin, they find that a firm employing foreign-born workers exports 30 per cent more in value than a control firm, and that this increase is spread across all destinations, suggesting that the effect of foreign-born workers goes beyond a destination-specific informational channel, and that a productivity effect may also be at play.

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[2]There is a large body of macroeconomic literature on the link between trade and immigration. Two main channels through which immigrants affect trade have been identified in this literature. Immigrant workers have a preference for products from their home country and they reduce the transaction costs between their host and home countries. Through these channels, immigrants foster bilateral trade (both imports and exports). See the seminal paper by Gould (1994) and subsequent work surveyed by Rauch (2001) and Parsons and Winters (2014).

3 Data and stylised facts

3.1 Descriptive statistics

The Viet Nam Industry Investor Survey 2010 was carried out by UNIDO in 2009 and 2010 in collaboration with Vietnamese institutions[3] (UNIDO, 2012). It covers 1,490 firms across nine major provinces – Ba Ria-Vung Tau, Bac Ninh, Binh Duong, Dong Nai, Vinh Phuc, Da Nang, Ha Noi, Hai Phong and Ho Chi Minh City – and across three sectors of the economy – manufacturing, construction and utilities. The latter sector includes the public and energy sector. The sample consists of 72.54 per cent foreign firms, 22.44 per cent domestic firms and 5.02 per cent state-owned firms. This dataset is biased towards foreign firms; the Viet Nam General Statistics Office (GSO) estimates that the Vietnamese economy consisted of 2.6 per cent foreign firms, 96 per cent domestic firms and 1.4 per cent state-owned firms in 2010. Note that in order to take part in the survey, a firm's capital must be higher than US$225,000 and it must have more than 50 employees.

For this study, we only include manufacturing and exporting firms that represent 65.50 per cent of the initial sample (976 firms). A number of descriptive statistics are provided in Table 1. The survey collected information on firm characteristics such as value of assets, domestic sales and exports. The data also contained characteristics specific to foreign firms such as market entry mode and origin country of the investor (about 38.92 per cent of foreign firms are from Asia and 46.85 per cent from East Asia).

Using data from the GSO, we find that this sample captures about 68.34 per cent of Vietnamese exports realised by manufacturing firms in 2009.[4] Most firms only export to one destination. We identify nine main export destinations (Australia, the EU, China, Japan, South East Asia, Republic of Korea, Taiwan Republic of China, the US and others), the most important destinations being Japan (19.08 per cent), the EU (17.34 per cent), the US (15.36 per cent), Taiwan Republic of China (14.25 per cent) and South East Asia (11.89 per cent).

Crucially, the survey provides information on the export mode of the firms. Respondent firms had to answer the following question: "What percentage of this enterprise's total sales by value was: sold in Viet Nam, exported directly, exported indirectly?" Total exports represent about 49.40 per cent of total sales, and indirect exports represent about 3.18 per cent of total exports.

Finally, the survey contains detailed information on the workforce composition of the firms, disaggregated in four skill categories: (i) technical and supervisory employees, (ii) managers, (iii) clerical and administrative employees, and (iv) production workers. Henceforth, we refer to the first two groups as skilled workers and to the last two groups as unskilled workers. For each skill category, we know the number of native and foreign workers. On average, foreign workers account

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[3]The Ministry of Planning and Investment, the Viet Nam Chamber of Commerce and Industry and the General Statistics Office.

[4]In this sample, only 13.11 per cent of manufacturing exporters were surveyed in 2010. We thus use 2009 as the reference year for our analysis.

for 1.80 per cent of total employment. Looking at skills, foreign workers account for about 16.70 per cent of skilled employment and about 0.40 per cent of unskilled employment. Note that 27.51 per cent of firms do not employ foreign workers, 30.36% do not employ skilled foreign workers and 85.12 per cent do not employ unskilled foreign workers.

Table 1: Descriptive statistics on manufacturing and exporting firms

	Obs.	Mean	Std. Dev.	Min	Max
Total (fixed and current) assets (in US$)	964	6.62e+07	5.68e+08	5,860	9.34e+09
Capital intensity (fixed assets in US$/empl.)	963	177,502	2,041,667	29.3	4.06e+07
Sh. of foreign capital	976	0.697	0.445	0	1
Age of the firm	976	12.494	9.529	2	113
Size (no. of full time employees)	975	714.799	1,446.205	22	20,034
Total sales (in US$)	973	6.09e+07	5.62e+08	12,599	1.10e+10
Domestic sales (in US$)	973	3.24e+07	4.13e+08	0	9.10e+09
Exports (in US$)	976	3.00e+07	2.73e+08	22.04	6.85e+09
Sh. of indirect exports (over total exports)	803	0.102	0.274	0	1
No. of export destinations	807	2.390	1.568	1	9
Sh. of foreign workers	876	0.018	0.040	0	0.889
Sh. of foreign skilled workers	876	0.167	0.230	0	1
Sh. of foreign unskilled workers	876	0.004	0.034	0	0.909

3.2 Stylised facts

We derive two stylised facts from the UNIDO dataset. First, Figure 1 shows the distribution of firms with respect to their assets for indirect-only and direct-only exporters. We observe that larger firms tend to select into direct exports while small firms select into indirect exports. This sorting pattern is in line with the literature discussed in Section 2.1. It confirms that although the share of indirect exports in Viet Nam is rather low in comparison to other developed and developing countries (3.18 per cent according to the UNIDO dataset), this case study should enable us to conduct our analysis on the impact of foreign employment on firms' export mode decision.

Second, Figure 2 presents the distribution of firms with respect to their employment of skilled foreign workers for indirect-only and direct-only exporters. The two distributions are quite distinct. We observe that direct exporters tend to hire less skilled foreign workers than indirect exporters. Although not reported, the difference between the two groups of firms in terms of skilled foreign employment is significantly different from zero at the 1 per cent level. In the remainder of the paper, we further investigate this difference to derive a causal relationship between foreign employment and export mode.

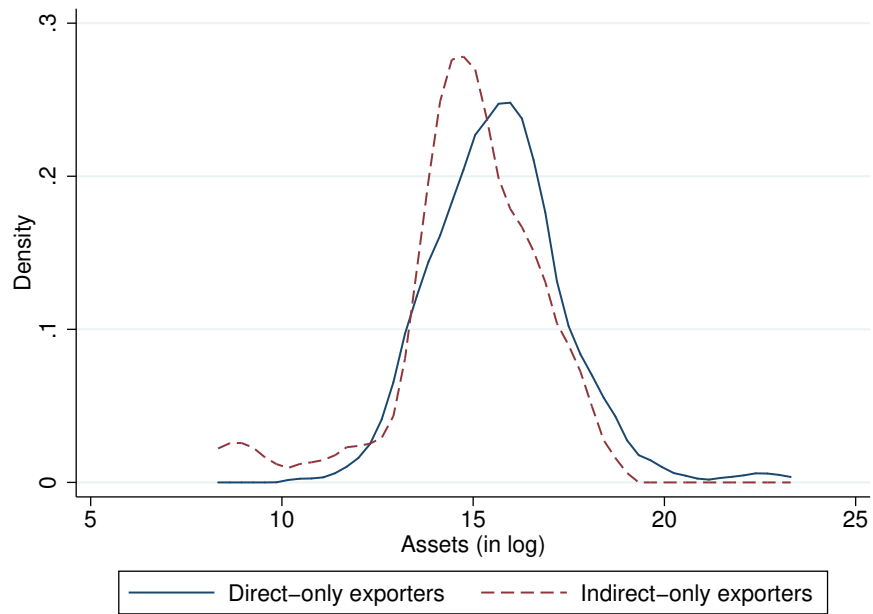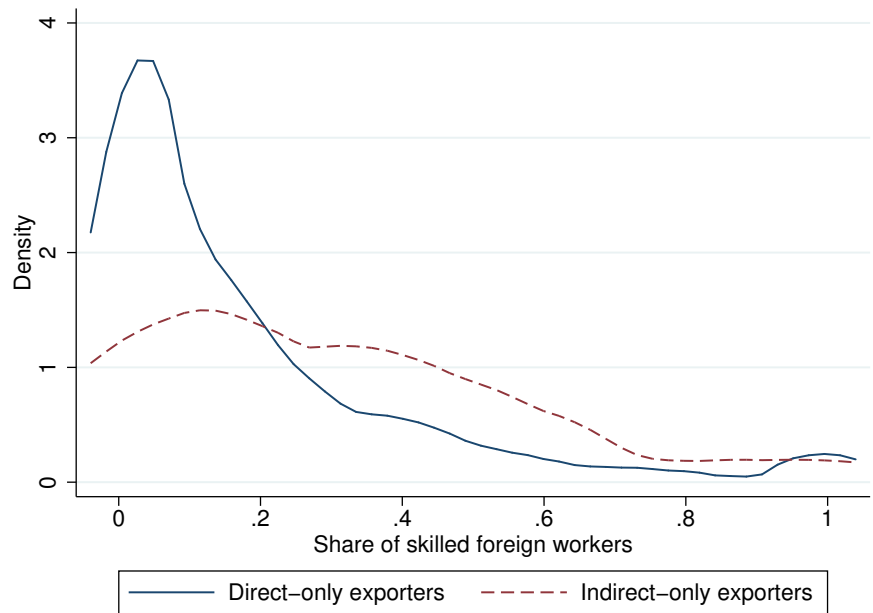Figure 1: Kernel distribution of firms with respect to their assets

Figure 2: Kernel distribution of firms with respect to their skilled foreign employment

4 Theoretical framework

4.1 Model set-up

Following Melitz (2003), we consider a world with $n+1$ symmetric countries open to trade, a domestic country and n foreign countries indexed by x. In each country, firms operate under monopolistic competition. Each manufacturing firm faces the following demand function on market x:

$$q^x = \xi^x \left(p^x\right)^{-\sigma} \tag{1}$$

where ξ^x is the demand shock the firm faces in market x, p^x is the price of the firm's variety in market x and σ denotes the elasticity of substitution between any two goods.

Each firm is characterised by a productivity level denoted by φ and given by:

$$\varphi = \phi\alpha \tag{2}$$

where ϕ denotes an exogenous productivity level drawn from a random distribution denoted by $G\left(\phi\right)$ and α represents an endogenous productivity level. φ increases in both arguments.

Following Marchal and Nedoncelle (2017), α depends on the foreign employment of the firm and is given by $\alpha = a\left(\lambda\right)$ where $\lambda = \sum_{x=1}^{n} \lambda_x$ and λ_x represents the share of workers born in a foreign country x ($\forall x = 1...n$) and employed by the firm. The function is symmetric and concave in its arguments such that there exists an optimal level of foreign employment that maximises the endogenous productivity of the firm. However, due to factor scarcity, its foreign employment is always sub-optimal such that:

$$\frac{\partial \alpha}{\partial \lambda} \geq 0 \tag{3}$$

Allowing the derivative to equal zero, we account for non-linearity in the effect of foreign employment on firm productivity. Additionally, assuming that the derivative is never negative, we restrict our analysis to firms that can indeed benefit from foreign employment.[5]

4.2 Direct exports

Let us denote the technology of the firm to produce q^x units to be directly exported to market x:

$$c_d^x = \frac{\tau^x}{\varphi} q^x + f_d^x \tag{4}$$

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[5]Here, we consider that firms that would face a productivity loss due foreign employment would never employ such workers. See Marchal and Nedoncelle (2017) for a thorough discussion of this assumption.

where the wage of one unit of labour is normalised to unity. To export directly, the firm incurs a destination-specific fixed cost denoted by f_d^x and a bilateral iceberg cost denoted τ^x.

Foreign workers provide valuable information on foreign markets and give access to business networks which help their firm overcome trade barriers. Thus, export costs to market x decrease with the firm's employment of foreign workers, such that $\frac{\partial f_d^x}{\partial \lambda} \leq 0$ and $\frac{\partial \tau^x}{\partial \lambda} \leq 0$.

After profit maximisation, we obtain the price charged by the firm and the corresponding export quantity:

$$p_d^x = \left(\frac{\sigma}{\sigma - 1}\right) \frac{\tau^x}{\varphi} \tag{5}$$

$$q_d^x = \xi^x \left[\left(\frac{\sigma}{\sigma - 1}\right) \frac{\tau^x}{\varphi}\right]^{-\sigma} \tag{6}$$

The firm's profit derived from direct exports is given by:

$$\pi_d^x = \frac{1}{\sigma} \xi^x \left[\left(\frac{\sigma}{\sigma - 1}\right) \frac{\tau^x}{\varphi}\right]^{1-\sigma} - f_d^x \tag{7}$$

Finally, the optimal value sold directly on market x is given by:

$$v_d^x = \xi^x (\sigma)^{1-\sigma} (\sigma - 1)^{\sigma - 1} \left(\frac{\varphi}{\tau^x}\right)^{\sigma - 1} \tag{8}$$

where $v_d^x = p_d^x q_d^x$.

4.3 Indirect exports

Following Ahn et al. (2011), firms exporting indirectly rely on an intermediary sector that operates under perfect competition. Instead of exporting directly and paying the destination-specific fixed cost, firms pay a fixed cost to the intermediary denoted by f_i which grants them indirect access to all destinations. In line with the literature, we assume that $f_i < f_d^x \, \forall x$ (Schröder et al., 2005; Ahn et al., 2011). It implies that intermediaries can spread their fixed costs across manufacturers, which lowers the costs for each individual firm.

Foreign workers pertain to a business network that eventually includes workers involved in trade intermediation. Thereby, we assume that foreign workers help their firm access intermediary firms such that $\frac{\partial f_i}{\partial \lambda} \leq 0$.

The price of a variety exported to destination x by an intermediary is given by:

$$p_i^x = \gamma \tau^x p_i \tag{9}$$

where γ is a per-unit cost incurred by the intermediary firm to prepare the variety for the foreign market and p_i denotes the price charged by a manufacturer to the intermediary.

Using equation (9) and maximising the manufacturer's variable profit, we obtain the price for indirect exports and the corresponding export quantity:

$$p_i = \frac{1}{\varphi} \left(\frac{\sigma}{\sigma - 1} \right) \tag{10}$$

$$q_i^x = \xi^x \left[\gamma \frac{\tau^x}{\varphi} \left(\frac{\sigma}{\sigma - 1} \right) \right]^{-\sigma} \tag{11}$$

The variable profit derived from indirect exports to market x is given by:

$$\varpi_i^x = \gamma^{-\sigma} \frac{1}{\sigma} \xi^x \left[\frac{\tau^x}{\varphi} \left(\frac{\sigma}{\sigma - 1} \right) \right]^{1-\sigma} \tag{12}$$

Finally, the optimal value sold indirectly on market x is given by:

$$v_i^x = \xi^x (\sigma)^{1-\sigma} (\sigma - 1)^{\sigma - 1} (\varphi)^{\sigma - 1} \left(\frac{1}{\gamma \tau^x} \right)^{\sigma} \tag{13}$$

4.4 Decision to export

A firm that serves the domestic market should decide whether or not to export – indirectly or directly – and its export volume. The indirect export cut-off identifies firms that are indifferent about paying f_i to gain indirect access to all foreign markets or not. This cut-off is determined by the zero-profit condition where the aggregate profit across destinations from indirect exports is:

$$\pi_i = \sum_{x=1}^{n} \varpi_i^x - f_i \tag{14}$$

Thus, the indirect export cut-off is given by:

$$\varphi_i = \left(\frac{1}{\xi^x} \gamma^{\sigma} \sigma f_i \right)^{\frac{1}{\sigma - 1}} \left(\frac{\sigma}{\sigma - 1} \right) \sum_{x=1}^{N} \tau^x \tag{15}$$

Additionally, there are n cut-offs that determine the firms that are indifferent between direct and indirect exports for each foreign market x, that is, whenever $\pi_d^x = \varpi_i^x$:

$$\varphi_x^d = \left(1 - \gamma^{-\sigma} \right)^{\frac{1}{1-\sigma}} \left(\frac{\sigma f_d^x}{\xi^x} \right)^{\frac{1}{\sigma - 1}} \left(\frac{\sigma}{\sigma - 1} \right) \tau^x \tag{16}$$

Finally, in order to determine the sorting pattern, we follow Ahn et al. (2011) and assume that a firm exporting directly to one market may also export indirectly to the remaining $n - 1$ markets.

In that case, the following condition should hold: $\sum_{x=1}^{n} \varpi_i^x > \varpi_d^x$ or equivalently:

$$\gamma^{-\sigma} \frac{1}{\sigma} \xi^x \sum_{x=1}^{n} \left[\left(\frac{\sigma}{\sigma - 1} \right) \frac{\tau^x}{\varphi} \right]^{1-\sigma} > \frac{1}{\sigma} \xi^x \left[\left(\frac{\sigma}{\sigma - 1} \right) \frac{\tau^x}{\varphi} \right]^{1-\sigma} \qquad (17)$$

The aggregate indirect profit from the remaining countries is thus enough to cover the fixed cost of exporting indirectly. This assumption is sufficient, but not necessary to ensure $\varphi_i < \varphi_d^x$.

Under this assumption, the model exhibits the following sorting pattern: firms with a productivity that lies in the interval $[\varphi_i, \varphi_d^x]$ export indirectly to market x, and firms with a productivity greater than φ_d^x export directly to market x. This sorting pattern is standard in the literature on indirect exports (Ahn et al., 2011; Akerman, forthcoming; Crozet et al., 2013; Schröder et al., 2005).

4.5 Comparative statics

4.5.1 Impact of foreign employment on the export mode

Let us look at what happens to the export cut-offs when the firm increases its employment of foreign workers. We find that foreign employment lowers both indirect and direct export cut-offs:

$$\frac{\partial \varphi_i}{\partial \lambda} = \left(\gamma^{-\sigma} \right)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{\xi^x} \right)^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma - 1} \right) (f_i)^{\frac{1}{\sigma-1}} \left[\left(\frac{1}{\sigma - 1} \right) \frac{1}{f_i} \frac{\partial f_i}{\partial \lambda} \sum_{x=1}^{n} \tau^x + \frac{\partial \tau^x}{\partial \lambda} \right] \le 0 \qquad (18)$$

$$\frac{\partial \varphi_d^x}{\partial \lambda} = \left(1 - \gamma^{-\sigma} \right)^{\frac{1}{1-\sigma}} \left(\frac{\sigma}{\xi^x} \right)^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma - 1} \right) (f_d^x)^{\frac{1}{\sigma-1}} \left[\left(\frac{1}{\sigma - 1} \right) \frac{1}{f_d^x} \frac{\partial f_d^x}{\partial \lambda} \tau^x + \frac{\partial \tau^x}{\partial \lambda} \right] \le 0 \qquad (19)$$

We also investigate to what extent foreign employment complements or substitutes trade intermediaries. On the one hand, foreign workers help their firm access trade intermediaries, which can favour the indirect export mode. Under the assumptions of the model, we find that, as long as the following condition holds:

$$(f_d^x)^{\frac{1}{\sigma-1}} \left[\frac{\partial \tau^x}{\partial \lambda} + \frac{\partial f_d^x}{\partial \lambda} \frac{1}{f_d^x} \left(\frac{1}{\sigma - 1} \right) \tau^x \right] - (\gamma^\sigma - 1)^{\frac{1}{\sigma-1}} (f_i)^{\frac{1}{\sigma-1}} \left[\frac{\partial \tau^x}{\partial \lambda} + \frac{\partial f_i}{\partial \lambda} \frac{1}{f_i} \left(\frac{1}{\sigma - 1} \right) \tau^x \right]$$

$$\ge (\gamma^\sigma - 1)^{\frac{1}{\sigma-1}} (f_i)^{\frac{1}{\sigma-1}} \frac{\partial f_i}{\partial \lambda} \frac{1}{f_i} \left(\frac{1}{\sigma - 1} \right) \sum_{\substack{k=1 \\ k \neq x}}^{n} \tau^k \qquad (20)$$

then foreign employment lowers the indirect export cut-off more than the direct export cut-off for market x:

$$\frac{\partial \varphi_i}{\partial \lambda} \le \frac{\partial \varphi_d^x}{\partial \lambda} \qquad (21)$$

Condition (20) implies that the benefit to export directly to a given destination should be lower than the gain realised by indirectly accessing all other destinations. In other words, the difference in cost to export indirectly to market x instead of directly, should be at least equal to the gain realised by indirectly accessing all other markets but x.

On the other hand, foreign workers help their firm reach the direct export cut-off by lowering fixed export costs, which may favour direct over indirect exports. As long as condition (20) does not hold, the direct export cut-off for market x is more sensitive to foreign employment than the indirect export cut-off:

$$\frac{\partial \varphi_i}{\partial \lambda} > \frac{\partial \varphi_d^x}{\partial \lambda} \tag{22}$$

4.5.2 Impact of foreign employment on the intensive margin

Let us now look at what happens to the value exported indirectly and directly to market x. In line with previous empirical evidence, we find that both derivatives with respect to foreign employment are positive:

$$\frac{\partial v_d^x (\varphi)}{\partial \lambda} = (\tau^x)^{1-\sigma} \xi^x \sigma \left(\frac{\sigma - 1}{\sigma} \right)^{\sigma} (\varphi)^{\sigma-2} \left(\frac{\partial \varphi}{\partial \lambda} - \frac{\varphi}{\tau^x} \frac{\partial \tau^x}{\partial \lambda} \right) \geq 0 \tag{23}$$

and:

$$\frac{\partial v_i^x (\varphi)}{\partial \lambda} = (\gamma \tau^x)^{-\sigma} \xi^x \sigma \left(\frac{\sigma - 1}{\sigma} \right)^{\sigma} (\varphi)^{\sigma-2} \left(\frac{\partial \varphi}{\partial \lambda} - \frac{\varphi}{\tau^x} \frac{\partial \tau^x}{\partial \lambda} \right) \geq 0 \tag{24}$$

Here again, we focus our analysis on the consequences of foreign employment on export mode by comparing the indirect and the direct export values to destination x. Let us re-write equation (24) as follows:

$$\frac{\partial v_i^x (\varphi)}{\partial \lambda} = \frac{\gamma^{-\sigma}}{\tau^x} \frac{\partial v_d^x (\varphi)}{\partial \lambda} \tag{25}$$

Given that $0 \geq \frac{\gamma^{-\sigma}}{\tau^x} \geq 1$, we can conclude that foreign workers increase more for direct than for indirect exports to market x:

$$\frac{\partial v_i^x (\varphi)}{\partial \lambda} \leq \frac{\partial v_d^x (\varphi)}{\partial \lambda} \tag{26}$$

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5 Empirical analysis

5.1 The Heckman selection model and specification

Our empirical analysis aims to shed light on the induced effect of foreign employment on the export mode and export value of Vietnamese firms. Following the literature, we expect the effect of foreign workers on exports to be positive at both trade margins. The originality of our study lies in the comparison of indirect and direct exporters. At the extensive margin, it is rather unclear from the theory whether foreign workers should favour direct over indirect exports, or the opposite. At the intensive margin, our model predicts that foreign employment should foster direct exports more than indirect ones.

The difficulty of our analysis lies in the fact that a firm's choice of export mode – to export indirectly or directly – may condition the value it exports to each foreign market. Therefore, estimating the impact of foreign employment on the share of indirect exports over total exports or over total sales – as was conducted by Abel-Koch (2013) and Ahn et al. (2011), respectively – one could fail to control for a potentially strong selection bias.

To deal with this challenge, we use a two-stage selection model *à la* Heckman (1976, 1979) to identify the impact of foreign workers on (i) the export mode decision of the firm, and (ii) its export value which is conditional on its export mode. In other words, the Heckman selection model allows us to estimate the probability of a firm to be classified in one of the two groups of exporters (indirect or direct exporters), and to then use the estimated probability to analyse the firm's export value.

Let us denote the total export value of a firm as:

$$v = \sum_{x=1}^{n} v_i^x + \sum_{x=1}^{n} v_d^x \tag{27}$$

and the share of indirect exports over total exports as:

$$sh_i = \frac{\sum_{x=1}^{n} v_i^x}{v} \tag{28}$$

Let us define a *selection* equation as follows:

$$M = aW + u_1 \tag{29}$$

where M is a binary variable equal to one if the firm exports only indirectly ($sh_i = 1$) and zero if the firm exports only directly ($sh_i = 0$). For now, we exclude firms that export both directly and indirectly from our sample. W denotes a vector of regressors and u_1 is an error term following a bivariate normal distribution such that $u_1 \sim N(0, 1)$.

Then, we can define a *response* equation as follows:

$$v|M = bZ + u_2 \tag{30}$$

where Z denotes a vector of regressors and u_2 is an error term following a normal distribution such that $u_2 \sim N(0, \sigma)$. We assume that corr $(u_1, u_2) = \rho$, which implies that the export mode decision and the export value may not be independent from each other.

In a first step, we estimate the selection equation using a Probit model. The vector W may include the following variables of interest: the number of foreign workers employed by the firm, its total assets, a binary variable equal to unity for multinational companies, the number of destinations served, the age of the firm, a binary variable equal to unity for mono-product firms, a binary variable equal to unity if the firm's buyers are mainly located inside Viet Nam, a binary variable equal to unity if the firm imports indirectly, the total population and the poverty rate of the firm's province in 2008. Province-level data are derived from the Viet Nam GSO. All continuous variables are in logarithm. Depending on the regression, we may also include sector, province, export-destination and survey-year fixed effects.

In a second step, we use the estimated vector of parameters (a) to compute the inverse Mills ratio. We then include this ratio as an explanatory variable in the response equation that we estimate using an OLS estimator. It allows us to correct for a potential bias due to the endogenous nature of the selection process into direct or indirect exports. A significant coefficient associated with the inverse Mills ratio implies that the error terms in the selection and the response equations are correlated. In that case, the use of a two-stage model *à la* Heckman is appropriate.

In addition to the inverse Mills ratio, the vector Z may include the following explanatory variables: the number of foreign workers employed by the firm, its total assets, a binary variable equal to unity for multinational companies, the age of the firm, the total population and the poverty rate of the firm's province in 2008. We may also include sector, province, export-destination and survey-year fixed effects.

5.2 Results

First-stage estimates

Probit estimates for the selection equation are presented in Table 2. In column (1), we estimate the impact of employing skilled foreign workers on the probability of a firm being an indirect exporter. We find a positive and highly significant effect. The sign and magnitude of this coefficient is robust to the inclusion of additional firm-level control variables (column 2) and a large set of fixed effects (column 3). In column (4), we control for province-level variables instead of including province fixed effects, such as population and poverty rate.

In column (5), we include a dummy variable to control for firms that declare that more than 50 per cent of their long-term buyers are located within Viet Nam. Thereby, we control for the fact that firms with a large distribution network abroad are expected to sort into direct exports, while firms saving on these fixed costs are expected to sort into indirect exports (Fryges, 2007). We find that firms that have a network of buyers mainly within Viet Nam have a significantly higher probability to sort into indirect exports.

In column (6), we control for firms that are indirect importers. Note that the variable capturing the import status is poorly correlated with assets and the multinational status of the firm. In line with Grazzi and Tomasi (2016), we expect indirect exporters to have a higher probability to export indirectly. However, similarly to Abel-Koch (2013), we find no significant effect.

In column (7), we look at the impact of foreign employment, without distinguishing workers by skill category, on the probability of being an indirect exporter. We find that the coefficient is positive and significant at the 10 per cent level. In column (8), we only look at unskilled foreign workers. In that case, the coefficient becomes negative and losses its significance. These results suggest that the firm's probability of being an indirect exporter is mainly determined by skilled foreign workers. Following available evidence on exports and immigration, one could have expected that all foreign workers would have had a positive impact, the effect of unskilled individuals being lower (Rauch, 2001; Parsons and Winters, 2014). Here, the nil effect of unskilled foreign workers may be attributable to the low number of firms in the dataset employing unskilled foreign workers (14.88 per cent). Another possible explanation may be that unskilled foreign workers often originate from countries that are closer to Viet Nam (as compared to skilled individuals), since the literature on south–south migration shows that the relevant migrants are primarily low-skilled workers (Lackzo and Appave, 2014). They would thus provide less valuable information to their firms.

Finally, looking at columns (1) to (8), we find that larger firms in terms of assets and number of destinations served have a lower probability to export indirectly. Multinational firms also tend to favour direct over indirect exports. This result corroborates available evidence on the sorting pattern of firms across export modes: small firms select into indirect exports while large firms select into direct exports, as the literature on indirect exports indicates (*c.f.* Section 2.1).[6] We also find that being a mono-product firm does not significantly impact the probability to export indirectly, while we would expect a significant and negative coefficient (McCann, 2013). Then, although export-destination dummies are not reported in the table, we find that the largest export markets – namely Japan, the EU and the US – show negative and significant coefficients. Here again, this result is in line with available evidence and corroborates that smaller and poorly accessible markets are served through trade intermediaries, while larger and easily accessible markets are served directly.

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[6]Although not reported in the table, we investigate whether the impact of foreign workers on the firm's export mode decision may depend on its size. Yet, the coefficient associated with the interaction between foreign employment and firm size is never significant.

Second-stage estimates

OLS estimates for the response equation are presented in Table 3, which strictly reproduces the structure of Table 2. In columns (1) to (4), we find that, conditional on the export mode choice, the employment of skilled foreign workers positively and significantly determines export value. This result is in line with previous papers that look at how foreign workers impact the intensive margin of trade (*c.f.* Section 2.2). In columns (5) and (6), we respectively control for the network of buyers and the import status of the firm in the first-stage regression. Results on foreign employment are as we expected. We find that the effect of foreign workers is slightly lower when we consider all skill categories (column 7), and loses significance when we only consider unskilled foreign workers (column 8).

For each specification, the coefficient associated with the inverse Mills ratio is positive and significant, which indicates that the results of a standard linear model would have been upwardly biased due to a lack of control for the selection process. In other words, we can conclude that foreign workers impact firms that select into direct exports more than firms that select into indirect exports, as predicted by the theoretical model developed herein before.

Looking at the control variables from columns (1) to (8), we see that the larger the assets of the firm, the larger its export value. We also find that multinational firms tend to export lower values. This could be explained by a large heterogeneity in trade performance across types of multinational companies (foreign companies, domestic-dominated and foreign-dominated joint ventures). It could also be explained by the motivations lying behind the foreign investment. For instance, an affiliate could be established in Viet Nam to serve the domestic market more easily. Finally, the population of the firm's province positively impacts its exports, while the poverty rate negatively impacts its export value.

5.3 Additional endogeneity concern

Studies analysing the impact of immigration on trade outcomes face a well-known endogeneity issue due to the presence of a potential reverse causality bias (Hatzigeorgiou and Lodefalk, 2014; Parsons and Winters, 2014). In our empirical analysis, we cannot exclude that a firm may hire a foreign worker because it already serves a foreign market, or because it plans to export in the future. In case of multinational firms, foreign workers may be expatriates sent by the mother company or by an affiliate in order to develop trade activities. Alternatively, a firm's export performance may determine its capacity to attract a certain type of workers, and thus bias the estimation. On the link between foreign employment, export experience and export performance, see Choquette and Meinen (2015) and Minondo (2011).

In line with the literature, we insulate our results from reverse causality using an instrumental variable (IV) approach. We use three instruments. First, we use UNIDO data to compute the

Table 2: Heckman model - Estimation of the *selection* equation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Skilled foreign empl.	0.244^a	0.270^a	0.283^a	0.264^a	0.457^a	0.279^a		
	(0.088)	(0.093)	(0.099)	(0.096)	(0.152)	(0.103)		
Assets	-0.166^a	-0.191^a	-0.233^a	-0.200^a	-0.329^a	-0.230^a	-0.214^a	-0.172^a
	(0.056)	(0.061)	(0.069)	(0.066)	(0.100)	(0.071)	(0.067)	(0.064)
MNE	-0.502^b	-0.436^c	-0.604^b	-0.589^b	-0.282	-0.662^a	-0.549^b	-0.204
	(0.222)	(0.232)	(0.237)	(0.235)	(0.353)	(0.238)	(0.239)	(0.223)
Export destination nr.	-0.492^b	-0.538^b	-0.562^b	-0.577^b	-0.606^c	-0.609^b	-0.615^b	-0.591^b
	(0.231)	(0.237)	(0.285)	(0.276)	(0.314)	(0.279)	(0.289)	(0.285)
Age		0.247	0.271	0.243	0.525^b	0.296	0.248	0.190
		(0.160)	(0.202)	(0.194)	(0.222)	(0.205)	(0.197)	(0.187)
Mono-product		-0.044	0.012	-0.037	0.190	-0.003	0.013	-0.008
		(0.174)	(0.188)	(0.190)	(0.249)	(0.191)	(0.187)	(0.183)
Population				0.056				
				(0.146)				
Poverty rate				-0.090				
				(0.130)				
Domestic network of buyers					1.074^a			
					(0.269)			
Indirect importer						-0.398		
						(0.260)		
Foreign empl.							0.218^b	
							(0.088)	
Unskilled foreign empl.								-0.031
								(0.125)
Constant	1.587^c	1.391	3.040^b	2.131	2.406	3.208^a	2.946^b	2.212^c
	(0.813)	(0.871)	(1.185)	(1.622)	(1.475)	(1.223)	(1.192)	(1.215)
Sector FE	no	no	yes	yes	yes	yes	yes	yes
Province FE	no	no	yes	no	yes	yes	yes	yes
Export-destination FE	no	no	yes	yes	yes	yes	yes	yes
Survey-year FE	no	no	yes	yes	yes	yes	yes	yes
Observations	648	648	481	497	317	481	481	482

Note: This table provides Probit estimates for equation (29). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

Table 3: Heckman model - Estimation of the *response* equation

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Skilled foreign empl.	0.389^a	0.395^a	0.422^a	0.374^a	0.537^a	0.360^a		
	(0.077)	(0.077)	(0.101)	(0.094)	(0.092)	(0.091)		
Assets	0.451^a	0.442^a	0.435^a	0.472^a	0.384^a	0.497^a	0.474^a	0.517^a
	(0.073)	(0.073)	(0.104)	(0.091)	(0.093)	(0.095)	(0.093)	(0.085)
MNE	-0.540^a	-0.502^a	-0.623^a	-0.541^b	-0.459^b	-0.496^b	-0.501^a	-0.058
	(0.164)	(0.157)	(0.216)	(0.215)	(0.188)	(0.199)	(0.189)	(0.126)
Age		0.112	0.024	-0.016	0.229	-0.021	-0.021	-0.069
		(0.094)	(0.111)	(0.116)	(0.151)	(0.104)	(0.106)	(0.104)
Population				0.166^c				
				(0.086)				
Poverty rate				-0.228^a				
				(0.079)				
Foreign empl.							0.310^a	
							(0.073)	
Unskilled foreign empl.								-0.020
								(0.068)
Inverse Mills ratio	1.060^a	1.014^a	0.855^b	0.717^b	0.706^a	0.584^c	0.760^b	0.883^b
	(0.320)	(0.299)	(0.366)	(0.358)	(0.135)	(0.327)	(0.337)	(0.351)
Constant	5.843^a	5.763^a	8.395^a	7.110^a	7.252^a	7.725^a	8.032^a	7.312^a
	(0.706)	(0.703)	(1.303)	(1.151)	(1.529)	(1.213)	(1.228)	(1.187)
Sector FE	no	no	yes	yes	yes	yes	yes	yes
Province FE	no	no	yes	no	yes	yes	yes	yes
Export-destination FE	no	no	yes	yes	yes	yes	yes	yes
Survey-year FE	no	no	yes	yes	yes	yes	yes	yes
Observations	648	648	481	497	317	481	481	482
R-squared	0.469	0.470	0.494	0.466	0.491	0.493	0.491	0.493

Note: This table provides OLS estimates for equation (30). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

number of foreign workers employed by other firms located in the province or in the sector of the firm. Second, we use the internal migration rate in the firm's province for 2005 provided by the Viet Nam GSO. The latter instrumental variable excludes international immigrants and only considers movements of nationals across provinces. Moreover, no instrument includes the number of foreign workers of the firm. These instruments should be correlated with the firm's employment of foreign workers, but poorly correlated with its economic performance. Tables 6, 7 and 8 (presented in Appendix) show that each instrument is reasonably correlated with the firm's employment of skilled foreign workers (between 8 per cent and 15 per cent), and poorly correlated with our independent variables. The instruments appear weaker in the case of unskilled foreign employment.

First-stage estimates

The first-stage results of the Heckman selection model using theses instrumental variables are presented in Table 4. Due to the inclusion of province-level instruments, we now favour the use of province-level control variables (population and poverty rate) over province fixed effects.

Column (1) shows that the impact of skilled foreign employment is robust to the control of a reverse causality bias. The coefficient is highly significant and larger than in the baseline regression (Table 2, column 4). In column (2), we control for firms that have more than 50 per cent of their long-term buyers located within Viet Nam. In column (3), we control for firms that are also indirect importers. Our previous findings remain unchanged for both specifications. When looking at columns (4) and (5), we find that the effect of unskilled foreign employment has no impact on the export mode of the firm, since the coefficients for total and unskilled foreign employment are not significant.

In each specification, the size of the firm still has a significantly negative impact on the probability to export indirectly, which corroborates previous studies on trade intermediation.

Finally, we perform a Wald test of the exogeneity of the instrumented variable. Results are reported at the bottom of the table. The test is never significant; thus, we cannot reject the null hypothesis. In other words, the test does not allow us to conclude on the presence of an endogeneity bias due to reverse causality.

Second-stage estimates

The second-stage results are reported in Table 5. Column (1) shows that, conditional on the firm's export mode decision, the employment of foreign skilled workers positively determines export value. In column (2), we control for firms that have more than 50 per cent of their long-term buyers located within Viet Nam. In column (3), we control for firms that are also indirect importers. Our previous findings remain unchanged for both specifications. Columns (4) and (5) reveal that the effect of foreign employment on export value is primarily driven by skilled individuals.

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Previous results on control variables related to firm size also remain unchanged. For each specification except in column (3), which controls for import status in the first-stage regression, the inverse Mills ratio is positive and significant, demonstrating the relevance of using a two-stage Heckman selection model.

We perform a Durbin endogeneity test to determine whether foreign employment could be treated as an exogenous variable. Results are reported at the bottom of the table. As the test is significant when we consider skilled foreign workers (columns 1 to 3), we must continue to treat this variable as endogenous. We also perform a Hansen J-test. The test is never significant which confirms the orthogonality of at least one instrument.

5.4 Robustness tests

We perform three robustness checks, the results of which are reported in the Appendix. Hereafter, we compare the results we obtain with our baseline estimates presented in column (4) of Tables 2 and 3, and in column (1) of Tables 4 and 5.

First, we use a broader definition of indirect and direct exporters. We now define M as a binary variable equal to 1 if the firm exports at least 90 per cent of its total exports indirectly ($sh_i \geq 0.9$) and zero if the firm exports at least 90 per cent of its total exports directly ($sh_i \leq 0.1$). This broader definition allows us to slightly increase our sample from 497 to 508 observations. The first- and second-stage results using a standard Heckman selection model are reported in column (1) of Tables 9 and 10 respectively. Results using a Heckman model including instrumental variables are presented in column (1) of Tables 11 and 12. For both empirical strategies, the results are fully in line with our baseline estimates, both in terms of significance and magnitude.

Second, we use the total value of stocks (in logarithm) as an alternative measure of firm size. Results are reported in column (2) of Tables 9, 10, 11 and 12. In line with what we expected, the size of the firm has a negative and significant impact on the probability to export indirectly and a positive impact on export value, whether we use the total assets of the firm (as in the baseline specification) or its stocks.

Lastly, we control for outliers by excluding the top-5 per cent of the distribution of firms in terms of assets. Results are reported in column (3) of Tables 9, 10, 11 and 12. Excluding the largest firms does not change the impact of the firm size on its export mode decision and its export value. The coefficients associated with foreign employment prove to be robust as well.

6 Conclusion

In this paper, we analyse whether foreign employment impacts the decision of firms to export either directly or indirectly and their export value. To this end, we first develop a heterogeneous firm model with an intermediation technology in line with Ahn et al. (2011). The model predicts that,

Table 4: Heckman model with IV - Estimation of the *selection* equation

	(1)	(2)	(3)	(4)	(5)
Skilled foreign empl.	0.328^a	0.445^a	0.354^a		
	(0.101)	(0.166)	(0.096)		
Assets	-0.213^a	-0.293^a	-0.216^a	-0.178^a	-0.130^b
	(0.066)	(0.091)	(0.067)	(0.066)	(0.063)
MNE	-0.667^a	-0.430	-0.763^a	-0.477^c	-0.090
	(0.245)	(0.339)	(0.236)	(0.287)	(0.232)
Export destination nr.	-0.578^b	-0.647^b	-0.618^b	-0.607^b	-0.465
	(0.275)	(0.305)	(0.269)	(0.277)	(0.297)
Age	0.260	0.480^b	0.291	0.215	0.122
	(0.192)	(0.212)	(0.191)	(0.188)	(0.187)
Mono-product	-0.038	0.113	-0.054	-0.036	-0.055
	(0.189)	(0.237)	(0.192)	(0.188)	(0.179)
Population	0.063	0.335	0.021	0.058	0.017
	(0.146)	(0.205)	(0.151)	(0.145)	(0.137)
Poverty rate	-0.095	-0.284	-0.151	-0.076	-0.040
	(0.130)	(0.173)	(0.132)	(0.129)	(0.123)
Domestic network of buyers		1.078^a			
		(0.268)			
Indirect importer			-0.336		
			(0.242)		
Foreign empl.				0.164	
				(0.125)	
Unskilled foreign empl.					-0.438
					(0.397)
Constant	2.263	-0.585	2.961^c	1.890	1.268
	(1.610)	(2.005)	(1.712)	(1.648)	(1.582)
Sector FE	yes	yes	yes	yes	yes
Province FE	no	no	no	no	no
Export-destination FE	yes	yes	yes	yes	yes
Survey-year FE	yes	yes	yes	yes	yes
Observations	497	331	497	497	498
Wald test	0.276	0.924	0.111	0.632	0.272

Note: This table provides IV-Probit estimates for equation (29). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

Table 5: Heckman model with IV - Estimation of the *response* equation

	(1)	(2)	(3)	(4)	(5)
Skilled foreign empl.	0.461^a	0.582^a	0.412^a		
	(0.095)	(0.106)	(0.096)		
Assets	0.475^a	0.412^a	0.522^a	0.509^a	0.536^a
	(0.079)	(0.090)	(0.078)	(0.073)	(0.069)
MNE	-0.615^a	-0.572^a	-0.511^a	-0.421^b	-0.001
	(0.197)	(0.213)	(0.197)	(0.169)	(0.123)
Age	-0.017	0.188	-0.051	-0.062	-0.097
	(0.115)	(0.149)	(0.111)	(0.109)	(0.107)
Population	0.173^b	0.234^c	0.160^c	0.167^c	0.140
	(0.087)	(0.133)	(0.087)	(0.086)	(0.086)
Poverty rate	-0.235^a	-0.337^a	-0.229^a	-0.208^a	-0.201^a
	(0.078)	(0.097)	(0.081)	(0.077)	(0.078)
Foreign empl.				0.288^a	
				(0.069)	
Unskilled foreign empl.					-0.144
					(0.117)
Inverse Mills ratio	0.595^b	0.588^a	0.356	0.578^b	0.778^b
	(0.288)	(0.131)	(0.259)	(0.281)	(0.306)
Constant	7.174^a	5.779^a	6.853^a	6.811^a	6.406^a
	(1.078)	(1.491)	(1.089)	(1.068)	(1.093)
Sector FE	yes	yes	yes	yes	yes
Province FE	no	no	no	no	no
Export-destination FE	yes	yes	yes	yes	yes
Survey-year FE	yes	yes	yes	yes	yes
Observations	497	331	497	497	498
R-squared	0.453	0.437	0.455	0.460	0.463
Durbin test	0.003	0.000	0.014	0.077	0.208
Hansen-J test	0.708	0.271	0.677	0.674	0.944

Note: This table provides IV-2SLS estimates for equation (30). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

at the extensive margin, foreign workers should favour indirect over direct exports, as long as the benefit to export directly towards a given destination is lower than the gain realised by accessing all other destinations indirectly. The prediction is therefore ambiguous. At the intensive margin, we find that foreign employment should foster direct exports more than indirect ones.

We test these predictions using a sample of foreign and domestic firms collected through the Viet Nam Industry Investor Survey 2010 by UNIDO. We implement a two-stage Heckman sample selection model to account for the fact that the export value of a firm may be conditioned by its selection into a specific export mode. We find a robust impact of employing skilled foreign workers on the probability of a firm to be an indirect exporter. We also corroborate the fact that firms with a large distribution network abroad sort into direct exports, while firms saving on these fixed costs sort into indirect exports. Finally, we find that conditional on the firm's export mode, the employment of skilled foreign workers positively and significantly determines its export value. Our findings are robust to the use of an IV procedure to control for reverse causality and to a number of robustness tests.

Our results are quite instructive on the role of foreign workers on the firm's export mode decisions. This paper goes beyond the existing literature by looking at indirect exports, while most studies only consider direct exports. Nonetheless, further research is needed to identify who these foreign workers are and the mechanisms through which they affect the decisions of their firm.

In the light of the available empirical literature, our results imply a number of policy recommendations. Trade intermediation presents a potential for welfare improvement (Akerman, forthcoming). Yet, indirect exports in Viet Nam do not represent a large share of total exports, as is the case in a number of middle income countries, for instance in China and Turkey (Abel-Koch, 2013; Ahn et al., 2011). Thus, there seems to be a potential to improve export-led growth thanks to indirect exports in Viet Nam. Our results suggest that such a commercial policy could include a pro-active immigration policy that would favour foreign employment by manufacturing firms.

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Appendix

Table 6: Correlation matrix - instruments for skilled foreign employment

	(a)	(b)	(c)	(d)	(e)	(f)
(a) M (indirect export dummy)	1.000					
(b) v (export value)	-0.083	1.000				
(c) Skilled foreign empl.	0.026	0.318	1.000			
(d) Province skilled foreign empl.	-0.036	-0.041	0.110	1.000		
(e) Sector skilled foreign empl.	-0.001	0.032	0.077	-0.038	1.000	
(f) Province internal migration rate	0.040	-0.053	-0.148	-0.374	0.031	1.000

Table 7: Correlation matrix - instruments for total foreign employment

	(a)	(b)	(c)	(d)	(e)	(f)
(a) M (indirect export dummy)	1.000					
(b) v (export value)	-0.083	1.000				
(c) Foreign empl.	0.020	0.308	1.000			
(d) Province foreign empl.	-0.028	-0.048	0.113	1.000		
(e) Sector foreign empl.	0.031	-0.001	0.004	0.061	1.000	
(f) Province internal migration rate	0.040	-0.053	-0.144	-0.255	0.117	1.000

Table 8: Correlation matrix - instruments for unskilled foreign employment

	(a)	(b)	(c)	(d)	(e)	(f)
(a) M (indirect export dummy)	1.000					
(b) v (export value)	-0.083	1.000				
(c) Unskilled foreign empl.	-0.010	0.101	1.000			
(d) Province unskilled foreign empl.	0.005	-0.059	0.040	1.000		
(e) Sector unskilled foreign empl.	0.066	-0.064	0.030	0.198	1.000	
(f) Province internal migration rate	0.040	-0.050	-0.050	0.170	0.146	1.000

Table 9: Heckman model - Estimation of the *selection* equation - Robustness tests

	(1)	(2)	(3)
Skilled foreign empl.	0.246^a	0.206^b	0.257^b
	(0.0919)	(0.100)	(0.0998)
Assets	-0.188^a		-0.174^b
	(0.0632)		(0.0742)
MNE	-0.523^b	-0.613^b	-0.574^b
	(0.232)	(0.254)	(0.238)
Export destination nr.	-0.529^b	-0.736^b	-0.568^b
	(0.266)	(0.309)	(0.275)
Age	0.234	0.229	0.223
	(0.190)	(0.211)	(0.196)
Mono-product	0.0365	-0.0964	-0.0594
	(0.184)	(0.195)	(0.193)
Population	0.0361	0.0384	0.0579
	(0.143)	(0.159)	(0.146)
Poverty rate	-0.104	-0.131	-0.0851
	(0.127)	(0.143)	(0.129)
Stocks		-0.106^a	
		(0.0381)	
Constant	2.004	1.157	1.819
	(1.590)	(1.656)	(1.671)
Sector FE	yes	yes	yes
Province FE	no	no	no
Export-destination FE	yes	yes	yes
Survey-year FE	yes	yes	yes
Observations	508	469	474

Note: This table provides Probit estimates for equation (29). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

Table 10: Heckman model - Estimation of the *response* equation - Robustness tests

	(1)	(2)	(3)
Skilled foreign empl.	0.391^a	0.625^a	0.378^a
	(0.0942)	(0.0829)	(0.0877)
Assets	0.468^a		0.501^a
	(0.0919)		(0.0860)
MNE	-0.518^b	-0.758^a	-0.534^a
	(0.210)	(0.215)	(0.207)
Age	-0.0278	0.236^c	-0.0236
	(0.114)	(0.125)	(0.0944)
Population	0.145^c	0.216^b	0.143^c
	(0.0842)	(0.108)	(0.0770)
Poverty rate	-0.243^a	-0.157	-0.166^b
	(0.0826)	(0.0992)	(0.0750)
Stocks		0.115^c	
		(0.0594)	
Inverse Mills ratio	0.791^b	1.175^a	0.736^b
	(0.382)	(0.321)	(0.348)
Constant	7.325^a	10.93^a	6.761^a
	(1.187)	(1.071)	(1.111)
Sector FE	yes	yes	yes
Province FE	no	no	no
Export-destination FE	yes	yes	yes
Survey-year FE	yes	yes	yes
Observations	508	469	474
R-squared	0.469	0.284	0.432

Note: This table provides OLS estimates for equation (30). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

Table 11: Heckman model with IV - Estimation of the *selection* equation - Robustness tests

	(1)	(2)	(3)
Skilled foreign empl.	0.303^a	0.287^a	0.338^a
	(0.102)	(0.103)	(0.102)
Assets	-0.200^a		-0.192^a
	(0.0642)		(0.0737)
MNE	-0.597^b	-0.724^a	-0.673^a
	(0.248)	(0.267)	(0.245)
Export destination nr.	-0.528^b	-0.744^b	-0.568^b
	(0.265)	(0.307)	(0.272)
Age	0.248	0.247	0.244
	(0.187)	(0.208)	(0.192)
Mono-product	0.0350	-0.103	-0.0611
	(0.184)	(0.195)	(0.192)
Population	0.0422	0.0410	0.0676
	(0.143)	(0.160)	(0.146)
Poverty rate	-0.108	-0.137	-0.0900
	(0.127)	(0.143)	(0.129)
Stocks		-0.113^a	
		(0.0380)	
Constant	2.134	1.256	1.994
	(1.584)	(1.630)	(1.648)
Sector FE	yes	yes	yes
Province FE	no	no	no
Export-destination FE	yes	yes	yes
Survey-year FE	yes	yes	yes
Observations	508	469	474
Wald test	0.345	0.147	0.160

Note: This table provides IV-Probit estimates for equation (29). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.

Table 12: Heckman model with IV - Estimation of the *response* equation - Robustness tests

	(1)	(2)	(3)
Skilled foreign empl.	0.463^a	0.743^a	0.455^a
	(0.0913)	(0.0935)	(0.0959)
Assets	0.482^a		0.491^a
	(0.0755)		(0.0763)
MNE	-0.571^a	-0.860^a	-0.608^a
	(0.187)	(0.227)	(0.200)
Age	-0.0383	0.235^c	-0.0140
	(0.113)	(0.128)	(0.0962)
Population	0.151^c	0.215^c	0.153^b
	(0.0854)	(0.110)	(0.0778)
Poverty rate	-0.242^a	-0.160	-0.173^b
	(0.0783)	(0.0993)	(0.0737)
Stocks		0.122^b	
		(0.0561)	
Inverse Mills ratio	0.598^b	1.011^a	0.689^b
	(0.282)	(0.287)	(0.292)
Constant	7.296^a	11.00^a	6.889^a
	(1.081)	(1.133)	(1.034)
Sector FE	yes	yes	yes
Province FE	no	no	no
Export-destination FE	yes	yes	yes
Survey-year FE	yes	yes	yes
Observations	508	469	474
R-squared	0.456	0.262	0.421
Durbin test	0.003	0.001	0.011
Hansen-J test	0.619	0.379	0.702

Note: This table provides IV-2SLS estimates for equation (30). Robust standard errors are shown in parentheses. The superscripts a, b and c, respectively, denote significance at the 1, 5 and 10 per cent levels.