

Providing a Safe Working Environment: Do Firm Ownership and Exporting Status Matter?

ZARA LIAQAT*

This paper hypothesizes that there exists a relationship between the exporting and ownership characteristics of firms and the incidence of accidents at work, using a detailed dataset of manufacturing firms in Viet Nam. There appears to be a positive and highly significant effect of both exporting and foreign ownership on the frequency of accidents. The results obtained are robust across various specifications as well as alternative measures of exporting status and the severity of accidents. The study highlights a greater need for the implementation of labor standards in countries that are becoming increasingly reliant on globalization as a source of economic growth.

Keywords: foreign direct investment, international trade, labor standards, working conditions

JEL codes: F14, F16, J28, J81, O53

I. Introduction

The rapid growth of international trade and foreign direct investment (FDI) since the 1990s has produced a large number of studies evaluating the effects of globalization on national welfare as well as on the economic conditions of firms, consumers, and workers in open economies. Although a majority of the existing literature hypothesizes, both theoretically and empirically, that international trade leads to an overall gain in welfare, some of the recent evidence has intensified apprehensions over globalization. One of these concerns is that in the race to employ the cheapest methods of producing goods, firms often use production processes that compromise on the working conditions they provide to their workers. The increasing pressures of globalization often come at the expense of deteriorating labor standards at workplaces merely to keep the unit cost of production lower than that of other firms in the same country or compared with average costs in other countries (Liaquat

*Zara Liaquat: Lecturer, Department of Economics, University of Waterloo, Canada. E-mail: zliaquat@uwaterloo.ca. The author would like to thank the participants of the 2016 Rimini Conference in Economics and Finance in Waterloo, Jeff Nugent, Brian McCaig, David Hummels, Jakob Munch, and Chong Xiang for their insightful comments. The author would also like to thank the managing editor and journal referees for helpful comments and suggestions. This work was supported by the Contract Academic Staff Research Grant, Wilfrid Laurier University. ADB recognizes "China" as the People's Republic of China and "Vietnam" as Viet Nam. The usual ADB disclaimer applies.

2017). In the absence of appropriate labor regulations, increased world trade may, therefore, result in inferior working conditions and a rise in accidents at work.

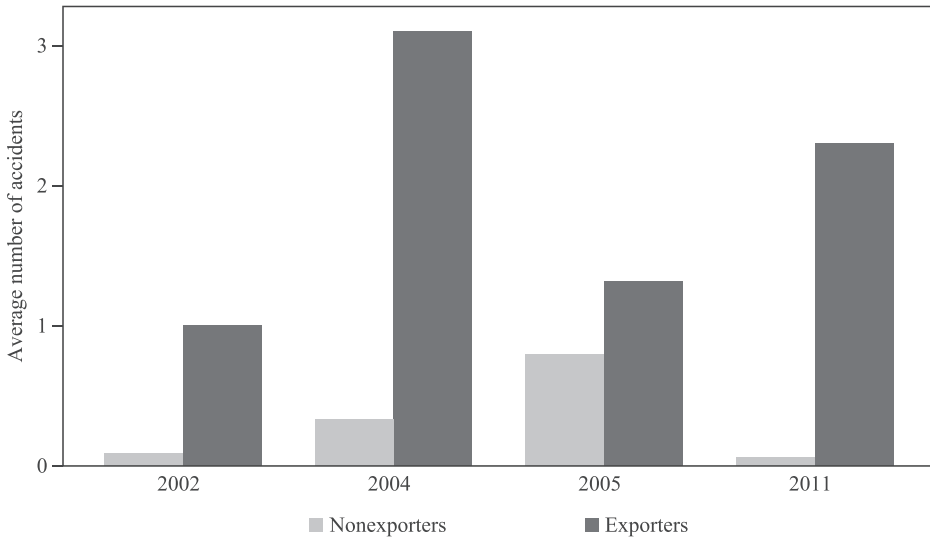
The inability of earlier theoretical analyses to yield unambiguous predictions about the effects of globalization on worker conditions provided by firms has led to numerous empirical studies on wage and nonwage working conditions in relation to globalization.¹ Nevertheless, there are still relatively few quantitative studies of the effects in large samples, as well as several unresolved issues, particularly on how best to link exporting and the ownership status of a firm to the nonwage working conditions provided to its workers. In this paper, I aim to offer evidence of this association by estimating a relationship between the exporting and foreign ownership characteristics of firms and the occurrence of accidents at work. I utilize detailed data of manufacturing sector firms in Viet Nam. The most important finding of this study is that there appears to be a positive and highly significant effect of exporting behavior and foreign ownership on the incidence of accidents at manufacturing firms in Viet Nam. The identification approach used attempts to exogenously determine the effects of exporting and the ownership characteristics of firms in the dataset by controlling for a comprehensive set of firm, province, and industry attributes, as well as with the use of appropriate robustness checks. The results obtained in the paper point toward the need for adequate enforcement of labor standards, especially in countries becoming increasingly dependent on globalization as a source of economic growth and development.

Figure 1 reveals the disparity between exporting and nonexporting firms in terms of the average number of accidents occurring at work in 2002, 2004, 2005, and 2011. The sample used in the study is from data provided by the General Statistics Office of Viet Nam. There seems to be a noticeable difference across the two groups of firms. Exporting firms, on average, incurred a greater number of accidents than nonexporting firms in all 4 years. In Figure 2, this comparison is carried out across foreign and domestically owned firms. Once again, the mean number of accidents differs considerably across the two categories of firms. Fewer accidents arose on average at firms that are domestically owned as opposed to those having foreign owners. Both snapshots of the data used in this study pose a relevant question about the nonwage working environment provided by manufacturing firms in Viet Nam: is there a systematic relationship between these two essential traits of firms and the workplace safety that they offer to their workers?

Whether or not globalization has a positive impact on workers and working conditions has been unclear so far. Trade liberalization increases labor demand in exporting sectors, thereby leading to higher wages for workers employed in those sectors. However, by decreasing the demand for workers, it can lead to a loss of

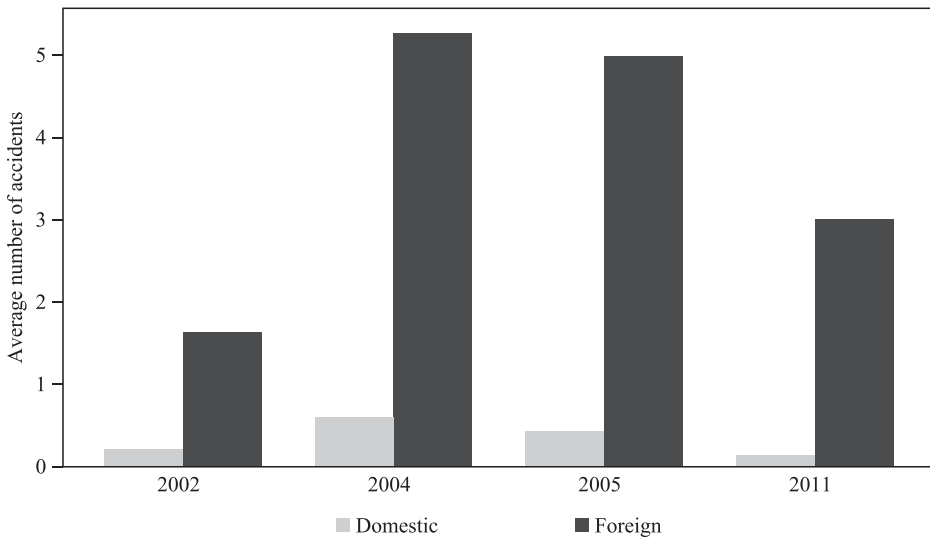
¹ While the term “globalization” is broadly used to refer to the growing volume of world trade, FDI, and to denote the movement of capital and labor across national borders, this paper refers to globalization as an expansion of trade and foreign ownership of domestic firms.

Figure 1. Accidents at Work by Exporting Status



Source: General Statistics Office, Viet Nam.

Figure 2. Accidents at Work by Ownership Status



Source: General Statistics Office, Viet Nam.

jobs in the import-competing sectors, and in some cases, it can force firms to attempt to reduce costs through deteriorating working conditions. Even if trade creates jobs in the exporting industries, growing pressures to remain competitive in a highly integrated global market may also compel firms to cut unit costs by

worsening working conditions. The same is true as far as the effects of FDI on working conditions is concerned. The argument for a race to the bottom is founded on the assumption that capital moves from countries with better working conditions to countries with poorer working conditions or unenforced labor standards because firms find it profitable to do so. On the other hand, if foreign firms decide to maintain working conditions between the domestic level and those in the origin country, the average level of working conditions may rise. This may even induce domestic firms to improve working conditions (Jayasuriya 2008).

An Employment Policy Primer published by the World Bank provides a summary of various research assessments carried out on the topic of globalization and its impact on working conditions (Jayasuriya 2008). By referring to the results from five countries (Cambodia, El Salvador, Honduras, Indonesia, and Madagascar), it outlines an approach for a systematic cross-country comparison of the relationship between globalization and working conditions. The note highlights the significance of accounting for each country's unique history, trade reforms, and economic conditions. Secondly, it proposes paying close attention to the evolution of labor standards in the country, in general, and to select the most appropriate measures of working conditions specifically. One way to investigate the effects of globalization on working conditions between industries is by inspecting the wage differentials between industries after controlling for worker characteristics (e.g., gender, age, education, and other factors). The note also lists a set of nonwage working conditions that may be included in the regression analysis: health and safety, hours, security, benefits, union representation, and details about the working environment of industries directly affected by globalization.

A difficulty that complicates the analysis at hand is the quantification of working conditions. In several existing studies, wage rates have been used to denote working conditions, principally because wage data are often more complete than data on individual characteristics of working conditions. Yet, many studies do focus on nonwage working conditions as well. These conditions may include number of hours worked, overtime hours worked, health and safety, job security, benefits, union representation, working environment, and so forth. In most cases, the necessary data are acquired from household or labor force surveys. A study that relies on data for the number of accidents at a workplace to denote working conditions is that by Neak and Robertson (2009). It provides both qualitative and quantitative analyses of the link between globalization and working conditions, and it pays close attention to the role of international organizations and monitoring in Cambodia's globalization experience using data originated from labor market surveys. Their evaluation is derived from two measures of working conditions: the interindustry wage differential and the number of accidents. The results propose that wages and working conditions tend to be positively related and are better in sectors receiving FDI. The study reveals that wages and working conditions in the garment sector are above the industry average by providing evidence of relatively fewer accidents in the

clothing industry. Given that trade and investment in Cambodia seem to be largely focused in the garment sector and that employment in this sector has drastically increased due to advances in globalization, the results offer meaningful insights into the relationship between export growth and working conditions.

Workplace environment has been the subject of numerous recent studies. Although not directly linked with the assessment of globalization, a recent paper by Blattman and Dercon (2018) uses experimental evidence from Ethiopian industrial firms to examine the long-run impact of occupational choices faced by local workers. They show that industrial jobs offered more working hours than informal job opportunities, had little impact on incomes because of lower wages, were riskier in nature, and thus were often associated with serious health problems. A study more closely related to this paper is that of Hummels, Munch, and Xiang (2016). It combines Danish data on individuals' health with Danish matched worker-firm data to determine how increases in exports by firms affect their employees' job injuries and sickness. They find that rising exports indeed lead to higher rates of injury and sickness, including severe depression, use of antithrombotic drugs, and hospitalizations due to heart attacks or strokes. They use external shocks to Denmark's trading environment—such as weighted averages of world import demand, world export supply, and transport costs—to construct instruments for exports. Another study inspecting data on injuries at manufacturers in the United States (US)—adapting from recent work by Autor, Dorn, and Hanson (2013)—uses Chinese import growth during 1996–2007 as a shock to competition. McManus and Schaur (2016) show that injury rates in competing US industries increase over the short to medium run, particularly at smaller establishments. Following Autor, Dorn, and Hanson (2013), they too instrument for Chinese import growth in the US with Chinese import growth in a set of other Organisation for Economic Co-operation and Development countries. To my knowledge, the relationship between greater exposure to international competition and worker health and workplace conditions in emerging or developing economies has not yet been thoroughly investigated. Accordingly, in this study, I attempt to provide a comprehensive analysis of the potential association between trade openness as well as foreign ownership and the incidence of workplace accidents using enterprise-level data from Viet Nam.

A relatively larger body of literature attempts to analyze the impact of FDI and multinational production on the recipient country's labor market outcomes. Foreign-owned firms are often associated with the provision of on-the-job training and tend to offer higher wages compared to their domestic counterparts (see, for example, Javorcik 2015). The study by Brown, Deardorff, and Stern (2004) evaluates the empirical evidence on the effects of multinational production on wages and working conditions in developing countries. Their paper recognizes that attempts to define and measure the living wage are fraught with insuperable difficulties. Nonetheless, there is a large body of empirical evidence showing that foreign ownership results in increasing productivity and wages by expanding the

scale of production. A valuable summary of some of the evidence is offered by Lim (2000), demonstrating that foreign-owned and subcontracting firms in manufacturing industries have a propensity to pay higher wages than domestic firms. Foreign-owned firms are more likely to make use of labor organizations and democratic institutions that advance the efficiency of their factory operations, thus improving the conditions of work. The Organisation for Economic Co-operation and Development (2000) discovered that FDI was positively correlated with the protection of union members and the right to establish free unions, strike, and bargain collectively. However, several problems have been cited with the use of ratification of International Labour Organization (ILO) conventions and the Freedom House indicators of democracy as measures of worker rights and labor costs (Martin and Maskus 2001).

The discussion section of this paper briefly examines the usefulness of linking labor standards with trade reforms. Mounting global pressures to improve labor standards have not always produced the desired outcomes. Berik and Rodgers (2009) examine the status and enforcement of labor standards in two Asian economies, Cambodia and Bangladesh, that have lately experienced intense pressure to enhance the price competitiveness of their textile and clothing exports. While compliance with basic labor standards improved in Cambodia following a trade agreement with the US, the empirical evidence pointed toward opposing results in Bangladesh. The divergent experiences indicate that trade-linked schemes may at times achieve improvements in labor standards without deterring export or job growth.

The remainder of the paper is organized as follows. Section II provides an overview of trade and FDI reforms introduced in Viet Nam. Section III summarizes relevant findings from recent studies specific to Viet Nam and sets the stage for the empirical analysis. Section IV discusses data sources and descriptive statistics, and identifies the empirical model used in this paper. Section V presents the results. Finally, section VI offers some policy implications and concludes.

II. Overview of Trade Reforms and Foreign Direct Investment in Viet Nam

Viet Nam has undergone extraordinary rates of economic growth in the last 2 decades. Gross domestic product (GDP) per capita in purchasing power parity terms almost tripled between 1986 and 2010. As discussed in McCaig and Pavcnik (2013), over a third of Viet Nam's growth can be attributed to structural change triggered by movements of labor from low-productivity agriculture toward more productive manufacturing and services. In 1986, Viet Nam introduced a series of reforms, commonly known as Doi Moi, as an attempt to transform the economy from central planning to a regulated market economy. The exceptional rate of economic expansion was coupled with a significant shift in the composition of its

GDP in the form of economic activities shifting away from agriculture and toward the manufacturing and service sectors (McCaig and Pavcnik 2013).

It is widely accepted that the Communist Party executed the reforms as a result of poor economic conditions in Viet Nam during the 1980s (World Bank 2011). Viet Nam was an agrarian country at the start of the reforms and witnessed low growth rates. State-owned enterprises (SOEs) were the leading means of production and employment in the nonagriculture sector. Furthermore, the US had imposed a trade embargo on Vietnamese exports that was only lifted in 1994. Prior to the reforms, Viet Nam was very much a closed economy with very few exports. Exports and imports were limited by the imposition of export duties, quotas and licenses, and an overvalued exchange rate.

As a part of the Doi Moi reforms, there was massive decentralization and the provision of enterprise autonomy over production and pricing, along with the implementation of policies that tremendously encouraged competition. The Foreign Investment Law of 1987 allowed foreign enterprise activities by offering tax concessions and duty exemptions (Dodsworth et al. 1996). Several export processing zones and industrial parks were created, which provided firms favorable tax rates and import and export duties. The SOEs received autonomy over price-setting and production processes. Although by 2010, only 3,364 of them remained in operation, SOEs remained a crucial sector in terms of production and manufacturing output, contributing 36.1% to GDP during 2006–2009 (Minh et al. 2010).

Viet Nam experienced a huge inflow of FDI in the 1990s and 2000s. There was also a significant rise in the relative share of output produced by the FDI sector, which was close to 18% during 2006–2009. The Enterprise Law of 2000 made it easier for private household enterprises to register and operate by decreasing the time required to register (World Bank 2002). The enterprise reforms led to noteworthy improvements in many business environment characteristics that significantly contributed to the growth of foreign ownership and international trade.

Domestic trade reforms and the signing of a number of free trade agreements led to the rapid growth of Viet Nam's international trade. Doi Moi reforms helped allow private enterprises to engage in international trade by removing numerous import and export quotas, budget subsidies for exports, and import permit requirements; lowering or eliminating export duties; and simplifying licensing procedures (Dodsworth et al. 1996). These reforms were accompanied by a devaluation of the exchange rate in 1989. Viet Nam signed a preferential trade agreement with the European Economic Community in 1992 (Glewwe 2004). It became a member of the Association of Southeast Asian Nations Free Trade Area in 1995. The US–Viet Nam Bilateral Trade Agreement was signed in 2001, and in 2007, Viet Nam became a member of the World Trade Organization (World Bank

2011). There was also an improvement in the ability of firms to export and import, indicated by an overall rise in the ease of doing business in Viet Nam (World Bank 2013).

Between 1986 and 2011, there was a remarkable increase in Viet Nam's aggregate exports and imports. Imports and exports averaged only about 15% and 5% of GDP, respectively, in the middle of the 1980s before rising to about 88% and 78% of GDP by 2010 (McCaig and Pavcnik 2013). At the same time, there were major changes in the composition of trade, with a decline in exports of agricultural and aquaculture products, and a sharp rise in the exports of relatively unskilled, labor-intensive manufactured goods. There was a drop in the share of clothing and footwear imports and an increase in that of nonferrous metals. As noted in the empirical sections of this paper, there was an important interaction between the liberalization of trade and foreign investment in Viet Nam. By 2010, foreign-owned firms had captured over half of all exports and about 44% of imports.

III. Globalization and Labor Standards in Viet Nam

The consequences of the rapid expansion in international trade and FDI in Viet Nam, as discussed in the previous section, have been the subject of numerous empirical studies and reports. McCaig and Pavcnik (2014) study the effects of a rise in exports on labor allocation across businesses in Viet Nam. They learn that workers reallocate from household businesses to employers in the formal enterprise sector; the reallocation seems to be more apparent in industries that experience larger cuts in tariffs. Glewwe (2000) examines the status of workers in Viet Nam employed by businesses that have foreign owners or are in joint ventures with foreign investors—*vis-à-vis* the average Vietnamese worker—by comparing wages, the consumption expenditure levels of the households to which these workers belong, and whether workers in foreign-owned ventures were officially declared poor. In almost all the cases, the evidence confirmed that workers in foreign-owned businesses were better off than the average Vietnamese worker.

Another paper centered on Vietnamese data considers the impact of liberalized trade policy on the incidence of child labor. Edmonds and Pavcnik (2002) exploit the variation in the real price of rice to study the link between price movements of an exported commodity and economic activities of children using a panel of household data. They find that rice price increases can account for almost half of the decline in child labor that occurred in Viet Nam in the 1990s. This outcome is especially remarkable as it suggests that the use of trade sanctions on exports from developing countries to eradicate child labor is unlikely to produce the desired outcome.

Nevertheless, a large body of anecdotal evidence tends to imply a less optimistic outcome associated with the expansion of international trade in Viet Nam. O'Rourke (1997) conducted research on over 50 Vietnamese factories,

including the Tae Kwang Vina factory, a Nike subcontractor in the Dong Nai province of Viet Nam. This factory was the subject of an earlier audit report conducted by Ernst & Young, which revealed a number of striking conclusions about the working conditions inside the factory (Ernst & Young 1997). Below are some of the points raised in the Ernst & Young audit:

- (i) In 48 out of 50 cases, workers were required to work more than the maximum working hours.
- (ii) Only 15 out of 50 workers were not satisfied with their working conditions (e.g., “hot, stuffy”).
- (iii) Personal protective equipment (e.g., gloves, masks) was not provided on a daily basis.
- (iv) Workers did not wear protective equipment, “even in highly-hazardous places where the concentration of chemical dust and fumes exceeded the standard frequently.”
- (v) From a sample of 165 employees from the mixing and roller sections, 128 employees (77.6%) contracted respiratory disease.

Despite the issues identified, the key conclusion of the report was that Tae Kwang Vina was in compliance with the Nike codes of conduct. Even so, O’Rourke (1997) performed walk-through audits of environmental and working conditions in the factory and interviewed management personnel as well as representatives of Nike in Viet Nam. Owing to his confidential interviews with workers, O’Rourke’s (1997) assessment lead to remarkably contradictory results. In particular, the audit neglected information regarding occupational health and safety, environmental, and general working conditions, and the methodology employed ignored conventional standards of labor and environmental auditing. O’Rourke (1997) suggested that a truly independent audit of labor and environmental practices should involve a more comprehensive analysis of the system within the factory that affects working conditions, health and safety, and the environment. Moreover, he presented a persuasive argument against accounting firms being retained by manufacturers conducting audits of labor and environmental conditions.

According to official government reports, Viet Nam lacks mechanisms and incentives for investments in improving working conditions and in using clean and advanced technologies to minimize workplace environmental pollution and protect workers (Ministry of Labour, Invalids and Social Affairs and International Labour Organization 2006). The standards on occupational safety and health (OSH) and fire-explosion prevention are rather insufficient, particularly those on

the management of new equipment and technologies. The report also emphasizes that compliance with OSH regulations in many branches, localities, and enterprises is not taken seriously. Moreover, workers are not aware of their rights to protect themselves from risks of occupational accidents, sickness, and diseases, while employers do not understand, or perhaps ignore, their responsibilities. A briefing paper for the Worker Rights Consortium (2013) concludes that Vietnamese workers faced severe safety and health hazards on the job. It cites several interviews with employees in various factories near Ho Chi Minh City—including Nike suppliers Tae Kwang Vina and Yupoong Viet Nam; All Super Enterprise, a supplier to J.C. Penney and Lacoste; and Scavi Viet Nam, a supplier to Puma and VF. In many cases, it was found that working hours exceeded the legal limit. Furthermore, factory workers were often at risk from hazards such as locked fire exits and failure to provide protective equipment. A 2011 survey by the Vietnam General Confederation of Labour indicated that over 90% of the safety gear supplied to employees failed to meet applicable industrial standards. Strike organizers faced dismissal, blacklisting, prosecution by employers, and imprisonment by government authorities (Vietnam General Confederation of Labour 2011). Not only were the nonwage working conditions worse, the confederation described the wages paid by foreign-invested factories as “shockingly low.”

IV. Data and Empirical Methodology

A. Description of Data

I use data from the enterprise surveys conducted by the General Statistics Office of Viet Nam since 2000. The dataset covers firms from the manufacturing sector in Viet Nam. The annual survey dataset records responses from all formally registered enterprises in the country and contains basic information pertaining to each registered enterprise. This includes information about the type of firm (e.g., central government, local government, or foreign); industry; total turnover and profits; as well as information about employment.² Along with the basic characteristics of the enterprise, there are also questions about firm-provided training, investment in research and development, and taxation.³ Results from these enterprise surveys are published but the datasets are not publicly available. Access to the datasets and permission to use them were granted by the General Statistics Office.

Even though, generally, there is consistency in the topics covered in the annual surveys, in some cases (especially during more recent years), there have been a few disparities in the questionnaires. Although the survey responses were

²In case a firm produces multiple products, I use the primary industry of the firm for classification purposes.

³The survey includes a supplementary set of questions for enterprises in the service sector.

collected annually from 2000 to 2015, the question about the number of labor accidents that occurred during the year was included only in four annual surveys: 2002, 2004, 2005, and 2011. I am, consequently, restricted to utilize data only from these years. Nonetheless, because the dataset covers a broad sample of manufacturing firms and is reasonably spread over almost a decade, it allows for extensive analysis using advanced econometric techniques.

Each of the questionnaires for 2002, 2004, 2005, and 2011 inquires the firm about the number of labor accidents that occurred during the year and how many of those accidents were fatal. The second part of the question asks about the number of victims of these accidents and the resulting number of deaths, if any. The final part of the question pertains to the total cost (in millions of Vietnamese dong) of damages caused by these accidents. The baseline regression utilizes the first part of the questions related to labor accidents. Notwithstanding, as explained in the following section, I also use several measures of the severity of accidents as a robustness check.⁴

In terms of the representativeness of various subjects, the coverage is rather uneven. This can be seen by comparing the summary statistics across the 4 years included in Table 1. These differences owe to the variation across questionnaires, with the most recent questionnaire in 2011 being more detailed in terms of the information about the firm's workforce and exporting behavior. The questionnaires for 2002, 2004, and 2005 simply ask the firm whether it engaged in any exporting activities.⁵ Therefore, exports is modeled as a binary variable that takes the value of 1 if a firm exports and 0 otherwise in a majority of regressions reported in the paper. For the year 2011, however, I have specific information about the fraction of total sales that are exported, and thus obtain a more refined measure of exporting status. For this reason and as explained later in the section containing econometric specifications, I run separate cross-sectional regressions for the year 2011, hoping

⁴The accidents data depicted in Table 1 were compared with the totals reported by various issues of official national reports such as the National Profile on Occupational Safety and Health and Fire-Explosion Prevention in Viet Nam (Ministry of Labour, Invalids and Social Affairs and International Labour Organization 2006, 2010). The number of accidents, victims, deadly accidents, and fatalities are all stated to be much higher according to the enterprise survey dataset used in this paper. For example, the number of accidents, victims, deadly accidents, and deaths in 2005, according to the report, are 4,050; 4,164; 443; and 473, respectively. One possible reason for this inconsistency is the difference in sources and coverage of the data compiled under the Ministry of Labour, Invalids and Social Affairs, which is the primary data source for the ILO national reports. The data collected are based on the reporting system from enterprises to local labor inspectors and to the Labour Inspectorate of the Ministry of Labour, Invalids and Social Affairs. The report itself warns that not all enterprises reported their annual occupational accidents, resulting in the data that reflect annual occupational injuries not to be precise. Furthermore, data on occupational injuries by provinces, types of industries, ages, and sex are not available in these national reports.

⁵There is no consistent change in the share of either exporting or foreign-owned firms over the years. However, the share of exporting firms in 2005 is reported to be much smaller than that for other years. This is because the questionnaire for 2005 enquires whether the firm exported services, while the other three questionnaires queried specifically about the export of goods. Thus, as expected, the reported exporter share in 2005 is only 0.5% as opposed to 24.4%, 18.9%, and 10.8% in 2002, 2004, and 2011, respectively. Due to the discrepancy in the definition of exports, I also estimate the model excluding data for 2005, as discussed later in the paper.

Table 1. Descriptive Statistics

Variables	2002		2004		2005		2011	
	N	Mean	N	Mean	N	Mean	N	Mean
Fixed assets	18,476	10,677	11,851	583.3	14,466	773.5	64,527	25,007
Foreign	18,966	0.0701	23,934	0.0812	27,620	0.0827	70,160	0.0693
Joint	18,966	0.0221	23,934	0.0191	27,620	0.0165	70,160	0.00795
SOE	18,966	0.112	23,934	0.0655	27,620	0.0450	70,160	0.00244
Export	18,045	0.244	23,934	0.189	25,767	0.00516	70,160	0.108
Import	18,966	0.268	23,934	0.171	27,620	0.468	70,160	0.111
Size	18,944	136.5	23,922	134.3	27,596	126.6	70,157	81.67
Female workers (No.)	16,187	87.27	22,355	80.05	26,240	73.40	57,483	10.56
Age	18,956	7.487	22,145	7.135	26,675	6.768	15,316	13.26
Average wage	18,819	9.238	23,895	11.78	27,561	13.10	69,017	33.21
Accidents (No.)	16,366	0.311	6,635	1.122	7,741	0.901	33,593	0.307
Deadly accidents (No.)	15,900	0.00698	5,558	0.0202	6,995	0.0134	28,367	0.00338
Victims (No.)	16,360	0.372	6,015	1.242	7,321	1.139	28,985	0.356
Deaths (No.)	15,893	0.00799	5,549	0.0216	6,978	0.0153	28,333	0.00416
Cost of damages	16,191	66.64	5,809	12.10	7,173	43.14	28,890	278.7
Training expenditure	16,784	1.925	4,222	3.608	24	790.8	24	680.1
Capital intensity	18,470	76.70	11,844	10.27	14,448	11.73	64,446	208.2
R&D intensity	3,896	0.0421	5,018	0.229			288	7.202
Environmental expenditure	5,461	114.2	6,899	71.04	7,313	635.7		
Workers hired (No.)	10,332	66.74	17,122	55.34	20,119	54.32		
Workers fired (No.)	8,340	41.91	14,509	45.23	18,045	47.82		
Intermediate inputs					3,571	121,159		
Export intensity							24,224	0.949
Industrial zone							68,856	0.0852
Workers (No., 15–34 years)							64,309	61.47
Workers (No., 35–55 years)							67,885	24.56
Workers (No., 56–60 years)							41,246	2.372
Workers (No., over 60 years)							32,921	0.346
Unskilled labor (No.)							33,648	57.61
Skilled labor (No.)							28,615	31.02

R&D = research and development, SOE = state-owned enterprise.

Notes: Fixed assets, average wage, cost of damages, training expenditure, cost of damages, environmental expenditure, and intermediate inputs are values in million dong. Capital intensity is fixed assets per worker. R&D intensity is spending on research and development expressed as a percentage of total sales. Export intensity is measured by the fraction of sales exported.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

to perceive a more robust relationship between the exporting propensity of the firm and the working conditions that it offers.

The ownership variables (foreign, SOE, or joint ownership) also take the form of dummy variables. Firm size is measured using the total number of workers, and capital intensity is measured as fixed assets per worker. I also control for the number of female employees in the regression models. Age is computed as the difference between the survey year and the year the firm started operations. The average wage is calculated by dividing the total compensation paid to employees by the number of full-time employees of the firm.⁶

As shown in Table 1, I also report some of the human capital measures for the 2011 dataset, which provides the numbers of employees with high school diplomas and college or university degrees. These figures are used to compute the fractions of skilled and unskilled workers in each firm. Other supplementary data available only for 2011 include location in an industrial zone, workers by age group, and export and import status. Lastly, the variables with uneven coverage across years are spending on environmental protection, value of intermediate inputs, research and development (R&D) intensity, and number of workers hired and fired during the year.⁷

Table 2 shows the sample representativeness by exporting and ownership status of the firm and indicates the dissimilarity across subsamples. The mean values of foreign-owned exporters and foreign-owned firms that export in the dataset are both quite high at 34.9% and 56.6%, respectively. Foreign-owned and exporting firms possess more capital, higher export intensity, more fixed assets, and a greater likelihood to import; they are relatively bigger as measured by the number of workers (total size as well as by age groups, skill intensity, and gender). They also both hire and fire more workers compared to nonexporters and domestically owned enterprises. A greater share of exporters and foreign-owned firms are located in industrial zones (40% and 61.3%, respectively) than are nonexporters and domestically owned enterprises (both at 4.6%). As frequently assessed in the trade literature, a typical exporting and foreign firm in Viet Nam pays a higher average wage than firms that do not export or those with domestic owners.

On the other hand, unlike the findings of Javorcik (2015), the average spending on training and environmental protection is lower for the foreign firms than for domestic firms. As far as the proxies of nonwage working conditions are concerned, exporters and foreign-owned firms tend to do worse in virtually all cases; with higher averages for number of accidents, number of victims of accidents, and cost of damages as a result of accidents, it appears that nonexporters and domestically owned enterprises deliver superior nonwage working conditions. Since

⁶The total compensation includes wages, salaries, bonuses, gratuities, social security contributions, as well as other compensation out of production costs.

⁷R&D intensity is defined as the spending on R&D expressed as a percentage of total sales.

Table 2. Descriptive Statistics by Exporting and Ownership Status

Variables	Nonexporter		Exporter		Domestic		Foreign	
	N	Mean	N	Mean	N	Mean	N	Mean
Export	–	–	–	–	127,665	0.0846	10,241	0.566
Import	121,302	0.154	16,604	0.385	130,261	0.174	10,419	0.693
Foreign	121,302	0.0366	16,604	0.349	–	–	–	–
Fixed assets	93,296	8,953	14,145	69,781	101,628	13,522	7,692	59,123
Joint	121,302	0.00838	16,604	0.0511	130,261	0.0145	10,419	0
SOE	121,302	0.0320	16,604	0.0575	130,261	0.0393	10,419	0
Size	121,250	62.82	16,604	427.3	130,203	80.81	10,416	432.0
Female workers (No.)	103,929	27.58	15,845	170.8	112,401	34.82	9,864	184.7
Age	68,846	8.070	12,175	9.292	76,010	8.388	7,082	6.489
Accidents (No.)	54,136	0.196	9,550	1.919	59,530	0.230	4,805	3.350
Deadly accidents (No.)	48,114	0.00584	8,094	0.0149	53,052	0.00675	3,768	0.0146
Victims (No.)	49,037	0.223	9,015	2.131	54,229	0.260	4,452	4.064
Deaths (No.)	48,070	0.00655	8,073	0.0181	53,002	0.00766	3,751	0.0176
Cost of damages	48,714	32.87	8,733	889.8	53,838	151.1	4,225	326.2
Training expenditure	15,109	2.580	5,340	8.135	19,408	4.075	1,646	2.275
Environmental expenditure	15,289	286.9	4,260	204.3	17,322	299.9	2,351	241.5
Average wage	120,035	21.21	16,590	32.08	128,974	20.99	10,318	38.89
Capital intensity	93,191	132.5	14,144	190.2	101,597	123.3	7,611	340.7
R&D intensity	5,941	0.557	3,256	0.0244	8,196	0.170	1,006	1.981
Workers hired (No.)	38,323	37.02	7,546	163.1	42,544	38.82	5,029	214.4
Workers fired (No.)	32,718	31.71	6,708	114.8	36,508	33.32	4,386	148.7
Intermediate inputs	3,332	120,141	34	89,090	2,958	113,250	613	159,321
Export intensity	23,432	0	792	29.01	23,466	0.687	758	9.061
Industrial zone	61,311	0.0464	7,545	0.400	64,058	0.0457	4,798	0.613
Workers (No., 15–34 years)	56,829	24.29	7,480	344.0	59,500	36.96	4,809	364.7
Workers (No., 35–55 years)	60,409	14.18	7,476	108.4	63,102	20.25	4,783	81.43
Workers (No., 56–60 years)	36,348	1.715	4,898	7.249	38,418	2.228	2,828	4.337
Workers (No., over 60 years)	29,315	0.301	3,606	0.716	30,812	0.323	2,109	0.691
Unskilled labor	30,179	24.16	3,469	348.6	31,778	38.87	1,870	375.9
Skilled labor	25,689	15.39	2,926	168.2	27,047	24.56	1,568	142.5

R&D = research and development, SOE = state-owned enterprise.

Notes: Fixed assets, average wage, cost of damages, training expenditure, cost of damages, environmental expenditure, and intermediate inputs are values in million dong. Capital intensity is fixed assets per worker. R&D intensity is spending on research and development expressed as a percentage of total sales. Export intensity is measured by the fraction of sales exported.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

the figures displayed so far are purely descriptive, I now turn to the quantitative analysis of a comparison of these two types of firms in Viet Nam.

B. Econometric Framework

I have established that the firm-level empirical evidence on the relationship between exporting behavior and working conditions is insufficient and ambiguous. I now turn to the primary goal of this paper. In this section, I explain the econometric approach used to gauge the impact of a firm's exporting status on the number of workplace accidents using enterprise survey data from Viet Nam. Identifying the causes of workplace accidents is challenging due to a number of factors. On one hand, a higher number of accidents may be brought about by an inferior state of the working environment (e.g., the condition of the plant or factory), while it is also equally likely that inadequate implementation or enforcement of labor standards in a particular region or industry leads to a greater incidence of accidents at the plant. In other words, the reasons for the occurrence of workplace accidents can be manifold. Because the principal goal is to identify the role of exporting and ownership status in determining the number of accidents, it is of utmost importance to control for a range of potentially significant causes of accidents at the factory. Unfortunately, due to data limitations and the resulting omitted variable bias, it is impossible to account for all the potential determinants of workplace accidents. In addition, a simple regression of the number of accidents on exporting status is expected to yield biased results because exports are likely to be endogenous; a firm providing a safer working environment is also likely to be more productive by means of either using better technology or by employing healthier, more efficient workers, and is thus expected to be exporting a part or all of its superior quality output. Consequently, exporting behavior itself may be associated with a number of firm-, industry-, or region-specific characteristics that will need to be controlled for in the specification in order to obtain any meaningful relationship between exporting propensity and accidents at work.

In order to measure this association, I define the following linear model:

$$A_{ijt} = \alpha_0 + \alpha_1 E_{ijt} + \alpha_2 x_{it} + \mu_{j,t} + \mu_p + \varepsilon_{ijt} \quad (1)$$

where A_{ijt} is the number of accidents that took place in the survey year t at firm i in industry j for every thousand workers in firm i . As noted above, both exporting and foreign firms are much larger than nonexporting or domestic firms, and therefore may be more likely to have accidents simply because they are larger in size. In order to adjust for size differences and obtain estimates that can be easily interpreted, I use accidents per thousand workers as a dependent variable instead of the total number of accidents or number of accidents per worker. I do not log transform A_{ijt} because there are a considerable number of zeros in the dataset, indicating that many firms did not experience any serious accidents during the course of the year.

E_{ijt} is the observed binary export variable that takes a value of 1 if firm i is an exporting firm. x_{it} denotes the vector of time-varying firm characteristics, including its status of ownership (foreign or SOE), size, capital intensity, number of female employees, and age of the firm. The choice of firm characteristics to be included in x_{it} is explained below. Since the number of accidents occurring in a firm is expected to vary across different types of manufacturing industries overtime, I include the three-digit ISIC industry-by-time fixed effects, given by $\mu_{j,t}$. Industry-year fixed effects allow for industry-specific trends in accidents and control for shocks that affect all firms in a given industry in a certain year. Lastly, μ_p represents province fixed effects.

The foremost threat to the identification of equation (1) is that the estimates may be driven by unobserved factors related to both the exporting status of a firm as well as the number of workplace accidents, such as demand shocks. In order to exogenously identify different shocks, I also provide an alternative estimation of the model by replacing the industry-year and province fixed effects by an interaction of industry, time, and province fixed effects. By controlling for a rigorous set of time-invariant local sectoral determinants of accidents, I ensure that no systematic information is shifted into the error term that is correlated with the independent variables, or which creates an endogeneity bias for the variables that I treat as exogenous.

As discussed above, it is imperative to control for a variety of firm and industry characteristics in order to obtain any meaningful estimates of the effect of exporting behavior on workplace accidents. A fundamental concern for the estimating strategy is that exports, E_{ijt} , are likely to be correlated with the error term, ε_{ijt} , and therefore cause an omitted variable bias in the estimated results. Although I am unable to include some of these factors in the estimation of equation (1) above because of the lack of available data, it is nevertheless possible to make use of adequate proxies to incorporate numerous variables missing in the dataset.⁸ More importantly, the inclusion of industry-year and province fixed effects can help wipe out the time-invariant industry and/or province-specific factors that might affect working conditions. For example, it is expected that the working conditions provided by a given firm are likely to be associated with the overall firm competitiveness along with its other key characteristics. Accidents at work may also be connected with local and world demand for the finished product, which in turn is affected by the industrial competitiveness of local firms. By capturing the industry-specific trends in the regression estimates, I am able to pick up the influence of worldwide industrial demand shocks.

⁸As explained in this section, I control for various seemingly unrelated variables in all the regressions, such as R&D spending by the firm and expenditure on environmental factors, that can potentially serve as proxies for firm productivity and thereby be classified as determinants of the number of accidents that take place.

Another essential aspect in influencing the state of the work environment offered is the effectiveness of the implementation of labor standards in a given industry or region. The existing literature points to the significance of various firm and industry characteristics that are likely to be related to the enforcement of labor regulations (Liaqat and Nugent 2016). The existence of satisfactory labor standards per se is not sufficient to encourage employers to improve working conditions. A more effective implementation is likely to be related to a number of individual firm attributes and not just to the existence of complementary institutions. Larger firms, for example, are more likely to implement labor laws in their workplaces because they are more noticeable to regulatory officials. The same is true if a firm is located in a capital city or in an industrial or exporting zone. The inclusion of province fixed effects sweeps out the differences across firms in terms of the implementation of existing labor regulations in Viet Nam and to some extent tackles the concern over lack of data availability about the state of the factory (e.g., use of obsolete equipment, suitable safety measures introduced, and amount of overtime hours). Since some of the province fixed effects may be varying over time, I use a combination of either industry-year and province fixed effects, or industry-year-province effects, which enables controlling for the inherent endogeneity bias arising from the unobserved influences on both the exporting status and ownership status of a firm, and on the number of accidents at work. As seen below, the fundamental results remain robust across all of these specifications.

Another complexity pertaining to the empirical technique is that the dependent variable, the number of accidents (accidents per thousand workers), is a much-skewed variable. Many firms do not respond to the question about accidents, and a large number of manufacturing firms that do respond report no accidents at all.⁹ A comparison of the descriptive statistics of accidents data derived from the enterprise surveys with the official national reports illustrates that, despite concerns about underreporting, the enterprise surveys yield greater totals for all the different variables used in the study pertaining to accidents.¹⁰ Yet, in terms of selection into responding, I would be interested in detecting why any given firm would not respond to the question about labor accidents.¹¹

To observe how much variation in responding is related to observed firm characteristics, I estimate a logistic probability model with an indicator for responding to the question as the dependent variable and control for a range of firm

⁹As far as the presence of a large number of zero observations is concerned, a linear model appears to be sufficient, at least theoretically. It is not a requirement that the dependent variable be normally distributed or approximately normally distributed for least squares regressions to work. Furthermore, the calculation of robust standard errors can control for heteroscedasticity in the error terms.

¹⁰Please refer to footnote 6 for a detailed explanation.

¹¹Nonresponse could reflect either a desire to hide something or simply a lack of information by the person filling out the form. For example, small and poorly funded firms are more likely to not respond. Presumably, this should affect some of the other variables as well and not just accidents. Similarly, nonresponse is probable if the survey is handed to someone who cannot fully comprehend the survey questions.

characteristics as potential explanatory factors. The list of explanatory variables is wide ranging; as a first step, I incorporate as many controls as the dataset permits, while ensuring there is no multicollinearity in the selected controls—ranging from information about employment, ownership, fixed assets owned by the firm, exporting as well as importing behavior, type of industry, and the firm's location, to also including apparently less relevant characteristics such as R&D and environmental protection spending carried out by the firm in a given year. This exercise enables us to identify the significant determinants of (non)response, which can then be controlled for in equation (1) within x_{it} . I report the logistic probability estimates, which form the basis of the choice of firm characteristics included in x_{it} , in the Appendix. Although the magnitude of the coefficient of ownership status is relatively large, the effects of exporting and foreign ownership on the probability of not responding to the questions about labor accidents are both statistically insignificant.¹² The variables that do turn out to have a significant impact on response include importing status, fixed assets, R&D intensity, and spending on environmental protection. Therefore, I control for all of these variables in the regressions, along with the other firm characteristics expected to have an influence on working conditions.

The earlier overview of trade reforms and FDI in Viet Nam shows that there was a key interaction between trade openness and foreign investment in Viet Nam, especially during 1986–2011. Foreign-owned firms had captured over half of all exports by 2010. Table 2 also shows that a major proportion of exporting firms were foreign owned and vice versa. Therefore, I extend the empirical model specified in equation (1) to test whether foreign-owned exporters incur a higher number of workplace accidents than domestically owned exporting firms:

$$A_{ijt} = \beta_0 + \beta_1 E_{ijt} + \beta_2 F_{ijt} + \beta_3 (E_{ijt} * F_{ijt}) + \beta_4 x_{it} + \mu_{j,t} + \mu_p + \varepsilon_{ijt} \quad (2)$$

By estimating the model in levels (with the exception of x_{it}), I can account for zero accident observations, which would have to be dropped in the log-linear model. I once again control for industry-by-time and province fixed effects, as well as industry-province-year effects in separate regressions.

Up to now, I have used a binary measure of the exporting status of a firm to disclose any potential relationship between accidents and exports. A more refined independent variable for quantifying exporting status is perhaps the fraction of total sales revenue that is exported. As noted above, the questionnaires for the years 2002, 2004, and 2005 only question the firm about whether or not it exported any of its output. On the other hand, the longer and more comprehensive questionnaire for

¹²The sample selection bias is expected to be mitigated if both exporters and foreign-owned firms are not systematically underreporting the number of accidents.

2011 consists of information about the percentage of total turnover attributable to exports. In order to check if the results are sensitive to the proxy of exporting status and to more accurately capture the link between export propensity and the number of workplace accidents, I replace the exporting dummy variable by the logarithm of fraction of sales exported in equation (2) and run the model separately only for the year 2011. I also utilize the additional information provided in the 2011 survey by extending the firm characteristics, x_{it} , to include a range of other controls, including a dummy variable for the firm's location in an industrial zone. The results based on the cross-sectional estimation are displayed in Table 5.

C. Alternative Measures of Working Conditions

In the estimation methodology, I try to address the likely bias arising due to sample selection. The primary cause of sample selection in the data is not reporting or misreporting information about accidents at work. Many manufacturing firms did not respond to the questions about labor accidents and this lack of response is unlikely to be random. It may be the case that larger firms or those located in more heavily populated provinces or industrial zones are more likely to report accidents simply because they are more noticeable to regulators. Despite controlling for some of these potential sources of bias in x_{it} , I perform a robustness check using more serious deadly accidents and the resulting rate of fatalities, under the proposition that these accidents are difficult to hide and less prone to misreporting. I utilize a number of other proxies of working conditions available in the enterprise surveys' dataset: the number of victims of accidents, the number of deadly accidents, and the total number of deaths caused by these deadly accidents. Additionally, all of these variables take into consideration the severity of workplace accidents modeled earlier, and hence can be perceived to be superior measures of unsafe working conditions. The estimation results generated based on the alternative measures of working conditions are reported in Tables 6 and 7.

Another cause of concern is the existence of outliers in the reported accidents data. A few firms with a very large number of accidents could heavily influence the regression results. I check for the influence of outliers by excluding the firms reporting very large numbers of accidents (e.g., over 50, over 100, or more) and limiting the estimating samples. Nonetheless, the results are consistent across various samples and are not driven by a handful of firms. In addition to controlling for some of the potential sources of bias arising due to sample selection, a robustness check using more serious deadly accidents and the resulting rate of fatalities is also performed, as explained above.

Lastly, a threat to the representativeness of the estimates derived in this paper is that the yearly samples only target formal manufacturing enterprises in Viet Nam, which are not representative of the full population. A large number of workers in the manufacturing sector are employed in informal plants. The sample is

therefore biased toward excluding labor accidents that occur outside the universe of firms covered in this analysis. Ideally, I would like to extend the sample to include informal manufacturing firms, but that is not possible with the data source. Even so, to the best of my knowledge, there is no compelling evidence on accidents among informal firms in Viet Nam. As a result, I will focus on labor accidents in the formal sector alone. The results reported here do not necessarily imply an overall increase in accidents in manufacturing.

To summarize, the baseline estimation regresses the number of accidents for every thousand workers on exporting and ownership characteristics of firms, while controlling for a comprehensive set of firm, industry, and provincial determinants of the type of workplace environment provided by a given firm. As a robustness check, I test the model using alternative measures of working conditions.

V. Results

A. Estimation Results

The results of the baseline regressions are depicted in Table 3. Column (1) controls for industry-year fixed effects, while column (2) adds provincial controls to the initial specification. Column (3), on the other hand, includes a different combination of fixed effects, allowing for variation in the level of accidents after controlling for industry- and province-specific trends for the reasons discussed above. Columns (5)–(6) control for the complete set of time-varying firm characteristics, denoted by x_{it} , while column (4) repeats the estimation under column (3) but restricts the sample to include only the observations used in columns (5)–(6).¹³ As denoted by the positive and significant coefficients of Export in all columns of Table 3, there appears to be on average a positive relationship between the number of accidents and the exporting status of a firm; firms exporting a part or all of their output experience an average of 3.26 more accidents per thousand workers than their nonexporting counterparts, for whom the average number of accidents is 0.92 for every thousand workers employed. The positive association between exporting status and the number of accidents persists upon the inclusion of a range of firm, industry, and provincial characteristics and trends, although there is a large decline in the number of observations in columns (4)–(6), along with a slight reduction in the magnitude of the coefficient of Export. While controlling for various firm attributes reduces the sample size, there is no drastic change in either the size or significance of the coefficient of interest.

¹³This intermediate step, whereby I run the same regression as in column (3) but limit the observations to those included in columns (5)–(6), checks whether the coefficient of the variable of interest changes due to the change in the sample or because of the addition of control variables, or both.

Table 3. **Baseline Ordinary Least Squares Estimation Results**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Export	3.257***	2.144***	1.735***	2.116***	1.030***	1.051***
					(0.142)	(0.144)
Log (Capital intensity)					0.202*	0.194
					(0.119)	(0.119)
Log (Age)					0.461***	0.471***
					(0.157)	(0.152)
SOE					-1.502**	-1.208*
					(0.683)	(0.704)
Import					0.494*	0.567
					(0.295)	(0.346)
Log (R&D intensity)					-0.998	-0.341
					(0.995)	(0.594)
Log (Environmental expenditure)					0.584**	0.607**
					(0.246)	(0.266)
Constant	0.921***	-0.005	1.150***	0.204	-1.238	-1.966**
	(0.084)	(0.203)	(0.033)	(0.239)	(2.260)	(0.793)
Observations	63,584	63,584	63,584	8,051	8,051	8,051
R-squared	0.021	0.050	0.252	0.062	0.055	0.074
Industry-year effects	Yes	Yes	No	No	Yes	No
Province effects	No	Yes	No	No	Yes	No
Industry-province-year effects	No	No	Yes	Yes	No	Yes

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are given in parentheses. The dependent variable is the number of accidents per thousand workers. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

Let us examine the estimates attained for other control variables. As one would have thought, older firms are expected to encounter more accidents for every thousand workers. The coefficient of capital intensity always takes a positive value in these regressions, but the estimates are lower in magnitude and significance. Interestingly, firms importing a part of their intermediate inputs are also likely to be associated with a larger number of accidents. The coefficient of SOEs yields a negative and significant influence. Higher spending on environmental protection, surprisingly, is linked with more accidents, on average. However, the effect of R&D intensity appears to be insignificant in Table 3. As mentioned earlier, the choice of firm characteristics to be controlled for stems from the results of the logistic probability model, through which I attempt to account for the various firm characteristics linked with missing or unreported information about accidents at the factory.

I have shown that the exporting status of an average firm in Viet Nam tends to be highly associated with a larger number of accidents. The descriptive statistics depicted in Table 2 indicated that a significantly large proportion of exporting firms are foreign owned, and an even larger fraction of foreign-owned firms generate at

Table 4. **Baseline Ordinary Least Squares Estimation Results—Interaction of Exporting Status and Foreign Ownership**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Export	1.858*** (0.380)	1.380*** (0.213)	1.141*** (0.178)	1.458*** (0.345)	0.632*** (0.196)	0.666*** (0.202)
Foreign	5.084*** (1.334)	3.993*** (1.145)	2.617** (1.025)	2.284** (1.007)	1.842* (0.990)	1.854* (1.019)
Export × Foreign	-0.067 (0.753)	-0.705 (0.727)	-0.083 (0.757)	0.563 (1.976)	0.695 (1.910)	0.629 (1.943)
Log (Female)					0.260** (0.111)	0.249** (0.113)
Log (Capital intensity)					0.154 (0.121)	0.148 (0.122)
Log (Age)					0.532*** (0.169)	0.540*** (0.164)
SOE					-1.009* (0.514)	-0.704 (0.549)
Import					0.249 (0.298)	0.309 (0.349)
Log (R&D intensity)					-0.954 (0.948)	-0.259 (0.517)
Log (Environmental expenditure)					0.585** (0.238)	0.606** (0.255)
Constant	0.761*** (0.114)	-0.062 (0.212)	1.050*** (0.061)	0.126 (0.224)	-1.019 (2.157)	-1.712** (0.698)
Observations	63,584	63,584	63,584	8,051	8,051	8,051
R-squared	0.029	0.054	0.254	0.070	0.061	0.079
Industry-year effects	Yes	Yes	No	No	Yes	No
Province effects	No	Yes	No	No	Yes	No
Industry-province-year effects	No	No	Yes	Yes	No	Yes

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are given in parentheses. The dependent variable is the number of accidents per thousand workers. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

least a part of their sales revenue from outside Viet Nam. In order to ascertain the connection between these two comparable characteristics of firms, equation (2) is estimated, which includes an interaction term (Export × Foreign). The results are illustrated in Table 4. Across all the columns and with the inclusion of various fixed effects, the coefficients of both Export and Foreign are positive and significant; it appears to be the case that foreign ownership is also associated with having more accidents. Furthermore, the average number of accidents occurring in a foreign-owned firm is much higher in magnitude in comparison to not only domestically owned firms but also exporting firms (5.11 accidents per thousand workers as opposed to 1.89 accidents). Although the interaction term (Export × Foreign) coefficient is always insignificant, it remains positive in columns (4)–(6). The significance of other control variables in Table 4 is largely comparable to those

discussed earlier in Table 3, with the exception of Capital Intensity and Import, the coefficients of which now become insignificant.¹⁴

The empirical findings somewhat offer support to the argument for a race to the bottom and, especially in the context of a developing country, to the postulation that capital is likely to move toward countries with poorer working conditions simply because firms find it profitable to do so. As seen in Table 2, foreign firms do tend to pay a higher wage on average but, coupled with the estimates derived pertaining to the nonwage working conditions, the overall effect on worker welfare is unlikely to be distinctly positive. If foreign firms, however, choose to retain working conditions between the domestic level and those in the origin country, the average level of working conditions may improve with domestic firms being prompted to improve their working conditions (Jayasuriya 2008). This does not seem to be true in the case of Viet Nam, where foreign ownership is evidently associated with a greater number of accidents at work. On the other hand, it is also probable that foreign firms report information about accident occurrence more accurately compared to domestically owned firms because they are likely to be under greater scrutiny by regulatory officials, whereas the domestic firms may deliberately misreport or understate the number of workplace accidents. While I do extend the analysis to test the validity of the information reported by accounting for more severe accidents that are rather difficult to hide, it is equally likely that workers in foreign firms are indeed exposed to hazardous working conditions. As described in O'Rourke's (1997) assessment discussed earlier, compliance with OSH regulations in many enterprises (domestic and foreign owned) and regions in Viet Nam is often not taken seriously. This perception is corroborated by the audits of several multinational firms, which knowingly neglected information about OSH and general working conditions.

The regression results presented so far quantify the exporting status of a firm as an indicator variable, assuming the value of 1 if the firm exports a part of its sales revenue abroad and 0 otherwise. If there is a large degree of variation across firms in the fraction of total revenue generated from foreign sales, or the majority of firms export only a small percentage of sales, the use of a binary variable may fail to accurately capture the link between export intensity and the number of accidents at work. The descriptive statistics illustrated in Table 2 indicate that an average exporting firm earned only 29% of sales revenue from exports. It is, therefore, imperative to test whether the results stand if I measure exporting status by the fraction of total sales exported instead of using a dummy variable. This information is available in the 2011 dataset.

¹⁴As noted in footnote 6, the questionnaire for 2005 uses a different definition of exporting by asking firms about the export of services rather than goods. In order to take into account the inconsistency in these definitions, I repeat the estimation of equations (1) and (2) excluding data for 2005 and confining the sample to the years 2002, 2004, and 2011. The results, which are available in the Appendix, are very similar to those illustrated in Tables 3 and 4.

Table 5. Estimation Results after Controlling for Export Intensity, 2011

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Log (Export intensity)	0.253** (0.106)	0.246** (0.106)	-0.060 (0.129)	0.067 (0.096)	0.054 (0.103)	0.023 (0.103)
Foreign	1.287** (0.582)	1.282** (0.590)	1.015* (0.511)	0.801* (0.452)	0.932* (0.504)	0.442 (0.473)
Export intensity × Foreign	1.432*** (0.508)	1.439*** (0.507)	0.109 (0.526)	0.512 (0.411)	1.547*** (0.496)	1.296** (0.502)
Log (Female)					0.086** (0.038)	0.016 (0.036)
Log (Capital intensity)					0.036** (0.014)	0.016 (0.011)
SOE					-0.725*** (0.153)	-0.452** (0.189)
Import					0.621** (0.229)	0.388 (0.259)
Log (15 < Age < 34)						0.056 (0.053)
Industrial zone						1.614*** (0.448)
Constant	0.327*** (0.080)	-0.001 (0.003)	-0.233** (0.091)	0.360*** (0.010)	0.128 (0.106)	-0.134 (0.079)
Observations	23,747	23,747	23,747	23,747	23,462	23,461
R-squared	0.002	0.003	0.009	0.021	0.003	0.004
Industry effects	No	Yes	Yes	No	No	Yes
Province effects	No	No	Yes	No	No	No
Industry-province effects	No	No	No	Yes	No	No

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are given in parentheses. The dependent variable is the number of accidents per thousand workers. All columns use a single year of data (2011). Export intensity is measured by the fraction of sales exported *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

The estimated results obtained by running equation (2) using export intensity instead of exporting dummy variable are exhibited in Table 5.¹⁵ Once again, the effect of percentage of sales exported on the number of accidents is consistently positive across all specifications, both with and without industry fixed effects. The only exception is column (3), which includes industry and province fixed effects. The coefficient of Foreign is almost always positive and statistically significant. Moreover, the coefficient of the interaction term (Export Intensity × Foreign) is now significant and much higher in magnitude than those reported in Table 4 in a majority of cases. This result corroborates the earlier finding that foreign-owned exporting firms in Viet Nam experienced a greater number of workplace accidents in 2011 than their domestically owned, nonexporting counterparts due to the very

¹⁵Since I use only the 2011 dataset in this case, yearly effects are not included.

reasons hypothesized above. The coefficients of Capital Intensity and Import are both positive and greater in significance compared with those displayed in Table 4. The estimates for the number of female workers and SOE are also comparable in size and significance with those reported in Table 4. Table 5 reports the results generated upon the inclusion of the number of employees by age group. A higher number of workers in the age group of 15–34 years, on average, is linked with a greater number of workplace accidents, but the estimates are not statistically significant. Column (6) controls for a firm's location in an industrial zone, and the estimated coefficient is sizable and significantly positive.

B. Robustness Check: Alternative Measures of Working Conditions

Based on the results depicted in Tables 3–5, I have shown that both the exporting status and foreign ownership status of firms are positively associated with the number of accidents occurring in manufacturing firms in Viet Nam. The results discussed above are robust across various specifications and, more importantly, based on different methods of quantifying exports. But are these results sensitive to the measure of nonwage working conditions? The focus so far has been on only one specific measure, the number of accidents. Accidents at manufacturing plants may vary in their severity in terms of the number of workers affected by the accident. Next, I check whether this association holds for related but distinct measures of working conditions: number of victims of accidents, number of deaths caused by accidents, and number of deadly accidents. The regression results are revealed in Tables 6 and 7 for the complete sample set and the year 2011 only, respectively.

I notice that the coefficient of the interaction term remains positive and significant for the first of the three proxies of working conditions: the number of victims of accidents that occurred in the firm; exporters that have foreign ownership are likely to incur a larger number of victims from workplace accidents, even after controlling for industry-year-province fixed effects as well as numerous firm characteristics (Table 6). I find these results to be stronger for exporting firms whereby the estimates obtained are positive and highly significant across all three proxies of working conditions. Yet, the coefficient of Foreign assumes a negative value in columns (3) and (5), but in both of these cases, the much larger positive coefficient of the interaction term outweighs the negative coefficient for foreign ownership alone.¹⁶ Nonetheless, there occurs a large drop in the number of observations upon the inclusion of firm characteristics. An interesting finding is that importing firms are less likely to witness serious (deadly) accidents than firms in other industries. In Table 7, which reports cross-sectional results attained by using 2011 data only, yet again a positive and significant association between exporting

¹⁶For example, in Table 6 column (3) the coefficient of Foreign is -0.00041 , but the coefficient of $\text{Export} \times \text{Foreign}$ is 0.00716 .

Table 6. Estimation Results for Alternative Measures of Working Conditions

Variables	(1)	(2)	(3)	(4)	(5)	(6)
	Number of Victims		Number of Deaths		Number of Deadly Accidents	
Export	0.86166*** (0.138)	0.00516 (0.148)	0.01283*** (0.004)	0.00077 (0.003)	0.01053*** (0.003)	-0.00169 (0.002)
Foreign	1.46143*** (0.410)	0.28419 (0.331)	-0.00041 (0.002)	0.00134 (0.006)	-0.00144 (0.002)	0.00127 (0.006)
Export × Foreign	1.16173* (0.656)	1.76151** (0.723)	0.00716 (0.007)	0.00208 (0.007)	0.00717 (0.006)	0.00284 (0.006)
Log (Female)		0.46173*** (0.106)		0.00159* (0.001)		0.00185** (0.001)
Log (Capital intensity)		-0.00409 (0.014)		0.00009 (0.000)		0.00028 (0.000)
SOE		0.20434 (0.294)		-0.00330 (0.003)		-0.00464 (0.003)
Import				-0.00394** (0.002)		-0.00348** (0.001)
Log (R&D intensity)				0.00271 (0.004)		0.00274 (0.004)
Log (Environmental expenditure)				0.00078 (0.001)		0.00124 (0.001)
Constant	-0.16292* (0.087)	-0.47071** (0.182)	-0.00470 (0.003)	0.00193 (0.002)	-0.00339 (0.002)	0.00030 (0.002)
Observations	58,052	54,430	56,143	8,334	56,208	8,335
R-squared	0.086	0.172	0.173	0.705	0.195	0.550
Industry-year effects	Yes	No	Yes	No	Yes	No
Province effects	Yes	No	Yes	No	Yes	No
Industry-province-year effects	No	Yes	No	Yes	No	Yes

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are clustered by industry and given in parentheses. The dependent variables are number of victims of accidents, number of deaths, and number of deadly accidents. Export intensity is measured by the fraction of sales exported. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

intensity and the number of victims of accidents continues to hold. However, no significant relationship between exporting and foreign ownership and the number of deadly accidents or fatalities can be detected. Yet, compared to Export and Foreign, the coefficients of other controls yield results unmistakably better and consistent with the earlier findings.

In short, the overall effect of exporting behavior and foreign ownership continues to be undesirable only when workplace hazards are measured in terms of the number of workers affected by these accidents. With the use of deadly accidents and the subsequent fatalities as measurements, the results are generally less supportive of the main proposition with regard to foreign ownership compared with those results discussed earlier.

Table 7. Alternative Measures of Working Conditions, 2011

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Number of Victims		Number of Deaths		Number of Deaths		Number of Deadly Accidents		
Log (Export intensity)	0.16530*** (0.044)	0.07479** (0.030)	0.02337 (0.028)	0.00292 (0.002)	0.00187 (0.002)	0.00069 (0.001)	0.00291 (0.002)	0.00132 (0.002)	0.00068 (0.001)
Foreign	0.28769* (0.151)	0.16996 (0.145)	0.15202 (0.156)	0.00089 (0.002)	-0.00047 (0.002)	0.00068 (0.002)	0.00906 (0.009)	0.00610 (0.007)	0.00068 (0.002)
Export intensity × Foreign	0.43791** (0.166)	0.37976*** (0.123)	0.08027 (0.135)	0.00392 (0.007)	0.00452 (0.007)	-0.00191 (0.002)	0.01681 (0.014)	0.01785 (0.014)	-0.00190 (0.002)
Log (15 < Age < 34)		0.03652*** (0.010)	0.03282*** (0.009)		0.00046 (0.000)	0.00038 (0.000)		0.00006 (0.000)	0.00038 (0.000)
Log (Female)		0.04643*** (0.009)	0.02955*** (0.009)		0.00141* (0.001)	0.00098 (0.001)		0.00213* (0.001)	0.00098 (0.001)
Log (Capital intensity)		-0.00228 (0.001)	0.00013 (0.001)		0.00005 (0.000)	0.00005 (0.000)		0.00009 (0.000)	0.00005 (0.000)
Industrial zone		0.09616** (0.037)	0.04296 (0.041)		-0.00142 (0.001)	-0.00086 (0.001)		0.00257 (0.004)	-0.00086 (0.001)
SOE		-0.11371 (0.112)	-0.13902** (0.063)		-0.00557 (0.003)	-0.00382 (0.003)		-0.00678* (0.004)	-0.00381 (0.003)
Import		0.04749 (0.036)	0.01901 (0.038)		0.00068 (0.001)	-0.00023 (0.001)		0.00192 (0.002)	-0.00023 (0.001)
Constant	0.01995*** (0.004)	-0.09136*** (0.021)	-0.06559*** (0.023)	0.00038** (0.000)	-0.00180 (0.001)	-0.00116 (0.001)	0.00038** (0.000)	-0.00184 (0.001)	-0.00086 (0.001)
Observations	23,693	23,417	23,417	23,649	23,375	23,375	23,652	23,378	23,378
R-squared	0.039	0.049	0.253	0.003	0.007	0.268	0.005	0.007	0.796
Industry-province effects	No	No	Yes	No	No	Yes	No	No	Yes

R&D = research and development, SOE = state-owned enterprise.
 Notes: Robust standard errors are clustered by industry and given in parentheses. The dependent variables are number of victims of accidents number of deaths, and number of deadly accidents. All columns use a single year of data (2011). Export intensity is measured by the fraction of sales exported. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

VI. Conclusion and Policy Discussion

Apart from anecdotal evidence, there is no comprehensive study presenting evidence to test whether foreign-owned or exporting firms in developing countries suppress worker rights by worsening their nonwage working conditions. The popular press is filled with claims of multinational firms paying awfully low wages to domestic workers in low-income countries and forcing them to work under horrific conditions. The objective of this paper is to offer evidence of this association by estimating a relationship between exporting and foreign ownership characteristics of firms and the occurrence of accidents at work. The results generated are based on a comprehensive database of manufacturing sector firms in Viet Nam, a country that experienced a remarkable increase in aggregate exports, imports, and FDI from 1986 to 2011.

The empirical specification is built on the premise that, after controlling for various firm characteristics and unobserved cross-sectoral differences, there is a significant disparity in the number of accidents at work occurring in exporting as opposed to nonexporting firms. The most imperative outcome of this study is that there appears to be a positive and highly significant effect of exporting behavior and foreign ownership on the incidence of accidents in Vietnamese manufacturing firms. This result is robust to the inclusion of numerous firm and industry characteristics, and across alternative measures of nonwage working conditions and different quantifications of exporting status. Some other relevant findings pertain to these very firm characteristics: (i) older enterprises experience more accidents at work; (ii) SOEs are predicted to incur fewer accidents; (iii) firms with a greater degree of capital intensity experience a higher number of accidents than other manufacturing firms; (iv) a larger share of female employees is, on average, associated with incurring more accidents; and (v) a firm's location in an industrial zone is generally linked with a greater volume of accidents compared with firms located outside of industrial zones.

There is no doubt that international trade and FDI have helped provide improved job opportunities for Vietnamese workers. At the same time, the government deems it necessary that workers' rights be legally mandated and properly enforced, especially so in export processing zones and other industrial locations. A higher number of accidents may possibly be linked with excessive amounts of overtime hours. Several studies have reported disproportionate overtime hours in Vietnamese firms.¹⁷ Milberg and Amengual (2008) point out that reducing overtime necessitates paying workers a sufficient salary to diminish the need for extra hours as well as adjusting production processes, as has been demonstrated by the ILO's Factory Improvement Programmes in Viet Nam and Sri Lanka. Increasing

¹⁷See, for instance, Wang (2005) and Barrientos and Smith (2006).

consumer demand for products produced under decent labor conditions can also prove to be effective (Harrison and Scorse 2010). An anti-sweatshop campaign can harm the reputation of a multinational company and encourage it to foster voluntary workplace codes of conduct as well as to comply with labor standard norms.

Certainly, more qualitative and quantitative research into the effects of trade agreements on labor standards would be useful, particularly if it could identify the most effective mix of enforcement mechanisms. It is imperative to analyze additional measures of nonwage working conditions including the health and safety of workers, number of hours worked, security and other benefits, details about the working environment, and age of the factory or plant, among others. It is hoped that given the significance of firm-supplied safer working conditions to continued growth and development in developing countries, the results generated in the paper may contribute to the design of more appropriate labor safety standards.

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Appendix

Table A.1. Logistic Probability Model Estimation Results

Variables	(1)	(2)	(3)
Log (Female)	0.091 (0.215)	0.063 (0.272)	0.117 (0.276)
Log (Age)	-0.212 (0.236)	-0.209 (0.255)	-0.231 (0.256)
Log (Size)	0.130 (0.271)	0.211 (0.323)	0.100 (0.331)
SOE	0.161 (0.471)	0.248 (0.489)	0.400 (0.496)
Export	-0.126 (0.353)	-0.171 (0.394)	-0.164 (0.395)
Import	-1.218*** (0.338)	-1.431*** (0.361)	-1.295*** (0.370)
Foreign	0.232 (0.472)	0.390 (0.510)	0.432 (0.514)
Log (Fixed assets)	0.157*** (0.044)	0.155*** (0.047)	0.222*** (0.061)
Log (R&D intensity)	1.151*** (0.395)	1.247** (0.491)	1.246** (0.490)
Log (Environmental expenditure)	0.475*** (0.068)	0.471*** (0.076)	0.479*** (0.075)
Constant	-6.333*** (0.635)	-6.228*** (1.217)	-6.751*** (1.248)
Observations	8,106	6,711	6,711
Year effects	No	No	Yes
Industry effects	No	Yes	Yes

R&D = research and development, SOE = state-owned enterprise.
 Notes: Standard errors are given in parentheses. The dependent variable is a dummy variable that is equal to 1 if the firm does not respond to the question about labor accidents at work and 0 otherwise. The sample size is reduced upon the inclusion of industry fixed effects in the logistic probability regression, i.e., going from column (1) to (2) to (3). This is because, unlike an ordinary least squares estimation, the use of logit drops observations whose contribution to the log-likelihood function is 0 for given values of the parameters. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

Table A.2. **Baseline Ordinary Least Squares Estimation Results—2002, 2004, and 2011**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Export	3.290*** (0.565)	2.299*** (0.303)	1.751*** (0.222)	2.116*** (0.672)	1.030*** (0.367)	1.051*** (0.374)
Log (Female)					0.369** (0.142)	0.358** (0.144)
Log (Capital intensity)					0.202* (0.119)	0.194 (0.119)
Log (Age)					0.461*** (0.157)	0.471*** (0.152)
SOE					-1.502** (0.683)	-1.208* (0.704)
Import					0.494* (0.295)	0.567 (0.346)
Log (R&D intensity)					-0.998 (0.995)	-0.341 (0.594)
Log (Environmental expenditure)					0.584** (0.246)	0.607** (0.266)
Constant	0.760*** (0.096)	-0.238 (0.205)	1.021*** (0.038)	0.204 (0.239)	-1.238 (2.260)	-1.966** (0.793)
Observations	55,919	55,919	55,919	8,051	8,051	8,051
R-squared	0.018	0.045	0.232	0.062	0.055	0.074
Industry-year effects	Yes	Yes	No	No	Yes	No
Province effects	No	Yes	No	No	Yes	No
Industry-province-year effects	No	No	Yes	Yes	No	Yes

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are given in parentheses. The dependent variable is the number of accidents per thousand workers. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.

Table A.3. **Baseline Ordinary Least Squares Estimation Results: Interaction of Exporting Status and Foreign Ownership—2002, 2004, and 2011**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
Export	1.854*** (0.378)	1.423*** (0.229)	1.138*** (0.181)	1.458*** (0.345)	0.632*** (0.196)	0.666*** (0.202)
Foreign	4.006*** (1.455)	3.041** (1.316)	2.100** (1.039)	2.284** (1.007)	1.842* (0.990)	1.854* (1.019)
Export × Foreign	1.007 (1.093)	0.448 (1.040)	0.411 (0.841)	0.563 (1.976)	0.695 (1.910)	0.629 (1.943)
Log (Female)					0.260** (0.111)	0.249** (0.113)
Log (Capital intensity)					0.154 (0.121)	0.148 (0.122)
Log (Age)					0.532*** (0.169)	0.540*** (0.164)

Continued.

Table A.3. *Continued.*

Variables	(1)	(2)	(3)	(4)	(5)	(6)
SOE					-1.009*	-0.704
					(0.514)	(0.549)
Import					0.249	0.309
					(0.298)	(0.349)
Log (R&D intensity)					-0.954	-0.259
					(0.948)	(0.517)
Log (Environmental expenditure)					0.585**	0.606**
					(0.238)	(0.255)
Constant	0.671***	-0.242	0.957***	0.126	-1.019	-1.712**
	(0.111)	(0.212)	(0.057)	(0.224)	(2.157)	(0.698)
Observations	55,919	55,919	55,919	8,051	8,051	8,051
R-squared	0.025	0.048	0.234	0.070	0.061	0.079
Industry-year effects	Yes	Yes	No	No	Yes	No
Province effects	No	Yes	No	No	Yes	No
Industry-province-year effects	No	No	Yes	Yes	No	Yes

R&D = research and development, SOE = state-owned enterprise.

Notes: Robust standard errors are given in parentheses. The dependent variable is the number of accidents per thousand workers. *** = significant at 1%, ** = significant at 5%, and * = significant at 10%.

Source: Author's calculations based on annual enterprise surveys (various years) obtained from the Government of Viet Nam, General Statistics Office.