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Spillover effects of international standards

Work conditions in Vietnamese small and medium enterprises

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Abstract: Most studies focus on trade effects and organizational outcomes of international standards, neglecting the effect of standards on employees. Using a two-year matched firm–employee panel dataset, this paper finds that the application of standards improves work conditions in small and medium enterprises in Vietnam. Certified firms pay higher wages on average. They are also more likely to offer formal contracts and to pay social and health insurance to workers. The estimation accounts for endogenous matching of workers with firms and unobserved heterogeneity using an instrumental variable approach. The study reveals unexpected benefits from certification, calling for higher investment in standards.

Keywords: international standards, work conditions, wages, SMEs, externalities, Vietnam
JEL classification: D22, F16, J31, J81, O12

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1 Introduction

International standards that regulate characteristics of products and production processes are a prominent part of discourse in international trade, business, and development circles. They are seen as facilitators of global market access, helping the small-scale producers in developing countries reach customers in industrialized economies (Henson and Reardon 2005; Jaffee and Masakure 2005). They are, however, also seen as obstacles to participation in global trade for developing countries as they impose controls over production and shift the balance of power to the side of developed countries (García Martínez and Poole 2004; Gibbon et al. 2010). At the firm level, standards play a key role in accessing higher-value markets (Masakure et al. 2009) and improving competitiveness (Delmas 2001), but only if firms can overcome costs of implementation (Maskus et al. 2013).

While most of the literature on the implications of international standards focuses on trade effects and organizational outcomes, very few studies look at the effects of standards for firm employees, thereby overlooking an important aspect of poverty reduction. This paper examines the effects and mechanisms of certification on the employment conditions of workers in small and medium enterprises (SMEs) in Vietnam. Of particular interest are workers' wages, insurance contributions, and formal contracts.

While the literature on standards and employee outcomes in agriculture is starting to grow (Asfaw et al. 2010; Barrientos et al. 2003; Ehlert et al. 2014), studies on work conditions and standards in firms are scarce. Blunch and Castro (2005) investigate the role of ISO 9000 or ISO 14000 certification on the firm's training decision in five developing countries. They treat the ISO certification status as predetermined, neglecting the traditional self-selection problem. Levine and Toffel (2010) study the change in employment, earnings, and worker health and safety with the adoption of ISO 9001 on a sample of firms in California. They rely on propensity score matching to identify the effect of standards, overlooking the bias from unobservable heterogeneity. Colen et al. (2012) analyse the effects of GlobalGAP certification of exporter–producer companies on the employment conditions of workers in these companies. Due to data limitations they were, however, unable to control for the time-varying unobserved firm characteristics.

This paper also speaks to the literature on standards and firm performance, covering both developed and developing countries. Fontagné et al. (2013) analyse the impact of standards on export performance of French firms, while Martincus et al. (2010) and Otsuki (2011) investigate the effect of ISO certification on export performance of firms in Argentina, Europe, and Central Asia. Schuster and Maertens (2015) investigate the effect of various types of private standards on export performance of firms in Peru using fixed effects and general method of moments models. Henson et al. (2011) and Masakure et al. (2009) analyse the returns to certification in terms of export sales revenue for Sub-Saharan African countries and Pakistan. They base the estimation on propensity score matching, which controls for self-selection into treatment based only on the observable firm characteristics. However, the identification of a causal effect can be biased by unobservable heterogeneity, which may or may not vary over time. In contrast to previous literature, this paper controls for both observed and unobserved firm heterogeneity using an instrumental variable (IV) estimation approach on a matched firm–employee panel data from a survey of SMEs in Vietnam from 2011 and 2013.

Apart from self-selection bias and unobserved heterogeneity, an issue that has been overlooked in past studies is whether certified firms pay a higher price for labour of a given quality. Aggregate firm-level estimations cannot account for factors observable to firm managers, but unobservable to the econometrician, that affect worker wages, arising from complementarities in the match

between the worker and the firm (Krishna et al. 2014). For example, Levine and Toffel (2010) found that ISO 9001 adopters had higher growth rates for employment, payroll, and average annual earnings in addition to having lower rates of work-related injuries and deaths. However, the dataset they use is at the firm level, so they do not have the information on worker characteristics. This means that they cannot control for the effect of specific matching of employers and employees, which could positively affect wages irrespective of the application of standards. Thanks to the matched firm–employee panel data with an extensive set of observed worker and firm characteristics, this paper can compare the labour quality between certified and non-certified firms and its role in accounting for wage differences.

What is the link between standards and work conditions? Briefly, standards can affect work conditions in both direct and indirect ways. The direct effect can arise as implementation of standards induces positive or negative changes in employee effort and skills (e.g. routine vs. specialization). Whether this leads to higher or lower wages is not known *a priori*. One of the main requirements linked with the implementation of international standards is that firms respect national labour laws by, for example, paying for employee social and health insurance or offering formal contracts. Given this requirement, standards may lead to regularity in insurance contributions and more formal contracts. The indirect effect of standards on work conditions can arise from changes in overall firm performance, which are then transmitted to employees. The international standards are often mentioned as a source of competitive advantage in the marketplace, leading to new markets and more stable trading relationships, and consequently to longer periods of production activity and employment. Therefore, firms who apply international standards may be more likely to offer formal contracts to employees and pay higher wages.

This paper finds that the application of international standards improves work conditions in SMEs in Vietnam. Certified firms on average pay over 70 per cent higher wages to their workers. These firms are also 46 per cent more likely to offer permanent formal contracts and 56 per cent more likely to pay social and health insurance. That certified firms offer better work conditions for their employees can be seen as a consequence of stricter adherence to national laws and regulations and remuneration for higher effort and skill levels linked to the application of standards. The IV estimation has enabled overcoming the problems with self-selection and unobserved heterogeneity. The IV estimation results are on average larger than the OLS estimates, pointing to the downward bias of the OLS estimation.

In many developing countries, the SME sector is the main driver of employment and economic growth (Beck et al. 2005). As value chains extend both economically and geographically, understanding how international standards affect work conditions uncovers the hidden implications of certification. The application of international standards is not usually guided by a desire to improve worker conditions, but by more profit-oriented or market access goals. By linking standards and work conditions, this paper brings evidence on externalities of certification and a policy-relevant perspective on worker welfare. This knowledge is important for increasing the capacity of the SME sector for participation in global trade flows.

The paper is structured as follows: Section 2 presents previous findings from the literature and Section 3 describes the data. Section 4 proposes the theoretical framework and presents the empirical specification and identification strategy, including the model and variable construction. Section 5 presents and discusses the results, while Section 6 concludes.

2 Background: standards and work conditions

Good performance in export markets is crucial for job creation and poverty alleviation in developing countries. Compliance with internationally recognized standards for quality, safety, and environmental protection is often mentioned as one of the key factors that affect not only the export performance, but also participation in foreign markets. Studies have shown that some developing countries have suffered considerable export losses due to their inability to respond to the strict standards and regulations set in developed countries (Wilson and Otsuki 2004). Conversely, standards can reduce transaction costs and improve market access and competitiveness (Henson and Jaffee 2006).

Standards are measures by which products, processes, and producers are judged (Hatanaka et al. 2005). They formalize consumers' requirements about the production process (e.g. ethics, environment) or product (e.g. safe, organic). With standards, it is easier for buyers to validate product quality and trust the producer, so standards can increase sales by reducing transaction costs. Where firms are likely to take advantage of cross-country differences of national government regulations, international standards can be a useful governance mechanism for firm behaviour (Christmann and Taylor 2006). This is possible as certification based on third-party auditing systems lowers transaction costs for customers in global value chains.

Traditionally, standards were devised by individual governments, but more recently, the non-governmental, international, and private bodies increasingly take part in their design and implementation. For example, international standards ISO 9001 for quality management and ISO 14000 for environmental management require that firms implement specific processes that improve quality or environmental performance. These standards are developed by non-governmental organizations such as the International Organization for Standardization (ISO), and specify requirements that go beyond government regulations. OHSAS, the internationally-applied British Standard for occupational health and safety management systems, and the SA 8000 social accountability standard explicitly require that firms implement specific management processes that are intended to improve working conditions. Independent third-party auditors monitor firm performance and certify compliance with standard requirements. Although not mandatory, these private standards are equally important as they are requested by buyers in developed countries, becoming thus *de facto* obligatory for accessing major markets (Henson and Humphrey 2010). Also, non-exporting firms use standards in domestic markets to signal better quality or to increase competitiveness.

Previous studies have found benefits in terms of productivity improvements, price premiums, increased market access, growth in market share, reduced customer complaints, and increased ability to attract new customers (Fouayzi et al. 2006; Masakure et al. 2009; Masakure et al. 2011). However, the implantation of standards can be expensive, especially for producers from developing countries. The costs include repairs, adjustments of the production process, record-keeping, audits, and certification. Such costs vary by product, firm size, sector, and geographical location due to economies of scale and location-specific differences (Masakure et al. 2009). Often it is not only sufficient to comply with one standard, but producers are often compelled to certify several standards, which can further increase the costs.

Standards can thus have both negative effects (too costly) and positive effects (better market access, price premium) on firm performance. It remains unexplored what effect standards can have on the employment conditions. Irrespective of the main focus of standards (be it quality, safety, or environment), there are some shared components between them that can affect employment conditions, such as worker wages, insurance contributions, and contracts.

3 Data

The data are from a SME survey conducted to assess characteristics of the Vietnamese business environment. The survey has been implemented in ten provinces in Vietnam: Ho Chi Minh City, Hanoi, Hai Phong, Long An, Ha Tay, Quang Nam, Phu Tho, Nghe An, Khanh Hoa, and Lam Dong every second year since 2005. The analysis in this paper is based on the data from the 2011 and 2013 survey rounds because the question about the compliance with international standards was introduced in 2011 (and repeated in 2013). The survey instrument is almost identical in these two years.¹ The main questionnaire includes information on enterprise characteristics and practices. All questions refer to the situation in the previous calendar year, namely 2010 and 2012, while the economic accounts contain information on two consecutive years prior to the survey.

The sample of firms was created by random draws from a consolidated list of formal enterprises obtained from the Establishment Census from 2002 (GSO 2004) and the Industrial Survey 2004–2006 (GSO 2007). The sample was stratified by the ownership type to obtain representative information about household-owned, private, co-operative, limited-liability, and joint-stock enterprises. The survey included both officially registered (with a business registration licence) and informal firms that were identified randomly on-site.² Informal firms make up around one-third of the sample, but they were excluded from the analysis as the implementation of standards is not relevant for unregistered businesses. Unregistered businesses are unlikely to obtain a certificate of compliance with standards as the main information on the certificate is precisely the firm registration number. Due to the high firm turnover rate in Vietnam, the balanced panel includes the information on 1,988 SMEs in each year.

A separate employee module was administered to a randomly chosen subset of firms in both 2011 and 2013. The employee module was administered to a subsample of 596 firms in 2011 and 599 in 2013 covering all ten provinces, different firm size categories, legal ownership status, and sectors so as to accurately represent the firm population. In total 1,478 employees completed the employee module in 2011 and 1,571 did the same in 2013. The module contained information on personal characteristics, job features, earnings, and other non-wage benefits. After dropping observations with missing information on the variables of interest, the final sample comprised 1,423 employees in 2011 and 1,516 employees in 2013, representing 575 enterprises. Summary statistics for employee and firm characteristics are presented in Table 1.

The core modules of the SME survey only reveal whether a firm applies any of the internationally recognized standards. To obtain detailed information on the types of standards applied and the motives for implementation, a phone survey was administered in the first quarter of 2014. Only firms which stated that they had an internationally recognized standard in the 2013 survey round were interviewed in 2014. From 177 firms with standards in 2013, 108 firms were reached by phone but only 86 firms gave detailed information about the types of standards they applied in 2014. The overview of the information on the types of standards applied is presented in Table 2.

¹ One of the more important differences is in the definition of education and occupation categories, for which the conversion was straightforward between the 2011 and 2013 survey rounds.

² Detailed information about sampling is available in CIEM et al. (2010) and CIEM et al. (2012).

Table 1: Summary statistics

	2010		2012		Total	
	Mean	SD	Mean	SD	Mean	SD
Worker wage (million VND)	1,410	986.0	1,445	648.1	1,429	826.4
Insurance (%)	35.74	47.94	46.11	49.87	41.12	49.21
Indefinite formal contracts (%)	27.13	44.48	25.86	43.80	26.47	44.13
Firm size	21.77	29.98	22.70	33.54	22.25	31.86
Firm size (ln)	2.42	1.12	2.41	1.14	2.42	1.13
KL ratio (ln)	4.70	1.64	4.72	1.67	4.71	1.66
Age of the firm (years)	15.07	8.83	14.97	9.64	15.02	9.25
Export (%)	9.51	29.34	9.81	29.76	9.66	29.55
Share of female employees (%)	36.99	24.49	38.47	24.67	37.75	24.59
Worker age (years)	34.26	10.16	34.73	10.02	34.50	10.09
Experience (years)	6.34	5.88	6.47	5.73	6.41	5.81
Female (%)	41.60	49.31	41.03	49.20	41.31	49.25
Married (%)	74.42	43.65	76.58	42.36	75.54	42.99
None (%)	0.77	8.76	1.12	10.53	0.95	9.72
Primary (%)	5.20	22.21	4.42	20.56	4.80	21.38
Secondary (%)	75.40	43.08	74.08	43.84	74.72	43.47
Tertiary (%)	18.62	38.94	20.38	40.30	19.53	39.65
Manager (%)	10.75	30.99	11.94	32.44	11.36	31.74
Professional worker (%)	9.28	29.02	9.43	29.24	9.36	29.13
Office worker (%)	7.66	26.60	8.91	28.49	8.30	27.60
Sales worker (%)	8.85	28.42	7.12	25.73	7.96	27.07
Service worker (%)	3.37	18.06	4.55	20.85	3.98	19.55
Production worker (%)	60.08	48.99	58.05	49.36	59.03	49.19

Note: The figures are from the matched firm–employee data. Average 1994 exchange rate: US\$1 = 10,307 VND.

Source: Author's calculation.

Table 2: Number and type of standards applied by Vietnamese SMEs

	Applying 1 standard	Applying 2 standards	Applying 3 standards
Number of firms	62	19	5
Share of firms (%)	72.1	22.1	5.8

Note: The information is based on 86 firms that provided information about the types of standards they apply in the follow-up phone survey conducted in 2014.

Source: Author's calculation.

4 Analytical framework and empirical specification

The literature has identified a couple of potential channels through which the implementation of standards can affect firm activities. In the following, a framework to help interpret how standards affect work conditions is outlined. This results in an empirical specification and approach to identification of the causal effect of standards on work conditions.

4.1 Analytical framework

Focusing on three measures of work conditions—worker wage, formal contracts, and employee benefits—direct and indirect mechanisms in which standards can affect work conditions are described. Both direct and indirect mechanisms point to an ambiguous effect of standards on work conditions.

The direct effect of standards on worker wages can be positive or negative. Wages can increase as a part of remuneration for development of new skills, higher effort, or engagement in more complex tasks. As part of the implementation of standards, workers are usually trained about quality, safety, record-keeping, as well as the implementation of new procedures, product conformity assessment, and audits. It is through these activities that workers acquire new or enhance existing skills. The effect of training is expected to be positively correlated with worker wages and job security because firms may be induced to pay efficiency wage premiums and offer more secure contracts to trained workers. In addition, the majority of certified standards routinely requires documenting work tasks and procedures, as well as the development of ideas for quality improvement, which together can induce higher levels of effort among workers (Levine and Toffel 2010). Helper et al. (2002) associate greater levels of employee involvement with higher wages as a compensation for achieving higher skill levels. Thus, improvements in human capital through training and increased effort on specific tasks due to standards can lead to higher wages.

Opposite mechanism may also be at play: If the training introduces a high level of routinized tasks, a wage premium is not expected. A low degree of specialization gained through training could make workers easily replaceable and this will in turn have a negative impact on wages and contract duration. Standards can also impose adherence to written procedures and lead to an increased amount of routine tasks at the workplace. Routinized workplaces are often associated with lower skills and low demand for problem-solving, judgment, and creativity (Acemoglu and Autor 2011; Autor et al. 2003). If these conditions prevail, standards can lead to lower wages.

Standards seek compliance with fundamental principles and rights at work (ILO 2013), as well as the compliance with national labour laws. The Vietnamese Labour Code (10/2012/QH13) regulates the length of working hours, the content of contracts, the rules for hiring, the payment of social and medical insurance, and the minimum salary level that is established at the region and sector level. It is believed that the contract regime gives more autonomy to firms in terms of hiring and firing (Liu 2004). If, in the absence of standards, firms tend to pay lower wages and shirk on paying benefits, the implementation of standards can lead to higher wages, better social and medical coverage, and a higher share of formal contracts. Where standards do not have a say in temporary and informal work (Barrientos et al. 2003), so if, because of standards, the costs of formal employment become too high, firms may be induced to use more informal labour, where the conditions of employment are unfavourable.

The impact of standards on work conditions can come indirectly from the influence on firm profitability. While standards increase operational costs (e.g. investments in infrastructure and worker training), the implementation of standards is likely to result in better market access, higher product quality, or increased productivity achieved through employee training. Combined, these could yield higher prices and higher returns if the wage share of the increased value added does not go down. Depending on the amounts invested and earned, the net effect of standards on the marginal profitability of the firm could be positive or negative.

Application of standards is also associated with higher competitive advantage of certified firms. Thus, better performance of the firm in the marketplace incurred by the compliance with standards can potentially result in redistribution of surplus to the employees. In this way, international

standards could lead to better job stability and higher use of formal contracts. Similarly, it may become more costly to lay off workers who have had the training related to certification of standards, thereby ensuring higher job stability and consequently higher wages.

Taken together, the described direct and indirect mechanisms of the impact of standards on work conditions can be considered as ambiguous, so I proceed to explore the effects of standards on work conditions by looking at worker wages, payment of insurance contributions, and formal contracts.

4.2 Empirical strategy

The main goal is to estimate the causal effect of international standards on work conditions over the period 2010–12. It is important to note here that the intention is not to investigate the direct impact of *labour standards* on workplace conditions, but the auxiliary effects of any internationally recognized standard that primarily address non-labour issues. In other words, firms adopt non-labour standards with non-labour objectives in mind and any changes in work conditions represent potential auxiliary benefits.

The impact of standards on work conditions is investigated through several measures. The first dependent variable used as a measure of work conditions is the individual worker wage, which is used to capture differences in remuneration for different education levels and work positions. The average nominal monthly worker wage in the sample was 3.7 million Vietnamese Dong (VND) in 2012 and 2.9 million VND in 2010. The figure for 2012 is identical to the average wage of the working population in Vietnam reported by the General Statistics Office (GSO 2013), while the figure for 2010 is slightly higher than the official average wage estimated at 2.5 million VND for 2010 (GSO 2011). There are noticeable gender differences in wages. The average nominal wage for men was 3.4 million VND and 3.2 million VND for women in 2012. The gap in wages by gender of 7.5 per cent existed also in 2010, when wages were 26 per cent lower for both sexes than in 2012. Table 1 shows that the average wage measured in real terms rose between 2010 and 2012. The average real monthly wage was 1.45 million VND in 2012 and 1.41 million VND in 2010. Hence, the real wage has increased by 2.5 per cent during the considered two-year period.

The second variable used as a measure of work conditions is the provision of social and health insurance contributions and the third variable is the provision of formal labour contracts. Although far from finding robust evidence, literature considers both a positive correlation between wages and fringe benefits (Rand and Tarp 2011), as well as a trade-off between those, whereby firms who pay fringe benefits pay lower wages (Baicker and Chandra 2006). Also, the likelihood of having social insurance is higher for workers with formal contracts (Gao et al. 2012). Thus, it is valuable to investigate whether the benefits of standards go beyond the monetary nature. It is estimated that around 20 per cent of Vietnamese workers received social insurance compensation in 2012, while the target for 2015 is 30 per cent coverage (MOLISA 2014). In the SME sample, Table 1 shows a positive trend in both insurance payments and formal contracts, but a much higher increase is observed for insurance payments. Around 43 per cent of firms paid social and health insurance to their employees in 2012, which represents an increase of 10 percentage points compared to 2010. The share of firms with indefinite formal contracts in the sample was 27 per cent in 2012 and 26 per cent in 2010. Social and health insurance contributions are measured as an indicator variable that takes value 1 if a firm pays social or health contributions to their employees and 0 otherwise. Provision of formal contracts is measured through a dummy variable that takes value 1 if a firm offers indefinite formal contracts and 0 otherwise.

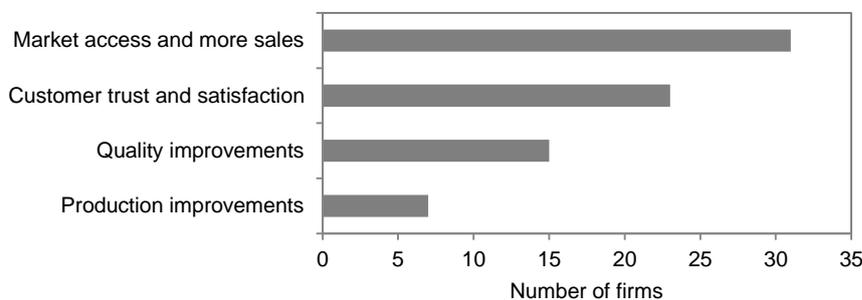
The basic specification is Equation (1) in which work conditions depend on both individual worker characteristics and firm characteristics.³

$$w_{ijt} = \beta_i S_{ijt} + \delta F_{it} + \gamma X_{jt} + \rho_{sp} + \tau_t + e_{ijt} \quad (1)$$

As is visible from Equation (1), work conditions, w_{ijt} , in a firm i for worker j in year t are related to the application of international standards, S_{ijt} , while controlling for individual characteristics, X_{jt} , of workers employed in firm i and firm-specific parameters, F_{it} .

The variable of interest is S_{ijt} that takes value 1 if a firm applies any international standard and 0 otherwise. The proportion of firms with internationally recognized standards in the sample is about 7 per cent. The number of certified firms increased from 163 in 2010 to 177 in 2012, which is an increase of 8.5 per cent. The most commonly applied standard among the Vietnamese SMEs is ISO 9001. It is closely followed by ISO 14001 and the Hazard Analysis and Critical Control Point (HACCP). Around 20 per cent of firms decide to certify more than one standard, as illustrated in Table 2. Standards that are explicitly designed for improvement of work conditions, such as OHSAS and SA8000, are not frequently applied. Only four firms from the sample apply these. The surveyed SMEs report to have experienced some benefits from the application of standards, which relate mostly to expanding market access (41 per cent) and securing more sales (30 per cent). Around 20 per cent of the SMEs have seen improvements in product quality and 9 per cent in the production process, some of which surely affect work conditions. Responses about the benefits from standards are shown in Figure 1.

Figure 1: Benefits from standards



Source: Author's calculation.

F_{it} are time-varying firm-specific control variables, such as firm size, ratio of capital and labour, and the age of firm. Firm size is controlled for as larger firms have an advantage in complying with standards. This arises because some fixed costs that are induced by standards are less significant for larger firms. A positive size effect on the adoption of standards was found in previous studies (Nakamura et al. 2001; Herath et al. 2007; Masakure et al. 2011). Also, due to the well-established occurrence of the employer size–wage premium (Troske 1999), the firm size is expected to impact positively on different measures of work conditions. Firm size is measured as the total number of full-time employees. Summary statistics on the firm size are provided in Table 1, showing that the average firm employed around 20 employees and that the average size decreased slightly between

³ For a similar approach, see Troske (1999) and Larsen et al. (2011).

2010 and 2012, consistent with aggregate formal employment trends in the country during the same period.

The ratio of capital and labour (KL) is also included in the estimation to proxy for the cost and the nature of technology. Contrary to the firm size, it is not clear *a priori* in which direction the firm's KL ratio affects work conditions. At one extreme, capital-intensive firms may need to employ high-skilled workers to operate advanced technology and consequently pay higher wages. Acemoglu (2001) argues that 'a firm with a capital-intensive job, which has already sunk its more expensive investment, is forced to bargain to a higher wage and creates a greater positive (pecuniary) externality on workers'. At the other extreme, however, capital-intensive firms may use workers only for low-skilled tasks and consequently pay low wages. Violante (2002) has shown that technological acceleration reduces the average skill level which can generate a temporary slowdown in average wage growth. Table 1 shows that the KL ratio in the surveyed SMEs went up slightly between 2010 and 2012.

Firm age is also added as a control variable, because the wage levels may differ between old and young firms. Older firms are more likely to pay higher wages because they are more likely to survive and to have workers with a high level of tenure (Brown and Medoff 2003). Recent empirical studies on newly established firms show that their level of wages is lower (Brixy et al. 2007; Malchow-Møller et al. 2011). However, this relationship depends on the workforce composition. For example, young firms tend to pay young employees higher than old firms (Ouimet and Zarutskie 2014). The average age of firms in the sample is 15 years.

Links to foreign markets are important as firms are more likely to implement standards if their business is export-oriented. It is also well-established in the literature that export firms pay higher wages (Verhoogen 2008). The indicator variable takes value 1 if a firm exports any part of its output and 0 otherwise. Table 1 shows that only 9 per cent of the firms in the sample are engaged in foreign trade, with a slight positive trend in the 2010–12 period.

The share of female workers in the firm has in previous studies been shown to have a negative and statistically significant effect on wages of all workers in the firm (Lipsey and Sjöholm 2004), which has also been found to hold for Vietnam (Larsen et al. 2011). Table 1 shows that the share of female employees has increased by 4 per cent between 2010 and 2012.

X_{it} is a vector of worker characteristics, which includes age and experience. These two variables routinely enter human capital earnings function (Spence, 1973; Mincer 1974). Squares for both of these variables are included to allow for diminishing marginal effects. The average worker has been working for the enterprise around six years and is around 35 years old. Gender wage gaps have been identified in Vietnam (Liu 2004) as in other developing countries (Jones 2001), so a gender dummy is added to the estimation. Controlling for marital status is also necessary as marriage might affect not only how much men and women work, but also how much they earn (Ahituv and Lerman 2007; Sobel 2012). As visible from Table 1, the surveyed SMEs predominantly hire male workers who are married.

As education and job function account for a large share of the variation in earnings (Larsen et al. 2011), these workforce parameters are included in the estimation as well. The employee education level is high with 75 per cent of workers finishing secondary school and 20 per cent having a college or university degree. Between 2010 and 2012, the share of workers with finished tertiary education has increased by 9 per cent. At the same time, the share of workers with primary and secondary school education has slightly declined. There was also a small increase in the share of the uneducated workforce, but considering that the share of workers with no school education is less than 1 per cent, this could not be having any meaningful impact on the work conditions of

the surveyed firms. In terms of the labour-force composition, the sample is dominated by production workers, who take around 60 per cent of work places. Between 2010 and 2012 the share of production workers has declined by two percentage points.

Finally, ρ_{sp} denotes sector–province effects of policy changes that may differentially impact wages of firms in different regions and sectors. Time fixed effects, τ_t , control for general trends affecting all firms and sectors. Robust standard errors are clustered at the province and sector level to account for heteroskedasticity and equicorrelation of errors. As specific practices and characteristics of different industries may affect firm and employee outcomes, the estimation controls for the sector of production by including sector dummies defined at the 2-digit level of the International Standard Industrial Classification (ISIC), revision 3. The food and beverages sector is used as a baseline. The estimation also controls for the province in which the firm is located through dummy variables and using Ho Chi Minh City as a baseline. This is important because Vietnamese provinces are relatively autonomous and differ in the degree and willingness to implement government initiatives (Nguyen et al. 2007).

Identifying the causal effect of standards on work conditions requires accounting for the fact that the application of standards is not random among the firms from the sample. This means that self-selection bias, whereby firms with already better work conditions are more likely to adopt standards, needs to be accounted for. A typical way of dealing with unobserved heterogeneity includes fixed effects estimation to remedy the bias from time-invariant unobservable characteristics. Because fixed effects are not appropriate for data with slow changing variables over time, the time-invariant unobservable firm characteristics, such as sector and location are controlled for.

Firms can also have time-varying changes in characteristics that are correlated with both implementation of standards and work conditions. To control for the time-varying unobservable characteristics, the IV estimation in two stages is implemented:

$$S_{ijt} = \pi_0 + \pi Z_{it} + \chi F_{it} + \lambda X_{jt} + \eta_{ijt} \quad (2)$$

$$w_{ijt} = \sigma + \theta S_{ijt} + \kappa F_{it} + \varphi X_{jt} + \varepsilon_{ijt} \quad (3)$$

where Z_{it} is the instrumental variable for firm adoption of standards, which is correlated with the implementation of standards but uncorrelated with work conditions in a firm. The share of firms applying international standards at the district level is used as the IV for firm-specific adoption of standards. The basis for using this IV is related to knowledge and availability of information about standards as the efficiency of information flows for adoption of standards has been emphasized in earlier studies. For example, adoption of environmental management systems can be attributed to mimetic behavior, whereby firms are more likely to adopt standards if their rivals have been certified in the past (Hofer et al. 2012; Grekova et al. 2014). Thus, the likelihood of certifying standards is assumed to be increasing with the proximity of other certified firms, where non-certified firms are likely to observe and mimic practices of neighbouring firms in the hope of becoming more competitive or attracting more customers in the future.

Lacking the true measures of firm knowledge about standards, I construct the district-level instrumental variable that takes value 1 if at least one firm in the district is certified and 0 for districts where none of the firms are certified. In this way, it is assumed that specific knowledge

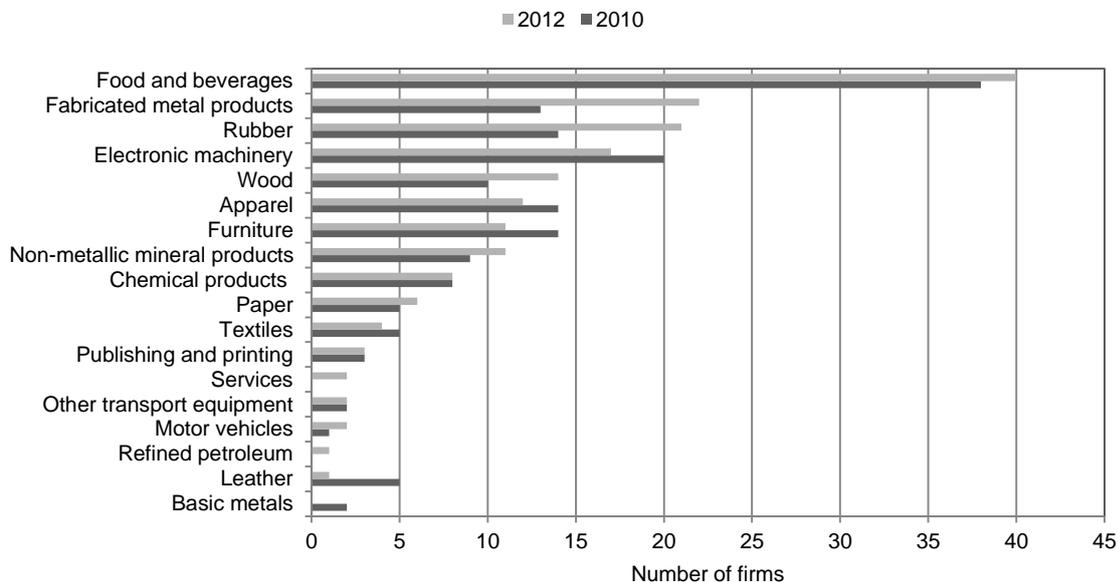
about standards spreads more easily within than across districts and by restricting the instrument to the district level, it is possible to minimize the correlation with the unobservable firm characteristics such as managerial skills. A further assumption made is that the prevalence of standards at the district level has no independent impact on work conditions. Using the instrument in the two-stage least squares (2SLS) regressions, the impact estimator corresponds to a Local Average Treatment Effect (LATE), which is the effect of treatment for compliers—those whose treatment status is affected by the instrument (Angrist et al. 1996). If the key IV assumptions hold, any observed relationship between the treatment variable (standards in this case) and the outcome (work conditions) has a causal interpretation for compliers (Imbens and Angrist 1994; Abadie et al. 2002).

To provide evidence on the precision of the identified link between standards and work conditions, I conduct a falsification exercise using the information on whether the buyers require certification of international standards instead of direct information on the application of standards. The justification for this method is that, unlike in the case of the practical implementation of standards, there should be no effect on work conditions from simply requiring standards from the supplier. Restricting the sample to the firms who have started applying standards between 2010 and 2012 provides further evidence on robustness.

4.3 Descriptive statistics

In this section the main variables of interest are discussed, that is, the application of standards and the differences in firm performance related to the application of standards. As Figure 2 shows, standards are most commonly applied in the food and beverages sector, followed by the fabricated metals, rubber, and electronic machinery sectors. Most of the sectors have experienced an increasing trend in the application of standards, while the electronic machinery, apparel, furniture, textiles, and basic metals sectors went through a decline between 2010 and 2012.

Figure 2: Application of standards among Vietnamese SMEs at the sector level in 2010 and 2012



Source: Author's calculation.

Table 3 describes the average performance at the firm level for 2010 and 2012 by certification of international standards. First, the indicators of work conditions for certified and non-certified SMEs are compared, as indicated in panel (a). Favourable outcomes for certified firms are readily

notable. Certified firms on average pay 22 per cent higher wages. Also, the distribution of wages for certified and non-certified firms is different, as illustrated in Figure 3.

Table 3: Differences between firms by certification

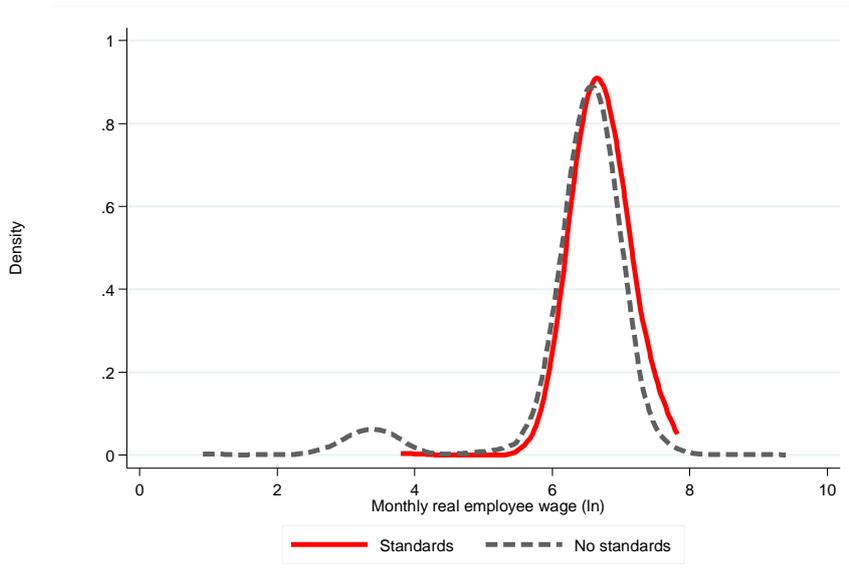
Variable	Definition	All	Non-certified	Certified	t-value
<i>a) Dependent variables</i>					
Worker wage	Average real worker wage (1000 VND)	741.7 (441.8)	718.9 (452.8)	872.2*** (345.4)	6.30
Insurance	Share of firms paying social and health insurance contributions	41.12 (49.21)	34.58 (47.57)	83.51*** (37.16)	19.36
Formal contracts	Share of firms providing indefinite formal contracts	26.47 (44.13)	21.40 (41.02)	59.79*** (49.09)	16.70
<i>b) Control variables</i>					
Firm size	Total full-time regular labour force	22.25 (31.86)	17.62 (26.56)	52.66*** (44.62)	21.74
Firm size (ln)	Total full-time regular labour force	2.42 (1.13)	2.23 (1.05)	3.62*** (0.86)	24.80
KL ratio (ln)	Ratio of capital and labour	4.71 (1.66)	4.78 (1.67)	4.25*** (1.54)	5.79
Age of the firm	Number of years since the firm has been established	15.02 (9.25)	15.0 (9.24)	14.48 (9.35)	1.22
Export	Firm exporting output	9.66 (29.55)	5.49 (22.79)	38.48*** (48.72)	21.58
Share of female employees	Female employees as a percentage of total number of workers	37.75 (24.59)	36.87 (25.10)	43.57*** (19.96)	5.02
Worker age	Worker age in years	34.52 (10.11)	34.54 (10.16)	34.33 (9.73)	0.37
Experience	Years of working for the firm	6.41 (5.81)	6.50 (5.98)	5.77** (4.39)	2.25
Female	Share of female workers	41.31 (49.25)	39.63 (48.92)	52.32*** (50.01)	4.75
Married	Share of married employees	75.68 (42.91)	75.58 (42.97)	76.42 (42.97)	0.35
No education	Share of uneducated workers	0.95 (0.18)	1.06 (0.20)	0.26* (0.26)	1.51
Primary education	Share of workers with primary school	4.80 (0.39)	5.45 (0.45)	0.52*** (0.36)	4.25
Secondary education	Share of workers with secondary school or high school	74.72 (0.80)	77.50 (0.83)	56.44*** (2.52)	9.01
Tertiary education	Share of workers with college or university	19.53 (0.73)	15.99 (0.73)	42.78*** (2.52)	12.73
Manager	Share	11.36 (0.59)	11.13 (0.62)	12.89 (1.70)	1.01
Professional worker	Share	9.36 (0.54)	8.39 (0.55)	15.72*** (1.85)	4.64
Office worker	Share	8.30 (0.51)	7.57 (0.52)	13.14*** (1.72)	3.72
Sales worker	Share	7.96 (0.50)	7.25 (0.51)	12.63*** (1.69)	3.65
Service worker	Share	3.98 (0.36)	3.65 (0.37)	6.19*** (1.22)	2.39
Production worker	Share	59.03 (0.91)	62.01 (0.96)	39.43*** (2.48)	8.53

Note: Average 1994 exchange rate: US\$1 = 10,307 VND. Standard deviation in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

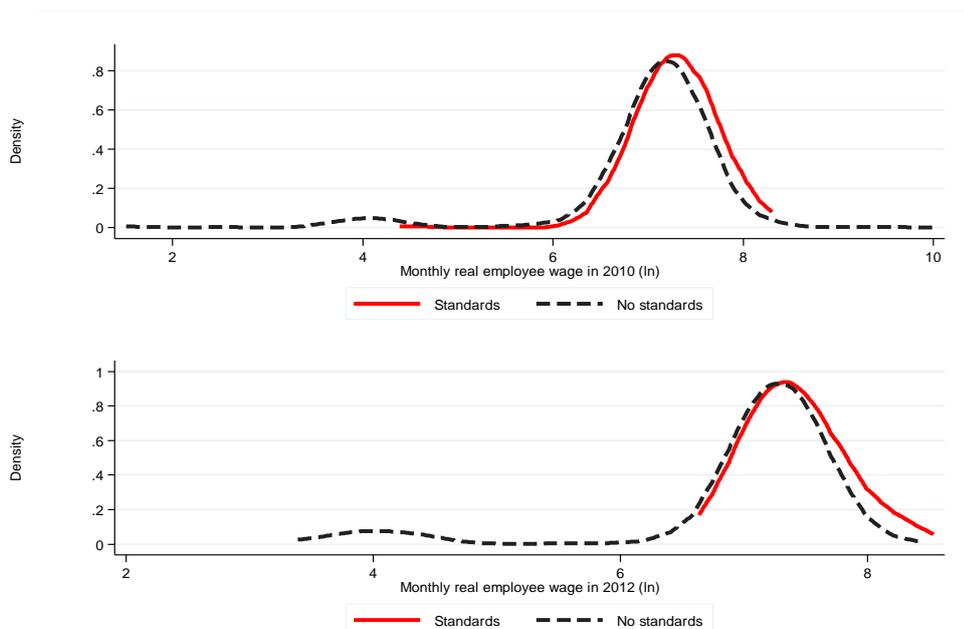
The higher wages were paid both in 2010 and 2012, as Figure 4 shows. As can be seen in Figure 5, the wage cumulative distribution function (CDF) of certified firms significantly dominates the wage CDF of non-certified firms. Even though these differences in work conditions cannot be interpreted as impacts, they offer an indication of possible structural differences in work conditions between certified and non-certified firms.

Figure 3: Kernel density estimation of worker wages across firms by application of standards with Epanechnikov kernel and bandwidth 0.25



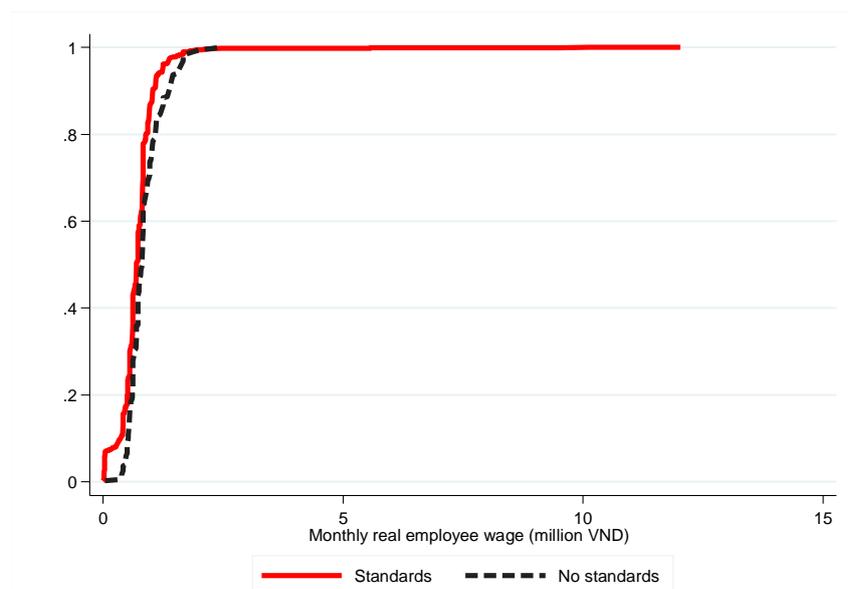
Source: Author's calculation.

Figure 4: Kernel density estimation of worker wages across firms by application of standards in 2010 and 2012 with Epanechnikov kernel and bandwidth 0.25



Source: Author's calculation.

Figure 5: Cumulative distribution of worker wages across firms by application of standards



Note: The Kolmogorov–Smirnov test statistic is 0.169, indicating that the distributions of worker wages in certified and non-certified firms are statistically different ($p = 0.00$).

Source: Author's calculation.

Returning to Table 3, it is visible that certified firms are almost three times more likely to provide health and social insurance to their workers. While 84 per cent of certified firms pay fringe benefits to their workers, only 39 per cent of non-certified firms do the same. More than half of certified firms provide formal contracts to their employees. This practice is half less likely among non-certified firms.

Focusing on panel (b) in Table 3, some basic firm characteristics of certified and non-certified firms are compared. There are significant differences with respect to some of the variables. Certified firms are on average 2.5 times larger than non-certified firms, as measured by the size of the total full-time labour force. Wages in certified firms are substantially higher than wages in non-certified plants. However, worker characteristics in these firms differ and that fact might account for some or all of the wage difference. Certified firms have on average a lower share of uneducated workers and workers with primary and secondary education. Correspondingly, they have a higher share of workers with college or university degrees than non-certified firms. It is also visible that certified firms have a different occupational structure compared to non-certified firms. While the share of managers is the same, certified firms have a higher share of professional, office, sales, and service workers. Non-certified firms have a higher proportion of production workers.

5 Results

The paper estimates the impact of international standards on work conditions among Vietnamese SMEs, where the work conditions are measured by three indicators: average real worker wage (in 1000 VND), provision of social and health insurance (indicator variable for providing both), and the provision of formal labour contracts (share of employees with indefinite formal labour contracts). The following sections present results for each of the cases.

5.1 The impact of standards on wages

I start by describing the impact of standards on individual worker wages. Columns (1) and (2) in Table 4 show the OLS estimates of the wage equation that is specified only for firm characteristics including firm size, capital–labour ratio, age of the firm, export status, and the share of female employees. Columns (3) and (4) show the estimates of wage equation based solely on worker characteristics such as age, experience, gender, and marital status. Columns (5) and (6) show the results of the joint estimation with firm and worker characteristics.

The impact of standards on worker wages is positive and significant in all specifications. The estimation with firm controls in column (1) shows that, on average, the implementation of standards leads to 20 per cent higher worker wages. Adding the sector and location controls changes the effect size to 12 per cent, as shown in column (2). The estimates of the wage equation reach 27 per cent when only worker characteristics are included, as in column (3), but decrease to 22 per cent with the addition of sector and location controls. Finally, the effect size decreases to 17 per cent when both firm and worker characteristics are controlled for and to 11 per cent with sector and location controls. This result confirms the skill-building and effort-increasing effect of standards, disproving the effects of routines and worker expendability.

The positive and significant coefficient on the firm size confirms the wage-size premium is commonly found in empirical studies (Oi and Idson 1999; Troske 1999). The relationship between firm age and worker wages is negative, meaning that younger SMEs in Vietnam pay higher wages. This could perhaps be a consequence of the inability of younger firms to recognize and compensate adequately for the specific skill level of employees. The learning process for older SMEs is surely more advanced, so they are more efficient in setting the wage level. Firms with a higher share of female employees tend to pay lower wages on average, which could be a consequence of lower productivity of female workers or lower productivity of firms employing more females.

The estimates further show a positive association between wages and worker age, but the returns are diminishing after a certain age. The wages are higher for male workers, which was also found in previous studies in Vietnam (Liu 2004). There is, however, no consistent evidence for the return on work experience. The results also point to the wage premium for tertiary education, which is held as a base category so the coefficients for no formal education and for primary and secondary education are negative. The effect of work position is evaluated against the production workers and we see a positive and significant wage premium for all non-production positions including managers, professional, office, and sales workers. Service workers fare at least as well as the production workers.

Table 4: Impact of standards on worker wages—Dependent variable: monthly average employee wage (ln).

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.184*** (0.045)	0.117* (0.059)	0.238*** (0.045)	0.197*** (0.053)	0.159*** (0.049)	0.105* (0.063)
Firm size	0.167*** (0.026)	0.155*** (0.027)			0.115*** (0.024)	0.112*** (0.026)
KL ratio (ln)	-0.038* (0.023)	-0.024 (0.024)			-0.031 (0.023)	-0.018 (0.024)
Age of the firm	-0.009** (0.004)	-0.008** (0.004)			-0.010** (0.004)	-0.009** (0.004)
Export	-0.039 (0.061)	0.004 (0.065)			-0.031 (0.065)	-0.006 (0.063)
Share of female employees	-0.004*** (0.001)	-0.003** (0.001)			-0.004*** (0.001)	-0.004** (0.001)
Worker age			0.034** (0.016)	0.027* (0.016)	0.033** (0.016)	0.028 (0.017)
Worker age squared (x1000)			-0.487** (0.201)	-0.388* (0.206)	-0.454** (0.208)	-0.378* (0.213)
Male			0.083* (0.047)	0.022 (0.040)	0.018 (0.038)	-0.007 (0.037)
Married			-0.020 (0.056)	-0.009 (0.061)	-0.038 (0.055)	-0.022 (0.060)
Experience			0.023* (0.012)	0.024** (0.012)	0.021* (0.012)	0.024* (0.013)
Experience squared (x1000)			-0.393 (0.372)	-0.492 (0.354)	-0.220 (0.394)	-0.343 (0.390)
No education			-0.397 (0.291)	-0.492* (0.266)	-0.368 (0.299)	-0.405 (0.283)
Primary education			-0.718*** (0.137)	-0.650*** (0.130)	-0.618*** (0.129)	-0.554*** (0.121)
Secondary education			-0.172*** (0.051)	-0.153*** (0.049)	-0.102** (0.048)	-0.093** (0.046)
Manager			0.396*** (0.074)	0.329*** (0.074)	0.346*** (0.076)	0.287*** (0.075)
Professional worker			0.216*** (0.058)	0.169*** (0.056)	0.166*** (0.055)	0.147*** (0.053)
Office worker			0.227*** (0.051)	0.173*** (0.048)	0.156*** (0.045)	0.127*** (0.045)
Sales worker			0.177*** (0.053)	0.121** (0.054)	0.125*** (0.046)	0.084* (0.049)
Service worker			0.104 (0.064)	0.060 (0.060)	0.003 (0.067)	-0.016 (0.061)
Year	0.018 (0.025)	0.016 (0.025)	0.005 (0.024)	0.002 (0.024)	0.09 (0.024)	0.008 (0.024)
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Constant	-29.161 (50.290)	-25.937 (50.019)	-3.508 (48.909)	2.603 (48.651)	-11.608 (48.172)	-10.188 (47.907)
N	2329	2329	2382	2382	2328	2328
R ²	0.08	0.14	0.09	0.5	0.13	0.17

Note: Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

Table 5: Impact of standards on worker wages—Instrumental variable: share of certified firms in the district.
Dependent variable: monthly average employee wage (ln)

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.947*** (0.292)	0.705*** (0.197)	0.907*** (0.277)	0.709*** (0.210)	0.786*** (0.259)	0.548*** (0.184)
Firm size	0.080* (0.043)	0.092*** (0.033)			0.049 (0.036)	0.068** (0.030)
KL ratio (ln)	-0.041* (0.023)	-0.027 (0.024)			-0.034 (0.023)	-0.021 (0.024)
Age of the firm	-0.010*** (0.004)	-0.009** (0.004)			-0.011*** (0.004)	-0.010** (0.004)
Export	-0.238** (0.117)	-0.173* (0.099)			-0.192* (0.110)	-0.137 (0.091)
Share of female employees	-0.004*** (0.001)	-0.003** (0.001)			-0.004*** (0.001)	-0.003** (0.001)
Worker age			0.033** (0.015)	0.026* (0.015)	0.033** (0.016)	0.028* (0.016)
Worker age squared (x1000)			-0.482** (0.194)	-0.377* (0.198)	-0.466** (0.200)	-0.390* (0.203)
Male			0.112** (0.048)	0.053 (0.042)	0.029 (0.039)	0.000 (0.037)
Married			-0.007 (0.062)	-0.003 (0.062)	-0.024 (0.059)	-0.020 (0.061)
Experience			0.019 (0.013)	0.017 (0.012)	0.021* (0.013)	0.021* (0.013)
Experience squared (x1000)			-0.200 (0.395)	-0.181 (0.387)	-0.114 (0.408)	-0.187 (0.401)
Year	0.011 (0.027)	0.014 (0.026)	0.004 (0.026)	0.008 (0.025)	0.004 (0.025)	0.007 (0.024)
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Constant	7.194*** (0.150)	7.137*** (0.167)	6.218*** (0.273)	6.467*** (0.301)	6.595*** (0.328)	6.689*** (0.327)
N	2329	2329	2382	2382	2328	2328
Kleibergen-Paap Wald F statistic	37.82	63.77	38.51	63.68	40.02	63.71

Note: Instrumental variable (IV) used is the share of firms with certified international standards at the district level. Kleibergen-Paap Wald F statistic is the test of identification for weak instruments. Education levels are: no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

Table 5 shows the instrumental variable 2SLS estimation of the impact of standards on worker wages. Again, the models with firm and employee controls are estimated separately, and then the joint firm–employee model. The impact of standards on wages is significant and positive across different specifications, yielding a result of 73 per cent higher wages in firms which apply standards, as shown in column (6). The F statistic for a test of significance of the instrumental variable is

between 37 and 64 in different specifications, precluding the weak instrument concerns (Stock and Yogo 2005).⁴

5.2 The impact of standards on social and health contributions

After controlling for firm and employee characteristics, the results show that firms which apply international standards are more likely to pay social and health insurance contributions to their employees. The impact of standards on insurance contributions is measured separately with firm and employee controls, and in joint firm–employee estimation. The results with both firm and employee controls in column (6) in Table 6 show that standards increase the chances of firms paying insurance by 12 per cent, which supports the argument that certified firms are more likely to adhere more strictly to national laws and regulations.

Table 6: Impact of standards on social and health insurance contributions

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.100*	0.124***	0.366***	0.390***	0.093*	0.117***
	(0.053)	(0.044)	(0.071)	(0.059)	(0.054)	(0.044)
Firm controls	Yes	Yes	No	No	Yes	Yes
Employee controls	No	No	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-913.07***	-962.91***	-523.90***	-499.86***	-916.16***	-952.83***
	(177.36)	(204.82)	(140.9)	(151.11)	(181.69)	(210.57)
N	2567	2565	2620	2618	2566	2564
R ²	0.42	0.50	0.17	0.27	0.44	0.51

Note: Education levels are: no formal education, primary, secondary, and tertiary education. The baseline is tertiary education. Work positions are: manager, professional, office, sales service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

Table 7 shows the impact of standards on social and health insurance contributions in the instrumental variable estimation. The instrument used is the same as before—the share of firms with standards in a given district. The result shown in column (6) confirms the positive relationship between standards and the payment of social and health insurance contributions to workers. The chances of paying insurance to employees are 56 per cent higher for firms with standards.

⁴ Critical values for the Stock-Yogo (2005) identification test are 16.38 (10 per cent maximal IV size), 8.96 (15 per cent maximal IV size), 6.66 (20 per cent maximal IV size), and 5.53 (25 per cent maximal IV size). These apply to all IV estimations in the paper.

Table 7: Impact of standards on social and health insurance contributions—Instrumental variable: share of certified firms in the district

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.330*** (0.124)	0.600*** (0.225)	0.672*** (0.160)	0.960*** (0.289)	0.301** (0.124)	0.560** (0.227)
Firm controls	Yes	Yes	No	No	Yes	Yes
Employee controls	No	No	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
N	2567	2567	2620	2620	2566	2566
Kleibergen-Paap Wald F statistic	37.83	65.77	39.45	68.80	39.80	65.91

Note: Instrumental variable (IV) used is the share of firms with certified international standards at the district level. Kleibergen-Paap Wald F statistic is the test of identification for weak instruments. Education levels are: no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales, service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Source: Author's calculation.

5.3 The impact of standards on labour contracts

Table 8 shows that firms which apply international standards are more likely to offer indefinite formal contracts to their employees. The impact of standards on contracts is measured separately with firm and employee controls, and jointly in the firm–employee estimation. The results with both firm and employee controls in column (6) show that standards increase the chances of firms offering formal contracts by 9 per cent. This can be a consequence of better adherence to the national laws and regulations, but also a way of rewarding for perhaps the higher effort related to the application of standards or for the skills acquired in training related to the implementation of standards.

Table 9 shows the relationship between standards on formal contracts in the instrumental variable estimation. The instrument used is the same as in previous estimations, the share of firms with standards in a given district. The result shown in column (6) confirms the positive relationship between standards and the provision of formal contracts to the employees. The chances of offering permanent formal contracts to the employees are 46 per cent higher for firms with standards when the influence of unobserved heterogeneity is controlled for.

Table 8: Impact of standards on the provision of formal labour contracts

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.121*** (0.046)	0.092* (0.048)	0.232*** (0.044)	0.216*** (0.043)	0.109** (0.044)	0.086* (0.045)
Firm controls	Yes	Yes	No	No	Yes	Yes
Employee controls	No	No	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	210.62 (201.84)	223.42 (217.50)	138.64 (175.65)	207.82 (182.56)	229.29 (205.22)	240.73 (218.87)
N	2576	2574	2629	2627	2575	2573
R ²	0.22	0.30	0.11	0.20	0.24	0.31

Note: Education levels are no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales, service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

Table 9: Impact of standards on the provision of formal labour contracts—Instrumental variable: share of certified firms in the district

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.601** (0.240)	0.481* (0.256)	0.803*** (0.261)	0.710** (0.293)	0.579** (0.242)	0.461* (0.262)
Firm controls	Yes	Yes	No	No	Yes	Yes
Employee controls	No	No	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	36.49 (31.56)	31.07 (28.70)	26.90 (34.94)	22.64 (31.20)	38.78 (31.40)	33.26 (28.75)
N	2576	2576	2629	2629	2575	2575
Kleibergen-Paap Wald F statistic	37.91	65.81	39.48	68.83	39.90	65.92

Note: IV used is the share of firms with certified international standards at the district level. Kleibergen-Paap Wald F statistic is the test of identification for weak instruments. Education levels are: no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales, service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

5.4 Discussion

The size of coefficients in all IV estimations in Tables 5, 7, and 9 are higher than the OLS coefficients in Tables 4, 6, and 8, illustrating a downward bias of the OLS estimation, which probably comes from the unobservable firm and employee characteristics that are negatively correlated with covariates. The unobserved characteristics which lower the probability of applying standards lead to better work conditions (higher worker wages, insurance payments, and formal

contracts), pointing perhaps to the fact that firms with weaker managerial capabilities are more likely to seek to improve work conditions through standards. On the contrary, managerially more capable firms may not need standards for this purpose as they potentially hire and reward more workers with better (unobservable) personal characteristics. In this way, the downward bias in the OLS estimation may point to a trade-off between the investment in standards and better work conditions for financially constrained firms.

The results show that certified firms have better work conditions than their non-certified counterparts. Workers in certified firms have on average higher wages than in non-certified firms, when individual worker wages are used in the estimation. The result is comparable to the study by Levine and Toffel (2010) who found that annual wages in ISO firms have a 7.5 per cent higher growth rate and that the total payroll at ISO firms grew by 17.7 per cent more than at matched control firms. The result is also comparable to the result in Colen et al. (2012), who found an increase in worker daily wages of 13 per cent. In addition to higher wages, certified firms are also more likely to pay social and health insurance benefits for their employees and to provide more indefinite formal contracts. This result is in contrast to Colen et al. (2012) who have not found robust evidence for more secure contracts in certified export companies in Senegal.

The estimation of the impact of standards on work conditions could not include the impact of different standards separately because some firms apply more than one standard at the same time and each of these could have specific provisions that could affect work conditions. This may raise concerns about the precision of estimates if potential synergic benefits of multiple standards are experienced, so in addition to the main analysis, I assess the impact of standards on the sample without the firms which apply more than one standard. As Table 10 shows, the results remain very close in significance and magnitude to the original estimation.

Table 10: Impact of standards on worker wage: OLS and IV estimation on the subsample of firms with only one certified standard

	Average wage		Insurance contributions		Formal contracts	
	(1) OLS	(2) 2SLS	(3) OLS	(4) 2SLS	(5) OLS	(6) 2SLS
One standard	0.102 (0.062)	0.538*** (0.178)	0.162*** (0.047)	0.543** (0.219)	0.151** (0.070)	0.467* (0.267)
Firm size	0.112*** (0.026)	0.072** (0.029)	0.241*** (0.015)	0.206*** (0.025)	0.151*** (0.021)	0.121*** (0.032)
KL ratio	-0.018 (0.024)	-0.020 (0.024)	-0.031*** (0.009)	-0.033*** (0.010)	-0.022** (0.010)	-0.024** (0.011)
Age of the firm	-0.010** (0.004)	-0.010** (0.004)	-0.003 (0.002)	-0.004 (0.002)	-0.002 (0.002)	-0.002 (0.002)
Export	-0.003 (0.063)	-0.137 (0.092)	-0.040 (0.062)	-0.155 (0.096)	-0.037 (0.076)	-0.131 (0.113)
Share of female employees	-0.004** (0.001)	-0.003** (0.001)	0.000 (0.001)	0.000 (0.001)	0.001 (0.001)	0.001 (0.001)
Worker age	0.027 (0.017)	0.029* (0.016)	0.005 (0.006)	0.006 (0.006)	-0.002 (0.006)	-0.001 (0.006)
Worker age squared (x1000)	-0.372* (0.215)	-0.397* (0.205)	-0.065 (0.066)	-0.080 (0.066)	0.021 (0.076)	0.007 (0.078)
Male	-0.009 (0.038)	-0.002 (0.037)	-0.032* (0.018)	-0.025 (0.020)	-0.010 (0.016)	-0.004 (0.018)
Married	-0.019 (0.061)	-0.023 (0.060)	0.004 (0.024)	0.002 (0.024)	0.016 (0.027)	0.014 (0.028)
Experience	0.024* (0.013)	0.021* (0.013)	0.004 (0.005)	0.002 (0.006)	0.013** (0.005)	0.011** (0.005)
Experience squared (x1000)	-0.329 (0.398)	-0.180 (0.407)	-0.075 (0.190)	0.009 (0.209)	-0.348* (0.205)	-0.279 (0.225)
Education controls	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	No	Yes	No	Yes
Sector controls	No	Yes	No	Yes	No	Yes
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-8.75 (47.91)	-8.97 (48.64)	-103.84*** (23.78)	-103.43*** (24.69)	26.92 (28.06)	26.40 (28.74)
N	2309	2309	2547	2547	2556	2556
R ²	0.17	0.15	0.52	0.47	0.34	0.30
Kleibergen-Paap Wald F statistic		67.94		69.48		69.47

Note: Education levels are: no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales, service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculations.

Focusing on the subsample of firms which became certified between 2010 and 2012, I estimate the difference-in-differences model, comparing the changes in wages in certified and non-certified firms before and after certification. By comparing changes, it is possible to control for observed and unobserved time-invariant characteristics that may be correlated with the adoption of standards as well as the work conditions. The results are shown in Tables 11 and 12.

Comparing the wages in certified and non-certified firms over time shows that non-certified firms on average pay lower wages and also that the wage level increased in both types of firms between two years. The difference in wage–time differences can be interpreted as the causal effect of

standards on wages, under the assumption that in the absence of standards the wages would not have been systematically different in certified and non-certified firms. An employee in a certified firm receives on average 0.029 higher wages in logarithms, but this amount is not significantly different from zero, as shown in Table 11. As the wages could vary systematically across sectors and firm locations, capturing these factors is achieved in a regression framework by adding the firm, worker, sector, location, and time controls. The finding that emerges is that conditional differences between certified and non-certified firms are significantly different from zero, measured for firms who have switched from not having standards in 2010 to having standards in 2012. This result is shown in Table 12, indicating that certified firms pay on average 21 per cent higher wages.

Table 11: Means of employee wages (ln) by compliance with standards

	Standards (Yes) (1)	Standards (No) (2)	Difference (3)
2010	7.376 (0.083)	7.036 (0.040)	0.340*** (0.091)
2012	7.381 (0.094)	7.070 (0.050)	0.311*** (0.106)
Difference	-0.005* (0.073)	-0.034 (0.036)	0.029 (0.102)

Note: Standard errors are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

Table 12: Effect of standards on employee wages in conditional and unconditional differences

	Unconditional differences (1)	Conditional differences (2)
Difference in difference	0.029 (0.102)	0.192* (0.103)
Firm controls	No	Yes
Worker controls	No	Yes
Location controls	No	Yes
Sector controls	No	Yes
Time dummy	Yes	Yes

Note: Standard errors are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.

To provide a check for the robustness of the result on the impact of standards on work conditions among Vietnamese SMEs, I conduct a falsification exercise. The key estimations are replicated while the indicator variable for standards is replaced with the variable that measures whether the key buyer has requested that a firm certifies any international standard. The associations between requests for standards and application of standards are shown in Table A1 in the Appendix, while the estimation results for the relationship between certification requests and work conditions are shown in Table A2 in the Appendix. Table A1 shows a growing trend in requesting certification and actual certification, but that there are also firms which have certified without the request from their buyers. Even though the association between standards being requested from the main buyer and application of standards is high (Table A1), no effect on work conditions could be identified for simply requesting certification (Table A2). The lack of any effect suggests that there indeed is a difference between intentions and practice when it comes to the effectiveness of standards.

6 Conclusion

There is a growing body of literature that analyses the implications of international standards for developing countries. While most of the literature focuses on trade effects and organizational outcomes such as profits, very few studies look at the effect of standards for firm employees, overlooking this important aspect for poverty reduction. Using a panel dataset on SMEs in Vietnam with matched firm–employee information, the paper shows that the application of standards contributes to the improvement of work conditions, evaluated for worker wage, payment of health and social insurance contributions, and formal contracts. This result is among the first studies on the spillover effects from international standards, implying that standards can contribute to more than market access, export performance, or profits. In comparison with previous cross-sectional studies, this paper has also made a methodological contribution in accounting for endogenous matching of workers with firms.

Even though based on a dataset from Vietnam, this study offers important policy implications. As firms can obtain different sets of benefits by investing in international standards, government policies should be more supportive of the adoption, especially among the SMEs which are one of the major creators of employment and growth in developing economies. The application of standards is still rather low in developing countries, but the considerable benefits associated with standards suggest that far more employees could benefit than they currently do.

This analysis does not come without several caveats. First, the study offers evidence on several secondary benefits from standards that target firm performance and product quality. Due to the very infrequent application of core labour standards, such as SA 8000 and OHSAS in the sample, estimating direct benefits of labour standards was not possible. Second, the study does not make a distinction between various types of standards, as the core survey questionnaire did not contain the information about the names of standards applied. While an attempt was made to obtain this information through a phone survey, the non-response rate was insufficient for a precise analysis. Future work could thus estimate the effect of different types of standards on work conditions. Third, the estimation is based on a short panel, which has prevented the use of firm fixed effects in handling the time-invariant unobservable heterogeneity. Future work in this area can perhaps focus in greater detail on mobility patterns of workers between certified and non-certified firms and subsequent wage outcomes. Matched firm–employee datasets from other countries would be a great source of additional evidence of auxiliary impact of standards in other institutional settings.

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Appendix

Table A1: Associations between application of standards and requests for standards (number of firms)

	2010		2012	
	Certification requested (No)	Certification requested (Yes)	Certification requested (No)	Certification requested (Yes)
Standards (No)	1,194	46	1,251	60
Standards (Yes)	94	89	72	133

Note: The Pearson $\chi^2(1)$ test of independence between applying standards and requested certification is 374.8 ($p = 0.000$) for 2010 and 580.2 ($p = 0.000$) for 2012.

Source: Author's calculation.

Table A2: Placebo test: Impact of requesting certified standards on average wage (IV share of certified firms in the district).

	Average wage		Insurance contributions		Formal contracts	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	2SLS	OLS	2SLS	OLS	2SLS
Requesting certification	-0.190 (0.195)	-3.776 (2.443)	-0.070 (0.158)	-3.892* (2.269)	0.007 (0.100)	-2.113 (1.424)
Firm size	0.145*** (0.030)	0.237*** (0.066)	0.259*** (0.017)	0.360*** (0.060)	0.175*** (0.022)	0.231*** (0.049)
KL ratio (ln)	-0.005 (0.030)	0.001 (0.040)	-0.026** (0.012)	-0.020 (0.026)	-0.025** (0.011)	-0.021 (0.018)
Age of the firm	-0.010** (0.005)	-0.010 (0.007)	-0.004 (0.003)	-0.003 (0.005)	-0.003 (0.002)	-0.003 (0.003)
Export	0.115 (0.080)	0.721 (0.496)	0.048 (0.075)	0.658 (0.459)	0.005 (0.080)	0.344 (0.291)
Share of female employees	-0.005*** (0.002)	-0.005* (0.003)	-0.001 (0.001)	-0.001 (0.002)	0.001 (0.001)	0.001 (0.001)
Worker age	0.029 (0.020)	0.042* (0.025)	0.004 (0.006)	0.016 (0.014)	0.001 (0.007)	0.008 (0.012)
Worker age squared (x1000)	-0.405 (0.247)	-0.561* (0.316)	-0.046 (0.077)	-0.196 (0.179)	-0.018 (0.086)	-0.102 (0.140)
Male	-0.029 (0.043)	-0.063 (0.050)	-0.052** (0.022)	-0.081** (0.033)	-0.019 (0.019)	-0.035 (0.025)
Married	-0.047 (0.074)	-0.120 (0.112)	0.010 (0.024)	-0.061 (0.084)	-0.001 (0.028)	-0.040 (0.054)
Experience	0.027* (0.015)	0.031 (0.020)	0.014** (0.005)	0.018 (0.013)	0.016*** (0.005)	0.019** (0.008)
Experience squared (x1000)	-0.363 (0.477)	-0.027 (0.767)	-0.353* (0.183)	-0.128 (0.504)	-0.514*** (0.179)	-0.394 (0.275)
Education controls	Yes	Yes	Yes	Yes	-0.058	-0.178
Work position controls	Yes	Yes	Yes	Yes	(0.074)	(0.370)
Location controls	No	Yes	No	Yes	-0.075*	-0.344
Sector controls	No	Yes	No	Yes	(0.044)	(0.372)
Time dummy	Yes	Yes	Yes	Yes	Yes	Yes
Constant	6.680*** (0.336)	6.630*** (0.596)	-0.068 (0.121)	-0.199 (0.513)	0.131 (0.123)	0.029 (0.436)
N	2328	2328	2566	2566	2575	2575
R ²	0.17	-2.31	0.51	-8.48	0.33	-6.97
Kleibergen-Paap Wald F statistic		2.52		2.49		2.48

Note: Kleibergen-Paap Wald F statistic is the test of identification for weak instruments. Education levels are: no formal education, primary, secondary, and tertiary. The baseline is tertiary education. Work positions are: manager, professional, office, sales service, and production worker. The baseline category is production worker. Robust standard errors clustered at the province and sector level are in parentheses. Significance levels: *p<0.10, **p<0.05, ***p<0.01.

Source: Author's calculation.