

Spillover effects of international standards: Work conditions in the Vietnamese SMEs

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Abstract

International standards are commonly applied to improve market access and competitiveness. While most studies focus on trade effects and organizational outcomes, very few studies look at the effect of standards on employees. Using a three-year matched firm-employee panel dataset, this paper finds that the application of international standards improves work conditions in small and medium enterprises (SMEs) in Vietnam. Certified firms pay higher wages on average. They are also more likely to offer formal contracts and to pay health insurance to their 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.

Keywords: standards, work conditions, certification, SMEs, Vietnam

JEL Codes: D22, D62, F16, J81, O12

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Acknowledgements

The author is grateful for collaboration with the Institute of Labor Science and Social Affairs (ILSSA) and Central Institute for Economic Management (CIEM) in Hanoi, Vietnam. The author also acknowledges valuable comments from Professor John Rand and participants at the CIEM workshop in Hanoi on 21 May 2014. Financial support from Danida is appreciated. The usual disclaimer applies.

1. Introduction

Private 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).

Most of the literature on the implications of private standards focuses on trade effects and organizational outcomes, with very few studies looking at the effect of standards for firm employees, thereby overlooking an important aspect of poverty reduction. This paper examines the effects of voluntarily applied private standards on the employment conditions of workers in small and medium enterprises (SMEs) in Vietnam. Of particular interest are spillover effects of certification of non-labour standards on employee wages, formal contracts and health insurance contributions. For example, international standard ISO 9001 is implemented to optimise processes while ISO 14000 streamlines firm's environmental responsibilities. Both of these have components related to labour, such as compliance with national labour laws and employee training, which can affect work conditions. Whether employee outcomes will be positive or negative after implementation of standards is not known *a priori*. Training may improve employee effort and skills if it is linked to more specialised work positions that are usually better paid than routine tasks. By requiring compliance with national labour laws, standards may lead to regularity in health 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. Private 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 private standards may be more likely to offer formal contracts to employees and pay higher wages.

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; Schuster and Maertens, 2016), studies on work conditions and standards among manufacturing 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, however, they were unable to control for the time-varying unobserved firm characteristics.

This paper also speaks to the literature on standards and firm performance. Corbett et al. (2005) found improvements in financial performance for ISO 9000 certified firms in the US and Terlaak and King (2006) discovered that certified facilities grow faster after certification. Using a large cross-section of firms from developing countries, Goedhuys and Sleuwaegen (2013) found that certification increases firm productivity. 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 ISO certification on export performance of firms in Argentina and in 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 GMM 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, 2013 and 2015.

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.

This paper finds that the application of standards improves work conditions in SMEs in Vietnam. Certified firms on average pay around 50% higher wages to their workers. These firms are also

16% more likely to provide health insurance and around 20 percentage points more likely to offer formal contracts to their employees. That certified firms offer better work conditions for their employees could be 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 results are robust to 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. by considering different choices of instrumental variables

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 standards affect work conditions uncovers the hidden implications of certification. The application of private 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 7 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 recognised standards for quality, safety and environmental protection is often mentioned as one 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 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. They formalise consumers' requirements about the production process (e.g., ethics, environment) or product (e.g., safe, organic). Standards communicate information about the attributes of products and production processes. With standards, it is easier for buyers to validate product quality and trust the producer, so standards can increase sales by reducing transaction costs. Standards provide reassurance to any downstream business that threats to the safety and sustainability of food

products have been identified and managed appropriately (Lockie et al., 2015). 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 system 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 have increasing importance 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 organisations such as the International Organization for Standardization (ISO), and specify requirements that go beyond government regulations. OHSAS 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., 2011; Masakure et al., 2009). However, the implementation 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 small- and medium-sized enterprise (SME) survey conducted to assess the characteristics of the Vietnamese business environment. The survey has been implemented in 10 provinces in Vietnam: Ho Chi Minh City (HCMC), 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 2011, 2013 and 2015 survey rounds because the question about the compliance with international standards was introduced in 2011. The survey instrument is almost identical in these three years.¹ The main questionnaire includes information on enterprise characteristics and practices. All questions refer to the situation in the previous calendar year, while the economic accounts contain information on two consecutive years prior to the survey. The questionnaire from 2015 asked about international and domestic standards separately, while earlier survey rounds asked only about international standards.

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, cooperative, limited-liability and joint-stock enterprises. The survey included both officially registered (with a business registration license) and informal firms that were identified randomly on-site.² The survey traces the same firms over the years, which enables capturing legal structure changes and formalisation of unregistered business entities. Due to the high firm turnover rate in Vietnam, the balanced panel includes the information on 1,663 SMEs in each year.

A separate employee module was administered to a randomly chosen subset of firms. The employee module was administered to a sub-sample of 597 firms in 2011, 600 in 2013 and 524 in 2015, 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, 1,571 did the same in 2013 and 1,342 in 2015. 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 1,166 employees in 2011, 1,243 employees in 2013 and 1,080 in 2015, representing 428 enterprises. Summary statistics for employee and firm characteristics are presented in Table 1.

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, I outline a framework to help interpreting

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

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

how standards affect work conditions. 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, health insurance contributions and formal contracts, I describe direct and indirect mechanisms in which standards can affect work conditions. 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 a part of the implementation of standards, workers are usually trained about quality, record-keeping, implementation of new procedures and audits. Workers can also undergo specialised trainings, for example, competency training and product conformity assessment training in case of ISO 9001, or safety and hazardous waste handling training in case of ISO 14000. 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 premium and offer more secure contracts to trained workers. In addition, 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. 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.

Another mechanism may be at play: if the training introduces a high level of routinized tasks, a wage premium is not expected. Low degree of specialisation 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 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 is 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, standards could lead to better job stability and higher use of formal contracts. In addition, it may become more costly to lay off workers who have had the training related to certification of standards, thereby insuring higher job stability.

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 standards on work conditions over the period 2010–14. It is important to note here that the intention is not to investigate direct impact of *labour standards* on workplace conditions, but the auxiliary effects of any internationally recognised private 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 4.5 million VND in 2014, 3.6 million VND in 2012 and 2.9 million VND in 2010. The values are quite close to the average

wage of the working population in Vietnam reported by the General Statistics Office (GSO, 2013; GSO, 2015). Table 1 also shows that the average wage measured in real terms rose between 2010 and 2014. The average real monthly wage was 2.7 million VND in 2010 and 2.9 million VND in 2014. Hence, the real wage has increased by around 5% during the considered period.

[Table 1 here]

The second variable used as a measure of work conditions is the provision of health insurance contributions and the third variable is the provision of formal labour contracts. Although far from finding the 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 could be paying lower wages (Baicker and Chandra, 2006). Also, the likelihood of having any form of 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% of Vietnamese workers received social insurance compensation in 2012, while the target for 2015 is 30% coverage (MOLISA, 2014). Health insurance contributions are compulsory for individuals formally employed for a period longer than three months or an undefined period. Workers in the informal economy and the poor are also entitled to partly or fully subsidised health insurance (Bonnet et al., 2012). It is estimated that more than 60% of the total population had either compulsory or voluntary health insurance in 2010 (MOLISA, 2010). In the SME sample, Table 1 shows a positive trend in both health insurance payments and formal contracts, but a much higher increase is observed for insurance payments. Around 54% of firms paid health insurance to their employees in 2014, which represents an increase of 14 percentage points compared to 2010. The share of firms with formal contracts in the sample was 51% in 2010 and 52% in 2014. 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 as a share of employees with formal contracts.

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

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

As it 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 standards, S_{ijt} while controlling for individual characteristics, X_{jt} , of

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

workers employed in firm i and firm-specific parameters, F_{it} , α_i , ρ_{sp} and τ_i are, respectively, firm, sector, and time fixed effects. e_{ijt} is the statistical noise term.

The variable of interest is S_{ijt} that takes value 1 if a firm applies any international standard and 0 otherwise. Proportion of firms with private internationally recognised standards in the sample is about 7%. The number of certified firms increased from 155 in 2010 to 167 in 2012, which is an increase of 8.5%. The application of standards in the sample declined to 106 firms in 2014. The observed decline follows the pattern of decline in the total number of ISO certificate in Vietnam between 2012 and 2014 reported in the ISO Survey, when the number of all ISO 9001 certificates decreased from 6,164 in 2012 to 3,786 in 2014 (ISO, 2014). The most commonly applied standard among the Vietnamese SMEs is ISO 9001. It is closely followed by ISO 14001 and ISO 22000. Around 10% of firms decide to certify more than one standard. Only two firms from the sample reported applying standards that are explicitly designed for improvement of work conditions, such as SA8000.

F_{it} are time-varying firm-specific control variables, such as firm size and ratio of capital and labour. 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 (Herath et al., 2007; Masakure et al., 2011; Nakamura et al., 2001). 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. The average firm employed around 29 employees. Firm size has decreased slightly between 2010 and 2014, consistent with aggregate formal employment trends in the country during the same period.

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 worker.' 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 decreased slightly between 2010 and 2014.

The adoption of standards could be linked to firm's position in the value chain and this requires controlling for the type of output, that is, whether a firm produces final or intermediate goods.

The control variable measures the share of final goods in total output. Firms in direct contact with foreign markets could be more likely to implement standards, as foreign customers or suppliers may transfer specific requests about product requirements that go beyond the national regulatory framework. It is also well-established in the literature that export firms pay higher wages (Verhoogen, 2008). The first control of firm's relationship with foreign markets measures the share of output that is exported. Table 1 shows that, overall, a modest share of total output is exported, but there has been an increase in the considered period, from 3.3% in 2010 to 5.2% in 2014. Importing raw materials could have similar effect, so the estimation also includes an indicator variable for whether a firm imports any of its raw materials.

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% between 2010 and 2014. Unregistered businesses are unlikely to obtain certificate of compliance with standards as the main information on the certificate is precisely the firm registration number. That is why the estimation controls for whether a firm owns a tax code.

X_{jt} is a vector of worker characteristics, which includes age and experience. These two variables routinely enter human capital earnings function (Mincer, 1974; Spence, 1973). The average worker has been working for the enterprise around 6 years and is around 34 years old. 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 73% of workers finishing secondary school and 22% having a college or university degree. Between 2010 and 2014, the share of workers with finished tertiary education has increased by 6%. At the same time, the share of workers with primary and secondary school has slightly declined. There was also a small increase in the share of uneducated workforce, but considering that the share of workers with no school is less than 1%, 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, which take around 62% of work places. Between 2010 and 2014 the share of production workers has increased by three percentage points.

Sector-province effects, ρ_{sp} , account for 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. 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 act more likely to adopt standards, needs to be accounted for. A common way of dealing with unobserved heterogeneity includes fixed effects estimation to remedy the bias from time-invariant unobservable factors, such as manager characteristics. Firms can also have time-varying changes in characteristics that are correlated with both implementation of standards and work conditions. In the presence of these factors, OLS estimates would be biased, but the direction of the bias may not be easy to predict. A change in management could lead a firm to both implement standards and improve work conditions, in which case OLS estimates would be biased upwards. Opposite, new management could reduce the extent of activities related to standards in order to invest in improving work conditions, or trade partners could require certification, which could divert from efforts to improve work conditions. These factors would cause OLS estimates to be downward biased. Instrumental variable (IV) estimation in two stages allows dealing with time-varying unobservable characteristics, which is specified as follows:

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

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

where Z_{it} is the instrumental variable for adoption of standards, which is correlated with the implementation of standards but uncorrelated with work conditions in a firm. The share of firms applying standards at the district and sector level is used as the first IV for firm-specific adoption of standards. The second IV a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam, the number of which is obtained from ISO Survey (ISO, 2014).⁴ The basis for using these IVs 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 behaviour, whereby firms are more likely to adopt standards if their rivals have been certified in the past (Grekova et al., 2014; Hofer et al., 2012). 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

⁴ Note that the present study uses only firms with matched employee data and that a larger sample of firms without employee data is also available. Both IVs are constructed on the integral sample of firms so the values represent all available information on standards from the full sample, not just the matched enterprise-employee sample.

neighbouring firms in the hope of becoming more competitive or attracting more customers in the future. In this way, it is assumed that specific knowledge about standards spreads more easily within than across sectors and districts and by restricting the IVs to the sector and district level, it is possible to minimise the correlation with the unobservable firm characteristics such as managerial skills. The prevalence of standards at the sector and district level is expected to positively affect the likelihood of certification at the firm level, but not to have independent impact on employee outcomes.⁵ In this way, the parameters are identified using the within-firm variation in the application of standards and work conditions over time. That certified and non-certified firms have significantly different work conditions is illustrated in Table 2 and described in Section 4.3, showing that mimetic practices are not relevant for work conditions. In other words, certified firms in any district are more similar to certified firms in any other location than to non-certified firms in the same district.⁶

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 (Abadie et al., 2002; Imbens and Angrist, 1994). I use linear IV estimation approach also in the case of health insurance contributions, which is a binary dependent variable. The approach is considered suitable to preserving the control function assumption (Angrist, 2001).

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 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 and to firms who apply only one standard provides further robust evidence. To avoid the possibility that parameter estimates are influenced by the exit and entry of firms rather than within-firm variations, I use a balanced panel of firms that are present in every year for the main analysis but

⁵ A similar approach to constructing sector and location specific IVs is used in a study of innovative performance of young small firms in Germany, where innovation is instrumented by the share of subsidized firms in the region where the focal firm is established and the share of subsidised firms per industry (Schneider and Veugelers, 2010). Schuster and Maertens (2016) use interaction between the number of labour-standard firms in a radius of 30 min traveling from the village and a dummy variable for hearing the recruitment loudspeakers of companies from home. Instrument at the firm level would perhaps have been more appropriate, but it was not possible to identify firm-level variables in the data capable of meeting all the criteria of instrument validity. For example, distance to the main buyer passed the test of instrument validity only in the health insurance equation.

⁶ District-level comparisons of key variables are not included in the paper, but are available from the author upon request.

also conduct estimates using the unbalanced panel. The extent of the within-firm variation in the main variables of interest in the unbalanced panel is presented in Table 1.

4.3 Descriptive statistics

This section describes the main variables of interest, that is, the application of standards and the differences in firm performance related to the application of standards. As Figure 1 shows, standards are most commonly applied in chemical industry, followed by electronic machinery, leather, food and beverages, fabricated metals, and rubber sector. Most of the sectors experienced a decline in the application of standards, while chemical products went through a substantial increase between 2010 and 2014.

[Figure 1 here]

Table 2 describes the average performance at the firm level for the entire observed period by certification of private standards. The indicators of work conditions show differences between certified and non-certified SMEs. Certified firms paid on average higher wages in all years. The distribution of wages for certified and non-certified firms is different, as illustrated in Figure 2. 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 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 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.

[Table 2 here]

Returning to Table 2, it is visible that certified firms are twice as likely to provide health insurance and contracts to their workers. While 86% of certified firms pay fringe benefits to their workers, only 41% of non-certified firms do the same. More than 90% of certified firms provide formal contracts to their employees. This practice is twice less likely among 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. 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. They are also more likely to produce intermediate goods and to import raw materials. Certified firms also have higher share of female employees and all are formally registered, meaning that they possess a tax code. They also have a much higher share of final goods exports, but overall, the application of standards does not appear to be only about accessing stringent foreign markets, as around 40% of certified firms

export. In 2010, certified firms exported equal amount of goods to China and EU (around 35% of total sales), while in 2012, certified firms sent 30% of total exports to ASEAN countries, 20% to EU and 13% to China.

[Figure 2 here]

5. Results

The paper estimates the impact of standards on work conditions among the Vietnamese SMEs, where the work conditions are measured by three indicators: average real worker wage, provision of 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

Table 3 shows the results of the impact of standards on individual worker wage. Equation (1) is estimated using OLS and a firm fixed effects estimator, while the two-stage IV estimator is used for Equations (2) and (3). Columns (1) and (2) show the pooled OLS estimates for the unbalanced and balanced panel, respectively with sector, location, and time fixed effects, in addition to the firm and worker control variables reported. Columns (3) and (4) include firm-specific fixed effects which control for all firm-specific time invariant heterogeneity, again on the full and balanced sample, respectively. Columns (5) and (6) show the results of the IV estimation with firm fixed effects all other firm and worker controls on the full and balanced sample, respectively.

The impact of standards on worker wages is positive and significant in all specifications. The estimation in column (1) shows that on average, the implementation of standards leads to 11% higher worker wages. Estimating Equation (1) on the balanced sample changes the effect size to 13%, as shown in column (2). The estimates of the wage equation with firm fixed effects on the full sample are also 13%, shown in column (3), but they reach 20% with balanced sample, as shown in column (4). The effect sizes in the IV estimations on the unbalanced sample are around 20%, increasing to 55% in the balanced sample estimation in column (6) and to 48% in column (8). 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), but it is precisely determined only in the OLS estimation. Capital labour ratio is precisely determined only in the IV estimations and points to higher wages in more labour intensive firms. Women receive lower wages on average, which is demonstrated by the negative coefficient on the share of female

employees. This could be a consequence of lower productivity of female workers or lower productivity of firms employing more females. 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, primary and secondary education are negative. The effect of work position is evaluated against production workers and we see a positive and significant wage premium for managers and professional workers. Service workers are slightly worse off than production workers. The estimates of worker age and experience are not consistently determined in all specifications. The F statistic for a test of significance of the instrumental variable is between 183 and 382, precluding the weak instrument concerns (Stock and Yogo, 2005).⁷

[Table 3 here]

5.2 The impact of standards on health insurance contributions

After controlling for firm and employee characteristics, the results show that firms who apply private standards are more likely to pay health insurance contributions to their employees. The results in Table 4 show that standards increase the chances of firms paying health insurance by around 16%, which supports the argument that certified firms are more likely to adhere more strictly to national laws and regulations.

[Table 4 here]

5.3 The impact of standards on formal labour contracts

Table 5 shows that, controlling for firm and employee characteristics, firms who apply standards offer higher share of formal contracts to their employees. The results show that standards increase the share of formal contracts in an enterprise by 17-20 percentage points. 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 5 here]

5.4 Discussion

The results show that certified firms have better work conditions than their non-certified counterparts. Workers in certified firms have on average higher wage than in non-certified firms, when individual worker wages are used in the estimation. The result is comparable to the study

⁷ Critical values for the Stock-Yogo (2005) identification test are 16.38 (10% maximal IV size), 8.96 (15% maximal IV size), 6.66 (20% maximal IV size) and 5.53 (25% maximal IV size). These apply to all IV estimations in the paper because critical values are determined by the number of IVs and endogenous variables, both which are equal to one in this study.

by Levine and Toffel (2010) who found that annual wages in ISO firms have 7.5% higher growth rate and that the total payroll at ISO firms grew 17.7% 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%. In addition to higher wages, certified firms are also more likely to pay health insurance benefits for their employees and to provide significantly higher share of indefinite formal contracts. This result is in line with Schuster and Maertens (2016) who find that workers employed in certified companies are more likely to have a contract, but the 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 size of coefficients in all IV estimations in Tables 3, 4 and 5 are higher than the OLS coefficients, illustrating a downward bias of the OLS estimation, which probably comes from the unobservable firm and employee characteristics that are negatively correlated with covariates. 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.

As IVs are constructed at the sector-district level, I estimate Equations (1) and (2) with district fixed effects instead of province fixed effects. The results shown in Table A1 in the Appendix remain largely unchanged, apart from the 2SLS estimations on unbalanced panel.

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 from which the firms who apply more than one standard have been removed. As Table 6 shows, the results remain very close in significance and magnitude to original estimations.

[Table 6 here]

To provide a further check for the robustness of the result on the impact of standards on work conditions among the 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 internationally recognised

standard. The associations between requests for standards and application of standards are shown in Table A2 in the Appendix, while the estimation results for the relationship between certification requests and work conditions are shown in Table 7. Table A2 shows a growing trend in requesting certification and actual certification, but that there are also firms who 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 A2), no consistent effect on work conditions could be attributed to simply requesting certification (Table 7). The lack of any effect suggests that standards are responsible for meaningful changes in firm's operations, indicating further that external pressure from buyers for improving work conditions is not the main motivation for implementing standards.

6. Conclusion

There is a growing body of literature that analyses the implications of private internationally recognised 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, provision of formal contracts and health insurance contributions. This result is among the first studies on the spillover effects from 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 methodological contribution in accounting for endogenous matching of workers with firms. The results are robust to a number of specification changes: placebo exercise, use of different instrumental variables, restriction of the sample to firms who apply only one private standard and the use of different levels of fixed effects.

Even though based on a dataset from Vietnam, this study offers important policy implications. As firms can obtain different set of benefits by investing in the application of standards, government policies should be more supportive of the adoption, especially among the SMEs who 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 module did not contain the

information about the name of the standard. While an attempt was made to obtain this information through a phone survey, the nonresponse rate was too high for any 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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Tables

Table 1: Summary statistics

	Definition	2010		2012		2014		Total	
		Mean	SD	Mean	SD	Mean	SD	Mean	SD
Standards	Firm applies standards (1/0)	6.61	24.84	7.14	25.76	4.31	20.30	5.99	23.73
Worker wage (ln)	Average real worker wage	7.72	0.83	7.59	0.94	7.77	0.84	7.69	0.88
Health insurance (%)	Workers with health insurance payment	39.00	48.79	47.63	49.96	53.57	49.90	46.53	49.89
Formal contracts (%)	Workers with formal contracts	50.17	46.91	47.41	46.26	52.35	45.87	49.85	46.39
Firm size (ln)	Total full-time regular labour force	2.71	1.07	2.66	1.14	2.77	1.12	2.71	1.11
KL ratio	Ratio of capital and labour value	16.59	26.13	13.34	20.16	10.47	18.61	13.56	22.07
Final goods (%)	Share of final goods in total output	27.25	34.63	34.30	37.04	35.19	38.78	32.19	36.95
Raw materials import	Firm imports raw materials (1/0)	7.45	26.27	8.06	27.23	7.69	26.66	7.74	26.73
Exports share (%)	Share of exports in total output sales	3.22	16.84	3.29	16.11	5.18	19.94	3.84	17.62
Female employees share	Share of female employees in total workforce	36.73	24.57	38.52	24.95	38.28	25.01	37.84	24.85
Tax code (%)	Firm has a tax code (1/0)	92.05	27.06	93.05	25.44	97.50	15.63	94.07	23.63
Worker age	Worker age in years	33.40	9.59	33.85	9.54	35.80	9.62	34.29	9.64
Experience in firm	Number of years working in the firm	5.43	4.83	5.74	4.95	6.91	5.31	5.99	5.06
No education (%)	Worker has no formal education (1/0)	0.84	9.11	0.79	8.86	0.93	9.59	0.85	9.17
Primary education (%)	Completed primary school (1/0)	4.77	21.32	3.63	18.72	3.24	17.72	3.90	19.36
Secondary education (%)	Completed secondary school (1/0)	73.89	43.94	74.17	43.79	71.83	45.01	73.36	44.21
Tertiary education (%)	Completed college or university (1/0)	20.50	40.39	21.41	41.03	24.00	42.73	21.89	41.36
Manager (%)	Working as a manger (1/0)	7.20	25.85	8.53	27.94	6.67	24.97	7.51	26.37
Professional worker (%)	Working as a professional worker (1/0)	10.04	30.07	10.27	30.37	8.80	28.35	9.75	29.66
Office worker (%)	Working as an office worker (1/0)	8.45	27.83	9.00	28.64	10.29	30.39	9.21	28.92
Sales worker	Working as a sales	8.28	27.58	7.35	26.10	6.67	24.97	7.46	26.27

(%)	worker (1/0)								
Service worker (%)	Working as a service worker (1/0)	3.68	18.84	4.34	20.39	3.15	17.48	3.76	19.02
Production worker (%)	Working as a production worker (1/0)	62.34	48.47	60.51	48.90	64.41	47.90	62.32	48.47
Observations		1,195		1,266		1,079		3,540	

Source: SME surveys in 2011, 2013 and 2015.

Table 2: Differences between firms by certification

	All	Non-certified	Certified	t-value
Worker wage (ln)	7.69	7.65	7.97	7.49***
Health insurance (%)	46.53	40.48	86.14	19.42***
Formal contracts (%)	49.85	43.40	92.08	22.64***
Firm size (ln)	2.71	2.54	3.82	25.25***
KL ratio	13.56	13.62	13.15	0.43
Final goods (%)	32.19	34.55	16.73	9.86***
Raw materials import	7.74	3.71	34.12	24.87***
Exports share (%)	3.84	1.64	18.26	20.09***
Female employees share	37.84	36.82	44.54	6.30***
Tax code (%)	94.07	93.16	100.00	5.87***
Worker age	34.29	34.30	34.26	0.09
Experience in firm	5.99	6.02	5.84	0.70
No education (%)	0.85	0.94	0.21	1.61
Primary education (%)	3.90	4.40	0.64	3.92***
Secondary education (%)	73.36	75.84	57.14	8.62***
Tertiary education (%)	21.89	18.82	42.00	11.52***
Manager (%)	7.51	6.84	11.94	3.91***
Professional worker (%)	9.75	8.89	15.35	4.41***
Office worker (%)	9.21	8.60	13.22	3.23***
Sales worker (%)	7.46	6.74	12.15	4.17***
Service worker (%)	3.76	3.32	6.61	3.49***
Production worker (%)	62.32	65.61	40.72	10.52***
Observations	3,540			

Source: SME surveys in 2011, 2013 and 2015.

Table 3: Impact of standards on worker wages. Dependent variable: monthly average employee wage (ln).

	OLS unbalanced	OLS balanced	FE unbalance d	FE balanced	IV1 unbalance d	IV1 balanced	IV2 unbalanced	IV2 balanced
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standards	0.110** (0.046)	0.121* (0.066)	0.126** (0.058)	0.185** (0.082)	0.202* (0.104)	0.449*** (0.138)	0.170* (0.103)	0.403*** (0.135)
Firm size (ln)	0.101*** (0.024)	0.116*** (0.034)	-0.068 (0.103)	-0.080 (0.133)	-0.067 (0.063)	-0.070 (0.079)	-0.068 (0.063)	-0.071 (0.079)
KL ratio	-0.001 (0.001)	-0.001 (0.002)	-0.003 (0.002)	-0.004 (0.002)	-0.003** (0.001)	-0.004** (0.001)	-0.003** (0.001)	-0.004** (0.001)
Final goods share	0.000 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)	0.000 (0.001)
Raw materials import	0.002 (0.053)	-0.041 (0.082)	-0.063 (0.088)	-0.134 (0.111)	-0.087 (0.064)	-0.196** (0.080)	-0.077 (0.064)	-0.185** (0.080)
Final goods exported share	0.061 (0.067)	0.075 (0.110)	-0.163 (0.133)	-0.121 (0.147)	-0.204 (0.128)	-0.237 (0.150)	-0.187 (0.128)	-0.217 (0.149)
Female workforce share	-0.002** (0.001)	-0.003** (0.001)	-0.005** (0.002)	-0.006* (0.003)	-0.005*** (0.001)	-0.006*** (0.002)	-0.005*** (0.001)	-0.006*** (0.002)
Tax code	-0.138 (0.104)	-0.258** (0.125)	-0.304 (0.258)	-0.303 (0.302)	-0.304* (0.164)	-0.302* (0.180)	-0.304* (0.164)	-0.302* (0.180)
Worker age (years)	-0.000 (0.002)	-0.002 (0.003)	0.003* (0.002)	0.003 (0.002)	0.003* (0.002)	0.004 (0.003)	0.003* (0.002)	0.004 (0.003)
Experience in firm (years)	0.008* (0.004)	0.007 (0.005)	0.006 (0.005)	0.004 (0.006)	0.006 (0.005)	0.003 (0.005)	0.006 (0.005)	0.003 (0.005)
No education	-0.565*** (0.216)	-0.575** (0.281)	0.039 (0.259)	0.162 (0.347)	0.039 (0.217)	0.163 (0.302)	0.039 (0.217)	0.163 (0.302)
Primary education	-0.447*** (0.130)	-0.471*** (0.148)	-0.159 (0.103)	-0.237** (0.116)	-0.159* (0.093)	-0.235** (0.109)	-0.159* (0.093)	-0.236** (0.109)
Secondary education	-0.140*** (0.036)	-0.139*** (0.051)	-0.100*** (0.031)	-0.105** (0.044)	-0.100*** (0.031)	-0.109** (0.045)	-0.100*** (0.031)	-0.109** (0.045)
Manager	0.295*** (0.062)	0.251*** (0.087)	0.240*** (0.053)	0.188** (0.074)	0.240*** (0.049)	0.190*** (0.069)	0.240*** (0.049)	0.189*** (0.069)
Professional worker	0.124*** (0.042)	0.132** (0.061)	0.104*** (0.037)	0.090* (0.053)	0.104*** (0.040)	0.085 (0.057)	0.104*** (0.040)	0.086 (0.057)
Office worker	0.078* (0.045)	0.057 (0.064)	0.016 (0.039)	-0.014 (0.055)	0.016 (0.035)	-0.016 (0.050)	0.016 (0.035)	-0.015 (0.050)
Sales worker	0.097** (0.041)	0.095 (0.059)	0.069* (0.039)	0.070 (0.057)	0.069* (0.038)	0.065 (0.054)	0.069* (0.037)	0.066 (0.054)
Service worker	-0.024 (0.049)	-0.028 (0.070)	-0.107*** (0.040)	-0.122** (0.059)	-0.107** (0.042)	-0.123* (0.063)	-0.107** (0.042)	-0.123* (0.063)
Location controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	7.864*** (0.155)	7.979*** (0.205)	8.766*** (0.473)	8.855*** (0.563)				
No. obs.	3,540	2,382	3,540	2,382	3,429	2,332	3,429	2,332
No. firms	739	433	739	433	628	383	628	383
R ²	0.14	0.14	0.09	0.09	0.09	0.09	0.09	0.09
Cragg-Donald Wald F statistic					379.50	183.53	382.12	185.34

Note: The first instrumental variable (IV1) is the share of firms with certified international standards at the district, sector and year level. The second instrumental variable (IV2) is a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam. Cragg-Donald Wald F statistic is the test of identification for weak instruments. The baselines are tertiary education and production worker. Robust standard errors clustered at the firm level are in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: SME surveys in 2011, 2013 and 2015.

Table 4: Impact of standards on health insurance contributions.

	OLS unbalanced (1)	OLS balanced (2)	FE unbalanced (3)	FE balanced (4)	IV1 unbalanced (5)	IV1 balanced (6)	IV2 unbalanced (7)	IV2 balanced (8)
Standards	0.127*** (0.042)	0.123** (0.050)	0.121*** (0.043)	0.112** (0.056)	0.154*** (0.039)	0.157*** (0.056)	0.151*** (0.038)	0.153*** (0.055)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employee controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-0.227*** (0.076)	-0.247*** (0.088)	0.085 (0.150)	0.169 (0.160)				
No. obs.	3,540	2,382	3,540	2,382	3,429	2,332	3,429	2,332
No. firms	739	433	739	433	628	383	628	383
R ²	0.51	0.54	0.10	0.12	0.10	0.12	0.10	0.12
Cragg-Donald Wald F statistic					379.50	183.53	382.12	185.34

Note: The first instrumental variable (IV1) is the share of firms with certified international standards at the district, sector and year level. The second instrumental variable (IV2) is a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam. Cragg-Donald 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 are in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Source: SME surveys in 2011, 2013 and 2015.

Table 5: Impact of standards on the provision of formal labour contracts.

	OLS unbalanced (1)	OLS balanced (2)	FE unbalanced (3)	FE balanced (4)	IV1 unbalanced (5)	IV1 balanced (6)	IV2 unbalanced (7)	IV2 balanced (8)
Standards	16.888*** (3.417)	10.590** (4.279)	9.296** (3.915)	8.481** (4.184)	19.961*** (3.273)	18.050*** (4.432)	19.275*** (3.277)	17.070*** (4.482)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Employee controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Work position controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Location controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-23.204*** (7.158)	-24.651*** (8.800)	22.408** (11.279)	23.654* (12.943)				
No. obs.	3,540	2,382	3,540	2,382	3,429	2,332	3,429	2,332
No. firms			739	433	628	383	628	383
R ²	0.51	0.53	0.13	0.14	0.12	0.14	0.13	0.14
Cragg- Donald Wald F statistic					379.50	183.53	382.12	185.34

Note: The first instrumental variable (IV1) is the share of firms with certified international standards at the district, sector and year level. The second instrumental variable (IV2) is a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam. Cragg-Donald 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 are in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Source: SME surveys in 2011, 2013 and 2015.

Table 6: Impact of standards on worker wage, health insurance and formal contracts (firms with more than one standard are removed).

	OLS unbalanced (1)	OLS balanced (2)	FE unbalanced (3)	FE balanced (4)	IV1 unbalanced (5)	IV1 balanced (6)	IV2 unbalanced (7)	IV2 balanced (8)
Worker wage	0.121*** (0.047)	0.124* (0.068)	0.169*** (0.062)	0.195** (0.085)	0.316*** (0.106)	0.417*** (0.131)	0.287*** (0.104)	0.372*** (0.128)
Health insurance	0.126*** (0.043)	0.130** (0.051)	0.136*** (0.044)	0.128** (0.057)	0.179*** (0.040)	0.146*** (0.054)	0.176*** (0.040)	0.144*** (0.053)
Formal contracts	16.565*** (3.524)	11.073** (4.340)	11.743*** (3.896)	10.444*** (4.032)	23.869*** (3.572)	20.391*** (4.416)	22.990*** (3.592)	19.299*** (4.464)
N	3,470	2,342	3,470	2,342	3,358	2,291	3,358	2,291

Note: Separate estimations for each dependent variable. All estimations include firm, employee, education, work position, location and sector controls. The first instrumental variable (IV1) is the share of firms with certified international standards at the district, sector and year level. The second instrumental variable (IV2) is a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam. Robust standard errors clustered at the firm level are in parentheses. Significance levels: * p<0.10, ** p<0.05, *** p<0.01. Source: SME surveys in 2011, 2013 and 2015.

Table 7: Placebo test: Impact of requesting certified standards on average wage, health insurance and formal contracts.

	OLS unbalanced (1)	OLS balanced (2)	FE unbalanced (3)	FE balanced (4)	IV unbalanced (5)	IV balanced (6)
Worker wage	-0.078 (0.075)	-0.136 (0.116)	-0.053 (0.135)	-0.132 (0.175)	0.064 (0.085)	0.069 (0.122)
Health insurance	0.053 (0.039)	0.063 (0.048)	0.024 (0.038)	-0.025 (0.051)	0.021 (0.022)	-0.010 (0.026)
Formal contracts	11.473*** (4.143)	15.275*** (4.432)	-0.427 (4.426)	1.772 (3.791)	3.355 (2.786)	4.661 (2.843)
N	3,470	2,342	3,470	2,342	3,358	2,291

Note: Separate estimations for each dependent variable. All estimations include firm, employee, education, work position, location and sector controls. IV is the share of certification requests by sector, district and year. Robust standard errors clustered at the firm level are in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: SME surveys in 2011, 2013 and 2015.

Figures

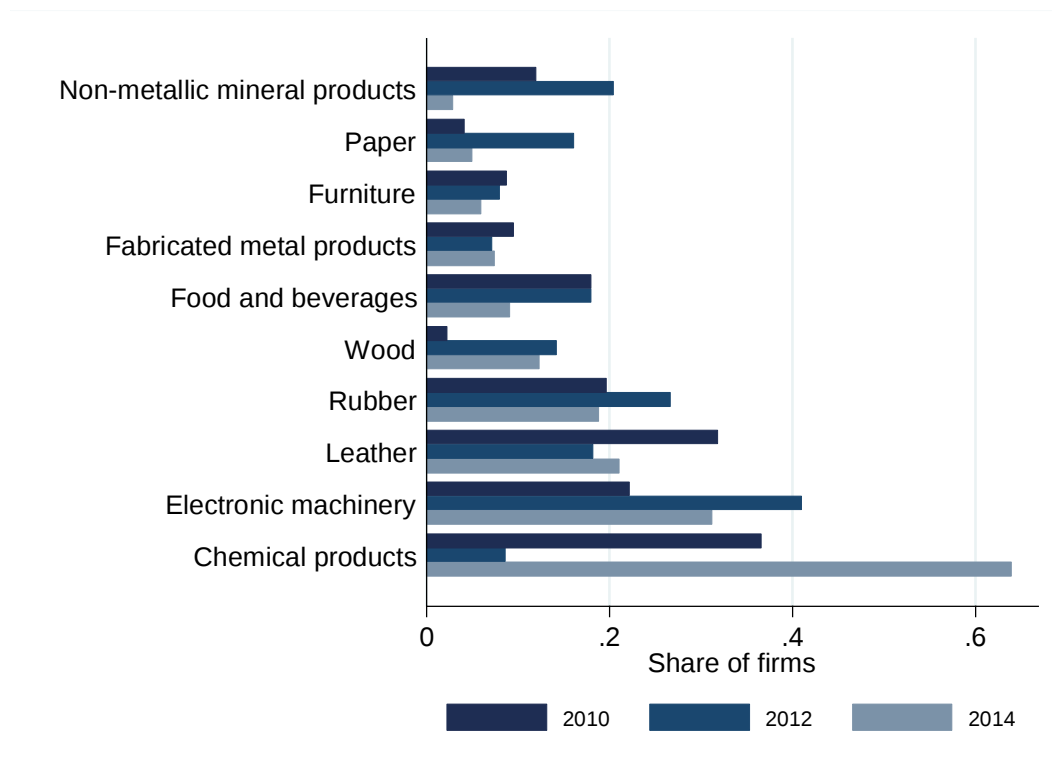


Figure 1. Application of standards among the Vietnamese SMEs in selected sectors

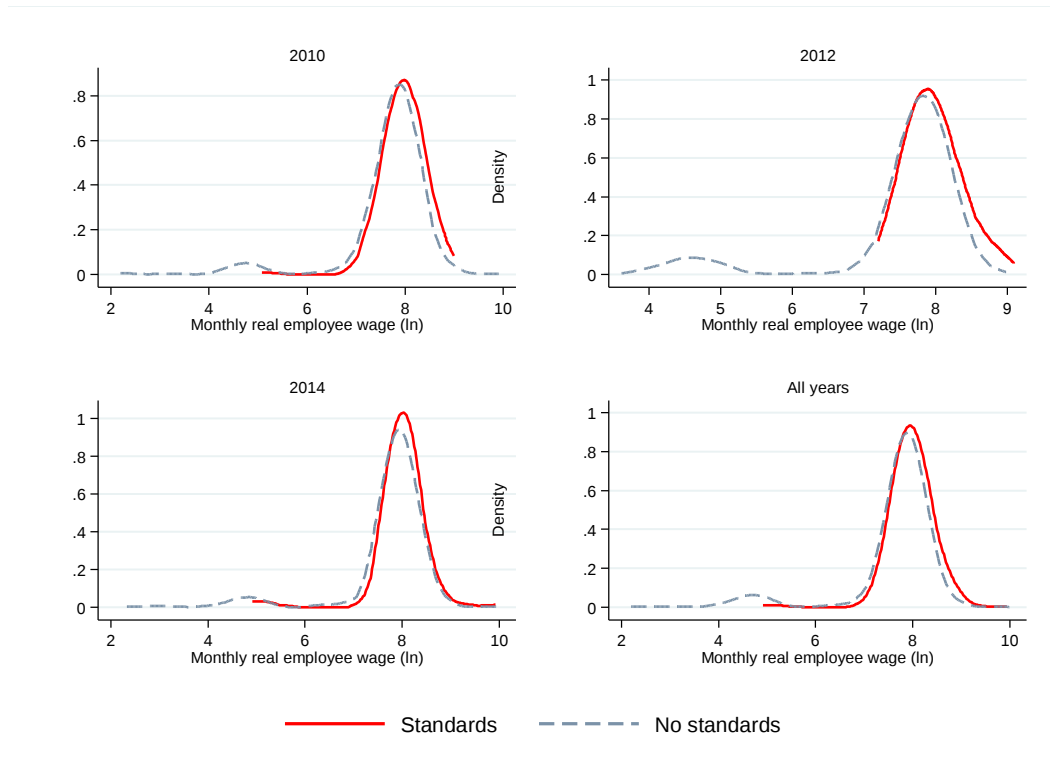


Figure 2. Kernel density estimation of worker wages across firms by application of standards with Epanechnikov kernel and bandwidth 0.25

Appendix

Table A1: Impact of standards on wages, provision of health insurance and formal labour contracts with district fixed effects.

	OLS unbalanced (1)	OLS balanced (2)	FE unbalanced (3)	FE balanced (4)	IV1 unbalanced (5)	IV1 balanced (6)	IV2 unbalanced (7)	IV2 balanced (8)
Worker wage	0.097* (0.051)	0.108 (0.075)	0.117** (0.059)	0.176** (0.082)	0.121 (0.105)	0.364*** (0.130)	0.096 (0.105)	0.330** (0.128)
Health insurance	0.106** (0.042)	0.101* (0.054)	0.122*** (0.044)	0.109* (0.056)	0.169*** (0.041)	0.174*** (0.056)	0.164*** (0.040)	0.168*** (0.056)
Formal contracts	15.183*** (3.445)	6.636 (4.541)	9.385** (4.046)	8.235* (4.210)	22.292*** (3.457)	20.093*** (4.439)	21.555*** (3.456)	19.169*** (4.519)
N	3,540	2,382	3,540	2,382	3,429	2,332	3,429	2,332

Note: The first instrumental variable (IV1) is the share of firms with certified international standards at the district, sector and year level. The second instrumental variable (IV2) is a two-year sector and district share of total ISO 9001, 14000 and 22000 certificates issued in Vietnam. Cragg-Donald 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 are in parentheses. Significance levels: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: SME surveys in 2011, 2013 and 2015.

Table A2. Associations between application of standards and requests for standards (number of firms)

	2010		2012		2014	
Standards	Certification requested (No)	Certification requested (Yes)	Certification requested (No)	Certification requested (Yes)	Certification requested (No)	Certification requested (Yes)
No	989	45	1,021	50	890	76
Yes	84	77	71	124	50	63

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.