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

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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 Codes: D22, O12, J31, J81, F16

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 Martinez and Poole 2004; Gibbon, Ponte, and Lazaro 2010). At the firm level, standards play a key role in accessing higher-value markets (Masakure, Henson, and Cranfield 2009) and improving competitiveness (Delmas 2001), but only if firms can overcome costs of implementation (Maskus, Otsuki, and Wilson 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 effect 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, Mithöfer, and Waibel 2010; Barrientos, Dolan, and Tallontire 2003), 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) analyze 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) analyze 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) analyze the returns to certification in terms of export sales revenue for sub-Saharan African countries. 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 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 labor 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, Poole, and Senses 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 labor 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 labor 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 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% higher wages to their workers. These firms are also 46% more likely to offer permanent formal contracts and 56% 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

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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, Demirguc-Kunt, and Levine 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.

2. Data

The data are from a small- and medium-sized enterprise (SME) survey conducted to assess characteristics of the Vietnamese business environment. The survey has been implemented in 10 provinces in Vietnam every second year since 2005. The analysis in this paper is based on the data from 2011 and 2013 survey rounds because the question about the compliance with standards was introduced in 2011. All questions refer to the situation in the previous calendar year, namely 2010 and 2012.

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.[1] Informal firms make 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 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 sub-sample 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 module of the SME survey only reveals if a firm applies any standards. To obtain detailed information on the types of standards applied and the motives for implementation, a phone survey was administered in the Spring of 2014. Only firms who 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 apply in 2014. The overview of the information on the types of standards applied is presented in Table 2.

3. 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 that the intention was not to investigate direct impact of *labor standards* on workplace conditions, but the auxiliary effects of any internationally recognized standard

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[1] Detailed information about sampling is available in CIEM, DoE, ILSSA and UNU-WIDER (2012, 2014).

that primarily address non-labor issues. In other words, firms adopt non-labor standards with non-labor objectives in mind and any changes in work conditions represent potential spillover effects.

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 VND in 2012 and 2.9 million VND in 2010, which are comparable to the average wage of the working population in Vietnam reported by the General Statistics Office (GSO 2013). 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. Table 1 shows that the average wage measured in real terms rose by 2.5% between 2010 and 2012.

[Table 1 here]

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 labor 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 pay lower wages (Baicker and Chandra 2006). Also, the likelihood of having social insurance is higher for workers with formal contracts (Gao, Yang, and Li 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). 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% 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

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was 27% in 2012 and 26% 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 though a dummy variable that takes value 1 if a firm offers indefinite formal contracts and 0 otherwise.

The basic specification is the equation (1) in which work conditions depend on both individual worker characteristics and firm characteristics[2]:

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

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 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. Proportion of firms with internationally recognized standards in the sample is about 7%. The number of certified firms increased from 163 in 2010 to 177 in 2012, which is an increase of 8.5%. The most commonly applied standard among the Vietnamese SMEs is ISO 9001. It is closely followed by ISO 14001 and HACCP. Around 20% 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%) and securing more sales (30%). Around 20% of the SMEs have seen improvements in product quality and 9% in the production process, some of which surely affect work conditions.

[Table 2 here]

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[2] For a similar approach, see Larsen, Rand and Torm (2011) and Troske (1999)

F_{it} are time-varying firm-specific control variables, such as firm size, ratio of capital and labor and the age of firm. Firm size is measured as the total number of full-time employees. Summary statistics in Table 1 show that the average firm employed around 20 employees and that the average size has decreased slightly between 2010 and 2012. Ratio of capital and labor (KL) is also included in the estimation to proxy for the cost and the nature of technology. 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. The average age of firms in the sample is 15 years. Link to foreign markets is important as firms are more likely to implement standards if their business is export-oriented. Only 9% of the firms in the sample are engaged in foreign trade, with a slight positive trend in the 2010-2012 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, Rand, and Torm 2011). The share of female employees has increased by 4% between 2010 and 2012.

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). Squares for both of these variables are included to allow for diminishing marginal effects. The average worker has been working for the enterprise around 6 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). 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, Rand, and Torm 2011), these workforce parameters are included in the estimation as well. The employee education

level is high with 75% of workers finishing secondary school and 20% having a college or university degree. Between 2010 and 2012, the share of workers with finished tertiary education has increased by 9%. 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 labor force composition, the sample is dominated by production workers, which take around 60% 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. 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 typical way of dealing with unobserved heterogeneity includes fixed effects estimation to remedy the bias from time-invariant unobservable characteristics. Because firm 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 instrumental variable (IV) estimation in two stages is implemented:

$$w_{ijt} = \sigma + \theta S_{ijt} + \kappa F_{it} + \varphi X_{jt} + \varepsilon_{ijt} \tag{2}$$

$$S_{ijt} = \pi_0 + \pi Z_{it} + \chi F_{it} + \lambda X_{jt} + \eta_{ijt} \tag{3}$$

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 (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 neighboring 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. 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, Imbens, and Rubin 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, Angrist, and Imbens 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.

3.1 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. Standards are most commonly applied in the food and beverages sector, followed by fabricated metals, rubber and electronic machinery sector. Most of the sectors have experienced an increasing trend in the application of standards, while electronic machinery, apparel, furniture, textiles and basic metals sectors went through a decline between 2010 and 2012.

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). Favorable outcomes for certified firms are readily notable. Certified firms on average pay 22% higher wages.

[Table 3 here]

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Certified firms are almost three times more likely to provide health and social insurance to their workers. While 84% of certified firms pay fringe benefits to their workers, only 39% of non-certified firms do the same. More than half of certified firms provide formal contracts to their employees. This practice is twice less likely among 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 labor 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 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. Non-certified firms have higher proportion of production workers.

4. Results

4.1 The impact of standards on wages

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% higher worker wages. Adding the sector and location controls changes the effect size to 12%, as shown in column (2). The estimates of the wage equation reach 27% when only worker characteristics are included, as in column (3), but decrease to 22% with the addition of sector and location controls. Finally, the effect size decreases to 17% when both firm and worker characteristics are controlled for and to 11% 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.

Table 5 shows the instrumental variable two-stage least squares (2SLS) estimation of the impact of standards on worker wages. The impact of standards on wages is significant and positive across different specifications, yielding a result of 73% higher wages in firms who 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)[3].

[Tables 4 and 5 here]

4.2 The impact of standards on social and health contributions

After controlling for firm and employee characteristics, the results show that firms who apply international standards are more likely to pay social and health insurance contributions to their employees. 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%, which supports the argument that certified firms are more likely to adhere more strictly to national laws and regulations. Table 7 shows the impact of standards on social and health insurance contributions in the instrumental variable estimation. 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% higher for firms with standards.

[Tables 6 and 7 here]

4.3 The impact of standards on labor contracts

Table 8 shows that firms who apply international standards are more likely to offer indefinite formal contracts to their employees. The results in column (6) show that standards increase the chances of firms offering formal contracts by 9%. 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

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[3] 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.

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 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% higher for firms with standards when the influence of unobserved heterogeneity is controlled for.

[Tables 8 and 9 here]

4.4 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 wage 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 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 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 who apply more than one standard. As Table 10 shows, the results remain very close in significance and magnitude to the original estimation.

[Table 10 here]

To provide a 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 international standard. The associations between requests for standards and application of standards show 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,[4] no effect on work conditions could be identified for simply requesting certification (Table 11). The lack of any effect suggests that there indeed is a difference between intentions and practice when it comes to the effectiveness of standards.

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[4] 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.

[Table 11 here]

5. Conclusion

There is a growing body of literature that analyzes 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 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 set of benefits by investing in international 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. 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

	2010		2012		Total	
	Mean	SD	Mean	SD	Mean	SD
Worker wage (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.

Table 2. Number and type of standards applied by the 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.

Table 3. Differences between firms by certification

Variable	Definition	All	Non-certified	Certified	t-value
a) Dependent variables					
Worker wage	Average real worker wage (1,000 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
b) Control variables					
Firm size	Total full-time regular labor force	22.25 (31.86)	17.62 (26.56)	52.66*** (44.62)	21.74
Firm size (ln)	Total full-time regular labor force	2.42 (1.13)	2.23 (1.05)	3.62*** (0.86)	24.80
KL ratio (ln)	Ratio of capital and labor	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)	15.10 (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.

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***	0.117*	0.238***	0.197***	0.159***	0.105*
	(0.045)	(0.059)	(0.045)	(0.053)	(0.049)	(0.063)
Firm controls	Yes	Yes	No	No	Yes	Yes
Employee controls	No	No	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	-29.161	-25.937	-3.508	2.603	-11.608	-10.188
	(50.290)	(50.019)	(48.909)	(48.651)	(48.172)	(47.907)
N	2329	2329	2382	2382	2328	2328
R^2	0.08	0.14	0.09	0.15	0.13	0.17

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

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***	0.705***	0.907***	0.709***	0.786***	0.548***
	(0.292)	(0.197)	(0.277)	(0.210)	(0.259)	(0.184)
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	7.194***	7.137***	6.218***	6.467***	6.595***	6.689***
	(0.150)	(0.167)	(0.273)	(0.301)	(0.328)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

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)	(140.79)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

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***	0.600***	0.672***	0.960***	0.301**	0.560**
	(0.124)	(0.225)	(0.160)	(0.289)	(0.124)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 8. Impact of standards on the provision of formal labor contracts.

	Firm characteristics		Worker characteristics		Firm and worker characteristics	
	(1)	(2)	(3)	(4)	(5)	(6)
Standards	0.121***	0.092*	0.232***	0.216***	0.109**	0.086*
	(0.046)	(0.048)	(0.044)	(0.043)	(0.044)	(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	223.42	138.64	207.82	229.29	240.73
	(201.84)	(217.50)	(175.65)	(182.56)	(205.22)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 9. Impact of standards on the provision of formal labor 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**	0.481*	0.803***	0.710**	0.579**	0.461*
	(0.240)	(0.256)	(0.261)	(0.293)	(0.242)	(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	31.07	26.90	22.64	38.78	33.26
	(31.56)	(28.70)	(34.94)	(31.20)	(31.40)	(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: 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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

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)	(2)	(3)	(4)	(5)	(6)
	OLS	2SLS	OLS	2SLS	OLS	2SLS
One standard	0.102	0.538***	0.162***	0.543**	0.151**	0.467*
	(0.062)	(0.178)	(0.047)	(0.219)	(0.070)	(0.267)
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	-8.75	-8.97	-103.84***	-103.43***	26.92	26.40
	(47.91)	(48.64)	(23.78)	(24.69)	(28.06)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.

Table 11. 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	-3.776	-0.070	-3.892*	0.007	-2.113
	(0.195)	(2.443)	(0.158)	(2.269)	(0.100)	(1.424)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Worker controls	Yes	Yes	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	6.680***	6.630***	-0.068	-0.199	0.131	0.029
	(0.336)	(0.596)	(0.121)	(0.513)	(0.123)	(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: * $p<0.10$, ** $p<0.05$, *** $p<0.01$.