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Gender matters

Private sector training in Vietnamese SMEs

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Abstract: In many developing countries the skill base is a cause of concern with respect to international competition. Firm-provided training is generally seen as an important tool for bridging the skills gap between labour force and private sector demand. Yet little is known about how successful such training may be in closing the gender wage gap. We use a matched employer–employee panel dataset to assess why firms train and whether formal training affects wage outcomes in Vietnamese SMEs. Training is generally found to be firm-sponsored and specific in nature. We find that training is associated with a wage increase of 7–22 per cent for female workers only, depending on the analytical approach taken. We also show evidence that the wage increase is associated only with on-the-job training and that lower ability workers are more likely to be trained. Our findings indicate that, at least in Viet Nam, firm-sponsored on-the-job training helps close the gender wage gap.

Keywords: training; wage, SME, Viet Nam
JEL classification: J31, J16, M53, O53

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1 Introduction

In Viet Nam, as in several other developing countries, there is a growing concern about the inadequacy of the skill base to keep up with international competition levels and technological advances in an increasingly globalized world. For instance, 80 per cent of business leaders in Viet Nam complain about a lack of appropriate qualifications among job applicants, while 84 per cent cite lack of experience as a major business constraint (World Bank 2013; VNA 2014). The inability of the educational and vocational training system to match the needs of companies is also noted in small and medium enterprise (SME) surveys in Viet Nam, where 30–40 per cent of firms report difficulties in finding workers with the required skills (CIEM et al. 2014).

Job training is potentially an important tool in bridging the skills gap and is often cited as the most effective human resource management tool for improving competitiveness (Truong et al. 2010). A substantial body of work focusing on training outcomes shows that the accumulation of human capital is favourable to both employers and employees.[1] Female and male employees, however, differ with respect to nearly all labour market outcomes, including the likelihood of participating in employer-provided training and the return to labour.[2] Barron et al. (1993) argue that women sort into jobs with less training and experience lower wage growth over time due to their higher resignation rate. Given this divergence in the evidence to date, it is worthwhile exploring empirically whether female employees, with their lower skill base, benefit differently from formal training in comparison with male employees. Higher returns on training for male employees may increase the gender wage gap even further, but if female employees can efficiently improve their skills through training, the gender wage gap could be decreased.

In this paper we investigate differences across gender in terms of formal training, purpose, and financing, and test whether training leads to different wage outcomes for female and male workers in Vietnamese SMEs. We use a unique matched employer–employee dataset from 2013 and 2015 covering formal and informal manufacturing SMEs in Viet Nam, which allows us to consider not only the effect of training by gender and training type but also the motivation for firms to train.

We find that training tends to be financed by firms, not employees, and thus to be specific in nature. The main purpose of offering training is to teach both new and existing workers new production technologies. We find that female workers who have undergone training in their current occupation receive wages that are around 7 per cent higher than non-trainees, when both employer and employee characteristics are included in the specification. When accounting for time-varying unobservable characteristics in an instrumental variable estimation, the wage difference amounts to 22 per cent. The latter difference indicates that individual unobserved heterogeneity correlates negatively with training incidence, in turn implying that lower ability workers are more likely to be trained. We also provide evidence that the wage increase is associated only with on-the-job training. If the wage increase is considered to be a lower bound on the productivity gain from training, then offering employee training can also be a worthwhile investment from a firm perspective. Our results also indicate that, by raising the skill base of

[1] See, e.g., Almeida and Carneiro (2009), Ballot et al. (2006), Blundell et al. (1999), Conti (2005), Parent (1999).

[2] For evidence on training participation, see, e.g., Backes-Gellner et al. (2014), Barron et al. (1993), Blundell et al. (1996), Lynch (1992), Ng (2005), Pischke (2001), Yamauchi et al. (2009). For return to labour, see, e.g., Bertrand (2011), Blau and Kahn (2006), Gneezy et al. (2003), Goldin (2014), Manning and Swaffield (2008), Statt (1998).

female workers, firm-sponsored training could be a viable way to reduce the gender wage gap and to improve gender equality in the Vietnamese labour market.

Gender equality has come into focus in recent years in Viet Nam. The Committee on the Elimination of Discrimination against Women, the National Policy Framework for Gender Equality, and the Gender Equality Law of 2010 aim to highlight the importance of gender equality for the socio-economic development of the country. These initiatives are important, as women still have a lower societal standing and fewer rights in practice than men. For instance, women are found to have much less access to assets than men (UN Women and OHCHR 2013) and to have lower ownership of land titles (UNDP 2010). Household chores are overwhelmingly performed by women, while men usually take financial responsibilities in the household (UNDP 2013). Female employees across different industries and services routinely earn lower wages than their male colleagues (GSO 2015b; Liu 2004). This last situation may not persist in the future, as our results indicate that, by raising the skill base of female workers, firm-sponsored training could be a viable way to reduce the gender wage gap and to improve gender equality in the Vietnamese labour market.

By providing evidence from Viet Nam, our paper adds to the literature on the impact of firm-provided training on employee wages, most of which was previously based on data from developed countries. Studies on the impact of training on employee wages in developing countries tend to use firm-level data, which neglects to account for the selection of workers and firms into training based on unobserved heterogeneity. In the case of Viet Nam, existing work is limited by rather small cross-sectional samples of state-owned enterprises (SOEs) or larger private companies and a lack of focus on gender differences in training uptake (Quang and Dung 1998; Thang and Quang 2005a, 2005b, 2007; Thang et al. 2011; Zhu et al. 2008). To the best of our knowledge, no previous studies have used a matched employer–employee panel dataset from a developing country to analyse the impact of training on individual wages.[3] The matched aspect of the data enables us to control for observed worker- and firm-specific characteristics that are correlated with training incidence and individual wage outcomes. By constructing a balanced panel from a sub-sample of the full dataset we account for individual unobserved heterogeneity such as worker ability, which is likely to influence both training and wages. Several studies use matching methods to identify the average effect of training on wages (e.g. Almeida and Faria 2014; Rosholm et al. 2007). These methods, however, control only for selection into training based on observable characteristics. If selection into training is based partly on unobserved characteristics, such as worker ability or firm's training practices, the impact of training on individual wages could be over- or under-estimated. We correct for unobservable heterogeneity bias by using instrumental variable estimation and show evidence of adverse selection into training. This implies that workers with lower abilities are more likely to opt for firm-sponsored training and that not controlling for unobservables under-estimates the true effect size.

The paper is structured as follows: in the subsequent section we provide an overview of the existing literature, focusing on studies that look at individual wage returns on training. In Section 3, we describe the data and present descriptive statistics. Section 4 outlines the methodology for the empirical analysis. Section 5 discusses the firm- and employee-level evidence of training as well as the determinants for training. Finally, Section 6 presents the results of the analysis of the impact of training on wages.

[3] Cross-sectional matched employer–employee data have previously been used in the literature. See, for example, Almeida and Faria (2014) and Görg et al. (2007).

2 Literature review

Workers can increase their productivity through the accumulation of human capital by learning new skills and upgrading old ones. The increase in individual productivity in turn raises earnings, and is often used to explain upward-sloping wage profiles.[4] One way to accumulate human capital is through on-the-job training, which is a process that raises future productivity but differs from school training since the investment is undertaken while employed. The cornerstone of the standard human capital theory as developed by Becker (1964) is the strong distinction between general and specific training. According to the standard human capital model, the cost and benefit of specific training are shared by the worker and employer, whereas workers are the sole beneficiaries of general training, and thus in a competitive market will bear the entire cost associated with it.

In practice, however, it is often observed that firm-sponsored training programmes regularly include a general training component and that firms pay part of the investment in training (Barrett and O'Connell 2001; Loewenstein and Spletzer 1999). Acemoglu and Pischke (1999) show that when wages are compressed below workers' marginal productivity, firms are willing to pay part of the cost associated with general training.[5] This reasoning is embedded in the idea that the current employer has more information about the worker's ability than potential employers, and since the firm obtains part of the marginal return, it has an incentive to invest in human capital and pay part of the cost. This implies that both general and specific training affect workers' wages and also lead to higher firm productivity.[6] This is also consistent with empirical evidence showing that firm-sponsored training has a positive and significant impact on productivity and wages, and thus the accumulation of human capital has favourable effects for both parties (for a review of studies in developed countries, see Ballot et al. (2006) and Blundell et al. (1999)).

Building on the theoretical labour market literature, where the marginal product of labour is equal to the real wage rate in a competitive market, most empirical studies use wage rates as a proxy for labour productivity. A striking feature of the empirical literature is the very mixed evidence across both developed and developing countries, which is partly explained by the differential estimation methods and data used.

For instance, Lynch (1992) and Veum (1999) both apply the US National Longitudinal Survey of Youth (NLSY) and find evidence suggesting that employer-provided training is largely firm-specific, as only training provided by the current employer has a significant impact on wages for both male and female workers. While both on- and off-the-job company-paid training are positively related to wage growth for males, only on-the-job training is significantly related to wage growth among females (Veum 1999). Using the same data, Loewenstein and Spletzer

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[4] Alternative compensation models have little to do with training, and thus are not discussed here. However, these theories should not be seen as mutually exclusive but rather as complementary. For instance, the efficiency wage theory suggests that firms set wages above the market equilibrium in order to increase the quality of the applicant pool. Weiss and Landau (1984) show that firms use higher wages as a kind of screening mechanism, while Montgomery (1991) uses a model of adverse selection to show that firms may raise wages in order to increase the number of applicants. Others show that raising wages is a way for firms to discourage 'shirking' (Spence 1973), or workers from moving once they have been trained.

[5] See Acemoglu and Pischke (1999, 2002) for different explanations of the presence of compressed wage structures.

[6] A number of other authors have pointed to similar explanations for why firms sometimes pay for general training (Acemoglu and Pischke 2002; Bishop 1994; Stevens 1994).

(1999) in contrast find that most of the training provided by employers is general in nature. In line with the prediction that employer and employees share the costs and benefits of both general and specific training, the authors find no systematic difference in wage returns across training types. Pischke (2001) also finds that much of the training in Germany is general in nature, and is provided by employers at no direct cost to the employee. Allowing for heterogeneous wage growth rates, he finds that returns on training during work hours are smaller than on training during leisure hours, particularly for women, even though none of the training variables are found to be well determined. Using longitudinal firm-level data on training and productivity, Ballot et al. (2006) also find that firm-sponsored training includes a large general training component, and that workers in both France and Sweden capture part of the return through higher wages, though the heterogeneous effects by gender are not investigated. Analogously, past training may exert a positive effect on the wages from the current employer. Based on youth cohort data from the NLSY, previous on-the-job training increases wages by, on average, 3 per cent for males (Dolton et al. 1994) and 7 per cent for mature women (Hill 2001). Moreover, Lynch (1992) provides evidence that previous off-the-job training measured in weeks has a positive impact on wages for both white females and white males.

In terms of training impacts on individual wages in developing countries, empirical evidence is more limited, partly due to a lack of comprehensive data. One of the early studies examining the effect of training on employment and earnings found that training improves employment probability but not wages among urban Peruvian women (Arriagada 1990). In contrast, urban Peruvian men employed in the private sector experience wage gains as a result of training. Distinguishing the impact of education and on-the-job training on employee salary, Xiao (2002) estimates a hierarchical linear model using longitudinal employee data from Shenzhen, China, and shows that on-the-job training provided by employers in the workplace does not automatically contribute to annual wage growth at either individual or firm level. However, on-the-job training contributes to wage increases through firm-recognized improved job performance: training indirectly increases wages by 1.5 per cent. Exploring propensity score matching using a matched employer–employee dataset, Almeida and Faria (2014) find significant wage returns on on-the-job training for male workers in Malaysia and a lower return on training for women in Thailand (though only significant at the 10 per cent level). Rosholm et al. (2007) also apply matching methods and find a positive average effect of training lasting longer than 10 hours on those trained. Kahyarara and Teal (2008) reach a similar conclusion in Tanzania. In contrast, Ng (2005) finds no general effect of on-the-job training on earnings in manufacturing firms located in Shanghai, while only female workers are found to experience a 2 per cent return from off-the-job training. As with the distinction between general and specific training, evidence of wage returns from past training is mixed. While the findings presented by Xiao (2002) and Ng (2005) support the hypothesis that firm-provided training includes a general skill component, which is transferable between firms, Kahyarara and Teal (2008) find no evidence that wage returns from past on-the-job training are significantly different from zero. Common to many of the studies is the finding that foreign-owned firms are more likely to provide on-the-job training. Using matched employer–employee data from Ghana, Görg et al. (2007) show that workers with on-the-job training have higher earnings the higher the degree of foreign ownership of the firm.

A major shortcoming of these studies is their failure to account for the potential endogeneity of training. If selection into training is based partly on unobserved characteristics such as worker ability or a firm's training practices, this could lead to an over-estimation of the impact of training on individual productivity. Yamauchi et al. (2009) address this point by using an employee panel dataset based on retrospective training questions (over three years) for workers employed in large Thai manufacturing enterprises. The findings suggest that on-the-job training is important, particularly among production workers and newly hired workers; however, the

impact disappears when an interaction term with past experience is included. Although this approach accounts for omitted time-invariant heterogeneity, estimates may still be biased if training participants and non-participants have different wage growth rates (Frazis and Loewenstein 2005; Pischke 2001). Alternative approaches are to use IV estimation (van den Berg et al. 2011) or to define a comparison group of similar non-participants (Görlitz 2011; Leuven and Oosterbeek 2001). Using Dutch data, Leuven and Oosterbeek (2001) find insignificant results for participating in one training course. Considering the effect of multiple training courses and controlling for employer characteristics, Görlitz (2011) finds that the number of courses matters for wage growth in Germany, though none of the effects is found to be statistically significant.

In summary, existing work shows that when taking both worker and firm characteristics into consideration and also accounting for factors that determine selection into training, the impact of training is far from unambiguous. Besides, while several studies reveal women's training disadvantage in comparison with men (Barron et al. 1993; Lynch 1992; Ng 2005; Pischke 2001; Yamauchi et al. 2009), few studies explicitly investigate the heterogeneous wage returns on different training types. In this paper, we make use of a matched employer–employee panel dataset, which allows us to account for worker and firm unobserved heterogeneity and to correct for self-selection bias, providing a methodological contribution to the existing literature. To our knowledge, no previous study has attempted to examine the gender–training wage gap among SMEs using matched worker–firm panel data from a developing country.

3 Data

This paper uses matched employer–employee data from two Vietnamese SME surveys, conducted in 2013 and 2015 (CIEM et al. 2014). The surveys trace the same manufacturing firms over time in 10 provinces (Ho Chi Minh City (HCMC), Ha Noi, Hai Phong, Long An, Ha Tay, Quang Nam, Phu Tho, Nghe An, Khanh Hoa, and Lam Dong). The sampling scheme of the surveys is based on a representative sample of registered household and non-household firms drawn from enterprise census information (GSO 2010). The samples were stratified by ownership form to ensure that all types of non-state enterprises, including officially registered households, private firms, cooperatives, limited liability companies, and joint stock enterprises, were represented. For reasons of implementation, the surveys were confined to specific districts in each province/city. The employee component was implemented in a random sub-sample of firms stratified by location. Between one and seven randomly selected workers were interviewed in each firm. In addition to registered firms, the surveys also include informal household firms based on random selection within the survey districts observed by the enumerator. This on-site identification of unofficial firms operating alongside officially registered enterprises means that our sample of informal firms is not representative of the informal sector in Viet Nam.[7]

After undertaking a thorough data cleaning, including checking the consistency of time-invariant variables between the two survey rounds, we were left with an unbalanced panel of 2,300 permanent workers: 1,255 in 2013 and 1,045 in 2015, corresponding to 562 firms. The aim of the survey was not to create a balanced employee panel, but we were able to identify repeatedly

[7] It is not possible accurately to assess the size of the informal sector in Viet Nam, so we cannot say if our sample is representative of the general population of informal firms. The sample includes 185 informal firms, corresponding to 6 per cent in both years. We keep informal firms in the sample since 11 per cent of workers in informal firms reported receiving training.

surveyed employees and thus to construct a balanced panel consisting of 1,130 individual observations (565 in each year), corresponding to 265 repeated firms.

The training questions were posed to both firm owners and employees. While the employee-level training module distinguishes between training under the current and previous employer, the firm-level training module distinguishes between the training of existing and new workers. Both data modules include questions regarding training types: on-the-job training and off-the-job training. On-the-job training is defined in the survey as training received while at the job during 'normal' working hours, i.e. formal in-house training that has an identifiable start and end, while off-the-job training is defined as training received outside the formal workplace (i.e. in a vocational school, an SME association or similar).[8]

3.1 Descriptive statistics

Descriptive statistics of the main variables are presented in Table 1. Average nominal wages increased from 3.6 million Vietnamese dong (VND) in 2013 to VND4.5 million in 2015. Average real wages across both years are VND2.9 million per month (in 2010 prices) and, like nominal wages, real wages increased over the period considered.[9] The overall training incidence—including both on-the-job and off-the-job training—increased from 17 to 24 per cent between 2013 and 2015. The observed increase is mainly driven by on-the-job training. The share of female employees in the unbalanced panel declined from 41 to 40 per cent. Around 25 per cent of workers have higher education, while 72 per cent have finished secondary school, illustrating generally high levels of education in Viet Nam. The shares of highly educated and production workers increased in the observed period. Specifically, the share of production workers accounted for 62 per cent of the sampled employees in 2015. It has become less common to be hired through an informal contact (decline from 73 to 69 per cent), suggesting that the Vietnamese labour market is formalizing as the educational level continues to increase.

The average firm has 28 employees, the size increasing slightly over time. The sample includes firms with 1 to 254 employees, indicating no particular selection into the sample based on size. Limited liability companies make up the majority of our sample, followed by household firms, private firms, joint stock companies, and, finally, cooperatives (this category also includes collectives and partnerships). Slightly more than half of the sample comprises firms located in urban areas (HCMC, Hanoi, and Hai Phong). The majority of observations fall into the medium-value-added category, and the trend is rising over time. Female labour market participation in the private manufacturing sector has increased in terms of the number of both owners and workers. In line with the observed rise in employees' educational level, the share of owners with secondary and higher education is rising.

[8] The questionnaire also includes information about informal training, but we do not base our key estimations on this variable, as it is likely to include substantial measurement error due to the vague definition of this training type. We show in the Appendix that informal training is not significantly associated with individual wages.

[9] In nominal terms, the average wage is in line with the average monthly earnings of salaried workers reported by the General Statistics Office, which were VND3.8 million in 2012 and VND4.5 million in 2014 (GSO 2015b). The wages we observe are higher than the current minimum wage, which, depending on the region, was between VND1.9 million and VND2.7 million in 2014 (Decree 182/2013/ND-CP).

Table 1: Summary statistics

	2013		2015		All	
	Mean	SD	Mean	SD	Mean	SD
Nominal monthly wage VND1,000	3,657	1,266	4,478	1,964	4,030	1,671
Real monthly wage VND1,000	2,719	941	3,065	1,344	2,876	1,155
Training (on- and off-the-job)	0.17	0.37	0.24	0.43	0.20	0.40
On-the-job training	0.16	0.37	0.24	0.43	0.20	0.40
Off-the-job training	0.02	0.14	0.03	0.17	0.02	0.15
Female	0.41	0.49	0.40	0.49	0.41	0.49
Worker age	34.00	9.66	35.91	9.74	34.87	9.74
No school	0.01	0.10	0.01	0.08	0.01	0.09
Primary school	0.03	0.17	0.03	0.17	0.03	0.17
Secondary school	0.73	0.45	0.70	0.46	0.72	0.45
College and higher	0.23	0.42	0.26	0.44	0.25	0.43
Manager	0.09	0.29	0.07	0.26	0.08	0.28
Professional worker	0.11	0.31	0.09	0.29	0.10	0.30
Office worker	0.10	0.30	0.11	0.31	0.10	0.30
Sales worker	0.08	0.27	0.07	0.26	0.08	0.26
Service worker	0.05	0.21	0.03	0.18	0.04	0.20
Production worker	0.57	0.49	0.62	0.49	0.59	0.49
Informally hired	0.73	0.45	0.69	0.46	0.71	0.45
Firm size (ln)	2.60	1.12	2.76	1.12	2.67	1.12
Household	0.29	0.45	0.31	0.46	0.30	0.46
Private	0.16	0.37	0.12	0.32	0.14	0.35
Cooperative	0.04	0.20	0.04	0.20	0.04	0.20
Limited liability	0.40	0.49	0.44	0.50	0.42	0.49
Joint stock	0.10	0.30	0.09	0.29	0.10	0.30
Sector low value added	0.35	0.48	0.33	0.47	0.34	0.47
Sector medium value added	0.39	0.49	0.41	0.49	0.40	0.49
Sector high value added	0.24	0.43	0.24	0.43	0.24	0.43
Owner male	0.55	0.50	0.51	0.50	0.54	0.50
Owner has higher education	0.86	0.35	0.88	0.33	0.87	0.34
Share of professionals	0.07	0.09	0.06	0.09	0.07	0.09
Female labour force share	0.38	0.24	0.39	0.25	0.39	0.24
Urban	0.52	0.50	0.53	0.50	0.53	0.50
Observations	1,255		1,045		2,300	

Note: Summary statistics are for unbalanced panel. USD1 is around VND20,500.

Source: Authors' elaboration based on SME data.

Table A1 shows differences in firm and worker characteristics by gender. Male employees are significantly more likely to receive all types of training and to earn higher wages. The majority of workers have finished secondary school, while female employees have twice as high a rate of completion of tertiary education (college and higher) as male workers. The latter finding is in line with the general tendency observed in Viet Nam, where the number of female students in college and university overtook the number of male students in 2013 (GSO 2015a). Women are not commonly employed as managers or production workers. Male employees are hired informally on more occasions than female employees, who tend to work in larger firms. The types of firm that favour female employees are private, cooperative, and limited liability companies. Male owners prefer hiring male employees, but better educated owners appear to prefer female employees. Finally, low-value-added sectors employ the largest share of females, and the share of males in high-value-added sectors is twice as high as the female share.

4 Econometric approach

In order to analyse the relation between job training and wages, we estimate an equation where individual wages depend on both worker attributes and the characteristics of the firm where the worker is employed. Building on the basic model of Abowd and Kramarz (1999), the specification takes the following form:

$$lnw_{ijt} = \alpha + \beta T_{it} \times G_{it} + \gamma T_{it} + \delta G_{it} + \varphi X_{it} + \theta F_{jt} + \theta_t + \varepsilon_{ijt} \qquad (1)$$

where lnw_{ijt} is the log of real monthly wage of worker i in firm j at time t, X_{it} is a vector of worker i's characteristics, F_{jt} is a vector of characteristics for firm j, G_{it} is an indicator for female workers, θ_t is a time-fixed effect, and ε_{ijt} is an error term. The coefficient estimate of the interaction term, β, captures the effect of training on female worker wages. Our main variable of interest is job training (T_{it}), which is defined as an indicator variable for whether the worker has received on-the-job or off-the-job training in their current job. In a subsequent analysis we also separately consider the effects of different training types, distinguishing between on-the-job and off-the-job training.

In terms of other worker characteristics (X_{it}), we control for the age, education, and job function of the worker and the hiring method. We use the age of the worker as a proxy for experience—a key variable in the standard human capital earnings function (Mincer 1974)—and include age squared to allow for a diminishing marginal effect. We also include a series of education indicator variables, since educational attainment accounts for a large share of the variation in earnings (Mincer 1974; Spence 1973). Moreover, some studies find that the firm-level effects of training disappear once the average educational level of workers is controlled for (Goux and Maurin 2000; Pischke 2001). Furthermore, based on the understanding that better educated workers are faster learners and thus make training investments more worthwhile (Pischke 2001; Xiao 2002), several studies have provided evidence of complementarity between education and training (Biggs 1995; van Smoorenburg and van der Velden 2000; Tan and Batra 1996). Moreover, if training is associated with technical change, this will create a higher demand for skilled labour with greater 'adaptive skills' and 'absorptive capabilities' (Mainga et al. 2009; Yamauchi et al. 2009). In contrast, some studies have shown that education and training are negatively correlated (Ng 2005) or that all workers, irrespective of educational level, are equally likely to participate in training (Goux and Maurin 2000). We also control for work position (manager, professional, sales, service, office, and production worker), since wages tend to vary across occupation categories (beyond what is captured by education). Finally, we control for whether the worker found their current job through an informal contact as opposed to formal, since this can be associated with a higher wage (Larsen et al. 2011).

As for firm attributes (F_{jt}) we control for firm size, legal status, location, sector, the owner's gender and education, and the share of female and professional workers. Firm size accounts for the fact that earnings tend to rise with firm size (Söderbom et al. 2005) and that working in a larger firm increases the likelihood of being trained (Goux and Maurin 2000; Ng 2005). In the case of Viet Nam, ownership form has been shown to be a critical variable in the adoption of different human resource practices (Zhu et al. 2008) and therefore we include dummies for key legal categories (all shown in Table A1). We also control for firm location, as wages and human resource initiatives can differ across provinces (Zhu et al. 2008), possibly due to the relative autonomy of provinces in the implementation of centrally planned initiatives (Nguyen et al. 2007). Both wage returns and human resource practices may vary across sectors of production,

so we include dummies indicating whether the sectors are low-, medium- or high-value-added.[10] We control for the gender of the firm owner, since female owners tend to be more generous in the provision of non-wage benefits (Rand and Tarp 2011). We therefore include a dummy to represent that the firm owner is male. It has been shown that well educated managers are more likely to hire well educated workers (Rosenbaum 2002), and thus we add a dummy indicating whether the owner has at least completed secondary school. We also include the share of professional workers as a proxy for the general quality of the workforce, since workers with higher (lower) unobserved ability will tend to have co-workers with higher (lower) average skills, and including a measure for the latter in the specifications based on the unbalanced sample will help to reduce the bias arising from omitted worker-specific ability. Finally, the share of female workers in the firm is included, as this may be related to lower overall wage outcomes.

In estimating equation (1), we take account of several potential biases. First, as with any analysis of repeated observations over time, there is the possibility of autocorrelation, which could lead to biased results. In order to address this, the standard errors are clustered at the firm level throughout the analysis, thereby allowing for intragroup (within firm) correlation over time and between workers, whilst maintaining the assumption that the observations are independent across firms.

Second, bias may arise from the presence of unobserved individual heterogeneity, such as worker ability, which influences both wages and training. For example, an observed wage differential between trained and untrained workers may arise simply because the workers who are most likely to participate in training programmes are also the ones with the highest unobserved abilities.[11] Thus, we use the balanced panel to control for worker fixed effects, e.g. ability, in the wage specification.

Third, bias may arise if the decision to participate in training is a function of the perceived wage increase. Considering a short panel, the best way to overcome such self-selection bias is to use instrumental variables that account for time-varying unobservable factors that may simultaneously influence the decision to train and subsequent wage outcomes. As our specification contains two endogenous variables (training and interaction of training and gender), we need at least two instruments. To instrument for training (T_{it}), we interact a variable that captures whether an employee has taken any test to prove his or her abilities when applying for the job with the firm-level variable that captures whether the firm trains new or existing workers. The direct link between this variable and individual earnings is not obvious, considering other covariates in the model, but we expect this variable to influence the probability that the individual will take part in training. To instrument for the training–gender interaction ($T_{it} \times G_{it}$), we interact the share of firms that offer training in a specific district and four-digit sector with the gender of the employee. It is unlikely that training intensity per district and sector affects

[10] Low-value-added sectors include food and beverages, textiles, apparel, leather, and recycling. Medium-value-added sectors include wood, paper, publishing, rubber, petroleum, chemicals, non-metallic minerals, basic metals, and fabricated metals. High-value-added sectors include electronic machinery, vehicles, transport equipment, and furniture.

[11] Beret and Dupray (1998) show that the selection effect explains most of the apparent impact of training on wages, and Goux and Maurin (2000) show that, once the selectivity of firms' training practices is controlled for, the estimated impact of training on wages is zero. Statt (1998) analyses the use of training to induce self-selection among heterogeneous workers. Similar, Autor (2001) considers a model in which workers know their ability and firms over time learn about their employees' abilities during training. The implication is that workers self-select into jobs that offer training and that they have lower wages initially but a steeper wage profile.

individual wages, but it is possible that employees in sectors and districts with high training intensity stand higher chances of receiving training.

The estimation is performed in two stages. We first estimate the predicted values of the training–gender status with the full set of controls specified in equation (2) and then use the predicted variables of interest when estimating equation (3):

$$E_{ijt} = \omega Z_{ijt} + \mu X_{it} + \pi F_{jt} + \eta_{ijt} \quad (2)$$

$$lnw_{ijt} = \beta' \hat{E}_{ijt} + \delta' G_{it} + \varphi' X_{it} + \theta' F_{jt} + \xi_{ijt} \quad (3)$$

where $\hat{E_{ij}}$ denotes predicted values of training (T_{it}) in the first case and training–gender interaction ($T_{it} \times G_{it}$) in the second case. Z_{ij} is the set of instrumental variables. The sum of coefficients β' and γ' captures the effect of training on female worker wages. If the key IV assumptions hold, any observed relationship between training and wages has a causal interpretation for subjects whose training status is affected by the instrument (Angrist et al. 1996).

Our choice of instrumental variables is akin to the use of instruments in earlier training studies. For example, Leuven and Oosterbeek (2001) use information about workers who planned to participate in training but did not due to some exogenous event, as an instrument for training. Kuckulenz and Zwick (2003) use employees' perceived need for training and whether any restructuring has taken place in the firm, such as downsizing or reorganization of the workplace, to instrument for internal and external training. Kuckulenz and Maier (2006) use training intensity by industry, share of firms that include continuous training in their collective bargaining agreement, and a dummy variable indicating whether workers are employed in a modern job as opposed to a traditional job. Our set of instruments has good predictive power in the training equation. The joint test of significance indicates that the instruments are jointly statistically significant at the 1 per cent level. We test the validity of our instruments in a standard linear IV model. Based on Hansen's J-test, we do not reject the null hypothesis that the instruments are exogenous. We also examine the strength of our instruments using the Cragg–Donald Wald F-statistic, which provides evidence that the IVs identify the model. As shown in Table 8, we reject the null hypothesis that the model is under-identified. Taken together, these characteristics suggest that the instruments influence wages only through their effect on training participation.

5 Incidence, financing, and benefits of training

5.1 Firm-level evidence

Table 2 reports basic statistics about training incidence and duration for new and existing workers. More than one-third of the firms train new workers and 9 per cent train existing workers. The training of existing workers is generally shorter in duration. Female owners provide more training to existing workers and for a longer duration, whereas male owners provide more training to new workers. Firms belonging to the low- and medium-value-added sector offer more training to both new and existing workers. The incidence and the duration of the training for existing workers increase with firm size, while the reverse picture is observed for new workers.

Table 2: Descriptive statistics about training: firm-level

		Firm-level training			Training duration of new workers			Training duration of existing workers		
		New workers	Existing workers	All workers	< 1 week	1–3 weeks	> 3 weeks	< 1 week	1–3 weeks	> 3 weeks
All workers		0.36	0.09	0.37	0.27	0.39	0.34	0.55	0.25	0.20
Gender	Female owner	0.47	0.53	0.48	0.47	0.51	0.43	0.64	0.18	0.64
	Male owner	0.53	0.47	0.52	0.53	0.49	0.57	0.36	0.82	0.36
Firm size	Micro (<10 emp)	0.27	0.09	0.25	0.38	0.18	0.28	0.02	0.18	0.17
	Small (10–49 emp)	0.52	0.45	0.52	0.49	0.52	0.55	0.49	0.38	0.40
	Medium (50–300 emp)	0.21	0.46	0.22	0.14	0.30	0.17	0.48	0.43	0.43
Firm age	1–10 years	0.30	0.26	0.32	0.32	0.35	0.23	0.39	0.18	0.00
	10–30 years	0.65	0.68	0.63	0.62	0.64	0.70	0.52	0.78	1.00
	> 30 years	0.04	0.06	0.05	0.06	0.02	0.06	0.09	0.03	0.00
Sector	Low-value-added	0.32	0.29	0.32	0.37	0.27	0.35	0.27	0.32	0.30
	Medium-value-added	0.43	0.49	0.43	0.43	0.49	0.36	0.56	0.28	0.53
	High-value added	0.23	0.20	0.23	0.20	0.22	0.27	0.17	0.30	0.17

Source: Authors' elaboration based on SME data.

One of the unique features of the dataset is that the questionnaire asks for information about the main reason that firms normally train existing and new workers as well as information about who generally pays for the training. According to Table 3, the main reasons firms train newly hired workers are to teach them new production technologies (48 per cent) and to overcome the general lack of skills required to perform specific tasks relevant to their position (24 per cent). Three explanations for why firms train existing workers predominate: to teach them new production technologies (26 per cent), to improve worker productivity (25 per cent), and to improve the general lack of skills required to perform the task for which they were hired (21 per cent).

Information on the financing of training is also presented in Table 3. For existing workers, more than 70 per cent of the employers report that the cost of training is covered by the enterprise, while the remaining employers state that the training of existing workers has no cost. The large share of employer-sponsored training implies that the training of existing workers is firm-specific. In comparison, it is less common for firms to pay for the training of new workers (49 per cent) and more common for new workers to bear the cost of training through reduced wages prior to or during training (10 per cent). The difference in the financing of training suggests that the training of existing workers is likely to be specific in nature while the training of new workers includes a larger general training component, influencing the willingness of firms to finance the training. Whereas formal training costs are tax deductible, only three firms state that they applied for tax deductions in 2013, while none applied in 2015. The main reason for firms not applying for a deduction of training expenditure is a lack of knowledge and understanding of the tax regulations (42 per cent). The next most prevalent explanations are that the firm does not pay taxes (23 per cent) and that the cost of training is negligible (19 per cent).[12]

[12] Of the firms that stated that they do not pay taxes, 91 per cent are informal, i.e. firms without a tax code.

Table 3: Reason and payment for training: firm-level

Main reason for training	New workers % (n)	Existing workers % (n)
New production technology	48 (263)	26 (58)
General lack of skills required to perform tasks	24 (133)	21 (47)
Introduction of a new product	1 (6)	9 (20)
Improvement of existing products	6 (35)	7 (16)
To improve worker productivity	8 (46)	25 (55)
To manage new areas of responsibility	11 (58)	6 (14)
New regulatory requirements	2 (10)	4 (8)
Other	0	2 (5)
Who generally pays for the training?		
Paid for by the enterprise	49 (271)	72 (160)
Paid for by the worker through fixed cost	2 (11)	2 (4)
Paid for by the worker through reduced wages prior to/during the training	10 (57)	1 (2)
Public sources of finance	0.4 (2)	0
Local trade union	0	0
Business/SME association	0	0
Training has no cost	38 (209)	24 (54)
Other	0.2 (1)	1 (3)
Total	100 (551)	100 (223)

Note: Shares based on the unbalanced panel.

Source: Authors' elaboration based on SME data.

5.2 Employee-level evidence

Table 4 reports some basic statistics about the incidence and intensity of the two basic types of training received by employees. On-the-job training (19 per cent of workers) is more common than off-the-job training (3 per cent). Men receive almost twice as much on-the-job training as women, who, in contrast, receive more off-the-job training. Workers with no schooling or only primary schooling receive almost no formal training. Training incidence remains high for workers into their forties, but drops thereafter. Sales and service workers do not tend to receive training, while training appears to be common among production workers. Almost 20 per cent of the workers were trained by their previous employer, and 97 per cent found the training useful when they started in the current enterprise. In contrast to the human capital accumulation theory, 56 per cent of the workers that received some sort of training state that they experienced no increase in wages after the training. Workers find off-the-job training less beneficial in terms of wage increases than on-the-job training. It is important here to note that 25 per cent of the participants were unaware of the influence of training on their wage rate.

Table 4 also reports measures of the number of times an employee has attended training (i.e. training incidence/sessions). Irrespective of training type, the vast majority of workers report being trained only once (66 per cent in case of off-the-job and 78 in case of on-the-job training). More than one-third of the workers engaged in off-the-job training courses are trained more than once, while workers receiving on-the-job training are trained fewer times by the same firm. Female, lower educated, and older workers who receive less on-the-job training also have fewer training sessions. However, the share of women receiving off-the-job training more than once is twice as large as that of men. Furthermore, production workers receive off-the-job training more than once, while on-the-job training is often considered to be a one-time event.

Table 4: Descriptive statistics about training: employee-level

		Training type		Number of times trained				Trained before
				On-the-job		Off-the-job		
		On-the-job	Off-the-job	One time	> one time	One time	> one time	
All workers		0.19	0.03	0.78	0.22	0.66	0.35	0.18
Gender	Women	0.37	0.55	0.34	0.44	0.53	0.67	0.39
	Men	0.63	0.45	0.66	0.56	0.47	0.33	0.61
Education	None	0.00	0.00	0.00	0.01	0.00	0.00	0.00
	Primary school	0.01	0.00	0.01	0.02	0.00	0.00	0.01
	Secondary school	0.72	0.62	0.74	0.64	0.63	0.58	0.70
	College and higher	0.26	0.38	0.25	0.33	0.37	0.42	0.29
Age	15–30 years	0.36	0.16	0.39	0.25	0.10	0.17	0.37
	31–45 years	0.48	0.65	0.46	0.57	0.70	0.67	0.50
	> 45 years	0.16	0.18	0.15	0.18	0.20	0.17	0.13
Position	Manager	0.10	0.24	0.09	0.13	0.40	0.00	0.08
	Professional worker	0.08	0.07	0.08	0.10	0.07	0.17	0.12
	Office worker	0.10	0.09	0.10	0.09	0.10	0.08	0.11
	Sales worker	0.06	0.11	0.06	0.05	0.10	0.25	0.09
	Service worker	0.03	0.02	0.03	0.07	0.03	0.00	0.04
	Production worker	0.63	0.47	0.64	0.56	0.30	0.50	0.57

Note: Shares based on the unbalanced panel.

Source: Authors' elaboration based on SME data.

The duration of the training courses is split into three categories (less than one week, between one and three weeks, and more than three weeks) and the results are reported in Table 5. On-the-job training courses are generally longer than off-the-job courses: the median duration of on-the-job training courses is 10 days, while the median duration of off-the-job training is one week. Consistent with the training incidence, men enjoy courses of longer duration than women when it comes to on-the-job training. The duration of training is also higher among production workers in the 31–45 age group and workers with secondary schooling.

Table 5: Descriptive statistics about training duration: employee-level

		Duration of on-the-job training			Duration of off-the-job		
		1 week	2–3 weeks	> 3 weeks	1 week	2–3 weeks	> 3 weeks
All workers		0.45	0.27	0.28	0.60	0.16	0.25
Gender	Women	0.39	0.31	0.38	0.50	0.67	0.53
	Men	0.61	0.69	0.62	0.50	0.33	0.47
Education	None	0.00	0.01	0.00	0.00	0.00	0.00
	Primary school	0.00	0.03	0.01	0.00	0.00	0.00
	Secondary school	0.77	0.60	0.77	0.69	0.75	0.41
	College and higher	0.23	0.36	0.22	0.31	0.25	0.59
Age	15–30 years	0.36	0.39	0.32	0.15	0.00	0.29
	31–45 years	0.46	0.48	0.51	0.73	0.67	0.53
	> 45 years	0.17	0.13	0.17	0.12	0.33	0.18
Position	Manager	0.09	0.14	0.07	0.15	0.25	0.35
	Professional worker	0.08	0.09	0.08	0.08	0.00	0.12
	Office worker	0.10	0.09	0.09	0.12	0.00	0.12
	Sales worker	0.06	0.06	0.04	0.15	0.17	0.00
	Service worker	0.05	0.02	0.02	0.04	0.00	0.00
	Production worker	0.61	0.60	0.70	0.46	0.58	0.41

Note: Shares based on the unbalanced panel.
Source: Authors' elaboration based on SME data.

To further investigate the correlations between training incidence and demographic characteristics observed in Table 4 we consider which characteristics drive the results. Estimation results are reported in Table 6. In line with the above findings, female workers are less likely to receive training (columns 4 and 5). Production workers generally receive more training and firms with a higher share of professionals are more likely to train. These results are mainly driven by on-the-job training. Besides, larger firms are more likely to train, irrespective of the type of training considered.

Table 6: Determinants of training

	(1) On-the-job	(2) Off-the-job	(3) Both types	(4) Both types	(5) Both types
Female	-0.202	0.616	-0.179	-0.097***	-0.193***
	(0.165)	(0.378)	(0.164)	(0.031)	(0.048)
Worker age	0.014	0.407**	0.022	0.000	-0.015
	(0.049)	(0.189)	(0.050)	(0.007)	(0.012)
Age squared	-0.150	-4.821**	-0.264	-0.007	0.172
	(0.592)	(2.311)	(0.599)	(0.081)	(0.146)
Higher education	0.042	0.264	0.083	0.017	0.016
	(0.209)	(0.495)	(0.203)	(0.030)	(0.050)
Manager	-0.236	0.807	-0.113	0.016	0.042
	(0.215)	(0.585)	(0.205)	(0.033)	(0.053)
Professional worker	-0.684***	-1.066	-0.699***	-0.092***	-0.061
	(0.213)	(0.763)	(0.209)	(0.029)	(0.048)
Office worker	-0.584***	-0.572	-0.530**	-0.066**	-0.035
	(0.226)	(0.506)	(0.214)	(0.031)	(0.048)
Sales worker	-0.690***	0.251	-0.672***	-0.074***	-0.008
	(0.228)	(0.774)	(0.228)	(0.027)	(0.045)
Service worker	-0.696**	-1.319*	-0.712***	-0.086**	-0.019
	(0.275)	(0.749)	(0.276)	(0.037)	(0.070)
Firm size (ln)	0.259**	0.490**	0.276**	0.030*	0.038
	(0.122)	(0.246)	(0.121)	(0.017)	(0.024)
Sector medium value added	-0.245	-1.297**	-0.289	-0.045	-0.041
	(0.253)	(0.610)	(0.254)	(0.035)	(0.053)
Sector high value added	0.019	-0.463	-0.051	-0.017	-0.032
	(0.297)	(0.639)	(0.302)	(0.044)	(0.070)
Owner male	-0.009	-0.928*	-0.012	0.002	-0.038
	(0.224)	(0.496)	(0.223)	(0.032)	(0.043)
Owner has higher education	0.047	0.591	0.001	0.002	-0.010
	(0.323)	(0.974)	(0.320)	(0.039)	(0.059)
Share of professionals	3.783***	3.516	3.760***	0.593***	0.544**
	(1.033)	(2.170)	(1.040)	(0.188)	(0.249)
Female labour force %	-0.209	0.269	-0.262	-0.021	-0.043
	(0.484)	(1.454)	(0.489)	(0.067)	(0.093)
IV1				0.205***	0.356***
				(0.064)	(0.088)
IV2				0.230***	0.227***
				(0.051)	(0.066)
Constant	-2.437**	-15.557***	-2.574**	0.114	0.445*
	(1.026)	(4.190)	(1.044)	(0.144)	(0.238)
Firm fixed effects	No	No	No	No	No
Year dummy	Yes	Yes	Yes	Yes	Yes
Observations	2,300	2,300	2,300	2,300	1,130

Notes: Columns 1–3 show marginal effects for the pooled logit estimations, while columns 4 and 5 show the first stage results of the two-stage least squares estimation (discussed in Section 4). All estimations include legal ownership dummies, firm location, dummy for whether the workers were informally hired, and a year dummy. Only the year dummy is statistically significant. Standard errors (in parentheses) are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' elaboration based on SME data.

6 Results

Table 7 shows the effect of employee training on wages. Column 1 shows that the raw gender wage gap between trained and non-trained female workers is 8 per cent. The coefficient decreases to 2 per cent when employee and firm characteristics are controlled for in column 2, implying that the training of female workers could boost productivity. The concern that the wage gap is a result of unobserved heterogeneity, i.e. that higher ability workers select into training, leads us to construct a balanced panel of workers. Column 3 presents the firm fixed effects results, which confirm a significant positive effect of training. In contrast to the OLS results from column 2, the size of the coefficient increases to 7 per cent, indicating that unobserved heterogeneity correlates negatively with training incidence. This in turn implies that lower ability workers are more likely to be trained, in line with Table 6, which shows that non-production workers are less likely to receive training than production workers. Since production workers are unlikely to pay for their own training, this confirms that training costs are generally covered by the firm, as shown in Table 3. Moreover, it is an indication that self-selection into a 'training firm' may not be an important concern, since presumably this category of worker is less likely to choose which firm to work for.

The wage return is, however, considered a lower bound on the productivity gain: if the firm pays for the training, the true productivity return will exceed the wage return (Acemoglu and Pischke 1999), but if some of the training is general and workers are willing to share some of the costs (through lower wages during the training period), then the wage return may be overestimated. It is possible that firms that generally train workers (more than 50 per cent of the time) differ from non-training firms along certain dimensions that are not captured in our specifications. To check this, we restrict the sample to firms that provide training. The estimates in column 4 show that the wage premium from training remains significant at the 5 per cent level for female employees. We also add controls for the main reason firms train workers and the source of finance for training. Controlling for the training purpose and finance does not affect the significance and the magnitude of the results, as shown in columns 5 and 6. The results are robust to removing outliers in terms of wages (bottom and top 1 per cent) and winsorizing, where the results of the positive effect of training on female wages remain significant at the 5 per cent level.[13]

The possible endogeneity bias that may arise from worker selection into training leads us to do instrumental variables estimation, which accounts for unobserved time-varying factors that may simultaneously influence the decision to attend training and individual wages. The results, shown in Table 8, confirm the positive effect of training on the wages of female workers. The first estimation, shown in column 1, is based on unbalanced panel and the second estimation, shown in column 2, is based on balanced panel. The estimated effect is statistically significant and indicates a 22 per cent increase in wages for female workers, which is larger than the fixed effects estimate of 7 per cent. The larger training coefficient indicates adverse selection due to unobservable characteristics, which implies a higher likelihood of training for workers with lower ability. It also suggests that not controlling for unobservables under-estimates the true size of the effect of training on employee wages. This result is in contrast with earlier evidence, in which selection into training is primarily associated with highly skilled workers (Ballot et al. 2006).

[13] We do not show these results for reasons of space, but they are available upon request.

Table 7: Impact of training on real wages

	(1) OLS	(2) OLS	(3) FE, bal.	(4) OLS	(5) OLS	(6) FE, bal.
Training X Female	0.083**	0.096***	0.128**	0.092**	0.089***	0.128**
	(0.038)	(0.033)	(0.056)	(0.043)	(0.032)	(0.056)
Training	-0.008	-0.051*	-0.064**	-0.053	-0.046*	-0.072**
	(0.032)	(0.027)	(0.033)	(0.040)	(0.027)	(0.032)
Female	-0.098***	-0.118***	-0.109***	-0.131***	-0.117***	-0.109***
	(0.021)	(0.020)	(0.031)	(0.029)	(0.020)	(0.031)
Worker age		0.022***	0.027***	0.023***	0.022***	0.027***
		(0.005)	(0.010)	(0.008)	(0.005)	(0.010)
Age sq. (X 1,000)		-0.242***	-0.309***	-0.248**	-0.239***	-0.310***
		(0.062)	(0.116)	(0.099)	(0.063)	(0.117)
Informally hired		-0.026	-0.010	-0.054**	-0.027	-0.010
		(0.021)	(0.032)	(0.023)	(0.021)	(0.032)
Firm size (ln)		0.071***	0.095*	0.047***	0.073***	0.089*
		(0.011)	(0.052)	(0.014)	(0.011)	(0.052)
Sector medium value added		-0.067***	-0.139	-0.068**	-0.068***	-0.126
		(0.021)	(0.114)	(0.032)	(0.021)	(0.106)
Sector high value added		-0.037	0.021	-0.031	-0.038	0.035
		(0.028)	(0.112)	(0.041)	(0.027)	(0.110)
Owner male		-0.033*	-0.005	-0.046*	-0.035*	-0.017
		(0.020)	(0.032)	(0.026)	(0.020)	(0.034)
Owner has higher education		-0.053*	-0.081	-0.071	-0.052*	-0.079
		(0.031)	(0.077)	(0.048)	(0.031)	(0.079)
Share of professionals		-0.049	-0.257	-0.071	-0.047	-0.257
		(0.129)	(0.220)	(0.205)	(0.127)	(0.214)
Female labour force %		-0.216***	-0.202*	-0.159***	-0.221***	-0.203*
		(0.049)	(0.120)	(0.060)	(0.048)	(0.120)
Training to improve skills					-0.006	0.122*
					(0.057)	(0.064)
Training due to innovation					0.064	0.089
					(0.056)	(0.077)
Enterprise pays for training					-0.035	0.005
					(0.031)	(0.059)
Employee pays for training					-0.091	-0.074
					(0.056)	(0.090)
Year	0.115***	0.098***	0.108***	0.105***	0.099***	0.105***
	(0.018)	(0.017)	(0.026)	(0.027)	(0.017)	(0.027)
Constant	7.887***	7.496***	7.138***	7.517***	7.499***	7.138***
	(0.017)	(0.110)	(0.231)	(0.155)	(0.110)	(0.228)
Education controls	No	Yes	Yes	Yes	Yes	Yes
Work position controls	No	Yes	Yes	Yes	Yes	Yes
Legal ownership controls	No	Yes	Yes	Yes	Yes	Yes
Location controls	No	Yes	Yes	Yes	Yes	Yes
R^2	0.04	0.25	0.21	0.36	0.25	0.21
Observations	2,300	2,300	1,130	921	2,300	1,130

Notes: OLS are based on the unbalanced panel. Standard errors (in parentheses) are clustered at the firm level.
* p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' elaboration based on SME data.

Returning to Table 7, we see that the results for worker characteristics generally conform to human capital theory. Older workers receive higher wages, yet at a diminishing rate and with a maximum at about 40 years of age. In terms of the firm-level control variables, larger firms pay

higher wages, which is in line with the literature (Goux and Maurin 2000; Söderbom et al. 2005). Medium-value-added sectors pay lower wage than low-value-added sectors. Firms headed by better educated owners tend to provide around 9 per cent lower wages. As expected, the female share is negative and indicates that shifting from a 0 to a 100 per cent female worker share is associated with approximately a 17 per cent lower wage bill. If a firm conducts training to improve worker skills, it is more likely that the employees will have higher wages. We do not report but note that secondary and higher education levels are positively associated with wages and that managers and professional and sales workers earn more than production workers. The legal categories (not reported) show that wages in household firms are higher than in cooperatives, but lower than in limited liability companies. The location controls (not reported) show that workers in HCMC earn as much as workers in the other urban areas, Hanoi, and Hai Phong, i.e. more than the average wage in rural areas, especially in Quang Nam and Khanh Hoa provinces. This is most likely because firms in urban areas pay efficiency wages in order to attract more productive workers. This is in line with the Vietnam Provincial Competitiveness Index (Malesky 2009), according to which Hanoi, Ha Phong, and HCMC ranked no. 1, no. 2, and no. 4, respectively, in the 2014 labour policy sub-index, which among other components includes a measure of labour quality (PCI 2015).

Table 8: Impact of training on real wages: IV estimation

	(1) IV, unb.	(2) IV, bal.
Training X Female	0.866***	0.566**
	(0.313)	(0.280)
Training	-0.645***	-0.364*
	(0.221)	(0.207)
Female	-0.275***	-0.249***
	(0.065)	(0.076)
Constant	7.586***	7.497***
	(0.126)	(0.199)
R^2	-0.04	0.16
Observations	2,300	1,130

Note: Estimations on the pooled sample. Control variables are the same as in columns 2−5 of Table 7. Stock−Yogo weak identification test critical value for 10% maximal IV size is 7.03. Standard errors (in parentheses) are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' elaboration based on SME data.

6.1 Results by training type and discussion

Our variable of interest contains both an on-the-job and an off-the-job training component, so we investigate further which training type has the dominant effect on female worker wages. We show the results in Table 9, where we see a positive association of on-the-job training and average wage returns for female workers. The size of the effect for on-the-job training is almost the same as that obtained for training in general (see Table 7). This means that the benefits from training go primarily through the on-the-job channel, which is in line with the evidence that workers believe on-the-job training to be the more valuable training type for wage growth. Our result is comparable to earlier studies, which attribute positive wage effects mostly to on-the-job training (Almeida and Faria 2014; Kahyarara and Teal 2008; Rosholm et al. 2007; Xiao 2002). Moreover, in accordance with human capital theory, the positive wage effect, combined with the fact that training is primarily firm-sponsored, suggests that on-the-job training is mainly specific in nature.

This result holds when we control for training duration and incidence, as shown in columns 4 and 6. Neither training duration nor incidence has a significant effect on wages. This could be a consequence of the very similar durations and types of firm-sponsored training or the fact that the benefits of longer training take more time to be reflected in employee wages. The causal effect of on-the-job training is shown in Table A2, which displays the estimates of IV regressions in which endogenous on- and off-the-job training and training–gender interactions are instrumented using the same instruments as in Table 8. The size of the coefficient implies approximately a 22 per cent gain in female employee wages from on-the-job training. The effect on wages from off-the-job training is not statistically significant, possibly due to the low number of workers receiving off-the-job training.[14]

Table 9: Impact of on-the-job and off-the-job training on real wages

	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	FE, bal.	OLS	FE, bal.	OLS	FE, bal.
On-the-job training X Female	0.061*	0.101**	0.061*	0.103**	0.058*	0.104**
	(0.032)	(0.047)	(0.032)	(0.048)	(0.032)	(0.047)
Off-the-job training X Female	0.227**	0.150	0.222**	0.129	0.224***	0.149
	(0.099)	(0.113)	(0.096)	(0.108)	(0.083)	(0.107)
Female	-0.117***	-0.108***	-0.118***	-0.106***	-0.117***	-0.110***
	(0.020)	(0.030)	(0.020)	(0.030)	(0.020)	(0.030)
On-the-job training	-0.041	-0.066*	-0.039	-0.085**	-0.052*	-0.051
	(0.027)	(0.033)	(0.030)	(0.042)	(0.029)	(0.037)
Off-the-job training	-0.064	-0.047	0.015	-0.134*	-0.128	-0.001
	(0.083)	(0.072)	(0.047)	(0.069)	(0.086)	(0.074)
Duration of on-the-job training			-0.000	0.001		
			(0.000)	(0.001)		
Duration of off-the-job training			0.002***	0.000		
			(0.001)	(0.002)		
On-the-job training incidence					0.008	-0.009
					(0.005)	(0.008)
Off-the-job training incidence					-0.009	-0.087
					(0.050)	(0.086)
Constant	7.496***	7.154***	7.488***	7.150***	7.495***	7.151***
	(0.110)	(0.236)	(0.110)	(0.243)	(0.110)	(0.234)
Worker controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Legal ownership	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.25	0.21	0.25	0.21	0.25	0.22
Observations	2,300	1,130	2,300	1,130	2,300	1,130

Note: OLS are based on the unbalanced panel. Control variables are the same as in columns 1–4 in Table 7. Standard errors (in parentheses) are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.
Source: Authors' elaboration based on SME data.

[14] Even though not statistically significant, the size of the effect for off-the-job training increases substantially between fixed effects and IV estimation (Table A3). This is most likely because the IVs for off-the-job training and training–gender interaction are not strong, as shown by the Cragg–Donald Wald F-statistic in the lower part of Table A3.

The size of the effect in our study is comparable to earlier studies. Almeida and Faria (2014) found wage returns on on-the-job training of 11 per cent for men in Malaysia and 4 per cent for women in Thailand. Rosholm et al. (2007) found an average effect of on-the-job training of roughly 20 per cent, while Kahyarara and Teal (2008) found the effect of training to be 22 per cent. Although the Cragg–Donald Wald F-statistic implies sufficiently strong instrument for on-the-job training and training–gender interaction (Table A3), a direct comparison of the size of the estimated impact of training with the results from earlier studies is not straightforward. The reason is that the impact estimator in a two-stage least squares regression with instrumental variables corresponds to a local average treatment effect, which is the effect of treatment for compliers—those individuals whose treatment statuses are affected by the instruments (Angrist et al. 1996). As mentioned in Section 2, the wage return can be considered a lower bound on the productivity gain, which implies that on-the-job training of female employees could lead to substantial productivity gains.

There is also a possibility that our training variable incorporates an informal training component, which may include learning from observing others performing a task, sharing easier ways to do the work between co-workers, and constructive work criticism from supervisors. This would imply that if we observe a positive outcome more often, our results are likely to be biased upward on the assumption that informal training is likely to lead to higher worker productivity and hence worker wages. This would partly explain why we overall observe a larger impact of employer-provided training than other comparable studies examining on-the-job training (Haelermans and Borghans 2012; Ng 2005; Xiao 2002). We thus estimate the effect of informal training. The estimates do not show any significant effect on female wages, as shown in Table A3. This is in line with a study by Ng (2005), who found no or even a negative wage effect of informal training, suggesting that workers reporting a positive training outcome due to informal training on average have lower wages. The absence of the effect of informal training in our case shows that even if the respondents were grouping formal and informal training together, our main results would be biased downwards.

7 Conclusion

This paper has examined the effects of training on individual wages among Vietnamese SMEs using a matched employer–employee two-year panel dataset. In our sample, training is mostly firm-sponsored and specific in nature. Even though the likelihood of receiving training is smaller for female employees, we find that training increases the wages of female workers by 7 to 22 per cent, depending on the exact specification. Focusing on different types of training, we also show that female employees benefit primarily from on-the-job training. The results account for unobserved time-invariant and time-varying heterogeneity, such as innate ability, and indicate adverse selection into training, whereby lower ability workers tend to select into firm-sponsored training. This is in contrast with previous studies, which have found that the impact of training is driven to a large extent by the selection into training of highly skilled workers, but is in line with the firm-level evidence that SMEs use training to compensate for inadequate education and vocational training.

Given that on-the-job training seems to be beneficial for female workers, the challenge for policymakers is to find a way of ensuring that employers do not restrict training access for women. In particular, there should be more focus on encouraging training activities to upgrade the skill level of the Vietnamese female workforce. More equal opportunities for women could come about with a more widespread female labour force participation in training activities. This could, in turn, weaken the ubiquitous gender wage gap. An initial step could be the introduction

of tax deductions for firms for both off- and on-the-job training expenditure. However, irrespective of whether the tax policy is changed to include on-the-job training, our results suggest that, in addition to better information campaigns, steps should be taken to simplify the procedure for deducting training expenditure. This should encourage SMEs in Viet Nam to increase investment in training, and thereby help to realize their growth potential through increased labour productivity as a result of human capital upgrading.

A couple of caveats still remain. The conclusion is based on the premise that we can extrapolate the degree of selection bias in our sample to the general population of SMEs in Viet Nam. Our sample includes formal and informal firms in different size categories, decreasing the concerns about focusing only on more visible (e.g. formal and larger) firms and neglecting to account for smaller firms, which may be less likely to train their employees. Besides, we are unable to see where the training is undertaken (institute, agency, or school) or with what aim (e.g. a typing course, a welding course); we only estimate wage returns, while some of the benefits of firm-sponsored training may be longer employment duration or reduced chances of immediate or future unemployment. Our data unfortunately do not offer information that could be used for such an analysis, as they cover only private sector firms over a two-year period.

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Appendix

Table A1: Differences in employee and firm characteristics by gender

	Male	Female	Diff. (M-F)	t-value
Training	0.21	0.18	0.03	1.82**
On-the-job training	0.21	0.18	0.03	2.02**
Off-the-job training	0.02	0.03	-0.01	-2.12**
Nominal monthly wage VND1,000	4,180	3,811	369	5.23***
Real monthly wage VND1,000	2,982	2,722	260	5.33***
Worker age	34.97	34.72	0.25	0.59
None	0.01	0.01	0.00	0.52
Primary school	0.03	0.03	0.00	0.67
Secondary school	0.79	0.61	0.18	9.48***
College and higher	0.17	0.36	-0.18	-10.34***
Manager	0.09	0.07	0.02	1.34*
Professional worker	0.05	0.18	-0.14	-10.97***
Office worker	0.04	0.19	-0.15	-11.78***
Sales worker	0.05	0.10	-0.05	-4.46***
Service worker	0.03	0.06	-0.02	-2.75***
Production worker	0.73	0.39	0.34	17.51***
Informally hired	0.73	0.68	0.04	2.18**
Firm size (ln)	2.51	2.90	-0.40	-8.49***
Household	0.35	0.22	0.12	6.36***
Private	0.13	0.16	-0.02	-1.49*
Collective	0.03	0.06	-0.03	-3.82***
Limited liability	0.38	0.48	-0.10	-4.59***
Joint stock	0.11	0.08	0.03	2.23**
Owner male	0.58	0.46	0.12	5.74***
Owner has higher education	0.85	0.90	-0.05	-3.39***
Share of professionals	0.07	0.07	-0.01	-2.43***
Female labour force %	0.30	0.51	-0.21	-21.72***
Sector low value added	0.27	0.44	-0.17	-8.56***
Sector medium value added	0.41	0.40	0.01	0.44
Sector high value added	0.31	0.15	0.16	8.93***
Ha Noi	0.16	0.19	-0.03	-1.76**
Phu Tho	0.02	0.03	-0.01	-0.81
Ha Tay	0.09	0.08	0.01	1.09
Hai Phong	0.12	0.10	0.02	1.66**
Quang Nam	0.07	0.09	-0.02	-1.56*
Nghe An	0.09	0.06	0.03	2.26**
Khanh Hoa	0.09	0.11	-0.02	-1.71**
Lam Dong	0.06	0.06	0.00	0.42
HCMC	0.23	0.25	-0.02	-1.11
Long An	0.06	0.03	0.03	3.14***
Observations	2,300			

Note: Summary statistics are for unbalanced panel.

Source: Authors' elaboration based on SME data.

Table A2: Impact of on-the-job and off-the-job training on real wages: IV estimation

	(1)	(2)	(3)	(4)	(5)	(6)
	FE, bal.	IV, unb.	IV, bal.	FE, bal.	IV, unb.	IV, bal.
On-the job training X Female	0.091**	0.882***	0.575**			
	(0.043)	(0.322)	(0.283)			
Off-the-job training X Female				-0.074	-4.982	-2.054
				(0.076)	(5.555)	(2.380)
On-the job training	-0.065*	-0.656***	-0.370*			
	(0.034)	(0.225)	(0.206)			
Off-the job training				0.185**	8.852	4.198
				(0.072)	(10.879)	(4.614)
Female	-0.132***	-0.273***	-0.246***	-0.117***	-0.333	-0.278
	(0.031)	(0.065)	(0.074)	(0.027)	(0.284)	(0.175)
Constant	7.367***	7.598***	7.499***	7.338***	7.295***	7.274***
	(0.177)	(0.128)	(0.200)	(0.181)	(0.238)	(0.234)
Worker controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes	Yes	Yes
Location	Yes	Yes	Yes	Yes	Yes	Yes
Legal ownership	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.25	-0.05	0.16	0.25	-3.19	-0.67
Observations	1,130	2,300	1,130	1,130	2,300	1,130
Cragg-Donald Wald F statistic	n.a.	17.46	11.50	n.a.	0.71	1.43

Notes: Stock−Yogo weak identification test critical value for 10% maximal IV size is 7.03. Standard errors (in parentheses) are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' elaboration based on SME data.

Table A3: Impact of informal training on real wages

	(1)	(2)
	OLS	FE, bal.
Training X Female	-0.014	0.065
	(0.032)	(0.041)
Training	0.001	0.017
	(0.022)	(0.036)
Female	-0.094***	-0.099***
	(0.020)	(0.031)
Constant	7.550***	7.423***
	(0.138)	(0.230)
Worker controls	Yes	Yes
Firm controls	Yes	Yes
Sector	Yes	Yes
Location	Yes	Yes
Legal ownership	Yes	Yes
Year	Yes	Yes
R^2	0.25	0.21
Observations	2,300	1,130

Notes: Column 1 is based on the unbalanced panel. Standard errors (in parentheses) are clustered at the firm level. * p<0.10, ** p<0.05, *** p<0.01.

Source: Authors' elaboration based on SME data.