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Employment and quality of employment in Vietnam: The roles of small firms, formalization and education

Nguyen Tu Anh
Nguyen Thu Thuy
Dang Thi Thu Hoai

In this paper, we examine the contributions of Vietnam's SMEs to employment and quality of employment. We also study the impact of technological upgrading on employment in enterprises in Vietnam including SMEs. Finally, we examine the role of education in probability in getting a job and a decent job in Vietnam. Our results confirm that SMEs are net job creators. In addition, the main channel of Vietnam SMEs' technological upgrading is found to be investing in equipment, and by doing so it expands the possibility of employment. The results also show that education plays an important role in helping labors to get a job and a decent job. Based on these empirical results we propose some recommendations for Vietnamese government to improve quantity and quality of jobs in the country.

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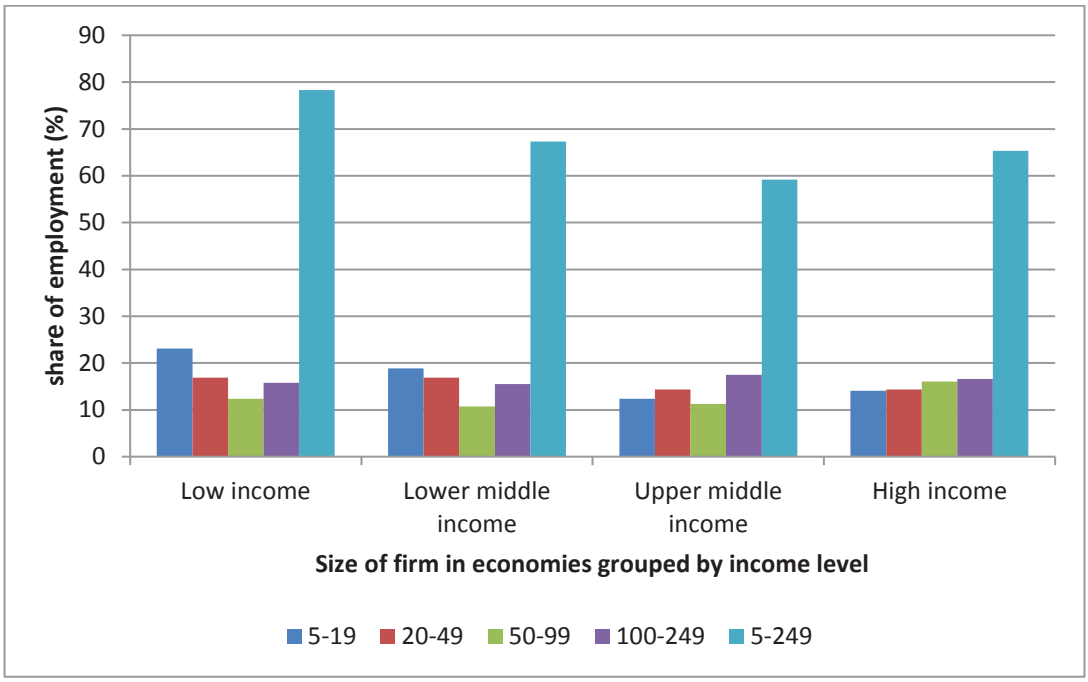
1 Introduction

In developing economies, the welfare for unemployed people are mostly absent while the scope of formal enterprises are small. As a result, creating jobs of any kind for all people is crucial in these economies. Economic literature usually emphasizes the role of small and medium enterprises (SMEs) in creating jobs in developed countries. Some argue that SMEs are usually labor intensive hence have more capacity in job creation (Birch, 1981). Some others argue that SMEs are more innovative (Schumpeter, 1943; Aghion et al., 2005). Those arguments propose that SMEs provide most of the jobs, creating most of the new jobs and having the highest employment growth rates. Furthermore, promotors of SMEs also argue that "*SMEs play important role in training young people, acting as a seed bed for the development of entrepreneurial talents, enhancing competition and hence generating external benefits on economy-wide efficiency, innovation, and aggregate growth*[1]." However, these arguments seem underpinned by observations in industrialized economies while those observations in developing economies have not yet carefully tested or not supported for those arguments. De Kok et al (2013) document that the structure, the characteristics and the features of SME in developing economies are different strongly from those in industrialized ones. Firstly, small enterprises in developing economies are mostly in micro size and operating in informal sector with low productivity. Secondly, the market where they are operating in are very segmented, crowded and with low entry barriers. These enterprises are born out of necessity and usually unable to perform social and economic functions mentioned above. Jobs in these enterprises mainly provide subsistent income without social welfare and protection; they are not decent ones but help to secure livelihood.

In a recent study, Ayyagari, Demirguc-Kunt and Maksimovic (2013) look at data of 47745 firms in 99 countries[2] in period 2006-2010 and find out that the mean share of employment created by SME across countries is 66.38% and SMEs are the biggest contributors to employment in all countries. They also find that SMEs in low income countries contribute more to employment than SMEs in developed countries. However, the SMEs' contribution to employment strongly depends on ages of SMEs: firms that are younger than two years on average contribute only 6.75% (4.78% in median country). Firms that survive for more than 10 years are the biggest contributors to employment; the shares of employment of these firms are 48.12% in low income countries to 72.76% in high income countries. These findings are compatible with findings of De Kok et al. (2013) where firms with less 250 employees contribute more than 50% of employment: the figure for low income countries is nearly 80%, around 67% for low middle income countries, more than 58% for upper middle income countries, and around 66% for high income countries (Figure 1).

[1] Cited in De Kok et al. (2013).
[2] This database does not include microenterprises whose employees are less than 5.

Figure 1: Employment shares across countries from different income groups, by size class (median)



Source: Reproduced from Figure 1 in De Kok et al (2013).

De Kok et al (2013) review 119 papers published in period 2007-2012 on the issue of employments and quality of employment. They show that these studies have proved that SMEs are the most important contributors to employments, and employment growth rate tends to decrease with firm size. However these studies (including 22 papers from Word Bank, 8 working papers from Inter-American Development Bank and 7 articles from Scientific Journal of Small Business Economics) all have the following shortcomings: (*i*) most of these studies focus on only small and medium enterprises in formal non-agricultural sector, they mostly exclude micro and self-employed enterprise, and informal enterprises; (*ii*) these studies cannot include separately employment effect of firm entry on job creation and of firm exit on job destruction; (*iii*) the quality of job in terms of earnings and social protection is not examined in these studies[3]; (*iv*) there is no consensus on definition of SMEs. Some countries use the combination of multiple indicators to define SMEs including size of employment, sales volume, and/or amount of capital invested. However, the indicator of size of employment is the crucial one. The thresholds to differentiate SMEs from large ones and micro ones are also various. The range of 50-250 is mostly used but some other used the range of 50-500 (*e.g.* Canada, New Zealand, USA, and Yemen).

Hence, the role of SMEs in net creating jobs, and quality of jobs in SMEs in the world, especially in developing countries are not examined empirically. In this study, we look at the direct impact of small- and medium-sized enterprises (SMEs) of Vietnam on employment. We will measure the net job creation in SMEs to find out whether SMEs are the key driver in employment creation. Furthermore the quality of jobs in SMEs is also examined against the

[3] Few studies examined the differentials between earnings in formal sector and in informal sector.

quality of jobs in large firms. SMEs in this research include small and medium enterprises in manufacturing sector: the small ones are those who employ no less than 10 employees and less than 200; the medium ones are those of size employees in the range of 200 to 300.. This definition is compatible with other studies reviewed in De Kok et al (2013).

The quality of job in SMEs is supposed to depend on the technological upgrading and education and training. Hence in this paper we also would like to test whether the expanding of private sectors, especially the SMEs, is accompanied with technological upgrading or not. This may result in policy implications for Vietnam in promoting technological changes. In addition, the role of investment in education and training in improving the quality of employment in Vietnam is tested in this paper as well.

Data for this study are mainly from Vietnam's Enterprise Census (VEC) from 2000 to 2013, Vietnam Technology and Competitiveness Survey (TCS) from 2009 to 2012 and Household Living Standard Survey from 2000-2012. The data for informal sector is not available in details but some aggregate data from Statistical Yearbooks in various years.

As in all other developing economies, the main pool of employment in Vietnam is in informal sector. In this paper, the formal sector is defined as all economic units that are registered as enterprises or cooperatives by law and state agencies that include those in state-run health care and education. The informal sector is defined as all private economic units that produce at least some of their goods and services for sale or barter, or for themselves are not registered (no business license), including agricultural activities. Informal employment is defined as employment in economic units that have not registered as either enterprises or cooperative, including people who are working as own account workers, unpaid family workers, and individual farmers. Our definition includes all household activities in agriculture that are not registered as business or cooperative. This inclusion is based on the fact that Vietnam is still in the period of "unlimited supply of labor" from agriculture to industry and service sector. Farmers, who work for themselves or for their own family gain only subsistent income from agricultural activities, have no social welfare and protection. According to Labor-force Survey 2007, there were less than 0.1% of workers in agriculture sector protected by social insurance; and the average monthly income from agricultural activities is around 59.4% of average monthly income in informal non-agricultural sector. Hence, in Vietnam there is no difference between working in agriculture sector without registered as an enterprise or cooperative and working in informal non-agricultural sectors. On the other hand, our definition includes workers working in enterprises and cooperative without social insurance which in fact is informal employment. Our definition takes all employment in formal sector as formal.

We also examine the role of education on chance of getting jobs and decent jobs in Vietnam. If education has positive impact on these chances, the education system does work well for labors. Researches have shown that education has substantial impact on the chance to get employment and to stay employed. On the OECD report in "Education at a Glance 2012: Highlights", the main conclusion is that "people with higher levels of education have better job prospects" and "In all OECD countries, tertiary graduates are more likely to be in work

than non-graduates." On average across OECD countries, the employment rate falls corresponding to the level of education (from 83% for people with tertiary education to just below 56% for those without an upper secondary education) (OECD, 2012). Using data from the Displaced Workers Surveys (DWS) from 1984-2002, Farber (2004) concludes that the job loss rate of younger and less-educated worker during the period in USA were substantial higher than those for older and more educated worker.

In the developing countries, education also has a strong influence on the chance to get a job, especially in the formal market. The recent ILO study in lower and middle-income economies shows that the lack of post-secondary education leaves the majority of young men and women stuck in vulnerable and informal employment. Building on the results of school-to-work transition surveys conducted in 28 countries worldwide in 2012-2013, the study highlights that having the highest level of education "serves as a fairly dependable guarantee" towards securing a formal job (Sparreboom and Staneva, 2014).

The OECD report also points out that education is also a good insurance against unemployment in difficult economic times. During the recent crisis, the average unemployment rate for individuals without an upper secondary education increases at 1.1 percentage points higher than for those with at least an upper secondary degree (OECD, 2012). Statistics from U.S department share the same point that in the hard economic situation, the individuals with lower level of education attainment will have to suffer greater impacts such as higher unemployment rate and lower average earnings (U.S Department of Labor, Bureau of Labor Statistics, 2010). The same findings can be found on other research such as Kaufman and Rosenbaum (1992), Wolbers (2000), and Farber (2004).

To study further the relationship between education and mobility between employment and unemployment, some research have also approved that unemployed people with higher education or training have higher probabilities of regaining employment than the people lower education (Wolbers, 2000; Riddell and Song, 2011; and Farber, 2004). Farber (2004) finds that job losers with higher levels of education have higher post-displacement employment rates and are more likely to be reemployed full-time.

Besides, Wolbers (2000) finds that the relationship between education and unemployment is stronger when there is ample supply of labor on the labor market. Using the Netherlands' data in the period from 1980-1994, the researcher compares the odds of unemployment versus employment for the lowest educated to the odds of unemployment versus employment for the highest educated. As a result, the odds ratio was greatest in 1985 when unemployment reached a peak (Wolbers, 2000).

The structure of the paper as follows: section 2 examines the contributions of Vietnam's SMEs to employment and quality of employment; section 3 applies GMM-SYS model to examine the impact of technological upgrading on employment in enterprises in Vietnam including SMEs; section 4 we examine the role of education in probability in getting a job and a decent job in Vietnam. Based on these empirical results we propose some recommendation for government to improve quantity and quality of jobs in Vietnam.

2 SMEs' Contribution to employment

2.1 Job creation

Since Vietnam launched its economic reforms in 1986, the country has enjoyed more than two decades of rapid economic growth with concomitant reductions in poverty (World Bank, 2012). Thanks to the improvement in legal and institutional system, private sector in Vietnam has developed rapidly. From to 2000 to 2013, the contribution to GDP by state sector steadily decreases from 38.98% to 32.2%, while the contribution by private sector increases from 43.83% to 48.25%[4]. The non-state and foreign sectors increasingly play leading role in economic growth in Vietnam.

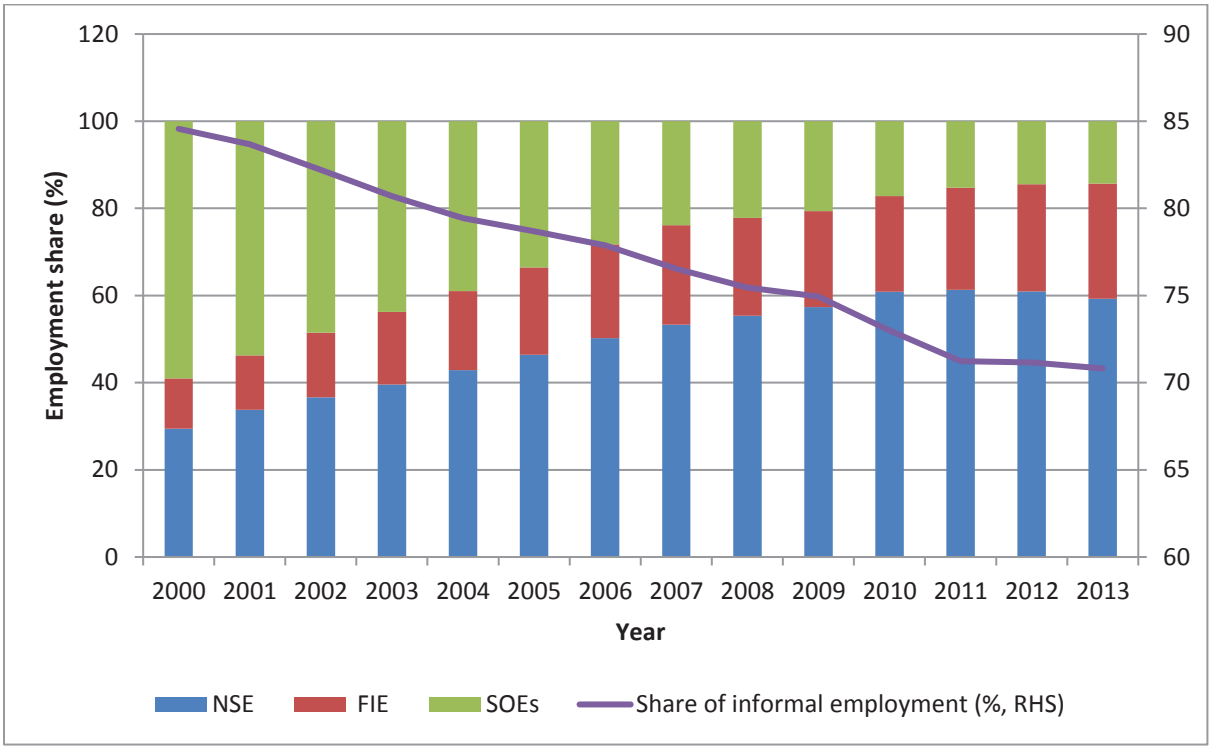
On the job creation side, most of the jobs in Vietnam are created in informal sector. In 2000 only 9.4% of total working labor worked in formal enterprise sector, and by 2013 thanks to the development of private sector and foreign invested sector the total jobs in formal enterprise sector increased to 22.15%. This means that up to 2013, it is around 70.8% of total working labor, or around 37 million of labors, are still in informal sector[5].

Non-state sector and foreign invested sector play the crucial role in formalization process in labor market in Vietnam (Figure 2). Within the formal sector, the share of jobs in non-state and foreign invested sectors increased sharply from 41% in 2000 to 85.7% in 2013; and in 2013 the state sector creates only 14.3% of total jobs in formal sector equivalent with 3.2% of total jobs in the economy.

Figure 2: Formal labor share by sector and the ratio of formalization in labor market

[4] In 2014 General statistical Office of Vietnam detracted the contribution by "products taxes less subsidies on production" out of value added in all three sectors: state, non-state and foreign. As a result, the shares of these sectors in total GDP decreased accordingly and are not comparable with the past data.

[5] In 2013, there were around 3,671 thousand workers who were working in state sector but not in SOEs.



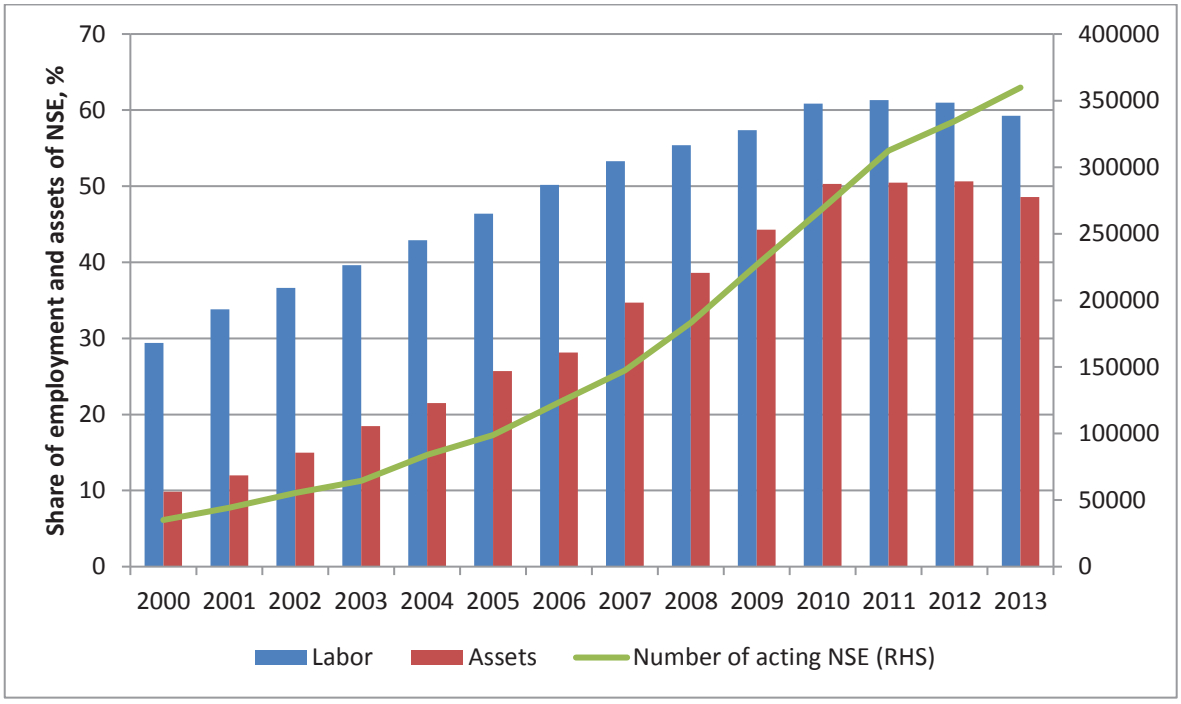
Source: Calculated from VEC in period 2000-2013. NSE: non-state enterprises, FIE: foreign invested enterprises.

The annual growth rate of job creation in formal enterprise sector in period 2004-2013 is about 9.6%. In order to absorb all labor in informal sector into formal sector, Vietnam needs to maintain this growth rate over the next 15 years. This is really a challenge for Vietnam when the growth rate of job creation in formal enterprise sector drops sharply in period 2011-2013.

Two main engines of formal job creation in Vietnam are private sector and foreign invested sector. The private sector in Vietnam has shown their high entrepreneurship by rapidly increasing the number of enterprise units, employed labors and assets (Figure 3). The number of acting non-state enterprises (NSEs) (mostly small firms, including collective enterprises, partnerships, private enterprises[6], limited companies, joint stock companies having state capital under 50%, and joint stock companies without state capital) increases sharply, even in time of recession from 2008 to present. In 2013, the number of acting NSEs amounted to more than 10 times those in 2000. These enterprises absorb more than 59% of total employed labor in enterprises of all types in 2013[7]. This share is more than twice of the one in 2000. Furthermore, NSEs are playing an increasingly important role in accumulating capital: the share of capital in NSEs (in total capital of enterprises of all types) increased from 35% to more than 50% in 2011 and slightly declined to 48.6% in 2013.

Figure 3: Number of acting non-state enterprises (NSE) and shares of labor and assets

[6] Private enterprise is a firm owned by an individual (legal representative). The owner has full discretion in making business decisions, and is liable for its operations to the extent of all his assets.
[7] The decline of NSE's labor share and capital share in the total from 2011 is due to the difficulties in domestic economy in time of restructuring, and to the increasing role of FIEs.



Source: Statistical Year Book in various years, GSO

In the period of slowing down economic growth during 2011-2014, job creation share of private sector drops slightly from 61.33% to 59.27%. Fortunately, foreign invested sector is immune from domestic problems (such as high interest rate, sinking banking sector, etc.) therefore, grow robustly to offset loss of jobs in private sector. The share of job creation by FIEs in formal enterprise sector increased nearly 2.3 times from 2000 to 2013. It is obvious that attracting more foreign invested capital and encouraging private sector investment are the crucial solution to formalize employment in Vietnam in next ten years. Joining TPP, signing Vietnam-EU FTA and Vietnam –Customs Union of Russia, Belarus and Kazakhstan FTA are promotive factors to push Vietnam economy on that way.

In the formal sector, large enterprises still play a crucial role in job creation and account for 54.56% of total jobs in formal enterprise sector. Job creation in this sector keeps growing steadily with the average rate of 6.83% annually. Interestingly, all types of enterprises (micro, small, medium and large ones) show positive growth rates of employments in the period 2004-2013 (Table 1). This implies that in the course of development in Vietnam, these types of enterprises are all net job creators. The growth rate of jobs creation in micro and SME is even higher, resulting in enlarging the share of employment of these enterprises. However, in 2004 the share of employment of these enterprises was too small in comparison with the share of large enterprises, who in 2013 are still the largest net job creator in absolute term. From 2004 to 2013, large enterprises have created 2.85 million new jobs; medium enterprises have created 473 thousand new jobs, small enterprises have created 1.92 million new jobs; and the micro enterprises have created 930 thousand new jobs. The total jobs newly created in period 2004-2013 by micro, small and medium enterprises (MSMEs) have surpassed the total jobs created by large enterprises in the same period.

Table 1: Share of employment in large and smaller enterprises 2004-2013 (%)

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Growth
Micro-enter	5.10	5.89	7.17	7.79	9.17	10.66	11.33	10.06	10.50	10.37	17.65
Small-enter	23.52	24.29	23.72	26.00	27.44	27.81	29.34	29.08	28.20	27.50	10.64
Medium-enter	7.45	7.19	7.20	7.82	7.58	7.56	7.85	7.84	7.59	7.57	8.92
Large-enter	63.93	62.63	61.91	58.39	55.80	53.97	51.49	53.02	53.70	54.56	6.83
Total											8.73

Source: Calculated from VEC in various years 2004-2014

Hence in terms of labor share, large enterprises are still the biggest employment pool for labor. This feature in Vietnam employment structure is different from those observations in Ayyagari et al. (2011) and in De Kok et al. (2013). However, in terms of new jobs created, MSMEs increasingly play a bigger role. This feature and higher growth rate of employments in MSMEs are compatible with observations from other developing countries. If Vietnam's employment structure finally converges to the common structure that observed in Ayyagari et al. (2011) and in De Kok et al. (2013) there is a large room for MSMEs expansion in Vietnam.

In the long run, micro and small enterprises will play an increasingly important role in creating new jobs, hence formalizing employment in Vietnam. However, in the short run, large enterprises are still the most crucial base for formal jobs, and the next would be small enterprises.

2.2 Quality of jobs

2.2.1 Formal versus informal

So far, there is no comprehensive study on employment in informal sector in Vietnam. As mentioned in De Kok et al. (2013), this situation is similar in all other countries in the world; there is no study that in their review covers informal sector. Cling (2011) gives three reasons for this situations: (i) the concept of informal sector is vague and varies from author to author; (ii) informal sector operates mostly in the fringes of the economy, hence it is unable to measure activities and factors in this sectors accurately; (iii) authorities pay little attention to this sector due to their contribution of no taxes, and creation of nuisance.

In 2011, ILO and Ministry of Labor, Invalids and Social Affairs supported the most comprehensive analysis on Vietnam's informal economy. The analysis was conducted by Cling, Razafindrakoto, and Roubaud. Cling et al. (2011) use data from Household Business and Informal Sector survey in Hanoi (2007) and in Ho Chi Minh City (2008) to compare the quality of jobs in formal and informal sector. Most of employment (92.78%) in household businesses is not covered by social insurance. They have to work for more than 8 hours per day and earn less than those who work in formal sector. The rate of wage earners in Hanoi and Ho Chi Minh city in informal household businesses are less than half of those in formal household businesses (Table 2)[8]. Rate of monthly income earned by workers in informal

[8] Rate of wage earners is the ratio of total wage earners in each sector to total working labor in that sector. E.g in informal sector in Hanoi there is only 15.3% of total working labor in this sector are wage earners.

household business (HB) to those earned by worker in formal HB in Hanoi and Ho Chi Minh City are 65.7% and 57.7%, respectively.

Table 2: Comparison of quality of jobs in formal HB and informal HB

	Hanoi		HCM City	
	IHB	FHB	IHB	FHB
Rate of wage earners	15.3	31.4	16.9	41.9
Avg. Weekly working hours	49.3	54.4	52.1	59.9
Avg. Monthly Income	2365	3597	2156	3737

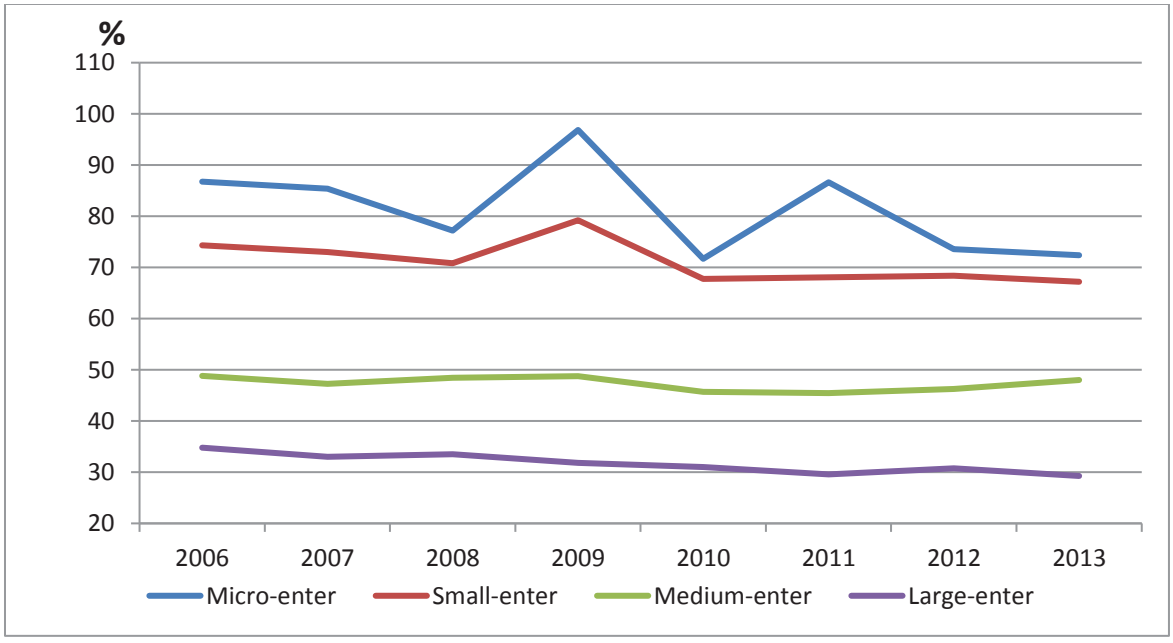
Source: Appendix 2, Cling et al. (2011), IHB = informal household Businesses, FHB = formal household businesses.

On the nationwide, the average monthly income in informal sector is equivalent to 62.3% of average monthly income in formal household business[9]. It is obvious that the quality of employment in informal sector is far worse than that of employment in formal sector. In the course of development, Vietnam initially encouraged people to take any kind of employment to help lift themselves out of poverty. The informal sector has provided necessary jobs for people who could not find job in formal sector. This sector is crucial for developing countries like Vietnam to ease social tense in the course of development. However, as Vietnam has moved to lower middle income country, Vietnam needs a strategy to formalize employment to improve the quality of employment, hence quality of living.

2.2.2 Within formal sector

In formal sector, the quality of employment seems positively correlated with size of enterprises. Using data of Enterprise Survey from 2003-2014, we calculate the proportion of labor without social insurance in different types of enterprises.

Figure 4: Proportion of labor without social insurance 2006-2013



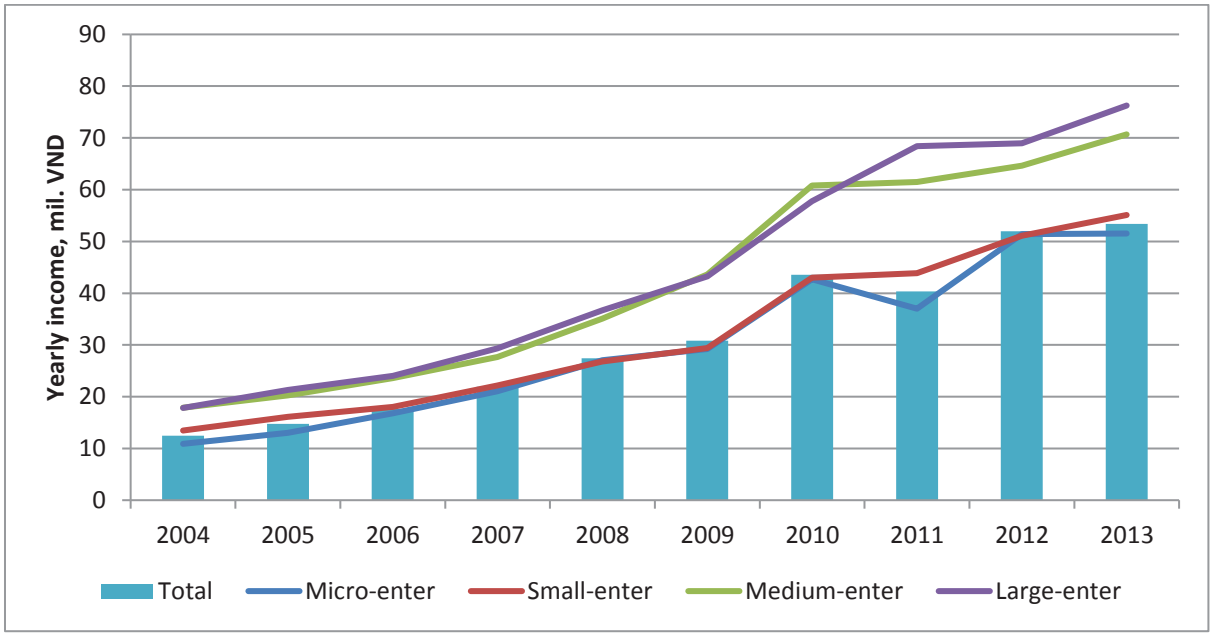
[9] Cling et al. (2011), Table 4.

Source: Calculated from VEC 2006-2013. In period 2000-2005, the data on labor without insurance is not available.

Figure 4 shows the tendency of improvement of quality of employment in all types of enterprises. There is an obvious positive relationship between size of enterprises and quality of employment: the larger enterprises the better quality of employment. Large enterprises show steady improvement of quality of employment in terms of social insurance. There is improvement of quality of employment in MSMEs, however the tendency is not very firm. Despite of that fact, labor without insurance in micro and small enterprises are still popular; in 2013 there are more than 70% of labor in these enterprises who are not covered by social insurance. The situation in medium and large enterprises is much better, especially in large enterprises where more than 70% of labors are under social insurance.

In terms of income, the larger enterprises also show the better income for labor. From 2004 to 2013 the nominal average yearly income[10] of labor in general keeps increasing. The annual growth rates of income in all types of enterprises are not different significantly: the growth rate of income in micro enterprises is the highest, 18.85% in period 2004-2013, while medium enterprises have the lowest growth rate of 16.51%.

Figure 5: Yearly average labor income in all types of enterprises (millions VND/year)



Source: Calculated from VEC 2003-2013.

Due to no much difference in growth rate of income, the gap between income in medium and large enterprises and income in micro and small enterprises keeps widening since 2004 (Figure 5). In 2013, labors who are working for micro enterprises have similar level of income of those working for small enterprises and equates 70% of average income of labor in large enterprises. Recall that, formal household businesses in Cling et al. (2011) are micro and

[10] Income here is all payments paid for working labor (wages, bonus, allowances, social insurance paid in case of sickness, …), but it does not include dividends and profits from other kinds of investments.

small enterprises and income earned in informal sector equates around 65% of income in FHB. This implies that the income in informal sector is far below the income in large enterprises in formal sector.

In short, informal sector in Vietnam has helped large portion of labor force to have something to do to help themselves improving living standards. However, the quality of jobs in informal sector is far below those in formal sector. MSMEs now become the biggest creator of new jobs in formal sector while larger enterprises are still the biggest employment pool. Promoting MSMEs should be an important solution to formalize employments for Vietnamese labors. Furthermore, within formal sector, quality of employment in large and medium enterprises are much better than quality of labor in micro and small enterprises. Upgrading technology that being applied in MSMEs and increasing investment in education and training could be key solutions to improve the quality of employment in MSEMs. We will examine these hypotheses in the following sections.

3 Technological upgrading in MSMEs

In this section, we examine the questions that private sector expansion has been accompanied with the technological upgrading in Vietnam or not, and how it affects the firms' employment both in terms of employment quantity and quality (i.e. skill upgrading). There are three types of technological upgrading in Vietnamese firms, including: equipment modernization, product innovation, and process innovation. Of which, equipment modernization reflects the development process of Vietnam from a low to a higher development level based on the international available technology. A development theory shows that the equipment modernization can be a way for lower development level country to catch up with the more developed one. Product and process innovations are done through conducting research and development (R&D) to improve the production process to be more productive, and to innovate new products to attract and meet the increasing demand of the consumers. In the context of increasing the level of income in Vietnam and the rapid opening to the world market over the past decades, the expansion of private sector in Vietnam, especially the SMEs has been expected to promote technological upgrading and therefore accelerate the improvement of employment quality in Vietnam, which creates a condition for a better income and living standard.

Regarding to the employment and technological upgrading, the literature shows a mix picture and depending on the types of technological upgrading and the sector. The impact of technological upgrading on employment growth also depends on its' transmission mechanisms, feedback loops and institutional factors (Pianta, 2006; Vivarelli, 2011). Empirical literature shows that the relationship between innovation and employment primarily depends on the type of innovation (Harrison et al., 2014; Hall et al., 2008; Lachenmaier and Rottmann, 2011) and the sector (Greenhalgh et al., 2001; Coad and Rao, 2011; Bogliacino et al., 2012). Technological upgrading in the form of modernizing the equipment can create more jobs when it helps firms to expand their capacity and business opportunities meanwhile can also reduce the number of jobs if the upgrading means to replace labor by capital. The former technological upgrading, which in fact takes advantage

of labor abundance in Vietnam, may not create a significant impact on the employment quality while the latter may need the improvement in human capital of firms. The technological upgrading through conducting R&D activities and innovation may require a higher level of human capital in firms.

3.1 Data

In this section we utilize information from Vietnam's Enterprise Census - VEC (2000-2013) on equipment modernization, and R&D investment in enterprises. However, although the questions on R&D investment are repeated in all VECs, the information from census is quite limited. For example, the data in 2007 shows that only 1,477 firms out of 155,607 surveyed firms answered this question; or the data in 2010 shows only 533 firms out of 249,254 surveyed firms answered questions on R&D investment. As a result, only information on equipment modernization is available. The data on the R&D investment, or product and process innovations, are not enough for our analysis, therefore we use The Vietnam Technology and Competitiveness Survey (TCS) in between 2009 and 2012 conducted by the Central Institute for Economic Management (CIEM), the General Statistics Office (GSO) and, University of Copenhagen instead. TCS and VEC all report codes of enterprises; hence we can track information of these enterprises from both surveys. The panel data is including the rich information about innovation activities of enterprises in Vietnam. According to GSO (2010), the enterprises with 30 or more employees were all included in the surveys, and smaller enterprises were selected randomly as a sample. Therefore, we use threshold of 30 employees as a cutoff point for manufacturing sector.

The VECs provide information on the firms' number of labors for all years but the information for skills labors are available only in three datasets of VEC for the year 2001, 2007 and 2011 with detailed information on the labors' training.[11] The survey questions have been pushed forward on the employees' education and training by 9 categories, such as doctoral level, master level, bachelor degree, etc. These information are not yearly reported, although, we use information in these three years to examine the skill-upgrading effects of technological upgrading.

On the upshot, the paper will use the VEC during 2000-2013 and TCS during 2009 – 2012 to investigate the issue of private/SME expansion, technological upgrading, innovation activities and employment. However, given the quality of the surveyed data and the availability of needed information, the specific survey data sets will be selected for a certain analysis. The technological upgrading will focus on equipment modernization. In overall, the unbalanced panel data set for use includes 1,349,715 firm-year observations. However, due to data missing of some variables, the number of observations for econometric models will be smaller.

[11] Although there was a question on training of labors in the 2009 survey questionnaire, that information is not available in the dataset.

3.2 Overview of employment, skills and technological upgrading of firms in Vietnam during 2000-2013

3.2.1 Employment and skill upgrading

Table 3 shows the trend of labor employed in firms in Vietnam over the last 13 years. It shows that size of firms in terms of employment have been decreasing, especially in MSMEs. This characteristic is specific to transition economy where at the beginning of transition most of enterprises were medium and large ones. In the liberalization process number of micro and small private enterprises increases quickly, hence the median and medium sizes of MSMEs have been declining. In period 2010-2013 large firms tend to expand their size while the MSMEs keep contracting in size. Medium firms seem lose momentum to expand size, this reflects a "phenomenon of missing in middle" in Vietnam's economy.

Table 3: Number of labors of in enterprises during 2000-2013

Year	All firms		Micro firms		Small firms		Medium firms		Large firms	
	Mean	Med	Mean	Med	Mean	Med	Mean	Med	Mean	Med
2000	85.5	10	5.2	5	44.2	27	142.7	89	689.5	395
2001	86.3	10	5.5	5	42.5	26	143.8	90	717.7	392
2002	84.3	11	5.7	6	41.6	26	141.1	87	731.7	408
2003	81.6	11	5.8	6	40.3	25	140.1	86	758.6	412
2004	70.2	11	5.8	6	38.6	24	139.5	86	718.2	417
2005	62.1	10	5.8	6	37.1	23	135	85	769.1	404
2006	51.3	7	5.9	6	37.4	24	134.4	83	775.2	403
2007	45.9	8	5.7	5	36.6	23	131	81	718.3	397
2008	39.1	8	5.7	5	32.5	20	127	79	711.5	385
2009	76.2	16	6.3	6	38.2	25	127.2	78	721.8	380
2010	33.3	7	5.4	5	32.8	21	123.6	79	690.4	370
2011	31.3	6	4.4	4	33.0	21	119.6	77	704.8	358
2012	34.1	7	5	5	32.7	21	120.6	77	732.9	362
2013	34.1	7	4.7	4	32.4	21	118.6	78	744.8	367

Source: Calculated from Vietnam's Enterprise Surveys during 2000-2013. Note that in the year of 2009, the total reliable observations are 98981 out of the population of 236584 enterprises. The shortage of observations cause figures for 2009 are out of trend and unreliable. We do not use data of 2009 for following regressions, therefore our results are not affected by this shortage.

Table 4 presents the number of labors employed in different kinds of firms by industry. In all industries the size of firms, are steadily declining, in which mean size of firms in manufacturing and construction sector and in service sector decline sharply. This partner is compatible with the tendency of booming newly established and small enterprises in these sectors. The mean size in agriculture and fishing sector declining much more slowly may imply that there are very few number of newly established firms in Agriculture and Fishing sector in this period. Put it differently, Agriculture and fishing sector is not as competitive as other sectors for small enterprises to start up. In addition, firms in the manufacturing and construction tend to employ more labor while firms in the service sector employ the least. This pattern reflects the fact that for long time, most of newly established enterprises in Vietnam are operating in service sector which requires least capital and technology.

Table 4: Average size of labor in Vietnamese firms by industry

	Agriculture and fishing		Manufacturing and construction		Service s	
	Mean	Med	Mean	Med	Mean	Med
2000	73.7	12	166	30	38.9	6
2001	75.4	12	161.4	30	41.1	7
2002	72.2	12	157.3	30	38.6	8
2003	106.3	18	150.2	28	35.2	8
2004	122.1	20	133.6	25	26.8	8
2005	108.2	18	120.5	22	26.6	7
2006	97.2	16	105.7	18	23.2	6
2007	96.4	17	99.6	17	18.7	6
2008	88.2	20	81.2	14	18.3	7
2009	86.8	20	133.2	33	38.2	11
2010	81	19	70.4	12	16.3	6
2011	60.4	13	67	11	16.2	5
2012	70	14	71.3	12	17.8	6
2013	70.8	15	72.2	12	17.4	5

Source: Calculated from VEC during 2000-2013.

Figures in 2009 are out of trend as mentioned in previous table. From 2004 on, codes of industries have been detailed to 5 digits, this practice could have some impacts on comparability of figures along time.

Table 5 shows the training level of labors in firms in two years 2007 and 2011. The trained labor have improved significantly between these two years. For example, in 2007 on average, 38% of labors in firms did not have any training certification; this rate was reduced to 35% in 2011. It is notable that this rate did increase for the large firms and decreased for the MSMEs. Large firms in Vietnam have been exploiting labor abundance and creating jobs for unskilled labors. MSMEs tend moving to use more skilled labor. Furthermore, share of unskilled labor in industry has increased from 44% to 48%. This implies that industry in Vietnam is still taking advantage of abundant, cheap and low skill labor; or the industry in Vietnam basically is labor-intensive one.

Pattern of skill development in Vietnam is "contracting the middle", in which share of medium skill decreased sharply while share of high skill increased significantly in the same period. This pattern reflects the fact that young people reluctantly enroll into vocational schools; they either try to matriculate in university or participate labor market as no-skill labor. Skills gained in vocational schools in Vietnam have not been paid off. There may be mismatch between skills provided in vocational schools and what required at work. Decreasing demand for medium skills likely causes shortage of these skills which are necessary for upgrading the economy from labor-intensive production to skill-intensive one and consequently gets the economy stuck at middle income trap.

Table 5: Share of labors by skills in Vietnamese firms, %

	2007			2011		
	No skill	**Medium**	**High**	**No skill**	**Medium**	**High**

			skill	skill		skill	skill
All firms	Mean	38	38	24	35	24	41
	Median	29	30	13	29	15	33
By firm size	Large firms	38	44	18	45	26	29
	MSMEs	38	38	24	35	23	42
Private MSMEs		38	38	24	35	24	41
By sector	Agriculture	65	26	9	63	25	12
	Industry	44	40	16	48	22	30
	Services	31	37	32	28	24	48

Note: "No skill" means labor without any certification on training; "medium skill" means labor having vocational training certifications; "high skill" means labor with a degree of university and over.
Source: Calculated from VEC in 2007 and 2011.

3.2.2 Technological upgrading and employment

The role of investment in equipment on economic growth have been examined by De Long and Summers (1991, 1992, 1993, 1994) and Temple (1998). These studies show strong relationship between investment in equipment and economic growth. For example, in De Long and Summers 1993, extra 1 percentage point devoted for equipment investment is associated with an 0.302 percentage point increase in the annual GDP per worker growth rate. The poorer countries, the larger effect of investment to equipment on GDP per worker growth rate.

Table 6 shows that annually, on average, a third of Vietnam's firms invested in purchasing new equipment. On average, firms invest about more than 12% of their revenue for equipment modernization over period 2000-2012. These rates are similar among types of firms regardless of firms' size or ownership.

Table 6: Investments in equipment upgrading of firms in Vietnam

Year	All firms		MSMEs		Private MSMEs	
	Percentage of firms investing in equipment	Equipment investment/total revenue	Percentage of firms investing in equipment	Equipment investment/total revenue	Percentage of firms investing in equipment	Equipment investment/total revenue
2000	16.9	2.9	14.9	2.8	11.3	2.3
2001	22.2	6.5	18.9	6.5	17	5.6
2002	31.6	30.4	30.2	31.2	28.3	33.5
2003	29	16.3	28	16.4	26.8	16.7

2004	26.3	12.1	25.1	12.3	23.6	10.5
2005	28.1	7.1	27.1	7.1	26	6.5
2006	28.2	7.1	27.1	7.1	26	6.5
2007	39.7	16.8	38.6	17.2	37.9	15.7
2008	37.4	17.8	36.4	17.6	35.2	16
2009	37.3	10.6	36.6	10.8	36	10.3
2010	75.2	30.9	75.3	31.2	75.9	31.7
2011	30.1	8.9	29.5	8.9	29	8.5
2012	12.3	2.1	11.6	2.1	11.2	2
Total	**33.8**	**12.4**	**33.1**	**12.5**	**32.8**	**12.3**

Source: Calculated from VEC during 2000-2012.

The bigger enterprises have higher marginal productivity of capital, hence higher profitability of investing in equipment. Bigger enterprises are predicted to have more incentive to invest in technology in general and in equipment in specific. This prediction is strongly confirmed in Vietnam. Table 7 shows enterprises with equipment investment have a bigger labor size. This trend is also applied to the MSMEs or the private MSMEs.

Table 7: Average labor size of firms with and without equipment investments

Year	Firms with equipment investment	Firms without equipment investment	MSMEs with equipment investment	Private MSMEs with equipment investment
2000	193	47.5	67.6	34.5
2001	306	60.3	57.4	43.8
2002	101	34.9	41.6	28.7
2003	100	35.5	41.1	31.2
2004	101	25.7	43.1	33.4
2005	104	40.8	45.3	37.8
2006	108	40.1	45.3	37.9
2007	108	45.3	42.2	36.7
2008	95.2	38.1	44	38.7
2009	80.3	37	39.9	35.6
2010	22.6	33.1	14.2	13
2011	62.5	19.3	28.1	25.3
2012	129	17.6	50.2	48.4
Total	**69.3**	**26.7**	**29.6**	**25.7**

Source: Calculated from VEC during 2000-2012.

Table 8 does not show a clear difference in terms of labor skills between the firms with and without equipment investments.

Table 8: Share labor by skills in firms with and without equipment investments

	Firms without equipment investment			Firms with equipment investment		
	Share of	Share of	Share of	Share of	Share of	Share of

	no skill	medium skill	high skill	no skill	medium skill	high skill
All firms	38.5	23.5	38	39	24.5	36.4
SMEs	38.4	23.5	38	38.7	24.6	36.8
Private SMEs	38.5	23.6	37.9	38.9	24.8	36.3

Source: Calculated from VEC during 2000-2013.

Interestingly, firms with investment in equipment tend to have smaller share of high skilled labor. This phenomenon is compatible with above observation: firms with investment in equipment are bigger in labor size, and Vietnam is still in stage of labor-intensive production.

3.3 Empirical evidence on Vietnamese private MSMEs' expansion and technological upgrading and employment

3.3.1 Methodology

This section aims at investigating the employment effects of technological upgrading of firms in Vietnam in general and of private MSMEs in particular over the past decade. In order to do so, we apply the econometric strategy, which have been used in many studies such as Van Reenen (1997); Piva and Vivarelli (2005), Lachenmaier and Rottmann (2007), etc.

Specifically, starting from labor demand function of firms, an econometric model for a panel data augmented for technological upgrading will be applied as follows:

$$LnL_{it} = \alpha_1 LnY_{i,t} + \alpha_2 LnW_{i,t} + \alpha_3 LnTechup_{i,t} + \alpha_4 X_{i,t} + (u_i + v_{i,t}) \quad (1)$$

Of which: *i,t* indicate firm *i* at the year *t*; *L* is labor, *Y* is revenue of firm, *W* is wage of labor, *Techup* is an equipment purchase proxied for technical upgrading, *X* are control variables including firms' characteristics, *u* is an idiosyncratic individual and time-invariant fixed effect of firm and *v* the error term.
With this specification the demand for labor depend on growth of firm (revenue growth), wage, level of technology applied in firm and other specific characteristics of firm.
With the firms' data for 13 years, a dynamic specification of the above equation will be more appropriate to reflect the relation between variables as follows:

$$LnL_{it} = \beta_1 LnL_{i,t-1} + \beta_2 LnL_{i,t-2} + \alpha_1 LnY_{i,t} + \alpha_2 LnW_{i,t} + \alpha_3 LnTechup_{i,t} + \alpha_5 LnTechup_{i,t-1} + \alpha_4 X_{i,t} + (u_i + v_{i,t}) \quad (2)$$

However, the above specification may create a bias and inconsistent results when estimated by OLS due to the correlation between lagged labor variable and the firms' individual fixed effects. The first differences, therefore, will be used to overcome the mentioned issues as follows (lower case letters are natural logarithms):

$$\Delta l_{it} = \beta_1 \Delta l_{i,t-1} + \beta_2 \Delta l_{i,t-2} + \alpha_1 \Delta y_{i,t} + \alpha_2 \Delta w_{i,t} + \alpha_3 \Delta techup_{i,t} + \alpha_5 \Delta techup_{i,t-1} + \alpha_4 \Delta X_{i,t} + \Delta v_{i,t} \quad (3)$$

However, the OLS estimation of the above equation will be likely biased due to the endogeneity of the lagged dependent variables[12]. These problems will be solved by GMM

[12] Achen (2001), Roodman, (2009), Van Reenen (1997)

estimators. In this particular case, GMM-SYS will be used because the panel data set is short in time in relation to the number of surveyed firms (Roodman, 2009a). The test for over-identification (Hansen test) and appropriate lagged variables (AR test) will be conducted.

Specific variables of the models will be as follows:

- Dependent variables: Two types of dependent variables will be modeled, namely growth of employment of firms and share of skilled-labor. The first one aims at investigating the impacts of technological upgrading on employment creation and the second aims at investigating the impacts of technological upgrading on skill upgrading of firms.
- Independent variables:
    - SME is the dummy variable for being enterprises belonging to SMEs.
    - Technical upgrading are proxied by four variables: growth of investment in equipment (this variable may be added in non-linear form), dummy variable for having a product innovation, management innovation and having a process innovation.
    - The interaction between SME and technological upgrading variables in order to see the employment impact of technological upgrading in SMEs.
    - Y is value added of the firms, whose lag will be used as an instrument variable.
    - Firm yearly wage rate.
    - Industry variables at 2-digit level (ISIC level 2).
    - Firms' ownership, including private firms, state-own enterprise and foreign firms.

3.3.2 Results and discussions

According to Roodman (2009a, 2009b), in empirical practices of dynamic GMM we need to report not only Hansen test for over-identification, but also other values as Difference-in-Hansen test, number of instruments, and Arellano-Bond test for AR (1), AR (2). Windmeijer (2005) and Roodman (2009b) highlighted that reducing the instrument count to cut the bias of parameters in the two step estimate. The results of the models on the employment impact of firms' equipment investments were presented in Table 9. Different columns present different model specifications, we include time dummy variables all models and only include industry dummy variables in model 1 and model 3. Following strategy of Roodman (2009a), we use a lagged limitation in sub-option of GMM style of xtabond2 command in Stata to reduce the instrument count, which report in the model 1 and model 2. Importantly, the tests results presented at the bottom of Table 9 (model 1) implying that we should interpret its results with caustion. For example, Hansen test for over-identification not rejecting the Ho, meaning that validity of instrument variables is acceptable, our result is 21.78 and p-value is 0.533. Similarly, Difference-in-Hansen test for the validity of instrument subsets is also acceptable. However, the Hansen test is rejecting the Ho in model 2, 3 and 4.

In the model 1, the coefficients of the lagged of dependent variables has a significantly positive effect on employment and they are also the indicators considering the stability of

model. Van Reenen (1997) highlighted that the stability when the sum of two lags have a range of 0.4 to 0.8. Using one lag of dependent variable Piva and Vivarelli (2005) found the coefficient is 0.86 for Italian micro-data. Model 1 and models 3 (with industry dummy variable) also shows that equipment modernization has negative impact on employment. However, models without industry dummy show positive impact. With the fact that only model 1 pass Hansen test and stable, hence in general, data in VEC show the replacement effect of technological upgrading on employment. Vietnam is still in surplus of labor, moving to capital-intensive production model in general has negative impact on employment growth.

The SMEs invert the relation with employment comparing with the large firms, interestingly: SMEs with technological upgrading (equipment investment) have a positive effect on employment. This effect implies that SMEs who be able to make investment in equipment are likely to expand production hence employment. Final, the SOEs and Private firms are not different from FDI firms in term of effect on employment growth. The effect is not statically significant.

The lag of employment has positive impact on growth of employment. This implies that the larger firms tend to expand employment more than the smaller ones. The SMEs status has negative impact on growth of employment. The employment expanding mainly happened in big ones. However, the number of SMEs increase quickly, hence aggregately SMEs play important role in creating jobs.

Firms with high value added are most likely expanding employment as expected. Findings of positive effects of lagged employment, equipment modernization in SMEs, high value-added firms on employment imply that the employment increase in Vietnam mainly depend on supply side (employers' demand); as soon as demand for employment increase these demand can be met with insignificant constrains.

Wage rate has negative effect on employment as predicted by theory. This implies that rapid increase in wage may harm employment opportunity for people who are working in informal sector.

Table 9: Employment and MSMEs technological upgrading (equipment modernization)

(Dependent variable: growth of firms' employment)

	(1)	(2)	(3)	(4)
Lag of employment	0.328*	0.965***	0.208***	0.508***
	(0.180)	(0.030)	(0.031)	(0.020)
2nd lag of employment	0.092**	-0.008	-0.008	0.033***
	(0.044)	(0.013)	(0.013)	(0.008)
Equipment investment	-0.102*	0.023***	-0.121***	0.010***
	(0.054)	(0.006)	(0.021)	(0.004)
Lag of equipment investment	0.010	-0.006	0.003**	0.002**
	(0.009)	(0.005)	(0.001)	(0.001)

Value added	0.323***	0.043**	0.208***	0.113***
	(0.106)	(0.019)	(0.031)	(0.010)
Wage rate	-0.443**	0.017	-0.123***	-0.037**
	(0.180)	(0.041)	(0.035)	(0.015)
SME	-0.703***	0.207**	-3.477***	-1.300***
	(0.0495)	(0.088)	(0.296)	(0.091)
SME with equipment investment	0.189**	-0.025**	0.169***	0.007
	(0.089)	(0.011)	(0.027)	(0.004)
SOEs firms	0.364	-0.102***	0.089	0.006
	(0.222)	(0.016)	(0.102)	(0.021)
Private firms	0.045	-0.048***	0.131**	-0.012
	(0.103)	(0.017)	(0.054)	(0.014)
_cons			-6.191	2.210***
			(4.540)	(0.174)
Industry (ISIC 2)	YES	NO	YES	NO
Time	YES	YES	YES	YES
N	58178	58178	58178	58178
Hansen test (p-value)	21.78	126.01	570.13	2220.65
	(0.533)	(0.000)	(0.000)	(0.000)
Difference-in-Hansen tests	12.93	73.56	417.23	1826.22
(p-value)	(0.532)	(0.040)	(0.497)	(0.000)
Number of instruments	87	87	192	192
AR (1)	-6.03***	-16.82***	-10.98***	-20.66***
AR (2)	-1.64	2.58**	-2.39**	1.43

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

The different models depend on the strategies of estimate and control the industry (2 digit) and time. In model 1 and model 2, we use the lagged limitation in xtabond2 command in Stata written by Roodman (2009a) to reduce the number of instruments. However, we do not use it in the model 3 and model 4. Additionally, in the model 1 and model 3 we include the industry and time dummy variables and do not include the industry dummy variable in model 2 and model 4.

SMEs tend to contract in size as the coefficient of dummy variable SMEs is negative. The increase of employment is mostly due to moment of increase of employment.

Table 10 shows the employment impact of different types of innovations of manufacturing firms. The impacts of product innovation are presented in the first column, the management in the second column and the last is process innovation. In general, three types of innovation do have positive impact on employment. These findings seem contradictory to the effect of technological upgrading by equipment modernization as reported in table 9. In general, firms in Vietnam base mainly on labor-intensive technology and demand for their products is very

sensitive to costs of production[13]. The innovation make firms more efficient hence help them more opportunity to expand production and employment.

Interestingly, the above impacts seem adverse for the SMEs. The more SMEs do innovations in product and production process the lesser growth rate of employment. This finding, once again, contradict to the effect of equipment modernization in SMEs on employment. In developing countries, the first step of technological upgrading is crucially replacing obsolescent equipment with modern ones. SMEs in developing countries are constrained by financial resource and knowledge for R&D. Hence in response to increase demand for their products, SMEs optionally upgrading equipment and expand employment. Those innovative SMEs maybe operating in fields that demand is not very dynamic[14], hence the replacing effect of innovation is superior to income effect (demand for product increase due to total income of the economy increase). Consequently, innovative SMEs show declining rate of employment.

Table 10: Employment and SMEs technological upgrading (innovations) in manufacturing sector

(Dependent variable: growth of firms' employment)

	(1) Production innovation	(3) Management innovation	(2) Process innovation
Lag of employment	0.807***	0.744***	0.701***
	(0.037)	(0.039)	(0.046)
SOEs firms	0.029	0.086	0.004
	(0.079)	(0.069)	(0.080)
Private firms	-0.035	-0.001	0.017
	(0.046)	(0.036)	(0.024)
Product innovation	0.231***		
	(0.051)		
Lag of product innovation	0.026**		
	(0.012)		
SME with product innovation	-0.235***		
	(0.059)		
Management innovation		0.138***	
		(0.042)	
Lag of management innovation		0.077***	
		(0.019)	
SME with management innovation		-0.139***	
		(0.043)	
Process innovation			0.190***
			(0.034)
Lag of process innovation			-0.011
			(0.015)
SME with process innovation			-0.214***
			(0.036)

[13] Rising labor cost in China has negatively affected on investment in this country and cause slowing down economic growth (Fang Cai 2015).

[14] As mentioned above, Vietnam's economy basically is labor-intensive production with high demand for labor-intensive products. The demand for skill-or-innovation –intensive is still trivial.

Value added	-0.008	0.070	-0.030
	(0.046)	(0.051)	(0.053)
Lag of value added	0.116***	0.113***	0.087***
	(0.026)	(0.026)	(0.030)
Wage rate	0.175**	0.142	0.704***
	(0.089)	(0.095)	(0.135)
_cons	-0.874**		
	(0.339)		
Industry (2 digits)	YES	YES	YES
Time	YES	YES	YES
N	14402	12646	15201
Hansen test (p-value)	119.00	106.98	17.51 (0.014)
	(0.000)	(0.000)	
Difference-in-Hansen tests (p-value)	89.81	72.06	7.43
	(0.000)	(0.000)	(0.28)
AR (1)	-9.57***	-5.47***	-10.58***

Robust standard errors in parentheses
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 11 presents the impacts of technological upgrading (equipment modernization) on skill upgrading of firms. The impacts have been investigated on different types of labor skill. Specifically, the first column presents the impact of technological upgrading on the share of high-skilled labor in firms. The second one presents the impacts on the share of medium skilled labor and the last on the share of both medium and high skilled labor. The high skilled labor is defined as the labor with the education level at university and above, the medium skilled is the one having a college degree or a vocational training certificate. Due to the small number of time period of the panel data (only data for three years due to the unavailability of the data on labor training in the VEC), we apply fixed effect model. The Hausman test for choosing between fixed effect and random effect model is presented at the end of the table.

Table 11: Labor skill and SMEs technical upgrading

(Dependent variables are shown in the header of each column)

	Share of high skilled labor		Share of medium skilled labor		Share of high and medium skilled labor	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
SME	-2.022179	0.004	-1.296415	0.311	-3.318594	0.016
Equipment investment	0.004449	0.610	-0.012712	0.420	-0.008263	0.626
SME with equipment investment	0.000106	0.022	-0.0001202	0.151	-0.000014	0.874
Annual wage rate	0.037578	0.008	-0.0299456	0.243	0.0076319	0.782
Value added	0.009593	0.004	-0.0103479	0.090	-0.000755	0.908
State-own firm	-6.74533	0.381	0.7108227	0.959	-6.034508	0.687
Domestic private	-7.811332	0.310	0.5272545	0.970	-7.284079	0.626
Time dummy	Yes	0.000	8.999686	0.000	7.738273	0.000
Industry	Yes	0.000	Yes	0.805	Yes	0.006

Constant	21.3119	0.005	24.2246	0.076	45.5365	0.002
Number of observation	58056		58056		58056	
Hausman test	740.32	0.00	261.38	0.00	558.27	0.00

The results show that in general, technological upgrading (investment in equipment) do not have a clear impact on demand for skill. Even with modern technologies, enterprises in Vietnam are still exploring surplus of low-skilled labor. Weak demand for skilled labor, especially medium skilled labor from enterprises has induced weak demand for enrolling into vocational schools in Vietnam as we mentioned in data description section.

However, interestingly, SMEs with the investments in equipment are likely to employ more high skilled labor. The impact of this kind of technological upgrading on demand for medium skilled labor is not evidenced. Improvement of technology in SMEs goes with increase of high skilled labor share in these enterprises. Recall that SMEs with investment in equipment also tend to increase employment (Table 9). With these two tests, it is evidenced that upgrading technology in SMEs not only increases employment but also increases employment of high-skilled labor at faster pace.

4 The impact of education on probability of getting decent employment

In this section we examine the impact of education on probability of getting decent job after controlling for other differences such as gender, age and so on. The relationship between education and employment has been widely studied on various aspects from work accessibility, mobility between employment and unemployment and re-employment success. Furthermore, we also examine the impact of location on probability of getting jobs in different kinds.

The structure of labor market in Vietnam has changed rapidly since Vietnam entered WTO in 2007. The elementary occupations decreased sharply from 61.7% of total to 39.98% with annual decreased rate of 5.89% (Table 12). The demand for unskilled labor declined quickly. All other kinds of occupations show increases in their shares. However, occupations that require simple and medium skills, such as Service workers and shop and market sales workers, Skilled agricultural and fishery workers, Plant and machine operators and assemblers have much greater growth rates than other occupations that require higher skills. Vietnam is gradually changing from labor-intensive economy to skill-intensive one.

Table 12: Changes in structure of occupation (%)

	2009	2010	2011	2012	2013	2014	Growth
Leaders/managers	0.96	0.95	1.07	1.03	1.06	1.09	**4.51**
High level professionals	4.65	5.09	5.31	5.48	5.69	6.11	**7.74**
Mid-Level professionals	3.81	3.64	3.52	3.39	3.25	3.11	**-2.04**
Clerks	1.64	1.44	1.52	1.63	1.69	1.73	**3.07**
Personal services, guardian, sale workers	15.57	14.56	14.98	15.97	16.21	16.10	**2.70**
Skilled agricultural, forestry and	14.77	15.47	14.04	12.70	12.03	12.22	**-1.78**

fishery workers							
Craft and related trade workers	12.53	12.62	12.04	11.78	12.02	11.97	**1.08**
Plant and machine operators and assemblers	6.68	7.00	6.97	7.25	6.97	7.37	**4.05**
Unskilled occupation	39.39	39.22	40.54	40.76	41.09	40.31	**2.35**

Source: GSO, "Report on survey on labor and employment" in 2010, 2011 and 2012, 2013, 2014. The data before 2009 was collected with different categorizations, hence they are not comparable with those in this table.

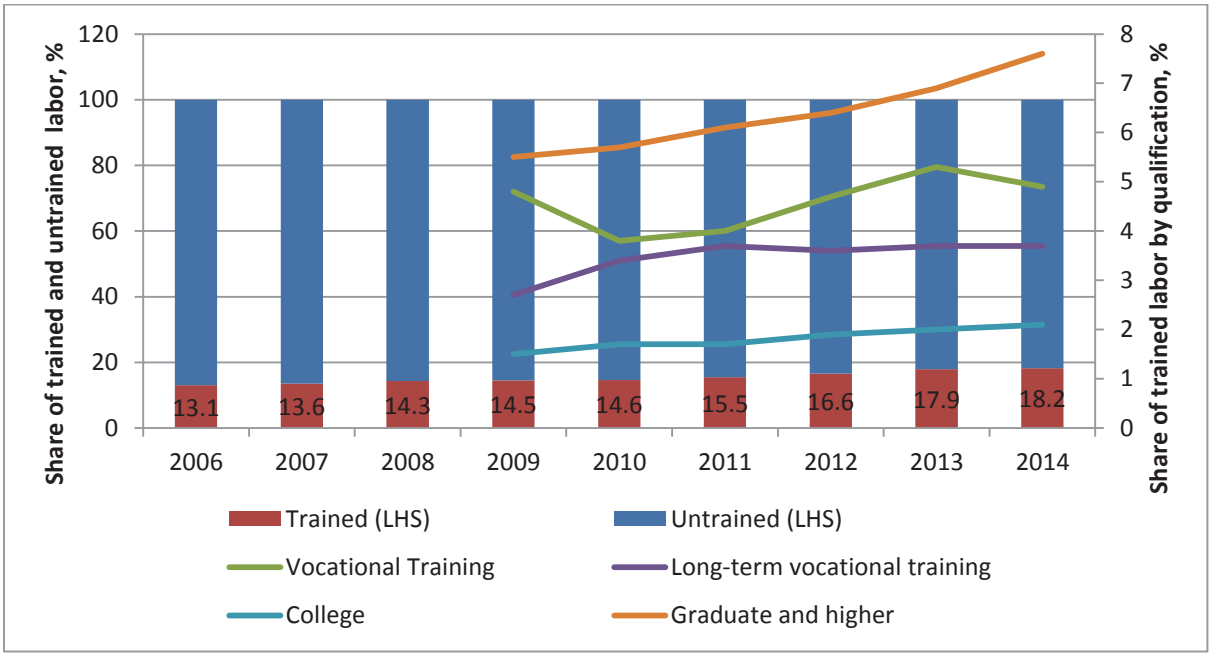
These figures imply that education and training in Vietnam may help people to get decent jobs and go out of informal sector.

However, the supply of skills does not meet rapid changes of demand for labor. From 2006 up to 2014, the proportion of untrained labor changes quite slowly: from 86.9% to 83.15% (Figure 6). This seems contradictory to the movement of structure of jobs in (Table 12). The contradiction can be explained by a large portion of untrained labor is trained at work by enterprises themselves[15]. This fact may imply that official education and training institutions do not meet the requirements for labor markets; employers have to recruit unskilled labor and then trained them at work. Employers can only use this kind of labor training for simple skills that can be trained shortly, massively, and cheaply. For complicated skills that require comprehensive syllabus, costly facility and customized learners, enterprises are not willing to supply at work because of high cost and risk of learners quitting jobs after training. The failure of supplying medium skills by formal education and training institutions may put an obstacle on Vietnam economic growth path. These facts may imply that investment in education and training in Vietnam may not very efficient, therefore creating insignificant impacts on quality of jobs.

Furthermore, the growth rate of employed workers with university degree and higher is higher than growth rate of workers with vocational degree. This phenomenon may cause mismatch of skill between supply and demand.

Figure 6: Structure of labor by skills

[15] There is 30.7% of untrained labor in 2011 that can be categorized as skilled labor since they have been trained at work.



Source: GSO *"Reports on survey on labor and employment" in 2010, 2011 and 2012; Statistical year book 2014.*

Trained employees are those who have ever attended and graduated from a school/class/center of technique and qualification training of the educational level or equivalent level belonging to the National Education System for 3 months and over with degree or certificate of training results. Workers trained at college level are those who have Diploma degree which is junior to Bachelor degree.

The recent survey conducted by World Bank and CIEM (2012)[16] also indicates a mismatch between supply and demand of skills. Around 47% of firms claim that education system does not meet skill needs of their workplace; in the subsample of international firms 66% of them claim this mismatch; 36% of local firms claim so. These skills imbalances should be seen as a major issue in Vietnam, leading to a policy focus on the following: employers' engagement at the strategic level; government incentive programs for skills upgrading; and efforts to address future skills challenges.

4.1 Methodology

With an aim of evaluating the impact of education on the access to decent work, regression models relating to probability can be used. This paper uses Probit model to estimate the impacts of the existence of a number of factors (Xi) on the probability of getting decent work. Considering the insecurity of job so far in Vietnam, the probability of getting a decent job means one or some of the followings:

- Probability of getting a job, regardless the type of job

- Probability of getting a full time job

[16] Vietnam STEP Employers Survey 2012.

- Probability of getting an employed job

- Probability of getting an employed job with a legal labor contract

- Probability of getting an employed job with social insurance scheme

Assuming that the utility is identified as below:

$I = \beta_1 + \beta_2 X_i$ (where X_i are independent variables)

Then, there exists a degree of utility I* so that:

Y=1 if I > I*

Y=0 if I< I*

As I* can not be observed, it is assumed that I* = I + u (in which u is the ramdom factor of the model)

Then $Ii^* = \beta_1 + \beta_2 X_i + u_i$

With all I smaller than I*, the probability of having a non-farm job is equal to 0. On the contrary, if I of the household is greater than I*, the probability of the household having anon-farm job is:

$Pi=Pr(Y=1|X) = p(Ii^* < Ii) = F(\beta_1 + \beta_2 X_i)$

In which F is the standardized cummulative density function (CDF): $F(I_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{I_i} e^{-s^2/2} \, dZ$

4.2 Data and variables

The data used for this analysis is withdrawn from the Vietnam Household Living Standard Surveys (VHLSS) carried out in 2010 and 2012 by the General Statistical Office (GSO) of Vietnam. These are nation-wide surveys designed to find out information about income, expenditures, employment in both rural and urban areas. With great scope of survey (9,399 households comprising of about 40 thousands individuals in each survey) and diversified questions covering various aspects in family life, VHLSS is considered a good source of information and can be used for different research purposes.

Variables used in the models

Five proxies of the quality of jobs as introduced above can be terminologically identified as below:

Variable Y: dependent variable:

Variable name	Description
Y_1: Probability of getting a job, regardless the type of job	Y_1 = 1 if a person gets any job and Y_1=0 otherwise.
Y_2: Probability of getting a full time job	Y_2 = 1 if a person gets a job with average total weekly working hours greater than 35 hours, and Y_1=0 otherwise.
Y_3: Probability of getting an	Y_3 = 1 if a person gets a paid job (meaning getting wage),

employed job	and Y_1=0 otherwise.
Y_4: Probability of getting an employed job with a legal labor contract	Y_4 = 1 if a person gets a job which is based on a legal labor contract, and Y_4=0 otherwise.
Y_5: Probability of getting an employed job with social insurance scheme	Y_5 = if a person gets a job with full social insurance scheme, and Y_5=0 otherwise.

Independent variables:

- Variable "**schooling"** is a continuous variable, which is measured by the number of years of schooling which is the sum of general education and higher education. Many researchers have found out that the higher the education attainment, the easier it is for a school leaver to get a job.

- Variable "**age"** is the age of laborers termed in years. Research has also pointed out that age is directly associated with the chance of getting a job.

- Variable **"gender**" is a dummy variable which is equal to 1 if a laborer is male and 0 if female. This variable is incorporated into the model in order to find out whether there is any difference between men and women in their respective chances of getting jobs or not.

- Other control variables are also used, including marital status (married), locality, and ethnicity.

Description of variables

Basing on VHLSS 2010 and 2011, the focus is on citizens from 15 years old upwards in Hanoi rural area, Table 13 shows statistical description of the variables which are Mean, Standard deviation, max and min from the observations.

Table 13: statistical description of the variables used in the model

Variable name	Description	Number of observations	Mean	Std.Dev.	Min	Max
Emp	Y_1	55741	0.776	0.417	0	1
Fullemp	Y_2	55741	0.680	0.466	0	1
Wage_emp	Y_3	55741	0.350	0.477	0	1
HD_emp	Y_4	15477	0.502	0.500	0	1
BH_emp	Y_5	15477	0.392	0.488	0	1
Schooling	Years of schooling	55741	8.116	4.390	0	22

Gender	Male	55741	0.484	0.500	0	1
Age	Age	55741	39.625	17.508	15	102
Married	Married	55741	0.661	0.473	0	1
Region	Urban, North	55741	0.286	0.452	0	1
Local2*	Mountainous area	55741	0.181	0.385	0	1
Local3	Central area	55741	0.224	0.417	0	1
Local4	Central highlands	55741	0.069	0.253	0	1
Local5	South East area	55741	0.115	0.319	0	1
Local6	Mekong River Delta	55741	0.206	0.405	0	1

Source: Author's calculation from VHLSS 2010-2012

**base: Local 1: Red river delta*

Table 13 shows that in the sample, there are 77.6% with any jobs. However, only 68% have paid jobs, and among these wage-earners, only 50.2% have labor contracts and 39.2% can enjoy insurance scheme. The average number of years of schooling is quite high, 8.1 years; males account for 48.5% and the average age is 39.2.

4.3 Regression results

The results of econometric analyses on marginal impacts of the independent variables in the Probit model show that all the coefficients are statistically significant.

We assume that the number of years of schooling or professional education can signify respective laborers' capacity to carry out their work. In all the models, the coefficients have positive signs, meaning the significance of contribution of general and professional education to the ability of person getting jobs. In general, more education leads to higher probability of getting a job in any of the five types, though the extent of impact varies. If the number of years of schooling increases, the probability of getting a paid job goes up by the most magnitude. Also, for paid job takers, higher investment in education can also help them get more secure jobs with labor contract and insurance scheme.

Table 14: Estimation results on the impact of education on probability of getting a decent job

	Model 1	Model 2	Model 3	Model 4	Model 5
	Having a job of any type	Having a full time job	Having a paid job	Having a paid job with a labor contact	Having a paid job with social insurance scheme
VARIABLES	Emp	Fullemp	Wage_emp	HD_emp	BH_emp
Schooling	0.00313***	0.00729***	0.0185***	0.0777***	0.0831***
	(9.99e-06)	(1.03e-05)	(1.10e-05)	(2.63e-05)	(2.64e-05)
Gender	0.0435***	-0.0169***	0.144***	-0.140***	-0.160***
	(7.44e-05)	(7.60e-05)	(8.10e-05)	(0.000187)	(0.000186)
Age	-0.00297***	0.00168***	-0.00590***	-0.00268***	-0.00154***
	(2.24e-06)	(2.53e-06)	(3.03e-06)	(9.04e-06)	(9.01e-06)
Married	0.434***	-0.254***	0.215***	0.0889***	0.126***

	(8.49e-05)	(7.20e-05)	(8.82e-05)	(0.000226)	(0.000208)
Ethnicity	0.0225***	-0.0259***	0.0125***	-0.0822***	0.0107***
	(7.61e-05)	(7.77e-05)	(8.38e-05)	(0.000186)	(0.000182)
Region	-0.107***	0.227***	0.0260***	0.0934***	0.0769***
	(9.22e-05)	(7.20e-05)	(9.68e-05)	(0.000200)	(0.000197)
Local2	0.0916***	-0.103***	-0.0690***	0.0150***	0.0672***
	(0.000109)	(0.000144)	(0.000137)	(0.000372)	(0.000372)
Local3	0.0427***	-0.0722***	-0.00107***	-0.0811***	-0.0181***
	(0.000102)	(0.000117)	(0.000122)	(0.000271)	(0.000265)
Local4	0.0699***	-0.0183***	0.0358***	-0.0407***	0.00760***
	(0.000147)	(0.000181)	(0.000200)	(0.000528)	(0.000532)
Local5	0.0198***	0.189***	0.121***	0.179***	0.276***
	(0.000114)	(9.10e-05)	(0.000144)	(0.000257)	(0.000266)
Local6	0.0362***	0.0516***	0.0631***	-0.0191***	0.0759***
	(0.000110)	(0.000109)	(0.000137)	(0.000297)	(0.000308)
Observations	58,328	58,328	58,328	15,548	15,548

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

The estimation results have proven a clear impact of investment in education on the opportunity of getting a decent job. However, the coefficients are not sufficiently high to be considered a determinant in that respect.

The probability of getting jobs varies with gender in different labor market segments. In Vietnam, generally men have higher probability of getting jobs than women (Model 1), however they are more vulnerable to women. Probability of a man getting full-time job is less than that probability of women. Similarly, men have smaller probability to get job with contract or with social security than women do. Model 3 supports a trend that men have advantages when taking on paid jobs. These findings may attribute to the culture in Vietnam where man has to bear all responsibility and risks to feed his family while woman tend to do unpaid jobs (taking care of children, housework,…). Consequently men have to accept any kind of jobs as long as he gets paid. Women have less probability of getting paid jobs however, as soon as they get paid job they usually have more secured jobs than men do. Women in Vietnam seem to be more protected than man is.

In fact, the labor market is affected by various factors and also works under the law of supply and demand. Moreover, statistics still show a higher rate of unemployment among university graduates and post graduates as compared to technical college leavers. This may signify a mismatch between university training program or profession and businesses' requirements or needs, or difficulties in arriving at a mutually agreed salary, which lead to temporary unemployment. On the other hand, the mismatch may not work in the segment of technical college graduates as learners may have careful choice before taking on a course or a major from the market signal and they can easily accept manual work. Thus they can have a greater chance of having jobs.

Effects of location on chance of getting jobs in Vietnam are all significant at 1%. This implies weak labor mobility between regions.

5 Policy implications

The empirical results in this study show that technological upgrading in the form of new equipment investments creates positive impacts on the SMEs' employment, both in terms of quantity and the quality (namely skill upgrading). Investing in new equipment leads to a higher growth of employment in SMEs and a higher share of SME high skilled labor. However, having product and process innovations creates an opposite impact on the quantity of labor employed in manufacturing SME firms. This shows that SMEs in Vietnam are more active in the forms of new equipment investment. Investing in equipment helps SMEs have more opportunity to expand their business, and therefore creating more employment. However, the statistics also show that the average scale of SME in terms of labor has been decreasing in Vietnam. This implies that the number of SMEs investing in equipment is not big enough to expand the average scale of SMEs in Vietnam. Meanwhile, innovations in product and production process could help SMEs to be more productive but have not yet brought a better opportunity for SMEs to expend their business. These results provide some implications for policy makers in promoting SMEs development in Vietnam as follows:

- Vietnam is still in surplus of labor, moving to capital-intensive production model in general has negative impact on employment growth. Vietnam needs to focus on expanding labor-intensive industries to create employment opportunity for underemployed or unemployed labor. This orientation significantly helps formalizing jobs, creating more decent jobs for people.

- More efforts should be made in order to create more favorable conditions for SMEs to invest in new investments. These types of investment will help SMEs more competitive hence create more jobs and also facilitate the skill upgrading in the economy. In this regard, better credit access to SMEs in new equipment investment is one of the aspects that should be paid more attention to.

- Innovations play an important role for firms to increase their competitiveness and to grow overtime. In general, innovation helps enterprises expand production, especially for large ones. Majority of SMEs do not have innovative activities. However, it seems that SMEs with innovative activities are operating in less dynamic sector (demand is not very rising), the replace effect of innovation outweighs the income effect of rising demand. Consequently, SMEs with innovative activities are contracting in size. Vietnam needs policies to encourage SMEs that have not yet had innovative activities to do innovation. In the context of a deeper international economic integration, innovations are no longer a choice but a must to help SMEs stay competitive in a more fierce competition. This poses a greater need for Vietnamese government to create better enabling environment for firms in general and for SMEs in particular to do innovations and to make innovations play a more positive role in their development. Various policy instruments should be considered to promote innovations,

ranging from tax incentives to research and development funding, trainings, scholar exchanges, R&D infrastructure, etc.

- The empirical analysis shows that SMEs are very active in equipment modernization but less so in innovations in manufacturing sectors, especially management innovation. The supports to SMEs in innovations may change the picture and help SMEs contribute better to job creation in Vietnam.

In addition, our study also emphasizes the role of training and education in training and education in getting good employment. However, Vietnam is now facing the phenomenon of "contracting medium-skill-labors". Demand for medium skills is low lead to low demand for enrollment into technical vocational schools. Shortage of medium-skill-labor will hinder the economy to upgrade from labor-intensive production to skill-intensive production. Put it differently, this shortage may prohibit the economy moving to higher value-added in the ladder value.

To promote skilled labor, Vietnam needs to reduce the mismatch between the skills provided by schools/ universities and the skills demanded by enterprises. It is, therefore, necessary to implement the consistent policies to narrow down the mismatch, such as:

- ✓ The stakeholders in the labor market, including students about to register to technical vocational schools or to colleges and universities, the schools/colleges/universities themselves, should have more access to better information about what the labor market needs in the current stage and in the medium-term to make the right choice from the very beginning.
- ✓ The Government should play the role of coordination and connection for the employers to speak out about their demands for labor and necessary skills that they are seeking.
- ✓ It is essential to promote competition between education and training institutions in order to force them to keep updates on market demand for skills. The monopoly in skill providing should be eliminated.
- ✓ The stakeholders including enterprises, training institutions and laborers should have reasonable incentives to provide feedback on the information they receive.
- ✓ Foreign firms and private sector should be encouraged to invest in education and vocational training system.

There is significant difference in probability of getting a job or a decent job between regions. This implies that there are obstacles for labor mobility across region according to market signals. The government needs to remove these obstacles (system of household registration, helping immigrants to access necessary services such as housing, healthcare, education for their children,…). Building economic zone, industrial parks with centralized sponsored facilities for immigrant workers may help to remove these obstacles.

6 Conclusions

In this study, we document that the informal sector in Vietnam has an important role in giving work to earn a living for a quite large portion of the overall labor force. However, the quality of jobs in informal sector is far below those in formal sector. Micro, small and medium firms now become the biggest creator of new jobs in formal sector while larger enterprises are still the biggest employment pool. We show that in the short run, large enterprises, not small firms, are still the most crucial base for formal jobs in Vietnam. However, in the long run, Vietnamese micro and small enterprises will play an increasingly important role in creating new jobs, and therefore also helping in formalizing employment in Vietnam.

Our paper shows that Vietnamese private SMEs' expansion accompanies with equipment modernization. In the meantime, SMEs in Vietnam have been employing less skilled labor. However, interestingly enough, SMEs with the investments in equipment are likely to employ more high skilled labor. This reveals a positive impact of technological upgrading of firms on the skill upgrading in Vietnamese SMEs.

We also find evidence that investment in education on the opportunity of getting a decent job in Vietnam. However, the impact is not fairly high. We document the mismatch between the demand of employers and the supply of education providers. Vocational training graduates tend to have more satisfied jobs. In brief, education and training is vital for employment, but there should be a harmonization between training and education institutions and employers so that the mismatch should be kept at minimum in order to increase the socio-economic efficiency.

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