Do business linkages play a role in upgrading workers' skills among small and medium-sized enterprises in Vietnam?

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Abstract

Business linkages are of interests to many firms as they can have positive impacts on firms' performance. Nevertheless, there have been few studies on possible influence of business linkages on motivation to upgrade workers' skills among small- and medium-sized enterprises (SMEs). Applying a Probit estimation model with Fixed-Effects techniques for panel data with a sample covering more than 6,000 observations of SMEs from Vietnam, the study provides key findings. First of all, the increase in the number of business linkages helps SMEs to upgrade workers' skills by reducing the percentage of unskilled workers. Secondly, the rise in workers' skills increases the probability that SMEs train their existing workers, but not new workers. Finally, the increase in firm size plays an important role for SMEs in Vietnam to upgrade their workers' skills.

Keywords: Business linkages, Skills, SMEs, Vietnam

1. Introduction

In this increasingly interconnected world, it seems that no firm could stand alone. Therefore, the establishment of linkages is found in many aspects of life. From the business perspective, one of the most important reasons for firms to participate in business linkages is to acquire knowledge and managerial experience. Indeed, since running a business involves networking with mostly all other sectors, standing alone in the business battlefield could lead to an inevitable stagnancy.

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The establishment of business linkages could be at different levels, from simple linkages with suppliers and buyers to a closer relationship such as business alliances, which include joint ventures, franchising, cross-licensing, cross-marketing, and co-manufacturing. Each type of alliance offers both advantages and disadvantages. Engaging in an alliance enables a firm to realize its growth potential more quickly than if that firm just pursues an objective alone (Cross, 2016).

Collaborative business linkages with the win-win objectives could provide firms with many benefits. One of the benefits is the enhancement of skills of workers as knowledge is shared and the pressure from the partners' forces firms to offer training and other activities to raise workers' skills. Anand and Khanna (2000) in their study on the learning effect of the high level of linkages with data from R&D joint ventures suggest that benefits to alliances increase as firms learn prior experience from the alliances. This learning process leads to an increase in the efficiency of management and gives higher potential benefits as firms gain experience in alliance formation (Hoang and Rothaermel, 2005; Sampson, 2005). This would give rise to the relation of increasing returns to alliances.

As reported by Vietnam General Statistics Office (2017), the number of SMEs in Vietnam accounts for 98 percent of the total number of business entities, which makes significant contribution to the economy. During the period of 2010-2017, SMEs in Vietnam contributed about 45 percent of GDP and created more than five million jobs (Phung, 2019). With their majority in terms of the number of firms, how the participation of SMEs in business linkages affects workers' skills is worth investigating.

Workers' skills play an important role in raising firms' performance as they determine productivity of firms. For SMEs, which are mainly in the labor-intensive industries, upgrading skills of workers could have a considerable impact on their performance. Despite its importance, there have been few studies on the impact of business linkages on upgrading workers' skills for SMEs. Nour (2013) clarifies the effect of growth of the linkages on the skill upgrading due to either a shift away from unskilled workers or an increase in the share of high-skilled white-collar workers. However, this relationship has not been considered from the perspective of SMEs.

To bridge this gap in the literature, the authors are motivated to investigate the question whether business linkages play a role in upgrading workers' skills among SMEs in Vietnam. We find that business linkages help SMEs in Vietnam reduce the percentage of unskilled labor. In addition, business linkages raise the probability of training existing workers. Moreover, the probability of training new workers is higher if business linkages exist among the SMEs.

The remainder of the paper is organized as follows. Section 2 presents the business linkages and how SMEs could acquire business linkages. Section 3 presents theories on business linkages and upgrading workers' skills. Section 4 shows the estimation

methodology, which is followed by Section 5 on data description. Section 6 presents the estimation results. Section 7 concludes the paper.

2. Business linkages and how SMEs could play a part in business linkages

2.1 Business linkages

As mentioned in GTZ (2006), business linkages are generally considered to include selling and buying activities in all commercial interactions. In a narrower perspective, collaborative business linkages, which relate to connections among groups of mutual interest for win - win objectives, are more frequently taken into account. The development of business linkages depends on many conditions such as distance and physical infrastructure, trade policy or existing business linkages. These business linkages could exist among a wide range of enterprises, either among ones with the same or different sizes.

Business linkages, specifically collaborative business linkages, are normally classified on the basis of the way that a firm interacts with partners in the value chain. Two popular kinds of business linkages include horizontal and vertical linkages:

Horizontal linkages relate to connections among firms at the same step of the value chain. These firms have their activities in the same sector to produce the same kinds of products. Via the interaction and further cooperation under the horizontal linkages, firms could integrate faster and stronger in the market. Moreover, opportunities to learn from partners are valuable for firms, especially the ones with a similar firm size.

Vertical linkages relate to the cooperation among firms along the value chain as each member takes responsibility for a part of the process from production to distribution. This type of linkage becomes more and more popular as products get more complicated with higher technology, requiring the participation of multiple enterprises specializing in a certain phase of the production process. Within vertical linkages, there could be various firms with different sizes, either multinational enterprises (MNEs) or micro, small- and medium-sized enterprises (MSMEs/SMEs).

2.2 How SMEs could play a part in business linkages

As mentioned before, collaborative business linkages with the win - win targets are beneficial for all participants, not excluding SMEs. For SMEs, they could join business linkages in both horizontal and vertical ones as follows.

For horizontal linkages as confirmed by GTZ (2006), they are advantageous for MSMEs/SMEs as the limitation of the firm size could be overcome. Firms could find it easier to interact with each other without much wondering about the bargaining powers, which are related to firm size. Moreover, the benefits that SMEs could achieve via business linkages are quite considerable, including:

- Economies of scale in purchasing as linkages help firms to enjoy reduced purchasing costs, which is resulted from reduction in the prices of inputs due to large quantity bought;
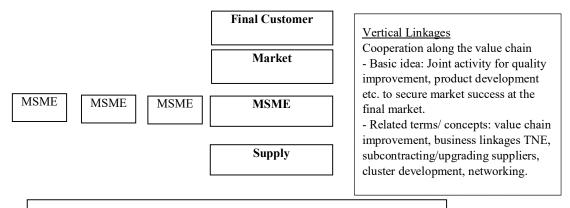
- A scope to serve certain customers, especially big ones in new markets;
- Cost reduction in marketing and distribution;
- Joint development of products via sharing resources.

As an individual firm, it will be hard for SMEs to obtain such benefits mentioned above. Horizontal linkages represent the intensity of linkages within a sector.

For vertical linkages from Figure 1, it could be seen that SMEs could join the value chain at many steps towards either supplying or distributing activities. As the value chain gets longer and more complicated, the role of SMEs, which specialize in a specific phase, could be more significant. The remarkable benefits that firms gain in vertical linkages could be related to cost reduction and/or quality improvement, which come from a wide range of activities that small firms rarely take all on its own. These activities, according to GTZ (2006), are comprised of:

- Meeting certain quality or standards;
- Creating communication channels;
- Participating in joint actions for product improvement;
- Participating in joint actions for development of new products.

Vertical linkages represent the diversity of linkages across different sectors.

Figure 1. Horizontal versus vertical linkages of MSMEs/SMEs

Source: GTZ (2006)

3. Literature review and theoretical effects of SMEs' business linkages on upgrading workers' skills

The theoretical effect of business linkages on upgrading workers' skills has just been considered for firms in general. In the authors' perception, there has been no theory which just focuses on the cases of SMEs. As a result, in this section, we just clarified the general effect on firms, which could be also applied to SMEs. Regarding that impact, there has long been an ongoing debate in the business world. This matter is becoming more relevant in the modern-day where globalization is necessary as well as turbulence in the business world occurs at a high frequency.[2]

The fact is that the faster the growth of the linkages, the more important the role of skill upgrading is. The increasing demand for skilled labor can be understood in either the shift away from unskilled toward skilled employment or an increase in the share of high-skilled white-collar workers (Nour, 2013). There are few studies carried out to further explain the correlation and causation between linkages and upgrading workers' skills. Thus, what people know about this remains ambiguous. There exist some channels to explain the positive effects. Meanwhile, the negative ones should not be ignored.

3.1 Positive effects

The participation into business linkages could be beneficial to upgrading workers' skills, which leads to the enhancement of productivity of firms. This effect could be explained via the following channels.

Knowledge sharing and learning effect

A business linkage, especially at the high level, provides an access to the unique know - how of partner companies. For example, a tutoring company might find itself challenged to meet the demand for math tutors within the community it services. By partnering with a computer software manufacturer, the tutoring company can release a software series of math tutoring lessons that assist a larger student population with its math services. This new knowledge will be transmitted to workers and related staff in the partner companies, which broaden their

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[2] Linkages embody inter-firm transactions, interactions, and on-going relationships (UNCTAD, 2006). Even though this terminology can differ vastly between researchers, there are three major groups of linkages: (1) supply chain or vertical linkages with either supplier (i.e. backward or upstream linkages) or customers/agents (forward or downstream linkages), (2) collaborative (relational or horizontal) linkages with other firms such as alliance partners (for example, technology sharing agreements, management contracts, and co-production agreements) or competitors (Chen and Chen, 1998; Günther, 2005; Murray, Kotabe and Zhou, 2005; Saggi, 2002); and (3) institutional linkages with government, research institutes, industries, organizations, and universities (Santangelo, 2009).

understanding. In accordance with the knowledge, workers' skills will be upgraded as firms apply the new technology or know-how from their partners. Learning by doing plays an important role to raise the skills of workers.

Strategic management researchers through their studies provide firms with more insights into the attributes that are important to inter-firm development via linkages. For example, the literature on alliances, joint ventures and strategic technology partnering (Hagedoorn, 2006; Hagedoorn and Hesen, 2007; Tallman *et al*., 2004) provide support for the importance of quality in inter-firm partnerships, and in particular the transfer of knowledge, inter-firm learning and joint development of resources (Fynes *et al*., 2005; Holmqvist, 2003). Relationships among units of firms facilitate access to potentially useful knowledge transfer (Reagans and McEnvily, 2003). Various studies have shown that relevant knowledge can be accessed. Moreover, relations enhance information processing capacity, which enables knowledge flows through these relationships (Gupta and Govindarajan, 2000; Hansen, 1999).

Some studies have been based on a belief that the spillover effect is the basis for the development of participants in linkages. The spillover effect is the assumption that particular enterprises possess superior firm-specific assets (Dunning and Lundan, 2008), which are transferable at no cost due to the high technology competences (Girma *et al*., 2008). Direct spillovers appear when there are direct relationships between multinational enterprises and local firms, notably through vertical linkages, training of local employees, and technical assistance (Blomström *et al.,* 2000). Direct spillovers induce improvement in the quality and efficiency of local firms.

To be part of linkages in a value chain, especially vertical linkages, firms are normally put into high pressure to increase their workers' skills to achieve the targets of economies of scale and competitive capacity.

Economies of scale might develop from business linkages. It relates to the cost advantages that a company gains from expansion. In business linkages, this might include access to wider marketing channels, which a company might not otherwise be able to afford outside the partnership. Cost reductions might also result from joint investments on activities such as research and development, or access to a partner's operational facilities. However, these benefits could just be achieved as firms have a certain level of capability. It is the pressure from partners that require firms to be faster in increasing their capability, particularly via upgrading their workers' skills.

There are numerous benefits that firms can draw from linkages, especially vertical linkages. A company can improve its productivity by gaining access to new, improved, or less costly intermediate inputs (Girma *et al.,* 2001; Javorcik, 2004) as well as have more enhanced market opportunities, from which they achieve the economies of scale. These benefits induce the pressure for firms to make the first - order changes in their activities, such as the production of new goods, improvement of product quality, and reorganization of R&D activities aimed at adopting the technologies embodied in the received inputs. These activities are often associated with better relative demand for high-skill labor.

Bernard *et al.* (2006) find that import penetration from low-wage countries provide firms with an important incentive to adjust their product mix to avoid trade pressure. This suggests that firms shift toward more skill-intensive activities as a consequence of increased competition and this shift may take place with many industries.

Indeed, many authors have argued for the inclusion of inter-firm resource transfer in the study of linkages and firm development (Giroud, 2003; Lall, 1980; Saggi, 2002). Resources transferred include those associated not only with information and technology but also technical, financial, procurement, location-specific, managerial, marketing, organizational, and pricing assistance. Such resources allow firms to benefit from the joint development of products, specialization, economies of scale, quality, prices, and competitiveness (Duanmu and Fai, 2007; Giroud, 2007; Spencer, 2008). Nevertheless, these benefits could just be achieved as firms have a certain level of capability. It is the pressure from partners to require firms to be faster to increase their capability, particularly via upgrading their workers' skills.

3.2 Negative effects

Previous literature has shown that business linkages potentially benefit workers since their skills, standards and capacity have been improved thanks to the acceleration of knowledge transfer and technology upgrading (Reagans and McEnvily, 2003). Nonetheless, not all alliances positively affect workers' skills. As the number of business linkages increases or firms join in business linkages, those skills could be negatively affected. This could be explained as follows.

Specialization into low-skill part of the value chain

Specialization and economies of scale are expected outcomes that all firms care about as they join the business linkages. However, especially in the vertical linkages, the specialization process leads to the consequence that some firms will focus on some certain production parts in the value chain, which just require low

skills of the labor. Therefore, this causes the down-grading workers' skills of the firms which participate in the business linkages.

Lack of specialization skills as the number of business linkages increases with a rise in the number of business linkages, the diversification in firms' activities could take place. This diversity, despite its advantage of making firms more adaptive to the changing world, as a result, leads to the requirements of multi-skills of workers, which reduces the specialization level and economies of scale.

Moreover, in accordance with the boost of the business linkages, Deeds and Hill (1996) argue that the decreasing quality of screening and monitoring acts as a main determinant of possible negative returns. As the number of linkages rises, a firm becomes more vulnerable to possible mismatches or partners that show opportunistic behavior. Especially with the knowledge-based view and the social exchange theory, linkages also carry the risk of knowledge leakage to competitors or bring communication problems and management style conflicts. Therefore, the workers' skills could be negatively affected.

Moreover, Fosfuri *et al*. (2001) show that in some circumstances an MNE might prefer to resort to exports rather than foreign direct investment (FDI), precisely to avoid dissipation of superior technology to local rivals and/or the payment of informational rents to local workers. This could be changed in some certain conditions. One of those key conditions is that the knowledge acquired by workers is broad rather than specific, meaning that the skills of workers are not at a high specialization level.

On the other hand, Girma *et al*. (2008) argue that the export-oriented multinationals, through the backward linkages, affect negatively their domestic supplier's productivity. The local firms when joining the value chain do not provide a variety of inputs foreign exporters require (Rodriguez-Clare, 1996) as they just specialize in a specific production stage. The research also indicates strong competition effects of this kind of MNE to local firms in the high-tech sector. By that reason, horizontal spillovers might be mitigated. Aitken and Harrison (1999) argue that this competition effect may actually result in negative effects on domestic firms' productivity if multinationals "steal business" from domestic firms and force them up their average cost curve.

With the mixing effects of business linkages on workers' skills in theory as mentioned above, further study is needed to clarify the certain case of Vietnam.

4. Model and methodology

With the purpose of clarifying the impact of business linkages on workers' skills in SMEs in Vietnam, the authors constructed our models with basic specifications,

which include the dependent variables for measuring the skill upgrading in SMEs. Moreover, regarding the independent variables, we would take advantages of the availability of the data with three variables to measure the linkages of firms, which are TotalNetwork, Diversity, and TimesHelped. The inclusion of the three variables in the model is applied to avoid omission of variables. For controlling firms' basic characteristics, we use firm age and firm size, which are measured by the number of years of establishment and the quantity of labors of firms. These variables are normally used in a wide range of research papers. Dummies are also included for province, sector, and year to control for the heterogeneity of firms across provinces, sectors, and years. These methods are often applied as well. As a result, we came up with the following three models for estimation:

$$\text{Perunskilled}_{it} = \alpha_1 \text{TotalNetwork}_{it} + \alpha_2 \text{ Diversity}_{it} + \alpha_3 \text{TimesHelped}_{it} + \beta_1 \text{Log (Firm\_age}_{it}) + \beta_2 \text{LogWorkers}_{it} + \theta i + \in it \tag{1}$$

$$\text{Prob(Train\_existingworkers)}_{it} = \alpha_1 \text{TotalNetwork}_{it} + \alpha_2 \text{ Diversity}_{it} + \alpha_3 \text{TimesHelped}_{it} + \beta_1 \text{Log (Firm\_age}_{it}) + \beta_2 \text{LogWorkers}_{it} + \in it \tag{2}$$

$$\text{Prob(Train\_newworkers)}_{it} = \alpha_1 \text{TotalNetwork}_{it} + \alpha_2 \text{ Diversity}_{it} + \alpha_3 \text{TimesHelped}_{it} + \beta_1 \text{Log (Firm\_age}_{it}) + \beta_2 \text{LogWorkers}_{it} + \in it, \tag{3}$$

where i denotes firm i; t denotes year t. The dependent variables in the three models include: 1) Perunskilled_{it} in Model 1 denotes the percentage of unskilled labor of firm i, at year t; 2) Prob (Train_existingworkers)$_{it}$ in Model 2 shows the probability of training existing workers of firm i at year t; and 3) Prob (Train_newworkers)$_{it}$ in the Model 3 regards the probability of training new workers of firm i at year t.

The independent variables to be proxied for the business linkages are comprised of: 1) TotalNetwork$_{it}$ is total number of business linkages in firm i at year t; 2) Diversity$_{it}$ presents the percentage of business linkages in other sectors out of the total business linkages of firm i at year t; and 3) TimesHelped$_{it}$ regards times firm i gets help from its business linkages at year t;

Other control variables include: 1) Firm_age$_{it}$ denotes the year in operation of firm i; 2) Logworkers$_{it}$ presents the natural logarithm of the total employee in firm i at year t; 3) $\in ijt$ is the error term; and 4) θi denotes the time-invariant characteristics of firm i in Model 1.

Model 1 looks into the effect of each variable on the percentage of unskilled labor in SMEs. The techniques of panel data will be applied and Hausman test

will be used for the choice of appropriate techniques. Model 2 and 3 consider the impact of each variable on the probability of SMEs to train existing employees (Model 2) or new employees. The probit regressions will be applied for these cases.

5. Data

The sample used in this research consists of more than 3,200 SMEs surveyed in Vietnam biennially during the period of 2011-2015[3]. Regarding the definition of SMEs, we follow the one provided in the Article 6, Decree No. 39/2019/NĐ-CP detailing some articles of the Law on supporting small and medium sized enterprises issued by the Government on 11th March 2018. According to this definition, SMEs are classified into micro-enterprises with having up to 10 employees; small-scale enterprises with up to 50 employees; and medium-sized enterprises with up to 200 employees. The data have been collected through surveys carried out in nine provinces of the country including Hanoi (Ha Tay is included), Hai Phong, Ho Chi Minh city, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An. The data are based on face-to-face interviews with firm owners/managers and employees and are typically collected during the months of June-August. The SMEs are distributed across approximately 18 sectors such as food processing, fabricated metal products, and manufacturing of wood products.

The surveys have been conducted through a collaborative effort of the Central Institute for Economic Management (CIEM), the Institute of Labor Science and Social Affairs (ILSSA), the Development Economics Research Group (DERG) at the University of Copenhagen, and UNU-WIDER (2019). The enterprise-level surveys solicit information on firm performance, enterprise history, employment, business environment, and owner/manager background characteristics.

To summarize, there are total 6,347 observations used for regression analyses. Data were collected in 2011, 2013, and 2015. Missing some pieces of information is unavoidable. In addition, due to the method of collecting data every two years, some adjustments have been made in the survey instruments in order to catch up the changes of development within the private economic sector in Vietnam. Table 1 provides information about summary statistics of variables (See Appendix 1 for the correlation among variables).

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[3] The data for some important variables regarding the network is not available for 2009 or the years before or after the researched period.

Table 1: Summary statistics of variables

Variable	Measurement	Obs	Mean	Std. Dev.	Min	Max
Perun-skilled	the percentage of unskilled labors out of the total number of labors	6,347	23.422	25.881	0	100
Train_existingworkers	a dummy variable with 1 denoting that a firm did train its existing workers, and 0 otherwise	6,341	0.060	0.237	0	1
Train_newworkers	a dummy variable with 1 denoting that a firm did train its new workers, and 0 otherwise	5,889	0.166	0.372	0	1
Total-network	total number of business linkages	6,347	39.334	58.248	2	1437
Diversity	the percentage of business linkages in other sectors out of the total business linkages	6,347	57.329	22.179	0.676	99.206
Times-helped	the number of times that a firm gets help from its business linkages	6,347	248.2401	793.209	0	30002
Log-workers	natural logarithm of the number of workers	6,347	1.891	1.112	0	5.298
Firmage	the number of years of establishment	6,347	14.987	9.847	2	76
Year		6,347	2013.130	1.626	2011	2015

Note: Nine provinces of the country have been considered as follows: Hanoi (including Ha Tay), Hai Phong, Ho Chi Minh city, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An. These provinces have been coded randomly.

Source: Synthesized by the authors

Throughout more than 6,347 observations, on average, the size of network of SMEs is at 39.33, while the values range from 2 to 1,437. We can conclude that the number of firms having extremely high number of business linkages is minor. For

further clarification of the characteristics of the variable of Totalnetwork, see Appendices 5 and 6 about the histogram of density of firms by total network and sectors with firms having more than 100 linkages in the total network.

The Diversity variable (Percentage_other_sector) is measured by the percentage of business linkages in other sectors out of the total business linkages. It is indicated that the mean of this variable is 57.39%. The diversity of SMEs networks indeed accounts for more than a half of the total business linkages of firms on average.

Regarding the TimesHelped variable, some firms in the sample get helped many times. There are a few particular cases when their means are at 248.

6. Results

6.1 Results on the impact of business linkages on the percentage of unskilled labor

Results in Table 2 are based on the specification from Model 1 with the usage of more than 6,300 observations over more than 3,200 SMEs in Vietnam. Hausman tests have been conducted for the choice between Fixed Effects and Random Effects models. The results for the tests, which can be seen in Appendix 2, support the usage of Fixed Effect estimation techniques. The null hypothesis is that the preferred model is Random Effects. The alternate hypothesis is that the preferred model is Fixed Effects. If the p-value is small, which is often less than 0.05, the null hypothesis will be rejected. That means the Fixed Effects estimation method will be chosen.

In Table 2, we look into the business linkages from the perspective of Total Network, which means total number of linkages. In Column (1), the statistically negative coefficient proves the upgrading skills of workers. As the number of linkages increases by one, the percentage of unskilled workers of SMEs decreases by 0.0185%. This effect of business linkages remains unchanged as other two proxies for the linkages, which are Diversity and Timeshelped, are included in Column (4).

Regarding Diversity, the insignificant coefficient of the regression model in Column (2) shows that linkage diversification across sectors does not necessarily lead to the significant change in the percentage of unskilled labor. The positive sign perhaps captures the unclear possibility of a rise in the unskilled labors for SMEs as explained in the theories by the cases that SMEs will concentrate on the low-skill part of the value chain.

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Table 2. Result of effects of business linkages on upgrading skills, which are proxied by percentage of unskilled labors, of SMEs in Vietnam

Variables	Perunskilled			
	(1)	(2)	(3)	(4)
Totalnetwork	-0.0185**			-0.0173*
	(0.0088)			(0.0089)
Diversity		0.0043		0.0062
		(0.0204)		(0.0205)
Timeshelped			-0.0008	-0.0006
			(0.0006)	(0.0006)
Firmage	-0.171	-0.176	-0.173	-0.169
	(0.15)	(0.15)	(0.15)	(0.15)
Logworkers	6.172***	6.158***	6.167***	6.155***
	(-1.091)	(-1.093)	(-1.091)	(-1.092)
Observations	6,322	6,322	6,322	6,322
Number of manmade	3,275	3,275	3,275	3,275
Type	FE	FE	FE	FE
Province	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Timedummies	Yes	Yes	Yes	Yes

Note: *, **, and *** denote 1%, 5% and 10% statistically significant, respectively. A Fixed Effects model for panel data has been applied. Number of manmade is the identification number of firms considered in the sample.

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TimesHelped is the variable reflecting the total number of times SMEs in the surveyed data get help from the contact in their organizational linkages. The insignificant impact of the coefficient implies the unclear impact of the number of supports from others in the network on SMEs' performance.

While Firmage does not have a significant impact on the percentage of unskilled labors, Firmsize, which is measured by Logworkers, has the significantly positive coefficient with high magnitudes across all regressions. The regression coefficient indicates that when Firmsize increases by one percent, the percentage of unskilled labors rises by around six percent. This result indicates that SMEs in

Vietnam participate more in the low-skill part of the value chain in the vertical linkages, or in the low-skill sectors in horizontal linkages.

6.2 Results of the impact of business linkages on the probability of training existing and new workers of SMEs in Vietnam

Tables 3 and 4 present the results of the impact of business linkages on the probability that Vietnamese SMEs will train their existing and new workers.

Regarding existing workers, the statistically positive coefficients of Totalnetwork supports a hypothesis that business linkages do play a role in the training process of SMEs for their laborers, helping to upgrade the workers' skills in general. As the number of business linkages increases, the probability that SMEs train their workers is higher. Meanwhile, the Diversity and Timeshelped from the linkages do not significantly affect the probability of training existing workers of SMEs in Vietnam.

Moreover, the rise in the Firmage leads to the lower probability of training the existing workers. This makes sense as the "older" firms normally have more experienced workers, who could work more on their own without more formal training activities.

By contrast, the increase in the firm size, which is measured by Logworkers, helps raise the probability of training existing workers considerably. This finding demonstrates a fact that the more workers SMEs have, the more training they are required to do to increase the productivity as specialization is carried out.

Table 3. Result of effects of business linkages on the probability of training existing workers of SMEs in Vietnam

Variables	Train_existingworkers			
	(1)	(2)	(3)	(4)
Totalnetwork	0.00238***			0.00245***
	(0.000326)			(0.000337)
Diversity		-0.00171		-0.00152
		(0.0013)		(0.00131)
Timeshelped			3.30E-05	-4.21E-05
			(3.44E-05)	(5.56E-05)
Firmage	-0.00927***	-0.00926***	-0.00927***	-0.00924***
	(0.0033)	(0.00328)	(0.00328)	(0.0033)
Logworkers	0.372***	0.390***	0.390***	0.372***
	(0.0255)	(0.0251)	(0.0251)	(0.0255)
Observations	6,270	6,270	6,270	6,270
Province	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Timedummies	Yes	Yes	Yes	Yes

Note: *, **, and *** denote 1%, 5% and 10% statistically significant, respectively. A probit has been applied.

Regarding new workers, for all of the three proxies for the business linkages, it could be clearly seen that there are no significant coefficients, meaning that the business linkages impose insignificant impact on the probability of training new workers for SMEs in Vietnam. This could be explained that as SMEs are normally lacking financial resources they will be careful in doing formal training activities. This is especially true for new workers, who need to experience a year of working for the firms before they could obtain the training provided by the SMEs.

The increase in the firm size, which is measured by Logworkers, also raises the probability of training new workers, even with higher magnitude than for the case of training existing workers.

Table 4. Result of effects of business linkages on the probability of training new workers of SMEs in Vietnam

Variables	Train_newworkers			
	(1)	(2)	(3)	(4)
Total_network	-0.000318			-0.000221
	(0.000424)			(0.000431)
Diversity		9.16E-05		0.000297
		(0.00101)		(0.00102)
Timeshelped			-7.32E-05	-7.12E-05
			(4.99E-05)	(5.10E-05)
Firmage	-0.00318	-0.0032	-0.00318	-0.00317
	(0.00233)	(0.00233)	(0.00234)	(0.00234)
Logworkers	0.413***	0.410***	0.412***	0.414***
	(-0.0211)	(-0.0208)	(-0.0209)	(-0.0211)
Observations	5,858	5,858	5,858	5,858
Province	Yes	Yes	Yes	Yes
Sector	Yes	Yes	Yes	Yes
Timedummies	Yes	Yes	Yes	Yes

Note: *, **, and *** denote 1%, 5% and 10% statistically significant, respectively. A probit has been applied.

7. Conclusion

Employing the database sourced from UNU WIDER with more than 6,000 observations from more than 3,000 SMEs in Vietnam for the period from 2011 to 2015 and applying both Fixed Effects techniques for panel data and Probit regressions, the paper has figured out different interesting results. In general, the increase in the number of business linkages does help SMEs to upgrade workers' skills by reducing the percentage of unskilled labors. Via the knowledge sharing and learning effect, as well as the pressure from the partners towards the targets of economies of

scales and competitive capacity, SMEs have more motivation to raise their workers' skills. Especially, the statistically positive impact of business linkages on the probability of SMEs to train their existing workers provides further evidence for the upgrading skills in SMEs. SMEs have more incentives to carry out the training for their current workers rather than the new ones.

Meanwhile, the evidence for the effect of diversification of business linkages across sectors on upgrading skills are statistically insignificant. This effect is still consistent when the probabilities of training both existing and new workers are considered. For SMEs, the increase in the firm size plays an important role in the motivation to upgrade skills. As firm size rises, the percentage of unskilled labor will decrease. Moreover, SMEs will be more likely to do the training for both existing and new workers. The probability of carrying out the training for new workers is even higher than that for existing workers.

From the above results, what could be seen is that the participation of SMEs in business linkages is not just good for their performance, which are shown in many previous studies such as Burt (1992) and Putnam (1993), but also for their workers' skills. SMEs have more incentives to do the training for their workers and reduce the proportion of unskilled labors. However, it is necessary to further study how SMEs really join in the value chain. Although there could be some signals for the participation in the low-skill part of the value chain, especially in the vertical linkages, it is worth doing further studies to confirm this point.

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Appendix 1. Correlations among variables

	perunskilled	train_existingworkers	train_newworkers	total_network	diversity	timeshelped	logworkers	firmage
perunskilled	1							
train_existing workers	0.0143	1						
train_newworkers	0.0002	0.2668	1					
total_network	-0.0494	0.1799	0.0127	1				
diversity	0.0079	-0.0303	-0.0064	-0.0066	1			
timeshelped	0.0308	0.0247	-0.0351	0.1934	0.16	1		
logworkers	0.1262	0.2233	0.2672	0.1621	-0.0539	0.0619	1	
firmage	0.0359	-0.0544	-0.0229	-0.0418	0.0193	-0.0181	-0.1395	1

Appendix 2. Hausman test result

```
                 b = consistent under Ho and Ha; obtained from xtreg
       B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test:  Ho:  difference in coefficients not systematic

        chi2(26) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                 =        55.47
        Prob>chi2 =      0.0007
```
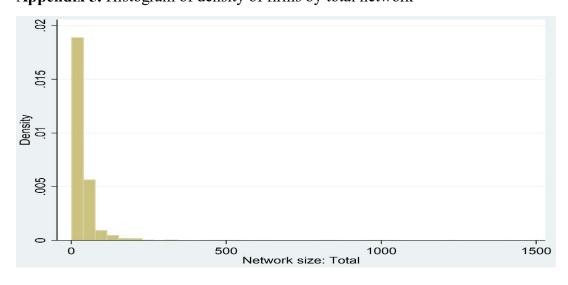
Appendix 3. List of provinces in the sample

Province	Freq.	Percent	Cum.
Ha Noi	1,624	25.59	25.59
Phu Tho	526	8.29	33.87
Hai Phong	571	9	42.87
Nghe An	805	12.68	55.55
Quang Nam	386	6.08	61.64
Khanh Hoa	229	3.61	65.24
Lam Dong	181	2.85	68.1
HCMC	1,676	26.41	94.5
Long An	349	5.5	100
Total	**6,347**	**100**	

Appendix 4. List of sectors in the sample

Sector	Freq.	Percent	Cum.
Agriculture	5	0.08	0.08
Food and beverages	1,760	27.84	27.92
Tobacco	1	0.02	27.93
Textiles	247	3.91	31.84
Apparel	338	5.35	37.19
Leather	134	2.12	39.31
Wood	651	10.3	49.6
Paper	182	2.88	52.48
Publishing and printing	198	3.13	55.62
Refined petroleum etc.	20	0.32	55.93
Chemical products etc.	137	2.17	58.1
Rubber	363	5.74	63.84
Non-metallic mineral products	266	4.21	68.05
Basic metals	84	1.33	69.38
Fabricated metal products	1,121	17.73	87.11
Electronic machinery, computers, radio,	177	2.8	89.91
Motor vehicles etc.	33	0.52	90.43
Other transport equipment	20	0.32	90.75
Furniture, jewelry, music equipment	490	7.75	98.5
Recycling etc.	20	0.32	98.81
Services	75	1.19	100
Total	**6,322**	**100**	

Appendix 5. Histogram of density of firms by total network

Appendix 6. Sectors with firms having more than 100 linkages in the total network

Sector	Freq.	Percent	Cum.
Food and beverages	119	37.07	37.07
Textiles	15	4.67	41.74
Apparel	18	5.61	47.35
Leather	7	2.18	49.53
Wood	5	1.56	51.09
Paper	9	2.8	53.89
Publishing and printing	19	5.92	59.81
Refined petroleum etc.	1	0.31	60.12
Chemical products etc.	8	2.49	62.62
Rubber	27	8.41	71.03
Non-metallic mineral products	11	3.43	74.45
Basic metals	4	1.25	75.7
Fabricated metal products	45	14.02	89.72
Electronic machinery, computers, radio,	12	3.74	93.46
Motor vehicles etc.	2	0.62	94.08
Furniture, jewelry, music equipment,	14	4.36	98.44
Recycling etc.	1	0.31	98.75
Services	4	1.25	100
Total	**321**	**100**	