

Pham, Hung D.; Runst, Petrik; Bizer, Kilian

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Hung D. Pham, Petrik Runst, Kilian Bizer

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Institute for Small Business Economics
Heinrich-Düker-Weg 6
University of Goettingen, 37073 Göttingen, Germany
(+49) 551 3917 4889
phung@wiwi.uni-goettingen.de, petrik.runst@wiwi.uni-goettingen.de

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Heinrich-Düker-Weg 6
37073 Göttingen

Tel. +49 (551) 39 174882
Fax +49 (551) 39 174893
E-Mail: info@ifh.wiwi.uni-goettingen.de
Internet: www.ifh.wiwi.uni-goettingen.de

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Networks and Firm Performance: A Case Study of Vietnamese Small and Medium Enterprises

Hung D. Pham¹ Petrik Runst² Kilian Bizer¹

¹ Georg-August-Universität Göttingen, Faculty of Economics Sciences, Chair of Economic Policy and SME Research, Germany

² Institute for Small Business Economics, Georg-August-Universität Göttingen, Germany

Correspondence: Hung D. Pham, Georg-August-Universität Göttingen, Faculty of Economics Sciences, Chair of Economic Policy and SME Research, Heinrich-Düker-Weg 6, 37073 Goettingen, Germany. Email: phung@wiwi.uni-goettingen.de

Abstract

Small and medium enterprises play an important role in developing and transition economies. Recently, more attention has been paid to the role of networks in improving firm performance. By using data from the DANIDA project on SME survey with more than 2,500 manufacturing firms in Vietnam, we examine the relationship between networks and firm performance, particularly focusing on small and medium businesses. Network data covers four dimensions of networking including within-sector-network, across-sector-network, informal and formal creditors, and politicians and civil servants. Multivariate panel regressions have been applied. The results suggest that firm performance is positively related to the existence and the size of networks with individuals in a different sector and networks connecting to politicians and civil servants.

Keywords: SMEs, Networks, Firm Performance, Vietnam, Panel Data

JEL Classification: L25, L60, L29

1. Introduction

Small and medium enterprises (SMEs) have an important role in economic growth worldwide. They have been found to create jobs (Chandler, 2012; Hu & Schive, 1998; Neumark, Wall, & Zhang, 2011; Wit & Kok, 2014), to reduce poverty (Beck, Demirguc-Kunt, & Levine, 2005), and bring about innovation (Hemert, Nijkamp, & Masurel, 2013; Lee, Park, Yoon, & Park, 2010). SMEs are the main drivers of economic development (Ayodeji & Balcioglu, 2010) and are also widespread in developed economies. SMEs make up 95% of all enterprises in the OECD area (OECD, 2004).

In this paper, we will investigate SME performance in one highly successful developing country, i.e. Vietnam. The annual growth rate of the Vietnamese economy is around 6% over the last five years. This positive development makes Vietnam an interesting country for research on SMEs (World Bank, 2015). Vietnamese SMEs generated about 40% of annual gross domestic product (GDP) in 2014. While most large companies are state owned, SMEs represent the growing private sector. In order to support economic development in general, and SME development in particular, the government has implemented many policies such as an economic reform program since 1986, the Company Law and Private Enterprise Law (1990) which were amended to the Enterprise Law (2005).

There is a growing body of literature on firm performance of SMEs in developing countries. Firm performance is measured by financial outcomes (Chadha & Sharma, 2016), sales growth or market growth (Swierczek & Ha, 2003), customer satisfaction (Hirons, Simon, & Simon, 1998; Williams & Naumann, 2011), employee growth rate, and return on assets (ROA) (Wolff & Pett, 2006). It is also measured by establishing a foundation upon which future growth may take place (Bevan, 1999; Hudson, Smart, & Bourne, 2001; Otter, Engler, & Theuvsen, 2014; Swierczek & Ha, 2003; Wolff & Pett, 2006) and by the level of satisfaction on the part of the founders (Vivarelli & Audretsch, 1998). Other author considers the societal contributions of small firms as an indicator of their performance (Reynolds, 1987).

Firm performance has been influenced by several factors, for instance owners' age (Le & Harvie, 2010), firm size (Le & Harvie, 2010), networking (BarNir & Smith, 2002; Hoang & Antoncic, 2003; Huggins, 2001; Lechner, Dowling, & Welp, 2006; Watson, 2007; Watson, 2011), ownership (Le & Harvie, 2010), etc.

Networking has been paid more attention in recent years for at least two reasons. Firstly, private SMEs face twin challenges with respect to business and ownership forms (state-owned vis-à-vis private sector) (Fogel, 2001). For example, large and state owned enterprises usually have better access to finance (Beck, Demirgüç-Kunt, & Maksimovic, 2005). In this case, SME networking could potential mitigate these disadvantages. Secondly, private SMEs are seen as very high-risk partners because of the high failure rate (Le & Nguyen, 2009), and information asymmetries (Frame, Padhi, & Woosley, 2001). For example, customers mainly rely on their personal networks to get information on a firm's credibility. Therefore, networks could help a firm to spread knowledge of its existence, product quality and credibility to related stakeholders.

Our main objective is to examine the effects of networking on SME performance (net income, gross margin, growth rate based on revenue and employee, ROA and ROE). Our study contributes to the previous literature by using panel data. Antecedent studies are based on cross sectional data. They mainly focus on developed countries and one network type, while our study investigates multiple network types in a developing country, i.e. Vietnam.

The rest of the paper is organized as follows: Section 2 presents the overview of SMEs development in Vietnam. Section 3 reviews the literature on networks and firm performance. Data collection and research methodology will be described in section 4. Then, section 5 shows the regression results. Finally, the paper closes with a conclusion and suggests implications to policy-makers and SMEs' owners in developing countries regarding the development of SMEs.

2. Overview of SMEs Development in Vietnam

The economic reforms in 1986 created a more liberal economic model and business environment for private firms in Vietnam. During the French colonial period (1884-1945), there existed a limited scope for private firm operations. In the period of 1954-1975, Vietnam was divided into two political systems: the democratic republic North and the republican South (with a presence of the United State in military and funding). In the North, the Communist Party followed a nationalized industrialization policy. In the South, private firms were comparatively more developed. Later, in the period between 1976 and 1980, the

Northern economic system was transferred to the South. The nationalization of all private companies brought the market system to a stand still.

Since 1986, a series of policies and economic reforms has paved the way for private firm development. In 1990, the Enterprise Law was first issued. However, there were a number of challenges for new start-ups, such as a complex legal procedure or lack of funding. To ease the registration process, the New Enterprise Law was implemented in 1999. The number of newly registered firms increased. From 2000 to 2004, about 121,000 enterprises registered, most of which were SMEs. Since 2010, the growth of SMEs has been increasing gradually (see figure 1). In 2010, there were 279 thousand enterprises, after 6 years, there was an increase of 198 thousand enterprises (equal to 70%).

(Insert Figure 1 here)

According to Decree No. 56/2009/ND-CP (2009), SMEs are divided into three levels: micro-sized enterprises, small-sized enterprises, and medium-sized enterprises based on the size of their total capital or the number of labourers annually (see appendix 1). Those enterprises have received support (e.g. access to credit, infrastructure, training activities) by the Vietnamese Government, the Vietnam Chamber of Commerce and Industry (VCCI), banking systems, and non-governmental organizations (NGO).

However, they still face numerous constraints such as low levels of supra-regional competitiveness, lack of well-trained workers, weak networking, poor infrastructure and lack of solid supporting industries (Tran, Le, & Nguyen, 2008), which could hinder their development. Based on several business environment indexes, it can be stated that there is a considerable potential in further improvements of the institutional quality. Vietnam current ease-of-doing-business rank is 82, and therefore comparable to China's. Similarly, its overall index of economic freedom is 54.2, with particular disadvantages in the area of judicial effectiveness and government integrity. Based on our findings, the authors recommended to improve the business environment as well as implementing firm-oriented policies (also see Hoang, 2016).

3. Literature Review on Networks and Firm's Performance

In the 1980s and early 1990s, research on social networks has been carried out in sociology (BarNir & Smith, 2002; Marsden, 1990). Networks can be systems, consisting of people or

things, in order to exchange information or develop personal or professional contacts. Networks play vital roles in many aspects: connecting people, transferring knowledge, enhancing business activities, etc.

Networks plays a crucial role in the development of SMEs (Joel A. C. Baum, Tony Calabrese, & Brian S. Silverman, 2000; Lechner et al., 2006). It can be defined as the personal relationships of owners or managers to individual suppliers, customers, business associations or the government officials. There is a growing body of literature on effects of networks in developing and transition countries. It is assumed to have larger effect on access to credit, access to resource or inputs, and access to markets (Blackwell & Winter, 1997; Fatoki & Odeyemi, 2010; Hung D. Pham, 2017; Li, Meng, Wang, & Zhou, 2008; O'Donnell, 2014; Petrik Runst, 2010; Watson, 2011). Firm owners rely on their networks for obtaining and exchanging information, as well as gaining social-economic supports. In addition, through networking firms can adopt technologies or innovations as well as reduce information asymmetry.

It is also hypothesized that if firms have larger networks they are more likely to display increased performance (Watson, 2007). As firm owners use their personal networks to contact stakeholders (customers or suppliers) and get better services (e.g., access to credit or information of modern technologies). Through networking, firms can enlarge their production scale. A strong network could potentially reduce transaction costs, thereby increase revenue or net income. In addition, it can play a role in reducing risks in markets. Blackwell and Winter (1997) pointed out that networking with bank officers helps firms reducing their costs of capital (lower interest rate). Le, Venkatesh, and Nguyen (2006) and Le (2013) also found a close network with banks help improving access to credit. The effect of networks on firm's performance also depends on types of firms. For instance, Acquah (2012) found that family owned firms and non-family owned firms get different benefits from network relationship with bureaucratic officials and politicians in Ghana. Similarly, Wu, Wu, and Rui (2012) and Li et al. (2008) also found political connection has a positive effect on firm value and performance in China. The literature on business networking is linked with the literature on development economics and institutional economics, since firm networking can overcome detrimental official rules or power structures (Méon & Weill, 2010).

(Insert Table 1 here)

Watson (2011) and Sue Birley (1985) categorized networks into 2 parts: (i) formal network including relationship with external accountants, banks, solicitors, industry associations, business consultants, tax officers; (ii) informal network such as relatives and friends, business contact. In the early stages of firm development, small firms' owners mainly rely on their informal network to search for funds. Curran, Jarvis, Blackburn, and Black Sharon (1993) classified networks of small businesses with four themes: the family and kindship, co-directors and partners, customers and the market, and investment or finance. From the literature, we can define that firm networks composed by the relationship with competitors, member of formal network organization, and personal contact of owners or managers as well as staffs. We paid more attention on the last four components to construct the networking indicators in our study.

In the Vietnamese context, Nguyen, Alam, Perry, and Prajogo (2009) found that networks of SMEs heavily depend on informal relationships and cultural characteristics which somewhat influence the SMEs' development. John Mcmillan and Christopher Woodruff (1999) examined the effect of trading relationship of firm in Vietnam, firms offer a larger credit to their partners for a longer relationship. Other studies also illustrated the role of networks in long-term development of firms (e.g., firm success or technical efficiency) (Santarelli & Tran, 2013; Viet Le & Charles Harvie, 2010).

There are several ways to quantify a firm's networks: network size (continuous variable), network intensity (time spent developing and maintaining business-related contact, see (Danis, Chiaburu, & Lyles, 2010), and network diversity (Carson, Gilmore, & Rocks, 2004). Network intensity and network diversity can be dummy or continuous variables. Lechner et al. (2006) found that the overall network size (e.g. the number of contacts across all types of networks) is less important for firm performance than the size of specific types of networks, i.e. the relational mix. Thus, our research contributes to the recent literature by examining the role of different network types on firm performance in Vietnam.

4. Research Methodology

4.1. Data collection

The data were obtained from the long-term survey of DANIDA Project in Vietnam. The survey was conducted by the Institute of Labor Science and Social Affairs (ILSSA), the Central Institute for Economic Management (CIEM), and Department of Economics of University of Copenhagen. The survey was distributed by more than 2,500 manufacturing SMEs in Vietnam. The data was collected in ten representative provinces and cities every two years, including Ho Chi Minh, Ha Noi, Hai Phong, Ha Tay¹, Quang Nam, Phu Tho, Nghe An, Khanh Hoa, Lam Dong, and Long An. For a geographic overview see the map in figure 2.

(Insert Figure 2 here)

Owners or representatives of SMEs were interviewed face to face, gathering information on firms characteristics, network characteristics and firm performance. The panel dataset includes five survey rounds from 2007 to 2015 with a total sample size 13,070 observations. The number of SMEs sorted by province and year is displayed in appendix 2.

In addition, we selected 1,173 firms have fully participated in 5 round-survey summing up to 5,865 observations to create a pure panel dataset. In each wave of the survey, bankrupt or over-developed enterprises (not SMEs anymore) were replaced by other enterprise in the same sector as well as same territory.

(Insert Table 2 here)

Table 2 shows the distribution of firms by ownership type. About 65% of firms are household businesses, 20.9% are limited liability companies and other types of firm ownership (e.g., private enterprise, cooperatives, Joint Stock Company) accounted for over 10%. For analyzing purpose, we re-categorized in two group based on firm legal status (household business and other firms). It is due to the fact that household businesses in Vietnam have smaller sizes compared to others. Another reason to reclassify is the trend of growing number of household business in many rural areas in Vietnam. Moreover, household businesses are significantly lower performing and all other types are insignificant.

Newman, Rand, Talbot, and Tarp (2015) used two-digit codes for manufacturing sectors to categorize firms. However, there are a small number of observations in several sectors,

¹ Ha Tay is now a part of Ha Noi since 2008

therefore we generate categories based on economic activities (see table 3). About 30% of all enterprises can be found in the largest sub-sector , i.e. food, beverages, and tobacco. Other sub-sectors are less common, for instance: wood, paper products, and painting (16.2%); basic metals (17.9%), furniture (6.43%), etc.

(Insert Table 3 here)

4.2 Model Specifications and Hypotheses

After summarizing descriptive statistics, we employ Pooled-OLS, and more importantly, Panel Data Techniques in order to analyse the relationship between selected independent variables and firm performance. We run several regressions to examine the relationship between performance outcomes and the main variables of interest (network variables) and other control variables.

$$Y_{it} = \lambda + \beta \text{Network type}_{it} + \sigma X_{it} + \mu D_{it} + \omega_i + \varepsilon_{it} \quad (1)$$

where X_i' is a vector of control variables comprising firm and owner characteristics. The year subscript t represents 2007, 2009, 2011, 2013 and 2015; ω_i captures unobserved heterogeneity and ε is the error term. Control variables (X_{it}) were measured at the firm and managerial levels including the log of the number of employees, firm age, year of education of owners. D_{it} is a vector of firm ownership dummies.

Firstly, we run pooled OLS regression to examine the relationship between variables. Later on, random effect (RE) and fixed effect (FE) models are employed. For RE models, the individual-specific effect (unobserved heterogeneity) is a random variable that is uncorrelated with the independent variables, whereas an FE specification is used when the two are correlated. Model choice depends on the results of a Hausman Test.

The following network types are analyzed: network with business people in the same sector; network with business people in the different sector; network with bank officials; network with politicians and civil servants. For each of them we generate a dummy variable, which is equal to zero if the manager or owner has zero contacts, and it is equal to one if more than zero contacts are available. We also generate a variable which records the number of

contacts in each network group. We replace outliers in terms of network size by mean value before regression since they do not affect our findings.

Since network size was measured by asking respondent to state how many people he or she has regular contact with, this method does not account for other nuances of networking (e.g. frequency of contact or intensity, duration of acquaintance, and network density). Lechner et al. (2006) found that the overall network size is less important than the size of specific types of networks. Thus, our study contributes to this more recent strand of the literature.

The correlation matrixes for all variables were created to explore the relationship between sets of variables using in the regressions. It was found that majority of the variables have both positive or negative correlation. For instance, number of labor force has the highest correlation with net income of the firm (0.49). The correlation could also identify collinearity within selected variables. Moreover, we tested the relationship between each of the selected independent variables for multicollinearity based on variance inflation factors (VIF).

Hypotheses:

Expansionary performance is positively affected by:

- H1: the existence and size of the network with business people in the same sector.
- H2: the existence and size of the network with business people in a different same sector.
- H3: the existence and size of the network with bank officials.
- H4: the existence and size of the network with politicians and civil servants.

In contrast, we do not expect that the non-expansionary performance measure (gross margin) is positively affected by networks.

Dependent Variables

All variables and their description can be found in table 4. According to Dhaliwal, Subramanyam, and Trezevant (1999) net income is an indicator strongly associated with the market value of equity and predicts future operating cash flows and income. Therefore, this study used net income as its first direct measure of firm performance. The second performance measure used in this study is gross margin (Otter et al., 2014). This is the ratio

of gross profits over total revenue. This performance measure must be interpreted with care as it captures the profit weighted by total revenue. In addition, we used four other variables for measuring firm performance: growth rate of revenue, growth rate of the number of employees, ROA and ROE. We tested for normality since some dependent variables are continuous and we control for outliers before running regressions.

While an increase in net income, the total employee growth rate, revenue growth, ROA and ROE represents an *expansionary* measure of success (increasing size and market share), the sixth measure, gross margin, is a measure of success related to companies close to the technological frontier. A company may increase sales by lowering prices, thereby expanding their market share. This strategy is to be expected in countries whose comparative advantage relates to low price production (*extensive* economic growth). The expansionary strategy can lead to revenue growth, a higher number of employees, and increased net income. However, an expansionary company may experience a growing total profit and a shrinking gross margin at the same time as per unit profits fall. In contrast, a high-tech company may not want to actively pursue a low prices/high sales strategy. Instead they may want to focus on the ratio of total profits to total revenue. Companies that focus on research and development are more likely to keep prices high and build up a reputation for innovative products instead. Overall, we expect expansionary measures of success to be more relevant to our research setting of small and medium sized companies in a developing country.

Independent Variables

Network variables were measured by asking respondents about the number of people that they currently have regular contact.

- How many businesses people in the same sector they regular talk to and share information with? (Within-sector-network)
- How many businesses people in a different sector they regular talk to and share information with? (Across-sector-network)
- How many bank officials (both formal and informal creditors) they have a close contact?
- How many politicians and civil servants they have a close contact?

Control Variables

We also control for age of company, the number of employees, whether the company has easy access to rail, survey year, ownership type, economic sector and education level of firm owner (see table 4).

(Insert Table 4 here)

5. Results and Discussions

5.1. Descriptive Statistics

We divided the sample into two groups according to firm ownership (household businesses and other type of firms) as mention before. Overall, household businesses are worse off than other company types (e.g., private enterprise, cooperative/partnership, limited liability companies, join stock company, and local state enterprise), both in terms of net income, network size, education level, and access to infrastructure. Most strikingly, household companies have a smaller likelihood of being connected to a source of finance and a politician or bureaucrat. The network size is lower for household businesses across all four types of networks. However, household businesses have slightly better performance outcomes such as gross margin, growth rate of revenue, growth rate of employee, ROA and ROE.

In regard to socio-economic characteristics, household businesses are older than other firms (16.3 and 11.4 yearolds), also the size of firms are much smaller (5.7 and 34.4 laborers).

(Insert Table 5 here).

Table 6 presents descriptive statistics of all variables used in the regression models from 2007 to 2015.

Net income is the excess of revenues over expense of a firm that is commonly used as a measurement of performance. On average, the net income of an individual firm was VND² 137,172,000 (USD 6,235; $\ln_{net} = 11.83$). The values of other outcome variables in total sample were: gross margin (0.21), growth rate of revenue (0.43) and growth rate of employee (0.019), ROA (0.30), and ROE (0.30). These descriptive results show that firms

² USD 1 = VND 22,000

experience increasing net incomes between 2007 and 2015 and mostly stagnant gross margins. Meanwhile, total revenue and the number of employees increase slowly.

On average, a firm keeps in touch with 5.5 business people in the same sector and a larger network of business people in different sectors with an average of 16.2. Meanwhile, the number of regular contacts for bank officials as well as politicians and civil servants is rather limited with 1 and 1.1 respectively. In the five year period, we can see that the average size of the four types of networks varies little.

Regarding firms and owners' characteristics, we measured the highest professional educational completed of respondents using dummy variables. On average, the number of employees in a firm is about 16 and the mean age of firms is about 14.5 years.

Regarding access to infrastructure, about 53.3% of all firms can easily access railways. In the period of 2007-2015, we observe an improving access to rail. Using dummies to measure the level of access to transport infrastructure, we expect the variable to have a positive influence on firm performance.

(Insert Table 6 here)

5.2. Regression Results

We illustrate the regression results for our dummy network variables together with the continuous network variables are displayed in table 7 and table 8. The network-dummy specifications (table 7) shed light on the performance effects of the *existence of a network*. In other words, does the existence of at least one contact in each type of network affect outcomes? On the other hand, the continuous network variables (table 8) captures the effects of *network size* on performance instead.

Each column investigates the performance determinants for one of our six outcome variables described above (log of net income, gross margin, growth in revenues, employee growth, ROA, and ROE). Based on Hausman Tests (Chi(2)) we select a fixed effects (FE) model for all regressions.

(Insert Table 7 here)

In table 7, the coefficient for the dummy "within-sector-network" displays a positive and statistically significant effect on growth of employee and negative effect on net income and

gross margin. Having a within-sector-network increase the growth rate of employees by 5.7% but lowers log income by 6%. Lechner et al. (2006) found that relationships with direct competitors have a significantly positive influence on firm development. In contrast, our results are mixed, and therefore inconclusive.

On the other hand, having a connection with business people in a different sector exerts a positive and significant effect on firm performance, for instance net income increases by almost 12.3 percentage points and the ROA and ROE increase by almost 8.7 and 11 percentage points respectively.

If there is at least one connection with a bank official, growth of revenue increases by 8.4 percentage points. Theoretically, a relationship with banks may help enterprises to obtain credit. This finding is similar to earlier research showing that the relationship with banks increases the likelihood to access credit (Blackwell & Winter, 1997; Hung D. Pham, 2017; Le, 2013; Le et al., 2006).

The existence of a political network increases net income by 4 percentage points, growth rate of revenue by 11.6%, and growth of employee by 2.7%. This result is in line with previous studies (Li et al., 2008; Wu & Chen, 2012)

However, the existence of three out of four network types has a negative impact on gross margin. The existence of a within-sector-network reduces gross margin by 1.2 percentage points. The existence of a bank-official-network lowers it by 1.4 percentage points, and the existence of a political network lowers it by nearly 0.9 percentage point. As we have stated above, gross margin is the only variable which does not belong to the category of an *expansionary* firm strategy (*extensive* growth), where prices fall and output increases. Instead, the gross margin relates to intensive growth driven by technological advances, which is arguably not the case for most of our sample.

Overall, the results in table 7 lend solid support to hypotheses H2 and H4, while there is some support for H3. Based on the findings we can acknowledge the important role of political networks and networks with people in a different sector in improving firm performance.

Moreover, we found some control variables such as firm age, total labor force of enterprise, firm ownership, firm sector and professional education level significantly influencing firm performance.

Furthermore, we also run regression in which *network size* is used as our main variable of interest (table 8). Overall, the size of the across-sector-network and the size of the political network have a positive and significant impact on expansionary firm performance. If the size of an across-sector-network increases by one, net income increases by 0.24 percentage points, employee growth increases by 0.12 percentage points. If the size of a political network increases by one, net income increases by 3.2 percentage points and revenue growth increases by 5.3 percentage points. Thus, the quantitative impact of political network size is larger than the quantitative impact of the across-network size. Overall, our results are very similar with the regression using dummy variables, lending support to hypothesis H2 and H4.

(Insert Table 8 here)

5.3. Testing for Multicollinearity

As mentioned earlier, we tested for multicollinearity using VIF before running all regressions. As showed in table 9A & 9B, VIFs range from 1.04 to 1.36 that are below threshold of 10 (Hair, Tatham, Anderson, & Black, 1998). There are no biased by the presence of severe multicollinearity in any regression.

(Insert Table 9A here)

(Insert Table 9B here)

6. Conclusions and Policy Implications

The paper analyzed factors influencing firms' performance using the unbalanced panel dataset from the survey in Vietnam with a sample of more than 2,500 firms. SMEs are very important for long-term development of the developing countries, particularly in Vietnam. In most country, firms play a role as a main driver of growth rate and sustainability. For development of SMEs, networks play a crucial role in their business, especially to get information from their partners and from the market in order to make a right decision. Firms have several types of networks, for instance: network with business people in the same sector, in a different sector, network with customers, or network with bank or societies. However, not every network type has the same effect on firm performance. Also, the existence and size of each type of network depends on the owners or managers' strategy.

Many firms strive to diversify their networks not only with other business people but also politicians and credit officers, meanwhile others only invested in specific network.

We contribute new insights to our understanding of the factors influencing SME performance (e.g. net income, gross margin, growth rate of revenue, growth rate of employee, ROA and ROE) in developing countries by using panel data from Vietnam. We focus on the role of different types of networks. We find that the four types of networks have different effect on firm performance measurement. It also depends on the Vietnamese context where SMEs are paying more attention on building their networks in order to improve firms performance. Other control variables (firm age, total labor force of enterprise, firm ownership, firm sector and professional education level) significantly influence firm performance. These results are in line with the previous studies on the role of networks (Acquaah, 2012; Le & Nguyen, 2009; Lechner et al., 2006; Watson, 2007). One of the most interesting findings is the role of network with politicians or civil servants in improving firm performance, that is similar to the results from studies by Wu et al. (2012) and Li et al. (2008).

In order to improve performance, firm owners invest in building their networks. Firm owners reduce price for their close partners. On the one hand, it might lead to a lower profit per unit. In this manner, the enterprise most likely sells more products, resulting in higher total profits. Relatively more successful owners build up the relationship with at least one firm in the same sector, and at least one bank. In addition, relatively more successful firms build up relationships with people in a different manufacturing sector as well as with politicians/civil servants.

Further research should aim at measuring networks in more detail, for instance, the diversity of networks or network ties. It is important to know how firm owners use their networks to exchange information such as frequency and importance of the exchanged information within the networks and its effect on firm performance.

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Table 1: Benefits of SME-Networks

Network Type	Potential Benefits	Literature
General, Multiple	Multiple	Watson (2007); O'Donnell (2014); Lechner et al. (2006); Santarelli and Tran (2013); Petrik Runst (2010); Nguyen et al. (2009);
Within-Sector-Networks	Production Cooperation	Lechner et al. (2006); Joel A. C. Baum et al. (2000);
Across-Sector and Customer Networks	Input Procurement, Sales of Intermediate or Final Products, Informal Credits through Customer Relationships	Petrik Runst (2010); McMillan and Woodruff (1999); Lechner et al. (2006)
Bank Officials	Access to Finance, Reduces Interest Rates (Overcoming Asymmetric Information Problems)	Le et al. (2006); Le (2013); Blackwell and Winter (1997); Lechner et al. (2006); Fatoki and Odeyemi (2010); Hung D. Pham (2017)
Bureaucrats and Politicians	Circumventing official rules; Gaining Information	Acquaah (2012); Petrik Runst (2010); Méon and Weill (2010); Li et al. (2008); Wu et al. (2012)
Other	Gender effects	Watson (2011)

Table 2: Category SMEs Based on Ownership (Pooled Sample)

Order	Firm ownership	Absolute number	Percent	Cum.
1	Household business	8,442	64.59	64.59
2	Private enterprise	1,002	7.67	72.26
3	Cooperative/Partnership	376	2.88	75.13
4	Limited liability companies	2,731	20.90	96.03
5	Joint stock company	515	3.94	99.97
6	Local state enterprise	4	0.03	100.00
Total		13,070		

Source: DANIDA Survey, Authors' calculation

Table 3: Category SMEs Based on Manufacturing Sector (Pooled Sample)

Order	Firm sector	Absolute number	Percent	Cum.
1	Manufacture of food, beverages, tobacco products	3,845	29.42	29.42
2	Manufacture of wood, paper products, and printing	2,112	16.16	45.58
3	Manufacture of coke and refined petroleum, chemical, rubber, plastics, and other non-metallic mineral products	1,579	12.08	57.66
4	Manufacture of basic metals and fabricated metal products	2,341	17.91	75.57
5	Manufacture of furniture	840	6.43	82.00
6	Manufacture of other products	2,061	15.77	97.77
7	Others	292	2.23	100.00
Total		13,070		

Source: DANIDA Survey, own calculation

Table 4: Variables, Measures and Expected Sign of Influence on Firm Performance

Variables	Measures	Expected signs
1 Dependent variables		
Innet	Natural logarithm of net profit	
gross_margin	Gross profit / Revenue	
growth_revenue	$(Revenue_t - Revenue_{t-1}) / Revenue_{t-1}$	
growth_emp	$(Employee_t - Employee_{t-1}) / Employee_{t-1}$	
ROA	Return / total assets	
ROE	Return / total equity capital	
2 Main independent variables		
d_same_sector	Dummy network with business people in the same sector	+
d_diferent_sector	Dummy network with business people in diferent sector	+
d_bank_officials	Dummy network with bank officials	+
d_politicians	Dummy network with politicians and civil servants	+
net_same_sector	Network size with business people in the same sector	+
net_diferent_sector	Network size with business people in diferent sector	+
net_bank_officials	Network size with bank officials	+
net_politicians	Network size with politicians and civil servants	+
3 Control variables		
firmage	Age of firm in years	
employees	Total labor force of enterprise	
access_rail	Easy access to rail	
year of survey	Year of survey (2007; 2009; 2011; 2013 and 2015)	
firm ownership	Firm ownership (household business; private enterprise; cooperative/ partnership; limited liability companies; joint stock company; local state enterprise)	
firm sector	Economic sector of firm (see table 3)	
owner education	Education level of owner (no_certificate; vocational; advanced_vocational; college degree; university degree)	

Table 5: Descriptive Statistics from Pooled Sample (by firm ownership)

Variables	Other firms	Household business	Differences
Innet	12.813	11.285	1.53 ^{***}
gross_margin	0.171	0.235	-0.06 ^{***}
growth_revenue	0.404	0.445	-0.04 [*]
growth_emp	0.001	0.028	-0.03 ^{**}
ROA	0.220	0.339	-0.12 ^{***}
ROE	0.227	0.345	-0.12 ^{***}
d_same_sector	0.929	0.898	0.03 ^{***}
d_diferent_sector	0.970	0.970	0.00
d_bank_officials	0.643	0.425	0.22 ^{***}
d_politicians	0.715	0.562	0.15 ^{***}
net_same_sector	6.456	4.998	1.46 ^{***}
net_diferent_sector	17.786	15.267	2.52 ^{***}
net_bank_officials	1.472	0.784	0.69 ^{***}
net_politicians	1.375	0.970	0.40 ^{***}
firmage	11.351	16.286	-4.93 ^{***}
employees	34.445	5.739	28.71 ^{***}
access_rail	0.645	0.472	0.17 ^{***}
<i>N</i>	4,628	8,442	

Note: ^{*} $p < 0.10$, ^{**} $p < 0.05$, ^{***} $p < 0.01$

Table 6: Descriptive Statistics from Pooled Sample

Variables	Full sample				2007		2009		2011		2013		2015	
	Min	Max	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
<i>Dependent variables</i>														
Innet	8.0	16.9	11.826	1.396	11.357	1.408	11.703	1.431	11.958	1.369	12.049	1.316	12.073	1.318
gross_margin	-0.2	1.0	0.212	0.119	0.224	0.136	0.205	0.110	0.216	0.123	0.207	0.098	0.207	0.123
growth_revenue	-1.0	5.0	0.431	1.034	.	.	0.680	1.200	0.499	1.060	0.257	0.930	0.294	0.859
growth_emp	-1.0	2.0	0.019	0.502	.	.	0.026	0.518	0.009	0.515	-0.004	0.493	0.044	0.481
ROA	-4.8	3.0	0.297	0.433	0.314	0.453	0.315	0.421	0.277	0.420	0.280	0.447	0.298	0.421
ROE	-2.0	3.0	0.303	0.478	0.307	0.500	0.323	0.499	0.280	0.458	0.289	0.472	0.316	0.459
<i>Independent variables</i>														
d_same_sector	0.0	1.0	0.909	0.287	0.857	0.351	0.948	0.223	0.928	0.259	0.925	0.263	0.890	0.313
d_diferent_sector	0.0	1.0	0.970	0.171	0.939	0.240	0.923	0.266	0.998	0.044	0.996	0.062	0.995	0.073
d_bank_officials	0.0	1.0	0.502	0.500	0.465	0.499	0.571	0.495	0.451	0.498	0.534	0.499	0.489	0.500
d_politicians	0.0	1.0	0.616	0.486	0.553	0.497	0.635	0.481	0.550	0.498	0.666	0.472	0.676	0.468
net_same_sector	0.0	29.0	5.514	5.159	5.309	5.244	6.251	5.655	4.897	4.421	5.781	5.234	5.313	5.038
net_diferent_sector	0.0	69.0	16.159	12.084	14.540	12.245	14.545	11.861	15.946	11.401	17.732	11.513	18.065	12.843
net_bank_officials	0.0	6.0	1.029	1.341	0.901	1.233	1.173	1.378	0.893	1.265	1.143	1.425	1.030	1.368
net_politicians	0.0	4.0	1.114	1.099	1.009	1.113	1.203	1.147	0.976	1.067	1.175	1.068	1.203	1.073
<i>Control variables</i>														
firmage	2.0	59.0	14.538	10.021	13.312	10.227	14.509	11.340	13.350	9.280	15.538	9.862	15.961	8.899
employees	1.0	300.0	15.903	30.077	17.137	31.456	17.004	29.690	15.758	29.649	14.724	28.685	14.853	30.719
access_rail	0.0	1.0	0.533	0.499	0.377	0.485	0.579	0.494	0.512	0.500	0.577	0.494	0.621	0.485
N	13,070				2,635		2,659		2,552		2,575		2,649	

Source: Authors' calculation

Table 7: Effects of Availability of Network Types on Firm Performance

VARIABLES	FE 1 Innet	FE 2 gross_margin	FE 3 growth_revenue	FE 4 growth_emp	FE 5 ROA	FE 6 ROE
dummy network with business people in the same sector	-0.05942* (0.03273)	-0.01165*** (0.00425)	0.04092 (0.05662)	0.05721** (0.02841)	-0.01351 (0.01633)	-0.01457 (0.01812)
dummy network with business people in a different sector	0.12294** (0.05911)	0.00329 (0.01074)	-0.08421 (0.11748)	-0.07659 (0.05437)	0.08726*** (0.03286)	0.11054*** (0.02748)
dummy network with bank officials	0.01076 (0.02106)	-0.01440*** (0.00262)	0.08484** (0.03753)	0.02179 (0.01791)	-0.01260 (0.00979)	-0.01642 (0.01089)
dummy network with politicians and civil servant	0.04127** (0.02045)	-0.00927*** (0.00248)	0.11556*** (0.03508)	0.02735* (0.01640)	-0.00791 (0.00900)	0.00323 (0.01000)
firm age (in years)	-0.00037 (0.00159)	-0.00051** (0.00025)	0.00771** (0.00336)	0.00118 (0.00148)	-0.00010 (0.00068)	-0.00071 (0.00077)
total labor force of enterprise	0.00833*** (0.00116)	0.00002 (0.00007)	0.00697*** (0.00135)	0.00711*** (0.00089)	0.00080*** (0.00028)	0.00045 (0.00032)
easy access to rail	-0.03146 (0.02263)	-0.01220*** (0.00271)	0.05943 (0.04188)	-0.02249 (0.02051)	0.00564 (0.00988)	-0.00071 (0.01160)
year of survey	yes	yes	yes	yes	yes	yes
firm ownership	yes	yes	yes	yes	yes	yes
firm sector	yes	yes	yes	yes	yes	yes
owner education	yes	yes	yes	yes	yes	yes
Constant	10.96672*** (0.12884)	0.24699*** (0.01638)	0.30258 (0.20843)	-0.12703 (0.11038)	0.25765*** (0.06365)	0.23919*** (0.05254)
Observations	12,979	12,980	8,379	8,379	12,980	12,980
R-squared	0.11455	0.02182	0.04858	0.04340	0.01712	0.01173
Hausman test (Chi2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of firm_ID	4,602	4,602	3,278	3,278	4,602	4,602

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 8: Effects of Network Size Variables on Firm Performance

VARIABLES	FE 7 lnnet	FE 8 gross_margin	FE 9 growth_revenue	FE 10 growth_emp	FE 11 ROA	FE 12 ROE
networksize with business people in the same sector	-0.00005 (0.00195)	0.00035 (0.00024)	0.00089 (0.00329)	0.00230 (0.00160)	-0.00195*** (0.00075)	-0.00088 (0.00092)
networksize with business people in a different sector	0.00239*** (0.00083)	-0.00018* (0.00009)	0.00123 (0.00136)	0.00117* (0.00066)	0.00043 (0.00037)	0.00044 (0.00042)
networksize with bank officials	-0.00539 (0.00864)	-0.00516*** (0.00096)	0.02100 (0.01346)	0.00010 (0.00672)	-0.00288 (0.00354)	0.00114 (0.00415)
networksize with politicians and civil servant	0.03162*** (0.00961)	-0.00211* (0.00111)	0.05343*** (0.01600)	0.01054 (0.00739)	0.00420 (0.00369)	0.00489 (0.00436)
firm age (in years)	-0.00064 (0.00158)	-0.00051** (0.00025)	0.00793** (0.00331)	0.00139 (0.00147)	-0.00025 (0.00067)	-0.00095 (0.00077)
total labor force of enterprise	0.00831*** (0.00116)	0.00002 (0.00007)	0.00702*** (0.00135)	0.00712*** (0.00089)	0.00077*** (0.00028)	0.00042 (0.00032)
easy access to rail	-0.03134 (0.02262)	-0.01239*** (0.00273)	0.05601 (0.04160)	-0.02545 (0.02043)	0.00692 (0.00977)	0.00183 (0.01151)
year of survey	yes	yes	yes	yes	yes	yes
firm ownership	yes	yes	yes	yes	yes	yes
firm sector	yes	yes	yes	yes	yes	yes
owner education	yes	yes	yes	yes	yes	yes
Constant	10.99731*** (0.10839)	0.23694*** (0.01244)	0.24604 (0.16676)	-0.17257* (0.09391)	0.32427*** (0.05219)	0.32317*** (0.04226)
Observations	12,979	12,980	8,379	8,379	12,980	12,980
R-squared	0.11556	0.01906	0.04827	0.04280	0.01623	0.01006
Hausman test (Chi2)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Number of firm_ID	4,602	4,602	3,278	3,278	4,602	4,602

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9A: Collinearity Tests (using dummies for network type)

Variables	VIF	1/VIF
d_same_sector	1.04	0.959
d_diferent_sector	1.07	0.933
d_bank_officials	1.12	0.890
d_politicians	1.1	0.908
firmage	1.16	0.860
employees	1.36	0.734
access_rail	1.09	0.917
year of survey	yes	yes
firm ownership	yes	yes
firm sector	yes	yes
owner education	yes	yes

Notes: Control for dummies of year of survey, firm ownership, firm sector and owner education; VIF, Variance inflation; 1/VIF, Tolerance.

Table 9B: Collinearity Tests (using network size)

Variables	VIF	1/VIF
net_same_sector	1.06	0.941
net_diferent_sector	1.08	0.930
net_bank_officials	1.18	0.848
net_politicians	1.12	0.891
firmage	1.15	0.870
employees	1.37	0.731
access_rail	1.08	0.925
year of survey	yes	yes
firm ownership	yes	yes
firm sector	yes	yes
owner education	yes	yes

Notes: Control for dummies of year of survey, firm ownership, firm sector and owner education; VIF, Variance inflation; 1/VIF, Tolerance.

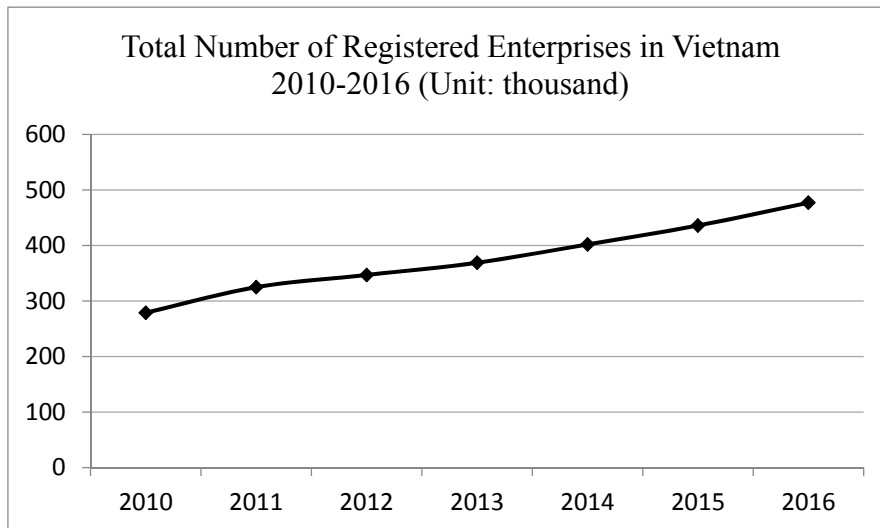


Figure 1: The Development of Enterprise in Vietnam (GSO, 2016)

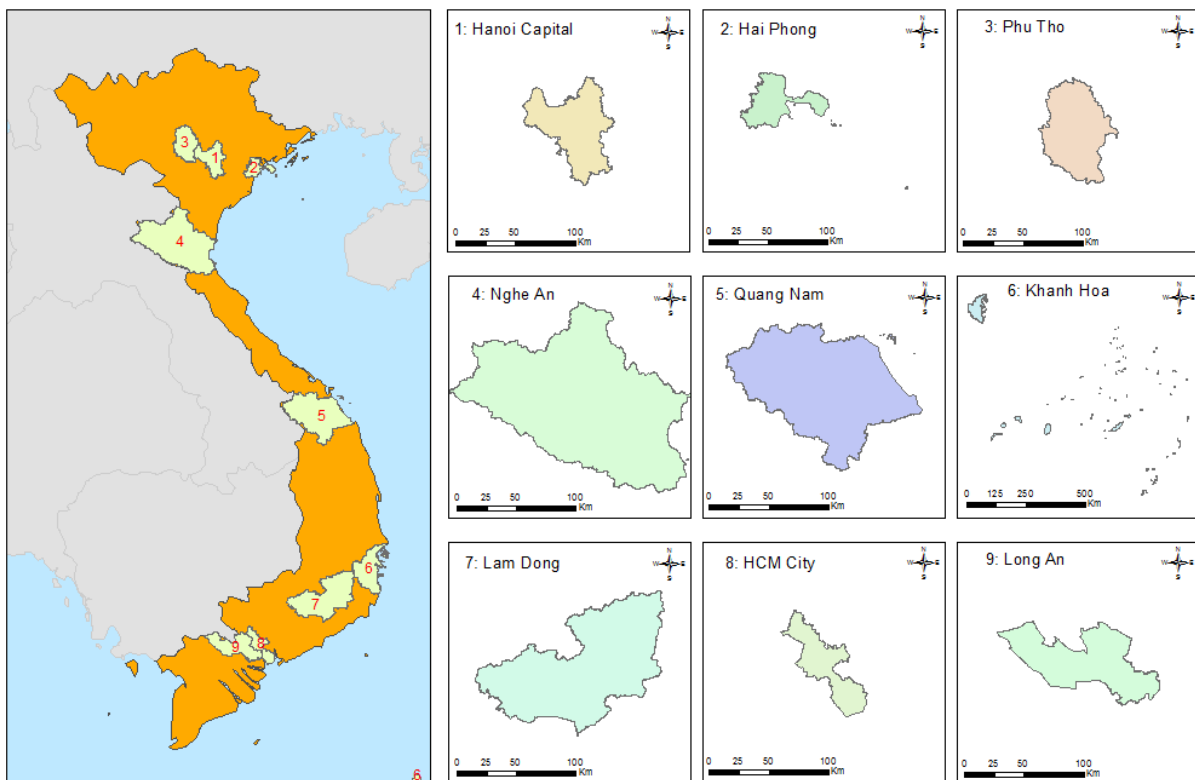


Figure 2: Map of Vietnam (left) and the Surveyed Provinces (right)

Source: <http://www.mapsofworld.com>

Appendix 1: The Definition of SME in Vietnam

Type of firm	Number of employees	Total capital
Micro	1-10	
Small	11-200	Maximum VND 20 billion (USD 900,000)
Medium	201-300	VND 20 - 100 billion (USD 4.5 million)

Source: Decree No.56 (2009)

Appendix 2: Number of SMEs Surveyed 2007-2015

Province/City	2007	2009	2011	2013	2015
Ha Noi	279	279	270	285	296
Phu Tho	242	257	252	259	254
Ha Tay	381	371	340	347	371
Hai Phong	194	208	205	190	219
Nghe An	349	352	349	347	340
Quang Nam	154	151	158	167	171
Khanh Hoa	86	93	97	90	99
Lam Dong	81	67	78	88	92
Ho Chi Minh	602	603	574	622	653
Long An	124	127	126	136	133
Total	2,492	2,508	2,449	2,531	2,628

Source: CIEM and DANIDA surveys, 2007-2015