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Social networks, geographic proximity, and firm performance in Viet Nam

Emma Howard*

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Abstract: This paper uses panel data to assess the relative importance of social networks and geographic proximity to micro, small, and medium enterprises in Viet Nam. The results suggest that a larger social network, and hiring employees mainly through social networks, are both correlated with higher value added per worker. The number of government officials and civil servants in a firm's network emerges as particularly important. When the quality of contacts is controlled for, firms with tighter social networks have, on average, higher value added per worker. The analysis of spatial networks reveals that firms with a lower percentage of customers and suppliers in the same district actually have higher value added per worker. The results suggest that for micro, small, and medium firms in Viet Nam, strong social networks are much more important than geographic proximity.

Keywords: social networks, geographic proximity, manufacturing firms, Viet Nam
JEL classification: L14, L20, D22

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* Mansfield College, University of Oxford, emma.howard@mansfield.ox.ac.uk

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Information and requests: publications@wider.unu.edu

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Katajanokanlaituri 6 B, 00160 Helsinki, Finland

1 Introduction

The geographic concentration of manufacturing activity and the resulting agglomeration economies have long been recognized as an important mechanism for facilitating industrial growth (Krugman 1991). There is growing empirical evidence from developing countries of the positive benefits associated with agglomeration (Deichmann et al. 2008; Bigsten et al. 2011; Howard et al. 2014). Knowledge spillovers are likely to play a particularly important role in a developing country context, where firms are operating far from the best practice frontier. For example, recent research suggests that they are the most important agglomerative force in Viet Nam (Howard et al. 2016).

The importance of geographic proximity for the sharing of knowledge has been a central assumption in conducting research into spillovers and knowledge transfers. However, technology such as the internet has changed how knowledge is shared, and the relevance of geographic distance has been questioned by many researchers (Zook 2000; Rodriguez-Pose 2011). Reconciling this set of issues, there is growing consensus that geographic proximity should not be assessed in isolation but in relation to other dimensions of proximity (Boschma 2005). The social capital of a firm, in terms of the strength of its position within a social network, is a dimension of knowledge transfer that needs to be explored, in addition to its geographic position within a spatial network.

Social networks may have particular importance for small firms in a developing country context. A number of empirical studies have found that strong social networks benefit this type of enterprise. Fafchamps and Minten (2002) find that larger networks are associated with higher value added for agricultural traders in Madagascar. Barr (2000) finds that small-scale manufacturing firms in Ghana with larger social networks are more productive. Using data from Kenya and Zimbabwe Fafchamps (2000) finds that network effects are a key determinant of access to credit for manufacturing firms.

Growth theory stresses the importance of knowledge as a key driver of productivity and economic growth. Similarly, knowledge spillovers play an important role in firm performance, and there is increasing empirical evidence that firms in developing countries benefit from locating in geographic clusters. However, this may be only part of the story. This paper addresses key issues centred on geographic clusters and social networks and how these influence firm performance. Industrial policy in many developing countries has been to foster and encourage geographic clusters. However, encouraging social networks may be as, or more, important. It may actually be the case that geographic proximity is only important when strong social network links are also present. This would have important policy implications. For example, Bessant et al. (2012) develop the policy option of learning networks that seek to mobilize shared learning between firms.

This paper uses panel survey data on both formal and informal (unregistered) small, micro, and medium enterprises to assess the relative importance of strong spatial and social networks in Viet Nam. A priori one might expect very different conclusions from those found in existing empirical work on agglomeration in Viet Nam, where data have included only registered enterprises (for example, Howard et. al. 2014).

The results suggest that larger social networks are correlated with higher value added per worker. However, for firms that are members of a business association and may therefore have more valuable contacts, a tighter social network is associated with higher value added per worker. Spatial networks emerge as relatively less important to firms than social networks, and there are surprising results for the geographic proximity of suppliers and customers. More suppliers or customers located in the same district is correlated with lower value added per worker. This suggests that

customers who buy from firms on the basis of geographic proximity, or firms who select suppliers using the same criteria, do so for convenience rather than because of the quality of products.

The remainder of the paper is organized as follows. Section 2 describes the data and details the social network measures, spatial network measures, and other explanatory variables used in the analysis. Section 2 also presents the empirical approach. Section 3 presents and discusses the results of the analysis, while Section 4 concludes the paper.

2 Data and empirical approach

The data is from an enterprise survey conducted in 2011, 2013, and 2015 by UNU-WIDER in collaboration with two Vietnamese partners: the Central Institute for Economic Management (CIEM) and the Institute of Labour Science and Social Affairs (ILSSA). The survey was administered to micro, small, and medium private manufacturing firms located in nine Vietnamese provinces.[1] The panel is unbalanced: 2,512 firms were surveyed in 2011, 2,541 firms in 2013, and 2,648 firms in 2015. The total number of observations is 7,701 and 2,478 firms were surveyed at least twice. Both formal and informal (unregistered) firms were included in the survey. Stratified sampling was used to ensure an adequate number of formal enterprises in each province with different ownership forms. However, the informal firms included are not representative of the informal sector as a whole, as the sampling scheme used covers only part of the informal sector.[2] The firms are distributed across 20 sectors, 30 per cent operating in the food and beverage sector. The majority are household firms (63 per cent) and, of these, 23 per cent are informal firms. The mean number of employees is 16 with a standard deviation of 39.23.

2.1 Empirical approach

In order to investigate the impact of social and spatial networks on firm outcomes, the following model is estimated using fixed effects:

$$Y_{it} = \boldsymbol{X_{it}}\beta_{\mathbf{1}} + \alpha_i + \phi_t + \varphi_t + \tau_t + u_{it} \quad (1)$$

The dependent variable Y_{it} is the log of value added per worker for firm *i* at time *t*.[3] The vector $\boldsymbol{X_{it}}$ includes measures of the strength of the social and spatial networks of firm *i* at time *t*, a number of firm-level controls, and owner/manager level controls. Time invariant characteristics of firms are captured by the firm fixed effects, α_i. Sector dummies, ϕ_t, control for changes in sectors over time. Similarly, province dummies, φ_t, control for changes in provinces over time, for example

[1] The nine provinces in which the survey was carried out are Hanoi, Hai Phong, Ho Chi Minh City, Phu Tho, Nghe An, Quang Nam, Khanh Hoa, Lam Dong, and Long An. Enterprises are classified as micro, small, medium, and large according to the current World Bank definition. Micro enterprises have up to 10 employees, small-scale enterprises up to 50 employees, medium-sized enterprises up to 300 employees, and large enterprises over 300 employees.

[2] The population of non-state manufacturing enterprises in the selected provinces is based on two data sources from the General Statistics Office of Viet Nam (GSO): The Establishment Census from 2002 and the Industrial Survey 2004–2006. The sampling scheme of the survey for informal firms is based on the GSO business censuses and surveys.

[3] The analysis was also conducted using profit per worker and revenue per worker as dependent variables and the results were consistent with those presented in this paper.

changes in regulation or infrastructure.[4] Survey year fixed effects are captured by the time dummy τ_t and u_{it} is the error term. Standard errors are clustered at the firm level in all specifications of the model.

Using firm fixed effects estimation controls for unobserved heterogeneity across firms, such as differences in business practices, and for changes across time that are common to all firms, such as fluctuations in the economy or consumer demand.

Sections 2.2 to 2.4 describe the independent variables used in the analysis and present summary statistics.

2.2 Social network measures

A number of questions are included in the surveys relating to social networks:

1. Approximately how many people do you currently have regular contact with? Of these, how many are: business people in the same sector; business people in a different sector; bank officials; politicians and civil servants?
2. How many of your contacts are suppliers to your firm?
3. How many of your contacts are customers of your firm?
4. How does the enterprise identify suppliers?
5. What are the main criteria in selecting suppliers?
6. How does the firm mainly hire workers?
7. Is the firm a member of a business association?

Table 1 summarizes the answers given to question 1. The majority of firms have a small number of contacts in the same sector, while for most their most numerous contacts are business people in other sectors.

Table 1: Size of social networks

	Size of network			
Contacts	0–4	5–9	10–19	20+
Same sector	55.0%	24.3%	14.3%	6.4%
Different sector	10.2%	18.1%	31.5%	40.2%
Bank officials	50.3%	18.9%	15.0%	15.8%
Politicians	36.6%	25.0%	21.2%	17.2%

Source: Author.

The mean number of contacts that are suppliers to firms is 7.13 with a standard deviation of 22.7. Perhaps unsurprisingly, the mean number of contacts that are customers of firms is higher: 21.5, with a standard deviation of 34.4.

Social networks are clearly utilized by firms to identify suppliers; 39 per cent of firms report that the most important way they identify suppliers is through personal contacts. However, once suppliers have been identified, only 1.7 per cent report that the main criterion they use to select a

[4] Some of these changes are captured by firm fixed effects, but as there are firms that change province and sector over time, province and sector dummies are included. The results when the model is estimated without these dummies are consistent with those presented in this paper.

supplier is that they know them personally. Most firms report that competitive price is the main criterion they use in selecting suppliers.

Social networks are also utilized by firms when hiring workers; 60 per cent of firms hire workers mainly through personal contacts, or through recommendations by friends, relatives, or other workers.

Finally, perhaps because the majority of firms are household enterprises, only 8 per cent of firms are members of a business association.

The answers to these questions are used to construct a number of measures of the strength of a firm's social network. First, the answers to questions 1 to 3 are used to measure the size of the firm's social network. The answers to questions 2 and 3 simply measure the size of the firm's network of suppliers and customers, respectively. The answers to question 1 result in five measures that are used in the analysis; the network size of each of the four categories of contacts, and the total network size. As illustrated in Table 1, the numbers of contacts reported by the firm are categorical and there are four categories. Therefore, each category network size ranges from 1 to 4. The total network size measure ranges from 4 to 16: where 4 represents a firm that has 0–4 contacts in all four categories, and 16 represents a firm that has 20+ contacts in all four categories. These categorical network size measures are standardized in the regression analysis, so that they have a mean of 0 and a standard deviation of 1, for ease of interpretation.

Second, the answers to questions 4 to 7 are used to construct a number of dummy variables that indicate that firms utilize social networks to some extent. Based on the answers to question 4, a dummy variable is included that takes the value 1 if a firm identifies suppliers through social contacts and 0 otherwise. Similarly, based on the answers to question 5, a dummy variable is included that takes the value 1 if a firm's main criterion in selecting suppliers is that they know the supplier personally and 0 otherwise. A dummy variable based on the answers to question 6 takes the value 1 if the main way the firm hires workers is through social networks, and 0 otherwise. Finally, a dummy variable is included that indicates whether the firm is a member of a business association.

2.3 Spatial network measures

A number of questions are included in the surveys relating to spatial networks:

1. Where are customers of the most important product (in terms of value) located?
2. What is the distance to your main customer in km?
3. What is the distance to your main supplier in km?
4. Where did the enterprise procure its raw materials and other inputs in 2014?

On average, firms are located closer to their customers than to their suppliers. The mean distance to the main customer is 40.7 km, while the mean distance to the main supplier is 50.2 km. The standard deviations are 205.4 km and 250.3 km, respectively.

The answers to questions 1 and 4 are given in terms of geographic area rather than exact distance. There are three levels of geographic/administrative areas in Viet Nam; communes, districts, and provinces. Provinces are the largest (there are 63 provinces), while communes are the smallest.

The mean percentage of customers located in the same commune as the firm is 28.2 per cent, with a standard deviation of 32.2 per cent. The mean percentage of customers located in the same district as the firm is similar: 28.7 per cent, with a standard deviation of 25.9 per cent. The mean

for suppliers located in the same commune as the firm is 18.3 per cent, with a standard deviation of 28.1 per cent. The mean for suppliers located in the same district as the firm is higher: 46.7 per cent, with a standard deviation of 35.2 per cent.

The answers to these four questions are used in the analysis to measure the strength of firms' spatial networks. For questions 1 and 4 the percentages of customers/suppliers in the same commune and in the same district are used, so in total there are 6 spatial network measures.[5] The shorter the distance to the main supplier/customer, the stronger the spatial network. Similarly, the higher the percentage of customers/suppliers in the same commune/district as the firm, the stronger the spatial network.

2.4 Controls

A number of controls are included in the analysis. Firm-level controls include the size of the firm (in terms of the number of employees), dummy variables to indicate whether the firm is a household firm; whether it is informal/unregistered; and whether it is innovative. The firms' level of innovation is potentially an important factor in their value added. A number of questions regarding innovation are included in the survey. Firms are asked if they have introduced new product groups since the last survey; if they have improved existing products since the last survey; and if they have introduced new technologies since the last survey. The innovation dummy takes the value 1 if the firm answers yes to any of these questions, and 0 otherwise; 33 per cent of firms report that they have engaged in some innovative process.

A number of controls are also included at the owner/manager level. These include their gender (a dummy variable that takes the value 1 if they are male and 0 if they are female); their age; and their education level. The majority (61 per cent) of owners/managers are male. Their average age is 46 years old, with a standard deviation of 11 years. Education level ranges from 0 (unskilled) to 3 (College/University/Postgraduate); the mean level of education is 1.8, with a standard deviation of 0.9.

A common criticism of empirical work using geographic distance and/or geographic areas is that these measures do not always capture, for example, the ease of transporting goods from suppliers to the firm, or to customers from the firm. This may be even more pertinent in a developing country context, where access to transport links may vary greatly across firms and regions. In order to control for this, two dummy variables are included in the analysis that indicate whether the firm has access to a rail network and to paved roads. Firms are asked if there is a main (paved) road leading to the firm; if they answer yes, the dummy variable takes the value 1, and 0 otherwise. Firms are also asked if they have easy access to a rail network; the dummy variable takes the value 1 if they answer yes to this question, and 0 otherwise. Eighty-two per cent of firms report that there is a main road leading to the firm, while 57 per cent report easy access to a rail network.

Finally, sector, survey year, and province dummies are included in all specifications of the model.[6]

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[5] Province dummies are used in all specifications of the model.

[6] These dummies are not necessary with fixed effects when firms do not change sector or province over time. However, a large number of firms (1,102) changed sectors between survey years. Only 21 firms moved province over the time period, but the inclusion of province dummies controls for this. The models are also estimated without sector or province dummies and the results are consistent with those presented in this paper.

3 Results

3.1 Social networks results

Table 2 presents the results of the analysis when equation 1 is estimated and $\boldsymbol{X_{it}}$ includes only social network measures and controls. The first column of Table 2 presents the results when total network size is included. The coefficient on total network size is positive and significant, indicating that a larger social network is correlated with higher value added per worker for the firm. A one standard deviation increase in the total network size is correlated with a 3.1 per cent increase in value added per worker. Somewhat surprisingly, business association membership is not significant, and is consistently insignificant throughout all specifications of the model. Hiring workers through social networks is not significant in this specification of the model.

Table 2: Regression results for social networks FE model

	(1)	(2)	(3)
Total network size	0.031***		0.032***
	(0.010)		(0.011)
Same sector network		0.007	
		(0.010)	
Different sector network		0.013	
		(0.010)	
Bank officials network		0.011	
		(0.010)	
Politicians/Civil servants network		0.018*	
		(0.009)	
Business association (BA) member	0.013	0.012	0.059
	(0.046)	(0.046)	(0.051)
Employees hired via networks	0.035	0.035	0.037*
	(0.021)	(0.021)	(0.021)
Total network size*BA member			-0.112***
			(0.037)
Size of firm	-0.002**	-0.002**	-0.002**
	(0.001)	(0.001)	(0.001)
Owner/Manager age	-0.001	-0.001	-0.001
	(0.002)	(0.002)	(0.002)
Owner/Manager gender	-0.024	-0.024	-0.024
	(0.027)	(0.027)	(0.027)
Owner/Manager education	0.039***	0.039***	0.041***
	(0.014)	(0.014)	(0.014)
Household firm	-0.099*	-0.099*	-0.095*
	(0.057)	(0.057)	(0.057)
Informal firm	0.051*	0.052*	0.050*
	(0.028)	(0.028)	(0.028)
Innovation	0.023	0.023	0.024
	(0.019)	(0.019)	(0.019)
R-Squared	0.07	0.07	0.08
Observations	7,423	7,423	7,423

***p<0.01,**p<0.05,*p<0.01. Dependent variable log of value added per worker. Standard errors clustered at firm level are presented in parenthesis. Specifications include province, sector, and time dummies.

Source: Author.

The coefficient on size (in terms of the number of employees) is small, but negative and significant. It suggests that smaller firms have higher value added per worker; hiring one extra worker leads to a 0.2 per cent decrease in value added per worker. This is plausible given fixed levels of capital.

The age and gender of owner/managers has no significant impact on value added per worker. However, more educated managers are associated with much higher value adder per worker. The coefficient on the dummy variable for household firms is negative and significant, suggesting that household firms have, on average, almost 10 per cent lower value added per worker. The positive and significant coefficient on the informal dummy indicates that informal firms have, on average, 5.1 per cent higher value added per worker. This result is most likely capturing the fact that informal firms have lower costs, and pay less in taxes and other regulatory charges. The innovation dummy variable is not statistically significant.

The second column presents the results of the analysis when the total network size is replaced with the four different network sizes for each of the four categories of contacts. The coefficient on the size of the politicians/civil servants network is positive and significant. It is the only one of the four network sizes that is significant, indicating that the positive correlation between network size and value added per worker found in the first specification of the model may be dominated, to some extent, by the size of the politicians/civil servants network. A one standard deviation increase of the politicians/civil servants network size is correlated with a 1.8 per cent increase in value added per worker. The significance and magnitude of the other coefficients is consistent with those found in the first specification of the model.

The size of the social network does not tell us the quality of the contacts; a small network may be more valuable to a firm than a large network, depending on the types of contacts. In order to try to control for the quality of the contacts, column 3 of Table 2 presents the results when an interaction term is included between the total network size and the business association member dummy variable. Firms that are members of business associations are likely to have better contacts; they have revealed themselves to be actively seeking contacts, and they have the means to form contacts with other firms that are engaged in the same network-strengthening activity. The coefficient on total network in this specification can be interpreted only for firms that are not members of a business association; a one standard deviation increase in total network size is associated with 3.2 per cent higher value added per worker. So, for firms that are not members of a business association the positive impact of a larger network is on average slightly greater than the impact for all firms. Interestingly, the interaction term is negative and significant, indicating that for firms that are members of a business association smaller networks are actually correlated with higher value added per worker. These results suggest that where contacts are particularly valuable, smaller, tight social networks are more beneficial. However, in the absence of the opportunity to form such high-quality links, a larger network is beneficial to the firm. The coefficient on employees hired via networks is significant in this specification of the model, indicating that firms that hire employees mainly through their social networks have, on average, 3.7 per cent higher value added per worker.

The size of a firm's social network depends partly on the number of suppliers and customers they have regular contact with. Customers and suppliers may be important sources of knowledge spillovers, and so the size of these networks in particular may be important to firm outcomes. Moreover, the impact on the firm of having a large/small supplier network may be quite different from the impact of having a large/small customer network. In order to assess the relative importance of these different types of network, customer and supplier social network measures are included separately as explanatory variables (Table 3).

Table 3: Regression results for supplier and customer networks FE model

	(1)	(2)	(3)
Supplier network size	-0.000 (0.000)		-0.001* (0.000)
Supplier identified via networks	-0.013 (0.017)		-0.012 (0.017)
Supplier selected via networks	-0.104 (0.069)		-0.104 (0.069)
Customer network size		0.000 (0.000)	0.001* (0.000)
Employees hired via networks	0.036* (0.021)	0.036* (0.021)	0.035* (0.021)
Business association member	0.017 (0.045)	0.017 (0.045)	0.017 (0.045)
Size of firm	-0.002** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Owner/Manager age	0.001 (0.002)	0.001 (0.002)	0.001 (0.002)
Owner/Manager gender	-0.025 (0.027)	-0.026 (0.027)	-0.026 (0.027)
Owner/Manager education	0.039*** (0.014)	0.040*** (0.014)	0.040*** (0.014)
Household firm	-0.097* (0.057)	-0.098* (0.057)	-0.095* (0.057)
Informal firm	0.048* (0.028)	0.048* (0.028)	0.049* (0.028)
Innovation	0.024 (0.019)	0.023 (0.019)	0.024 (0.019)
R-Squared	0.07	0.07	0.07
Observations	7,423	7,423	7,423

***p<0.01, **p<0.05, *p<0.01. Dependent variable log of value added per worker. Standard errors clustered at the firm level are presented in parenthesis. All specifications include province, sector and time dummies.

Source: Author.

Column 1 presents the results of the fixed effects estimation of equation 1 when supplier social network measures and controls are included as explanatory variables. The size of the supplier network is not correlated with value added per worker; similarly, there is no correlation with firms identifying or selecting customers through social networks. The size and significance of the coefficients of the control variables are consistent with those presented in Table 2.

Column 2 of Table 3 presents the results of the fixed effects estimation of equation 1 when the size of the customer network is included as an explanatory variable. The results indicate that there is no significant correlation between the value added per worker and the number of customers who are regular contacts. The size and significance of the coefficients of the control variables are again consistent with previous specifications of the model.

Column 3 of Table 3 presents the results of the model when both supplier and customer network measures are included in the analysis. The coefficients on both customer network size and supplier network size are now significant. This suggests that, controlling for the size of the customer network, a larger supplier network is associated with a lower value added per worker. The effect is small in magnitude; increasing the number of supplier contacts by 10 is associated with a 1 per cent decrease in value added per worker. Similarly, controlling for the size of the supplier network, a larger customer network is associated with a higher value added per worker. The effect is again

small in magnitude; increasing the number of customer contacts by 10 is associated with a 1 per cent increase in value added per worker.

The results suggest that firms with fewer suppliers may be able to negotiate better prices, and so have higher value added per worker. Conversely, if firms are unable to negotiate low prices from their suppliers, they will search for new suppliers; therefore, larger supplier networks are associated with lower value added per worker. The association between larger customer networks and higher value added per worker is unsurprising: firms with higher-quality goods are likely to attract more customers and have higher value added per worker. The coefficients on the other variables are consistent with previous specifications of the model.

3.2 Spatial network results

Table 4 presents the results of the fixed effects estimation of equation 1 when spatial network measures are included as explanatory variables. In addition to the controls included in the analysis presented in Section 3.1, access to paved roads and a rail network are controlled for. Column 1 presents the results when supplier spatial network measures are included. There is no correlation between value added per worker and distance to a firm's main supplier, the percentage of suppliers in the same district, or a firm selecting suppliers on the basis of geographic proximity. The coefficient on the percentage of suppliers in the same commune, however, is small but significant. A 10 per cent increase in the percentage of suppliers in the same commune is associated with a 1 per cent decrease in value added per worker. This may be because firms that source inputs nearby pay a higher price than firms that search further afield and can therefore find more competitive prices.

Interestingly, there is no correlation between access to a paved road or a rail network and value added per worker. This may be because the vast majority (82 per cent) of firms have access to a paved road, and although fewer have easy rail access (57 per cent), it is still a majority. The coefficients on the other controls are consistent with previous specifications of the model.

Column 2 of Table 4 presents the results of the analysis when customer spatial network measures are included. There is no correlation between value added per worker and distance to a firm's main customer. The coefficients on the percentage of customers in the same commune, and the same district, are both small but significant. A 10 per cent increase in the percentage of customers in the same commune (or district) is associated with a 1 per cent decrease in value added per worker. Again, this result may be reflective of the fact that higher-quality goods will be demanded by customers regardless of their proximity to the firm. The coefficients on the control variables are again consistent with previous specifications of the model.

Finally, column 3 of Table 4 presents the analysis when all spatial network measures are included in the model. The significance and magnitude of the coefficients are similar to those presented in columns 1 and 2.

Table 4: Regression results for spatial networks FE model

	(1)	(2)	(3)
Distance to main supplier	-0.000 (0.000)		-0.000 (0.000)
Supplier selected on proximity	-0.001 (0.099)		0.007 (0.099)
per cent of suppliers in same commune	-0.001*** (0.000)		-0.001** (0.000)
per cent of suppliers in same district	-0.000 (0.000)		-0.000 (0.000)
Distance to main customer		-0.000 (0.000)	-0.000 (0.000)
per cent of customers in same commune		-0.001*** (0.000)	-0.001** (0.000)
per cent of customers in same district		-0.001** (0.000)	-0.001*** (0.000)
Road access	-0.052 (0.034)	-0.045 (0.034)	-0.051 (0.034)
Rail access	0.016 (0.030)	0.018 (0.029)	0.012 (0.029)
Size of Firm	-0.002** (0.001)	-0.002** (0.001)	-0.002** (0.001)
Owner/Manager age	-0.001 (0.002)	-0.001 (0.002)	-0.001 (0.002)
Owner/Manager gender	-0.019 (0.027)	-0.026 (0.027)	-0.023 (0.027)
Owner/Manager education	0.042*** (0.015)	0.040*** (0.014)	0.042*** (0.015)
Household firm	-0.098* (0.058)	-0.088 (0.057)	-0.089 (0.058)
Informal firm	0.057* (0.030)	0.045* (0.029)	0.055* (0.030)
R-Squared	0.04	0.08	0.06
Observations	7,291	7,403	7,271

***p<0.01, **p<0.05, *p<0.01. Dependent variable log of value added per worker. Standard errors clustered at the firm level are presented in parenthesis. All specifications include province, sector and time dummies.

Source: Author.

3.3 Social and spatial network results

Table 5 presents the results of the analysis when both social and spatial network measures are included in the model.[7] Column 1 presents the results when customer and supplier network size are included as explanatory variables and column 2 when total network size is also included.[8] The results are consistent with those found when spatial and social network measures are analysed separately. A number of different specifications of the model, including interactions between spatial and social network measures, were also estimated and no significant effects were found.

[7] All control variables are included in the estimated model; however, coefficients are not presented in the table. Coefficients on all control variables are consistent with previous specifications of the model.

[8] Note that total network size includes the number of contacts who are in the same sector, are in different sectors, are politicians or civil servants, and are bank officials. Therefore, total network size is not simply supplier plus customer network size. In fact the correlation coefficients between supplier and customer network size and total network size are only 0.25 and 0.30, respectively.

Taken together, these results suggest that the impact of social networks on firms is independent of their spatial networks, and vice versa.

Table 5: Social and spatial network measures

	(1)	(2)
Total network size		0.029***
		(0.011)
Supplier network size	-0.001	-0.001**
	(0.000)	(0.000)
Customer network size	0.001**	0.001
	(0.000)	(0.000)
Employees hired via networks	0.039*	0.037*
	(0.021)	(0.021)
Business association member	0.021	0.018
	(0.046)	(0.046)
per cent of suppliers in same commune	-0.001**	-0.001**
	(0.000)	(0.000)
per cent of customers in same commune	-0.001*	-0.001
	(0.000)	(0.000)
R-Squared	0.05	0.05
Observations	7,294	7,294

***p<0.01, **p<0.05, *p<0.01. Dependent variable log of value added per worker. Standard errors clustered at the firm level are presented in parenthesis. All specifications include province, sector and year dummies, firm controls, and owner/manager controls.

Source: Author.

4 Conclusion

This paper uses panel data on micro, small, and medium enterprises to investigate the relative importance of strong social and spatial networks on firm outcomes. The unique data from Viet Nam includes both formal and informal firms. The results suggest that larger social networks are associated with higher value added per worker. In particular, a higher number of government officials and civil servants in the firm's network is correlated with higher value added per worker. Interestingly, however, if a firm is a member of a business association, a smaller social network is actually associated with higher value added per worker. This suggests that when the quality of links is controlled for, smaller, tighter social networks are more valuable to firms.

Larger networks of customers and smaller networks of suppliers are associated with higher value added per worker. This seems plausible; firms that have better-quality goods are likely to have a larger network of customers. Similarly, firms that have good, low-cost suppliers are less likely to expand their supplier network. Most firms cite competitive price as the most important criterion when selecting suppliers.

The results of the analysis indicate that firms that mainly use social networks to hire workers have on average higher value added per worker. This result again highlights the importance of social networks on firm outcomes.

The results of the spatial network analysis suggest that geographic proximity to suppliers and customers is not important to firms. In fact, the results indicate that a higher percentage of customers or suppliers located outside the same commune as the firm is correlated with slightly higher value added per worker. On the customer side, this result may be indicative of the quality

of the product sold; if the firm is selling a high-quality product, customers will be willing to travel further to purchase it. Similarly, on the supply side, if firms are choosing suppliers on the basis of geographic proximity, they may not be getting the most competitively priced inputs.

The results presented in this paper must be interpreted with caution. It is difficult to infer causality from the analysis; for example, it may be that higher value adder per worker leads to a larger social network, rather than vice versa. The fixed effects estimation, inclusion of controls, province, sector, and time dummies, together with the consistent results across all specifications of the model ameliorates some of the endogeneity issues. However, the direction of causality is still not entirely clear.

What is clear from the data and analysis presented here is the importance of social networks to micro, small, and medium enterprises. There are important implications for the formulation of industrial policy, which in developing countries has long focused on fostering and encouraging geographic clusters. Social networks in Viet Nam, at least for the types of enterprise analysed here, appear to be of greater importance to firm outcomes. It remains to be seen whether the results presented here are particular to Viet Nam or representative of developing countries more generally.

References

Barr, A. (2000). 'Social Capital and Technical Information Flows in the Ghanaian Manufacturing Sector'. *Oxford Economic Papers*, 52(3): 539–59.

Bessant, J., A. Alexander, G. Tsekouras, H. Rush, and R. Lamming (2012). 'Developing Innovation Capability through Learning Networks'. *Journal of Economic Geography*, 12: 1087–113.

Bigsten, A., M. Gebreeyesus, E. Siba, and M. Söderbom (2011). 'The Effects of Agglomeration and Competition on Prices and Productivity: Evidence for Ethiopia's Manufacturing Industry'. Mimeo, University of Gothenburg.

Boschma, R.A. (2005). 'Proximity and Innovation: A Critical Assessment'. Regional Studies, 39: 61–74.

Deichmann, U., V.S. Lal, S.J. Redding, and A.J. Venables (2008). 'Industrial Location in Developing Countries'. *World Bank Research Observer*, 23: 219–46.

Fafchamps, M. (2000). 'Ethnicity and Credit in African Manufacturing'. *Journal of Development Economics*, 61: 205–35.

Fafchamps, M., and B. Minten (2002). 'Returns to Social Network Capital Among Traders'. *Oxford Economics Papers*, 54(2): 173–206.

Howard, E., C. Newman, J. Rand, and F. Tarp (2014). 'Productivity-enhancing Manufacturing Clusters: Evidence from Viet Nam'. WIDER Working Paper 2014/071. Helsinki: UNU-WIDER.

Howard, E., C. Newman, and F. Tarp (2016). 'Measuring Industry Agglomeration and Identifying the Driving Forces'. *Journal of Economic Geography*, 16(5): 105–78.

Krugman, P.R. (1991). 'Increasing Returns and Economic Geography'. *Journal of Political Economy*, 99: 483–99.

Rodriguez-Pose, A. (2011). 'Economists as Geographers and Geographers as Something Else: On the Changing Conception of Distance in Geography and Economics'. *Journal of Economic Geography*, 11: 347–56.

Zook, M.A. (2000). 'The Web of Production: The Economic Geography of Commercial Internet Content Production in the United States'. *Environment and Planning*, A(32): 411–26.