

External Networks and Innovation: Evidence from FDI Embedded Clusters in China

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KEYWORDS Absorptive Capability. External Networks. Independent Innovation Performance. Mediating Effect. Moderating Effect

ABSTRACT This paper investigates the effects of absorptive capability on the relationship between different external networks and independent innovation in China, and explores their underlying mechanisms. It adopts four types of external networks—local business network, local institute network, horizontal spillover network, and vertical spillover network, which were treated as independent variables. Furthermore, the absorptive capability is analyzed as a mediator and moderator variable, and innovation performance is treated as a dependent variable. The findings reinforce that there is a mediating and moderating effect of absorptive capability on the relationship between external networks (local business network and horizontal spillover network) and independent innovation performance.

INTRODUCTION

In recent years, through critical observation of the small and middle-sized enterprises (SMEs), competitive advantages have been attained by learning and innovation instead of living on scarce resources. As one way to enhance self-competitive advantages, “cooperation-competition” has been a new topic among SMEs (Pu and Zheng 2015; Scutaru 2015). The geographical clustering, which is the classical form of SMEs’ survival and development, achieved great success in the developed countries and regions, such as Italy, Japan and Taiwan of China.

Similar to the classical clustering form above, a new kind of geographical clustering also promoted local businesses in south China, where most of the SMEs grew from the same or related industrial sectors, local administrative division and foreign businesses. Since the start of the reform and opening up, many foreign enterprises have settled in the southeast coastal zone in China. These zones took full use of local industrial advantages to form FDI-embedded clusters and mixed ownership enterprise clusters. These enterprise clusters were filled with much knowledge and information, which may come from spillovers of foreign ownership enterprises, the sharing of business organizations in the clusters, and the support of some relevant institutions (Tsai 2015).

In recent years, the key to achieve independent innovation for the Chinese local private

enterprises is to constantly study outside and exchange knowledge, instead of just increasing investment on research and development (Keller 2004). In this process, foreign ownership enterprises embedded in local private enterprises cluster, and involuntarily offered latest information and knowledge to local enterprises through their cooperation and competition, that is, they helped local enterprises reinforce their innovation capability indirectly. Moreover, local enterprise clusters also spread valuable information benefiting innovation activities.

According to the social capital theory, external networks play a principal role in improving enterprise competence and independent innovation by triggering off organizational learning and transfer of knowledge and technology know-how (Burt 1984). Based on the discussion about different FDI spillover channels, the local enterprises form the learning network, which includes horizontal spillover network among the industries and vertical spillover network inside the industry. The previous studies have made empirical analyses on how technology spillovers of foreign ownership enterprises facilitate the local firms’ innovation from points of views of the macro level (Blomstrom and Sjöholm 1999) and micro level (Sajid and Sizhong 2015), or from points of views of developed countries (Dana et al. 2014) and developing countries (Duarte 2014). Similarly, for different members in a local enterprises cluster, mutual beneficial information may be different. Therefore, for different mutually beneficial information of different members, many

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works distinguished the local business network from the institute support network, and made an empirical analysis on the relationship between different networks and independent innovation (Lee and Lee 2001; Gao et al. 2008).

Since technology spillovers from local clusters and foreign-invested companies are not automatically generated and turned into the local firms' independent innovation, absorptive capability refers to the capability to manage external knowledge and information, that is, the ability of acquiring, transferring, updating, renewing and applying knowledge spillovers. Absorptive capability, playing an important role in organizational learning and innovation, could be examined either as a mediator (Tsai and Wu 2011; Zheng et al. 2013) or a moderator (Gao et al. 2008; Branka et al. 2014). For enterprises in an FDI-embedded local enterprises cluster, they face many kinds of information sources. Thus, by what channels the enterprises can collect updated information and knowledge? Does this updated information and knowledge help improve the independent innovation performance? What role does the absorptive capability play in the information conversion process? How does it carry into effect in the process of information conversion and knowledge absorption?

In order to answer these questions, the current researchers have investigated the effects of different external networks and absorptive capability on local enterprises' independent innovation performance. Firstly, the researchers define different external spillover networks, including local business network, local institute network, horizontal spillover network and vertical spillover network. Secondly, the researchers make a questionnaire survey in Fujian and Guangdong, where the opening up policy was initiated. In these areas, FDI was embedded more widely and enterprise clusters typically developed. Thirdly, the researchers take simultaneous estimations of the mediating and moderating roles of absorptive capability in China. Based on the empirical analysis, the findings are expected to enrich the relevant studies and their conclusions. Furthermore, it will be helpful in analyzing and guiding the effective enhancement of absorptive capability and independent innovation for local enterprises.

The remaining part of this paper is organized as follows. The literature review section introduces some key concepts of the study and

proposes hypotheses linking external networks to absorptive capability and innovation performance of local firms from FDI-embedded clusters. The methodology section presents the procedures used to collect data and the measurement properties of the constructs. Major research findings are summarized in the results section. The paper concludes with a discussion of the findings and suggestions for the future research.

Literature Review and Hypotheses

Local Business Network

In social capital theory, an external business network is considered as a storehouse with potential, static, and valuable information and resources. Moreover, the relationship between enterprises and members in the network can provide mutually beneficial knowledge, technology and experience. It is good for cutting the cost of innovation, increasing management efficiency and expanding the market. Meanwhile, enterprises in the cluster increased the turnover rate of internal labor force, which led to higher requirements on the quality of labor force, as well as promoting the further spread of information and ideas, and ultimately created conditions conducive to technological innovation for these enterprises (Michael 2000). Additionally, to explore the positive effect of a local business network on enterprises innovation performance or innovative capabilities shown in the business networks, many studies tested the above effects in different countries and areas (Samson 2005; Fang and John 2013).

A stable cooperation network with local enterprises and suppliers can improve the absorptive capability and new product development performance (Saeed et al. 2014). During the transition period in many developed economics, SMEs' capabilities of gaining the information and promoting innovation are enhanced through business networks (Branka et al. 2014). Even for the leather shoes manufacturing enterprises in the developing countries, local business network contributes to improving the absorptive capability and innovation performance in a cluster (Gebreyesus and Mohnen 2013). Moreover, in Chinese automobile clusters, business cooperation networks positively affect absorptive capability and innovation performance (Sherzod and Zhao 2014). Based on the above analysis, the

researchers propose that a local business network positively affects absorptive capability or independent innovation performance.

Local Institute Network

Besides the business network, local institute support networks, such as government, industry association, scientific research institution, and financial institution, are regarded as the important factors, which influence a local firm's independent innovation (Lee and Lee 2001). Furthermore, institute networks support enterprises to develop through policy and financial support in the local industry cluster, so institute networks play an important role in improving the local firms' absorptive capability and independent innovation (Silva et al. 2014). Consequently, local enterprises are usually located in a place where there are many colleges and institutes, because they would benefit from the cooperation with the institutes around them, and finally improve their innovation performance and absorptive capability (Gao 2008; Tsai and Wu 2011).

Some empirical studies highlighted the relationship between local institute network and innovation performance. Accordingly, the government and some other institutions can encourage enterprises to cooperate with all kinds of partners and competitors in geographical clustering by proper guidance, which also promotes the absorptive capability and innovation performance (Zheng et al. 2013). Thus, innovation activities of SMEs seldom take place in a closed environment, and local enterprises are likely to seek opportunities to cooperate with the external organizations such as research institutions, intermediaries and industry association to develop new products (Gao 2008). Independent innovation of local enterprises could be improved through the cooperation networks linking local enterprises with colleges, research institutions and industry association (Patricia et al. 2013). Based on the above analysis, the researchers propose that a local institute network positively affects absorptive capability and independent innovation performance.

FDI Horizontal Spillover Network

The horizontal spillovers, including demonstration, labor mobility and competition dimensions, are likely to occur in the business between

foreign-invested companies and local enterprises. The channels, by which local enterprises hunt for new information from foreign-invested partners, positively affect the independent innovation. Accordingly, FDI-embedded networks greatly prompt the innovative capability and performance of local enterprises by maintaining knowledge exchanges (Park 2014). It was proved that horizontal spillover network has greater effects on the independent innovation in three ways (Li et al. 2001). Firstly, information and knowledge will be transferred from foreign subsidiaries to domestic firms through demonstration network (Kim and Li 2014). Secondly, foreign subsidiaries often give their local staffs opportunities of training or further education, and labor mobility network forms when employees go to domestic employers or run their own business after training and further education (Gerschenberg 1987). Thirdly, competition network may push local firms to modernize and innovate in order to keep pace with foreign subsidiaries (Lutz and Talavera 2003).

Many empirical studies on horizontal spillover network were conducted in emerging economies. Multinational companies improve the innovative capability of host enterprises by labor mobility spillovers, and it is necessary for host countries to possess absorptive capability during the knowledge conversion (Dana et al. 2014). Thus, there is a positive relationship between horizontal spillovers and the innovation performance of local private enterprises while the relationship between vertical spillover and innovation activities is not supported (Long et al. 2014). Based on the above analysis, the researchers propose that horizontal spillover network positively affects the absorptive capability and independent innovation performance.

FDI Vertical Spillover Network

In order to improve the technology and innovation capability of local enterprises, foreign-invested companies build connections with local enterprises to set down technical standards, and offer technique guide (Smarzynska 2004). In addition to the link with the suppliers, the entry of foreign subsidiaries help local downstream enterprises gain access to the high quality intermediate goods market at a low price, so that this makes it possible for the independent innovation in the subsequent production process (Goldsmith and

Sporleder 1999). These two different kinds of vertical cooperation networks help update technology and information absorptive capability of host enterprises (Markusen and Venables 1999). As for two different vertical cooperation networks of local enterprises and foreign enterprises, to examine whether or not they help promote the innovation capability of local enterprises, many studies have been based on the theoretical models and empirical analysis (Liu 2006; Gerschewski 2013; Scutaru 2015).

Foreign-invested companies choose local suppliers when investing in the host countries, and they also spill updated knowledge and information to the local enterprises when communicating with them (Shi et al. 2014). Many scholars made the empirical analysis based on different choices of countries and sample data. Based on the data collected from emerging economies, it is found that industry cooperation between foreign subsidiaries and local enterprises facilitates the productivity of local enterprises (Negara and Adam 2012). However, horizontal spillover from foreign enterprises slows down the upstream vertical cooperation, while downstream vertical cooperation plays a positive role (Kokko and Thang 2014). Further, building a theoretical model of knowledge flowing between foreign enterprises and local enterprises, the research found that the cooperation between local enterprises and foreign partners improved the knowledge absorptive capability and innovation performance (Christoffersen 2013). Based on the above analysis, the researchers propose that vertical cooperation network positively affects the absorptive capability and independent innovation performance.

The Role of Absorptive Capability

It does not mean that local enterprises can absorb the information once it is spilled, though external information has the characteristics as public goods. According to the corporate social capital theory and resource-based view, new knowledge spreading in external networks owns the potential resources of local enterprises (Cohen and Levinthal 1990; Uzzi 1996). However, whether it can converse to the independent innovation efforts depends on the absorptive capability of the local enterprises. Most of the empirical researches verify that external networks affect the enterprises' innovation performance

indirectly, and it is absorptive capability, which indirectly works as a mediating effect to promote innovation (Liao et al. 2007; Liu and Chen 2009; Zheng et al. 2013). Therefore, it must take into account the key organizational capabilities that affect the relationship between external networks and innovation performance.

Since external networks serve as a critical enabler to knowledge absorption and knowledge absorption is a fundamental source of competitive advantage, absorptive capability could be investigated as a critical mediator between external networks and innovation performance. Using data collected from 212 enterprises in Taiwan, Tsai (2006) empirically investigated the mediating effect of absorptive capability on the external networks and innovation relationship. It showed that absorptive capability partially mediates between structural embedment and innovation performance. Similarly, Shu et al. (2005) proposed that absorptive capability plays a mediating role in the relationship between commercial networks and product innovation, according to the data collected from 116 IT enterprises. The similar finding of the mediating effect of absorptive capability is proposed by Tsai and Wu (2011), who used the data collected from manufacturing firms in Taiwan and found that absorptive capability mediates between social capital and innovation performance.

In short, the existing studies have highlighted the mediating role of absorptive capability in external resources applications. However, most of the relevant studies were conducted in the developed countries or in the closed economies. As discussed above, the recent findings can be internationally generalized by further study, given the great differences in institutions and cultures among countries and zones. Thus, the following hypothesis is presented in a China context.

Hypothesis 1: Absorptive capability has a mediating effect on the relationship between external networks and independent innovation performance. External networks include local business network, local institute network, horizontal spillover network and vertical spillover network.

It is worth noting that a variable may be a hybrid in which it acts as both a mediator and a moderator (Sauer and Dick 1993). In addition to mediating the applications of external resources, absorptive capability can also be complementa-

ry with external networks in an interactive and harmonious way to achieve innovation performance. Therefore, internal interaction and cooperation are needed to integrate knowledge to build up a knowledge absorptive system, which will have positive effects on the independent innovation performance of enterprises (Bucklery and Carter 2004; Branka et al. 2014).

Although new information and knowledge can be easily disseminated among enterprises according to the external networks analysis, the extent to which local firms can benefit from external resources depends on absorptive capability of local firms. Using data collected from 174 enterprises in China, Gao et al. (2008) investigated the causal relation between FDI and local enterprise network and innovation performance, and found a moderating effect of absorptive capability on external networks and innovation performance. The similar moderating effect of absorptive capability is tested by Wu et al. (2007), and Zaheer and Bell (2005).

Thus, given the potential synergies resulting from the interactive integration of external networks and absorptive capability, as well as the positive effect of both external networks and absorptive capability on independent innovation, a moderating effect of absorptive capability on the relationship between external networks and independent innovation is expected. Up to now, there are few, if any, studies conducted in the

FDI-embedded context. Accordingly, the following hypothesis is set forth in a China context.

Hypothesis 2: Absorptive capability has a moderating effect on the relationship between external networks and independent innovation performance. External networks include local business network, local institute network, horizontal spillover network, and vertical spillover network.

RESEARCH METHODOLOGY

Conceptual Model

According to the hypotheses proposed above, the conceptual model about the mechanism acting among external networks, absorptive capability and independent innovation performance is shown in Figure 1.

Questionnaire Measures

A questionnaire is designed for conducting the following empirical analysis. Thirty-nine items are included in the questionnaire. These items were extracted or borrowed from previous studies, and they are translated into Chinese and rearranged in line with the analytic framework of this study. To ensure compatibility and consistency of the survey questionnaire, reverse translation and further modifications are also made

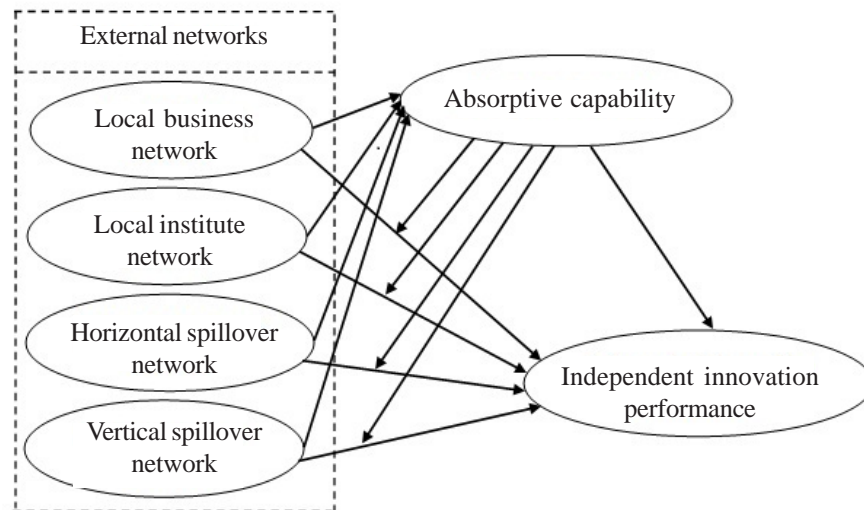


Fig. 1. Conceptual model of the action mechanism of external network

and respondents rated their perceptions of the items using seven-point Likert scales, ranking from 1 (for “strongly disagree”) to 7 (for “strongly agree”). Using the initial draft of the questionnaire, a small-scale pilot test is conducted on ten firms, and wording is refined to improve the clarity of the questionnaire.

Adopting the concepts proposed in previous studies (Thompson 2002; Lan and Young 1996; Lee and Lee 2001; Gao et al. 2008; Zahra and George 2002; Jansen and Bosch 2005; Tian and Li 2006), the questionnaire is divided into four parts (see appendix). The first part includes eleven items and measures FDI spillover networks. This study specified horizontal spillover networks as a second-order construct, measured by the three first-order constructs of demonstration network, competition network and labor mobility network. Demonstration network refers to the one where domestic firms learn from their observation of foreign investor’s actions. Competition network refers to the one where foreign investors may stimulate domestic firms to modernize in order to keep pace. Labor mobility network refers to the one where qualified employees transfer new knowledge when they go to work in the domestic firms or open their own business. Similarly, vertical spillover network is specified as a second-order construct, measured by the two first-order constructs of forward linkage network and backward linkage network, referring to the cooperation denoted as a direct link between foreign investors and domestic firms.

Meanwhile, the second part comprises of sixteen items and measures local networks. This study specified local business networks as a second-order construct, measured by the four first-order constructs of local suppliers, clients, competitors and related enterprises. Similarly, local institute network is specified as a second-order construct, measured by the four first-order constructs of government sectors, industry associations, scientific research institutions and financial institutions.

The third part contains seven items and measures absorptive capability. It is specified as a first-order construct, referring to the extent to which a firm can acquire, transfer, update, renew and apply spillover knowledge. Finally, the fourth part consists of five items and measures independent innovation performance. Since the disclosure of performance information is sensitive,

many firms are reluctant to report financial data such as profitability and return on investment (Tippins and Sohi 2003). The research therefore took an indirect and subjective approach, which could be a reasonable substitute for the objective measure of independent innovation performance (Tian and Li 2006). Specifically, innovation performance was defined as a subjective measure on improvement in overall independent innovation performance over the past 3 years.

Sample and Data Collection

Over five hundred questionnaires are distributed to local firms in Fujian and Guangdong Province, two of the most developed regions in China. Typical respondents are middle and senior managers or leaders who have a better understanding and experience in trade and technology management. Of the distributed questionnaires, 374 questionnaires were regained altogether. Furthermore, 49 responses were eliminated according to the following criteria: (a) respondents who seldom cooperate with foreign-invested companies in recent years, (b) missing values, and (c) respondents work or run business in current firms for less than 1 year. The remaining 325 responses are qualified. Considering the validity of the questionnaire, it should be accepted if the respondent rate reaches twenty percent, while the personnel who filled the questionnaires were high-level managers of the enterprise (Gaedeke and Tootelian 1976). Based on the criteria, the respondent rate is comparatively high and thus, acceptable.

What’s more, to account for the effects of extraneous variables, the researchers take into account the firm size, firm age, industry type and regional differences as control variables. Industry type can affect aggregate innovative activity through its effects on a corporation’s organization. To assess the extent of competition in different industries, the researchers use the dummy variable to differentiate these two industry types. The high-tech industry includes electronic components, information and communication equipment, chemical products, toy, packaging and printing, and new material. The three main industries of traditional industry are textile and garment, food processing, and handicraft. Since the survey was carried out in two different competitive areas and knowledge spillovers tend to be geographically localized, regional differences

is another control variable used in the form of a dummy variable to differentiate these two communities. Four cities, Guangzhou, Dongguan, Huizhou, and Shenzhen are located in the Pearl River delta area, where they are very close to Hong Kong and Macau. Four cities, Shantou, Xiamen, Chaozhou, and Jieyang are located in the western coast zone of Taiwan straits. They are shown in Table 1, including the demographic characteristic of the sample firms.

Preliminary Data Analysis

Since developed from the previous literatures, these items have content validity. Convergent validity, which measures construct identity, can be judged by looking at the item factor loadings. Each factor loading for the multi-item variables of local business network, local institute network, horizontal spillover network, vertical spillover network, absorptive capability and independent innovation performance is significantly related to its underlying factor. All standardized item factor loading are well above the cutoff of 0.50, which shows that the measures demonstrate adequate convergent validity. Additionally, all of the Cronbach's α exceeds 0.8, indicating that the measuring items of the related variables in the study are internal consistency and highly reliable. Hence, the measures the researchers construct in the research are verified to be adequate.

Table 1: Demographic characteristic of the sample firms

<i>Object</i>	<i>Criterion</i>	<i>Frequency</i>	<i>Percentage</i>
No. of employees (Firm size)	Less than 100	172	52.92
	More than 100	153	47.08
Years of operation (Firm age)	Less than 7	129	39.69
	More than 7	196	60.31
Industry type	Traditional industry	173	53.23
	High-tech industry	152	46.77
Regional differences	Western coast zone of Taiwan Straits	193	59.38
	Pearl River Delta area	132	40.62

Table 2: Descriptive statistics and correlations among constructs

<i>Variable</i>	<i>Mean</i>	<i>S.D.</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>	<i>6</i>
1. Independent innovation	4.74	0.87	1					
2. Local business	5.21	1.17	0.436***	1				
3. Local institute	4.40	1.31	0.278***	0.363***	1			
4. Horizontal spillover	5.05	0.98	0.463***	0.425***	0.427***	1		
5. Vertical spillover	4.86	1.14	0.302***	0.351***	0.350***	0.317***	1	
6. Absorptive capability	4.79	0.97	0.311***	0.304***	0.183**	0.226***	0.205**	1

Note: P<0.10, ** P<0.05, *** P<0.01

RESULTS AND ANALYSES

Correlation Analysis

Table 2 shows the mean values, standard deviations, and correlations for all the measured variables. As the table indicates, significant correlations among these variables are found. There is positive and statistically significant correlation among the local business network, local institute network, horizontal spillover network, vertical spillover network, absorptive capability and independent innovation performance. This suggests that different external networks and absorptive capability can help the local enterprises promote independent innovation performance and vice versa.

SEM and Path Analysis

The researchers use the 325 samples for further analysis with SEM. After a reliability test, the researchers construct measurement models of the latent variables for CFA to examine the validity of the measurement. All the results meet the goodness-of-fit criteria, and they indicate that the measurement models can be used for further full model analysis. Based on the conceptual model, the researchers sketch an initial SEM full model using LISREL and try to develop a satisfying model about effect mechanism of

external networks on independent innovation performance.

Six fit indices are selected to judge the models' goodness of fit, including χ^2/df , RMSEA, CFI, GFI, IFI and NNFI (Browne and Cudeck 1992). After several adjustments and modifications, the researchers get an adequate model, which is presented in Figure 2 and summarized below, with the implications being discussed in the following section. As to the estimated structural equation model, the values of, RMSEA, CFI, GFI, IFI and NNFI are 2.572, 0.046, 0.90, 0.92, 0.91 and 0.96 respectively, which are within the acceptable ranges and indicate a reasonable fit of the model with the data (Browne and Cudeck 1992). In short, all fit indices are within the acceptable limit. In other words, the structural model provides good fit with the data.

Path analysis is adopted to explicate the mediating effect of absorptive capability on the relationship between external networks and independent innovation. The result is presented in Figure 2. Local business network positively affects absorptive capability and independent innovation. The factor loading of local business network and absorptive capability is 0.35 ($p < 0.01$), while the factor loading of local business network and independent innovation is 0.63 ($p < 0.01$). Additionally, the factor loading of absorptive capability and independent innovation is 0.52 ($p < 0.01$), which confirms that absorptive capability is a partial, rather than full mediator (Baron and Kenny 1986).

Significant associations are also found in the paths by which horizontal spillover network is linked to independent innovation ($r = 0.22$, $p < 0.01$), and horizontal spillover network is linked to absorptive capability ($r = 0.38$, $p < 0.01$), and absorptive capability is linked to independent innovation ($r = 0.52$, $p < 0.01$). It indicates that absorptive capability mediates the relationship between horizontal spillover network and independent innovation.

Local institute network and vertical spillover network also positively affect independent innovation performance, but the factor loading is lower, respectively 0.18 ($p < 0.05$) and 0.11 ($p < 0.10$). Obviously, even though both networks positively affect independent innovation performance, the influence appears to be weak. Compared to local business network and horizontal spillover network, these two networks tend not to be very important for local firms to obtain knowledge and

innovation. However, in terms of the participating firms' absorptive capability, local institute network and vertical spillover network effect are not figured out as factors with positive association. Obviously, it is reasonable to test the effect of different networks on independent innovation separately. Overall, either local business network or horizontal spillover network has a positive effect under the transformation mechanism of absorptive capability.

Based on the above statistical analysis, the mediating effect of absorptive capability is partially validated and the first hypothesis should be accepted as, absorptive capability has a mediating effect on the relationship between external networks (including local business network and horizontal spillover network) and independent innovation performance.

Hierarchical Regression Analysis

Hierarchical regression analysis is performed to estimate the moderating effects of absorptive capability on the relationship between external networks and independent innovation. Before the regression analysis, the researchers mean-center the variables and re-run the regression to minimize any distortion due to high correlations between the interaction term and its component variables. Table 3 shows the results, which indicate that the incremental changes of F and R^2 value are significant. As shown in model 4, the coefficient of the interaction of local business network and absorptive capability is positive and significant ($r = 0.185$, $p < 0.05$), whereas the coefficient for the interaction of local institute network and absorptive capability is positive but not significant ($r = 0.131$, $p > 0.01$). This indicates that absorptive capability has a moderating effect on the local business network and independent innovation relationship.

Model 4 also shows the coefficient of the interaction of horizontal spillover network and absorptive capability is positive and significant ($r = 0.246$, $p < 0.01$), whereas the coefficient for the interaction of vertical spillover network and absorptive capability is positive but not significant ($r = 0.081$, $p > 0.10$). It shows that the impact of horizontal spillover network on independent innovation is positively dependent on a local enterprise's absorptive capability.

Based on the above statistical analysis, this study finds that the four types of external net-

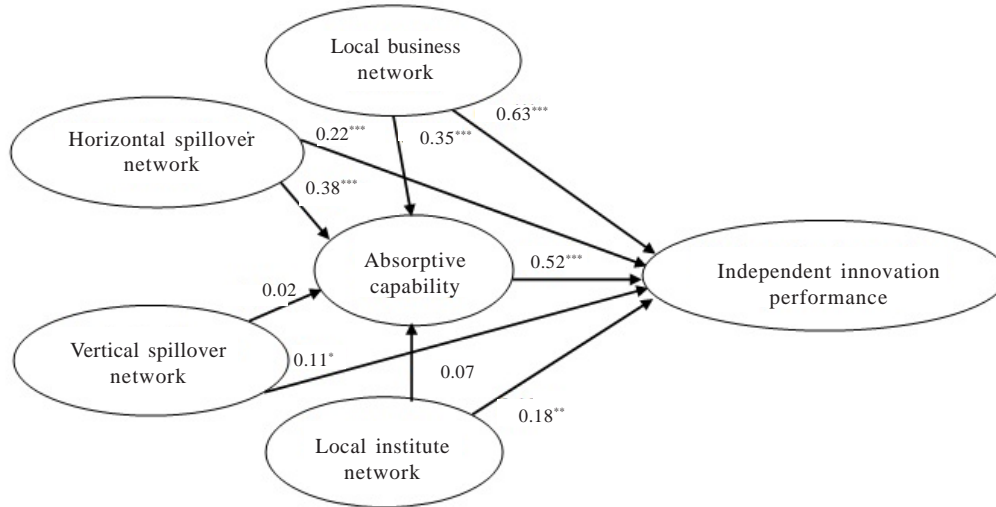


Fig. 2. Result of LISREL analysis model for research framework
 Note: *P<0.10, **P<0.05, ***P<0.01

works affect absorptive capability in different ways. Therefore, the moderating effect of absorptive capability is partially validated and the second hypothesis should be corrected as, absorptive capability has a moderating effect on the external networks (including local business network and horizontal spillover network) and independent innovation performance relationship.

DISCUSSION

The issue of external networks and local enterprises' innovation has attracted more and more attention, and previous studies have found various results. Recent studies show that the effects of external networks may be indirect as leveraged by absorptive capability (Liu and Chen

Table 3: Results of hierarchical regression analysis

Variables		Dependent variable: Independent innovation			
		Model 1	Model 2	Model 3	Model 4
Control Variables	Firm size	-0.062	-0.084	-0.084	-0.080
	Firm age	0.204**	0.186**	0.178**	0.165*
	Industry type	0.283***	0.252***	0.241***	0.217**
	Regional differences	-0.075	-0.091	-0.096	-0.113
Independent Variables	Local business network		0.385***	0.378***	0.340***
	Local institute network		0.183**	0.182**	0.166*
	Horizontal spillover network		0.273***	0.270***	0.242***
	Vertical spillover network		0.168*	0.171*	0.158*
Moderator	Absorptive capability			0.178**	0.163*
Interactions	Local business network×absorptive capability				0.185**
	Local institute network×absorptive capability				0.131
	Horizontal spillover network×absorptive capability				0.246***
	Vertical spillover network×absorptive capability				0.081
Parameters	R ²	0.093	0.316	0.348	0.393
	ΔR ²		0.223	0.032	0.045
	F		13.621***	15.725***	11.256***

Note: * P<0.10, ** P<0.05, *** P<0.01

2009; Zheng 2013). In this study, considering the different nature and characteristics of external networks, the researchers simultaneously examine the mediating and moderating roles of absorptive capability in one of China's context. The results of empirical analysis partially support the hypotheses.

External Networks and Innovation

This study strongly supports the positive effects of the four different external networks on independent innovation. By cooperating with local networks and FDI spillover network, local enterprises can treat each other well and share information. As a result, it dramatically increases the quantity and quality of new knowledge exchanged between them. These findings are consistent with the conclusions drawn by previous studies for local networks (Samson 2005; Tsai and Wu 2011; Sherzod and Zhao 2014) and FDI spillover network (Li et al. 2001; Lutz and Tala-vera 2003; Park 2014). However, few studies distinguish between local business network, local institute network, horizontal spillover network and vertical spillover network in FDI-embedded clusters, and simultaneously examine these different types of external networks affect the local firms' innovation.

The Role of Absorptive Capability

Overall, this study contributes to the literatures on social capital and organizational learning by examining the mediating and moderating effects of absorptive capability in local enterprises' innovative action. Consistent with previous research and with the first hypothesis of the study, external networks have indirect, significant effects on independent innovation through the mediation of absorptive capability (Shu et al. 2005; Tsai and Wu 2011). Therefore, absorptive capability should be considered as a necessary condition for adding business value from external resources applications and innovation. Furthermore, this study confirms that absorptive capability moderates the relationship between external networks and independent innovation, similar to the conclusion of the existing research (Wu et al. 2007; Branka et al. 2014). However, seldom studies simultaneously examine the mediating and moderating effect of absorptive capability in FDI-embedded clusters.

Sample Selection

FDI spillover is the non-market transfer of soft knowledge or hard technology from foreign subsidiaries to domestic companies. A large number of previous studies found that the FDI spillovers affect total factor productivity or industrial output from the country-level or industry-level perspective (Blomstrom and Sjöholm 1999; Hu and Jefferson 2012). Other studies investigate whether the FDI spillovers take place or not and collect data from foreign-invested companies (Lan and Young 1996; Thompson 2002; Urbano and Turro 2013). Overall, seldom researches answer these questions by a survey of the local enterprises. Moreover, previous studies highlighted the role of absorptive capability and FDI spillovers in developed countries. As shown in this study, the findings are widely applicable in south China. Thus, the study provides additional insights towards a better understanding on the issues related to external networks and innovation in FDI-embedded clusters.

CONCLUSION

Researchers have called for the study of absorptive capability that can influence the independent innovation of external networks in FDI-embedded clusters. This study addresses the current research concerns by empirical investigation on local enterprises based on survey data. Taking into account four different types of external networks, the researchers choose absorptive capability as the focal organizational variable of inquiry, due to the rising importance of absorptive capability in organizational learning and independent innovation. The findings confirm that there is a mediating and moderating effect of absorptive capability on the relationship between external networks (local business network and horizontal spillover network) and independent innovation performance. To enhance the local enterprises' independent innovation, it is important to take advantage of the benefits from different external networks through the development of absorptive capability.

RECOMMENDATIONS

Although this study provides some insights to the extant literature and managerial understandings, there are a number of limitations to

release in the future study. The findings by the current researchers broaden and deepen the understanding of how different external networks affect local enterprises' independent innovation, and underscore the need to enhance absorptive capability. However, this paper mainly focuses on the role of absorptive capability, regardless of other organizational capabilities, which have the potential effects on mediating the external networks and innovation relationship. To elicit further insights, some other behavioral variables should be incorporated and the better comprehensive variables should be designed to measure organizational capability. In addition, the current researchers only conducted a survey in Fujian and Guangdong province in south China, where most of the local firms are small and medium enterprises. Therefore, the extent to which the findings of this study may be generalized, even for firms in east China or other emerging economies, remains to be discussed. Nonetheless, such limitations should be considered as signaling opportunities, rather than forming barriers, for future studies.

ACKNOWLEDGMENTS

This paper is supported by "The National Social Science Fund of China" (12CJY042). The researchers wish to thank the anonymous reviewers for their helpful comments on earlier drafts of this manuscript. Business organizations that took part in this study are also gratefully acknowledged.

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APPENDIX

Measurement Items in Questionnaire***Independent Innovation Performance***

1. Over the past 3 years, the quantity of new products development has been outstanding.
2. Over the past 3 years, the quantity of core technology development has been outstanding.
3. Over the past 3 years, the quantity of new patent has been outstanding.
4. Over the past 3 years, the technological system of our company has been outstanding.
5. Over the past 3 years, all the innovation that matters about our company has been outstanding.

Absorptive Capability

1. We quickly understand the value of new available technology information.
2. We quickly recognize shifts in our industry and market in terms of new information.
3. We quickly recognize the usefulness of new external information to existing knowledge.
4. We periodically meet to discuss consequences of market trends and new product development.
5. We periodically modify quality control system according to the assimilation knowledge.
6. We regularly integrate the assimilation knowledge with other technology knowledge.
7. We frequently apply the assimilation knowledge for business innovation.

FDI Spillover Network***Horizontal Spillover Network***

1. We try to copy foreign-invested companies' production processes/techniques.
2. We attempt to learn from foreign-invested companies' managerial practices/style.
3. We have been prompted by our foreign-invested competitors to be more efficient.
4. We have learned more innovation that matters by our foreign-invested competitors.
5. We like particularly to hire foreign-invested companies' skilled workers.
6. We like particularly to hire foreign-invested companies' managerial staff.

Vertical Spillover Network

1. Our core raw-materials/ equipments were mainly purchased from foreign-invested companies.
2. We work closely with foreign-invested companies to obtain high quality raw-materials/equipments.
3. We upgrade our products/services as a result of foreign-invested companies' demand.
4. We work closely with foreign-invested companies to improve our products/services.
5. We provide better value for money than we used to be.

Local Networks***Local Business Network***

1. We contact with the suppliers very frequently in the region.
2. We contact with the clients very frequently in the region.
3. We contact with the competitors very frequently in the region.
4. We contact with the related enterprises very frequently in the region.
5. We keep in touch with a large number of suppliers in the region.
6. We keep in touch with a large number of clients in the region.
7. We keep in touch with a large number of competitors in the region.
8. We keep in touch with a large number of related enterprises in the region.

Local Institute Network

1. We contact with the government sectors very frequently in the region.
2. We contact with the industry associations very frequently in the region.
3. We contact with the scientific research institutions very frequently in the region.
4. We contact with the financial institutions very frequently in the region.
5. We keep in touch with a large number of government sectors in the region.
6. We keep in touch with a large number of industry associations in the region.
7. We keep in touch with a large number of scientific research institutions in the region.
8. We keep in touch with a large number of financial institutions in the region.