2019

Local relational embeddedness and subsidiaries' innovative performance

Qin Yang
Robert Morris University

Yong Wang
Western New England University

Crystal X. Jiang
Bryant University, cjiang1@bryant.edu

JBAM

Local Relational Embeddedness and Subsidiaries' Innovative Performance

Qin Yang
Robert Morris University

Yong Wang
Western New England University

Crystal X. Jiang
Bryant University

Abstract

We examine how foreign subsidiaries' local networks with clients, suppliers, and research institutes in emerging markets affect their innovative performance by incorporating resource- based view with local embeddedness perspective. Utilizing a survey dataset of 381 multinational corporation subsidiaries in China, we explore both quality and quantity of subsidiaries' relations with local clients, suppliers, and research institutes and their impact on subsidiaries' innovative performance. Specifically, we find that high-quality relations with local clients, broader network with local suppliers, and collaboration with local research institutes all contribute to subsidiaries' innovative performance. The follow-up on-site interviews with senior executives of foreign subsidiaries provide strong support to all of our empirical findings. This study provides theoretical and practical implications in understanding subsidiaries' innovative performance.

Keywords: *foreign subsidiaries, relational embeddedness, local networks, R&D intensity, innovative performance, emerging market*

Introduction

Multinational corporations (MNCs) are confronting greater challenges to survive and sustain their competitive advantage than ever before due to increasing global competition. MNCs' innovation has been playing vital roles in generating productivity growth and enhancing competitiveness (e.g., Aghion and Howitt, 1998; Battisti and Stoneman, 2003; Hansen and Løvas, 2004). Therefore, how to improve the innovative performance of MNCs has aroused much interest among both researchers and practitioners. Innovative performance refers to firms' introduction of new products, new process systems, or new devices into the market (Freeman and Soete, 1997).

An MNC's innovative performance depends on its ability to tap into and absorb knowledge from various external sources (Chesbrough, 2006; Figueiredo and Brito, 2010; Laursen and Salter, 2006; Teece, 2007). MNCs appear to be in an advantageous strategic position to build and renew knowledge bases from external sources because their subsidiaries are simultaneously embedded in two knowledge contexts: the internal network comprised of the headquarters and other peer subsidiaries, and the external network of local organizations of host

countries (Almeida and Phene, 2004; Meyer *et al.*, 2011). Such dual embeddedness (Andersson *et al.*, 2002; Frost and Zhou, 2005; Kostova and Roth, 2002) enables subsidiaries to possess great potential to gain access to different types of knowledge networks and strengthen their competitive advantage through accumulating capabilities for innovations (Cantwell and Mudambi, 2005; Kuemmerle, 2002; Pearce, 1999).

Although there is an increasing recognition of foreign subsidiaries' knowledge creation in local contexts, there is still a lack of empirical examination of the impact of local relational embeddedness on innovations at the subsidiary level (Figueiredo and Brito, 2010). Specially, there is an urgent need for empirical evidence on subsidiaries' innovative performance in emerging markets (EM) given the trend that MNCs invested heavily in EM in creating new products and processes in the last two decades (Ambos and Ambos, 2009). When examining foreign subsidiaries' behavior in EM, we need to consider the unique characteristics of EM (Ramamurti and Singh, 2009). For instance, unlike in developed countries, foreign subsidiaries must deal with weak institutional enforcement and enactment and therefore rely more heavily on informal institutional enforcement procedures such as network linkages with local stakeholders to improve their performance. In this sense, local embeddedness becomes an important element for foreign subsidiaries to consider when entering relationship-driven EM (Eden and Miller, 2004; Uzzi, 1997).

Although a few studies examined foreign subsidiary's relational embeddedness in a local context, local linkages have been analyzed at a congregate level rather than separating into specific linkages such as those with clients, suppliers, research institutes and among others, which have found generating different effects on firms' innovative performance (Un, Cuervo-Cazurra, and Asakawa, 2010). Moreover, according to previous research, when examining network relationships, both the quantity and quality of relationships needs to be taken into consideration (e.g., Thorelli, 1986). As a result, in this study, we investigate both the breadth and the length of a foreign subsidiary's relationship with clients and suppliers, and investigate how such relationships affect foreign subsidiaries' innovative performance. Further, since universities and research centers function as an important source of information for innovations (Cassiman and Veugelers, 2006), we also investigate how a foreign subsidiary's R&D collaboration with local universities and research institutes matter to their innovative performance. To our best knowledge, our study fills in the gap in empirical literature on the subject matter.

We explore three important questions in this study. 1) How a foreign subsidiary's relational capital with local clients affect its innovative performance? 2) How a foreign subsidiary's relational capital with local suppliers affect its innovative performance? Both quality (length) and quantity (breadth) of local embeddedness (relational capital) are separately investigated in the context, as suggested by literature (e.g., Thorelli, 1986). 3) How a subsidiary's R&D collaborations with local research institutes affect its innovative performance?

Our study contributes to current research on how local embeddedness exerts impact on firm performance. It also enriches our understanding of knowledge management of foreign subsidiaries in emerging contexts. Specifically, the empirical evidence not only provides solid evidence on the different effects of relational embeddedness (i.e., clients, suppliers, and research

institutes) but complimentary effects of subsidiaries' R&D investment on subsidiaries' innovative performance.

Resource-based view and knowledge network of foreign subsidiaries

Resource-based view (RBV) suggests that firm-specific resources play crucial roles in enhancing a firm's competitive advantage (Barney, 1991; Rumelt, 1974; Wernerfelt, 1984). In particular, knowledge is the most important resource for improving competitive advantage and sustaining superior performance (Drucker, 1995; Spender and Grant, 1996). At the end of the 20th century, MNCs have increasingly undertaken R&D in multiple subsidiaries (Cantwell and Piscitello, 2000; Håkanson, 1995) and consequently the subsidiaries have become centers of excellence (Holm and Pedersen, 2000) and/or regional innovation centers (Asakawa and Lehrer, 2003). This is because subsidiaries' exchange partners offer critical new ideas and information, and their relationships with the local network become a unique and productive resource for value creation (Li *et al*., 2009; McEvily and Marcus, 2005). In this context, the subsidiaries are the crucial nodes in MNCs, which contribute to their global operations and knowledge activities through both internal and external networks (Andersson *et al.*, 2002; Frost *et al.*, 2002).

In this research, we mainly focus on subsidiaries' external embeddedness in foreign countries and adopt the Figueiredo's (2011, p.420) definition of embeddedness, which "denotes the notion that the achievement of firms' competitive performance can be facilitated by the social attachments they create with several actors in their social environment (Granovetter, 1985; Uzzi, 1996)." Local relational embeddedness refers to a foreign subsidiary's relationship with different local networks such as clients, suppliers, and research institutes. Trust and cooperation will be built and developed between exchange partners in the networks so that knowledge sharing across the organizational boundaries is possible (Uzzi, 1996; Uzzi and Lancaster, 2003). This approach emphasizes that firms can obtain strategic resources through inter-firm linkages embedded in social relations and external networks (Uzzi and Gillespie, 2002). As Li *et al*. indicated, the local networks of subsidiaries provide "multiple potential sources of knowledge" (2009, p.350).

The most important local networks for subsidiaries are clients and suppliers (Dyer and Hatch, 2006; Uzzi, 1997) because of the buyer-seller relationships that occur through the subsidiary's sales and purchases of local products and services (Andersson *et al*., 2002). The relational embeddedness with local clients and suppliers and other entities affects the subsidiary's technical development, market performance, and innovative activities (Andersson *et al*., 2002; von Hippel, 2005).

In addition, local research institutes such as universities, government research institutions, and private research institutions are major contributors to host countries' innovation. MNCs consider local research environments as one of the top priorities when locating the subsidiaries because research institutes are very important sources for subsidiaries to acquire knowledge and enhance innovative capabilities. Subsidiaries both compete with local research institutes in human resources markets and collaborate with these institutes in R&D developments. As a result, we examine local relational embeddedness of a subsidiary from three

important local stakeholders: clients, suppliers, and research institutes to test whether they affect subsidiaries' innovative performance.

Relational embeddedness and innovative performance of foreign subsidiaries

Research studies suggest that clients are major sources of innovative ideas for business entities. Clients gather information about the products and services and reflect it back to the manufacturers or service providers when they specify their requirements and encourage new products and services (von Hippel, 2005). Specifically, more clients in the market lead to heterogeneous resources which promote innovation (Rodan and Galunic, 2004); whereas diverse knowledge can speed up learning process, leading to enhanced innovative performance (Zahra *et al.*, 2000). Therefore, we argue that foreign subsidiaries' broader relational capital with local clients encourages clients to share more crucial product and market information with foreign subsidiaries, thus helping subsidiaries to better adapt to local markets by introducing new product development or revising current product/service offerings.

Hypothesis 1a: *A subsidiary's relational breadth with local clients positively affects its innovative performance.*

A subsidiary's relational capital with local clients also facilitates its troubleshooting and market understanding in introducing new production elements or revising its service operation. This relational capital takes time to build up and maintain. But after a stable long-term relationship is well established, trust and cooperation will be promoted and communication and pursuit of shared goals and values will be enhanced (Morgan and Hunt, 1994). Higher partnership commitment and mutual goal attainment enable more in-depth information or knowledge sharing and more efficient collaboration, thus improving innovative performance. As a result, we argue that long-term social relationship with local clients improves firms' knowledge acquisition and integration effectiveness, thus affecting innovative performance.

Hypothesis 1b: *A subsidiary's relational length with local clients positively affects its innovative performance.*

The relationship between companies and their suppliers has also been recognized as a key element in firms' internal improvement process. On the one hand, local suppliers provide not only parts and materials, but also new ideas about how to incorporate the inputs into subsidiaries' production process. On the other hand, the subsidiaries specify their needs in production and require improvements to suppliers if necessary. This collaborative relationship benefit subsidiaries' innovative performance in the following ways. First, the collaboration between manufacturers and suppliers leads to new product development and improves product quality with reduced costs and lead time (Clark, 1998; Clark and Fujimoto, 1991), all of which in turn improve subsidiaries' innovative performance. Second, subsidiaries benefit from important proprietary information and spillovers through the linkages with local suppliers, which lead to further product differentiation or product quality enhancement through product innovation (Baldwin and Hanel, 2003). Third, a foreign subsidiary's relationship with local suppliers helps it cope with issues associated with liability of foreignness (LOF) (Luo *et al.*, 2002), thus helping a

foreign subsidiary adjust the product offering to the local market with enhanced innovative performance.

Hypothesis 2a: *A subsidiary's relational breadth with local suppliers positively affects its innovative performance.*

With access to a broad network of local suppliers, subsidiaries might also want to maintain long-term relationships with suppliers. Stable relationships with suppliers can help subsidiaries to reduce cost for searching and screening suppliers and focus their time and capital more on their innovative activities. In addition, long-lasting relationships also enhance trust and commitment, which lead to effective communication, cooperation, and the pursuit of shared goals and values (Morgan and Hunt, 1994). The cooperative commitment and common interests drive both parties to better share knowledge and introduce new products or processes. However, suppliers may have the tendency to discourage their buyer from developing new products to protect their own investment in existing technology and skills (Lau *et al.*, 2010). In other words, long-term relationships with local suppliers might have both helpful and harmful effects for subsidiaries' innovative performance. For empirical test purposes, we still propose a positive relationship.

Hypothesis 2b: *A subsidiary's relational length with local suppliers positively affects its innovative performance.*

Research institutes play a critical role in promoting local firms' innovative activities since they provide local businesses with external knowledge and information. The cooperation and interaction with these institutes significantly broadens a foreign subsidiary's knowledge and experience in its learning process when conducting innovative activities. Since innovation research is extremely risky and costly (Laursen and Salter, 2006), the co-occurrence of external resources from local research institutes could alleviate the risk and financial burden of subsidiaries in searching for and developing key technologies, which are essential for the evolution of products or services to support their innovative activities. Besides, the qualified scientists and engineers in local research institutes who may have both the breadth and the depth of knowledge in modifying products and services to local market needs are essential for subsidiaries' innovative performance. Therefore, we predict that a foreign subsidiary's relationship development with local research institutions enhances its innovative performance.

Hypothesis 3: *A subsidiary's collaboration with local research institutes positively affects its innovative performance.*

In sum, the important local linkages with clients, suppliers, and research institutes provide vital channels for foreign subsidiaries to access local resources, understand local market conditions, and adapt products or services to better compete in local environments. Although developing and maintaining a wide range of close relationships with local clients and suppliers requires high search and maintenance costs as well as high-quality managerial skills, the advantages subsidiaries could experience from these close relationships might outweigh the costs of obtaining and keeping these relationships.

Data

With the rapid economic growth and market potential, a large amount of foreign direct investment has flowed into China, and China has become one of the important investment destinations for foreign subsidiaries (UNCTAD, 2017). Further, relationships have been found to play a critical role in business transactions in China (Luo, 2002). Therefore, China is an appropriate context in examining the effect of local relational embeddedness on foreign subsidiaries' innovative performance.

We combined survey questionnaires and on-site interviews with some senior executives in this study to intensively explore the effect of our interest. Our survey data were drawn from a survey conducted by the World Bank from 2001 to 2002 with the help from Enterprise Survey Organization of the Chinese National Bureau of Statistics. The first stage of the survey covered 300 firms in each of the five Chinese cities: Beijing, Chengdu, Guangzhou, Shanghai, and Tianjin for a total of 1,500 firms. The survey collected detailed information on different aspects of firm-government relations, innovation, technology, and others. The questions were responded to by the senior managers of the main production facility of the interviewed firm. Most quantitative questions covered the period from 1997 to 2000; most qualitative questions covered only the time of the survey. The second stage of the survey, conducted in 2001 and 2002, covered the same set of firms. The questionnaire covered investment climate constraints on the establishment, infrastructure and services, finance, labor relations, sales and supplies, business-government relations, conflict resolution and the legal environment, crime, capacity, innovation, and learning (World Bank Enterprise Survey).

From the 1,500 survey results, we identified 381 firms as subsidiaries of MNCs and used them for our sample. The sample firms represent a wide spectrum of both manufacturing and service industries, including electronic components, autos and auto parts, clothing and leather products, electronic and communication equipment, household electrical goods, information technology services, accounting, auditing, and nonbank financial services, business logistics services, advertising and marketing services, and communication services. We categorized them into two general industries: manufacturing industry and service. Of the sample subsidiaries, 81.1% are in manufacturing industry (309) and the other 18.9% are in service industry (72).

Since the survey data were collected in 2000-2002, we further conducted face-to-face interviews with some senior executives as a follow up approach. Our qualitative approach is desirable when a phenomenon is not well understood (Eisenhardt, 1989). Further, relationship building is a dynamic process, so survey designs and statistical analyses are not well suited to generalize conclusions (Elsbach and Kramer, 2003). Since four to eight cases are desirable for qualitative research (Eisenhardt, 1989), in 2010-2012 we supplemented survey data with eight in-depth interviews with senior executives of foreign MNCs to provide an integrative view of how local embeddedness of subsidiaries with different stakeholders matters to innovative performance.

Measurement:

Dependent variable

Instead of using patent number or R&D expenses as proxy, we use a more straightforward variable to measure innovative performance: the total number of new product development and new process development in the foreign subsidiaries from year 1998 to year 2001. In the survey, the following five questions are asked about each subsidiary's business activity since the beginning of 1998: 1) whether introduced new products in an existing business line? 2) whether entered new business line? 3) whether new process improvements were conducted in the firm? 4) whether new management techniques were employed in the firm? 5) whether new quality controls in production were applied in the firm? The former two are treated as product innovation and the latter three are considered process innovation. The total number of yes answers in all five questions is used as a proxy for innovative performance of subsidiaries and this variable construction has a Cronbach's alpha value of 0.797.

Independent variables

The independent variables of interest measure foreign subsidiaries' local relational embeddedness, including relationships with local clients, local suppliers, and local research institutes. First, we use the numbers of the local clients and suppliers of the products in a subsidiary's main business to measure the breadth of relationships. The higher the number is, the wider the breadth of relationships. Second, since relationship length exerted an influence on trust (e.g., Blau, 1964; Lewickci and Bunker, 1996), longer business relationships build trust and improve cooperation between subsidiaries and local clients and suppliers. We use the length of the relationship to proxy for relational quality. The survey question measures how long the subsidiary has conducted business with local clients/suppliers in its main business lines with five scales: less than 1 year, 1 to 2 years, 2 to 3 years, 3 to 4 years, and more than 4 years.

As for the relations with local research organizations, the survey asks whether subsidiaries have a contractual or long-standing relationship with 1) local university, 2) government research institutions, 3) private research institutions, and 4) private companies to perform R&D activities in each year between 1998 and 2000. Since the survey questions do not separate the breadth and length of the collaboration relationship, we use the total number of yes answers in the four questions as the proxy for external R&D collaboration for the observation year. A higher number indicates more collaboration with local research institutes in conducting R&D activities.

Control variables

Empirical studies show that firms' innovations can be influenced by the business environment, industry, and firm characteristics. Accordingly, in the regression analysis we controlled for industry, firm size, firm age, foreign ownership of the local firm, external technological resources, subsidiaries' prior performance, and R&D intensity.

Industry effect. The industry context is likely to have an influence on innovative performance of foreign subsidiaries. Following Gupta and Govindarajan (2000), Kuemmerle (1999) and others, a dummy variable was used to indicate whether the subsidiary was in manufacturing or services, with service industry serving as the base case.

Subsidiary size. Firm size affects the innovative performance of a firm (Vaona and Pianta, 2008). Scherer (1991) also pointed out that product R&D increased with the growth of firm size, which improved innovations. We control subsidiary size by using the logarithm of the total sales averaged over the period 1998 to 2000, the past three years before our survey started. Total sales are important indicators for firm size in corporate finance, and they are more related to product market competition (Dang *et al.*, 2017).

Subsidiary age. Subsidiary age is likely to affect the innovative performance of subsidiaries in that the longer a subsidiary operates in the host country, the more relational capital it can obtain and the more resources it can access. Subsidiary age is measured by the logarithm of number of years the foreign subsidiary has operated in China until the survey year. The minimum age is less than 1 year, and the maximum age is 20 years. The mean value is 7.4 and standard deviation is 1.7.

Foreign ownership. The ownership of foreign companies in subsidiaries is controlled as a proxy for entry mode. The higher the foreign ownership, the more autonomy the subsidiary has in seeking and building local relationships. However, the higher the local ownership, the more the relational resources the firm has. It is measured as the percentage of the subsidiary being owned by multinational corporations. The foreign ownership ranges from 1% to 100%. The average foreign partner ownership share is around 58%.

Access to external technological resource. Since external resources are important for firms to improve their innovative performance (e.g., Laursen and Salter, 2006; Zheng *et al.*, 2013), we control this effect using the survey results on this subject. External technological resources include technical assistance received by the subsidiary on five different perspectives: R&D, quality control, troubleshooting, testing and design, from external sources excluding local clients, suppliers, and research institutes. The variable value is the total number of yes answers in the five categories.

Prior financial performance. It is widely accepted that past financial performance affects firms' resource commitment to innovative activities (Sorescu *et al.*, 2003) and thus innovative outcome. This effect is controlled using the average financial performance (return on sales) of subsidiaries in the three years before the survey year.

R&D intensity. R&D investment is necessary for firms to improve their absorptive capacity (Tsai, 2001) and to develop new knowledge (Roussel *et al.*, 1995). Since firms' success on innovation is dependent on their R&D intensity (Negassi, 2004), we control this variable and measure it with the average ratio of R&D to sales in the previous three years.

Empirical results

The means and standard deviations of all variables as well as correlation coefficients among all variables are shown in Table 1. We use ordinary least squares (OLS) regressions to test our hypotheses and report the regression results in Table 2. All the control variables: industry, subsidiary size, subsidiary age, foreign ownership, access to external technological resources, prior financial performance, and R&D intensity are included in the first model specification.

In the second model specification, we test Hypotheses 1a and 1b: effects of the breadth and length of relationship with local clients on subsidiaries' innovative performance. The breadth and length of relationship with local suppliers (Hypotheses 2a and 2b) and relational capital with local research institutes (Hypothesis 3) were tested in models 3 and 4, respectively. In the last model specification, all the previously tested results are included in one regression model to add robustness to the empirical finding. The adjusted R-square and F statistics of each model specification are reported at the bottom of the table. Models 2-5 have statistically higher adjusted R-square values than those in model 1, signalling the significant explaining power of the variables of our interest. Further, the variance inflation factors in all models are not significant, indicating no multicollinearity among variables

Table 1. Descriptive Statistics and Correlations

Variables	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12
1. Innovative performance	2.14	1.78	1											
2.Subsidiary size	4.69	.95	.314** (.000)	1										
3.Subsidiary age	.87	.22	-.069 (.183)	.003 (.947)	1									
4.Foreign ownership	.58	.27	-.217** (.000)	-.009 (.861)	-.094 (.068)	1								
5. Access to external technological resources	1.58	1.79	.375** (.000)	.363** (.001)	-.096 (.062)	.030 (.556)	1							
6. Prior financial performance	.11	1.30	.103 (.059)	.304** (.000)	-.018 (.748)	-.036 (.514)	.081 (.137)	1						
7. R&D intensity	.09	.99	.037 (.687)	-.134* (.011)	.044 (.402)	.006 (.906)	-.017 (.748)	.041 (.467)	1					
8.Number of local clients	1.46	.97	.091 (.104)	.066 (.283)	.-.054 (.332)	-.140* (.012)	-.007 (.898)	-.082 (.168)	.68 (.235)	1				
9.Length of relationship with local clients	4.02	1.31	.103* (.045)	.159** (.005)	.419** (.000)	-.073 (.156)	-.011 (.833)	.022 (.688)	.025 (.640)	-.056 (.316)	1			
10.Number of local suppliers	1.30	.63	.313** (.000)	.127* (.014)	.035 (.527)	-.128* (.019)	-.140* (.010)	.110 (.055)	.038 (.499)	.363** (.000)	.053 (.326)	1		
11.Length of relationship with local suppliers	4.00	1.30	.152** (.003)	.406** (.000)	.381** (.000)	-.134** (.009)	.068 (.188)	.048 (.386)	.002 (.963)	-.031 (.582)	.737** (.000)	.133* (.014)	1	
12. R&D collaboration with local institutes	.17	.52	.289** (.000)	.198** (.000)	-.086 (.097)	-.146** (.004)	.194** (.000)	.040 (.467)	-.013 (.799)	.232** (.000)	.060 (.243)	.221** (.000)	.077 (.135)	1

Note: * P < 0.05 (2-tailed) and ** P < 0.01(2-tailed)

Table 2. Regression Results of the Local Relational Embeddedness on Innovative Performance of Foreign Subsidiaries

Variables	Innovative Performance				
	Model 1	Model 2	Model 3	Model 4	Model 5
	Standardized coefficients (p value)				
Control Variables					
Industry	.144***	.165***	.122*	.157***	.147*
	(.004)	(.003)	(.024)	(.001)	(.012)
Subsidiary size	.178***	.147*	.151*	.147**	.101
	(.002)	(.022)	(.016)	(.009)	(.136)
Subsidiary age	-.101*	-.112*	-.131**	-.065	-.114*
	(.042)	(.038)	(.010)	(.186)	(.041)
Foreign ownership of the firm	-.246***	-.182***	-.180***	-.211***	-.134*
	(.000)	(.001)	(.001)	(.000)	(.017)
Access to external technological resources	.297***	.296***	.277***	.260***	.262***
	(.000)	(.000)	(.000)	(.000)	(.000)
Prior financial performance	.002	.034	.111	.007	.016
	(.972)	(.552)	(.912)	(.889)	(.763)
R&D intensity	-.009	-.008	-.019	-.284	-.015
	(.850)	(.877)	(.708)	(.777)	(.773)
Local Embeddedness – Clients					
Number of local clients		.139*			.032
(H1a)		(.014)			(.594)
Length of relationship with local clients		.102†			.138†
		(.064)			(.056)
(H1b)					
Local Embeddedness – Suppliers					
Number of local suppliers			.173**		.156*
(H2a)			(.002)		(.017)
Length of relationship with local suppliers (H2b)			.034		-.043
			(.526)		(.555)
Local Research Collaborations					
R&D collaboration with local institutes				.178***	.173**
				(.000)	(.003)
(H3)					
N	321	273	291	321	256
R square change	.264	.024	.025	.033	.066
Model F	16.054	4.313	4.930	14.796	4.772
Adjusted R square	.247	.249	.269	.279	.293

Note †p<.1; *p<.05; **p<.01; ***p<.005

Results in Model 1 show that manufacturing industry firms are more likely to have better innovation outcome than service industry firms (β =.144, p<.005). Firm size is positively related to innovative performance (β =.178, p<.005). Firm age is negatively associated with innovative performance (β =-.101, p<.05). A subsidiary's foreign partner ownership share is negatively related to its innovative performance and the effect is very significant (β =-.246, p<.001). The technological resources acquired from external sources benefit a subsidiary's innovations greatly (β =.297, p<.001). In addition, subsidiary's prior financial performance and R&D intensity has no significant impact on innovative performance.

Our Hypotheses 1a and 1b suggest that foreign subsidiaries' relational breadth and length with local clients are positively associated with subsidiaries' innovative performance. The regression results in Model 2 show that the breadth of relationships with local clients is positively associated with subsidiary innovations (β =.139, p<.05). The length of the relationship with clients also has a positive coefficient, but with a higher p value (β =.102, p<.1). Therefore, Hypotheses 1a and 1b are both supported and the relationship with clients plays a significant role for the subsidiary's innovative performance.

In Hypotheses 2, we argue that foreign subsidiaries' relational breadth and length with local suppliers would be positively associated with innovative performance. Regression results in Model 3 show that relational capital with a broader supplier base is positively associated with subsidiaries' innovative performance (β =.173, p<.05). Therefore, Hypothesis 2a was supported. However, the length of relationship with local suppliers has no significant impacts on innovative performance and thus Hypothesis 2b was not supported. As we discussed in the prior section, keeping long relationships with local suppliers has both positive and negative impact on subsidiaries' innovative performance. As a result, the overall impact might not be significant in either direction statistically.

Subsidiaries' collaborative relationship with local research institutes may benefit their innovative performance and this effect is our Hypothesis 3. Regression Model 4 tests this effect and the result is significantly positive (β =.178, p<.005), hence supporting this hypothesis.

Lastly, we include all the variables in Model 5 of the regression test to see whether the findings hold up in the multivariable setting. When all the local relational embeddedness effects are considered in the same model setting, the length of relationship with local clients, the number of local suppliers, and the collaborations with local research institutes all have positively impact on subsidiaries' innovative performance.

Overall, the findings suggest that when establishing relationships with local networks to improve innovative performance, foreign subsidiaries need to focus on all three dimensions in the local environment: clients, suppliers, and research institutes, but with different priorities in mind. Due to the limits of various resources, enlarging the relational network and keeping trustworthy long-term relationship with each member might be two goals that are mutually exclusive. In this situation, subsidiaries should put long-term relationship with local clients as the top priority over larger number of clients, if they could not achieve both. On the other hand, subsidiaries should aim at a broader network of local suppliers rather than trying to keep long-term relationship with suppliers when both goals are competing for resources. Lastly, a foreign

subsidiary's internal R&D investment and external relationship with local research institutes jointly generate positive effects on innovative performance. Collaborations with local research facilities and institutes should always be one of the top priorities in subsidiaries' localization efforts and local network building.

Supplementary analysis

Our main research agenda was to understand how local embeddedness matters to foreign subsidiaries' innovative performance. Based on the interview data, we found that subsidiary's long-term relationships with clients matter to their innovative performance. This is further supported by our interview with senior executives. In our informant's words:

Patient is the key to our success in China. When we first entered China, we didn't anticipate the amount of time we must dedicate to develop relationships with local clients. In our initial years of operation, it was frustrating because we didn't have a clear understanding of what clients want and why they could not articulate specific requirements directly with us. Over time, we learned that China has a relational culture in that trust with clients does not happen based on our past records in other markets. Instead, we must first overcome distrust from our clients, then gradually build our relationship with them. Once we build trust with clients, they become open to communicate with us about products and services which ultimately help us improvising products and services that satisfy local market needs.

Another informant supported the similar view from the legitimacy perspective:

What we have experienced in China is not exactly liability of foreignness that we experienced in other countries; instead we felt the pressure of the liability of distrust from clients. Our clients in China are hard to convince based on our past transaction records. What we experienced is the importance of establishing legitimacy in this fast-growing emerging market. Among different approaches, the longer we have worked with influential clients in the industry, the easier for us to showcase our credentials and competence. This is part of their Guanxi philosophy. Sometimes westerns confuse guanxi with guanxi web (guanxi wang in Chinese). A guanxi web is an aggregation of achieved guanxi relationship possessed by a firm. The longer the relationship with local clients, the denser the guanxi web we belong to locals, the stronger trust we could develop when developing new clients. Once we develop trust with local clients, they are more involved in our innovation activities which contribute to our subsidiary innovative performance.

When inquired about foreign subsidiaries' relationships with local suppliers, similar to our result about how the breadth of suppliers enhances firms' innovative performance and the arguments of possible negative effect of long standing relationship with suppliers, our informants mentioned the following:

We hesitated to bring our R&D activities to China, simply because of its weak intellectual property right (IPR) environment. Our hard-earned benefits of investing in patents and copyrights can't sustain in China because local partners and even suppliers can replicate our product and process fairly quickly. It is common for suppliers to pursue forward integration of their supply

chain, which may become direct competitors in the industry. In this regard, we are careful with our relationships with local suppliers. Instead of relying on one or a few major suppliers for our operation, we rely on different suppliers that are more cost effective with guaranteed products.

Further, foreign subsidiaries' relational capital with local research institution were found to play a significant role in local firms' innovation activities. As reflected by one informant:

Many research institutes in China have direct access to the National Basic Research Program, which is a government funded program directly financing firms' R&D projects. We have benefited from building long-term relationship with local research institutes in recognizing business opportunities, resolving unforeseen circumstances during integration process in innovation activities, and quickening the rate of new product development. It is cost effective for us to collaborating with research institutes and universities to fully understand market needs and become more agile involving innovate products and process based on market conditions and future trends.

Overall, our follow-up interviews with senior executives of foreign subsidiaries emphasize the importance of developing long-term relationships with local clients and research institutes to enhance firms' innovation activities. However, due to the country's undeveloped IPR environment in terms of enactment and enforcement, subsidiaries are reluctant to develop long-term relationship with local suppliers. This is an effective protection mechanism to avoid technology imitation and unfair competition with local companies.

Discussion and conclusion

This study aims to contribute to the current literature on the knowledge network of foreign subsidiaries by providing an empirical support of the effect of relational embeddedness on subsidiaries' innovative performance in emerging contexts. Our findings show that local relational embeddedness factors can enhance innovative performance of foreign subsidiaries. In addition, subsidiaries' relationships with different local organizations had different effects on their innovative performance.

Specifically, it was very important for subsidiaries to establish high-quality relationships with local clients, and to search and build more linkages with local suppliers and local research institutes. Our findings indicate that external resources from local clients, suppliers, and research institutes are very valuable resources for subsidiaries to implement innovation development, which is consistent with previous studies on the importance of external resources on firm innovative performance (e.g., Baldwin and Hanel, 2003; Chesbrough, 2003; von Hippel, 2005). Further, the employment of local research resources was very significant for subsidiary innovation, which supported the co-occurrence effect of internal know-how and external knowledge acquisition on firms' performance (e.g., Caloghirou *et al.*, 2004; Cassiman and Veugelers, 2006; Dieleman and Sachs, 2008; Kotabe *et al.*, 2017).

In addition, our study provided an in-depth analysis of how the local relational capital impacts innovation. Due to the limits of various resources, enlarging the relational network and keeping trustworthy long-term relationships with each member might be two goals that are

mutually exclusive. In this situation, subsidiaries should put long-term relationship with local clients as the top priority over larger number of clients, if they could not achieve both. On the other hand, subsidiaries should aim at a broader network of local suppliers rather than trying to keep long-term relationship with suppliers when both goals are competing for resources. Lastly, a foreign subsidiary's internal R&D investment and external relationship with local research institutes jointly generated positive effects on innovative performance. Collaborations with local research facilities and institutes should always be one of the top priorities in subsidiaries' localization efforts and local network building.

The results suggested that a complementary relationship of internal and external factors existed for innovation. R&D investment had a complementary effect with the relationship of local research institutes. According to Cassiman and Veugelers (2006), the degree of complementarity of internal R&D activities and external knowledge acquisition could be influenced by the firm's strategic environment. As such, other factors such as the competitive environment subsidiaries operate in should be taken into account in future research.

The study also advanced our knowledge of international management of foreign subsidiaries in several ways. Not much research investigated the effect of local embeddedness of subsidiaries on innovation, especially in emerging market contexts (Figueiredo and Brito, 2010). Although previous empirical studies examined how firms used local resources to improve innovative performance, their investigation was based on patent citations or R&D expenditure (Figueiredo and Brito, 2010). Our study extended previous research on local embeddedness of subsidiaries (Andersson *et al*., 2001, 2002; Kuemmerle, 2002; Almeida and Phene, 2004) by exploring how both length and breadth of local networks affect innovative performance of foreign subsidiaries in different ways.

Several key managerial implications can be drawn from our study. First, our research will help managers to use local valuable resources to achieve innovation efficiently and effectively. And when there is resource shortage, what local relational capital should be established and developed with top priority. Subsidiary managers need to nurture their relationship with local stakeholders to obtain access to important external knowledge and information to achieve good innovative performance. Prior research has emphasized the importance of mutual trust in business-to-business relationships. Our findings indicated that subsidiaries need to build relational capital with some external partners to promote long-term collaborative relationships to enhance their innovative performance. Second, since organizational capabilities that are crucial for firms to gain and sustain competitive advantage reside in the network of learning-based relationships, subsidiary managers need to continuously invest in R&D to better utilize diverse resources from local networks to enhance their firms' innovativeness.

As is the case with other studies, this research also has several limitations. First, this is not a longitudinal study, which can't provide a dynamic perspective about how the local relational embeddedness impact innovative performance of subsidiaries. Although we supplemented our initial survey with follow-up interviews, how foreign subsidiaries develop and maintain relationship with local organizations and its effect on firm performance over time will be a very interesting topic for future research. Second, the data in this study came from subsidiaries in China. Thus, the results might not be generalizable to other emerging market economies. Last

but not least, we don't consider subsidiary's internal embeddedness such as subsidiary mandate (Cantwell and Mudambi, 2005; Birkinshaw and Hood, 1998) and its interaction with subsidiary's external networks. We call for more research to incorporate those characteristics to further enhance our understanding of this new area of research.

References

Aghion, P. and Howitt, P. (1998). *Endogenous growth theory*. MIT Press: Cambridge, MA.

Almeida, P. and Phene, A. (2004). Subsidiaries and knowledge creation: the influence of the MNC and host country on innovation. *Strategic Management Journal*, 25, 8/9, 847-864.

Ambos, B. and Ambos, T. (2009). Location choice, management and performance of international R&D investments in peripheral economies. *International Journal of Technology Management*, 48, 1: 24-41.

Andersson, U., Forsgren, M. and Holm, U. (2001). Subsidiary embeddedness and competence development in MNCs a multi-level analysis. *Organizational Studies*, 22, 6: 1013-1034.

Andersson, U., Forsgren, M. and Holm, U. (2002). The strategic impact of external networks: subsidiary performance and competence development in the multinational corporation. *Strategic Management Journal*, 23, 11: 979-996.

Asakawa, K. and Lehrer, M. (2003). Managing local knowledge assets globally: the role of regional innovation relays. *Journal of World Business*, 38, 1: 31-42.

Baldwin, J. R. and Hanel, P. (2003). *Innovation and Knowledge Creation in an Open Economy. Canadian Industry and International Implications*. Press Syndicate: Cambridge University, Cambridge.

Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17, 1: 99-120.

Battisti, G. and Stoneman, P. (2003). Inter- and intra-firm effects in the diffusion of new process technology. *Research Policy*, 32: 1641-1655.

Birkinshaw, J. and Hood, N. (1998). Multinational subsidiary evolution: capability and charter change in foreign-owned subsidiary companies. *Academy of Management Review*, 23, 4: 773-795.

Blau, P. M. (1964). *Exchange and power in social life*. New York: Wiley.

Caloghirou, Y., Kastelli, I. and Tsakanikas, A. (2004). Internal capabilities and external knowledge sources: complements or substitutes for innovative performance? *Technovation*, 24, 1: 29-39.

Cantwell, J. and Mudambi, R. (2005). MNE competence-creating subsidiary mandates. *Strategic Management Journal*, 26, 2: 1109-1128.

Cantwell, J. and Piscitello, L. (2000). Accumulating technological competence: its changing impact on corporate diversification and internationalization. *Industrial and Corporate Change*, 9, 1: 21-51.

Cassiman, B. and Veugelers, R. (2006). In search of complementarity in innovation strategy: internal R&D and external knowledge acquisition. *Management Science*, 52, 1: 68-82.

Chesbrough, H. (2003). *Open Innovation*. Harvard University Press, Cambridge, MA.

Chesbrough, H. (2006). Open innovation: a new paradigm for understanding industrial innovation. In: Chesbrough H, Vanhaverbeke W, and West J. (Eds.) *Open innovation: researching a new paradigm* (pp. 1-14). Oxford University Press: New York.

Clark, K. B. (1998). Project scope and project performance: the effect on parts strategy and supplier involvement in product development. *Management Science*, 35, 10: 1247-1263.

Clark, K. B. and Fujimoto, T. (1991). *Product Development Performance*. Boston: Harvard Business School Press.

Dang, C., Li, Z. and Yang, C. (2017). Measuring firm size in empirical corporate finance. *Journal of Banking and Finance*, 86: 159-176

Dieleman, M. and Sachs, W. (2008). Economies of connectedness: concept and application. *Journal of International Management*, 14, 3: 270-285.

Drucker, P. (1995). *Managing in a time of great change*. Oxford: Butterworth Heinemann.

Dyer, J. and Hatch, N. (2006). Relation-specific capabilities and barriers to knowledge transfers: creating competitive advantage through network relationships. *Strategic Management Journal*, 27, 8: 701-719.

Eden, L. and Miller, S. R. (2004). Distance matters: Liability of foreignness, institutional distance and ownership strategy, in Michael A. Hitt and Joseph L.C. Cheng (Eds.) *Theories of the multinational enterprise: diversity, complexity and relevance" (Advances in International Management, Volume 16)* (pp.187-221). Emerald Group Publishing Limited.

Eisenhardt, K. M. (1989). Building theories from case study research. *Academy of Management Review*, 14, 4: 532-550.

Elsbach, K. D. and Kramer, R. M. (2003). Assessing creativity in Hollywood pitch meetings: evidence for a dual-process model of creativity judgments. *Academy of Management Journal*, 46, 3: 283-301.

Figueiredo, P. (2011). The role of dual embeddedness in the innovative performance of MNE subsidiaries: evidence from Brazil. *Journal of Management Studies*, 48, 2: 417-440.

Figueiredo, P. and Brito, K. (2010). The innovation performance of MNE subsidiaries and local embeddedness: evidence from an emerging economy. *Journal of Evolutionary Economics*, 21, 1: 141-165.

Freeman, C. and Soete, L. (1997). *The economics of industrial innovation*. Psychology Press.

Frost, T., Birkinshaw, J. and Ensign, P. (2002). Centers of excellence in multinational corporations. *Strategic Management Journal*, 23, 11: 997-1018.

Frost, T. and Zhou, C. (2005). R&D co-practice, and 'reverse' knowledge integration in multinational firms. *Journal of International Business Studies*, 36, 6: 676-687.

Granovetter, M. (1985). Economic action and social structure: the problem of embeddedness. *American Journal of Sociology*, 91, 3: 481-510.

Gupta, A. and Govindarajan, V. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal*, 21: 473-496.

Håkanson, L. (1995). Learning through acquisitions. *International Studies of Management and Organizations*, 25, 1/2: 121-157.

Hansen, M. and Løvas, B. (2004). How do multinational companies leverage technological competencies? moving from single to interdependent explanations. *Strategic Management Journal*, 25: 801-822.

Holm, U. and Pedersen, T. (2000). *The Emergence and Impact of MNC Centres of Excellence: A Subsidiary Perspective*. London: Palgrave.

Kostova, T. and Roth, K. (2002). Adoption of an organizational practice by subsidiaries of multinational corporations: institutional and relational effects. *Academy of Management Journal*, 45, 1: 215-233.

Kotabe, M., Jiang, C. X. and Murray, J. (2017). Examining complementary effects of political networking capability with absorptive capacity on EMF's innovative performance. *Journal of Management*, 43, 4: 1131-1156.

Kuemmerle, W. (1999). The drivers of foreign direct investment into research and development: an empirical investigation. *Journal of International Business Studies*, 30, 1: 1-24.

Kuemmerle, W. (2002). Home base and knowledge management in international ventures. *Journal of Business Venturing*, 17: 99-122.

Lau, A. K., Tang, E. and Yam, R. (2010). Effects of supplier and customer integration on product innovation and performance: empirical evidence in Hong Kong manufacturers. *Journal of Product and Innovation Management*, 27, 5: 761-777.

Laursen, K. and Salter, A. (2006). Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal*, 27, 2: 131-150.

Lewicki, R. J. and Bunker, B. B. (1996). Developing and maintaining trust in work relationships. In Kramer, R. M. and Tyler, T. R. (Eds.), *Trust in organizations: Frontiers of theory and research* (pp. 114-139). Thousand Oaks, CA: Sage.

Li, J., Poppo, L. and Zhou, K. (2009). Relational mechanisms, formal contracts, and local knowledge acquisition by international subsidiaries. *Strategic Management Journal*, 31, 349-370.

Luo, Y. (2002). Building trust in cross-cultural collaborations: toward a contingency perspective. *Journal of Management*, 28, 5: 669-694.

Luo, Y., Shenkar, O. and Nyaw, M. K. (2002). Mitigating liabilities of foreignness: defensive versus offensive approaches. *Journal of International Management*, 8, 3: 283-300.

McEvily, B. and Marcus, A. (2005). Embedded ties and the acquisition of competitive capabilities. *Strategic Management Journal*, 26, 11: 1033-1055.

Meyer, K., Mudambi, R. and Narula, R. (2011). Multinational enterprises and local contexts: the opportunities and challenges of multiple embeddedness. *Journal of Management Studies*, 48, 2: 235-252.

Morgan, R. M. and Hunt, S. D. (1994). The commitment-trust theory of relationship marketing. *Journal of Marketing*, 58, 3: 20–38.

Negassi, S. (2004). R&D co-operation and innovation: a microeconometric study on French firms. *Research Policy*, 33, 3: 365-384.

Pearce, R. (1999). Decentralised R&D and strategic competitiveness: globalised approaches to generation and use of technology in MNEs. *Research Policy*, 28, 157-178.

Ramamurti, R. and Singh, J. V. (Eds.). (2009). *Emerging multinationals in emerging markets*. Cambridge University Press.

Rodan, S. and Galunic, C. (2004). More than network structure: how knowledge heterogeneity influences managerial performance and innovativeness. *Strategic Management Journal*, 25, 6: 541-562.

Roussel, P., Saad, K. and Erickson, T. (1995). *Third generation R&D: managing the link to corporate strategy*. Boston: Harvard Business School Press.

Rumelt, R. (1974). *Strategy, structure, and economic performance*. Division of Research, Harvard Business School, Boston.

Scherer, F. M. (1991). Changing perspectives on the firm size problem in Z. J. Acs and D.B. Audretsch (Eds.). *Innovation and technological change: an international comparison*. Ann Arbor: University of Michigan Press.

Sorescu, A. B., Chandy, R. K. and Prabhu, J. C. (2003). Sources and financial consequences of radical innovation: Insights from pharmaceuticals. *Journal of Marketing*, 67, 4: 82-102.

Spender, J. and Grant, R. (1996). Knowledge and the firm: overview. *Strategic Management Journal*, Special Issue 17: 5-9.

Teece, D. (2007). The role of managers, entrepreneurs and the literati in enterprise performance and economic growth. *International Journal of Technological Learning, Innovation and Development*, 1, 1: 43-64.

Thorelli, H. B. (1986). Networks: between markets and hierarchies. *Strategic Management Journal*, 7, 1: 37-51.

Tsai, W. (2001). Knowledge transfer in intraorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal*, 44, 3: 996–1004.

Un, C. A., Cuervo-Cazurra, A. and Asakawa, K. (2010). R&D collaborations and product innovation. *Journal of Product Innovation Management*, 27: 673-689.

UNCTAD, (2017). *World investment report*. United Nations Conference on Trade and Development: New York and Geneva.

Uzzi, B. (1996). The sources and consequences of embeddedness for the economic performance of organizations: the network effect. *American Sociological Review*, 61: 674-698.

Uzzi, B. (1997). Social structure and competition in interfirm networks: the paradox of embeddedness. *Administrative Science Quarterly*, 42: 35-67.

Uzzi, B. and Gillespie, J. (2002). Knowledge spillover in corporate financing networks: embeddedness and the firm's debt performance. *Strategic Management Journal*, 23: 595-618.

Uzzi, B. and Lancaster, R. (2003). Relational embeddedness and learning: the case of bank loan managers and their clients. *Management Science*, 49: 383-399.

Vaona, A. and Pianta, M. (2008). Firm size and innovation in European manufacturing. *Small Business Economics*, 30, 3: 283-299.

von Hippel, E. (2005). *Democratizing Innovation*. MIT press.

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5, 2: 171-180.

Zahra, S. A., Ireland, R. D. and Hitt, M. A. (2000). International expansion by new venture firms: international diversity, mode of market entry, technological learning, and performance. *Academy of Management Journal*, 43, 5: 925-950.

Zheng, S., Li, H. and Wu, X. (2013). Network resources and the innovation performance: evidence from Chinese manufacturing firms. *Management Decision*, 51, 6: 1207-122

