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The impact of local linkages, international linkages, and absorptive capacity on innovation for foreign firms operating in an emerging economy

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Abstract This study analyzes the impact of local linkages, international linkages, and absorptive capacity on firm innovation for firms based in one emerging economy while operating in another emerging economy. Testing research hypotheses derived from the institutional and organizational learning perspectives on a sample of 102 Taiwanese manufacturing firms operating in China, we find that the impact of international linkages is greater than that of local linkages, while both local and international linkages have a positive impact on innovation. Further analysis confirms that absorptive capacity has a stronger moderating effect on the relationship between local linkages and innovation than it does on the relationship between international linkages and innovation.

Keywords Local linkages · International linkages · Absorptive capacity · Innovation

JEL Classification F23—Multinational firms · International business
O32—Management of technological innovation and R&D

1 Introduction

Technological innovation is crucial to business success (Kotabe et al. 2011), especially for foreign firms competing with rivals in host countries. Several studies taking the organizational learning perspective have recognized that not only firm-specific resources, but also formal external linkages in the forms of joint ventures (Lane et al. 2001) or strategic alliances (Lane and Lubatkin 1998; Al-Laham and Souitaris 2008) serve as effective means

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by which to infuse new knowledge into firms. Such formal external linkages are used to eliminate, or at least mitigate, the risk of opportunistic behaviors or the use of misleading information by locally based counterparts (Williamson 1991). However, the efficacy of formal linkages may be influenced by institutional environments, especially for foreign firms from emerging economies operating in other emerging economies.

According to the institutional perspective, institutions that represent the rules of the game in a given society will affect firm behavior, both for local and foreign firms (North 1990). Emerging economies, in general, are noted for the ambiguity of property rights, as well as the inconsistent and sometimes arbitrary enforcement of the law. Such institutional contextual factors appear to be a major source of uncertainty for firms wishing to establish formal external linkages (Park and Luo 2001). Further, many firms from emerging economies are usually smaller, compared with those from developed countries, and are less able to attract local firms with which to establish formal ties in host countries. Therefore, informal linkages that convey the positive properties of social networks and do not entail significant transactional or managerial costs (Kang and Kang 2009) would be a preferred means for firms from emerging economies to manage uncertainty or acquire information (Perks et al. 2009). To verify this proposition, we examine the impact of informal external linkages, including local linkages with firms in geographical proximity in a host country and international linkages with firms in other countries, on a foreign firm's innovation[1] in a host country.

Several studies have confirmed the importance of knowledge acquisition from both local and international linkages (e.g., Al-Laham and Souitaris 2008; Nishimura and Okamuro 2011; Whittington et al. 2009). One underlying assumption of these studies is that these linkages have uniform effects on innovation. However, when the institutional differences between developed countries and emerging economies are taken into account, local and international linkages might well be recognized as delivering different resources and knowledge (Kostova and Zaheer 1999). Recent studies have begun to explore the different impacts of heterogeneous linkages between businesses, universities, and government agencies within countries such as China (Gao et al. 2008; Kotabe et al. 2011), but global linkages have largely remained unexamined. In this study, we go beyond the existing literature by exploring the power of local and international linkages. Due to the breadth of knowledge available from international linkages—which may span several countries—we postulate that international linkages are more likely than local linkages to impact firm innovation.

Organizational learning studies have posited that firms need to possess a considerable level of absorptive capacity to recognize, transform, integrate, and apply knowledge acquired from external sources if innovation is to be enhanced (Abecassis-Moedas and Mahmoud-Jouini 2008; Cohen and Levinthal 1990; Zahra and George 2002). Further, such absorptive capacity positively moderates the relationship between external linkages and innovation in a foreign country (Gao et al. 2008). However, because international linkages across different countries deliver a great diversity of knowledge, and because there exists technology gaps between countries, it may be difficult for firms based in emerging economies to fully absorb the latent value of international linkages. Thus, it is worthwhile to examine whether the moderating effect of absorptive capacity on innovation is lower for international linkages than for local linkages.

[1] Since the research on innovation has been conducted by scholars in different disciplines, the terms 'innovativeness' and 'innovation' have been used interchangeably (e.g., Bell 2005; Gao et al. 2008). However, innovation is universally perceived as exploring something new, which is a distinct creation of a firm (Gao et al. 2008); thus, we chose to use this term in the paper.

There are four possible home country-to-host country combinations: emerging economies-to-developed countries, emerging economies-to-emerging economies, developed countries-to-emerging economies, and developed countries-to-developed countries. We tested our research hypotheses by analyzing survey data from a sample of foreign (i.e., Taiwanese) manufacturing firms operating in China. Because the home country is Taiwan and the host country is China in this study, our investigation will focus on the emerging economies-to-emerging economies combination. Notably, China is one of the world's largest recipients of foreign direct investments and Taiwan was its fifth largest foreign investor (Investment Commission 2006). By enhancing our understanding of how external linkages affect the innovation of foreign firms in an emerging economy, we intend to make the following contributions. First, by integrating the institutional perspective to complement the organizational learning perspective, we show that informal external linkages are conducive to the innovation of foreign firms operating in a host country. Second, by offering evidence that international linkages have a greater impact on firm innovation than local linkages do, we emphasize the importance of heterogeneity of information, which may be helpful to managers seeking to selectively build external relationships. Third, we illustrate that a firm's absorptive capacity affects the degree to which the firm is able to exploit the information available from different sources of external relationships. We also highlight the importance of making the distinction between absorptive capacity and sources of information on firm innovation.

After our introduction, we provide a brief overview of the literature. We develop our research hypotheses in Sect. 3. In Sects. 4 and 5 we describe our research methodology and research findings. The last section provides the paper's conclusion.

2 Literature review

Research taking the organizational learning perspective has paid increasing attention to the role of external linkages in firms' innovation. A widely accepted argument is that foreign firms can acquire new knowledge from external sources in host countries (Kotabe et al. 2011). Despite the appeal of this argument, a number of studies have in fact produced mixed findings on the impact of external linkages. Some studies have indeed found evidence of the positive impact of external linkages on innovation (Yli-Renko et al. 2001). Others, however, have found that external linkages have an inverted-*U* shaped relationship to innovation (Kang and Kang 2009). These inconsistent findings may be attributed to a failure to distinguish between external linkages within or outside a host country's institutional environment.

According to the institutional perspective, formal institutions (e.g., legal and governmental regulations) and informal institutions (e.g., norms, values, and beliefs) act to shape firm behavior (North 1990). Specifically, because firms are bounded by institutions, these institutions influence firms' strategy and competitive advantages (Asheim and Coenen 2006). Hence, an understanding of institutional environments becomes central to international firms' success in global markets (Kostova and Zaheer 1999). Recent studies have begun to explore the impact of heterogeneous connections embedded within different institutional environments. Gong (2006), using Japanese multinational enterprises as an example, found that internationally diverse teams perform better in creative idea generation because people of different nationalities offer distinct sets of knowledge and information. Whittington et al. (2009) found that both regional industrial districts and international network position have a positive impact on innovation for US-based life

science firms. Gellynck et al. (2007) argued that regional and international connections facilitated innovation in Belgium's food industry. Along these lines, both local linkages among a host country's institutions and international linkages across various national institutions act as critical means of accessing knowledge for innovation.

Local linkages with geographically proximate suppliers, competitors, and customers are much more likely to influence firm innovation (Boehe 2007; Coccia 2008; Porter 2000). Notably, a context of local linkages embedded in an emerging economy is quite different from a context of local linkages within a developed country (Peng et al. 2008). Several studies on local linkages have focused on high-technology hot spots in developed countries, such as Silicon Valley and Route 128 (Porter 2000), highlighting the flow of extremely new technical knowledge though social circles. However, the institutional framework in emerging economies tends to be underdeveloped, and its technical development, in general, is inferior to that of developed countries (Peng et al. 2008). It is unclear whether firms with local linkages in emerging economies are ultimately more innovative.

Emerging economies, represented by China in this study, are often characterized by underdevelopment and uncertainty, with both unevenly developed workforces and unequally allocated resources across different regions (Child and Tsai 2005). In such situations, local linkages with geographically proximate competitors, customers, and suppliers are likely to facilitate reciprocal interaction and unobserved knowledge flow (Boehe 2007; Zhang and Li 2008), as well as to generate legitimacy in support of foreign firms' innovation and to reduce operational risks (Porter 2000).

However, relying solely on local linkages is not enough when it comes to accessing external knowledge. Access to diverse sets of knowledge across several countries is likely to provide a more robust basis for learning (Cohen and Levinthal 1990). International linkages with customers increase firms' opportunities to learn through exposure to different systems of technologies, marketing demands, and cultural values across countries (Yli-Renko et al. 2001). These sorts of linkages are especially important for foreign firms from emerging economies due to their lack of sufficient resources. However, studies of Chinese firms have tended to focus on managerial linkages with local businesses and universities (Gao et al. 2008), linkages with government agencies and foreign partners invested in China (Kotabe et al. 2011), or business ties and governmental connections (Zhang and Li 2008). These studies have typically ignored the impact of international linkages for local firms as well as for foreign firms in China. International linkages with customers represent new opportunities for learning about culture, markets, and technology, and may allow foreign firms to substitute established, often rigid modes of behavior with more thoughtful and creative ones. Therefore, an understanding of the impact of international linkages is worthwhile.

While both local and international linkages are crucial, their relative importance with respect to a foreign firm's innovation seems to be unequal. The institutional environment in an emerging economy (e.g., China, in this study) is characterized by less developed resources, technologies, and managerial skills, as well as by turbulent markets (Peng et al. 2008). In contrast, the institutional environment in developed countries consists of well-developed and relatively stable political, social, and economic systems. Such stable contexts may well be more conducive to the transfer of a diversity of technical knowledge and market information. When there are stark differences in resources and knowledge in the institutional environments in which external linkages are created, such linkages—whether international or local—are likely to have different degrees of effect on foreign firms' levels of innovation.

While foreign firms may depend on knowledge derived from external linkages to promote innovation, they must also possess the right internal capabilities necessary to deploy such external knowledge resources (Vega-Jurado et al. 2009). According to the organizational learning perspective, firms must develop the absorptive capacity necessary to capitalize on knowledge acquired from external linkages (Lane and Lubatkin 1998). Absorptive capacity refers to the ability to efficiently acquire and assimilate knowledge from external sources, as well as to effectively recombine and apply the external knowledge to commercial ends (Cohen and Levinthal 1990). Following Cohen and Levinthal's work, many empirical and theoretical studies have explored the concept of absorptive capacity from different analytical modeling strategies (Newey and Shulman 2004). Some studies have examined absorptive capacity as an integrated dimension (Gao et al. 2008; Vega-Jurado et al. 2009; Kostopoulos et al. 2011). Some studies have separated the capacity to assimilate external knowledge (through imitation) from the ability to create knowledge (through innovation) (Kim 1998). Other studies have separated absorptive capacity into four dimensions, grouped into two categories: potential absorptive capacity (knowledge acquisition and assimilation) and realized absorptive capacity (knowledge transformation and exploitation) (Jansen et al. 2005; Zahra and George 2002). While several studies have divided absorptive capacity into different dimensions with the aim of improving our understanding of the learning process, these dimensions in fact play complementary roles. Practically, it is to some extent difficult to distinguish them clearly. For example, R&D efforts have traditionally been recognized as a proxy for absorptive capacity (e.g., Gao et al. 2008; Lane and Lubatkin 1998), because it demonstrates that a firm knows where and how to search for knowledge, and then builds the capability to classify and assimilate that knowledge. R&D efforts further advance the transformation and application of external resources to the development of the new component. Therefore, this study treats absorptive capacity as one integrated construct, reflected by a firm's R&D efforts.

Firms endowed with higher levels of absorptive capacity will be able to extract greater benefits from external knowledge, and will therefore outperform rivals in innovation activities (Fosfuri and Tribó 2008). In other words, absorptive capacity moderates the relationships between external linkages and innovation. However, local linkages and international linkages would likely transfer heterogeneous knowledge, creating different absorptive burdens for foreign firms from emerging economies. For example, international linkages to a wide range of developed country-based firms would increase the breadth of external search. To our knowledge, surprisingly few studies have bothered to compare the moderating effect of a foreign firm's absorptive capacity on innovation with respect to local linkages and international linkages. We hope to shed some light on this issue. Let us turn to the discussion of how local linkages, international linkages and absorptive capacity affect the innovation of a foreign firm.

3 Research hypotheses

If innovation is to be enhanced, foreign firms must be able to absorb the external knowledge embedded in local institutions (Kang and Kang 2009). One effective learning method is that of linking with geographically proximate suppliers, customers, and competitors. By linking with local firms located in close geographic proximity in emerging economies, foreign firms can learn how to apply their existing knowledge in new situations, as well as how to utilize complementary resources from institutional environments.

China, noted for the short time in which it transitioned from a planned economy to a free-market system, has experienced considerable political and economic uncertainty, and is still refining its institutional environment (Child and Tsai 2005). Given that foreign firms are by definition unfamiliar with the local environment, collaborating with local suppliers is a quick way of exploiting and adapting to local production systems, thereby transforming suppliers' technological knowledge into new products (Chen 2009). Local customers' connections might provide a firm with a better window for observing customer needs and industrial trends (Boehe 2007). Linkages with a group of local competitors in close geographic proximity can either help firms to be aware of the fledgling technology, or help to create a sort of positive peer pressure that encourages firm innovation (Porter 2000). Although the capabilities of foreign firms operating in China are generally greater than those of local firms, continuous product or service improvements (i.e., innovation) require the input of both suppliers and marketing partners.

Local linkages with geographically proximate firms are also likely to provide a sort of tacit endorsement of foreign firms. Through repeated interaction, groups of firms would likely develop common understanding and practices, transmit social identity, norms, and social support (Knoben 2009), and reduce the amount of time and investment required to gather information (Kotabe et al. 2011). Such institutional support, by freeing up precious resources, would likely facilitate product innovation. Accordingly, local linkages have a positive impact on a firm's innovation.

Hypothesis 1: When operating in an emerging economy, local linkages are positively related to the innovation of a foreign firm from another emerging economy.

Inter-firm knowledge flow or sharing is not limited to firms in close geographical proximity to one another (Nishimura and Okamuro 2011). In fact, international linkages in collaborative processes draw on a variety of resources based primarily in the institutional fields of which they are members (Yli-Renko et al. 2001). International linkages embedded in environments characterized by more fully developed market-oriented institutions are likely to transfer more advanced technical product knowledge, coupled with more marketing, distribution, and service knowledge; such knowledge is markedly different from the manufacturing information mainly provided by local environments (e.g., Chen 2009; Gellynck et al. 2007).

Kotabe et al. (2011) found that a customer's suggestions or ideas have the potential to lead to the discovery of new knowledge. Reciprocal interaction with global customers through knowledge sharing often provides foreign firms with information associated with product designs and fashion trends (Yli-Renko et al. 2001). External learning through joint action in new product development might also result in the acquisition of customers' tacit knowledge and the establishment of interpartner legitimacy, which enhances firms' capacities to combine and exchange knowledge (Low 2010). Further, Chen (2009) noted that international trade fairs serve as an efficient marketing instrument by providing access to global clients, new technological trends, as well as market opportunities. That is, the information collected through such international linkages helps foreign firms explore new ways of doing things, and enhances their knowledge diversity. Innovation, then, would appear to be a function of external relationships with international customers. Regardless of whether these international customer linkages are located in developed countries or emerging economies, access to a diversity of foreign markets and to knowledge of customers with heterogeneous cultural backgrounds are critical elements in advancing innovation (Gong 2006).

Hypothesis 2: When operating in an emerging economy, international linkages are positively related to the innovation of a foreign firm from another emerging economy.

While local and international linkages are both crucial to innovation, their relative influences are likely to be different (Pittiglio et al. 2009). Because emerging markets are characterized by less well-developed legal and business environments, resources and knowledge derived from local linkages in emerging economies are generally assumed to emerge from lower-level labor management and manufacturing technology (Peng et al. 2008). Further, local linkages with firms embedded in a host country lead to a relatively narrow field of knowledge (Poetz and Prügl 2010). Levinthal and March (1993) suggest that the repeated utilization of a similar knowledge base derived from local linkages has the potential to cause foreign firms to become more rigid, narrow, and simplistic in their focus. In contrast, international linkages with customers spanning institutions of a variety of nationalities are likely to present a wide range of products, know-how and market information, thereby presenting a greater potential to improve innovation. Learning and integrating knowledge from different countries can lead to cognitive change and increase awareness of new ideas and trends (Gong 2006). Observing new market dynamics and arranging new partnerships helps to facilitate the creation of new ideas. In particular, when foreign firms from emerging economies possess limited know-how and resources (Chen 2009), the influence of international linkages on innovation should be more significant for foreign firms, as compared with that of local linkages. Further, due to continuously changing customer demand, international linkages with customers may alleviate the possible negative consequences of the over-embeddedness, structural rigidity and organizational inertia that may result from local linkages.

Additionally, as suggested by Buckley and Casson (1976), foreign manufacturing firms engaging in overseas expansions generally have proprietary advantages in global customer-based relationships, in which firms may acquire unique know-how that allows them to compete with incumbent firms. Given such advantages, foreign firms are more capable of continuously differentiating themselves by exploring external linkages with international customers than by utilizing geographically proximate local linkages.

Hypothesis 3: When operating in an emerging economy, the impact on innovation is higher for international linkages than that of local linkages for a foreign firm from another emerging economy.

External linkages may be thought of as factors that raise the efficiency of knowledge exchange, help create systems of transactional coordination, and reduce institutional uncertainty—but firms must also build absorptive capacity to help internalize such external knowledge. While we have simply placed this construct in our model for examination without developing a direct hypothesis associated with absorptive capacity on innovation, its moderating effects on innovation for local linkages and for international linkages nevertheless have a place in our framework.

Absorptive capacity, manifested as a set of firm-specific capabilities, acts to enable firms to recognize, assimilate, and apply knowledge gained from local linkages, and thus improves firm innovation. The role of absorptive capacity is more important in situations of intense local competition. When it comes to besting local competitors, an aggressive firm with greater absorptive capacity is able to customize products quickly, exploit information continuously, and keep ahead of industry trends persistently (Fosfuri and Tribó 2008). Additionally, in order to persuade local partners to contribute knowledge, foreign firms need to demonstrate their reliability and reputation. Absorptive capacity acts to establish a foreign firm as a reputable

partner, because such capacity signals the presence of internal resources, which might contribute to collaborative relationships (Low 2010). Therefore, a good combination of absorptive capacity and local linkages will lead to more firm innovation.

The benefits associated with international linkages to customers located in several countries will be greater for firms located in one country; this is true for either local or foreign firms, so long as they have better absorptive capacity. Absorptive capacity enables a firm to combine its international customers' knowledge with its own technological resources, leading to innovative development (Kim and Park 2010). For example, several firms may attend trade exhibitions, but only those with good absorptive capacity will be able to capture and realize the knowledge and information derived from the experience. That is, international linkages, when integrated with absorptive capacity, would enhance the possibility of generating new combinations and novel ideas. We thus propose the following hypotheses:

Hypothesis 4: For a foreign firm from one emerging economy operating in another emerging economy, the relationship between local linkages and innovation is positively moderated by the firm's absorptive capacity.

Hypothesis 5: For a foreign firm from one emerging economy operating in another emerging economy, the relationship between international linkages and innovation is positively moderated by the firm's absorptive capacity.

Although the studies mentioned here have found substantial evidence to support the claim that firms with superior absorptive capacity tend to benefit more from external linkages, the moderating role of absorptive capacity as it affects the benefits of local and international linkages does not seem to be uniform. Though local linkages in emerging economies and international linkages across different national institutions have the potential to transfer heterogeneous resources (Kang and Kang 2009), much depends on whether a foreign firm's absorptive capacity has sufficient capabilities to digest them.

When foreign firms and local partners are both from emerging economies with more or less similar institutional patterns, it is more likely that there will be some overlap in knowledge stock, technologies, management practices, or norms. In such situations, foreign firms are able to become more familiar with local knowledge in the host country. Thus, the absorptive capacity of foreign firms can be used more effectively to integrate technologies and management practices derived from local linkages in emerging economies, and subsequently to improve their innovation.

By contrast, unfamiliarity with the knowledge transferred from international linkages may reduce the efficacy of the absorptive capacity of foreign firms from emerging economies. There exists a wide technology gap between emerging economies and developed countries (Peng et al. 2008). International customers spanning several countries deliver different knowledge, culture and norms (Kostova and Zaheer, 1999), leaving foreign firms from emerging economies with an imperfect knowledge of international customers' behavior patterns, as well as with potential difficulty imitating and decoding customers' knowledge. Foreign firms, thus, may not have sufficient absorptive capacity to recognize the value and content of the diverse external knowledge offered by international linkages. This indicates that for foreign firms based in emerging economies, the positive moderating effect of absorptive capacity on innovation is greater for local linkages than for international linkages. We therefore derive the following hypothesis:

Hypothesis 6: For a foreign firm from one emerging economy operating in another emerging economy, the moderating effect of its absorptive capacity on innovation is greater for local linkages than for international linkages.

4 Methodology

4.1 Survey procedure and samples

The hypotheses presented in this study were empirically tested by examining Taiwanese manufacturing firms operating in China. While Taiwan and China share the same language and Confucian value system, the two societies have largely developed independently since 1949, especially with regard to political policy and Westernization (Child and Tsai 2005). Given the distinct influence of institutional environments, a discussion of overseas operations for firms from Taiwan (as distinct from those from China) is warranted.

The sample firms in this study came from two sources: the government, and private banks. We collected the first set of samples by sending our surveys to the firms listed in the official report *Taiwanese firms investing in China* (Investment Commission 2006). After removing 379 non-manufacturing firms from our list, 450 firms were identified by means of systematic sampling from the list. Because executives were the best sources of information on strategic processes, production and technologies within a firm, and because they tend to be knowledgeable about issues both internal and external to a firm (Kumar et al. 1993), we mailed the questionnaires to them. The survey package included a cover letter, a postmarked envelope, and a questionnaire. This procedure resulted in the return of 45 usable questionnaires, a response rate of 10 % after accounting for undeliverable surveys.

Additionally, Gao (2007) and other Taiwanese government officials have recognized that many Taiwanese investors use personal nominations or third parties located in Hong Kong or other countries to make foreign direct investments, and these investments are not generally recorded in government reports. To gain access to these firms (while sacrificing some degree of external validity), we contacted them through two private banks that provide foreign exchange and banking services to Taiwanese firms with operations in China (Cook and Campbell 1979). The second set of samples, which consisted of 57 firms, was collected through the two banks. In total, the two surveys produced 102 usable questionnaires for further analysis. The two groups of respondents were compared across constructs (Armstrong and Overton 1977). No significant difference ($p > .05$) was found between the two sources of responses on any of the constructs, nor did we find any differences with regard to other variables (such as the number of employees), implying that the responses of the two groups do not differ significantly. We also combined the two groups together and assessed firm size and industry classification with those of the general population, as published by the Investment Commission, 2006. The results of our χ^2 test indicate that there is no significant difference between our samples and the general population ($p > .05$). In our study, the Taiwanese investments showed wide geographic coverage throughout China, including Guangdong (31.4 %), Jiangsu (19.6 %), Fujian (14.7 %), Shanghai (11.8 %), Zhejiang (13.7 %), Shandong (2.9 %), Liaoning (0.01 %), Tianjin (0.01 %), Beijing (0.01 %), Hubei (0.01 %), Shaanxi (0.01 %), and Hainan (0.01 %). We also compared the geographic distribution of the respondents in our study to that of the location of the Taiwanese investments in China, published in the Database of Enterprises in China and maintained by China Credit Information Service (CCIS). The result of the χ^2 test suggests no significant difference between our samples and the population of Taiwanese firms investing in China ($p > .05$).

4.2 Measurements

We derived our measurements from previous studies and from the in-depth interviews we conducted with nine executives of Taiwanese manufacturing firms.

4.2.1 Innovation

The somewhat subjective measures of innovation follow the suggestions of Gao et al. (2008) and Bell (2005). Given the limitations of data availability and the problems of accessing behavioral indicators of innovation, we employed perceptual measures. Existing studies have also showed a strong correlation between objective and perceptual indicators, implying the validity of this approach (see for example Tuominen et al. 2004). This study measured innovation against three statements, rating each statement on a 7-point Likert scale with 1 indicating strongly disagree and 7 indicating strongly agree: (1) We can respond to market needs quickly by developing new products in the host country; (2) We can convert new ideas into new products quickly in the host country; and (3) We are constantly able to improve manufacturing processes in the host country. Ultimately, the value of innovation for each firm was the average of the responses to these statements.

4.2.2 Local linkages

We measured this construct as the degree to which foreign firms build local linkages with competitors, customers, and geographically proximate suppliers (Boehe 2007; Knoben 2009; Porter 2000). Therefore, the items used were: (1) We and many competitors are located geographically close to one another in the area; (2) We have linkages with many suppliers in the same area; and (3) We have collocated with many customers in the same area. A 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree), was used to measure participants' responses. Local linkages were calculated as the average of these items.

4.2.3 International linkages

We conceptualized international linkages by modifying the three criteria suggested by Chen (2009) and Yli-Renko et al. (2001). The three criteria were: (1) Our customers outside of this host country and based in developed countries provide us with new market and trend information; (2) We and our customers outside of this host country and based in developed countries often take joint action in designing and developing new products; and (3) We frequently attend international trade exhibitions to acquire new market information. The above items were measured on a 7-point Likert scale, ranging from 1 (strongly disagree) to 7 (strongly agree); and the mean of these represents the international linkages a firm has.

In addition to the theoretical constructs discussed above, we included five control variables at both the firm level and the industry level, which account for the major factors identified in the literature as affecting innovation (e.g., Boehe 2007; Kostopoulos et al. 2011).

4.2.4 Absorptive capacity

Absorptive capacity is an organization's ability to recognize the value of new information, assimilate it, and apply it to commercial ends (Cohen and Levinthal 1990). Building on

previous work, we measured absorptive capacity by examining R&D efforts related to expenditure in R&D (Kostopoulos et al. 2011) and the acquisition routines and beliefs in exploratory learning that direct knowledge accumulation of R&D (Lichtenthaler 2009; Zahra and George 2002). A four-item scale was used to assess the degree to which (1) We provide significant financial support for R&D in product development; (2) We provide significant financial support for R&D in manufacturing processes; (3) We emphasize the need to stay ahead of our competitors; and (4) We emphasize the need to be a first mover by creating unique products. Each item was measured on a 7-point scale, ranging from 1 (strongly disagree) to 7 (strongly agree); the mean of the four items represents a firm's absorptive capacity.

4.2.5 Export intensity

Previous studies have noted that export volume appears to influence a firm's service offerings by allowing it to access a greater diversity of information related to customer linkages and, in turn, integrating such diversity to bolster its own capabilities to innovate (Tuominen et al. 2004). We controlled for this effect by taking into account the proportion of export sales to total sales. This measurement was coded on a 7-point scale: 1 for <15 %; 2 for 16–30 %; 3 for 31–45 %; 4 for 46–60 %; 5 for 61–75 %; 6 for 76–90 %; and 7 for 91–100 %.

4.2.6 Length of operation

A foreign firm with more experience in a host country is better able to adapt to both the national and local environments, which may be related to the firm's ability to innovate (Knoben 2009). We measured this variable by asking respondents to indicate the number of years they have operated in the host country. The length of operation within our sample ranged from 1 to 20 years, with a mean of 9.41 years and standard derivation of 4.42 years. This range provided sufficient variation.

4.2.7 Firm size

Larger firms might be particularly innovative (Boehe 2007). Firm size was captured by the number of employees. From the lowest to highest, the ordinal scale is: 1 for fewer than 100 employees; 2 for 101–500 employees; 3 for 501–1,000 employees; 4 for 1,001–1,500 employees; and 5 for more than 1,501 employees. Our results showed that 42 firms had fewer than 500 employees, 29 had between 501 and 1,500 employees, and 31 had more than 1,501 employees.

4.2.8 Industry

Studies show that industry characteristics related to technology-based business logic might affect innovation (e.g., Tuominen et al. 2004). In this study, 45.1 % of the respondents were in the electronics industry, and the remainder was in machinery (23.5 %), chemicals and plastics (14.7 %), and food, textiles and other industrial products (16.6 %). Consistent with this study's grouping of firms in terms of industry, nearly 46 % of the investments in China by Taiwanese firms were in the electronics industry (Investment Commission 2006). An industry dummy dichotomizes the samples into the electronics industry, which is typically characterized by cutting-edge knowledge (coded as 1), and otherwise (coded as 0).

In addition, industry type may have a significant influence on many dimensions of organizational behavior (Dess et al. 1990). Therefore, it is important to examine the effects of industry prior to aggregating the data for subsequent regression analysis. Classifying industry by the aforementioned dummy variable and examining the independent variables, none of the variables were found to vary significantly ($p > .05$) between electronics and other industries. Accordingly, it appears appropriate to pool the data, as industry effects can be overlooked.

Because we relied on respondents' perceptions to measure the multi-item constructs of innovation, local linkages, international linkages, and absorptive capacity, we felt that we must assess the validity and reliability of these measurements. To evaluate construct validity, exploratory factor analysis (using principal component extraction and varimax rotation) was used to verify the constructs empirically. Thirteen items were reduced into four factors and no items loaded poorly on its respective construct (i.e., item loadings <0.40). These factors were, namely, innovation (loadings were 0.84, 0.87, and 0.82 respectively), local linkages (loadings were 0.93, 0.90, and 0.80 respectively), international linkages (loadings were 0.84, 0.88, and 0.68 respectively) and absorptive capacity (loadings were 0.71, 0.90, 0.75 and 0.60 respectively). The results of the four-factor solution indicate that items loaded as expected with factor loadings >0.40. Further, all of these factors had eigenvalues >1, which together accounted for 77.70 % of the variance in the data. When we assessed the reliability of our scales, the levels of Cronbach α for all multi-item constructs exceeded the 0.70 level.

Common method variance may occur when multiple measures are collected from the same survey instrument. Because we relied on one informant for all of our information, we could not rule out the problem of common method variance. Following Podsakoff and Organ's (1986) suggestion, Harman's single-factor test was used to test for common method variance. This technique assumes that 'if a substantial amount of common method variance is present, either (a) a single factor will emerge from the factor analysis, or (b) one general factor will account for the majority of the covariance in the independent and criterion variables (Podsakoff and Organ 1986, p. 536). As we performed factor analysis on all items in the model, no general factor was apparent in the factor structure, indicating that the results did not have serious problems of common method variance. Table 1 presents the inter-correlations for the variables in the analysis.

Table 1 Pearson correlation matrix

	1	2	3	4	5	6	7	8
1. Innovation	1.00							
2. Local linkages	0.35**	1.00						
3. International linkages	0.59**	0.22*	1.00					
4. Absorptive capacity	0.50**	0.40**	0.34**	1.00				
5. Export intensity	−0.01	−0.21*	−0.01	−0.16	1.00			
6. Length of operation	−0.03	0.10	−0.03	−0.17	−0.03	1.00		
7. Firm size	0.09	0.14	0.22*	0.04	0.21*	0.16	1.00	
8. Industry	0.26**	0.04	0.19	0.09	0.05	−0.36**	0.14	1.00

** Significant at 0.05

* Significant at 0.10

5 Results

Hierarchical regression analysis was used in this study. To minimize the distortion caused by multicollinearity, each scale constituting an interaction term was mean-centered (Aiken and West 1991). The change in adjusted R^2 (Δ Adjusted R^2) between the models in Table 2 illustrates the explanatory power of added independent variables.

Model 1, which tests for control variables, shows that only the effects of industry and absorptive capacity on firm innovation are significant at the $\alpha = 0.01$ level. When local linkages and international linkages are included, Model 2 accounts for 47 % of the variance of innovation, while Model 1 explains only 28 % (see Table 2). When the moderating effect of absorptive capacity on innovation for local linkages and international linkages is added, the explanatory power is increased to 50 %, as shown in Model 3. Additionally, all individual VIFs were <4, indicating low collinearity (Neter et al. 1996).

Local linkages appear to have a significant impact on innovation ($\beta = 0.15$, $p < .10$ in Model 3), meaning that H1 is supported. International linkages are demonstrated to be positively and significantly related to innovation, which supports our H2 ($\beta = 0.42$, $p < .01$ in Model 3). To examine H3, a t test was conducted to examine the relative

Table 2 Hierarchical regression analysis for innovation

	Model 1	Model 2	Model 3
Control variables			
Absorptive capacity	0.51 (0.00)***[a]	0.31 (0.00)***	0.32 (0.00)***
Export intensity	0.07 (0.45)	0.09 (0.24)	0.10 (0.19)
Length of operation	0.15 (0.10)	0.11 (0.18)	0.10 (0.19)
Firm size	−0.01 (0.91)	−0.11 (0.17)	−0.14 (0.08)*
Industry	0.27 (0.00)***	0.19 (0.02)**	0.20 (0.01)**
Independent variables			
Local linkages		0.15 (0.08)*	0.15 (0.07)*
International linkages		0.45 (0.00)***	0.42 (0.00)***
Interaction			
Local linkages × absorptive capacity			0.18 (0.02)**
International linkages × absorptive capacity			−0.10 (0.24)
F value	8.81	13.64***	12.18***
R^2	0.31	0.50	0.54
Adjusted R^2	0.28	0.47	0.50
Δ Adjusted R^2		0.19	0.04
Incremental F value		17.94***	4.02***

[a] Standardized regression coefficients (β) with *** significant at 0.01, ** significant at 0.05, and * significant at 0.10

influence of international and local linkages (Chan and Makino 2007).[2] The resulting t value is 4.71 ($p < .01$), indicating that international linkages have a greater effect on innovation than local linkages do. Accordingly, H3 is supported.

To further investigate the moderating relationship between local linkages and innovation, we introduced absorptive capacity as a moderating variable. We found that it exhibits a moderating effect on the relationship between local linkages and innovation, and its effect is both positive and significant ($\beta = 0.18$, $p < .05$ in Model 3). Hence, H4 is supported. To gain further insight into this relationship, following procedures outlined by Aiken and West (1991), we conducted simple slope tests. These tests involved splitting the moderator (absorptive capacity) into a high group (greater than the mean) and a low group (less than the mean), and re-estimating the relationship between local linkages and innovation. The results show that when absorptive capacity is high, the positive relationship between local linkages and innovation is stronger (simple slope: $\beta = 0.33$, t value $= 2.877$, $p < .01$) than when it is low (simple slope: $\beta = 0.01$, t value $= 0.10$, $p > .10$). Thus far, our analyses support the moderating role of absorptive capacity in the relationship between local linkages and innovation. Surprisingly, the moderating effect of absorptive capacity does not appear to have a significant impact on the relationship between international linkages and innovation, meaning that H5 is not supported. These results suggest that the moderating effect of absorptive capacity on innovation is stronger for local linkages than it is for international linkages. Accordingly, H6 is supported. However, we must acknowledge the possibility that the formation of linkages is a part or a result of absorptive capacity. That is, absorptive capacity is likely to influence local linkages and international linkages (the two mediating variables), both of which in turn affect firm innovation. Comparing the mediating model with the non-mediating models using structural-equation models, we found that the mediating model did not fit better than the non-mediating models. Thus, the possible mediating role of linkages can be ignored.[3]

[2] $$t = \frac{b_1 - b_2}{\sqrt{S_{b1}^2 + S_{b2}^2}}.$$

[3] To further explore the potential mediating effects of local and international linkages, a full structural-equation model was estimated with each scale item used as an indicator of its associated latent construct for absorptive capacity (an exogenous variable), local linkages, international linkages, and innovation (endogenous variables). As discussed above, export intensity, length of operation, firm size, and industry are operationalized with the use of a single scale item as a control variable. After the full model is tested, the overall fit index for the potential mediating model is $\chi^2_{(105)} = 199.72$ ($p < .00$), GFI $= 0.82$, NFI $= 0.81$, and NNFI $= 0.86$. Absorptive capacity was positively related to local linkages (t value $= 3.80$, $p < .01$) and international linkages (t value $= 2.65$, $p < .01$). Local linkages (t value $= 3.12$, $p < .01$) and international linkages (t value $= 5.65$, $p < .01$) would likely facilitate innovation. Among the control variables, only industry was positively and significantly correlated with innovation (t value $= 2.31$, $p < .05$). Moreover, in order to test the "mediated paths" of local linkages and international linkages simultaneously, this study conducted two analyses. First, we adopted Garbarino and Johnson's (1999) suggestion and compared the hypothesized mediating model with a rival model without the mediator. In the rival model, all exogenous variables (i.e., absorptive capacity, export intensity, length of operation, firm size, and industry) directly affected all of the endogenous variables (i.e., local linkages, international linkages, and innovation). We then compared their fit via several features (i.e., overall fit statistics and percentage of significant paths) to decide whether the mediating model was better or not. Our results showed that the mediating model did not fit the data better [for the mediating model: $\chi^2_{(105)} = 199.72$ ($p < .00$), GFI $= 0.82$, NFI $= 0.81$, and NNFI $= 0.86$; for the non-mediating model: $\chi^2_{(96)} = 179.08$ ($p < .00$), GFI $= 0.84$, NFI $= 0.83$, and NNFI $= 0.87$], and a smaller percentage of the paths were significant in the mediating model versus the rival model (62.5 vs. 64.7 %). Accordingly, the mediating model with two mediating variables is not superior. Second, seeking additional evidence in support of the non-mediating role of local linkages and

As for the control variables, industry is positively related to innovation ($\beta = 0.20$, $p < .05$ in Model 3). Absorptive capacity also has a significant and positive impact on innovation ($\beta = 0.32$, $p < .01$ in Model 3). Surprisingly, firm size shows a negative relationship to innovation ($\beta = -0.14$, $p < .10$ in Model 3). It may be that some firms employing large numbers of people are producing low-end products or engaging in highly structured organizational routines that are not conducive to innovation. In any case, length of operation and export intensity do not appear to have a significant effect.

6 Discussion and conclusion

This study aims to integrate the institutional perspective and the organizational learning perspective, and to advance the institutional perspective as a complementary perspective for examining how foreign firms from emerging economies operating in another emerging economy improve their innovation. This study reveals that the innovation of a foreign firm is to a large extent dependent on local linkages, international linkages, and absorptive capacity.

Local linkages and international linkages would likely lead to varying benefits, depending on the institutional contexts (Kostova and Zaheer 1999). Local linkages in emerging economies typically lead to the transference of supply-side knowledge, or exploitative knowledge used for production purposes. International linkages that span several developed countries may lead to the transfer of deeper sorts of knowledge (e.g., knowledge acquired via close interactions with international customers) and greater breadth of knowledge (e.g., knowledge ascertained through trade fairs) (Chen 2009). In such cases, the influence of international linkages on innovation is likely to be greater than that of local linkages, although both types of external linkages are crucial to innovation.

Surprisingly, the results of this study show that absorptive capacity does not have a significant moderating impact on the relationship between international linkages and innovation. A plausible reason is associated with the limited absorptive capacity firms from emerging economies have. Compared to their international customers, in general these firms tend to possess lower levels of absorptive capacity. Therefore, international customers making business exchanges with firms located in emerging economies typically are attracted by their low costs and reliability, not by their technological advantages (Chen 2009). Thus, it is possible that their limited absorptive capacity is not able to reinforce the impact of international linkages on innovation.

Still, the importance of absorptive capacity should not be minimized. In fact, our results show that the direct impact of absorptive capacity is highly significant and in fact crucial to the improvement of foreign firms' innovation. Our findings also reveal a complementarity between absorptive capacity and local linkages when a foreign firm from an emerging

Footnote 3 continued
international linkages, another alternative model was also explored. We set absorptive capacity, local linkages and international linkages as the exogenous variables, and innovation as the only endogenous variable. These three exogenous variables had a direct effect on the outcome variable (innovation). The overall fit of the model shows a significant improvement [for the rival model: $\chi^2_{(95)} = 178.61$ ($p < .00$), GFI = 0.84, NFI = 0.83, and NNFI = 0.87], compared with the mediating model. We also have conducted the mediating model with only a single mediating variable; that is, local linkages and international linkages play a mediating role in two distinct mediating models. Following the aforementioned analyses, our results show that neither local linkages nor international linkages mediate the effects of absorptive capacity with respect to innovation. Taken altogether, the mediating model is rejected in favor of the non-mediating model.

economy operates in another emerging economy. If these foreign firms can upgrade their absorptive capacity, they are able to apply and combine the knowledge and resources derived from local linkages in emerging economies. Such findings also correspond to our suggestion that the moderating effect of absorptive capacity on innovation is greater for local linkages than it is for international linkages, when the technological gap between the firm in the sending country and the firm in the receiving country is taken into account.

This study was motivated by our awareness of a theoretical gap. Firstly, countries in emerging economies are known to use informal relationships to supplement institutional voids. Along these lines, we began by decomposing the broad concept of external linkages into local and international linkages. Given the fact that institutions are relatively stable and homogeneous in developed countries, most studies taking place in developed-country contexts do not emphasize the differing efficacy of local linkages and international linkages on firm innovation. However, taking into account the situation of foreign firms from an emerging economy operating in another emerging economy, international linkages are likely to have a greater influence on firm innovation than local linkages are. Second, this study, which incorporates the organizational learning perspective with the institutional perspective, suggests that when an emerging economy-based foreign firm forms linkages with local partners in an emerging economy host country, the value of these linkages with regard to innovation will be more evident. This is likely the result of the optimization of the foreign firm's absorptive capacity due to similarities in knowledge base, culture, and norms between the two countries involved. In such cases, the absorptive capacity of a foreign firm can act to strengthen the relationship between local linkages and innovation.

This issue is not only important to the extension of theory, but also has critical implications for managers. First, understanding how foreign firms from emerging economies are able to successfully innovate is extremely important. Foreign direct investments in China have mostly been recognized as market seeking, resource seeking, or efficiency seeking, and it has also been largely accepted that foreign firms' ability to continuously innovate leads them to remain competitive in China. China is also growing in importance as a location for innovative activities (Low 2010). Similarly, the subsidiaries of Taiwanese manufacturing firms in China have recently been granted greater autonomy to engage in technical development activities (Investment Commission 2006). This study shows how three factors—local linkages, international linkages, and absorptive capacity—may each contribute to improved levels of innovation. Second, while some benefits are associated with local linkages, local linkages' benefits are not without limitation. International linkages act as a means by which to broaden foreign firms' knowledge, which is distinct from the knowledge they are likely to receive in a host country. Thus, managers should add different linkages selectively. Third, this study found that foreign firms with greater absorptive capacity can enhance their gains in innovation from local knowledge. On the other hand, due to the likely presence of a technological gap, a foreign firm from an emerging economy would gain less, in terms of innovation, from linkages with firms in developed countries (Hull and Covin 2010). To overcome this gap, in addition to investing more in R&D, foreign firms may try other ways, such as acquiring firms in developed countries, to build technological capabilities that may allow them to capture the valuable information or knowledge that international linkages may convey.

The implications of this study should be evaluated in light of the following limitations; along these lines, we also suggest five possible directions for future research. First, the derivation of our empirical results from a sample of Taiwanese manufacturers operating in China (i.e., investment from one emerging economy to another emerging economy) gives rise to concerns about the generalizability of our findings to other contexts. We believe that

our findings should be applicable to other Asian emerging economies, such as Malaysia, Thailand and Indonesia. These countries share many significant cultural traits, including some important family norms that likely extend to social and business relations (Sun and Wong 2002). They are also all in the early stages of industrialization. If this perspective is taken, it would seem that the organizational patterns we described should be applicable to these countries. However, there may be differences across cultural blocks in terms of the impact of interorganizational linkages (Cultural blocs are groups of countries sharing similar cultures; such blocs include Southeast Asia, Latin America, and Central and Eastern Europe (Barkema and Drogendijk 2007)). Cultural heritage is likely to have a far-reaching impact on the effectiveness of linkages. Thus, evidence from other cultural and institutional environments would add to the strength of our study's findings. Second, our results are limited in that we only examine outcomes associated with foreign firms from one emerging economy investing in another emerging economy. Further research on investment scenarios including foreign firms from emerging economies-to-developed countries, developed countries-to-emerging economies, and developed countries-to-developed countries would nicely complement our findings. For example, countries such as the US and the Philippines may share the same language, but the two countries' very different beliefs, norms, and values may influence the relative effectiveness of linkages and absorptive capacity. Third, this study focuses on informal linkages, while ignoring formal linkages. Foreign firms may engage in joint ventures with local state-owned enterprises to acquire local resources, which would be likely to reduce the importance of local linkages. Indeed, conducting a study that included different types of foreign direct investments would help us to gain a more complete picture. Fourth, the purpose of our study is not to make inferences or arrive at conclusions about innovation per se, but to make comparisons of foreign firms having different linkages. While the possibility of a bias towards foreign firms highly capable of establishing linkages is less likely to distort such a comparison, response bias is one limitation of this study. Ideally, to increase response rates and encourage the participation of different types of respondents, we suggest that future researchers employ an electronic survey, followed by personal contact, rather than relying simply on a mailed survey. Fifth, this study is a cross-sectional model; as a consequence, the dynamism of innovation is ignored. An investigation of the relationship between external linkages and innovation during a subsidiary's life cycle would be a worthwhile endeavor.

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