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Xuesong GENG
Singapore Management University, xsgeng@smu.edu.sg

Kenneth G. HUANG
National University of Singapore

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Xuesong Geng and Kenneth G. Huang

The geography of innovation is an intriguing topic for economists and management scholars as well as corporate decision makers and government policymakers. The observation that firms are remarkably concentrated in geographic space has inspired a large body of research conducted in a variety of industries in management, economics and sociology (Krugman 1991; Saxenian 1994; Almeida and Kogut 1999; Sorenson and Audia 2000). According to the economic geography literature, firms tend to agglomerate to gain better access to pooled skilled labors, shared specialized suppliers, inter-firm knowledge spillovers, and greater consumer demands (Marshall 1920; for a recent review, see McCann and Folta 2008). Like other economic activities, firms' knowledge creation

[$]Authors contributed equally and listed in alphabetical order.

X. Geng
Singapore Management University, Singapore, Singapore

K.G. Huang (✉)
National University of Singapore, Singapore, Singapore

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and inter-firm knowledge exchanges are significantly clustered in space too (Audretsch and Feldman 1996; Jaffe et al. 1993; Almeida and Kogut 1999). Particularly for firm innovations, recent theoretical development suggests that the geography of innovation is contingent on social and institutional contexts that shape the interaction and knowledge exchange of firms (Morgan 1997; Storper 1997; Bell et al. 2009; Laursen et al. 2012). Given the wide variety of institutional contexts across countries, how would institutional environments impact the geographical distribution of firms' entrepreneurial and innovative activities?

Institutions in a country can be categorized into formal and informal ones: formal institutions represent structures of codified rules, laws or regulations, whereas informal institutions are enduring non-codified, socially constructed practices and norms (North 1990; Scott 1995). The concomitant consideration of both socio-institutional factors and spatial relationship has the potential to make important conceptual advance in our understanding of the innovation dynamics of entrepreneurs and firms (Geng et al. 2015; Huang et al. 2015). In this chapter, we explore this question: if institutions influence social interactions among entrepreneurs and firms both within and across geographical proximity, how does the geography of innovative activities vary across different institutional environment in different countries? Knowledge creation and innovation activities in firms play crucial roles in entrepreneurial activities and it has been found that entrepreneurship is influenced by the geographical collocation of established firms (e.g., Sorenson and Audia 2000). Therefore, our analyses focus on innovative activities of firms and we also discuss the implications for the geography of entrepreneurship.

Geographical Proximity, Clusters, and Innovations

One important mechanism through which agglomeration or collocation produces externalities is by facilitating the transfer of tacit knowledge. Knowledge in general is difficult to be confined within its originating firms because of its public goods nature (Arrow 1962). Once the knowledge spills over into the public domain, it creates positive externality that

benefits other firms (Jaffe 1986). Some knowledge can be tacit and difficult to articulate or express in codified language (Polanyi 1966). Although such knowledge may be transferred through formal channels, such as through licensing, alliance, or supply contracts, the efficient transfer of tacit knowledge across organizational boundaries generally requires close social interaction and face-to-face contact that can be enhanced by geographical proximity (Marshall 1920). Even with the modern communication tools like telephones, e-mails, or teleconference that can facilitate the transfer of codified knowledge, the acquisition of tacit knowledge still rely heavily on face-to-face interactions (Ganesan et al. 2005). As such, the resulting knowledge transfer and spillovers are significantly localized and clustered in space (Jaffe et al. 1993; Audretsch and Feldman 1996; Almeida and Kogut 1999; Rosenkopf and Almeida 2003; Stuart and Sorenson 2003; Huang and Ertug 2014).

Since densely clustered regions suggest close geographic proximity among collocated firms, scholars often conceptualize clusters as the proxy for the effect of vicinity on enhanced knowledge creation (Pouder and St. John 1996; Baptista and Swann 1998; Porter 1998; Maskell 2001). Clusters help knowledge creation and exchange for individual firms by providing a large pool of knowledge workers (Almeida and Kogut 1999; Rosenkopf and Almeida 2003), more channels of knowledge transfer through social networks (Owen-Smith and Powell 2004; Whittington et al. 2009), and greater learning opportunities among firms (Arikan 2009). Extant empirical evidences affirm that the degree of clustering positively affects the innovative output of individual firms (Baptista and Swann 1998; Beaudry 2001; Whittington et al. 2009; Geng et al. 2015).

Geography of Innovation and Local and Non-Local Social Interactions

When facilitated by inter-firm knowledge exchanges, innovation becomes a social and collective process, which requires joint action of clustered firms (Audretsch and Feldman 1996; Morgan 1997; Rosenkopf and Almeida 2003). Although the proximity of firms in a cluster can enhance direct observation and, therefore, the imitation of each other's inventions

even without direct social interactions (Porter 1998; Arikan 2009), the transfer and communication of deeper, tacit, and fine-grained information require intensive interaction and socialization between firms (Uzzi 1996; Hansen 1999; Laursen et al. 2012). Knowledge interaction can be impeded in the absence of disciplined social interactions that underpin the trust among firms in the clusters (Maskell 2001; Eapen 2012; Laursen et al. 2012).

As social interaction intensifies, geographical proximity promotes the convergence of idiosyncratic beliefs, assumptions, and values, which can evolve collectively into a shared 'macroculture' among clustered firms (Abrahamson and Fombrun 1994). Social and professional networks among individuals and firms emerge within the clusters (Stuart and Sorenson 2003). Trust develops among collocated firms with frequent interactions (Maskell 2001). The thus developed social norms and relationships among geographic proximate firms form a kind of 'geographically localized social capital' (Laursen et al. 2012). They are generally accepted as 'rules of the game' in the cluster (Pouder and St. John 1996) and enhance the 'untraded interdependence' among collocated firms, thus facilitating inter-firm interactions even in the absence of formal economic exchanges (e.g., licensing, alliances) (Storper 1997). Such interdependence increases firms' awareness of the appropriate and effective social relations and provides them with cues on how other firms will behave (Bell et al. 2009). Consequently, the knowledge exchange process is conditional on social interactions and embedded in a broader social structure that, in turn, guides interactions among firms (Morgan 1997; Storper 1997). For example, the success of Silicon Valley is believed to stem from its being embedded in a decentralized but cooperative industrial system with dense social networks and a high level of social capital (Saxenian 1994).

Although extant literature has focused on geographically localized social interaction, the geography of innovation can also be influenced by the non-local social interaction that goes beyond geographical vicinity. For example, Ganesan et al. (2005) found that the strength of relational ties with knowledge providers is unrelated to the geographic proximity and those relational ties across geographical distance play significant role in new product development. As this topic is still under-explored in the economic geography literature, we draw upon the social network literature that provides some discussions and empirical evidence on how informal ties between

individuals and firms can transcend geographic limits. For instance, in the Canadian mutual fund industry, the social networks of managers affect firm innovations independent of their spatial distance (Bell 2005). In addition, more knowledge will flow across geographically distant friendship ties than proximate ones, because friends in different locations exposed to diverse local milieus have acquired diverse localized knowledge (Bell and Zaheer 2007). Nevertheless, these friends with similar backgrounds can share the knowledge effectively. Meanwhile, informal ties are more resilient to geographic distance than formal ties, and the informal ties between units in an organization can mitigate the effect of geographic distance on knowledge transfer (Hansen and Lovas 2004). In addition, Sorenson and Stuart (2001) found that previous syndication participation with another venture capital firm mitigates the effect of geographic distance on the likelihood of venture capital investment on entrepreneurial start-ups. Finally, the influence of geographical proximity on firm innovation depends on the extent to which the firm is also embedded in a global social network comprising physically distant partners (Whittington et al. 2009).

In sum, the geography of innovation is contingent on the intensity and content of both the local and non-local social interactions. While local social interaction can be facilitated by geographical proximity and further increases the inter-firm knowledge exchange, the non-local social interaction may mitigate the limitation of geographical proximity on firm innovation. To the extent that the institutional environment influences how firms and individuals socially interact among one another, both locally and non-locally, the role of geographical proximity in inter-firm knowledge exchange and firm innovation should vary under different institutional contexts and the embeddedness of firms in such institutional contexts. Our next section will further explore this topic.

Geography of Innovation and Institutional Environments

The distinction between formal and informal institutions can be useful in investigating the complex relationship between institutional environments, geographical locations, and firm innovation. Formal institutions represent structures of codified or formally accepted rules that are nor-

mally enforced by laws, whereas informal institutions are enduring but unwritten societal norms and conventions (North 1990; Scott 1995). Both formal and informal institutions promote social order and stability by providing shared expectations and routinized guidelines for the appropriate behaviors when individuals or firms consider strategic choices (DiMaggio and Powell 1983; Peng 2003). Compared with informal institutions, formal institutions are more malleable because they can be consciously and purposely designed by human agency (Scott 1995). But the effect of formal institutions also depends on the supports or constraints of informal institutions that evolve more incrementally (Zucker 1987). The culturally and socially constructed informal institutions have strong binding effects on societal members (North 1990; Scott 1995). For example, collectivist beliefs and norms that value adherence to social norms and expect goodwill and cooperation among societal members have strong binding effects on individuals and firms because societal trust and cohesion are rewarded and nonconformity is disciplined (Hofstede 2001; Holmes et al. 2013). Moreover, the effect of informal institutions is usually associated with the trust-based informal relationships or networks (Zucker 1987). Indeed, recent studies have found that firms tend to rely more on social networks and ties to facilitate social interactions and resource exchanges when informal institutions are prevalent (Batjargal et al. 2013).

Compared with developed countries, developing countries have long been depicted as having weak formal institutions and strong informal institutions (Batjargal et al. 2013). In developing countries, the banking system, legal protection for private and intellectual property, financial disclosure and the judiciary are under-developed or ineffective (Peng and Heath 1996; Khanna and Palepu 2000; Huang et al. 2015). Recent literature also suggested that when formal institutions are weak and ineffective, firms tend to rely more on informal institutions (Hitt et al. 2004; Webb et al. 2009; Batjargal et al. 2013; Holmes et al. 2013).

For innovative activities that involve tacit knowledge, the interdependence between formal and informal institutions may have important bearings because 'no amount of legal protection can make a thoroughly appropriable commodity of something so intangible as information' (Arrow 1962, p. 615). To understand the relationship between institu-

tions and geographically constrained social interactions among firms, we draw from and build upon the insights from previous literature that examines the relationship between institutional environment and governance of inter-firm relationship (Williamson 1991; Bell et al. 2009; Abdi and Aulakh 2012). Under a specific institutional environment, firms can develop governance structure that is specific to the inter-firm relationship in order to facilitate economic exchange. In the absence of support from external formal institutions (e.g., laws regulating and enforcing contracts), formal safeguards (e.g., explicit contracting) become less effective (Abdi and Aulakh 2012). Therefore, firms have to rely more on informal safeguards based on trust and embeddedness, as well as reputation effects (Uzzi 1996; Dyer and Singh 1998). By contrast, reliance on such informal safeguards can be reduced when formal institutions are developed and effective, and provide clear guidance and enforcement.

Under weak formal institutions in developing countries, informal safeguards for inter-firm governance based on the localized social norms are important for geographically proximate firms, especially when complex exchange like knowledge transfer is involved (Dyer and Singh 1998; Bell et al. 2009). In particular, the formal institutions that protect knowledge creation and exchange are the intellectual property right (IPR) system which includes patents or licenses laws. Stronger formal institutions for IPR protection increase firms' incentive to innovate by providing them insurance against expropriation (Nordhaus 1969; Teece 1986; Levin et al. 1987). When the support from formal institutions is ambiguous, weak, or absent, firms have to rely more on informal safeguards and informal institutions that are shared by the interacting firms. As a result of the weak formal (and legal) environment for the protection of IPR, the weak formal safeguards for inter-firm knowledge exchange may push firms to develop informal safeguards (Pisano 1990; Geng et al. 2015; Huang et al. 2015), which would allow firms to discipline the inter-firm interactions given the potentially pervasive market failures and information asymmetry in the technology market in which firms can exchange and transact on their proprietary knowledge (Arora et al. 2001). As the monitoring of inter-firm social interaction and maintaining of trust-based informal safeguards are facilitated by spatial proximity (Maskell 2001), the effectiveness of such informal safeguards is more constrained by the geographical

distance. In other words, such informal safeguards are easier to monitor and maintain for geographically proximate firms (Laursen et al. 2012). Although knowledge can be exchanged between people with modern technologies like telephones or e-mails, face-to-face interaction is still important for the exchange of tacit knowledge (Ganesan et al. 2005). The importance of informal safeguards and relational ties in knowledge acquisition is not mitigated by the modern communication technologies (e.g., Ganesan et al. 2005).

As such, we would expect that the proximity effect on geography of innovation is more pronounced in developing countries where the informal institutions are prevalent and heavily relied upon by firms. Put formally, we postulate:

Proposition 1 To the extent that firms' innovative activities are concentrated in clustered regions, geographical proximity has a greater positive effect in developing countries than in developed countries on firms' innovation when they engage in inter-firm knowledge exchange within the clusters.

The reliance on informal institutions in developing countries may also influence non-local social interactions and subsequently the geography of innovation in these countries. Informal institutions and the significance of social networks are historically and culturally rooted; thus, they rely less on geographical proximity for maintenance. For instance, friends tend to still trust each other even in the absence of geographic propinquity (Bell 2005). Firms within a social network spanning spatial distance are still willing to undertake risky cooperative and joint actions without fear of opportunism (Uzzi 1996). Therefore, knowledge can still be exchangeable for geographically distant firms through such resilient social ties (Bell and Zaheer 2007). Indeed, Ganesan et al. (2005) found that the strength of relational ties with knowledge providers is not related to geographic proximity. These social ties provide the necessary informal safeguard for inter-firm knowledge exchange. Valuable knowledge is much more likely to be transmitted through strong relational ties (Frenzen and Nakamoto 1993; Rindfleisch and Moorman 2001). As such, those strong ties transcending geographic distance can facilitate the knowledge acquisition and innova-

tion (Ganesan et al. 2005). We therefore expect the social ties across geographical boundaries to play a bigger role in developing countries with strong informal institutions. Therefore, we propose:

Proposition 2 The effect of geographical proximity on firm innovation will be less positive for those firms that maintain more non-local social ties and interactions. This effect is more pronounced in developing countries than developed countries.

The Context of China

To illustrate the theoretical framework, we use the context of China to discuss the effect of informal institutions on innovative activities and outputs of different types of firms operating in China. Although China has undertaken substantial efforts in recent years to improve its institutional framework (Huang 2010), its formal institutions still remain generally weak and inefficient (Fan and Wang 2006). For instance, after China joined the World Trade Organization (WTO), to comply with the corresponding WTO obligation, China introduced and adopted several major institutional reforms to harmonize its institutions with international rules. The agreement on the Trade Related Aspects of Intellectual Property Rights (TRIPS) is one of such efforts and the associated passage of the 2001 patent law reform significantly improves upon its current judicial protection, reduces the ambiguity in application procedures, and strengthens the enforcement and protection of IPR (Hu and Mathews 2008). Nevertheless, the development of formal institutions in China is still weak compared to the developed countries (Huang 2016).

Given its weak formal institutions, the informal institutions in China that have been shaped by the long Chinese history and deep-rooted cultural tradition still have profound influence on Chinese business activities. The strong collectivistic culture of the Chinese people (Hofstede 2001) tends to emphasize networked relationships and in-groups (Xiao and Tsui 2007). For example, *guanxi* is a Chinese-style social network that has been used widely in the Chinese business community to obtain market information, scarce resources, and protection (Xin and Pearce

1996). Furthermore, Chinese people tend to form in-groups based on such characteristics as kinship, hometown, common schooling, or work experience (Yang 1994). These in-groups are usually permanent groups with inner or more intimate networks, in which resources flow easily. Both *guanxi* and in-groups, among other cultural and normative aspects, point to the long-lasting Chinese informal institutions that emphasize the importance of trust, obligation, and reciprocity in Chinese social interactions. These informal institutions are exceedingly enduring and can function both within and beyond geographical boundaries.

To deepen our understanding on the effect of informal institutions, we discuss the difference in innovative activities between multinational enterprises (MNEs) from developed countries and domestic Chinese firms located in different regions of China. To the extent that MNEs operating in China have less access to informal institutions and norms for knowledge exchange than Chinese firms, we should observe the differential impact of informal institutions on their innovations activities (Huang et al. 2015; Huang 2016).

In general, MNEs have considerable technological advantages compared with their domestic Chinese counterparts and they often transfer advanced knowledge into the domestic region in China where they operate and conduct research and development (R&D). However, there is an increasing need for MNEs to tap into the local knowledge of their host countries in order to develop context-relevant innovations and products (Govindarajan and Ramamurti 2011). Although the modern communication technologies like teleconference and e-mails can increase the efficiency of communication, they alone cannot help these companies to achieve the goal of acquiring tacit knowledge in the local market. This situation is demonstrated by the increasing number of R&D centers established in China by MNEs (Zhao 2006). Previous studies have also found that there are both significant inflow and outflow of knowledge between MNEs and host countries (Singh 2007), and that the knowledge structure of host countries has significant positive impact on MNEs' innovation (Almeida and Phene 2004).

In the process of gaining access to local knowledge, MNEs often rely less on informal institutions than domestic Chinese firms. The attitudes, beliefs, and values of managers in MNEs are strongly influenced

by the culture in their home countries despite their culturally diverse working environments (Hofstede 2001). MNEs from developed countries are generally more responsive to formal IPR protection because they traditionally attach greater importance to formal rules and regulations in their home countries (Grossman and Helpman 1991; Khoury et al. 2014). Their well-developed home institutional environments usually have clearly stipulated rules and effective enforcement, which reduce their need to rely on informal institutions to protect their intellectual assets from infringement. As MNEs have developed their organizational routines to suit the developed institutional environment of their home countries, these routines can constrain them from effectively adapting to the complex and sometimes ambiguous institutional environments in the host countries (Kostova and Zaheer 1999). It is often very difficult and time-consuming for foreign firms to adapt to Chinese informal institutions or break into the Chinese domestic social networks (Luo 2007).

In comparison with Chinese firms, the lack of access to the Chinese informal institutions and associated social networks makes geographical proximity not critically helpful for MNEs to effectively tap the local knowledge of proximate firms in a cluster (Geng et al. 2015). Therefore, we postulate:

Proposition 3 The effect of geographical proximity on firm innovation is stronger for domestic Chinese firms than for MNEs in China.

Furthermore, domestic Chinese firms are more likely to engage in knowledge exchange with distant firms through their maintained social networks which are not easily available for foreign MNEs. Therefore, for those MNEs located far apart from other firms, in order to develop context relevance and innovations suitable for local usage, they can primarily only tap into geographically localized knowledge in the immediate region in which they are located. Therefore, we suggest:

Proposition 4 MNEs are more disadvantaged than domestic Chinese firms in acquiring external knowledge in the host country (China) if they are located in less clustered regions in China.

Concluding Remarks

In this chapter, we integrate institutional theory and economic geography to explain f irms' innovative activities in the context of China. Although these two disciplines appear to have been largely developed independently, there exists synergy between them in that both emphasize the role of social interactions. Economic geographers focus on the concept of spatial proximity and suggest that social interactions are more likely to take place within the vicinity (Storper 1997; Maskell 2001). Meanwhile, institutional theorists argue that social interactions are guided and shaped by institutions that provide the rules and norms (North 1990; Scott 1995). The integrative perspective derived from these two disciplines can help deepen our understanding of the effect of spatial proximity on firm behavior. This chapter postulates that the influence of geographical proximity on inter-firm knowledge exchange depends on formal and informal institutions that underpin the social interactions both within and across geographical boundaries.

This chapter also provides a new perspective on the constraining and enabling function of geographical proximity in relation to economic and entrepreneurial activities, although this relationship is probably more salient in the case of China with its strong influence of informal institutions. On the one hand, although economic activities are generally territorially constrained, non-local social interactions may help firms to overcome such limitation. This might be especially important for new start-ups which may be more resource constrained and vulnerable to the localized competition. However, these entrepreneurs probably can take advantage of their relational ties with their prior friends or employees (e.g., Sorenson and Audia 2000). On the other hand, collocating with other firms does not guarantee that firms derive the full benefit from agglomeration. Localized social interaction sometimes can play a more important role than that played by geographical distance. Consequently, firms, especially start-up firms, need to take into account of the social structure when they make locational decisions. Moreover, some studies have suggested that firms with superior knowledge tend to stay away from clustered regions due to the concern for potential knowledge leak-

age to rival firms (Shaver and Flyer 2000; Alcácer and Chung 2007). The theoretical framework outlined in this chapter provides yet another motivation for these firms to behave in this way because they may be able to rely on social ties that are less constrained by geographical proximity to acquire the external knowledge.

In summary, this chapter sheds light on the social and institutional mechanisms underpinning the knowledge exchange processes and regional innovation. Although we used the case of China for illustration, our theoretical framework has the potential to serve as a starting point to advance our methodology in future empirical studies, particularly in the context of other developing countries. Our discussion shows that integrating an institutional perspective in understanding the geography of innovation is a promising agenda for future research on firm innovations in emerging economies.

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