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Technology transfer within China and the role of location choices

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ABSTRACT

We examine how emerging country business groups overcome various technological constraints and succeed in enhancing their performance. Our theoretical contribution lies in showing how the ability of a business unit to benefit from intra-group technology transfer depends on the idiosyncratic manner in which the group geographically configures its network of units. The findings reveal that the geographic dispersion and concentration of the units of a group alter both the ability and willingness of its business units to transfer technologies to (or receive technologies from) other units and subsequently result in different performance outcomes. The location of a business unit also determines whether or not a unit competes with other fellow units and, consequently, influences how much a unit benefits from the technologies held by the group.

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1. Introduction

Although emerging market enterprises (EMEs) do not typically possess strong R&D capabilities, they have recently become an integral component of the global technological system (Mudambi, 2008; Wang & Zhou, 2013). While this phenomenon opens up new avenues for theory development in international business and management, we have a limited understanding of how EMEs overcome various constraints and succeed in enhancing their performance. Research about developed countries considers technology to be one of the most important determinants of firm competitiveness and performance, but many firms in emerging economies do not possess and cannot quickly develop such technologies. Research on emerging markets suggests that some EMEs can compensate for such shortcomings by being part of a *business group*—i.e., organizations that own and control two or more business units (Khanna & Palepu, 1997). From a technological point of view, one of the key benefits of being part of a group is organizational learning. Each business unit is part of an integrated and interactive network of fellow units and can source knowledge and technology not only from the market but also from fellow units in the same group (Macher & Mowery, 2009; Szulanski, 2000; Tsai, 2001).

Business units that belong to groups are in a unique position to access the technologies developed by other units of the same group, but transferring and integrating spatially distributed technical knowledge can be a disruptive and challenging process (Gupta & Govindarajan, 2000; Kafouros & Buckley, 2008; Kasper, Lehrer, Mühlbacher, & Müller, 2013). As a result, technology transfer may not be equally beneficial to all the units of a group. Although prior research has emphasized the importance of a unit's capacity to absorb knowledge (Tsai, 2001), much less attention has been focused on the location of units and the geographic distribution of the group's network of units. From a theoretical point of view, this significantly limits understanding of how the location of a unit influences its ability to gain useful technology from fellow units and, subsequently, enhances its performance.

In order to address this gap in our understanding, in this study we examine how emerging economy business groups locate and geographically structure their network of units, and how such variations influence the effectiveness of intra-group technology transfer in enhancing the operational performance of business units (i.e., the efficiency with which a unit uses a given set of resources to create certain outputs; Dutta, Narasimhan, & Rajiv, 2005). Our theoretical contribution lies in demonstrating why the ability of a business unit to benefit from the collective knowledge and technologies of the group depends on the idiosyncratic manner in which the group geographically structures its network of units. We show that the operational performance of a business unit depends not only on its own location but also on the location of its fellow units. We also explicitly consider and capture the exact locations (i.e., cities) of the group's entire network of units, which

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in turn enables us to examine how location choices influence knowledge dependencies within the group.

To test our predictions, we need an emerging country that is innovative and exhibits significant geographic variation. We therefore focus on one of the largest, most diverse and innovative emerging countries in the world: China. We conceptualize each Chinese group as an interactive network or portfolio of geographically dispersed business units (Gupta & Govindarajan, 2000). We observe that groups differ in how widely they spread their units across different cities and in the degree to which they concentrate units in each city (some groups locate several business units within the same city while others locate only one unit). To capture these variations, we look at the geographic dispersion of the units of the group (*network breadth*) and the concentration of the group's business units in each given city (*network concentration*). These two aspects of a group's network of units are not always negatively associated, i.e., a group may be dispersed and operate in several cities but may also have several units located in the same city. Fellow business units often develop comparable products or invest in similar technologies (Birkinshaw & Lingblad, 2005). As a result, they often compete with one another and are not always willing to share knowledge with other units. We argue that variations in network breadth and concentration change the potential for collaboration and competition within the group, affect both the *ability* and *willingness* of units to transfer knowledge to (or receive knowledge from) fellow units and, thereby, have a profound impact on the operational performance of each individual unit.

Our analysis extends prior theorizing on the role of knowledge transfer by explaining why the performance-enhancing effects of technology transfer are contingent both upon the way in which groups in emerging economies configure their portfolio of business units, and the location of the unit in relation to that of fellow units. Given our focus on emerging economies and subnational variations at the city level, in this study we are concerned with groups that are uni-national. Although we do not consider multinational groups, some of the predictions of our framework could be adapted to firms that own business units abroad or to groups that operate in developed markets. Our focus on uni-national firms enables us to look more closely at cities (which are often ignored in international business studies that examine cross-country networks) and investigate how intra-firm network mechanisms function spatially within one country. Our approach also extends the clustering and co-location literature by demonstrating that merely participating in clusters or achieving proximal access to a knowledge-rich location is not sufficient for enhancing firm performance. Rather, we show that the way in which the firm distributes its business units relative to the unit in question determines whether this unit benefits from being located in a certain area, and whether the whole group benefits from positioning its units in a given way.

2. Theoretical background

Before developing specific hypotheses, the following sections provide a theoretical overview of the role of business groups in China, and how they may increase their performance by transferring knowledge and technology. They also discuss the dynamics of collaboration and competition within business groups, and how such dynamics are influenced by variations in location choices.

2.1. Business groups in China

A large body of research explains how market imperfections and underdeveloped institutions in emerging economies, such as China, give rise to business groups (e.g., Leff, 1978; Khanna & Palepu, 1997). Business groups can overcome institutional voids

and market failures by relying on the group's internal capital market and talent pool, by building intangible assets such as strong group reputation and brand names, and by accumulating expertise and knowledge from different affiliates operating in various locations (Belenzon & Berkovitz, 2010; Chang & Hong, 2000; Gopalan, Nanda, & Seru, 2007; Jian & Wong, 2010; Keister, 1998, 2001; Khanna & Palepu, 2000; Khanna & Rivkin, 2001; Mahmood & Mitchell, 2004). The literature points to the performance advantages that emerging market business groups enjoy compared with other firms (e.g., Mahmood, Zhu, & Zajac, 2011; Manikandan & Ramachandran, 2014). It also underscores the different ways in which knowledge is accumulated and assimilated within these business groups, and the non-monotonic process of intra-group knowledge transfer (e.g., Mahmood et al., 2011).

Chinese business groups function as an alternative (and more efficient) market to facilitate the transfer of resources including capital and knowledge among units of the same group (Nan, Jing, & Yongxiang, 2013). Business groups in emerging markets enjoy considerable advantages. Institutional voids in emerging markets (Manikandan & Ramachandran, 2014) result in a lack of low cost options and coordinated efforts in the external market to facilitate the innovation process. For example, firms that do not belong to business groups may find it difficult to conduct both local and distant search (Haakonsson, Jensen, & Mudambi, 2013) while the weak appropriability regime in these markets reduces the chances of creating competitive advantages through innovation (Bradley, McMullen, Artz, & Simiyu, 2012; Keupp, Friesike, & Zedtwitz, 2012). Groups can also deal with underdeveloped capital markets (Mahmood & Mitchell, 2004) by being able to finance the development and commercialization of new innovative ideas, and increase the benefits of sharing resources among affiliates (Mahmood et al., 2011; Nan et al., 2013), thus helping groups to enhance their overall performance.

2.2. Technology transfer within business groups

Knowledge is unevenly distributed not only across countries but also within sub-national geographic areas (Breschi & Lissoni, 2009; Kloosterman, 2008). Consequently business groups can tap into the knowledge of different regions and cities through the local operations of their units. The technological knowledge that a unit can access in one region can be transferred internally to other units of the same group in different regions. Theoretical insights from the innovation literature suggest that the technologies created in units within the group may help fellow research and development (R&D) business units to complement their own technical knowledge base, develop new or better products and processes and, thereby, enhance their capability and performance (Ebersberger & Herstad, 2012; Kafouros, 2008; Lai, Chiu, Liaw, & Lee, 2010; Macher & Mowery, 2009). Two distinct mechanisms (namely, intentional technology transfer and unintentional spillovers) may assist a business unit in benefiting from the technologies developed within the group. The first mechanism occurs when corporate headquarters (HQs) encourage, or even force, their business units to share technological discoveries with fellow units. This practice facilitates organizational learning within the group as a whole that in turn enhances the innovation performance of all units (Kogut & Zander, 1992; Tsai & Ghoshal, 1998; Tsai, 2001).

Because business units that operate in different locations have access to different knowledge pools (Kafouros, Buckley, & Clegg, 2012), the technologies developed by each business unit often differ from one another. Therefore, a unit's knowledge may complement the knowledge base of fellow units, enabling them to develop valuable technological combinations (e.g., Abecassis-Moedas & Mahmoud-Jouini, 2008; Lai et al., 2010). As a business unit

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