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The delicate balance: Managing technology adoption and creation in multinational affiliates in an emerging economy

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ABSTRACT

From a perspective of the resource-based view, this paper analyses the inter-connection between technology adoption and creation in affiliates of multinational enterprises (MNEs) in an emerging economy. Operating below the international technological frontier, multinational affiliates are more motivated to adopt technologies already existent from their MNEs than create new technologies, as the former already gives them competitive advantages over local firms. When technology creation is required, multinational affiliates will adopt further technology-based resources from their MNEs as they are unavailable in an emerging economy. As a result, technology adoption is a necessary but not sufficient condition for multinational affiliates to conduct technology creation. Given that networks are particularly important for working around institutional voids in the context of an emerging economy, this paper also investigates the different roles of R&D support from internal and external networks of multinational affiliates in technology adoption and creation. Hypotheses are tested and partially supported based on unique data from 465 multinational affiliates in China.

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1. Introduction

Does technology adoption facilitate technology creation and/or vice versa? Though technology adoption (or technology transfer) and technology creation (or innovation)¹ are arguably two of the most widely researched topics in the literature on R&D and strategy, they tend to be examined separately (e.g. Almeida & Phene, 2004; Chung, 2001; Cui, Griffith, Cavusgil, & Dabic, 2006; Cummings & Teng, 2003; Damanpour & Schneider, 2006; Frost, 2001; Mowery, Oxley, & Silverman, 1996; Mudambi, Piscitello, & Rabbiosi, 2014; Simonin, 2004; Tortoriello, 2014; Tsai, 2001; Zhao & Anand, 2013). To the best of our knowledge, there is limited research focusing on how they are connected; especially in context of affiliates of foreign multinational enterprises (MNEs) in emerging economies. This is partially related to how the role of multinational affiliates in emerging economies is viewed. The

conventional view tends to consider multinational affiliates as technology adopters, adopting technologies possessed by the parents or sister affiliates given the relative more advanced technology level of home countries to that of emerging economies (Athreye, Tuncay-Celikel, & Ujjual, 2014; Dunning & Lundan, 2008; Kuemmerle, 1999). Increasingly, there is a recognition of multinational affiliates taking on the role of technology creator, creating technologies of their own for local production which could also be shared across the MNE (Mudambi et al., 2014; Zhao & Anand, 2013). Kuemmerle (1999) and Cantwell and Mudambi (2005) distinguish the mandate of multinational affiliates as either technology adoption or technology creation. However some multinational affiliates may take the synchronous roles of both technology adopter and technology creator (Forsgren, 2008; Narula, 2014). Thus technology adoption and technology creation might be interconnected. Understanding a firm's R&D strategy, i.e. the plan that guides its decision on the development and use of technological resources and capabilities, is of great value for achieving market and financial success.

Although the extant literature treats technology adoption and creation separately, scholars have suggested a bi-directional and positive relationship between technology adoption and creation. On the one hand, successful technology adoption stimulates an

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¹ We use the terms of technology adoption and technology creation because this paper takes the perspective of multinational affiliates. For these affiliates, their technology mandates are related to adopting and/or creating technologies.

affiliate's creation of new technologies (Almeida & Phene, 2004; Ghoshal & Bartlett, 1988). On the other, technology creation leads to a greater demand for advanced technologies owned by other organizational units in the differentiated network of the MNEs (Athreye et al., 2014). Thus there is a potential endogeneity issue that needs to be taken into account: do technology adoption and technology creation mutually influence each other? Put it differently, a full understanding of a multinational affiliate's technological activities requires the consideration of technology adoption and creation in an integrated framework. This is particularly important in the context of emerging economies because multinational affiliates are often constrained by resources and institutional environment and face difficulties in creating new competencies (Chung, 2001).

Indeed, "institutional voids" have been much emphasized in understanding international business in emerging economies (e.g. Hoskisson, Eden, Lau, & Wright, 2000; Khanna & Palepu, 2010; Khanna & Rivkin, 2001, 2006; Meyer & Nguyen, 2005; Peng, Wang, & Jiang, 2008). Institutional voids result from a lack of market-supporting formal institutions and can have profound impact on a firm's R&D strategy. Institutional voids lead to the escalation of transaction costs arising from regulatory and bureaucratic burden, the enforcement of contracts, security and safety, and the state of corruption. Facing challenging formal institutional environments, firms establish strategies and structures which increase organizational flexibility so as to deal with missing or poorly developed markets (Dieleman & Boddewyn, 2012; Dixon, Meyer, & Day, 2010). Institutional voids undermine firm's ability to access and utilize resources required to support or stimulate technology adoption and creation. By its very nature, resources are scarce. Managing and allocating resources for efficient and effective use is a key to business success. Technology adoption and creation impose different levels of requirement on firm resources. Technologies adopted by affiliates sometimes need to be adapted to the local context and this process can put a strain on the affiliate's available resources (Chung, 2001). However, creating new technologies for local markets imposes even greater resource requirement due to the need to search, develop, transfer, understand, and integrate new knowledge (Cohen & Levinthal, 1990; Makadok & Barney, 2001). Therefore, considering the limited resources available, it is a perennial challenge how multinational affiliates in an emerging economy resolve the balancing act between technology adoption and creation.

In view of institutional voids, it has been widely recognized in the literature that informal institutions come in as a substitute for the missing or imperfect product and factor markets and for dealing with market uncertainty and volatility (e.g. Khanna & Rivkin, 2006; Li, 2005; Park & Luo, 2001; Peng & Luo, 2000). Indeed, it is important to note that in emerging economies such as China, it is not only domestic firms, but also foreign companies that cultivate their networks to support their strategies and to alleviate market failures (Hitt, Ahlstrom, Dacin, Levitas, & Svobodina, 2004; Hitt, Dacin, Levitas, Arregle, & Borza, 2000; Li, 2005). Thus, different from operating in developed countries which are characterized by market-supporting institutions, managers in emerging economies particularly rely on networks, both internal and external, for smooth business transactions and exchange coordination as substitutes for formal institutional support because networks provide them with much-needed resources for R&D strategy (Peng & Luo, 2000). Thus different from the previous literature that focuses on firm-level variables as technological capabilities variables (human capital, tangible support assets and technology gap) (e.g. Driffield, Love, & Menghinello, 2010; Kedia & Bhagat, 1988; Simonin, 2004; Stock, Greis, & Dibner, 1996) and organizational variables (ownership form, foreign equity share and autonomy) (e.g. Belderbos, 2003;

Desai, Foley, & Hines, 2004; Ghoshal & Bartlett, 1988), we pay attention to the different roles of R&D support from internal and external networks in technology adoption and creation. To the best of our knowledge, the *simultaneous* impact of internal and external networks has not been examined in the extant literature.

This paper contributes to two strands of literature. The first is the resource-based view (RBV) which draws on information economics aiming to uncover key strategic factors underpinning the adoption and creation of valuable resources (Makadok & Barney, 2001). From a perspective of RBV, we develop and test a conceptual framework that is firmly placed in the context of an emerging economy taking into account its formal institutional voids, and we advance the understating of multinational affiliates' R&D strategy by investigating the interconnection between technology adoption and technology creation. We first argue that such an economy has important resource implications for multinational affiliates, especially for balancing adopting existing technologies and creating new ones. Contrary to the existing literature, we argue that the relationship between technology adoption and creation can be uni-directional rather than bi-directional in emerging economies. We propose, and empirically demonstrate, that technology creation in multinational affiliates in emerging economies heavily relies on technology adoption. In contrast, technology adoption does not necessarily lead to technology creation.

We provide a more fine-grained picture of a multinational affiliate's R&D strategy in an emerging economy by analyzing the influence that both internal and external network resources could have on technology adoption and creation (cf. Moreno-Luzón & Begoña Lloria, 2008). By analyzing networks, we clarify boundaries within which they influence technology adoption and creation in an emerging country context. The consideration of internal and external networks in an emerging economy context also contributes to the literature on formal and informal institutions. In particular, we extend the literature on networks as an informal institution in a weak formal institutional environment (e.g. Khanna & Rivkin, 2006; Li, 2005; Park & Luo, 2001; Peng & Luo, 2000; Peng et al., 2008) by relating internal and external networks to technology adoption and development.

The second strand we contribute to seeks to understand firm strategy in emerging economies (Hoskisson et al., 2000; Khanna & Palepu, 1997; Wright, Filatotchev, Hoskisson, & Peng, 2005). We take a contextualized perspective and analyze specific environmental contingencies affecting technology adoption and creation (cf. Damanpour & Schneider, 2006). We thus move away from a simplistic way of treating technology adoption and technology creation as separate cases, which is often the feature of the extant studies, by taking into account their inter-connection and the simultaneous role of internal and external networks, and revealing the effect of an emerging-economy context in technology adoption and creation within multinational affiliates.

2. Theoretical background and hypothesis development

Following the RBV, technology is an important type of a firm's valuable, rare, inimitable, and non-substitutable resources (including capabilities) that determine its competitive outcomes (Barney, 1991). In the current highly competitive globalized world, an MNE's performance rests on its capability to effectively create technologies and transfer them between affiliates (D'Agostino & Santangelo, 2012). Indeed, one recent and most striking feature of MNE innovation activities is the internationalization of R&D into developing countries, especially BRIC countries (Brazil, Russia, India and China) (UNCTAD, 2005). However, internationalization of R&D into these locations seems somewhat counter-intuitive.

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