



Managing FDI technology spillovers: A challenge to TNCs in emerging markets

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ABSTRACT

Prior studies on foreign direct investment (FDI) technology spillovers have offered little guidance to transnational corporations (TNCs) on how to protect and exploit technology across borders. The present paper argues that TNCs can manage technology spillovers through selection of entry modes, selection of technologies, and selection of investment priorities in the affiliates they establish in foreign markets. A number of hypotheses are derived from theoretical analyses and are tested against firm-level data from China. The findings of the paper have significant implications for TNCs that face fierce competition from local firms in emerging markets.

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1. Introduction

After World War II, internationalization of production accelerated and foreign direct investment (FDI) increased on an unprecedented scale. In the early period, FDI was primarily made in the developed world. In recent years, some developing countries, particularly China and India, grew rapidly, and began to attract a large amount of FDI. China has been, for instance, the largest FDI recipient in the developing world since the mid-1990s, and has been among the top four largest FDI recipients in the world since the early 2000s. The shift of FDI destination has resulted in increasing interaction between transnational corporations (TNCs) from developed countries and local firms in emerging markets.¹

Given the technology gap between the developed and the developing world, technology transfer lies at the core of the interaction. Technology transfer may take direct forms. Local firms may, for instance, directly purchase advanced technology and equipments from TNCs. This kind of technology transfer is under control of TNCs. Most technology transfer takes, however, indirect forms, that is, the so-called FDI technology spillovers. By definition, FDI technology spillovers are externalities, for which local firms do not pay if the effect is positive and do not get compensation if the effect is negative. In other words, FDI technology spillovers take place when the entry or presence of TNCs lead to productivity gains or losses in local firms. TNCs are not able to internalise the full value of these benefits or losses (Blomstrom, Kokko, & Zejan, 2000; also Buckley, Clegg, & Wang, 2002). Being externalities, technology spillovers cannot be easily controlled by either side of the transaction.

Scholars have now increasingly realized the importance as well as the complexity of FDI technology spillovers, and have begun to make great effort to research this subject. Consequently, the debate over FDI technology spillovers has intensified. In the beginning, the debate was dominated by arguments for positive FDI technology spillovers. Positive spillovers may take place through a competition effect. That is, competition from TNCs forces local firms to increase their competitive capacity by reforming management style and updating production technology. Moreover, positive spillovers may take place through a linkage effect. That is, local firms learn from observing TNCs in the same industry, and benefit from the technical support, the demand and the supply provided by TNCs with which they have an upstream or downstream relationship in business chains. Furthermore, positive spillovers may take place through an employment effect. That is, TNCs train their employees who later move to local firms with acquired skills (see Görg & Strobl, 2001).

In recent years, it was argued that FDI may generate negative technology spillovers in the sense that the entry or presence of FDI negatively affects the productivity of local firms. Negative spillovers may take place through market stealing. That is, the aforementioned competition effect could turn negative if TNCs draw away demand from local firms and forces them to cut down production. In this case, the productivity of local firms would decline as they have to spread the fixed cost over a smaller amount of products (Aitken & Harrison, 1999). Negative spillovers may also take place through skill stealing. That is, the employment effect may turn negative if TNCs attract the best workers away from local firms, causing a decline of the productivity of the local firms (Girma, Greenaway, & Wakelin, 2001). Empirical studies have so far produced mixed results. Some studies showed evidence of positive technology spillovers from FDI to local firms, while other studies found that FDI negatively affects the productivity of local firms (see for instance, Aitken & Harrison, 1999; Buckley, Clegg, &

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¹ See United Nations: *World Investment Report* (2005–2008).

Wang, 2007; Caves, 1974; Chung, 2001; Chung, Mitchell, & Yeung, 2003; Djankov & Hoekman, 2000; Globerman, 1979; Javorcik, 2004; Kathuria, 2000; Kokko, 1996; Tian, 2007; Wei & Liu, 2006).²

Interestingly enough, both sides in the debate have looked at the issue almost exclusively from the perspective of local firms that receive the spillovers rather than the perspective of TNCs that generate the spillovers. As a result, the discussion can offer little, if any, guidance to TNCs on how to manage technology spillovers in emerging markets. This paper is intended to fill this vacuum. In the paper, I discuss theoretically how TNCs may manage FDI technology spillovers across borders through selection of entry modes, selection of technologies, and selection of investment priorities, and test empirically some derived hypotheses. Based on the empirical findings, I discuss specific measures that TNCs may take to protect as well as exploit technology in emerging markets. The paper is organized as follows. In Section 2, I review the current debate on cross-border technology management, develop a framework of FDI technology spillovers, and propose some hypotheses. In Section 3, I explain the method, variables and data that are used to test the hypotheses. In Section 4, I present the empirical results. In Section 5, I discuss the main contributions and limitations of the study. The final section concludes the paper.

2. Theoretical analyses and hypotheses

When TNCs invest directly in an overseas market, they want to make full use of their technology to gain cost and sales advantages abroad. These firms do not want local firms to gain quick access to their technology lest they may lose competitive leadership to local competitors (Anderson & Gatigno, 1986; Isobe, Makino, & Montgomery, 2000). They need, therefore, to think about how to exploit as well as protect their technology in the overseas market they enter. Cross-border technology management thus became an important topic of discussion in the management science, particularly in the management of technology (MOT) discourse. Driven by the needs to formulate appropriate technology strategy and business strategy at the same time, the MOT discourse tended to move away from the traditional R&D management, innovation management and technology planning schools, which discuss technology strategy in isolation, toward an emerging strategic MOT school. The strategic MOT school takes management of technology as “actually the practice of integrating technology strategy with business strategy in the company” (Gaynor, 1991, p. 2; also Drejer, 1996).

An early attempt to integrate technology strategy with business strategy can be traced back to internalization theory (Buckley & Casson, 1976). According to internalization theory, selecting an appropriate entry strategy is an effective approach to technology management. TNCs should choose to establish wholly owned subsidiaries rather than joint ventures (or other entry modes that involve local partners) to minimize unwanted technology appropriation. The rationale behind the argument is that whole ownership enables TNCs to exploit firm-specific knowledge internally, to avoid the costs of monitoring partner's use of their knowledge, and to minimize the risks of partner's appropriation of their knowledge. Despite the importance of entry strategy to cross-border technology management, increasing evidence shows that TNCs often have compelling reasons for entering an overseas market through joint ventures. In such developing countries as China and India, for instance, certain industries are open to joint ventures rather than wholly owned subsidiaries. TNCs that do not want to miss the opportunity of entering these industries have to establish joint ventures. Even without policy restrictions, TNCs

may choose to establish joint ventures in order to benefit from local partners' knowledge, marketing networks and social networks. Entry mode selection based on internalization theory is, therefore, insufficient for cross-border technology management (Cannice, Chen, & Daniels, 2003). TNCs have to think about what they should do to protect their technology if they have to enter an overseas market through joint ventures.

In search for new approaches, scholars recently turned to resource-based theory and focused on the technologies that TNCs use in their foreign affiliates. An important contribution was made by Cannice, Chen, and Daniels (2004). It was argued that technologies can be divided into core technologies and periphery technologies according to how critical they are to the distinctive competencies of TNCs. Technologies can also be divided into dependent technologies and independent technologies according to the extent to which they can operate independently. Technologies can be further divided into tacit technologies and explicit technologies according to whether they can be codified. It was suggested that TNCs should choose to use periphery, dependent and tacit technologies in foreign affiliates in order to protect themselves from unwanted technology appropriation. This line of thinking is also evident in other recent studies, and has indeed offered a new approach to cross-border technology management (see, for instance, Cannice et al., 2003; Jordan & Lowe, 2004; Norman, 2002).

Unfortunately neither selection of technologies nor selection of entry modes can eliminate technology spillovers that are externalities under control of neither side of the interaction. No matter what types of technologies (core or periphery, dependent or independent, and tacit or explicit) are used in foreign affiliates (wholly owned or jointly owned), the technologies are likely to spill over to local firms through various channels. The current research in management of technology stops at this point, and does not move further to investigate the specific channels by which foreign technologies spill over to local firms. Clearly, neither internalization theory nor resource-based theory can offer sufficient guidance in this regard.

It is essential to develop a framework about how technologies (no matter whether they are core or periphery, dependent or independent, and tacit or explicit) in foreign affiliates (no matter whether they are joint ventures or wholly owned subsidiaries) spill over to local firms via different channels. Based on prior empirical findings on sources of FDI technology spillovers, this paper proposes a tentative framework. As shown in Fig. 1, foreign technologies may spill over to local firms through the input foreign affiliates use in the production process as well as the output foreign affiliates produce and sell. The input includes both capital input, either tangible or intangible, and labour input, either skilled or unskilled. The output includes new products or traditional products on the one hand, and exported products or domestically sold products on the other. The productivity of local firms may be affected by foreign technology spillovers through these channels, either positively or negatively, depending on the nature and the scale of the spillovers through each of these specific channels.

It is crucial to note that these specific spillover channels actually represent investment priorities of TNCs in an overseas market. To manage FDI technology spillovers, therefore, TNCs can choose not only between different entry modes in light of internalization theory and between different technologies in light of resource-based theory, but also between different investment priorities in light of the spillover framework proposed in this paper. That is, they can choose between investment in tangible assets and in intangible assets, between investment in projects that require employment of skilled workers and in projects that require employment of unskilled workers, between investment in production of exported products and in production of domestically

² I would like to thank an anonymous reviewer for recommending some of the references to the author.

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