A Dual Networks Perspective on Inter-Organizational Transfer of R&D Capabilities: International Joint Ventures in the Chinese Automotive Industry

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May 21, 2004 (Version: JMS3_05_21.doc)

Acknowledgements: We appreciate the funding support of the William Davidson Institute of the University of Michigan Business School, and thank all respondents in China and the U.S. for their assistance and insights. The paper has benefited from insightful comments provided by David Krackhardt, Gabriel Szulanski, Mike Wright, three anonymous referees, attendees at the Academy of Management meetings, the Queen’s University conference on inter-firm alliances, the Strategic Management Society mini-conference on emerging economies in Hong Kong and the Corporate Strategy and International Business seminar at the University of Michigan, where we presented previous versions of this paper.
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Abstract

This study examines how the source networks and recipient networks in which international joint venture (IJV) partners operate influence inter-organizational knowledge flows. We study multiple cases in the Chinese auto industry to investigate how firms transfer knowledge from MNE source networks to IJVs and how the knowledge then diffuses to the local firms’ recipient networks (qiye jituan business groups in China). The study suggests ways that the dual networks influence knowledge transfers. First, asymmetries in capabilities and motives of the dual networks strongly influence knowledge flows. Second, while individually-carried capabilities diffuse easily through local networks via the movement of personnel, the diffusion of group-embedded capabilities requires more complex mechanisms such as vertical relationships. Third, the research helps understand when a recipient network’s knowledge stock serves as absorptive capacity and when it serves as core rigidity, such that individual knowledge has a positive influence on knowledge transfer, while organizational experience can create barriers. The conclusions are important in emerging economies where organizational transformation must accompany technical advance.

Key Words: emerging economies, knowledge transfer, international joint ventures, organizational capabilities, networks.
1. Introduction

Firms in emerging economies commonly attempt to use their relationships with multinational enterprises to increase their R&D capabilities (Baranson 1977; Brewer and Nollen 1998). The governments of many emerging economies (EEs) have created policies to solicit greater local knowledge content as well as greater local production when multinational enterprises (MNEs) operate in their countries (Martinsons and Tseng 1999). Under pressure from the local governments and facing global competition that creates the need for greater local responsiveness in their host countries’ markets, many MNEs are transferring R&D capabilities to their business partners in the EEs (Reddy and Zhao 1990). An extensive literature suggests that transferring R&D capabilities across firms involved in such international joint ventures (IJVs) requires substantial cultivation of tacit and organizationally embedded knowledge (e.g., Beamish 1993; Child and Yan 2001). This literature offers substantial insights about how characteristics of the joint venture and its partners influence firms’ ability to overcome difficulties in transferring knowledge, but typically focuses on the individual firms involved in an IJV. However, individual firms participate in larger networks of suppliers, distributors, public agencies, and other partners (Tichy, Tushman and Fombrun 1979;Granovetter 1985; Peng and Heath, 1996). Little research considers how such business networks shape the knowledge transfer process. This paper studies how source MNEs’ global networks and recipient firms’ local business networks in the Chinese auto sector— which the Chinese refer to as qiye jituan — influence attempts to transfer knowledge underlying R&D capabilities.

Previous research has used several perspectives to study knowledge transfer between partners. Early arguments based on internalization theory (Hymer 1976) and transaction cost economics (Teece 1976; Williamson 1981) emphasized incentives and safeguard mechanisms involved in knowledge transfer, with an underlying assumption of potential opportunism. More recently, resource-based and evolutionary theories (Nelson and Winter 1982; Kogut and Zander 1992, 1996; Teece, Pisano and Shuen 1997) have emphasized organizational cognitive abilities and activities more than concerns about opportunistic behaviour. The main concern of such knowledge-based views is to understand the processes of knowledge generation and coordination that occur within and across organizations. This study combines a knowledge-based approach with an emphasis on the characteristics of source and recipient firms’ business networks. The
combination helps provide a deeper understanding of the movement of knowledge among firms that operate in complex business environments.

A business network is a set of firms and other organizations that contribute to and draw from each other’s skills and resources. We emphasize two types of business networks. MNEs participate in business networks that consist of core firms and multiple subsidiaries and partners worldwide. Local firms, meanwhile, participate in networks of suppliers, technical institutes, production partners, distributors, and public agencies.

These networks have important influences on both intended and unintended transfers of knowledge through the IJV interface. For example, the experience of an MNE in its network of subsidiaries influences its ability to transfer capabilities. Further, much of what the IJVs learn from their source networks does not stay within the IJV, but spreads to other members of the recipient network. To date, little research has examined such patterns of knowledge flow within recipient networks and the mechanisms that facilitate or hinder intra-network knowledge diffusion. The goal of this study is to explore the flow of R&D capabilities from the MNE network into the local network through the IJV which joins them together, while examining both networks’ roles in enabling, diffusing, and restricting this inter-network knowledge flow.

The Chinese automotive industry is a useful setting for the study. The industry faces significant technical, cultural, and managerial barriers between source and recipient organizations, yet there is growing evidence of MNEs transferring R&D capabilities to their joint venture partners. The industry offers a setting to examine the interaction between two previously isolated networks, namely the networks of foreign and local IJV partners, and understand how firms use their inter-partner network structure to overcome knowledge transfer difficulties. We use an inductive design with qualitative data involving interviews and field observations, which we reinforce with archival data (Eisenhardt, 1989; Yin 1994; Hoskisson, Eden, Lau, and Wright 2000). The patterns that emerged from the study can help guide future research.

2. Background: Capability Transfer

Transferring capabilities from developed countries to EE

Capabilities and inter-organizational capability transfer are key concepts in the study. Capabilities are the means by which firms use physical and knowledge-based factor inputs to create goods and services (Richardson 1972). By inter-organizational capability transfer, we
mean that a recipient organization adopts capabilities that a source organization possesses (Baum and Ingram 1998). We use the terms capability transfer and knowledge flow interchangeably.

Transferring capabilities from MNEs to their partners in EEs differs in several ways from transferring capabilities within developed countries (DCs). First, larger technological gaps tend to exist between the source and the recipient organizations in DC-to-EE transfers. For example, the R&D/sales intensity of Chinese auto firms, including international joint ventures (IJVs), typically ranges between 1.0% to 1.5%, much lower than MNE auto company R&D investment, such as Honda’s 8.5% and Toyota’s 6.0% levels. Second, EE environments are socially and culturally distinct from DC environments. For an MNE, host country environments involve new firms and institutions within complex and dynamic settings (Peng and Heath, 1996; Luo and Peng 1999). Third, MNE and EE firm networks have grown in relative social and economic isolation, at least until recent rounds of economic liberalization. Therefore, unlike DC-to-DC knowledge transfer, DC-to-EE transfers face a paradox – although the need for knowledge flow is great, the technological gaps and cultural differences create high barriers that inhibit the knowledge flow.

In order to transfer capabilities, EE firms and MNEs must bridge cultural and managerial distances. Research suggests that the source organizations’ host country experience, multinational experience, and alliance experience as well as the recipient organization’s IJV experience help build this bridge and facilitate effective transfer (Johanson and Vahlne 1977; Dunning 1988; Kogut and Singh 1988; Anand and Khanna 2000). In addition, recipient organizations typically possess preexisting routines that they must unlearn in order to develop new routines that underlie desired capabilities, because the large technological and managerial gaps between the source and recipient organizations entail obsolescence of the recipient organization’s preexisting routines (Leonard-Barton 1992).

**Transferring R&D capabilities**

Transferring R&D capabilities faces particularly strong challenges. The knowledge-intensive nature of R&D capabilities and differences in local market contexts adds to the difficulty of DC-to-EE knowledge transfer. R&D capabilities, even for end stage activities such as modifying existing design to fit local conditions, involve many tacit routines, some of which involve single individuals but many of which require organizationally embedded inter-personal and inter-functional activities. Spender (1996) refers to knowledge that is both tacit and
organizationally embedded as collective knowledge. Collective knowledge is more complicated to understand and transfer than codified knowledge (e.g., blueprints, patents, and testing procedures), individual-embodied tacit skills (e.g., design skills, analytical skills, and testing skills), or physical technology (e.g., analytical and design equipment).

Prior research suggests that both the tacit and group-embodied characteristics of R&D capabilities impose several requirements when organizations seek to transfer collective knowledge from source to recipient. First, the source and the recipient must establish close inter-organizational contact, involving groups of people from both source and recipient organizations (Cook and Brown 1999). Transferring tacit knowledge requires direct interaction and first-hand observations including exposure to the source entity’s working environment and socialization processes (Polanyi 1962; Nonaka and Takeuchi 1995; Kimberly and Bouchikhi 1995). In parallel, transferring group-embedded knowledge requires coordinated relationships among members of the knowing community in which people interact to carry out routines or solve problems (Fiol and Lyles 1985; Levitt and March 1988; Szulanski 1996). As Cook and Brown (1999: 386) point out, “the body of [collective] knowledge is possessed by the group as a whole and is drawn on in its actions, just as knowledge possessed by an individual is drawn on in his or her actions”. Second, transferring collective knowledge arises through experience. Nelson and Winter (1982: 99) pointed out that organizations remember by doing in order to acquire the tacit and routine-based aspects of what we are referring to as collective knowledge. Third, source and recipient organizations must commit to long-term collaboration, because transferring tacit and organizationally embedded knowledge engenders time compression diseconomies (Dierickx and Cool 1989) and thus requires stable relationships (Teece 1986). The joint implication of these requirements is that transferring collective knowledge via an IJV usually requires long-term interactions that involve extensive hands on contact between groups of personnel from recipient and source organizations.

The Dual-Network Context of DC-to-EE R&D Capability Transfer

Like other business organizations, IJVs are not isolated islands, but are deeply embedded in a nexus of socioeconomic relationships of related organizations. Granovetter (1985) argues that virtually all economic behaviors in modern life embedded within networks of social relations that condition economic process. Network ties entail mutual influence between an organization and its network contacts in terms of information, power, resource, and trust. Such
ties provide benefits such as trustworthy relationships, fine-grained information sharing, and joint problem-solving arrangements (Burt 1992; Powell, Koput, and Smith-Doerr 1996; Gulati 1998).

IJVs commonly participate in two networks: the MNE network of the venture's foreign partner and the local partner’s business group. This dual-network context complicates the dynamics of DC-to-EE R&D capability transfer. Both the MNE network of the DC partner and the business network of the EE partner may influence the content and quantity of knowledge flow into and out of the IJV. These networks influence the nature of both the intended knowledge transfers as well the unintended knowledge leakages. Previous studies of IJV knowledge transfer typically treat the MNE as an aggregated knowledge source, rather than studying how the IJVs’ dual networks affect knowledge transfer (e.g., Lyles and Salk 1996; Dussauge, Garrette, and Mitchell 2000; Lane, Salk, and Lyles 2001). Even studies that use a network perspective to study knowledge flow between firms typically focus on inter-member knowledge transfer within a single MNE network, in areas such as product and process design, distribution, and marketing (e.g., Gupta and Govindarajan 2000).

Figure 1 contrasts the dual-network perspective on IJVs and knowledge flow with the traditional unitary-actor perspective. In the EE context, because technical knowledge primarily flows from the MNE to the local firm, we term the MNE network of the IJV’s foreign partner as the *source network* and the business group of the local partner as the *recipient network*. The dual networks are highly relevant in our empirical context, which we describe next.

********** Figure 1 about here **********

3. Research Setting

**The Chinese Auto Industry**

When China’s auto industry opened to foreign investors in the early 1980s, its R&D capability in the passenger vehicle sector was weak (see Buck, Filatotchev, Nolan, and Wright 2000). State owned enterprises (SOEs) in this sector initially produced commercial vehicles rather than passenger vehicles. The SOEs undertook low development effort (R&D spending was less than 1% of revenue, far lower than MNE R&D investments) and followed very long platform upgrade cycles (usually longer than 20 years).

The Chinese government views the auto sector as a pillar industry. Chinese industrial policy places strong emphasis on developing indigenous R&D capabilities in such pillar industries.
Approval guidelines for foreign MNEs to establish IJVs in the Chinese auto industry involve several provisions concerning technical development. The IJV must have an internal technical center that is capable of developing future generations of products that must quickly reach a technological level at par with global standards. The industrial policy provides three strategic guidelines for developing indigenous R&D capabilities (The State Administration of Machinery Industry 1995). First, vehicle OEMs should include 5% to 10% of total reinvestment for developing or expanding their technological centers. Second, R&D spending should reach at least 2% to 3% of sales within five to ten years. Third, key component suppliers should apply 10% to 20% of their reinvestment to set up R&D facilities and technical centers. The government provides financial and taxation support for joint R&D projects.

MNEs have recognized the tremendous potential of the emerging car market in China since the early 1980s (Buck, et al. 2000). AMC-Jeep and Volkswagen (VW) were the first MNEs to enter China. They entered with cautious attitudes about the industrial infrastructure and local market, and established simple vehicle assembly facilities with low local content and almost no local knowledge content. AMC-Jeep had a very low level of initial sales, but VW achieved early success in penetrating the Chinese market, primarily because its first vehicles met market needs better than available domestic products and the venture faced little foreign competition. The commercial success of VW in the late 1980s and early 1990s evoked an inflow of foreign investment throughout the 1990s, from OEMs and first-tier suppliers such as General Motors (GM), Ford, Daimler-Chrysler, Toyota, Honda, Visteon, Delphi, Cummins, and others. In order to earn approval for entering China, MNEs now must commit to bring in modern product and process technologies and help develop indigenous R&D capabilities at their local operations.

China’s demand for R&D capability transfer is at least partly consistent with the long-term incentives of MNE investors. As competition in China’s car markets becomes more global and intense, companies must develop new products that suit local tastes and regulations at a faster pace. Transferring R&D capabilities to operations close to local markets thus becomes essential (Buckley and Casson 1976). MNEs’ R&D activities in the EEs are mostly at the end stage of the R&D cycle, with tasks such as adapting the general design to the local environment. The design adaptation/localization process requires varying degree of local knowledge content, ranging from extending the length of the car to re-designing the exterior and interior and fitting a new engine. GM-Shanghai, for example, made 600 engineering changes to tailor the Buick
Century to Chinese driving conditions and regulations. Changes included elevating the rear seat, enhancing legroom in the back, and fine-tuning the suspension for China’s road conditions. Localization-related engineering work also includes validating the capabilities of local suppliers and certifying product designs to meet local quality, safety, and environmental requirements.

Most Chinese auto IJVs are embedded in both an MNE source network and a recipient qiye jituan network, as we describe below. Thus, the knowledge flow through the IJV is not limited to a one-to-one setting (foreign partner-to-local partner) setting, but includes a network-to-network setting. Such network-to-network transfers can have far-reaching implications for the diffusion of knowledge in an emerging economy.

**MNE Source Networks in the Auto Industry**

Since the early 1980s, automotive assemblers and component suppliers worldwide have been forming alliances and a few large MNE networks have emerged as a result (Nohria and Garcia-Pont 1991, Garcia-Pont and Nohria 2002). Most of the multinational firms that have entered the Chinese auto industry are large MNEs with multiple alliances and wholly owned subsidiaries in different countries. For example, General Motors, the world's largest vehicle manufacturer, employs about 325,000 people around the world, has manufacturing operations in 32 countries, and sells its vehicles in 192 countries. The GM Group of global partners includes Fiat Auto SpA of Italy, as well as Fuji Heavy Industries Ltd., Isuzu Motors Ltd., and Suzuki Motor Corp. of Japan, which are involved in various product, power train, and purchasing collaborations. In addition, GM is the largest shareholder in GM Daewoo Auto & Technology Co. of South Korea. GM also has technology collaborations with BMW AG of Germany and Toyota Motor Corporation of Japan, and vehicle manufacturing ventures with automakers around the world, including Toyota, Suzuki, Shanghai Automotive Industry Corp. of China, AVTOVAZ of Russia, and Renault SA of France.

**Recipient qiye jituan Networks in China**

The local partners of most IJVs in the Chinese auto industry are affiliated with local business groups (qiye jituan). These business groups are coalitions of firms, interwoven with complex legal, administrative, financial, and transactional ties under the control of a core firm (Kister 1998). By 1997, 2,302 qiye jituan had been established in China. These qiye jituan accounted for 51.1% of asset and 45.5% of revenue of all the industrial enterprises in China. The government had selected 120 of these business groups to be key qiye jituan, which spread among
pillar industries of China such as automobile, power, steel, transportation, electronics, coal, and chemicals (Yin and Zang, 1999). There are 21 qiye jituan in the Chinese automobile industry. They represent over 90% of total Chinese automotive firms and revenues (China Automotive Industry Yearbook, 2003). As the government has gradually reduced its control over the auto industry since the mid-1980s, the core firms of these qiye jituan serve as intermediaries between the state and individual firms, and have extensive administrative influence over their member firms. The member firms include both state-owned enterprises and joint ventures. Each qiye jituan has its own technical center or centers. Appendix 1 describes the three largest automotive qiye jituan. By the mid-1990s, many business groups in China had interlocking directorates and finance companies, while fewer firms remained rigidly hierarchical (Kister 1998).

Since the late 1990s, Chinese auto firms have faced strong competitive challenges from MNEs due to China’s entry into the WTO. In response, the firms have undertaken a wave of restructuring local firms within qiye jituan. The restructuring accomplishes multiple goals. First, many small assemblers and component suppliers are highly inefficient. There were 119 automotive assemblers and 1,628 automotive component suppliers in China in 1998. Individually, few of them are capable of surviving foreign competition. Joining a qiye jituan can increase the odds of survival by enhancing economies of scale. Second, a qiye jituan can provide an internal market for its members and thus help shield them from foreign competition. Third, when forming joint ventures or negotiating technology transfer issues with foreign firms, large qiye jituan represent greater bargaining power than individual Chinese firms. Fourth, a qiye jituan can gather resources from its members and conduct larger R&D projects than an individual firm could conduct alone. Fifth, qiye jituan provide an open field in which technical and managerial knowledge can diffuse from initial learners to other members of the group.

4. Methods

We took an inductive multiple case study approach (Yin 1994) for this study. Three factors create a rationale for using a qualitative inductive approach. First, the study seeks to explore new theoretical ground. As Hoskisson, Eden, Lau, and Wright (2000) note, “Theory development in emerging economies can be problematic. There are major issues to be addressed with respect to replication of tests of hypotheses and research instruments developed and used in developed markets in an emerging market context”. Second, the paper deals with detailed firm-specific constructs that quantitative research cannot easily obtain and analyze. Third, in-depth
fieldwork can reveal managerial intentions and causalities in complex issues such as R&D capability transfer (Yin 1981; Strauss and Corbin 1990; Rouse and Daellenbach 1999).

We interviewed multiple people at a limited number of sites. The people had experience with knowledge transfer activities that took place over several years. We sought to identify patterns in the information about network attributes that the respondents told us influenced the success and failure of different attempts to transfer capabilities. We organize these patterns as propositions to inform additional research. Because we are developing theory through inductive study rather than testing propositions drawn from existing theory, commonality among cases in knowledge transfer patterns, mechanisms, and outcomes, which Yin (1994) refers to as literal replication, is more relevant than variance among cases.

**The IJVs**

We undertook field observations at the R&D centers and manufacturing facilities of four IJVs, which we will refer to as A, B, C, and D due to confidentiality requirements. These IJVs involve three OEMs (A, B, C) and one supplier (D). Control of each IJV splits 50-50 between foreign and local partners. B and D’s foreign partners are auto MNE groups based in the U.S., whereas the common foreign partner of Case A and C is based in Europe.

Three criteria determined our choice of the four focal IJVs and the respondents. First, the businesses are major players in the Chinese auto sector, with Cases A, B, C accounting for 51% of the total passenger car market in 2002 and Case D ranking very high in the engine market. The Chinese partners of all four cases are drawn from the three largest Chinese auto qiye jituan that Appendix 1 describes. Cases A and B belong to the same qiye jituan. Second, all four IJVs have extensive experience with successful and unsuccessful attempts to transfer R&D capabilities. Third, the first author has personal contacts that provided the trust needed to gain the entry for the extensive discussions and visits that the research required (Inkpen 1997).

The core objective of each IJV was to introduce vehicles and/or motor vehicle components that suited the Chinese market. In addition, the Chinese and foreign partners in the IJVs had independent objectives, with the Chinese partners seeking a wide range of business capabilities and the foreign partners wanting to learn about the Chinese market.

**The Research Process**

Our research involved several stages. We began by reviewing literature concerning transfer of tacit knowledge. We also collected data from yearbooks, industry publications, and other
archival sources. Upon establishing an understanding of the basic conceptual and empirical contexts, we proceeded with forty-six open-ended interviews with managers in the four selected IJVs. Twenty-eight respondents were R&D, training, or manufacturing project managers (see Table 1). In each IJV, the respondents included both Chinese and foreign managers. We also interviewed five officials of qiye jituan related to the four IJVs, three senior executives of the MNEs, four officials from two government agencies that guide automotive industry management and technology development, and six industry experts. The interviews took place in either English or Chinese, with each interview lasting from thirty minutes to two hours.

Each interview followed the same four-part protocol to ensure reliability. First, the interviewer explained the purpose of the research. Second, the respondent provided personal background and her/his perception of the development and status of R&D capabilities of the company. Third, the respondent provided detailed chronologies of particular R&D or training project(s) he/she participated in that involved transferring R&D capabilities from the source firm to the recipient IJV and/or to the recipient or source networks. Fourth, the interviewer asked more specific and probing questions to acquire the respondent’s personal opinions about ways that source and recipient networks facilitated or interfered with knowledge flow within the IJVs and into the local qiye jituan networks. The interviewer recorded each interview, with the permission of the respondent, and then transcribed the interviews into English.

Several forms of information supplemented the interviews. We conducted field observations at the manufacturing facilities and R&D centers of the four IJVs, using the observations to learn more about the ventures’ development and production activities. In addition, we collected public and private documents that discussed the IJVs’ strategies, structures, activities, and performance. This supplemental information helped us understand the context of the information that the respondents provided.

We interpreted the information from the interviews in a series of discussions among the three authors. Common themes emerged from different interviewees and different cases during these discussions. Where we found inconsistencies, we sought clarification from respondents. Such instances typically stemmed from miscommunication or differences in interpretation of questions. We also discussed our preliminary conclusions with people who are knowledgeable about the Chinese auto industry, which helped us refine our interpretations. Thus, the
conclusions that we report in this paper emerged as an iterative process from a series of internal and external discussions. We found that several attributes of the dual networks of the four IJVs commonly facilitated or inhibited the transfer of R&D capabilities.

5. Findings

This section presents our findings in four areas regarding the roles of MNE source networks and recipient qiye jituan networks in transferring knowledge into the focal IJVs and diffusing the knowledge to other members of the recipient network. Table 2 summarizes the propositions that we develop from the discussions.

*************** Table 2 about here *******************

The propositions address flows of knowledge from an MNE network to an IJV and throughout the IJV's recipient network. Some of the knowledge flows were intended, while others were unintended, at least by some of the partners. From the MNE perspective, most flows to the focal IJV subsidiary are intended because they enhance the competitive and market positions of its products. However, most diffusion of the same knowledge from the IJV to other members of the qiye jituan recipient network was not desired by the MNE partner. Yet, from the points of view of the local partners and recipient networks, both kinds of flow are desirable. The propositions indicate that different elements of the networks facilitated or interfered with knowledge flows.

Knowledge Transfer from MNE Network to IJV: Role of Recipient Networks

Even though the Chinese auto firms have made extensive technological progress in the last two decades, a large gap remains between the capabilities of recipient firms in the Chinese networks and the MNE source networks. Intense competition in the Chinese product markets has driven the MNEs to transfer knowledge and upgrade the managerial and technical R&D capabilities of the IJVs, despite the potential leakage of these capabilities to the rest of the recipient network. This motivation notwithstanding, it is difficult to transfer capabilities when the asymmetry in capabilities is so stark. Quite simply, the recipient firms commonly lack absorptive capacity (Cohen and Levinthal, 1990) needed to understand and incorporate many of the source firms’ skills.

The research suggested that limits in absorptive capacity arose most strongly from organizational limits of the IJVs, even more than due to technical gaps between the source and recipient firms. A corporate culture of hierarchy and limited responsiveness that developed
through many years in the planned economy in China often continues to dominate firms throughout the qiye jituan. Several respondents believed that the Chinese firms needed to unlearn old mentalities and become more market oriented in order to acquire advanced R&D capabilities. They noted that technical education helped them learn about new capabilities, but that organizations dominated by old cultures inhibit the ability to incorporate the new skills.

Nonetheless, the firms have found ways to overcome organizational inertia. Some respondents noted that it is easier to make technical and organizational changes within a greenfield IJV than it is to undertake immediate changes of culture and practices in the traditional firms within the network. For example, a respondent in case B told us, “A lot of our engineers are from the technological center of our Chinese parent firm. When they were in the technological center, they could not achieve any new meaningful design [despite their knowledge of new skills]. Now, with new organization and advanced management [in the IJV], they developed a new car model based on an advanced chassis system from our foreign partner in only one year.”

Consequently, the firms have found that it is useful to invest in individual technical training throughout the network, while also emphasizing movement of skilled personnel in China toward the IJVs. The IJVs actively support such approaches. A respondent in case A remarked, “We have been trying to attract high quality personnel from our other companies and top-notch universities to work for us.”

The respondents noted that significant differences occurred when they moved several people en masse from an existing organization compared to when they moved individuals from several organizations. When there is a wholesale movement of personnel from a single organization, the practices and culture of the existing organization moves with them. A respondent in case C noted, “Transforming an old R&D unit is much more difficult than starting a new one from scratch.” By contrast, several respondents noted that it is possible to reduce this problem by moving people from a range of firms within the network’s established firms into the IJV. Such individual movement helps the IJV avoid replicating traditional practices and routines.

This contrast highlights how governance systems can facilitate or hinder knowledge transfer. IJVs that replicate existing governance systems will find it difficult to absorb knowledge from their MNE partners. By contrast, IJVs that create new governance systems by bringing together a diverse set of skilled individuals will be better able to absorb new knowledge.
The respondents further noted that the *qiye jituan* provide flexibility and leadership needed to transfer personnel from many different organizations. Such distributed movement was effective in assembling teams of qualified employees with a wide range of backgrounds. In the absence of a recipient network, the firm may have no choice but to use large numbers of personnel from a single established organization, leading to the problems we emphasized above. Thus, a solitary firm that operated outside such a network would have few options for moving and re-arranging people in order to break down old routines and transform an organization.

**P1a.** Large scale movement of personnel from a single established organization in the recipient network to the IJV brings obsolete organizational culture to the IJV, which hinders the IJV’s absorption of knowledge from the MNE.

**P1b.** Movement of people from multiple organizations in the recipient network to the IJV brings individually-embodied skills while disrupting obsolete organizational culture, which helps the IJV absorb knowledge from the MNE.

Another advantage of the recipient network is that it can encompass multiple MNE partners, which helps the *qiye jituan* improve their bargaining positions and thereby increase their access to capabilities. For example, Shanghai Auto Industry Corporation (SAIC) has allied with both VW and GM, while First Auto Work Group (FAW) has allied with both VW and Toyota. A *qiye jituan* official told us, “If [IJV No.1 in his *qiye jituan*] gives us the latest car model, [IJV No.2 in his *qiye jituan*] will feel the pressure to do the same. This is a good competition.” In turn, leading edge knowledge comes along with such up-to-date models. To counter the bargaining power of the recipient network, some MNEs have tried to enhance their own bargaining power by consolidating multiple IJVs in which they have equity share into a single venture or by implementing a centralized technology management policy in China.

**P2.** Internal competition among MNEs in a recipient network helps the recipient network bargain for better knowledge transfer to its IJV member from the MNEs.

**Knowledge Transfer from MNE Network to IJV: Role of Source Networks**

When an MNE and a local firm establish an IJV, the venture becomes a new member of the MNE network. All members of an MNE network can be potential contributors of technical and/or managerial knowledge to this new IJV node of the network. As a member of the MNE network, the IJV may gain access to the network’s databases, training courses, and information technology infrastructures that link MNE network members. Therefore, from the perspective of an IJV, its MNE partner is not a single source organization, but a source network.
Extensive knowledge flow from the MNE source network to the IJV occurred in all cases at the onset of IJV and at the beginning of new projects within established IJVs. Soon after Case A was established, for instance, the core firm of the MNE partner took on the overall R&D coordination role and implemented a comprehensive training plan aimed at improving the technical and managerial skills of the IJV’s local engineering personnel. This training plan drew on the accumulated experience of many members of the MNE in transferring knowledge to EE firms. At the beginning of almost every new vehicle project in Case B, meanwhile, the core firm of the MNE partner sent groups of expatriates from different functional areas to the IJV, who worked jointly with local engineers and managers. Respondents from these two IJVs emphasized the effectiveness of the local and foreign-based training programs for transferring technical and managerial knowledge from the core firm of the MNE partner to the IJVs.

Some training programs were organized not only for the focal IJV members, but for members of the broader recipient community. A qiye jituan official told us: “The [MNE partner of the key IJV assembler of the recipient network] has been very positive in training the suppliers within our business group. They made arrangement to send key engineers of some supplier firms to the site of their original suppliers in [Europe].” In two cases we studied, the MNE partners allow supplier members of the recipient network to participate in training programs at the training centers of IJV.

In all four cases, the respondents also identified significant knowledge flows from training that involved subsidiary firms in the MNEs’ networks to the IJVs. For example, the MNE source network’s global R&D knowledge stock resident in the global technological centers and engineering branches provides a reservoir of R&D skill and localization experiences that the IJV can draw from. In case B, engineers from a subsidiary in another EE country frequently traveled to the IJV to help local engineers implement an R&D procedure aimed at localization of the MNE core firm’s vehicle design. As a manager from this focal IJV told us, “[this subsidiary] does very similar localization work as what we do here. Their experiences were more relevant than those of [the core firm’s R&D center]. Their engineers come here and work with us on a regular base. We also send people to get on-job training in their site whenever needed.” In cases C and D, meanwhile, personnel from the IJVs went to work and study in their MNE partners’ subsidiaries in other Asian countries and regions, such as Singapore and Taiwan, where Chinese
culture and language dominate and the technological level is advanced, in order to reduce the cultural distance between the MNE partner and the IJV.

**P3a.** Integrative training programs derived from the source network’s accumulated IJV experiences in emerging economies facilitate knowledge inflow to the IJV.

Beyond training programs, we also found that MNEs’ regular group-wide conventions and forums that allow members from different subsidiaries that face similar issues to meet and communicate can be effective in transferring knowledge. In Case B, the MNE partner had quarterly conventions among top management and chief engineers from all subsidiaries. A manager in this IJV commented: “Those meetings allow us to discuss common technical issues with other member firms and form collaborative relationships with those that have complementary resources.” An engineering project manager from Case A mentioned that when a group of Chinese engineers worked in the technological center of the MNE’s core firm, they met engineers from many other countries who worked in the same building. The technical tasks among them are similar, e.g., to modify the vehicle design of the core firm to meet local needs. As a result, in addition to learning from the engineers of the core firm, Chinese engineers also acquired relevant knowledge from engineers from other EEs.

**P3b.** Interaction among members of the source network in emerging economies facilitates knowledge inflow to the IJV.

We also observed an occasional outflow of knowledge from the Chinese IJV to other IJVs in EE countries. In Case B, for instance, interviewees noted that engineers from a new IJV in another EE had visited their engineering and manufacturing facilities in China to learn about design and process localization approaches. As IJVs in China become more established, this outflow will increase.

Propositions 3a and 3b identify positive influences of the source network on knowledge flow to the IJV. We now turn to negative influences of the source network. While there was substantial flow of knowledge from the MNE source networks to the IJVs, we found that two factors significantly inhibited such knowledge flow, including hierarchical rigidity and the source network’s global division of labor in R&D tasks.

We define hierarchical rigidity as the presence of strict guidelines that direct how information flows through a network. An engineering manager from Case D mentioned that their MNE parent firm has a hierarchy of information flow and decision that goes from the
engineering unit of each country to the technological center of the region and only then reaches the decision-making layer of the MNE. Because of the many links in this chain, approval of engineering requests may take weeks. As the competition in China’s auto market intensifies and the need to react to the change of the market becomes more important, such obstacles can create significant barriers. Similarly, a manager from Case B complained about the large number and rigidity of MNE procedures, some of which are difficult to adapt locally: “The engineering modification procedure specifies more than ten steps that we need to go through to get an approval. But things change so quickly here, we just cannot afford the time to follow all these steps. I wish [the MNE parent firm] would do something to relax its procedures here.”

P4a. Hierarchical rigidity within the source network inhibits the flow of knowledge to the IJV.

The second inhibiting factor for knowledge flow arises from the source network’s global division of labor in R&D tasks. The division of labor limits which knowledge a source network will provide to firms in the recipient country. MNEs’ R&D activities in EEs usually are simpler than those they undertake at home, with an emphasis on tasks at late stages of the R&D cycle such as debugging, localizing, and adapting existing designs for the local environment. Since full-scale vehicle development can cost over US $10 billion, it makes business sense for an MNE to maintain a relatively centralized vehicle R&D force in its core R&D center and to staff few other technical centers worldwide. MNEs can achieve economies of scale of R&D by using the same vehicle design in as many countries as possible. However, because local regulations and consumer tastes differ from country to country and among regions, each context requires modifications and readjustment of vehicle design. MNEs do not have the human resources or knowledge needed to perform these design localization tasks centrally. Instead, they allocate such product/process localization tasks to their technological centers in different countries or regions. As a result of this global R&D layout, the parent firm of the MNE maintains most of its early and mid-stage R&D capabilities centrally, while distributing end-stage R&D capabilities such as minor and peripheral design/process modifications more broadly. Although this organization helps attain economies of scale in R&D, the division of labor inhibits the flow of knowledge to the different points in the network.

Several examples illustrate this point. One of the managers of an IJV stated: “Of course, our foreign partner did transfer a great deal of engineering and managerial knowledge to us. But
we feel that our engineers’ abilities to design a vehicle from initial concept stage have shrunk
tremendously. We cannot even make any decisions on engineering changes by ourselves. All we
are doing now is to technically support the design of our foreign partner.” A manager from Case
C had similar comments: “Our foreign partner is very tight about its know-how of platform
design and any information about their new products. But it doesn’t mind letting us acquire
managerial skills. It needs us to do engineering work that it doesn’t want to do in house.”

**P4b.** The source network’s global division of labor in R&D tasks may result in
knowledge content restrictions that limit knowledge flow to an IJV or even cause a local
partner’s existing capabilities to atrophy.

Of course, such limited knowledge transfer often suits the goals of the MNE. On the
surface, it may seem that transferring R&D capabilities is a common goal for both networks, yet
there are many differences between these two networks concerning their expectations about this
process. As we noted above, MNEs typically prefer to transfer end stage R&D activities and
capabilities to the IJV, whereas firms in the recipient network would prefer to develop a full-
range of R&D capabilities in the IJV. Despite any preference for limited knowledge transfer,
though, the training programs and informal interactions that proposition 3 identified frequently
overwhelm the barriers in proposition 4. In order to tailor vehicles to the local market, the
MNEs commonly needed to facilitate substantial knowledge flows to the IJVs.

A second point at which the goals of the local firm and the MNE often diverge concerns
knowledge diffusion from the IJV to the local network. MNEs typically do not want knowledge
transferred to the IJV to spill over to other network firms, while the recipient networks actively
seek such spillovers. Despite the MNE’s preference to limit spillovers, much diffusion commonly
take place. We found that characteristics of both the MNE source network and the recipient
network limit or facilitate knowledge diffusion.

**Knowledge Diffusion in the Recipient Network: Role of MNE Source Networks**

This section discusses our findings about the source networks’ role in restricting the flow
knowledge with the recipient network. Typically, a MNE partner of an IJV is cautious about
confidentiality in transferring proprietary technologies. Other members of the recipient network
in which the focal IJV resides are not entitled to receive technologies that the focal IJV’s foreign
partner agrees to transfer to this IJV. Each IJV we observed has a technology transfer contract
that strictly restricts the IJV from spreading the technology beyond its boundary. All technology
transfer contracts attached to joint venture agreements in the four cases we studied include
provisions on the scope and period of confidentiality and the post-contract ownership of the technology. An R&D manager in Case A told us that “At the onset of this joint venture, our foreign partner has made it very clear in the written agreement that the product technology transferred to the joint venture should not be freely available for any other firms, which include member firms of our business group.” One of the top managers of an IJV we interviewed indicated that to clearly define and negotiate the terms on valuation and confidentiality of the technology transfer is by far the most important and yet laborious job of joint venture contract negotiation. To enforce the contract, foreign partners sometimes monitor the flow of information through assigned personnel or information technology. In addition, contractual mechanisms included taking equity investment in the IJV in order to maintain control over technology and knowledge flows.

Among all the interviews, we heard of only one incident of unapproved spread of proprietary technical knowledge from an IJV to other members of the qiye jituan to which the IJV belonged. Of course, the respondents may have been reluctant to discuss such unauthorized transfers. Nonetheless, we carried out in depth discussions with a wide range of people – both from the IJVs and from their MNE partners – and we believe that illicit transfers of specific technology are relatively uncommon. The technology transfer contract appears to provide a meaningful line of defense for keeping specific proprietary knowledge within the boundaries of IJVs. Several respondents noted that in addition to the limits that MNE partners impose, the IJV now faces the provisions of the new WTO agreements that specify property rights and restrict unintended knowledge transfers.

**P5a.** Contractual limitations restrict the diffusion of proprietary technical knowledge from the IJV to the recipient network.

Beyond contractual terms, we found that IJV compensation practices also limited the diffusion of knowledge into recipient networks. Respondents identified substantial salary differences between the IJVs and other member firms within the recipient network, which have caused a brain drain from non-IJV members. Because most IJVs offer substantially higher salaries and benefits than non-IJV firms in China, the direction of flow of local technical talent often runs counter to the strategic goals of qiye jituan, which would like to use personnel rotation as a means of bringing knowledge from the IJV back to the firms in the local network. While administrative directives can enforce rotation of personnel at the top levels of the management,
as we discuss below, movement at lower levels generally takes place more organically in the direction towards higher compensation. A qiye jituan manager with experience in Case A and B told us that they initially sent many top-notch engineers to work in the IJV in hope that they would acquire technical and managerial skills from the IJV and then return to their original non-IJV firms with the knowledge they acquired. But none of these engineers have returned so far, because “we cannot pay them as well as what the IJV is paying them.”

**P5b.** Local technical talent tends to move toward the IJV members of a recipient network due to the difference in compensation between IJV and non-IJV members, which inhibits a recipient network’s efforts to diffuse technical knowledge from IJV to non-IJV members and may even create a brain drain from non-IJV members.

Nonetheless, R&D knowledge does spread from IJVs to their recipient networks, despite the contractual limits and compensation barriers. Much of the knowledge transfer involves general knowledge of technical skills and practices that specific contractual language cannot address. We next discuss mechanisms that facilitate or limit such knowledge transfer.

**Knowledge Diffusion in the Recipient Network: Role of Recipient Networks**

The recipient networks actively seek to encourage diffusion of capabilities within the networks. Some of the knowledge derives from activities of the IJVs. In addition, firms in the recipient networks are increasingly using non-IJV organizational mechanisms to acquire a broader range of R&D capabilities. These mechanisms include working with foreign and domestic R&D consulting firms, subsidizing their own in-group technical centers to perform a wider range of R&D work even when there is no immediate commercial pay-off for such investment, and establishing overseas technical centers as training centers and listening posts. As a result of both the IJV activity and the intra-network activity, firms within the qiye jituan possess extensive knowledge that has potential value throughout the network.

The three qiye jituan that are involved in the four cases we studied have all been active in developing unified knowledge creation and sharing systems within their networks. We found four mechanisms that facilitate intra-group transfer of management and technical capabilities, including management rotation, management training programs, in-house technical centers, and buyer-supplier relationships.

First, the networks often assign top managers of the IJVs to rotate among members of the qiye jituan. In our field interviews, interviewees from two out of the three qiye jituan indicate that their groups intentionally rotate senior managers of their IJV members in order to spread the
advanced managerial styles and approaches from the IJV to non-IJV member firms. In a similar vein, Kister (1998) discovered that director interlocks among qiye jituan member firms facilitate the spread of the IJV member’s information within the qiye jituan. In our interviews, the focus was on the flow of R&D-related knowledge, particularly tacit and group-embedded collective knowledge. Director interlocks, though capable of transferring relatively discrete information, are less effective for transferring collective knowledge about R&D practices, because the directors have little involvement with day-to-day R&D activities. By contrast, top management job rotation allows the people to acquire tacit knowledge through learning-by-doing over relatively long periods in an IJV, and then carry this knowledge to non-IJV firms as they rotate to new positions within qiye jituan members.

Managerial rotation is more effective than director interlocks for transferring collective knowledge, but not always sufficient because many R&D capabilities are embedded in group activities rather than individual top managers. Such capabilities are difficult to transfer with one or a few managers. A manager at the core firm of a qiye jituan affiliated with case C expressed her concerns over this knowledge transfer mechanism: “No top IJV manager in our qiye jituan will stay on his job forever. Our point is clear – he is expected to bring the advanced managerial experiences to other brother firms…But things have not been working in our ways. Things are too difficult to change in SOEs even with a manager who has worked in IJVs for many years. Their history is too long and their culture is too hard to change.” As her statement pointed out, individual managers cannot fully change group-level knowledge by themselves, although individual managers are capable of transferring individually-embodied tacit knowledge.

**P6a.** Managerial job rotation from IJVs to other members of the recipient network facilitates the diffusion of individual managerial practice, but is less effective for spreading the collective knowledge content of R&D capabilities.

A second means of diffusing knowledge involves management training programs, which partly overcome the limits in transferring group-embodied knowledge. All three qiye jituan that we studied possessed internal management training units. Besides routine technical training of personnel, these training units organized regular training sessions for the top-level and mid-level managers from all member firms to learn managerial techniques, especially from those of the IJV members. A project manager of an SOE that belonged to one of the qiye jituan we studied offered the following comments about this mechanism: “Yes, our qiye jituan works hard to spread managerial knowledge from [the largest IJV member of that qiye jituan] to us. How? By
training us on a regular basis. Sometimes we were even brought to that firm’s training facility to get trained there.” A manager representing the foreign partner of Case B credited the this mechanism for its business success: “When we first established our IJV here, the qiye jituan brought managers from [Case A, another IJV associated with the same qiye jituan as the Case B] to us and gave us seminars about how to conduct business in China for 3 days. We were also allowed to tour [Case A’s] manufacturing facilities. We’ve learned a lot of invaluable knowledge from [Case A].”

Despite the utility of the training program mechanism, the interviews also pointed out its limit, even for diffusing managerial skills. For example, a project manager in Case B reflected, "The training courses offered by the training center [of the recipient qiye jituan] are helpful but a bit basic. They provide more help to the small and technically underdeveloped member firms than to the large and developed firms." Similarly, another respondent remarked “High- and mid-level managers of all member firms in our qiye jituan have received a lot of training. But they are at most 10 percent of total employees of their firms. The rest of the people who have not received the training were mostly indifferent to whatever changes the managers wanted to implement to their firms. They just don’t believe in the new ways of management.” Thus, even training programs may not be sufficient to address the group-embedded aspect of collective knowledge, if they involve only a few top managers.

P6b. Intra-network training programs facilitate the diffusion of managerial practice from IJVs, with greatest effect if they include most top managers in a network.

Third, technical centers in the recipient networks help diffuse technical knowledge. All three qiye jituan we studied possessed technical centers. According a manager of one of the technical centers, the major goal for such centers is: “to ensure that we [local firms of the qiye jituan] do not totally rely on the foreign partner of the IJV to bring us R&D capabilities. If one day [the foreign partner of the IJV] decided to forsake us, we can still manage to design something that is reasonable.” Other managers of technical centers agreed with this philosophy, while adding that to compete with the giant foreign auto MNEs on new product development is not realistic. Their primary goal is to develop and maintain the R&D skills at the technical centers, to ensure that the IJV member of their network does not dominate R&D activities within the recipient network.

In all cases, we found descriptions of at least moderate knowledge flows from the IJVs to
the technical centers of the qiye jituan. For instance, one manager of the technical center of a qiye jituan affiliated with Case A mentioned: “[engineers in the IJVs’ technical staff] occasionally call us up and discuss technical issues with us. After all, we have more local experience than they do. We sometimes also learn from them. But this doesn’t mean that we can fully adopt their ways of management.”

**P6c.** Technical centers of recipient networks facilitate the diffusion of knowledge from IJVs.

Nonetheless, the technical centers faced limits in their effectiveness in facilitating knowledge diffusion. These limits commonly arose from a lack of deep contact between people at a technical center and those working within an IJV. For instance, an R&D manager in Case C remarked, “The technical center [of the recipient network] is supposed to be the product design center for member firms, which are responsible for process implementation. But there are a lot of communication difficulties due to geographic distance between the center and member firms.”

Fourth, even more than technical centers, we found that supplier relationships play a major role in diffusing technical knowledge within the qiye jituan networks. Strong social and administrative ties and previous transactional relations cause the assembler members of a recipient network to select suppliers within their recipient network. Such buyer-supplier ties can serve as a conduit of knowledge flows. We found two types of vertical knowledge flow within recipient networks: first, from the supplier IJV to its local assembler customers and, second, from the assembler IJVs to their local supplier firms.

Case D provides an example of supplier IJV to local assembler diffusion of technical knowledge. The IJV is a major diesel engine supplier for truck producers in China. Its major customer, Firm X, is a member of its local qiye jituan network. An engineer who worked as a project manager from this IJV has been working with Firm X for many years. He offered a detailed description of the content of the knowledge flow that his firm has brought to Firm X: “Engineers [from Firm X] have told me that their ability to design the power train-engine interface has been enhanced due to their connection with us. Why? Because our engine technology is world class. We have very strict technical standards and specifications regarding engine power-train matching. We send engineers to work with them to help them design this interface, test prototypes, make design changes based on our technical standards. We make a lot of design suggestions to ensure the overall vehicle performance.”
Case B provides an illustration of technical knowledge transfer from an assembler IJV to supplier firms in a qiye jituan network. The IJV in this case selected a clutch producer within its own qiye jituan to localize its clutch production. The clutch supplier received relevant drawings and documents regarding manufacturing process, and also received technical assistance from the IJV. Based on the QS 9000 quality standard, this clutch supplier needed to submit three versions of prototypes. One year after signing the sourcing contract, the supplier provided a beta prototype. The foreign expatriates at the IJV examined the prototype and concluded that the clutch supplier knew little about mass production of hydraulic clutches. Nonetheless, the IJV stayed with this supplier and provided additional technical assistance. Less than six months later, the local supplier’s beta II prototype passed the quality tests and received approval from the IJV.

Case C is another example involving knowledge diffusion from an assembler IJV to a supplier. The assembler selected a seat producer from within its own qiye jituan to supply seats for a new vehicle model that the IJV produces in China. The component sourcing engineers of this IJV formed a project team and worked closely with the project team of the seat supplier, with monthly meetings to coordinate technical issues. The seat supplier enhanced its R&D capabilities by following the IJV’s project management procedures and technical specifications.

P6d. Buyer-supplier relationships between an IJV and members of its recipient network facilitate diffusion of knowledge within the network.

The above patterns describe the positive effects of the local recipient network. Member firms in the qiye jitian network share knowledge with each other, particularly when they are involved in active operating relationships.

We found that internal competition inhibited knowledge flow among the member firms of this network, thus reducing its usefulness, including internal competition between assemblers and internal competition between managers. Managers from several cases identified the existence of internal competition within recipient networks. In order to control a major IJV member’s power, qiye jituan in the auto industry sometimes form more than one assembler IJV with different MNEs. These IJVs, although they belong to the same recipient network, often compete intensely in the same market with only slight product differentiation. Such competitive relationships between the assembler IJVs within a recipient network can prevent knowledge flows – between the assembler IJVs and to other firms in their recipient network. A qiye jituan top manager with experience in Case A and B told us that “Having two big IJVs in our group
may not be a good thing. They act more as real competitors than as members of the same [qiye JITUAN] group.”

P7. Internal competition among members in the recipient networks interferes with intranetwork knowledge flow.

We developed the fourteen propositions from patterns that arose during multiple examples from the forty-six interviews across the four cases. As Table 2 notes, each proposition reflects examples from at least two of the cases. Indeed, examples for six of the propositions arose in all four cases, while examples for another two propositions arose in three of the cases. Moreover, each IJV in the study provided information that was relevant for more than half of the propositions. Case A provided evidence for twelve of the propositions, Case B for thirteen propositions, Case C for nine, and Case D for eight. The smaller number for Case C may stem from the fact that it has a slightly shorter history, while the smaller number for Case D may stem from the fact that it is a supplier and has somewhat less intensive need for transferring collective knowledge than the OEM ventures. Overall, the propositions reflect common patterns among the cases.

6. Discussion and Conclusions

This paper focuses on the transfer of capabilities between source and recipient networks via a joint member of the two networks. We believe that the research will interest academics who are studying issues in emerging economies and the transfer of capabilities and knowledge, as well as practitioners in both the MNE and EE contexts. We observed significant knowledge flows from different MNE network members to IJVs and, in spite of restrictions, subsequent capability transfer into different members of recipients’ qiye JITUAN networks. The former kind of knowledge flow is intentional from the perspective of both networks, while the latter may not be desirable or intentional from the MNE network perspective. We also observed some counter-flow of knowledge from IJV to MNE source networks and from qiye JITUAN to IJVs. At the same time, we identified several barriers that reduce these flows.

We found a strong flow of both individually-carried knowledge and group-level technical and managerial knowledge between the MNEs’ source networks and their IJVs in the Chinese auto industry. Characteristics of recipient networks that encouraged knowledge flow into an IJV included movement of skilled individuals from multiple members of a qiye JITUAN network and forming relationships with multiple MNE partners. By contrast, large scale movement of
personnel from a single member of a recipient network to an IJV could limit the ability of the IJV to create absorptive capacity for the MNE’s knowledge. Characteristics of the source network that facilitated knowledge flow to IJVs included the existence of a training plan tailored to emerging economies and interactions with other subsidiaries similar in tasks and culture. By contrast, MNE hierarchical rigidity and global division of R&D labor inhibited this flow.

We also found that the knowledge flow between an IJV and its recipient qiye jituan network also occurs, although often facing more barriers than knowledge flow from the source network to the IJV. Knowledge that diffuses into the recipient network tends to be individually-carried managerial knowledge with a more limited diffusion of individual or group-embedded technical knowledge. The Chinese recipient networks use managerial job rotation and internal training to facilitate diffusion of managerial knowledge. They also use technical centers and internal sourcing to facilitate technical diffusion, with internal sourcing having the greatest effect.

At the same time, we found substantial barriers to information flow from IJVs to recipient networks, particularly to the flow of group-level knowledge. Contractual limitations that the MNEs placed on knowledge transfer limited technical diffusion, as did the fact that higher compensation in the IJVs reduced rotation of technical personnel back to non-IJV members of the recipient networks. In addition, competition between firms within a recipient network also inhibited knowledge flow from an IJV to its recipient network.

Finally, we found two kinds of asymmetries between the source and recipient networks: in terms of capabilities and in terms of motives. First, at this time, the MNEs have much stronger technical capabilities than their local partners in the Chinese auto industry, to the point that the IJVs sometimes lack absorptive capacity needed to learn from the MNEs. The study suggests that recipient networks help overcome capability asymmetries by investing in individual technical training while rearranging personnel within the recipient network in order to break down old cultures. Second, the MNEs and qiye jituan networks have different motives for knowledge diffusion. We found that several contractual and organizational mechanisms guard against undesired spillovers, with the organizational mechanisms such as compensation differences having the greatest impact. In turn, several organizational mechanisms – such as job rotation, training, and operating relationships – help qiye jituan networks overcome the limits on knowledge diffusion. Thus, the firms are carrying out an ongoing juggling of strategic interdependence and separation.
Implications for Theory

The field research has implications for theories related to flow of knowledge to EEs and, more generally, for the capability perspective on business strategy. First, the research emphasizes the need for network-to-network analysis rather than examining only individuals and firms. When source and recipient firms are embedded in broader networks, it is useful to recognize the relationships in the networks. In our case, the networks are firms linked through common ownership patterns, but one could consider other kinds of socially defined networks. The research shows that important implications arise from such an approach. We found patterns of knowledge flow between these two networks via their common member, as well as various network level variables that influence this flow. The dual networks both facilitate and inhibit knowledge flow from the source network to the focal firm, as well as the diffusion of this knowledge within the recipient network.

We identified several factors that enhance or retard the flow of knowledge. The results emphasize the correspondence between the nature of knowledge and the processes that will transfer them effectively. Hands-on experience plays an important role in the transfer of tacit skills, but the distinction between individually carried and group embedded capabilities is also critical because group-embedded capabilities typically require group-to-group contact to transfer. The observations are consistent with evolutionary theories of organization. Movement of personnel accomplishes the flow of individually carried capabilities, but not that of the group embedded knowledge, while ongoing organizational relationships can help transfer group-embedded tacit knowledge.

The tension between enhancing and retarding knowledge flows has implications for whether the prior network knowledge stock acts positively as absorptive capacity (Cohen and Levinthal 1990) or as a core rigidity (Leonard Barton 1992). Given that a recipient network affects the initial endowment of R&D routines in an IJV through its choices of which R&D personnel to transfer to the IJV, the recipient network’s previous R&D knowledge stock influences the learning capability of the recipient organization. A common notion concerning the effect of preexisting organizational knowledge on firms’ capability to learn is based on the idea of absorptive capacity, which enables the organization to learn new knowledge more effectively if the new knowledge builds cumulatively on the previous knowledge stock. However, the
preexisting knowledge stock may act as core rigidity that limits a firm’s ability to change. It is useful to compare these effects and consider situations where one of them will dominate.

Knowledge theory suggests that core rigidities are important when the environment changes disruptively and renders the knowledge stock obsolete (Levitt and March 1988; Leonard-Barton 1992; Baum and Ingram 1998). In general, group-embedded knowledge of the organization, although it can be modified cumulatively, is very difficult to change in a disruptive manner. Preexisting tacit and embedded routines (i.e., collective knowledge) can become core rigidities when they conflict with routines that the firm wishes to acquire (Uzzi, 1997). As Leonard-Barton puts it “Values, skills, managerial systems, and technical systems that served the company well in the past and may still be wholly appropriate for some projects or parts of projects, are experienced by others as core rigidities – inappropriate sets of knowledge” (Leonard-Barton 1992: 118).

We found that the effect of previous individual experience might differ from that of group experience. Previous individual experiences form individual absorptive capacity, which can help a recipient organization learn more effectively even when the environment changes disruptively and group-embedded capabilities have created core rigidities. This difference occurs because individual-carried knowledge tends to be less inertial than group-embedded knowledge in a time of disruptive change (Mukherjee, Mitchell, and Talbot 2004). We find that, when facing a disruptive change, existing group-embedded capabilities inhibit the transfer of new capabilities, whereas preexisting knowledge set carried by individuals can help an organization acquire new capabilities.

Is it possible for recipient firms to take advantage of absorptive capacity yet avoid the pitfalls of core rigidities? R&D capabilities typically involve extensive elements of collective knowledge and can decline when the knowledge group faces drastic reductions. Sproull, Weiner, and Wolf (1978) showed that old routines weaken when many new members join a group. Consistent with this, we found that the recipient organization could take advantage of the individual absorptive capacity of the experienced personnel when it transfers R&D personnel from its network. At the same time, the recipient organization may avoid inheriting undesirable routines, which act as core rigidities, by avoiding large-scale organizational transplantation. Thus, when new knowledge presents a drastic change from the preexisting knowledge, if the recipient organization can import the individual absorptive capacity of experienced R&D
personnel without inheriting the core rigidity, then the recipient network’s previous R&D stock improves the effectiveness of R&D capability transfer of the IJV.

*Management in Emerging Economies*

This study of knowledge transfer to firms in emerging economies presents an interesting paradox for managers. The gap between DCs and EEs is great in terms of technological as well as managerial skills. But this gap represents both a strong need for knowledge and capability transfer, and an effective hindrance to such a transfer. Thus, firms need to adopt strategies that will build absorptive capacity in their local organizations if they hope to benefit from their MNE partners’ skills.

The research has specific implications for managers in emerging economies, whether from MNEs or local firms. First, the study emphasizes the network nature of recipient organizations in emerging economies. Most previous studies have examined the recipient as a single organization, but our study shows that the flows within recipient networks can be significant enough that the source-recipient relationship should be managed at the network level. The intra-network capability flows have played a significant role in the upgrading of local firms in China and elsewhere. We believe that appreciation of the role of these networks is important for both local firms and the MNEs.

From the perspective of MNEs, the goal is to transfer knowledge to the IJV as efficiently as possible, while minimizing unintended leakage of knowledge from the IJV to the recipient network. We have identified conditions that can lead to such a favorable result in emerging economies from the MNE perspective. Overall, our research indicates that it is important to account for the collective nature of knowledge and limit the dependence on individual personnel or training alone. Issues of absorptive capacity and core rigidities are critical in the emerging economy context, as are the relative bargaining positions of the two parties. Perhaps counter-intuitively, we found that MNE experience in other emerging economies was at least as important as experience in sophisticated DC markets for assisting successful knowledge transfer.

We also suggest that the MNEs look beyond contracts to limit the unintended leakages in emerging economies, using compensation policy and competition among recipient network firms as additional deterrents. Hierarchical rigidity and division of labor for technical tasks that arose from global R&D strategies were most salient in reducing knowledge flow. The MNE managers must decide if these policies are optimal, keeping in mind their benefits as well as costs.
Similarly, our research sheds light on the role of networks in emerging economies. Recipient networks such as the *qiye jituan* networks in China not only provide internal commercial and capital markets, but also act as knowledge disseminators. Although the internal financial market role of these networks is fading as EE s become more market-oriented and external markets become more efficient, recipient networks’ role as knowledge disseminators remains salient. Firms in these networks often find it desirable to maximize the flow of knowledge from the MNE source network to the focal IJV as well as to diffuse this knowledge efficiently within the recipient network. They should also form teams of qualified individuals drawn broadly from throughout the network, in order to enhance absorptive capacity and mitigating the effects of old routines and inertia. Managerial rotation and training also assist to some extent, particularly in the dissemination of individually-embodied skills, but inter-organizational transactions such as buyer-supplier relationships permit even greater extent of knowledge transfers.

Firms in emerging economies should also realize that being a part of the MNE network has pitfalls. For example, the global division of labor in technical tasks determined by the MNE’s global strategy can reduce the local engineering capability to a narrow area. Although the amount of knowledge transferred can be great, the scope of knowledge is limited. In the long run, this can cripple the locals firms’ ability to conduct full-scale R&D. This study reminds EE firms that in addition to the quantity and quality of the technical knowledge to be transferred, they should also be careful about the scope of knowledge. Further, higher compensation in IJV members can foster a brain-drain from the rest of the local network.

Moreover, recipient networks also impose limits on their members. We discussed the inhibiting role of competition among *qiye jituan* members. Indeed, the role of the recipient networks might be declining. The role of the government bodies and the state-owned-enterprises is still salient in China and many other emerging economies. But SOEs are being privatized and their relative role in the Chinese economy may continue to decline. Some firms, especially recently privatized auto firms, find that the networks are rigid and restrictive. Some member firms are leaving the *qiye jituan* arrangement in pursuit of greater flexibility and independence. The most successful private auto assembler, for instance, has recently left its *qiye jituan* in order to gain greater autonomy in making business decisions. As China transforms further into a market economy, the administrative power of *qiye jituan* may weaken further.
MNEs and local firms should seek to maximize their relative bargaining positions relative to each other and relative to their own networks. The MNE can do this by having members of the recipient network compete with each other so that they are not willing to share their knowledge. The local firm can try to form multiple MNE relationships that will compete with one another.

Of course, MNE and local firm managers cannot control all of the factors we have identified. However, even the factors that are not under the control of the management can help them identify IJVs that are more or less likely to be associated with greater knowledge transfers or leakages.

MNEs doing business in emerging economies face an interesting challenge. As competition increases among MNEs, they need to upgrade technology in local markets to stay competitive. It is no longer possible to do business in major emerging economies with obsolete technology, as was the norm a few decades ago. Yet, transferring capabilities is demanding. Ongoing attempts to transfer capabilities – as against one-time technology transplants – to local subsidiaries or IJVs encounter large differences between local organizations and MNEs in terms of technical capabilities, organizational capabilities, and organizational cultures. Further, firms must balance the knowledge transfer process against procedures for reducing unintended knowledge flows. Our research helps shed some light on mechanisms to deal with these asymmetries and challenges.

Limitations and Future Research

As an exploratory study, we sought to apply a dual-network perspective as a new lens and to determine if we could identify implications that a firm-to-firm approach would not disclose. We believe that we have identified important potential conclusions concerning capability transfer within source and recipient networks. Nonetheless, the paper has several limitations.

First, larger studies would be valuable. A larger sample that tests our conclusions would be necessary to show that these conclusions are not due to the choice of specific cases.

Second, the choice of our industry context might influence our findings. We do not believe that any of the propositions apply only to the auto industry. Nonetheless, the auto industry has a substantial degree of collective knowledge in its underlying R&D. The patterns may be less evident in industries for which collective knowledge is less prevalent. For instance, knowledge may diffuse more quickly in industries that have greater emphasis on individually-embodied knowledge. Even in the auto industry, less coordination and group orientation may be
required as designs become more modular. Further, due to severe cost pressures in the auto industry, there is an emphasis to use standardized platforms and designs globally. Some other industries may have greater room for localization of designs, which would enhance the role of the local subsidiaries and JVs in R&D. Nonetheless, collective knowledge clearly is an important aspect of R&D capabilities in many industries and will continue to be so in the future.

Third, the Chinese context emphasizes the role of SOEs and government bodies. Such organizations have political motivations that might shape the mechanisms that they use to facilitate or interfere with knowledge flows. A broader study would help mitigate such concerns. Nonetheless, most SOEs in China are actively seeking to become commercially viable in the face of growing international competition as well as demands for greater efficiency and technical sophistication, so that they have strong incentives to encourage capability transfer and diffusion.

Fourth, we have emphasized the coordination aspects of governance underlying the transfer of R&D capabilities. Future work could usefully integrate a deeper discussion of how protection goals of governance influence knowledge flows.

Fifth, future studies could use more fine-grained network measures. For instance, differences in the degree of connectedness among members might influence knowledge diffusion in local networks.

Finally, our limited sample did not permit us to analyze the role of the country of origin of the MNE. For example, there may be systematic differences between the knowledge management practices of U.S., European, and Japanese MNEs.

It will be useful to examine the interplay between such factors. We believe that this study provides a base on which to build.
References
2. Baranson, Jack, 1977, International transfer of automotive technology to developing countries, United nations institute for training and research UNITAR research report No.8.


32. Lane, Peter, Jane Salk, and Marjorie Lyles, 2001, Absorptive capacity, learning, and performance in international joint ventures, Strategic Management Journal 22, 1139-1161.


54. The State Administration of Machinery Industry, P.R. China, 1995, Policies about China automotive industry (SAMI, Beijing)
Table 1. Respondent Backgrounds

<table>
<thead>
<tr>
<th>Position</th>
<th>Case</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>Total</th>
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</thead>
<tbody>
<tr>
<td>R&amp;D managers</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Training managers</td>
<td></td>
<td>2</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Project managers</td>
<td></td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>8</td>
<td>15</td>
</tr>
<tr>
<td>Foreign IJV managers</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>IJV managers</td>
<td></td>
<td>5</td>
<td>5</td>
<td>6</td>
<td>12</td>
<td>28</td>
</tr>
<tr>
<td><em>qiye jituan</em> managers</td>
<td></td>
<td>2</td>
<td>*</td>
<td>2</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>MNE top management</td>
<td></td>
<td>1</td>
<td></td>
<td>2</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>Government officials</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
</tr>
<tr>
<td>Industry experts</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>46</td>
<td></td>
<td></td>
<td></td>
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</table>

<table>
<thead>
<tr>
<th>MNE partner</th>
<th>European OEM</th>
<th>US OEM</th>
<th>European OEM</th>
<th>US supplier</th>
</tr>
</thead>
</table>

* Case B shares the same *qiye jituan* with Case A.
<table>
<thead>
<tr>
<th>Knowledge flow direction</th>
<th>Role of</th>
<th>Proposition</th>
<th>Influence on knowledge flow</th>
<th>Effect</th>
<th>Cases with consistent patterns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge flow from MNE source network to IJV</td>
<td>Recipient network</td>
<td>1a</td>
<td>Large scale movement of personnel from a single organization in the recipient network to the IJV</td>
<td>Negative</td>
<td>All four cases reported relevant examples</td>
</tr>
<tr>
<td></td>
<td>1b</td>
<td>Movement of people from multiple organizations in the recipient network to the IJV</td>
<td>Positive</td>
<td>All four cases reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2</td>
<td>Internal competition among MNEs in a recipient network</td>
<td>Positive</td>
<td>Cases A and B reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Source network</td>
<td>3a</td>
<td>Integrative training programs derived from the source network’s accumulated IJV experiences in emerging economies</td>
<td>Positive</td>
<td>All four cases reported relevant examples</td>
</tr>
<tr>
<td></td>
<td>3b</td>
<td>Interaction among members of the source network in emerging economies</td>
<td>Positive</td>
<td>Cases A and B reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4a</td>
<td>Hierarchical rigidity within the source network</td>
<td>Negative</td>
<td>Cases B and D reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>4b</td>
<td>The source network’s global division of labor in R&amp;D tasks</td>
<td>Negative</td>
<td>Cases A and C reported relevant examples</td>
<td></td>
</tr>
<tr>
<td>Knowledge flow from IJV to recipient qiyi jituan network</td>
<td>Source network</td>
<td>5a</td>
<td>Contractual limitations</td>
<td>Negative</td>
<td>All four cases reported relevant examples</td>
</tr>
<tr>
<td></td>
<td>5b</td>
<td>Higher compensation in IJVs</td>
<td>Negative</td>
<td>Cases A and B reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Recipient network</td>
<td>6a</td>
<td>Managerial job rotation from IJVs to other members of the recipient network</td>
<td>Positive for individual practices, less effective for collective knowledge</td>
<td>Cases A, B, C reported relevant examples</td>
</tr>
<tr>
<td></td>
<td>6b</td>
<td>Intra-network training programs</td>
<td>Positive, especially if they include most top managers in a network</td>
<td>All four cases reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6c</td>
<td>Technical centers of recipient networks</td>
<td>Positive, with limits imposed by lack of operating contact</td>
<td>All four cases reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6d</td>
<td>Buyer-supplier relationships between an IJV and members of its recipient network</td>
<td>Positive</td>
<td>Cases B, C and D reported relevant examples</td>
<td></td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Internal competition</td>
<td>Negative</td>
<td>Cases A and B reported relevant examples</td>
<td></td>
</tr>
</tbody>
</table>
Appendix 1. The Three Largest Chinese Automotive Business Groups (qiye jituan)

<table>
<thead>
<tr>
<th></th>
<th>First Auto Work Group (FAW)</th>
<th>Dongfeng Group</th>
<th>Shanghai Auto Industry Corp (SAIC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of car producers</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Number of truck producers</td>
<td>13</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>Number of engine producers</td>
<td>2</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Number of component producers</td>
<td>3</td>
<td>23</td>
<td>44</td>
</tr>
<tr>
<td>2002 revenue (at 1990 level)</td>
<td>10.7 billion US$</td>
<td>8.4 billion US$</td>
<td>12.8 billion US$</td>
</tr>
<tr>
<td>2002 assets (at 1990 level)</td>
<td>8.9 billion US$</td>
<td>7.0 billion US$</td>
<td>9.4 billion US$</td>
</tr>
<tr>
<td>2002 profit (at 1990 level)</td>
<td>2.4 billion US$</td>
<td>2.2 billion US$</td>
<td>3.4 billion US$</td>
</tr>
<tr>
<td>2002 ROA</td>
<td>27 %</td>
<td>31 %</td>
<td>36 %</td>
</tr>
<tr>
<td>Total R&amp;D personnel</td>
<td>2,594</td>
<td>4,946</td>
<td>2,390</td>
</tr>
<tr>
<td>R&amp;D/Sales intensity</td>
<td>1.5 %</td>
<td>1.5 %</td>
<td>1.3 %</td>
</tr>
<tr>
<td>Year developed first car</td>
<td>1958</td>
<td>not available</td>
<td>1958</td>
</tr>
<tr>
<td>Year developed first truck</td>
<td>1956</td>
<td>1975</td>
<td>not available</td>
</tr>
<tr>
<td>Number of technical centers</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Number of training centers</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Types of IJV</td>
<td>Car</td>
<td>Car, truck, engine</td>
<td>Car, truck, components</td>
</tr>
<tr>
<td>Foreign partners</td>
<td>VW, Toyota</td>
<td>PSA, Nissan, Cummins</td>
<td>GM, VW, Delphi, Visteon</td>
</tr>
<tr>
<td>IJV volume/Group volume *</td>
<td>85 %</td>
<td>100 %</td>
<td>100 %</td>
</tr>
<tr>
<td>IJV revenue/Group revenue *</td>
<td>34 %</td>
<td>not available</td>
<td>66 %</td>
</tr>
<tr>
<td>IJV profit/Group profit *</td>
<td>41 %</td>
<td>not available</td>
<td>60 %</td>
</tr>
<tr>
<td>IJV R&amp;D personnel/Group R&amp;D personnel *</td>
<td>12 %</td>
<td>not available</td>
<td>22 %</td>
</tr>
<tr>
<td>IJV R&amp;D intensity *</td>
<td>1.6 %</td>
<td>not available</td>
<td>1.2 %</td>
</tr>
<tr>
<td>Year first car-producing IJV began output</td>
<td>1989</td>
<td>1992</td>
<td>1983</td>
</tr>
</tbody>
</table>

Data source: China Automotive Industry Yearbook 2003

Note: We only include tightly-linked members of business groups for FAW and Dongfeng.
* We only include car-producing IJVs for items with asterisks.
Figure 1. Two Perspectives on Knowledge Source and Recipient in IJV Capability Transfer

a. The traditional aggregated perspective (The arrow depicts knowledge flow)

b. The dual-network perspective (The arrows depict knowledge flow)