

Knowledge transfer to China: policy lessons from foreign affiliates

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The recent strategy of the Government of China has been to attract foreign direct investment in order to obtain foreign technology and capital. There is an official preference for advanced technology, and for its rapid diffusion to domestic firms. This approach underpins the joint-venture legislation applicable to most parts of the manufacturing sector. Using four case studies of foreign affiliates, this article investigates ways in which policy on foreign ownership has shaped the knowledge-management and knowledge-transfer strategies of transnational corporations in China. The obligation to form a joint venture often generates partnerships in which goal conflicts are rife, resulting in the transfer of knowledge diminished in quantity and quality, and slowing the rate of transfer. In most manufacturing industries, ownership restrictions are now largely relaxed, but not so in many services. These findings question the efficacy of policies restricting foreign ownership in order to promote knowledge transfer and foster local technological capacity.

Key words: international knowledge transfer, China, foreign direct investment, government policy, international joint venture

Introduction

The Government of China has employed foreign direct investment (FDI) as a key element in its development strategy

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since the 1970s (Shi, 2001). Disentangling the effects of any one of the myriad of fundamental changes since the adoption of the Open Door Policy in December 1978 is highly problematic. Against a background of radical change, China is now estimated to be the second largest economy in the world in terms of purchasing power parity (World Bank, 2001) and, since 1993, second only to the United States as a destination for global FDI (Ghauri and Fang, 2001). Policy choices clearly influence outcomes, but aggregate studies are unable to trace the effects of individual elements of policy changes. This article uses a case method to examine the effect of the policy of restrictions on foreign equity ownership on the practice and performance of knowledge transfer to foreign affiliates in China. Four transnational corporations (TNCs) from two industries were selected for this analysis.

TNCs, in return for providing capital and technology, are allowed access to the Chinese market (Engardio, Roberts and Symonds, 1996). In the early years of China's liberalization, TNCs were as a rule unable to invest except via international joint ventures with a Chinese partner (Roehrig, 1994). This legal requirement enabled Chinese interests, typically the Government, to retain effective control over foreign affiliates. It was expected that Chinese industrial partners would acquire technical knowledge. It is still the case that certain manufacturing and a number of sensitive service industries are subject to ownership restrictions. However, little is known about the ways in which this policy towards foreign ownership has shaped the internal environment of foreign affiliates. In particular, do joint venture requirements set up conflicts within the foreign affiliate that take years to resolve?¹ If so, what is the impact of ownership restrictions on the policy goal of knowledge transfer to China?

¹ In recent years it has become possible in the liberalized industries to buy out the "unwanted" local partners that TNCs acquired during the earlier policy regime. The French telecommunications company Alcatel, for example, achieved control of Shanghai Bell through this route (Financial Times, 2001).

This article is concerned with policy lessons, as the title suggests. However, to derive these, it is important to study the strategic decisions of firms affected by the policy, as it is through these decisions that the policy has any effect (intended or unintended) at all. If there has been a weakness in the policy literature, it is that there has been inadequate integration of the policy dimension with the strategic responses of firms. This article seeks to rectify this deficiency. However, its treatment of the firm's strategic behaviour should not be misinterpreted as a preoccupation. It is plainly necessary to analyze the opportunity set and decisions made in detail in order to understand the behaviour of a firm in response to policy and therefore the outcome of policy (Buckley, 1996). The innovation in this article is to integrate policy with the strategic decisions of TNCs. The mere enunciation of policy is in itself insufficient to produce outcomes until it is mediated through the actions of firms.

Although the joint-venture requirement has been abolished for much of manufacturing (Lemoine, 2000; Luo, 2000), ownership restrictions remain a central part of the policy toolkit. It still applies to final automobile assembly, and to sensitive industries, notably services, including telecommunications network operation, banking and railways (Luo, 2001). It is therefore important to understand how ownership restrictions influence the strategic decisions and behaviour of foreign affiliates, which are the mediums through which the policy goal of knowledge transfer is targeted. This article addresses this need through an analysis of the operations of four TNCs from developed countries (Motorola, Alcatel Bell, Volkswagen, DaimlerChrysler) in China, based on the collection of original primary data. Of these four firms, Motorola has a wholly owned affiliate in China, the other three have joint ventures established under legal requirements.

Foreign ownership policy and knowledge transfer

This summary of the literature examines the impact of government ownership policy on the knowledge management and transfer strategies of foreign affiliates. This article confines

itself to the primary transfer of knowledge from headquarters to foreign affiliates,² because it concentrates on policies affecting the host country (China), rather than the home countries of FDI.

The definition of knowledge encompasses more than technology, since other forms of knowledge are crucial to primary transfer. In the context of management research, the term “knowledge” refers to the tacit or explicit understanding in a firm about the relationships between phenomena, structured in a scientific manner (Hedlund and Nonaka, 1993). It is embodied in routines for the performance of business operations (Nelson and Winter, 1982), in organizational structures and processes, and in embedded beliefs and behaviour. The transfer process consists of knowledge communicated from one agent to another, such as from one part of a TNC to another part of the firm.

There are several gradations in the policy towards foreign ownership in Chinese industry. First, outright prohibition of equity ownership. Second, the legal requirement to form a joint venture, with either a “sleeping” or an industrial partner. Two situations exist: where the local international joint venture partner is imposed by the Government, or where the partner is freely chosen and simply approved by the Government. In practice, choice may be very limited – not only for reasons of government policy but also because of the scarcity of potential partners. Third, foreign equity ownership may be unrestricted, allowing up to 100% equity, i.e. a wholly owned affiliate. Peter J. Buckley, Jeremy Clegg and Hui Tan (2003) suggest that, when the law requires an international joint venture, ownership structure determines business strategy, in a reversal of the conventional wisdom. In turn, business strategy determines knowledge-management and -transfer strategies, therefore impacting upon the attainment of host country knowledge transfer goals.

Ownership restrictions are part of a broad policy to transplant foreign technology. Local content requirements of

² Studies also exist of reverse transfer, e.g. Buckley, Clegg and Tan (2003), and Håkanson and Nobel (2001).

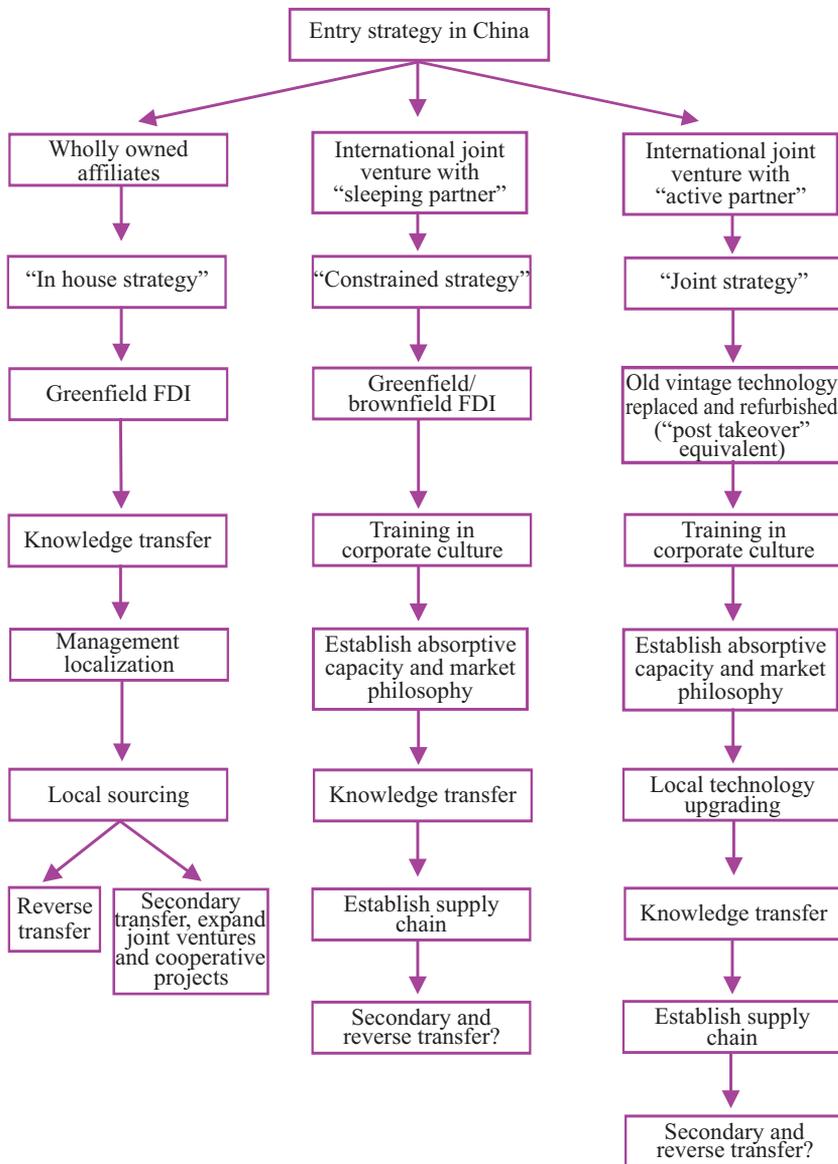
80% and constraints on importing components pressure TNCs to transfer their knowledge to China and then disseminate it to locally owned firms, in the form of spillover benefits (Buckley, Clegg and Wang, 2002). In effect, policy aims to reduce TNCs' appropriability (Hymer, 1960, 1976; Magee, 1977a, b), and to "cause bleedthrough" in international joint ventures (Harrigan, 1985). The challenge for the Government of China has been to devise ways of reducing TNCs' appropriation of the returns on their knowledge, without eliminating the incentive to produce in China altogether.³ Granting a degree of monopoly to international joint ventures, often through the exercise of monopsony power by the State and public bodies, has played a key role here.

Figure 1 sets out the entry strategy set, as determined by the ownership structure and the type of partner (Buckley, Clegg and Tan, 2003). Three strategy sets are outlined: an "in-house" strategy for wholly owned affiliates, a "constrained" strategy for joint ventures with a sleeping partner, and a "joint" strategy for a joint venture with an active partner. The operating mode of wholly owned affiliates follows an international strategy, adapts to the international environment and works with international technology transfer costs (Cannice and Daniels, 2000). The affiliate is free to invest, transfer knowledge and localize management, thus internalizing the development of absorptive capacity (Buckley and Casson, 1976). It can then establish local sourcing of inputs in an organized fashion, avoiding low-quality suppliers.

International joint ventures are constrained by their partners. Joint ventures with sleeping partners are less restricted in that there is a greater likelihood that the partner will have an interest only in profits.⁴ Initially, Chinese industrial partners may not make their true economic circumstances known (Child,

³ Although not strictly a policy, the alleged official Chinese laxity in enforcing foreign investors' intellectual property rights could be viewed as a part of this general approach (Potter and Oksenberg, 1999; Clegg, Cross and Xiao, 2000).

**Figure 1. International joint ventures in China:
the entry strategy set**



Source: Buckley, Clegg and Tan, 2003, p. 74.

2000), which has implications for trust on the part of partners. It is more often the case that an industrial partner aims to transfer its costs to the international joint venture (in the form of surplus labour, and obsolete capital assets), along with human-resources management practices that hinder efficiency (notably Communist Party politics).

The distinction between the two categories of international joint ventures may not always be clear-cut. Nevertheless, the model serves to outline the typical ways in which policy is implemented. The impacts of ownership restriction policy on international joint ventures are poorly addressed in the existing international joint venture literature. This stresses the importance of selecting a partner that offers complementarity in capabilities, compatibility in management strategies and low risk of becoming a competitor (Buckley and Glaister, 2002; Porter and Fuller, 1986). However, the literature has little to say on the consequences of adopting a joint venture when the wholly owned affiliate form would be the optimal mode, or when there is little or no freedom when selecting a local partner.

Both types of local partners may have profound implications for the ability of a foreign affiliate to absorb the primary knowledge transferred. Absorptive capacity is defined as a firm's ability to "[r]ecognise the value of new external knowledge, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990). A sleeping partner will not have unwanted resources to impose, but may disagree with the TNC over the level of investment in creating absorptive capacity (e.g. training⁵), thereby constraining strategy. In addition, in the case of an industrial partner, the resources it contributes to the

⁴ There are arguments both in favour of and against sleeping and industrial partners. One expatriate manager quoted by Rosen on the imperative of avoiding goal conflict says "The JV still works in China, but if you do use it, do so with someone who is not in your industry [...]. Go with someone who just wants to make money..." (Rosen, 1999, p. 50).

⁵ Chinese training norms are far lower than in the West (Zhang, 1995).

international joint venture may not support this capacity. Recent contributions to the literature suggest that absorptive capacity is a relative and not an absolute concept. Thus, the efficiency of inter-organizational learning does not depend simply on capacity residing in the recipient firm (Cohen and Levinthal, 1990), but on the joint characteristics of the donor and recipient firm. Peter Lane and Michael Lubatkin argue: “If student and teacher firms have very different organizational structures, the student will have difficulty assimilating knowledge from the teacher” (Lane and Lubatkin, 1998, p. 465). They find evidence that the efficiency of inter-organizational learning is determined jointly by the structural and knowledge processing mechanisms in both firms.

In the case of such international joint ventures, there are good reasons to believe not only that structures will differ between donor and recipient (Buckley and Glaister, 2002), but that goals may also diverge. Goal conflicts result in under and mis-investment in research and development (R&D) and human resources, hampering the building of absorptive capacity (Buckley and Casson, 1988; Buckley, Clegg and Tan, 2003).

This article argues that structural dissimilarity and goal conflicts between the foreign and local partners will slow and restrict the building of absorptive capacity for an international joint venture compared with a wholly owned affiliate. It is also likely that a TNC will differ with its local partner over the transfer of modern corporate culture into the international joint venture. The literature therefore suggests proposition one:

Proposition one: Primary knowledge transfer – from the parent to the Chinese affiliate – is swifter in a wholly owned affiliate than in an international joint venture under a policy of ownership restrictions.

When products require significant adaptation and development for large host markets, research intensive TNCs typically employ a knowledge creation strategy (Hansen, Nohria and Tierney, 1999). This begins with the transfer of primary

technology to the affiliate, along with the local development of the capacity to innovate. Human interaction and tacit knowledge transfer are appropriate to this strategy. Wholly owned affiliates are free to employ these strategies. However, under the model, for international joint ventures in which absorptive capacity is inadequate, the international joint venture may employ a strategy that simply re-uses the existing technology of the foreign parent (Buckley, Clegg and Tan, 2003). This strategy is inferior, as adaptation is held back. However, the codification of existing knowledge, and its transfer in the form of knowledge objects in databases or libraries, can be seen as a coping strategy. This is also likely to accord with the preference of the Chinese partner for “hard” technology. These various goal conflicts between the partners means that at some point the international joint venture faces a discrete choice in favour of a re-use strategy to avoid escalation in the cost of knowledge transfer (Hansen, Nohria and Tierney, 1999). The model suggests that the primary transfer of knowledge for re-use alone is diagnostic of low absorptive capacity in the affiliate. Propositions two and three follow:

Proposition two: Ownership restrictions requiring international joint ventures with local Chinese firms reduce the affiliates’ absorptive capacity.

Proposition three: Ownership restrictions militate in favour of a knowledge re-use strategy in an international joint venture rather than a knowledge creation strategy in a wholly owned affiliate.

Another aim of the Government of China is to encourage the local embeddedness of foreign affiliates to foster knowledge transfer and the growth of Chinese innovative capacity. For Swedish TNCs, Lars Håkanson and Robert Nobel (2001) found that “embeddedness in the local network” is a positive factor in achieving knowledge (technology) transfer. Embeddedness in the context of a knowledge creation strategy means that local absorptive capacity is developed to create a local extension of the TNC’s own learning network. This begins with the “in-house” development of local full-spectrum absorptive capacity

(including R&D capability), that is subsequently rolled out via collaboration with local firms. Such a network straddles the boundaries of the TNC, encompassing local firms and research bodies, and is associated with two-way, rather than one-way, flows of knowledge and more advanced technologies (Buckley, Clegg and Tan, 2003; Hansen, Nohria and Tierney, 1999). Learning networks develop the abilities of both foreign affiliates and local Chinese firms to generate new knowledge.

In contrast, foreign affiliates that become “embedded” through local linkages inherited from the Chinese international joint venture parent firm, or local joint venture partners, experience a qualitatively different type of embeddedness. Again, structure precedes strategy. Local partners’ goals do not include new knowledge creation. These linkages, propelled by the imperative to meet local content requirements, can only support a knowledge re-use strategy. Rather than promoting full-spectrum knowledge transfer and the local capacity to innovate, this type of embeddedness blocks or holds back the creation of a local learning network. Therefore proposition four is suggested.

Proposition four: A wholly owned affiliate can promote local embeddedness by creating a local learning network based on mutual exchange more effectively than an international joint venture.

Table 1 summarizes the four propositions. A “+” sign indicates that the ownership form under analysis promotes an increase in the variable under scrutiny. Likewise, a “-” sign indicates that the ownership form under analysis demotes or decreases the variable under scrutiny.

Research method

This article employs a multiple-case design of four firms (Yin, 1994). The propositions generated in the theoretical review are explored using these cases. According to Robert Yin: “[c]ase

studies are the preferred strategy when ‘how’ or ‘why’ questions are being posed” (Yin, 1994, p. 1). A case study approach consisting of four firms has been chosen because the research questions centre on the “how” and “why” of knowledge transfer in the emerging market of China. This permits a comparison across cases. Findings from multiple-case research can be generalizable to a wider context based on “analytical generalization” (Yin, 1994, p. 10). In this research, China’s telecommunications manufacturing and automotive industries have been chosen for the case studies. There are many similarities between these two industries, but there are also crucial differences that make them appropriate for case-study analysis. In terms of similarities, both are large-scale industries dominated by FDI in which extensive knowledge transfers have been reported. In respect of their differences, these largely arise in the technology intensity of production and their human capital intensity. The telecommunications manufacturing industry is at

Table 1. The four propositions

Propositions	Ownership form	
	Joint venture	Wholly owned affiliate
Proposition one: Speed of primary knowledge transfer	-	+
Proposition two: Absorptive capacity	-	+
Proposition three: Knowledge re-use or Knowledge creation	+ -	- +
Proposition four: Two-way flow of knowledge to and from the local economy	- (See text for short- and long term effects)	+

Source: the authors.

the forefront of advanced technology,⁶ and cutting-edge technologies are the basis for creating firm competitiveness. The automotive industry, on the other hand, is less technologically intensive, relying on mature technologies and large-scale production to reduce average cost and maintain competitive edge over rivals.

In identifying potential research candidates, TNCs that had been operating in China for a period of at least five years were chosen.⁷ This was deemed necessary so that the selected firms would have at least one key technology transferred and utilized, and the overall success of the transfer(s) could be assessed after a process of knowledge transfer and organizational learning. Thirty-nine companies meeting the above criteria, roughly equal numbers in the two industries targeted in this research, were contacted in order to seek permission for interviews. Twelve firms responded positively, and nine of them were selected. The other three were eliminated because they were either too small or only able to provide access outside the dates of the scheduled fieldwork. Based on the results of the first fieldwork, four firms from the two industries were identified as the cases for further research. As final assemblers, these firms have engaged in greater knowledge transfer and organizational learning than component suppliers. Being at the top of the FDI league table (Reuvid and Li, 2003), they were considered to be of large size and therefore more suitable for comparative analysis than others. In addition, according to the theory of international business,

⁶ “Advanced” or “high” technology normally refers to that which is relatively new and represents the application of recent research and development. “Low technology”, by contrast, refers to older, more mature technologies, arising from research and development carried out some time ago. There is often (but not always) an association between the level of technology and its factor intensity. Advanced technology, arising from recent R&D in high-wage economies, is often associated with relatively capital-intensive manufacturing process, while older technology is often relatively more labour-intensive (Child and Lu, 1996).

⁷ The five-year criterion is consistent with that established in previous research on knowledge transfer and organizational learning, e.g. Inkpen (1995, p. 129) and Lyles and Salk (1996, p. 887).

R&D and knowledge-intensive firms are likely to wish to maintain appropriability over their intellectual assets, either through ownership strategy or through effective internal organization to reduce dissipation (Buckley and Casson, 1976; Harrigan, 1985). The four cases can therefore be seen to seek similarities in respects where these are expected, on the basis of received theory.

There were two phases of data collection. In phase 1, information about TNCs' knowledge transfer and organizational learning in the Chinese telecommunications manufacturing and automotive industries was accumulated through a review of the relevant literature and the study of archives, and the four firms selected were contacted. In phase 2, two rounds of both open-ended and semi-structured in-depth interviews were conducted using multiple interviewees in each company.⁸ The interviewees were senior executives, including those responsible for functional divisions such as business planning, marketing, finance, production and human resources. Some of the top managers experienced the whole process of negotiation on establishing the foreign affiliates and attended numerous discussions on facilitating knowledge transfer and localization. The majority of the senior executives had at least ten years' employment in their respective firms, and participated in the process of knowledge transfer. Members of the knowledge transfer team, such as the training manager, operational manager, project engineer and other technical professionals, were also interviewed. As the interviewees consisted of both foreign expatriates and Chinese, the English version of the questionnaire was carefully translated into Chinese. Back translation, as suggested by Brislin (1970), was carried out to verify the content consistency between the two versions of the questionnaire. Managers, regardless of their positions and nationalities, were

⁸ It is a frequent criticism of case studies in China that they rely on single respondents. This study uses multiple respondents in each foreign affiliate in China. The range of respondents is six to eight in the four firms, with most of them interviewed more than once.

treated equally in interviews. Care was also taken in handling probing to avoid interview bias (Huber and Power, 1985).

Interview data and field notes were recorded by using the “critical incident” approach (Erlandson, Harris, Skipper and Allen, 1993), involving recording significant and meaningful data and structuring them to focus on emerging themes. The interviews were analyzed to focus on the managerial dimensions in the success of the knowledge transfer. Using a “within-case” analysis, theory was first developed by examining the context of knowledge transfer in one case. Then, pattern matching (Miles and Huberman, 1984; Yin, 1994) was adopted to compare the finding from this first case with the other three. Commonalities and differences in knowledge transfer practices between the firms were identified and reasons responsible were established with gained data and through prolonged contacts with interviewees. The findings and conclusions are generated from this process of raw data analysis combined with juxtaposition with the model. Wherever possible, the interview data were checked by triangulation with a second and independent source.

Business strategy and knowledge transfer

Profile of the four firms

Motorola set up its representative office in Beijing in 1987. In 1986 the law on foreign investment was changed, and complete foreign ownership was permitted in the telecommunications equipment industry. The firm established Motorola (China) Electronics Ltd. in Tianjin in 1992 as a wholly owned affiliate. It produces pagers, cellular phones, two-way radios, network equipment, semiconductors, auto electronics and accessories, largely for sale in China and other Asian markets. Motorola (China) had made \$3.4 billion of investment in China. By 2000, Motorola (China) had established one wholly owned company and seven joint ventures. As a wholly owned affiliate, the primary affiliate enjoyed total discretion over recruitment and the sourcing of inputs. At the time of this research it was

the largest foreign investor in China's telecommunications manufacturing industry, and its strong performance was a matter of public record.⁹ From entry, its strategy was to produce for both the Chinese and the global market. Eighty to ninety per cent of its output was for the buoyant and highly competitive local consumer market, with the balance going to exports.

In the case of the international joint ventures, TNCs were in the position of seeking local partners in a process that resembled an "arranged marriage". This was most pronounced for Alcatel Bell, which entered the Chinese telecommunications equipment market at a time when foreign TNCs were legally obliged to form international joint ventures with a local partner. The only partner with whom a TNC could form a joint venture was, in effect, the national State monopoly supplier. Shanghai Bell Telephone Equipment Manufacturing Company Ltd. (Shanghai Bell) was established in 1983 as a joint venture between Belgian Bell (32% of the equity), the Government of Belgium (8%) and China's Postal and Telecommunications Industries Corporation (PTIC), the industrial arm of the former Ministry of Post and Telecommunications (MPT, now Ministry of Information Industry; 60%). Through its monopsony power in fixed telephony, PTIC guaranteed a large market for Shanghai Bell's output. In 1986, Alcatel acquired Belgian Bell, becoming Alcatel Bell. However, Shanghai Bell still reports to Alcatel Bell in Antwerp, Belgium. It specializes in the production and installation of Alcatel 1000 S1240 (S1240 for short) exchanges and related parts and components. By 2000 Shanghai Bell had established 12 affiliates in China and 2 in Europe. The business strategy of Shanghai Bell was to service the local market to replace ageing analogue exchanges with digital, and it became a dominant supplier.

In the automobile final assembly industry TNCs have been, and still are to date, required to enter the Chinese market by

⁹ For example, according to the *Financial Times* ("Manufacturers turn to China's mobile market", 13 December 2001, p. 25), Motorola (China) is the largest supplier of handsets in China and occupies 30-32% of China's handset market, which is the largest in the world.

international joint venture with a local Chinese partner.¹⁰ At the time the two final assemblers entered China, not all locally owned producers were allowed, or wished, to form an international joint venture. Therefore the choice for TNCs was more limited in practice than it might have appeared. The role of the Government was to approve the choices once made. The local partners that were chosen by the two firms had decades of industrial experience.

Beijing Jeep was established in 1983 between Beijing Automotive Works (68.85%) and American Motor Corporation (31.15%), which was acquired first by Renault Group and then by Chrysler Motor Corporation (now DaimlerChrysler Group). It produced the Cherokee XJ series off-road jeeps at a rate of about 30,000 units per year, sold exclusively in China.

Shanghai Volkswagen Automotive Company Ltd (SVW) was established in 1984 between Volkswagen AG of Germany (50%), Shanghai Automotive Industry Corporation (25%), the Bank of China Shanghai Trust and Consultancy Company (15%) and China National Automotive Industry Corporation (10%). It produced the Santana range of cars with an annual output of 300,000 units, and 350,000 engines units, destined for the local market alone. In the 1990s it occupied around 50% of China's car sales.

Knowledge transfer

The purpose of this section is to examine the differences in the process of knowledge transfer between the four firms. If the policies of the Government of China affect knowledge transfer as the propositions suggest, then differences should be discernible in each of the logical stages of knowledge transfer.

¹⁰ It remains the case that, even after China's entry into the World Trade Organization, foreign affiliates cannot hold more than 50% of equity in any final car assembly operation. However, there are no ownership restrictions in other automobile manufacturing industries, for example, components.

Here knowledge transfer is analyzed in four stages: articulation, training, copying and adaptation. The propositions on policy identified above are examined for each of these stages.

Articulation

Articulation is the first stage in the knowledge transfer process, and concerns understanding, testing and sharing the knowledge transferred (Hedlund and Nonaka, 1993). The language difference between western TNCs and their Chinese staff poses a threat to the efficiency and effectiveness of articulation.¹¹ As part of the drive to open China, foreign languages (primarily English) were given priority in secondary schools in 1978. This generated a plentiful supply of graduates with a good command of foreign languages. However, this does not extend to non-graduates. Language differences were singled out by the interviewees across the firms as the biggest concern for management. For example, one senior manager in Shanghai Bell said that “[we] realised that product quality and service all depended on the understanding and assimilation of transferred knowledge by employees. The language barrier must be overcome straight away to enable understanding and assimilation”.

All four firms tackled the language problem early in the recruitment stage. University graduates with a good command of foreign languages are attracted by better pay and modern social facilities. The firms also provided workers with language training as part of their general training programmes. Differences emerge between the four firms. Following Motorola’s worldwide strategy, Motorola (China) employed intensive person-to-person communication in the transfer of knowledge and hence made heavy initial investments to ensure English language ability. Stringent recruitment requirements in language capabilities and

¹¹ For example, Marschan (1996) finds that the lack of language skills obstructed the effective inter-unit communication flows within a single TNC.

continuous in-house training enabled its managers and engineers to communicate efficiently and effectively. Chinese shop-floor employees as well as engineers and managerial staff underwent technical training in English before starting their jobs, with continuing training to improve their production and language skills. Frequent international personnel exchanges took place. The high frequency of personnel exchanges increased the exposure of the Chinese employees to English and the TNC's cultural environment, promoting learning effectiveness (De Geus, 1988; Nevis, DiBella and Gould, 1995). One manager commented that “[we] regularly host engineers and managers from the HQ and sometimes other affiliates. Some engineers and managers from Motorola (China) have also been sent to the HQ for training, placement, or entirely transferred there”.

In contrast, in the international joint ventures recruitment and training was constrained by the need to bargain with the local Chinese partners over human resource issues. One former foreign expatriate at Shanghai Bell described it as a “family quarrel”. All the international joint venture in-house training programmes involved language content, but this was less widespread. For example, in Shanghai Volkswagen, only after workers had passed German language examinations did they become eligible for further training in Germany.

Although the Chinese management teams and engineers in the international joint ventures generally had a good understanding and command of the foreign partners' language,¹² this did not apply to shop-floor workers, whose proficiency was at best basic. It is nevertheless important for production line workers to assimilate knowledge from the foreign parent. Therefore, in marked contrast to Motorola's (China) universal

¹² Unless they were graduates in the relevant foreign language, managers and engineers had to demonstrate language capability in the recruitment process, e.g. pass examinations in reading, speaking and writing. In-house training continued after they have taken up their posts. Language capability was taken into consideration in terms of promotion or opportunities of assignments in overseas countries, such as conducting joint research or receiving training in the headquarters of the foreign partner.

approach to language training, all three international joint ventures established translation and documentation centres to provide technical materials in Chinese. In Shanghai Bell a translation group screened and selected all the transferred documents. It translated the required materials into Chinese and distributed them to the relevant departments. This is representative of the articulation process in each of the international joint ventures, based on a codification strategy. The translation and documentation centres are repositories for translated knowledge objects, consistent with a knowledge re-use strategy. In the international joint ventures the international movement of knowledge objects substituted for the greater intensity of personnel exchanges and language training in the wholly owned affiliate. While this ensured that the transferred knowledge from the foreign parents was correctly understood and dealt with, articulation of the knowledge needed to build a knowledge creation strategy was absent.

Although language differences are the major problem in the articulation of knowledge transfer, there are others. The understanding of technical terminology, differences in operational norms and practices between parent firms and the Chinese affiliates, also come into this category, but have less impact on articulation than language.

Examining the four propositions, one can conclude from the case comparisons of the articulation stage that the foreign parent's sole ownership of the Motorola (China) venture made it possible to implement the type of articulation that increases the speed of knowledge transfer from the foreign parent firm, improves local absorptive capacity and, as a result of that, enhances local embeddedness. It is also consonant with the knowledge-creation strategy of the foreign parent. In contrast, local Chinese interests produced a lower investment in language training in the international joint ventures, and relied on translation centres to help tackle language barriers. This resulted in a slower speed of primary knowledge transfer from the foreign parent and complicated the process of absorption, which hindered local embeddedness. International joint ventures'

comparative deficiency in treating the language issue dictated articulation of the kind suitable only for a knowledge re-use strategy.

Training

The technologies and complementary management skills transferred by TNCs dictate a higher level of training for Chinese employees than is the norm in China.¹³ All four firms established training centres with dedicated facilities and special training officers. Every new employee undergoes a training programme to qualify for work. Training continues after each member's appointment and is a process that continues beyond the conclusion of the primary knowledge transfer.¹⁴

Training in Motorola (China) is the responsibility of Motorola University, an internal training organization in charge of training throughout the worldwide group. Training is systematic and intensive and part of Motorola's competitiveness strategy for local and global markets.¹⁵ Investment in training is high, in terms of training officers and in extensive personnel exchanges with headquarters. The scope of training is also wide, with local officials and tutors drawn from prominent Chinese universities contributing to in-house programmes. Fast track management localization takes place via the "Chinese Accelerated Management Program" (CAMP). Training was also used to transfer knowledge from headquarters and from

¹³ Chinese firms do have training systems, but training is carried out usually only for newly recruited employees. After the pre-employment training, it is normally the case that employees are expected to carry on learning on their own. Very few Chinese firms can afford large-scale post-employment training on regular basis. Training budgets are always the first to be cut when the business performance is unsatisfactory.

¹⁴ Primary knowledge transfer pertains to the knowledge specified in the parent-affiliate or joint venture contract. It usually concerns the technologies for producing a certain product or a range of products.

¹⁵ Training is a key element of Motorola's four-point business strategy: investment and technology transfer; management localization; local sourcing; joint ventures and cooperative projects.

established affiliates to new affiliates, to transform them into world competitors. As one training officer put it: “[t]raining is not for special people, or for a special period, but for all of the people all of the time”.

Each employee, including heads of companies, attends at least 40 hours of training each year arranged by the university. This training is extended to employees of the joint ventures of Motorola (China), its cooperative projects and component suppliers. In the affiliate, training is not limited to job-related technical and managerial knowledge, and encompasses social knowledge (including corporate culture) to create “Motorola people”. This integrates local and worldwide operations. The combination of training and learning strategies was expressed by a training officer as follows: “Learning does not stop after training. Instead, learning starts from training”. The spread of training beyond the boundaries of the firm, and the dual use of training as a means of transferring skills and technical and social knowledge, points to the building of a learning network and pursuit of a knowledge creation strategy in China.

In at least two of the international joint ventures social knowledge had been identified as important. A senior manager in the foreign parent firm stated that social knowledge was regarded as the “secret weapon” of Shanghai Bell’s performance. Training programmes were held in both Shanghai and Antwerp in Belgium, taught by Belgian managers. They were credited with being an effective way of injecting the belief, company-specific knowledge (internal jargon, management style, technical system, etc.) and corporate culture of Alcatel Bell. Shanghai Bell’s training scheme also covered employees in its affiliates and suppliers, clearly differentiating it from wholly Chinese-owned firms in its attempt to build absorptive capacity. In Beijing Jeep, training comprised seminars, professional short courses, case analysis within workshops, and sending trainees to the United States (including sponsored American university degrees). To equip employees with Volkswagen’s tradition of innovation and sense of quality, Shanghai Volkswagen sent managers and engineers to Germany for between 3-4 months to

2 years, and invited German experts to China to run training programmes and to exchange information.

The international joint ventures instituted training programmes that appeared capable of developing learning networks, following the parent TNCs' practice. But the international joint ventures' training was less systematic and intensive than in the wholly owned affiliate. The level of investment in training in an international joint venture depends on consensus between the partners. The Chinese partners undervalued training, consistent with local Chinese practice. In general, less frequent post-employment training programmes were provided by the international joint ventures than in Motorola (China). The training behaviour of the international joint ventures differed most with the wholly owned affiliate when they faced difficult times, when training was treated lightly, or even ignored. For example, training was scaled down dramatically when Beijing Jeep experienced serious market difficulties in the middle of the 1990s. The outcome of such behaviour was that the international joint ventures adopted levels and limitations on training consistent with a knowledge re-use, rather than a knowledge creation strategy. There appears little difference in the approach to training between the sleeping and the active Chinese international joint venture partners. For local partners, training is less seen as a strategic issue to promote competitiveness, but more a budgetary one, being a charge against the profits of the international joint venture. This is illustrated in one interviewee's comment: "Training is important, but profits always come first".

In terms of the propositions, one can discern no obvious relationship between training and speed of knowledge transfer. But the wholly owned affiliates enhanced absorptive capacity more effectively than the international joint ventures and are more supportive of a knowledge creation strategy, whereas the international joint ventures' training encouraged knowledge re-use. This difference comes out in the attitude towards the degree of priority afforded to human capital development as opposed to short-term goals.

Copying

Primary knowledge transfer from foreign parent firms to the Chinese affiliates is essentially a one-way process. Copying involves assembling business operations in the Chinese affiliates, based on the blueprints of the foreign parent firms. Its efficiency relies on the absorptive capacity that has been established. It requires the direct application of all the transferred technologies (product design, manufacturing process, product testing and quality control), and the employment of management skills (marketing, accounting and finance, planning, purchasing and supply, and stock control). In primary transfer, the aim is to achieve a “cloning” of the production system of the foreign parent firm, which requires that absorptive capacity is established (Cohen and Levinthal, 1990).

There are two strong pressures to produce components locally. First, importing components into China is very costly and subject to considerable delays (Zhang, 1995). Second, government policy imposes tax, profit repatriation and tariff penalties on firms achieving localization rates of under 80% of the value added. This has forced foreign affiliates to accelerate the transfer of technologies into China even when faced with weak local absorptive capacity (Zhang, 1995).

Component production may be localized either in-house or purchased from local suppliers. In the 1980s, Chinese firms lagged 30 years behind their counterparts abroad in production quality, and more in component production. Corporate culture was dominated by communist ideology, not professionalism. These shortcomings imposed heavy costs on foreign affiliates searching for reliable suppliers. Affiliates also risked “inappropriate internalization”, producing in-house in the absence of good independent suppliers.

From the outset Motorola (China) copied three product lines simultaneously, beginning production in 1992 of semiconductors, pagers and cellular phones. A software centre, a mobile telecommunications products development centre, a

manufacturing technology research centre, and a paging R&D centre were founded first. The centres established absorptive capacity, enabling the primary Chinese affiliate, secondary affiliates and subcontractors to assimilate efficiently and quickly the knowledge required for production. They also enabled the in-house production of a number of components in the absence of good local suppliers. Motorola (China) did not simply copy the technology of Motorola, it also copied the capacity to produce new technology and to innovate.

The principal differences between Motorola (China) and the international joint ventures in copying lies in breadth, volume and sequence. The three international joint ventures started with the assembly of only one product, i.e. the S1240 digital exchange in Shanghai Bell, the Cherokee in Beijing Jeep and the Santana passenger car in Shanghai Volkswagen. Hence, the range and volume of copying was greater in the wholly owned affiliate than in the international joint ventures. In contrast with Motorola (China), there was a “from-easy-to-difficult” sequence in copying in the international joint ventures. They began with the easiest parts of the production process: assembling and testing. Complete components were imported from the foreign parents to the international joint ventures for assembling. Copying within the international joint ventures firms was primarily a process of “learning by doing” (Nonaka and Takeuchi, 1995; Lall, 1980). In each case the establishment of the appropriate absorptive capacity did not take place in time to enable the primary knowledge transfer schedule to be met.

A signal of delay in the copying process is when expatriates from the foreign parent firms are retained longer in the recipient transfer teams and in key positions in the affiliate. In 1997, Shanghai Bell employed 15 Belgian expatriates, Shanghai Volkswagen 10-15 German experts, and Beijing Jeep 9 United States experts. Keeping expensive expatriates longer than planned is not decided lightly, and points to difficulties.

From the timing of the founding of the translation and documentation centres it appears that they were a response to

low absorptive capacity in the international joint ventures. Shanghai Bell founded its centre in 1985, to accelerate the rate of primary transfer. Beijing Jeep did the same in 1985 and Shanghai Volkswagen in 1986, two-to-three years after their establishment. The selection of knowledge re-use strategies was therefore a coping response to the low absorptive capacity of the international joint ventures. In contrast to the pro-active training in Motorola (China), the international joint ventures employed a system that removed the need for much of the workforce to absorb technical material directly in the foreign language. This codification strategy, with its selective nature, also worked against organizational integration within the international joint venture across the language barrier, and between the international joint venture and the foreign parent firm. It also militated against teamworking, which has been referred to as the single most important factor in facilitating the direct transfer of knowledge (Nonaka and Takeuchi, 1995). All three international joint ventures identified joint R&D with foreign parent firms on new products to be a crucial part of firm success. However, none of them was successful, partly due to a lack of effective teamworking. The outcome was that these international joint ventures still relied heavily on the transfer of the latest technologies at the time of the study. This is in stark contrast with Motorola (China), which had established R&D centres for the Chinese as well as Motorola's global markets.

The shortcomings in primary transfer point to fundamental goal conflicts in the international joint ventures. The TNC partners were all large firms with extensive experience in establishing operations abroad. Yet in the joint venture contract of Shanghai Bell there was no provision for the transfer of management and soft skills, and no recognition of the role of social knowledge. The exclusive focus on hard production technologies reflected the Chinese partner's preferences.¹⁶

¹⁶ The excluded elements were transferred later by the foreign partner outside the contract, when the impact of their omission had become evident.

For these foreign affiliates the choice of knowledge re-use strategies represents strategy following structure. It precluded knowledge creation. In the case of Shanghai Bell, the coping of the ability to conduct research was obstructed primarily by a fundamental conflict of goals with the Chinese partner:

The reason for this is that the market situation is so wonderful that the Chinese side just doesn't listen to you. We have no choice. [...] When production is six million lines a year and the joint venture's major shareholder and biggest customer is MPT, why should they worry about the next generation products? They try to extend the life cycle of the present products, which is wrong. In a one billion people market, it is not difficult to find customers (Senior manager, Alcatel Bell).

Government policy, local demand and competitive pressures obliged the board of directors of Beijing Jeep to set a target of 80% localization by 1987, i.e. three years after the establishment of the international joint venture. However, primary knowledge transfer was obstructed by two factors: weak in-house absorptive capacity and the cost and scarcity of good quality bought in components.¹⁷ The United States partner was bound by the joint venture contract to a target that reflected the preferences of the Chinese partner to transfer technology rapidly to the international joint venture, but without the investment in local absorptive capacity that this required. The target localization rate was achieved in 1994, ten years after the establishment of the international joint venture. Poor local management skills and outdated corporate culture contributed strongly to the local problems.¹⁸ As one manager said: "We and our suppliers are not up to the stringent standard to achieve a

¹⁷ According to Zhang (1995), a sample of 20 localized products indicated that their cost on average was 1.4 times of those imported which was composed of: manufacturer selling price + packaging + sea transportation + tariff + unloading at the port + surface transportation.

¹⁸ For Beijing Jeep's experiences, see Mann (1989); for a theoretical discussion of the topic, see Li and Shenkar (1996).

fast transfer and localization of the foreign technology. We have to learn the western way of management step by step which takes time, especially when people are reluctant to say no to their past.” In the short term, the flow of knowledge was reduced to match Beijing Jeep’s absorptive capacity. But eventually the international joint venture adopted a “localization community” approach in 1987, comprising itself and component producers, research institutions and universities, to build in-house and external local absorptive capacity. This enabled the international joint venture to conduct joint design with local interests, essential for product adaptation. In effect, Beijing Jeep constructed a learning network, but in a rearguard action. Learning was extended from the transferred technology alone to encompass technical, managerial and cultural inputs. For instance, Beijing Jeep applied the same quality control system of Chrysler and demanded quality to be maintained by all the employees instead of only the assembly line workers.

In the case of Shanghai Volkswagen, goal conflicts between partners were evidenced in product development. The German partner preferred a gradual approach in upgrading existing models (Santana cars) while the Chinese partner wished to develop new products for both the Chinese and global markets. Given the weak base of absorptive capacity,¹⁹ the German approach was adopted. Shanghai Volkswagen jointly developed the second generation of the Santana (Santana 2000) along with colleagues in Volkswagen in Germany and Brazil during 1992-1993. The Santana 2000GTI followed in 1997, and a much advanced model was also in development. While Chinese engineers have increasingly played a more important role in the product development process, it has taken an undue length of time to accomplish this.

The findings on the four propositions in this phase are that the speed of copying was more rapid in the wholly owned affiliate because of its greater absorptive capacity. In the

¹⁹ Shanghai Volkswagen achieved a localization rate of 80% only nine years into its establishment.

international joint ventures knowledge re-use strategies were a copying response to this low absorptive capacity. Both ownership forms created locally embedded networks of exchange.²⁰

Adaptation

The ability to modify products for the host market is a competitive advantage (Dunning, 1993). Technical and infrastructural differences between China and developed markets require product adaptation. For example, in mobile phone telephony there is a need for Chinese language text services on pagers and handsets. Motorola (China) established R&D centres in order to adapt and develop Motorola's existing product range, and to develop new products. Motorola's global structure enabled it to assign the Chinese affiliate to develop and manufacture for the Chinese and world markets.

Motorola's (China) approach was to manufacture a number of components in-house (as in the model), and simultaneously establish a number of research centres with local partners and potential suppliers to develop new products. This strategy raises local embeddedness within a knowledge creation strategy, and is congruent with internal organizational integration of the TNC and the creation of a learning network. This and the rapid localization of management enabled the affiliate quickly and effectively to acquire local knowledge (Inkpen and Beamish, 1997) with which to address the adaptation issue.

The main adaptation problem for Shanghai Bell was that the software of the S1240 exchange could not cope with the wide variation of network quality in China. As one senior manager commented:

The telephone system in China was then very complicated, with various systems installed at different times being

²⁰ Elsewhere it is shown that the wholly owned affiliate's network was of a high quality, particularly its local R&D network (Buckley, Clegg and Tan, 2003).

integrated into the national grid. The Belgian software was not capable of meeting the needs of the Chinese system. This gave us many nightmares. We had to carry out lots of modifications, or even develop some new functions, to meet the requirements of specific customers. We also had to revise the defects of the original system that became magnified only in the new environment.

Adaptation was conducted within Shanghai Bell by a dedicated customer development engineering department (with expatriates assigned to Shanghai Bell) on every component of the exchange, and by the technical transfer team in the headquarters of Alcatel Bell.²¹ Adaptation was therefore shared with the foreign parent, because the requisite capacity was not copied in its entirety to China. The local joint ventures' production role was limited to maturing items formerly produced by Shanghai Bell, rather than comprising the production of innovative products within a learning network. This indicates a dominance of knowledge re-use local embeddedness over knowledge creation. This is borne out in Shanghai Bell's choice of local partners. These were government bodies, such as local bureaux, rather than industrial partners, whose main role was to circumvent local market access barriers for Shanghai Bell products.

The poor road conditions in most cities and the countryside of China causes unusually high wear and tear on cars. Adaptation was therefore crucial. Substantial modifications, e.g. to the braking system, car horn and engine were required for the Beijing Jeep's Cherokee and Shanghai Volkswagen's Santana. One manager of Shanghai Volkswagen considered their capability for adaptation and modification to be an important firm specific advantage:

We have always regarded adaptation and modification as the only way of making the foreign product acceptable in the Chinese market. Indeed, we never ignored R&D.

²¹ This resembles the process of "learning by adapting" (Lall, 1980).

However, our R&D started with adapting the transferred product (the Santana) according to road conditions and customer needs.

Local knowledge is important to adaptation. In contrast to the network approach to joint production of Motorola (China) the international joint ventures draw principally on the Chinese partners. One senior manager in Shanghai Bell commented:

Lots of westerners don't listen to the Chinese. They think they know everything in this market. But the Belgians have been listening to us, they are very flexible, and can compromise if we are reasonable [in interpreting the customer needs and putting forward proposals for modifications]. So, if you [foreign investors] want to succeed in the Chinese market, you must have patience, you must be flexible, you must listen to the Chinese when coming to this market. You cannot say I am number one here.

Shanghai Volkswagen and Beijing Jeep also relied heavily on the local knowledge of their Chinese partners in the automobile industry in their adaptation processes. While they both benefited from the fact that their Chinese partners had been established passenger car producers for a long time, the linkages that this conferred were a mixed blessing. The extensive knowledge of, and links with, local government, component suppliers, financial institutions and marketing channels were not of the type essential for the joint design and implementation of rapid and efficient product adaptation. Their local embeddedness was predominantly knowledge re-use rather than knowledge creation. As a result, product adaptation in the international joint ventures took far longer than it would have had the targets set in the business plans for localization been reached on time.²² The cumulation of delays outlined in the first

²² The length of time in reaching a localization rate of 80% in the three international joint ventures was as follows: Shanghai Bell had not achieved this target by 1997; Beijing Jeep took 11 years; Shanghai Volkswagen took 9 years.

three stages of the knowledge transfer process in the international joint ventures therefore held adaptation back. This contrasts markedly with the organization and scheduling of adaptation by the wholly owned affiliate, which had constructed a knowledge-creation learning network.

In terms of the propositions, speed of adaptation to local conditions was swifter in the wholly owned affiliate than the international joint ventures. The international joint ventures were over reliant on their Chinese partners in securing feedback in adaptation, consequently the wholly owned affiliate was more successful in the adaptation stage of knowledge transfer.

Knowledge transfer to the Chinese parents in international joint ventures

International joint ventures with local partners have the potential to lower the costs of doing business in host markets. The resource-based view of the firm (Penrose, 1956, 1958; Wernerfelt, 1984; Grant, 1991; Foss, 1997) as applied to international joint ventures shows that firms can increase the returns on their assets when partners with complementary assets cooperate.²³ One of the motives for international joint ventures, especially in high-technology industries, is that of knowledge sharing and learning as part of a knowledge creation strategy (Inkpen, 1995; Lane and Lubatkin, 1998). In such instances knowledge transfers not only from the parent firms of the joint ventures but also, and not infrequently, back to the parent firms themselves. Such transfers are provided for, and governed by, the joint venture contract and supporting contracts relating to the transfer of technology. Informal transfers of knowledge (for instance, about markets) may also flow between the partners, and from the international joint venture to the partners (Buckley, Clegg and Tan, 2003). Although not governed by contracts, these

²³ This point can be related to that on the economies of common governance (Ot) advantages identified by John H. Dunning (1993). The resource-based view sees the firm as strategically acquiring Ot advantages.

non-proprietary transfers are generally considered reasonable by the partners.

Knowledge from operating an international joint venture can therefore be used by the parent company to enhance its own strategy and operations. The acquisition of this type of knowledge, called “output knowledge” by Eleanor Westney (1988), has been suggested as one of General Motors’ objective in its joint venture with Toyota (Keller, 1989). However, the situation in which transfers are legally governed or expected within an international joint-venture relationship must be contrasted with those in which they are not. International joint ventures may become a vehicle for the dissipation of proprietary input knowledge when there is non-contractual learning by another parent firm. Partners may specifically wish to prevent the “bleedthrough” of input knowledge assets to each other by attaching separate licensing agreements and through the design of the corporate governance structure (Harrigan, 1985).

Host government policies that restrict equity ownership by foreign TNCs are introduced both to facilitate knowledge transfer to local firms, as well as to protect local industries from foreign takeover (UNCTAD, 2003). The ownership restriction policy of the Government of China is intended to improve the transfer of foreign technology to domestic firms. However, ownership restrictions frequently interfere with a key stage in the formation of international joint ventures, that of partner search and selection (Li and Shenkar, 1996). The primary objective of partner search and selection is to ensure that the partners share the same goals for the international joint venture. Ownership restriction policy as practiced by the Government of China frequently involved the pre-selection of potential partners.²⁴ This practice considerably raises the likelihood of goal conflicts between the partners, and a resulting lack of trust.

²⁴ This is still the case in the automotive assembly industry where each foreign entrant is allowed to establish joint ventures with not more than two designated Chinese players in China as a whole. Similar patterns can be observed in other sensitive service industries, such as telecom service, insurance and stock brokering.

Knowledge transfers to the Chinese parent firms of these four firms²⁵ are largely in the form of the acquisition of foreign management skills and corporate culture. For example, some managers that received management training in Beijing Jeep later moved back to employment in the Chinese parent firm (Beijing Automotive Works), which launched a new international joint venture with Hyundai (Republic of Korea) in 2002. Using its pool of knowledge generated through working with Volkswagen, Shanghai Automotive Industry Corporation (Shanghai Volkswagen's Chinese parent) established an equally successful joint venture with General Motors (United States) and was also involved in purchasing Daewoo (Republic of Korea), so embarking on its own transnationalization process. Shanghai Bell's Chinese parent firm also employed managers that had worked in its international joint venture. In this case the staff were pivotal in setting up further international joint ventures with the foreign parent firm, Alcatel Bell. While they are not happy about the establishment of rival international joint ventures, the foreign parent firms in the above automotive assembly international joint ventures have to accept the fact that they lost appropriability of their input knowledge and now have to face increased competition from new international joint ventures established by Chinese parent firms with other foreign firms. Alcatel Bell has minimized the loss of its input knowledge by working with the Chinese parent firm of Shanghai Bell on new international joint ventures with different lines of business.

In the case of Motorola (China), the Chinese parent firms of its joint ventures obtained access to Motorola's unique system of management training and gained experience of its corporate culture. In addition, technology spillovers occurred in those cases in which Motorola (China) is keen on outsourcing components based on mature technologies. In this respect, Motorola (China) is more effective in bringing new knowledge (technology) to its Chinese partners.

²⁵ Motorola (China) only has Chinese joint venture parents at the secondary affiliate level, i.e. the wholly owned affiliate is a parent in local joint ventures with Chinese parent firms.

Chinese parent firms are the beneficiaries of any transfer of output knowledge from an international joint venture, or of input knowledge via the international joint venture from the foreign parent firm. This potential for the transfer of knowledge from the affiliate to the parent firm entirely changes the value equation, not only for the firm but also for the host Government.²⁶ However, insofar as these transfers are of proprietary input knowledge and are unintended by the foreign partner, they oblige the partner to transfer technology of lower value to the international joint venture, to limit the dissipation of its knowledge assets. It is this that underlines the weakness of a host policy designed to raise the quality and quantity of knowledge transfer, but which results in the truncation of the flow.

The findings of this article offer lessons for the design of government policy in China. Given that the objective of knowledge transfer to China is ostensibly shared by both foreign investors and the Chinese authorities and local international joint venture partners, it would make sense to adopt a regime that maximizes the quantity and quality of transfer to the Chinese economy. While ownership restrictions may maximize the short run bleedthrough of foreign partners' knowledge, it is at the expense of the greater long-run transfer of superior knowledge. The evidence is that the ownership restriction policy designed by the Government of China has not facilitated the flow of new knowledge into local industry as intended. On the contrary, it has created barriers to the maximization of knowledge transfer because the foreign parent firm has no incentive to dilute its bargaining power by releasing key assets. Consequently, knowledge re-use strategies are employed by foreign parent firms of international joint ventures formed under ownership restrictions to maximize the short-term return on investment. On the other hand, full equity ownership can encourage foreign entrants to transfer more knowledge to local component suppliers based on a knowledge creation strategy.

²⁶ The authors of this article are grateful to one of the referees for this insight.

Conclusions

This article has attempted to open ways to identify and analyze the inherent conflict within host-country policies between goals founded upon ownership restrictions and the policy goal of knowledge transfer to the host country. The case research suggests that foreign ownership restrictions cause goal conflicts, which in turn compromise both internal (to the international joint venture) and external absorptive capacity, so hindering the pursuit of knowledge transfer. Through the comparison of a liberalized and a non-liberalized industry, the case analysis provides evidence that full ownership liberalization actually promotes primary knowledge transfer to the host country. Evidence shows that the process of liberalization moves an industry forward in accelerating the transfer of knowledge to foreign affiliates and to the host country. The study suggests that ownership restrictions have profound and potentially damaging effects both on primary knowledge transfer and on the quality of local embeddedness of foreign affiliates. Such a policy limits the direct and the indirect benefits (via spillover effects to local firms) of knowledge transfer.

The case studies support the propositions set out in the article (table 2). They find support for the contention that there is an important policy conflict between an ideology of local ownership through international joint ventures and the speed of knowledge transfer (proposition one). They find that absorptive capacity is enhanced in wholly owned affiliates in the articulation, training and copying stages (proposition two). When policy requires the formation of an international joint venture, this reduces the absorptive capacity of the affiliate and biases knowledge transfer towards knowledge re-use rather than creation (proposition three). Degrees of embeddedness in local linkages are also affected by ownership policies. Wholly owned affiliates are better placed to create a “local loop” in their international learning network, rather than merely a local re-use enclave (proposition three). In the absence of local discrimination against them, wholly owned affiliates will create

a local learning network more rapidly and effectively than “forced” international joint ventures (proposition four).

The four-stage dynamic model of knowledge transfer (articulation, training, copying and adaptation) shows policy impacting on TNC strategy at every stage. The findings are of importance for the crafting of policy. Clearly, if the goal is knowledge transfer to the host country, but the policy tool actually inhibits this, then a re-think of policy is required.

A number of policy recommendations can be drawn from the study. First, the policy towards foreign equity ownership should be liberalized in restricted industries, up to and including 100% ownership. At present the Government of China fears that unfettered foreign entry, given the competitive disadvantage of Chinese industry, will mean extensive negative spillovers to locally owned firms. The cost of this approach is that establishing

Table 2. The four propositions and the knowledge transfer process

Item	Proposition 1: Speed (Rate of knowledge transfer)	Proposition 2: Absorptive capacity	Proposition 3: Re-use vs. creation	Proposition 4: Mutual exchanges
Articulation	+	+		+
Training	- (Takes more time because more thorough)	+	See text	- ^a
Copying	+	+		See text
Adaptation	+	? ^b		+

Source: the authors.

Note: The sign concerns wholly owned affiliate versus international joint venture.

^a International joint ventures create “shallow” links more rapidly while wholly owned affiliates internalize training.

^b Net effect of (+) result of intensive training and local embeddedness and (?) use of global standard and product mandate.

a strong capacity to create new knowledge is denied to Chinese industry. Part of this recommendation is the imperative to improve opportunities for outsourcing from local Chinese firms. These are the firms that will become part of the local loop in the learning network, and that have the potential to grow to be strong competitive firms in their own right. It is important that TNCs have a free choice of local suppliers, as this will maximize local embeddedness within a knowledge creation strategy that brings positive spillovers to Chinese industry.

Infrastructural improvements are also important, as these raise the rate of return to investment and therefore the rate of investment by TNCs and Chinese firms alike. The analysis has shown that there are reasons why one should expect international joint ventures' human-resources management policies to lag behind those of wholly owned foreign affiliates. The human-resources problems faced by international joint ventures are related to those endemic in Chinese owned industry. Reform of human-resources policies, in particular to detach politics from the process, is essential for Chinese firms to improve their competitiveness and ability to benefit from the presence of TNCs. Lastly, the standard of managerial and social knowledge needs to be raised. From the study it is concluded that there are reasons to believe that wholly owned affiliates are better placed to address this as goal conflicts are removed. However, existing international joint ventures and Chinese firms need their own approach. The first step is to challenge the ingrained tendency to relegate this important dimension to the status of an optional extra. If Chinese industry is to make the most of its opportunities to learn from TNCs, then progress along these lines is essential. This has the potential to be the best long-term guarantor of improvement in absorptive capacity and in the capacity to create new knowledge on the part of Chinese industry.

China has been outstandingly successful in recent years in attracting FDI. However, in terms of effective technology transfer and learning, many imperfections remain. These imperfections are often policy induced. They often result in higher costs and excessive internalization for TNCs unable to

find good quality local firms and institutions with which to create linkages. If China is to continue to forge ahead in attracting FDI, and making the best use of it, the policy conflicts outlined above must be addressed. As noted in this article, ownership restrictions are still in force in the final assembly stage of the automobile industry and in many services. Further research is needed to evaluate the way in which a policy of ownership restriction influences knowledge transfer in other industries.

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