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HOW DOES KNOWLEDGE TRANSFER FROM FOREIGN SUBSIDIARIES AFFECT PARENT COMPANIES' INNOVATIVE CAPACITY?

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Abstract

The paper investigates to what extent reverse knowledge transfer from foreign subsidiary to parent company (RKT), affects the latter's development of new product and process, when particular mechanisms are employed for transferring knowledge and specific subsidiary's characteristics are at work. The empirical analysis considers 162 competences possessed by foreign subsidiaries and then transferred to their Italian parent companies. Results confirm that the impact on parent company's innovativeness is greater when RKT occurs through person-based mechanisms than through ICT-written media; parent company's innovative capacity benefits from knowledge possessed by competence-creating subsidiaries and by subsidiaries developing new knowledge through external relationships.

**Key words:** knowledge transfer, organizational mechanisms, parent company's innovativeness, subsidiary's characteristics.

**JEL:** F23, O39
INTRODUCTION

Over the last decades there has been an upsurge of interest in the importance of knowledge management in multinational corporations (MNCs) as a crucial source of strategic competitive advantage. The very reason why MNCs exist and succeed is that they are efficient vehicles for creating and transferring knowledge across borders (Gupta and Govindarajan, 1991; Kogut and Zander, 1993; Birkinshaw et al., 1998). This idea has stimulated research on the process through which knowledge is managed by and within the MNC, and how this affects its innovativeness, productivity, and competitive advantage (Grant, 1996). Accordingly, although the parent company continues to serve as the most active creator and diffuser of knowledge within the corporation, foreign subsidiaries may also engage in knowledge transfer (KT) with their parent companies and sister units (e.g. Gupta and Govindarajan, 2000). In other words, as clearly explained by the seminal work of Bartlett and Ghoshal (1989), innovations can be developed on a joint basis, at both headquarters and subsidiary level, thanks to the integration of resources and capabilities of diverse worldwide units within the MNC.

From a theoretical point of view, the literature on KT in MNCs has implicitly (and positively) related it to the ability to integrate new geographic dispersed competences in the existing knowledge base, that consequently fosters technological and managerial innovation and creates synergies that can significantly leverage the MNC’s competitive advantage (Hedlund, 1986; Bartlett and Ghoshal, 1989; Kogut and Zander, 1992; Cantwell, 1995; Gupta and Govindarajan, 2000). In this context, generally relying on the patent citations analysis\(^1\), researchers have shown that MNCs appear to be more innovative thanks to the subsidiaries’ access to a larger stock of ideas, and to the extent that they are able to draw upon the existing knowledge pool in the local environment (Almeida, 1996; Frost, 1998; Almeida and Kogut, 1999; Iwasa and Odagiri, 2004; Yamin and Otto, 2004). However, this approach has been recently criticized in accordance with the well known shortcomings of patents\(^2\). Other authors have related KT to objective measures of performance – such as the Return on Equity – at the business unit level (Tsai, 2001; Hansen, 2002). However, it is difficult to identify the effects

\(^1\) In such an analysis, citations are interpreted as knowledge flowing from the inventor/applicant of the cited document to the inventor/applicant of the citing one (Jaffe et al., 1993).

\(^2\) Most patents are not commercialized and they are widely acknowledged to be a partial indicator of the innovation process only, since many innovations are only partly covered by patent protection - or not patented at all (Levin et al., 1987; Kleverick et al., 1995). Therefore, knowledge flows identified by patent citations are only partially captured. Patents citations may also reflect technological similarities in technological profiles of different firms (Patel and Pavitt, 1997), rather than transfer of knowledge. Moreover, many of the citations in patents are added by the Patent Office, rather than by the patentee (Alcacer and Gittelman, 2006) and in those cases the citations in patents itself may say little about the importance of different knowledge flows.
directly induced by the use of transferred knowledge on such aggregated performance measures that may indeed depend on other several factors. Only a smaller number of studies investigates the effect of KT on specific MNCs’ activities, such as changes in productivity (Mansfield, 1984; Darr et al., 1995), in survival’s rate (Baum and Ingram, 1998), in new products introduction and development (Tsai and Ghoshal, 1998; Subramaniam and Venkatraman, 2001; Tsai, 2001).

However, despite the mentioned notable exceptions that do analyze the extent to which the transferred knowledge is adopted and used in the recipient unit, the effectiveness of combining existing and transferred knowledge remains an issue still unsatisfactorily investigated. Even when KT does occur, the knowledge transferred is not necessarily transformed and exploited for profit generation by the receiving unit. The final stage of KT should involve the integration and combination of the knowledge transferred with existing knowledge in the receiving unit, which may in turn result in innovation (Kogut and Zander, 1992). Accordingly, the dynamics underlying the relationship between KT and how and to what extent it affects firms’ ability to innovate is an important issue that requires further understanding.

Within this context, we are interested in studying which conditions enable parent companies to benefit from ‘reverse knowledge transfer’ (RKT), that is from knowledge transferred from foreign subsidiary to parent company (Håkanson and Nobel, 2000). Specifically, we argue that RKT can ‘benefit’ parent companies’ innovative capacity – in terms of their ability of developing new products and processes – when particular ‘conditions’ of the process itself are at work. Specifically, we contend that within the number of factors that may affect the effectiveness and the outcome of RKT, the characteristics of the process itself, of the source and recipient firms, and of knowledge, play a crucial role. In other words, the probability that knowledge possessed by foreign subsidiaries would positively affect the parent companies’ innovative capacity is likely to be higher when parent firms have been able to develop and choose a suitable organizational structures allowing them to effectively transfer and utilize the subsidiary’s distinctive knowledge, and when the nature of the subsidiaries offer a greater potential for the integration and combination of the knowledge transferred with existing knowledge in the receiving unit. With regard to the parent company’s capacity of appropriating subsidiary’s knowledge, we focus on two different groups of mechanisms that parent firms may employ in RKT, namely: the person-based mechanisms and those based on ICT and/or written media. With regard to the subsidiary’s capacity to generate valuable
knowledge, we focus on three sets of factors: the subsidiary interaction with its local context, the subsidiary’s role, the allocation of decision making to the subsidiary.

In order to investigate these relationships in details, we developed an empirical analysis run at the level of single competences, developed by foreign subsidiaries and then transferred to their parent companies. Data collection was based on face-to-face structured interviews with 84 Italian MNCs, and their relevant 350 foreign subsidiaries. The key respondents to the questionnaire were the parent company’s top managers. It might not be out of place here to specify that, following previous approaches (Szulanski, 1996; Gupta and Govindarajan, 2000; Foss and Pedersen, 2002; Björkman et al., 2004), we mean RKT as the use of the foreign subsidiary’s competences by the parent company. Finally, according to Amit (1993: 35), we connote knowledge as a set of know-how and capabilities that “refer to a firm’s capacity to deploy resources, usually in combination, using organizational processes, to effect a desired end. They are information-based, tangible or intangible processes that are firm specific and are developed over time through complex interactions among the firm’s resources”. Therefore, we identify knowledge that exists in the subsidiary in the form of know-how, such as product design, business practices, quality issues, distribution expertise, customer handling, marketing know-how, and so on.

The rest of the paper is organized as follows. In the next Section, we review prior literature on factors influencing KT effectiveness, and we put forward our research hypotheses on the impact of RKT on parent companies’ innovative capacity. Section 3 describes the data used in the empirical analysis, explains the econometric model, and discusses the results. Section 4 summarizes and concludes the paper.

THEORY AND HYPOTHESES

Mechanisms for transferring knowledge

The literature often makes the distinction between tacit and explicit knowledge (Polanyi, 1967). Explicit knowledge is what can be formally expressed clearly, fully, and leaves nothing implied. Tacit knowledge, on the other hand, cannot be expressed outside the action of the person who has it; it is unvoiced and unspoken. Although different areas of knowledge have been categorized as relatively tacit or explicit (quantifiable technologies and process are more explicit (Von Glinow and Teagarden, 1988), managerial and marketing expertise is more tacit (Dhanaraj et al., 2004) than product development, production, and technology (Shenkar and Li, 1999; Lane et al., 2001)), it is always difficult to decide which knowledge
can be considered as tacit rather than explicit. However, within each domain, knowledge codifiability and tacitness should be considered as a continuum and when knowledge is transferred, that process will generally involve both tacit and explicit knowledge. On the other hand, what is crucial to be taken into account is that the transfer of different types of knowledge requires different types of channels (Szulanski, 1996). In fact, the larger is the use of unsuitable transfer channels, the greater is the knowledge’s transmission losses and the lower is the effectiveness and the efficiency of KT (Daft and Lengel, 1986; Feinberg and Gupta, 2004).

As tacit knowledge is a good that is difficult to make explicit, it is more ‘sticky’ than codified knowledge (von Hippel, 1994; Szulanski, 1996), it generally resides in individuals, and it is hard to transfer and reproduce (Foray, 2004). Thus, the efficient sharing of tacit knowledge is typically characterized by tight coupling between people from different MNC’s units, and to enhance this transfer it is important that each people involved know each other beforehand (Bresman et al., 1999). Accordingly, both direct face-to-face interaction and mobility of knowledge carrying individuals across organizations are the most appropriate mechanisms for transferring tacit knowledge in an effective and efficient manner (Zander and Kogut, 1995; Gupta and Govindarajan, 2000; Hansen, 2002; Feinberg and Gupta, 2004). Accordingly, several approaches suggest that MNC integration needs inter-firm and intra-firm linkages that facilitate knowledge sharing and transfer (e.g. Nahapiet and Ghoshal, 1998). Specifically, person-based mechanisms, such as inter-unit trips and visits, international committees, teams, task forces, and training – involving participants from multiple units – facilitate the development of interpersonal ties in the MNC, thus favoring KT (Ghoshal et al., 1994; Bresman et al., 1999; Gupta and Govindarajan, 2000; Pedersen et al., 2003; Björkman et al., 2004; Edwards and Ferner, 2004).

However, knowledge can also be transferred by written media as reports, publications, written instructions, and blueprints (Pedersen et al., 2003), as well as by ICT-based mechanisms (Howells, 1995; Sambharya et al., 2005). The role of ICT and their effects in KT have also been celebrated as fundamental in the international transfer of knowledge (Almeida et al., 2002; Andersen and Foss, 2005). Nevertheless, recent empirical evidence indicates that ‘codified communication’ based on impersonal source such as publications and reports, database or firm’s extensive intranet, is a much less effective way of transferring knowledge than the ‘personal communication’ (Buckley and Carter, 2004; Cross and Sproull, 2004). The transfer of knowledge through ICT and documents works only when supplemented by more complex mechanisms that allow for the exchange of qualitative, indefinite, and uncertain
knowledge, such as frequent direct contacts between people belonging to the different MNC’s units (Almeida et al., 2003). Mechanisms such as intranet, e-mail, file transfer, database, and reports, can efficiently transfer codified knowledge about products, operations, tangible assets, and so on (Daum, 2003). The transfer of such a knowledge mainly stimulates exploitation processes, increasing the overall efficiency in the receiving unit (Nonaka et al., 2001). However, ICT and written mechanisms do not allow for the additional transfer of tacit and experience-based knowledge critical to enhance new knowledge combinations. The ‘rich’ communication media\(^3\) may overcome the limits of electronic media (Daft and Lengel, 1986), and the more tacit knowledge transferred through them is expected to have a greater effect on the receiving unit’s innovativeness. Thus, the following hypothesis can be formulated:

**HP1: The effect of RKT on the parent company innovative capacity is greater when the transfer occurs through person-based mechanisms than through ICT and written media.**

**Subsidiary’s interaction with its local context**

The second aspect we want to take into account, is the subsidiary’s interaction with its local context, namely how subsidiary’s knowledge that has been developed tapping into the local sources and transferred to the parent company, affects the latter’s products and processes innovativeness.

Research has noted that knowledge from customers, supply chain partners, lead users, (von Hippel, 1988), outside experts or consultants (Huber, 1991), and universities (Cohen et al., 2002), enhances novelty. Therefore, a direct access to the local context may provide the use of complementary knowledge, as well as it might allow a firm to be open to new ways of knowledge applications, such as new product development (Kyriakopoulos and de Ruyter, 2004).

As far MNCs are concerned, the subsidiary’s ability to gain access to local knowledge sources is dependent upon its embeddedness in the host country context and the social relations with local partners (Zanfei, 2000), and MNC affiliates depend on localized knowledge sources in their own local knowledge generation (Cantwell et al., 2000). The relationship to the local

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\(^3\) “Information richness is defined as the ability of information to change understanding within a time interval. Communication transactions that can overcome different frames of reference or clarify ambiguous issues to change understanding in a timely manner are considered rich. Communications that require a long time to enable understanding or that cannot overcome different perspectives are lower in richness. In a sense, richness pertains to the learning capacity of a communication. Communication media vary in the capacity to process rich information” (Daft and Lengel, 1986, p. 560).
science centre thereby becomes crucial for knowledge creating processes taking place elsewhere in the MNC, the close ties to customers, competitors and local research institutions become central for upgrading existing products and for the introduction of new technologies (Pearce and Papanastassiou, 1999; Zander, 1999).

Building on the above arguments, we predict a connection between the extent of the subsidiary embeddedness into the local context, and the probability of observing a positive impact of RKT on the parent company innovative capacity. In other words, when interactions between the foreign subsidiary and local actors affect the generation of subsidiary’s knowledge, we predict that the use of that knowledge by the parent company will be positively correlated with its innovativeness. Accordingly, the following hypothesis can be formulated:

HP2: *The effect of RKT on the parent company innovative capacity is greater when the subsidiary develops knowledge also through external relationships with local actors, such as suppliers, customers, universities, etc.*

**Foreign subsidiary’s characteristics**

As far as characteristics of foreign subsidiaries are concerned, empirical and theoretical studies have highlighted their mandate/role, as well as their degree of autonomy.

Traditionally, the most prevalent factor that has driven the firm’s internationalization has been the need of accessing low cost resources and/or adapting existing products and processes to different demand and market conditions across locations, as well as the exploitation of ownership advantages (Dunning and Narula, 1995; Kuemmerle, 1999). However, over the last two decades, an active debate has focused on the idea that MNCs can undertake ‘home base augmenting’ investments (Kuemmerle, 1997) with the aim to gain access to new skills and competences, that may improve the whole firm’s technological base. Accordingly, next to the traditional subsidiary role of adopting technology transferred by the parent company, could be actually put the role of creating and developing local technological competences complementary to the rest of the MNC (Bartlett and Ghoshal, 1989; Gupta and Govindarajan, 1991; Birkinshaw, 1996; Kuemmerle, 1997). This idea fosters considerations on the urgency of distinguishing subsidiaries that have acquired a *competence-creating* role from those with a *competence-exploiting* role (Cantwell and Mudambi, 2005). Accordingly, we argue that competences developed in different types of subsidiaries are expected to affect the parent company innovative capacity in different ways.
Specifically, we expect that competence-creating subsidiaries might possess richer knowledge than competence-exploiting ones. In fact, the latter mainly refer to the adaptation of products and processes developed in the home countries to the local needs and production conditions\textsuperscript{4}. Competence-creating subsidiaries are instead more likely to generate and develop new products and technologies (Cantwell, 1995; Papanastassiou and Pearce, 1997; Pearce, 1999; Zander, 1999) that might become a valuable source of new knowledge for the parent company and the MNC as a whole. Therefore, it also may be expected that in competence-creating subsidiaries a greater volume of distinctive and precious knowledge than those in competence-exploiting subsidiaries, will be available simply by virtue of their specific role.

The hypothesis suggested sounds as follows:

**HP3:** The effect of RKT on the parent company innovative capacity is greater when the transfer occurs from a competence-creating subsidiary than from a competence-exploiting one.

Another crucial characteristics of the subsidiary often considered in the empirical literature is its autonomy degree. Stimulating the development of valuable knowledge and RKT may require incentives for the foreign subsidiary to engage in these activities. Consistent with the previous literature (Bartlett and Ghoshal, 1989; Birkinshaw, 1997; Zanfei, 2000; Foss and Pedersen, 2002; Castellani and Zanfei, 2006), we argue that the extent of the subsidiary’s degree of autonomy is a highly reliable indicator of the extent to which the subsidiary is organized to better tap into networks and local clusters, and to create an internal structure of incentives that is more conducive to creativity and innovation among local workers and managers. Limiting the extent of subsidiary autonomy reduces its ability to learn from the local system of innovation (Nobel and Birkinshaw, 1998), and to be attractive for qualified researchers (Criscuolo, 2004) thus preventing the generation of new knowledge. It can be expected that subsidiary’s knowledge developed exploiting its innovative potential is less duplicative vis-à-vis the knowledge stock of the rest of the corporation. Thus, the utilization of that knowledge is expected to create more valuable opportunities of knowledge recombination. It should also be noted that subsidiaries with a higher degree of autonomy are more likely to gain a ‘contributory role’ (Birkinshaw et al., 1998), i.e. the subsidiary has

\textsuperscript{4} Nevertheless, it is worth noting that although competence-exploiting subsidiaries depend on knowledge of their parent companies, they may also develop valuable knowledge, such as marketing know-how, competences on how handling with local customers and competitors, etc. (Chini, 2004).
specialized resources that are recognized by the corporation as a whole. As RKT is concerned, the above considerations suggest the following hypothesis:

HP4: The effect of RKT on the parent company innovative capacity is greater when the transfer occurs from a subsidiary with a greater/higher degree of autonomy.

EMPIRICAL ANALYSIS

The RITMO database

In order to test our hypotheses, we rely on the RITMO (Research on Innovation and Technology in Multinational Organizations) database, recently developed at Politecnico di Milano. Specifically, RITMO gathers data on Italian MNCs, their foreign subsidiaries’ competences, organisational mechanisms employed in knowledge transfer, and the effects of RKT on parent companies’ innovativeness.

Data has been collected through face-to-face structured interviews. The key informants were the parent company’s top managers, variously titled as president, managing director, or general manager. The following steps guided the development of the questionnaire submitted during the interview.

First, in order to understand and clarify the phenomenon of interest we chose to use a case study methodology; accordingly, we conducted interviews with top managers in 4 Italian MNCs. Second, we reviewed previous research to sharp our research questions and to choose, wherever possible, measures that would appropriately capture the constructs under study. Finally, we pre-tested the questionnaire for clarity and relevance with academics and through face-to-face interviews with some parent companies’ top managers. These interviews helped to refine the research instrument and to realize how managers understand the concept of knowledge transfer, what is knowledge for them, and the meaning to them of different mechanisms utilized for transferring knowledge. The diverse answers allowed us to develop some examples that we used for the purpose of illustration during the interviews to foster a better understanding of the respondents.

We then began the data collection process by contacting parent companies’ top managers by telephone and sending them a personalized letter with the description of the project, the

5 These firms operate in medium and high technology intensive sectors (such as chemical, biomedical, synthetic fiber, and automotive components) and they have production and R&D facilities in several countries all over the world. The reason to start the process with these firms had to do with the fact that we had strong a priori expectations of them being involved in RKT. Accordingly, we found that these firms would serve as a good benchmark in the subsequent analysis of the wider sample.
assurances regarding the confidentiality of collected data and a formal request for a face-to-face interview. The sample of parent companies to address was drawn from the database Reprint\(^6\), that provides the picture of foreign activities of the Italian firms as at the beginning of 2004. Then, out of the population of 2343 Italian MNCs operating into manufacturing industry, we contacted only those with at least one majority-owned subsidiary located in advanced countries and involved in “primary upstream activities” such as R&D and/or manufacturing. Additionally, we excluded the very small Italian MNCs (those with less than 50 employees). Therefore, our population consisted of 358 Italian MNCs.

The interviews, which lasted 90-150 min each, were conducted in February-June 2005. During the interviews, the respondents went through a pre-tested questionnaire and notes were taken by two interviewers to ensure accurate recording of the responses. While the structured questionnaire was important for making comparisons across the parent company–foreign subsidiary pairs, a significant strength of the ‘face-to-face survey’ was that each questionnaire’s answer was clarified by the respondent with detailed information and examples. In order to minimize response bias, the participants were interviewed at their office, wherever localized in Italy\(^7\). Such a process allowed the construction of the RITMO database, that provides primary information on 84 Italian MNCs (corresponding to a response rate of about 24 percent), and their relevant 350 foreign subsidiaries located in about 50 countries. The RITMO database is crucial and adequate to investigate our research issues because it provides information on each single competence that has been developed by foreign subsidiaries and then transferred to their parent companies. Specifically, the respondents to the questionnaire were directed to search for transfer of distinctive competences from each single foreign subsidiary to the parent company. Within the 350 subsidiaries analyzed, 94 subsidiaries were involved in RKT and 162 single distinctive transferred competences developed in different business areas of foreign subsidiaries (R&D, marketing, logistics, distribution, production, etc.), were identified.

\(^6\) The dataset Reprint is developed and yearly updated at Politecnico di Milano (Mariotti and Mutinelli, 2005). It provides a census of the Italian firms with foreign activities from the beginning of 1986 to the beginning of 2005, and the information available are the followings: (i) corporate name and address of the head office, for both the Italian parent companies and their foreign affiliates; (ii) the code of the industrial activity, and other relevant economic variables (the dimensional class in terms of employees and turnover) for the Italian parent companies; (iii) the year and the type of participation in each foreign affiliate participated by Italian firms (e.g. greenfield vs. acquisition, wholly/control/minority ownership).

\(^7\) Instead of running the interviews at the University, we chose to directly visit firms’ top managers to their offices in order to avoid that those closer to where the University is located, were more likely to participate to the project.
As far as the representativeness of the sample, it might be interesting to observe that the MNCs considered operate in diverse industries (food products, industrial machinery, computers, telecommunications, pharmaceuticals, auto vehicles, chemicals, electronics, consumer durables, consumer nondurables, etc.); they vary also by size, stage of internationalization, growth strategies, and so on. Concerning non-response bias, we compared the two subsets of respondents and non-respondents in terms of size (class of number of employees), sectors, and area of location in Italy (Table 1). Regarding size and parent company’s location area, no statistically significant differences between respondents and non-respondents were found, the only exception being firms with 500-5000 employees (that are overrepresented in our sample), and parent companies located in central regions (that are underrepresented). The two groups differ in terms of sector: our sample is overrepresented in science based and specialized supplier sectors, while it is underrepresented in traditional ones (or ‘supplier dominated’, see Pavitt (1984)).

Table 1 – Representativeness of the sample

<table>
<thead>
<tr>
<th></th>
<th>MNEs</th>
<th>Non Respondent</th>
<th>Respondent</th>
<th>$\chi^2$ test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sectors</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Science based</td>
<td>44</td>
<td>29</td>
<td>15</td>
<td>0.0757*</td>
</tr>
<tr>
<td>Specialized suppliers</td>
<td>65</td>
<td>42</td>
<td>23</td>
<td>0.0122**</td>
</tr>
<tr>
<td>Scale intensive</td>
<td>163</td>
<td>125</td>
<td>38</td>
<td>0.9765</td>
</tr>
<tr>
<td>Supplier dominated</td>
<td>86</td>
<td>78</td>
<td>8</td>
<td>0.0003***</td>
</tr>
<tr>
<td><strong>Size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>50 – 249</td>
<td>98</td>
<td>80</td>
<td>18</td>
<td>0.1624</td>
</tr>
<tr>
<td>250 – 499</td>
<td>81</td>
<td>66</td>
<td>15</td>
<td>0.2325</td>
</tr>
<tr>
<td>500 – 5000</td>
<td>145</td>
<td>102</td>
<td>43</td>
<td>0.0225**</td>
</tr>
<tr>
<td>&gt; 5000</td>
<td>34</td>
<td>26</td>
<td>8</td>
<td>0.9924</td>
</tr>
<tr>
<td><strong>Parent company’s location area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>North West</td>
<td>202</td>
<td>149</td>
<td>53</td>
<td>0.1587</td>
</tr>
<tr>
<td>North East</td>
<td>109</td>
<td>82</td>
<td>27</td>
<td>0.6994</td>
</tr>
<tr>
<td>Centre</td>
<td>40</td>
<td>36</td>
<td>4</td>
<td>0.0330**</td>
</tr>
<tr>
<td>South – Island</td>
<td>7</td>
<td>7</td>
<td>0</td>
<td>0.1390</td>
</tr>
</tbody>
</table>

One reason for the small number of firms in the supplier dominated sector could be that most of the MNCs investing abroad in that sector, declared they do not consider the possibility to transfer back knowledge from their subsidiary an important issue. That has prevented their interest in participating in the project. However, as this study is concerned with the
effectiveness of RKT, when it occurs, results should not be seriously influenced by the composition of the sample\(^8\).

**Measures**

*Dependent variables.* As the phenomenon we want to study is the effectiveness of RKT, and specifically its impact on innovative performance of the parent company, we asked to the respondents to rate – on a 7-point Likert scale where 1 = ‘no impact at all’; 7 = ‘a very high positive impact’ - the extent to which the knowledge transferred from the subsidiary to the parent firm affected the latter’s ability of “developing new product” and of “developing new technology”. Therefore, the variable *Innovativeness* as been built as a single composite measure, based on the average of the two items mentioned above (Cronbach’s alpha = 0.924).

*Independent variables.* As far as our explanatory variables are concerned, we rely on proxies for different mechanisms used for transferring knowledge and the subsidiary’s capacity to generate valuable knowledge. Definitions of these variables are illustrated in the rest of this section.

- As far as mechanisms employed for transferring knowledge are concerned, the questionnaire’s respondents were asked to indicate which mechanisms were used to transfer each distinctive subsidiary’s competence to the parent company. Specifically, the respondents assigned a relative percentage of use (summing up to 100%) to the following KT mechanisms: managers’ transfer, professionals’ transfer, teamwork, manual/database exchange and corporate intranet, reporting system, others. As far as the measure utilized in the questionnaire is concerned, in order to reduce linearity problems due to the relative percentages summing up to 100%, the generic *KT-mechanism*(\(j\)) is defined as \(\ln(p_{jk}/100 +1)\), where \(p_{jk}\) is the percentage assigned to the mechanism \(j\) for transferring the competence \(k\). The generic variable *KT-mechanism*(\(j\)) equals zero if the mechanism \(j\) has not been used in the RKT process. To the authors’ knowledge, this is a first attempt to directly survey the mechanisms employed for transferring knowledge. In fact, previous studies simply relied (Ghoshal *et al.*, 1994; Gupta and Govindarajan, 2000; Foss and Pedersen, 2002; Tsai, 2002; Björkman *et al.*, 2004) on information about the existence of different types of coordination

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\(^8\) Since it appears that firms in supplier dominated sectors has a much lower tendency to transfer knowledge in this way, and firms in science based and specialized supplier sectors have a higher tendency to transfer knowledge in this fashion, in the “true” population of firms transferring knowledge from the subsidiary to the parent, we will find that supplier dominated firms are underrepresented, while science based and specialized supplier firms are overrepresented.
and communication mechanisms within the MNC from which they inferred which mechanisms are used in the KT process.

- In order to measure the impact of the local context on the subsidiary’s knowledge development, respondents were asked to indicate whether local actors were important in the developing of the distinctive competences possessed by the subsidiary, the local actors being: customers, universities or research centers, specific competitors, experts or consultants. Then, to reduce collinearity, we run a principal component analysis for the four categories of local actors, thus obtaining two factors that are called Industrial context and Research context (see Table 2).

### Table 2 - Impact of the local context on the subsidiary’s knowledge development

<table>
<thead>
<tr>
<th></th>
<th>Industrial context</th>
<th>Research context</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>0.679</td>
<td>0.170</td>
</tr>
<tr>
<td>University or research centers</td>
<td>0.269</td>
<td>0.900</td>
</tr>
<tr>
<td>Specific competitors</td>
<td>0.856</td>
<td>-0.042</td>
</tr>
<tr>
<td>Experts or consultants</td>
<td>0.727</td>
<td>-0.442</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>1.795</td>
<td>1.036</td>
</tr>
<tr>
<td>Cronbach’s alpha</td>
<td>0.64</td>
<td></td>
</tr>
<tr>
<td>Cumulative % of variance</td>
<td></td>
<td>70.76%</td>
</tr>
</tbody>
</table>

Principal component analysis with Varimax rotation.

The first factor, industrial context, expresses the subsidiary’s exploitation of external relationships with local customers, competitors, and experts and consultants for developing its distinctive competences. While, the second factor, research context, captures the role of local universities and research centres in developing the subsidiary’s knowledge.

- In order to account for the subsidiary role/mandate we built the variable competence creating in the following way. The respondents were asked to indicate whether ‘the foreign subsidiary $j$ has introduced to the MNC: (i) new technology; (ii) better technology; (iii) new technological competence; (iv) better technological competence. The final measure is a dummy variable that equals one if at least one of the 4 items has been ticked.

- As far as the measure of subsidiary autonomy is concerned, the questionnaire’s respondents were asked to indicate the allocation of strategic decision-making. Specifically, we have detailed information on the following three firm's strategic decisions: (i) definition of R&D projects, planning, resources, etc.; (ii) introduction of new technologies; (iii) changes in products/services. Following the operationalization by Ghoshal et al. (1994), we used a five levels scale, where: (1) ‘the parent company decides alone’; (2) ‘the parent company decides
but considers subsidiary inputs’; (3) ‘both parent company and subsidiary have roughly equal influence on decision’; (4) ‘the subsidiary decides, but considers parent company suggestions’; (5) ‘the subsidiary decides alone’. The final measure of the variable autonomy is the average of responses to the three items (Cronbach alpha = 0.793).

- Additionally, we also considered some FDI-specific properties, such as the entry mode adopted and the motivation that led the investment, as these characteristics of the FDI become important when there are strong reasons to believe that they may influence the likelihood of RKT affecting parent companies’ innovativeness. As far as the entry mode is concerned, acquisitions and joint ventures have been recognized as a common way the MNC may adopt to access to local resources, competencies, skills, and precious links to the local environment (Bresman et al., 1999; Gupta and Govindarajan, 2000; Lyles and Dhanaraj, 2004). Even if the entry into a foreign market through a greenfield investment in a privileged centre of excellence may cause the subsidiary to enjoy positive externalities stemming from the interaction with other local actors, thus stimulating KT over time (Holm and Pedersen, 2000), subsidiaries established through acquisitions or joint ventures are more likely to have a knowledge stock that is less duplicative vis-à-vis the knowledge stock of the rest of the corporation (Hennart and Park, 1993). Therefore, in order to test the effect of the entry mode, we built the two dummy variables acquisition and joint venture.

Additionally, as the extent and the nature of KT may also significantly differ according to the investing parent company’s motives underling the foreign investment (Chung, 2001), we may expect an impact also on the parent company innovative capacity. Therefore, in order to control for motivations underlying an FDI, we built up the variable competence seeking stemming from the section of the questionnaire where respondents were asked to assign a relative importance of the motivation ‘access to specialized workforce and to localized competences’.

Control variables. Finally, to avoid picking up spurious effects, it is important to control for other likely predictors of the parent company’s innovativeness. Namely, we considered the following factors.

- The type of the competences involved in the transfer process. Specifically, based on the precise description of each competence given to us by the respondents, we defined the dummy variable technological competence that equals one if the transferred competence is of technological nature (product/process know-how, know-how about materials, design, etc.) instead of being of managerial nature (quality management know-how, marketing
strategies, managerial technique in production, etc.). In our sample, of 162 competences transferred from the foreign subsidiaries to the relevant parent companies, 94 are technical competences and the 68 leftovers refer to managerial competences. Intuitively, one can expect technological knowledge to show a higher impact on the parent’s capacity to create distinctive products and services, through product and/or process innovation (Chakravarthy et al., 2003).

- As foreign subsidiaries operating in different industries may be facing different technological opportunities to enhance knowledge creation and development, we control for the industry. Therefore, using the taxonomy developed by Pavitt (1984), we define the dummy high-tech that equals one if the subsidiary operates either in science-based or specialized suppliers sectors.

- In order to control for region-specific effects, we inserted the dummy variable advarea that equals one if the foreign subsidiary is located in an OECD\(^9\) country, and zero otherwise.

Table 3 shows descriptive statistics and the correlation matrix for all the explanatory variables.

**Analysis**

Given the nature of our dependent variable, i.e. the effect of RKT at the level of the single competence on the parent company’s innovativeness, we use the Heckman selection model, a two stage procedure that corrects for sample selection bias in regression analysis (Heckman, 1979). In fact, the intensity of the RKT impact on parent companies’ innovativeness is limited only to competences that have influenced the parent company’s ability of developing new products and processes (81 out of 162).

The Heckman selection model includes two equations: the first one (called selection equation) predicts the likelihood of each competence to affect or not the parent company innovative capacity, the second one (regression equation) predicts the outcome of interest, i.e. the extent each transferred competence influences the parent company’s innovativeness. When the error terms from these two equations are significantly correlated, standard regressions techniques applied to the second equation alone can yield biased results, and it is therefore necessary to correct it (see, Greene, 2000).

\(^9\) Unfortunately our sample census only one FDI located in Japan.
Table 3 – Variables characteristics and correlation matrix

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>S.D.</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
<th>(8)</th>
<th>(9)</th>
<th>(10)</th>
<th>(11)</th>
<th>(12)</th>
<th>(13)</th>
<th>(14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Team work</td>
<td>1.94</td>
<td>1.48</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>2 Managers' transfer</td>
<td>1.40</td>
<td>1.51</td>
<td>-0.10</td>
<td>1.00</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3 Professionals' transfer</td>
<td>0.63</td>
<td>1.29</td>
<td>0.15</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
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</tr>
<tr>
<td>4 Manual/Database-Corporate intranet</td>
<td>1.58</td>
<td>1.71</td>
<td>-0.01</td>
<td>0.25</td>
<td>-0.36</td>
<td>1.00</td>
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<td>5 Reporting system</td>
<td>0.60</td>
<td>1.13</td>
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<td>-0.05</td>
<td>-0.02</td>
<td>-0.11</td>
<td>1.00</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>6 Industrial context</td>
<td>2.30</td>
<td>0.73</td>
<td>0.15</td>
<td>0.06</td>
<td>-0.12</td>
<td>-0.07</td>
<td>-0.18</td>
<td>1.00</td>
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<td></td>
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<tr>
<td>7 Research context</td>
<td>0.71</td>
<td>0.46</td>
<td>0.48</td>
<td>0.07</td>
<td>0.01</td>
<td>0.30</td>
<td>-0.25</td>
<td>0.17</td>
<td>1.00</td>
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<tr>
<td>8 Competence creating</td>
<td>0.00</td>
<td>1.00</td>
<td>0.09</td>
<td>0.17</td>
<td>-0.25</td>
<td>0.51</td>
<td>-0.28</td>
<td>0.03</td>
<td>0.29</td>
<td>1.00</td>
<td></td>
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<tr>
<td>9 Autonomy</td>
<td>0.00</td>
<td>1.00</td>
<td>0.29</td>
<td>-0.10</td>
<td>0.19</td>
<td>0.11</td>
<td>-0.18</td>
<td>0.11</td>
<td>0.21</td>
<td>0.00</td>
<td>1.00</td>
<td></td>
<td></td>
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<tr>
<td>10 Technological competence</td>
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<td>0.50</td>
<td>0.11</td>
<td>0.34</td>
<td>-0.04</td>
<td>0.12</td>
<td>0.01</td>
<td>-0.02</td>
<td>0.23</td>
<td>0.26</td>
<td>0.15</td>
<td>1.00</td>
<td></td>
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<tr>
<td>11 Acquisition</td>
<td>0.48</td>
<td>0.50</td>
<td>0.24</td>
<td>-0.30</td>
<td>0.32</td>
<td>-0.56</td>
<td>0.14</td>
<td>0.14</td>
<td>0.10</td>
<td>-0.43</td>
<td>0.13</td>
<td>-0.08</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12 Joint venture</td>
<td>0.09</td>
<td>0.28</td>
<td>-0.06</td>
<td>-0.15</td>
<td>-0.15</td>
<td>0.08</td>
<td>-0.10</td>
<td>-0.17</td>
<td>-0.09</td>
<td>0.11</td>
<td>-0.10</td>
<td>-0.09</td>
<td>-0.30</td>
<td>1.00</td>
<td></td>
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</tr>
<tr>
<td>13 Competence seeking</td>
<td>0.48</td>
<td>1.07</td>
<td>0.10</td>
<td>-0.20</td>
<td>-0.01</td>
<td>-0.23</td>
<td>0.04</td>
<td>0.15</td>
<td>-0.13</td>
<td>-0.22</td>
<td>-0.01</td>
<td>-0.12</td>
<td>0.33</td>
<td>-0.14</td>
<td>1.00</td>
<td></td>
</tr>
<tr>
<td>14 High tech</td>
<td>0.31</td>
<td>0.47</td>
<td>0.04</td>
<td>-0.31</td>
<td>0.11</td>
<td>-0.27</td>
<td>0.33</td>
<td>0.03</td>
<td>0.02</td>
<td>-0.24</td>
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<td>0.04</td>
<td>0.41</td>
<td>-0.21</td>
<td>0.42</td>
<td>1.00</td>
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<tr>
<td>15 Advarea</td>
<td>0.77</td>
<td>0.43</td>
<td>0.07</td>
<td>-0.43</td>
<td>0.16</td>
<td>-0.30</td>
<td>-0.04</td>
<td>0.02</td>
<td>-0.03</td>
<td>-0.39</td>
<td>0.00</td>
<td>-0.44</td>
<td>0.39</td>
<td>-0.04</td>
<td>0.25</td>
<td>0.28</td>
</tr>
</tbody>
</table>
Results

Results from the econometric estimations are reported in Table 4. In order to control for the heteroskedasticity, we obtain robust variance estimates using the Huber/White/sandwich estimator of variance. Likewise, we correct the estimated standard errors and the variance-covariance matrix of the estimators for clustering on MNCs, i.e. the fact that the observations are independent across MNCs, but not necessarily within the MNC. In other words, we control for observations of competences transferred within the same MNC that are not expected to be independent, although they must be independent between different MNCs.\(^\text{10}\)

Table 4 – RKT effect on parent company innovative capacity (Heckman selection model)

<table>
<thead>
<tr>
<th>Variables</th>
<th>Selection equation</th>
<th>Regression equation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Dummy-Innovativeness</td>
<td>Innovativeness</td>
</tr>
<tr>
<td>Team work</td>
<td>0.323 ** (0.160)</td>
<td></td>
</tr>
<tr>
<td>Managers' transfer</td>
<td>0.358 ** (0.159)</td>
<td></td>
</tr>
<tr>
<td>Professionals' transfer</td>
<td>0.067 (0.155)</td>
<td></td>
</tr>
<tr>
<td>Manual/Database- Corporate intranet</td>
<td>-0.027 (0.181)</td>
<td></td>
</tr>
<tr>
<td>Reporting system</td>
<td>-0.225 (0.215)</td>
<td></td>
</tr>
<tr>
<td>Industrial context</td>
<td>-0.078 (0.200)</td>
<td>0.439 ** (0.218)</td>
</tr>
<tr>
<td>Research context</td>
<td>0.832 *** (0.295)</td>
<td>0.138 (0.230)</td>
</tr>
<tr>
<td>Competence creating</td>
<td>0.808 * (0.439)</td>
<td>-0.648 (0.448)</td>
</tr>
<tr>
<td>Autonomy</td>
<td>-0.562 (0.347)</td>
<td>-0.374 (0.285)</td>
</tr>
<tr>
<td>Technological competence</td>
<td>1.163 *** (0.360)</td>
<td>0.945 ** (0.447)</td>
</tr>
<tr>
<td>Acquisition</td>
<td>0.524 (0.408)</td>
<td>-0.515 (0.472)</td>
</tr>
<tr>
<td>Joint venture</td>
<td>-0.123 (0.470)</td>
<td>0.198 (0.744)</td>
</tr>
<tr>
<td>Competence seeking</td>
<td>-0.312 (0.208)</td>
<td>-0.031 (0.141)</td>
</tr>
<tr>
<td>High tech</td>
<td>0.644 (0.497)</td>
<td>1.746 *** (0.448)</td>
</tr>
<tr>
<td>Advarea</td>
<td>0.369 (0.327)</td>
<td>0.367 (0.259)</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.534 (0.959)</td>
<td>2.748 *** (0.963)</td>
</tr>
</tbody>
</table>

| Observations | 162 | 81 |
| Chi-square(15) | 243.42 *** |     |
| Rho           | 0.418 |     |

* \(p < 0.1\), ** \(p < 0.05\), *** \(p < 0.01\); two-tailed t-tests. Standard errors in parentheses. ^ Wald test of independent equations (\(\rho = 0\)): \(\chi^2(1) = 3.53\) (p-value=0.060).

The estimates obtained generally seem to confirm our hypotheses. In particular, as far as Hypothesis 1 is concerned, estimated coefficients strongly support it: the variables related to the use of person-based mechanisms, i.e. teamwork and managers’ transfer, are positive and statistically significant at \(p<0.05\), while the variables manual/database exchange and corporate intranet, and reporting system come out to be not statistically significant at any conventional level. Therefore, person-based mechanisms are effective channels to transfer

\(^{10}\) This correlation is due to unobserved MNC-specific effects that influence the overall occurrence of RKT in the parent-subsidiary dyad.
tacit and more valuable knowledge in the sense that they induce a positive impact on the parent company’s innovativeness. In fact, the use of unsuitable transfer mechanisms may cause loss of knowledge in the transmission process or may induce high communication costs (Pedersen et al., 2003) that consequently reduce the possible exploitation of knowledge transferred.

As far as our second hypothesis is concerned, i.e. the role of the subsidiary’s local context, the results show that subsidiary’s knowledge developed through collaborations with local universities, customers, and so on, when it is transferred to the parent company, affects positively the latter’s innovativeness. Specifically, the coefficients of the variables industrial context and research context show a positive sign and significant at p<0.05 and p<0.01, respectively.

Considering the role/mandate of the foreign subsidiary, the coefficient of the variable competence creating is positive and statistically significant (p<0.1) in the selection equation, thus supporting our third hypothesis, that is the idea that competence-creating subsidiaries are likely to posses high quality knowledge-based resources that contribute to increase the parent company’s probability to develop new product and process. Conversely, the ‘creative’ characteristics of the foreign subsidiary does not appear to affect the intensity of the RKT effects on the parent firm’s innovativeness.

As far as Hypothesis 4 is concerned, we do not find support to the expected role of the subsidiary’s autonomy. In fact, the coefficient of autonomy is negative and not significant at any conventional level. Such a result may – at least partially – be explained by the idea that a too high level of autonomy increases the distance between the parent company and the subsidiary thus constraining the circulation of knowledge within the MNC (Egelhoff, 1988). Nevertheless, the effect of RKT on the parent company’s innovativeness may depend not only on the subsidiary autonomy in strategic decisions but also on other variables not examined in this study. For instance, corporate control mechanisms may have an effect on RKT and its effectiveness.

As far as the other FDI-specific variables are concerned, the results do not show any significant impact, neither for the entry mode (the variables acquisition and joint venture are not statistically significant at any conventional level) nor for the motivations (competence seeking does not come out significant, either).

Finally, we do find support to the idea that the transfer of technological knowledge impacts more on parent company’s innovativeness (the variable technological knowledge comes out in the selection equation significant at p<0.05, and in the regression equation, at p<0.01).
Likewise, when the knowledge transferred is possessed by subsidiary in high tech sectors, the
parent company’s opportunities of drawing valuable distinctive subsidiary’s knowledge are
likely to be greater: the coefficient of the variable high-tech is positive and statistically
significant at the conventional level (p<0.01) in the regression equation.

CONCLUSIONS
This study contributes to research on the relationship between KT and MNC’s ability to
innovate. As far as we know, it is among the first attempts to (i) explore empirically whether
the occurrence of RKT, from the foreign subsidiary to the parent company, positively affects
the latter’s innovative capacity, and (ii) to evaluate if and how the use of different
mechanisms for transferring knowledge diversely influences it.

Our results show that RKT improves the parent company’s innovative advantage. This
provides further evidence on recent developments in the International Business field, where
the creative role of foreign subsidiaries is increasingly taken into account when assessing the
competitive advantage of the MNC as a whole. Moreover, the way the knowledge is
transferred affects the parent company innovative capacity. Specifically, when RKT occurs
through person-based mechanisms, in particular through team work and managers’ transfer, it
induces a greater impact on the parent company innovative capacity than when the transfer
occurs through ICT and written media. Moreover, the parent company’s innovativeness
benefits from competences transferred by competence-creating subsidiaries and/or by
subsidiaries better able to develop and generate new knowledge through external relationships
with local actors.

The hypotheses developed in this paper have been tested with a unique data set created
through personal interviews with the top managers of 84 Italian MNCs with regard to their
350 relevant FDIs located in about 50 countries. Specifically, the empirical analysis relied on
a sample of 162 single distinctive competences developed in different business areas of
foreign subsidiaries and transferred to their parent company.

As usual, the study remains subject to certain limitations that need to be considered. First, the
use of perceptual instruments to measure the extent of RKT and its effects on parent
companies’ innovativeness, and the fact that the same person provided all the questionnaire’s
answers, are aspects that may entail potential general common method bias. We tried to
reduce this risk submitting the questionnaire directly. However, given the limitation of self-
reported data, the complexity, and multi-dimensional nature of the phenomenon under
consideration, future research should observe not only the parent companies’ point of view, but also the perception of the same phenomenon from the subsidiaries’ side.

Although this study analyzed RKT at the dyadic level, that is recognized to be better than the nodal one (e.g. Gupta and Govindarajan, 2000), a superior approach would be an analysis at the ‘systemic’ level. This approach would allow to study the occurrence of KT and its effect on the receiving unit within all of the multinational network relationships. It can also be noted that, like most social science models, some potentially important factors may be excluded. For instance, among the potential other forces that might be at work in our analyses, corporate control mechanisms may have an effect on RKT. Therefore, future research should investigate how parent companies can influence the occurrence and the effectiveness of RKT by implementing different combinations of control mechanisms with integrative mechanisms, taking into account the subsidiary’s autonomy.

References


