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Parent company benefits from reverse knowledge transfer: The role of the liability of newness in MNEs

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Abstract
Research on reverse knowledge transfer has relegated subsidiary age to a control variable capturing different and indistinct subsidiary-specific unobserved heterogeneity. However, subsidiary age, capturing host country and internal network experience, reflects accumulated knowledge stocks and capabilities of the subsidiary. Accordingly, drawing on organizational ecology theory, we theorize subsidiary age as an important determinant of parent company?s benefits from reverse knowledge transfer. We argue and empirically document that reverse knowledge transfer from older subsidiaries is perceived more beneficial to the parent company. This relationship is negatively moderated by the use of acquisitions and majority-owned joint ventures, and positively moderated by the use of socialization mechanisms.

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Key words: reverse knowledge transfer, liability of newness, liability of senescence, subsidiary age, entry mode, socialization mechanisms.

1. Introduction

Knowledge transfer within multinational enterprises (MNEs) has increasingly gained great attention. One major reason for this growing interest lies in the recognition that knowledge ranks first in the hierarchy of strategically relevant resources (Grant, 1996). For a MNE, knowledge as a strategic resource is highly relevant, as multinationals leverage knowledge-based resources and capabilities across borders (Bartlett & Ghoshal, 1989; Gupta & Govindarajan, 1991, 2000; Kogut & Zander, 1992), and engage in different types of knowledge transfer. In particular, traditional parent-subsidiary knowledge transfers (Vernon, 1966) are increasingly combined with less-conventional, lateral transfers of knowledge among sister units (Ghoshal et al., 1994; Mudambi & Navarra, 2004; Noorderhaven & Harzing, 2009) and reverse knowledge transfers (RKT) from subsidiaries to parent companies (Ambos et al., 2006; Frost & Zhou, 2005; Håkanson & Nobel, 2000; Yang et al., 2008).

Over the last decade, international business (IB) and management research has investigated the extent to which parent companies may benefit from using and integrating knowledge originating in a foreign subsidiary (Eden, 2009). This literature has documented RKT's beneficial effects on the innovative performance of the receiving unit (Iwasa & Odagiri, 2004; Subramaniam & Venkatraman, 2001; Yamin & Otto, 2004) and, more generally, its effects on the competitive advantage of the multinational as a whole (Ambos et al., 2006; Haas & Hansen, 2005). Numerous determinants and obstacles have been considered in evaluations of RKT's impact on parents. Interestingly, subsidiary age, when considered, has been relegated to the status of a control variable that captures different and indistinct subsidiary-specific unobserved heterogeneity. However, given the escalating interest in subsidiary knowledge and capabilities as a source of competitive advantage (Birkinshaw & Hood, 1998; Birkinshaw et al., 1998), subsidiary age should merit closer attention. Drawing on extant IB literature, we resort to the idea that subsidiary age captures

2

the subsidiary experience in a host country and in the internal MNE network, which is a proxy for organizational learning (Birkinshaw & Hood, 1998; Erramilli, 1991b; Foss & Pedersen, 2002; Li, 2005; Luo & Peng, 1999).

Research in the organizational ecology tradition (Hannan & Freeman, 1984; Stinchcombe, 1965) indicates that firm age is crucial to explain the conditions under which organizations emerge, grow, and die. In particular, organizational ecologists suggest a number of patterns regarding how firm age relates to firm's strategic behaviors. Young firms can suffer from the phenomenon known as *liability of newness*. In other words, young firms are at a disadvantage to older firms that have, over time, developed the absorptive capacity to recognize and assimilate new ideas, and capabilities to innovate (Cohen & Levinthal, 1990; March, 1991; Nelson & Winter, 1982). On the other hand, other scholars have highlighted that old firms suffer from the phenomenon known as *liability of aging* as firms are increasingly inefficient in responding to changes in the external environment as they age (Barron et al., 1994; Ranger-Moore, 1997). Old firms suffer from organizational inertia and they need to undertake processes of unlearning to engage in innovation and knowledge creation (Autio et al., 2000; Casillas et al., 2010; Leonard-Barton, 1992; Sinkula, 1994).

We drawn on the ecology theory and extend the concepts of liability of newness and liability of aging to an intra-firm, inter-unit context with regard to RKT. In particular, we address the question of how subsidiary age affects the parent company benefits from RKT. In addition, over time foreign subsidiaries display different degrees of local embeddedness and different levels of integration within the MNE that influence subsidiary's knowledge accumulation and transfer from the sending to the receiving unit. Entry modes (Frost, 2001; Håkanson & Nobel, 2001) and the use of socialization mechanisms (Galbraith, 1990; Gupta & Govindarajan, 2000; Noorderhaven & Harzing, 2009; Rothwell, 1978) have been related to subsidiary local embeddedness and its internal integration within the MNE. Thus, we also

investigate a second set of questions on whether the impact of subsidiary age on parent's benefits from RKT is moderated by 1) the entry mode employed to establish the foreign subsidiary and 2) the use of socialization mechanisms within the parent-subsidiary dyad.

Our study offers theoretical contributions to IB theory and management literature on RKT in MNEs. First, we advance IB theory with regard to RKT by illustrating the relevance of several facets of organizational ecology for the study of intra-MNE knowledge transfer. To this end, it is worth clarifying that we borrow from organizational ecology arguments without carrying out an organizational ecology analysis. Second, the study offers a contribution to the management literature on knowledge transfer by explicitly assessing the beneficial effect of such knowledge for the recipient. We also provide managerial implications to design effective strategies in order to enjoy beneficial effects of internal knowledge transfer.

The paper is divided into six sections. In the next section, we briefly discuss the need for theorizing on subsidiary age. In the third section, we develop our theoretical framework and hypotheses. In the fourth section, we explain the method adopted. In section five, we report and discuss our empirical findings. We conclude our study by highlighting the contributions to theory, and suggesting directions for practice and further research.

2. Background

IB and management scholars have acknowledged that, although the parent company still serves as the most active creator and diffuser of knowledge, foreign subsidiaries may also engage in knowledge transfer with their parent companies and sister units (e.g. Gupta & Govindarajan, 2000). As a result, innovation can be developed at diverse units around the world, and subsidiaries' resources and capabilities can be transferred within the MNE and used as seeds for further enhancements of knowledge and capabilities (Bartlett & Ghoshal, 1989).

In this respect, recent studies have documented the beneficial effects of RKT on the competitive advantage of the whole firm (Ambos et al., 2006; Haas & Hansen, 2005), as

subsidiaries contribute to the resource base of the parent's global operations. These studies have identified different determinants of RKT and its effectiveness, which are now thoroughly conceptualized. In particular, RKT's contribution to the parent's competitive advantage has been traced back to subsidiary role (Ambos et al., 2006; Iwasa & Odagiri, 2004; Yang et al., 2008), subsidiary autonomy (Ghoshal et al., 1994; Noorderhaven & Harzing, 2009; Schulz, 2001), the subsidiary's international experience (Iwasa & Odagiri, 2004), development of intra-MNE trust relationships (Ambos & Ambos, 2009; Ambos et al., 2006; Björkman et al., 2004; Haas & Hansen, 2005) and different entry modes (Frost & Zhou, 2005; Yang et al., 2008), as well as technological, organizational and cultural distance (Ambos et al., 2006; Håkanson & Nobel, 2001; Sunaoshi et al., 2005). At the same time, research on intra-MNE knowledge flows has documented difficulties in this process arising from knowledge stickiness within organizations (Szulanski, 1996), as knowledge, especially tacit knowledge, does not necessarily flow easily within an MNE.

Some of these studies have included subsidiary age as a control variable in their empirical analyses in order to account for differently specified, unobserved heterogeneity. In particular, Minbaeva, Pedersen, Björkman, Fey and Park (2003) consider age as a proxy for subsidiary autonomy and innovative capacity. Monteiro, Arvidsson and Birkinshaw (2008) use age as a proxy for the efficacy/efficiency of intra-MNE communication, as older subsidiaries may have developed the mechanisms and relationships needed to share knowledge within the MNE over time, an argument also suggested by Birkinshaw, Nobel and Ridderstrale (2002), and Frost and Zhou (2005). Yamin and Otto (2004) include subsidiary age in their analysis of the influences of inter- and intra-organizational knowledge flows on innovative performance. Similarly, Yang et al. (2008) control for subsidiary age when investigating knowledge transfers within MNEs moving in various directions. In both cases, the argument for including subsidiary age relates to a broadly defined, unobserved heterogeneity that age may

serve to capture in investigations of innovation performance. Along these lines, other studies, such as Ambos, Ambos and Schlegelmilch (2006), recognize the limitations of not taking subsidiary age into account in analyses of parent company's benefits from RKT and suggest that there are subsidiary-specific factors related to age that still need to be considered.

A premise of our study is that the age of the subsidiary is an important determinant of the subsidiary's ability to accumulate knowledge and capabilities and, hence, to create value for the overall MNE. In the resource-based perspective, over time resource accumulation allows for the development of dynamic capabilities, which enable firms to build up new, related resources and exploit new opportunities from existing capabilities through a path-dependent learning process (Prahalad & Hamel, 1990). The accumulation of valuable, unique and difficult-to-imitate resources lays the foundation for a firm's competitive advantage (Barney, 1991; Dierickx & Cool, 1989). IB scholars have acknowledged the relevance of accumulated local experience, which is defined in terms of accumulated knowledge and capabilities about the host economy and takes the form of location-based intangible assets (Johanson & Vahlne, 1977). Specifically, the intensity of exposure to a certain host country environment (i.e., the number of years that a particular subsidiary has been operating in a foreign country) leads to host country-specific experience (Erramilli, 1991a; Luo & Peng, 1999). Similarly, the intensity of exposure to corporate vision and shared norms (i.e. the number of years that a particular subsidiary has been operating within the MNE network) leads to experience in dealing with internal relationships (Foss & Pedersen, 2002; Li, 2005). In both cases, experience is a prime source of learning in organizations (Barney, 1991). Consequently, at any given point in time, the subsidiary's stock of knowledge and capabilities is a function of subsidiary experience in the host country and in its internal network, and, thus, of its age, and may influence the effectiveness of RKT.

3. Theoretical framework and hypotheses

According to the liability of newness perspective, older organizations have an advantage over younger ones because they have more cumulative (productive) experience, a more experienced workforce and stronger external and internal relationships (Stinchcombe, 1965). Older firms have developed innovative capabilities over time, which younger firms lack.With respect to innovation, two supporting arguments are put forward: the time dependency of the accumulation of knowledge and the development of capabilities to innovate (Hannan & Freeman, 1984; Sørensen & Stuart, 2000; Stinchcombe, 1965). Cohen and Levinthal (1990) show that knowledge accumulation amplifies the organization's ability to recognize and assimilate new ideas, and to convert this knowledge into additional innovations. New ideas are more efficiently recognized and assimilated if organizations have established a solid knowledge base (March, 1991; Nelson & Winter, 1982). The innovation and accumulation of knowledge are recognized as self-reinforcing mechanisms, such that organizations with a large knowledge base are more likely to purse innovative opportunities that further contribute to knowledge accumulation (Cohen & Levinthal, 1990). Older firms have defined and consolidated routines, structures, incentives, programs and the like, which enable them to develop new technologies and bring them to market.

However, the argument of the liability of newness has not received unanimous consensus and a number of scholars suggest a liability of aging (Barnett, 1990; Barron et al., 1994; Ranger-Moore, 1997). That is, firms are increasingly unable to generate innovations as they age. In this perspective, aging goes hand in hand with the development of core rigidities and social defenses and, as a result, with a decline in organizational competencies (Bain, 1998; Leonard-Barton, 1992). Accordingly, firms need to engage in substantial unlearning activities in order to acquire and develop new knowledge and routines (Nonaka & Takeuchi, 1995; Sinkula, 1994), and younger firms have learning advantages over older firms because they

can refrain to unlearn obsolete knowledge and routines. (Autio et al., 2000; Barkema & Vermeulen, 1998; Casillas et al., 2010). Thus, the liability of aging argument implies that firms' innovative capacity diminishes as firms grow older. In addition, these scholars contend that over time firms' patterns of internal communication become increasingly rigid (Barnett, 1990; Ranger-Moore, 1997). A firm's ability to use its existing knowledge base critically depends on the patterns of communication and distribution of knowledge within the firm (Cohen & Levinthal, 1990). Accordingly, the development of obstacles to effective action (e.g., taken-for-granted attitudes, political coalitions, etc.) in older firms ultimately explains the positive relationship between aging and organization mortality (Barron et al., 1994).

In an intra-firm inter-unit context, how does subsidiary age affect parent company's benefits from RKT? In the following, we draw on the liability of newness and aging arguments to conceptualize the role of subsidiary age within the RKT phenomenon and develop testable hypotheses.

3.1 The effect of subsidiary age on parent companies' benefits from RKT

From a liability of newness perspective, older subsidiaries have had more time to accumulate and develop distinct resources and capabilities through interaction and exchanges with local counterparts and other parts of the MNE (Birkinshaw & Hood, 1998). Over time, subsidiaries themselves can acquire and develop distinctive valuable resources and, as they age, they can increasingly contribute to shaping and defining their organizational roles, although to different extents (Birkinshaw & Hood, 1998; Cantwell & Mudambi, 2005). The evolution of subsidiary role has been argued to occur over time as a result of different factors. In particular, subsidiaries achieve or do not achieve strategic roles as a result of subsidiary, group and location-specific factors (Birkinshaw & Hood, 1998; Cantwell & Mudambi, 2005). Therefore, aging does not deterministically imply the attainment of a strategic role. Nonetheless, older subsidiaries have had more time to embed in the host location and

accumulate a knowledge stock through their experience in the local environment (Benito & Gripsrud, 1992; Luo & Peng, 1999) which is the basis of effective RKT. This is in line with the time compression diseconomies argument, which suggests that knowledge stocks cannot be adjusted instantaneously, as it takes time to move them to a desired level (Dierickx & Cool, 1989). Accumulated experience not only affects the frequency and significance of knowledge production, but it has also been recognized as a principal determinant of technology transfer, as more experienced units are more capable of codifying and teaching their knowledge to recipients (Kogut & Zander, 1993).

Nevertheless, the liability of aging perspective would suggest that older subsidiaries are subject to organizational inertia. Knowledge is embedded in the organizational routines, norms and values as a result of years of accumulation, codification and structuring of tacit knowledge and the very same routines, values and norms that support the creation and development of knowledge can also constrain it (Leonard-Barton, 1992). Accordingly, old subsidiaries are less likely to develop explorative knowledge and capabilities that can benefit the parent company once they are reverse transferred. Instead, young subsidiaries will be better in engaging in more explorative innovations (Zhou & Wu, 2010). Young subsidiaries are less constrained in acquiring and integrating new knowledge because they possess less situation-specific knowledge and routines generated through past trial and error, and experience (Autio et al., 2000; Casillas et al., 2010; Sinkula, 1994).

However, a foreign subsidiary, its experience, and consequently its ability to develop and transfer knowledge potentially beneficial for the parent company, cannot be seen independently from the MNE network context (Ghoshal & Bartlett, 1990). First, for a foreign subsidiary aging implies to have had the time to invest in internal integration, to establish long-term relationships with the parent company and the other subsidiaries, to develop key knowledge regarding the roles of the game. These time consuming activities are all likely to

affect the subsidiary's capacity to capture attention from the parent company (Bouquet & Birkinshaw, 2008). Accordingly, although the liability of aging would suggest that older subsidiaries suffer more from organizational inertia, the liability of newness indicates that older subsidiaries are expected to be better in disclosing and broadcasting their knowledge within the MNE, in general, and to the parent company, in particular. Second, it has been shown that older subsidiaries of MNEs are more likely to receive investment funds than relatively younger subsidiaries as a result of persistence in resource allocation patterns over time (Mudambi, 1998). This favors older subsidiaries which have accumulated experience to influence parent companies' policies to their own advantage (Mudambi & Navarra, 2004), while young subsidiaries typically struggle to receive central support for development activities. Accordingly, in line with the liability of newness perspective aging allows for a greater accumulation of resources and confers an ability to innovate through the development of combinative capabilities that "generate new applications from existing knowledge" (Kogut & Zander, 1992, p. 391). Third, age is traditionally associated with innovation development along existing technological trajectories, while innovation spawning new technological fields typically emerges from younger organizations (e.g. ,Tushman & Anderson, 1986), as also suggested by the liability of aging. Within the MNE context, this has a critical implication. Older subsidiaries are more likely to generate new knowledge close to the domain of MNE's existing knowledge and younger subsidiaries new knowledge outside the MNE's existing knowledge domain (Autio et al., 2000; Lavie & Rosenkopf, 2006; Zhou & Wu, 2010). Therefore, the nature of the new knowledge generated by older and younger units is likely to ease the transfer and assimilation into the parent company's knowledge base more in the former than in the latter case. In other words, from a cognitive dimension the parent company perceives knowledge and capabilities accumulated over time by older subsidiaries as more easily recognizable and transferable. Thus, we state that:

H1. Subsidiary age will be positively related to parent's benefits from reverse knowledge transfers.

3.2 The moderating effect of entry mode

Over time, foreign subsidiaries display different degrees of local embeddedness and levels of internal integration that influence RKT and its effectiveness (e.g., Andersson et al., 2002; Noorderhaven & Harzing, 2009). The level and nature of subsidiary embeddedness and integration within the MNE critically depend on the entry mode employed (Buckley et al., 2003; Håkanson & Nobel, 2001). Thus, we expect the effect of subsidiary age on parent's benefits from RKT to change depending on the subsidiary origin. Subsidiary age has a different meaning for acquired subsidiaries and units resulted from majority-owned joint ventures than for greenfield establishments. For the latter subsidiary age signifies the age of the foreign unit, for the former the number of years since it was integrated into the MNE network.

Although the local embeddedness of acquired subsidiaries and units established through majority-owned joint ventures is likely to decline immediately after integration, with increasing age, the conditions determining the degree of local embeddedness are reestablished, and the degree of local embeddedness becomes similar to those of greenfields (Buckley et al., 2003; Håkanson & Nobel, 2001). On the other hand, at time of establishment, on average, compared to greenfield units acquired subsidiaries and those established through majority-owned joint ventures have had already time to accumulate and develop knowledge leveraging their local embeddedness (Buckley et al., 2003; Håkanson & Nobel, 2001). Greenfield units, instead, need time to gain reputation and legitimacy in the host country environment. This implies that as time goes by, greenfield subsidiaries become more embedded in the host country and increasingly self-sufficient in knowledge and capabilities accumulation (Frost, 2001). Thus, aging will benefit greenfield subsidiaries most.

However, entry modes do not only affect the subsidiary's knowledge accumulation but also the knowledge transfer process through the impact on the subsidiary's internal integration. Although, compared to greenfield units, subsidiaries established through acquisitions and majority-owned joint ventures have had already time to accumulate and develop knowledge that they can share potentially with their parent (Håkanson & Nobel, 2001; Makino & Delios, 1996), strategic combinations are not automatically realized. In this respect, the realization of synergies depends on the integration of the new firm (Datta, 1991; Hunt, 1990; Larsson & Finkelstein, 1999; Schweiger et al., 1987) which, traditionally, both in acquisitions and in international joint ventures is eased by similar cognitive structures and routines (Dhanaraj et al., 2004; Haspeslagh & Jemison, 1991; Lane et al., 2001). Accordingly, from an internal integration point of view, age should benefit subsidiaries established through acquisitions and majority-owned joint ventures more than greenfield units as the former need time to integrate into the MNE internal network in order to be able to effectively transfer knowledge to the parent.

Nevertheless, it is often retained that transfer of knowledge within organizations such as intra-MNE knowledge transfer, is easier to achieve than is the transfer of knowledge between organizations (Grant, 1996; Kogut & Zander, 1992; Kogut & Zander, 1993; Singh, 2005). Thus, if over time the achievement of a closer integration between the parent and the subsidiaries established through acquisitions and/or majority-owned joint ventures is a lengthy process with uncertain outcomes, knowledge creation rooted in extensive external relationships (i.e., local embeddedness) can be even more time consuming and uncertain. Parent companies and foreign subsidiaries can directly encourage and enforce the use of communication and coordination systems and human resource management practices to positively affect the occurrence and effectiveness of knowledge transfers within the MNE (Björkman et al., 2004; Gupta & Govindarajan, 1991, 2000). Conversely, co-creation of

12

knowledge across firm boundaries requires different firms to overcome opportunism and free-riding behaviors, to align incentives, resources and routines, to engage in reciprocity (e.g., Dyer & Singh, 1998). The successful development of local embeddedness strategy depends on long-term relationships that are largely based on trust and mutual commitment (Andersson et al., 2002). These processes are more time consuming and less under the control of the parent company and MNE units. Accordingly, we expect the net effect of entry mode on subsidiary age to be primarily captured by the knowledge accumulation process—driven by the local embeddedness mechanism—than by the internal knowledge transfer process— affected by internal integration. Therefore, the effect of subsidiary age on parent's benefits from RKT will be less strong for subsidiaries established through acquisitions and majority-owned joint ventures than for greenfield units.

H2. The use of acquisitions or majority-owned joint-ventures (*versus* greenfield) as entry mode negatively moderates the relationship between parent's benefits from reverse knowledge transfers and subsidiary age.

3.3 The moderating effect of socialization mechanisms

Face-to-face interactions based upon the use of socialization mechanisms are particularly conducive to the transfer of tacit, non-codified knowledge (Bartlett & Ghoshal, 1989; Haas & Hansen, 2005; Noorderhaven & Harzing, 2009; Tsai, 2001). Extant research largely converges on the positive effects of moving employees as a powerful mechanism for facilitating knowledge transfer in organizations (Frost & Zhou, 2005; Galbraith, 1990; Gupta & Govindarajan, 2000; Rothwell, 1978). Socialization mechanisms encompass information-processing routines that facilitate over time knowledge transfer from subsidiary to parent (Ambos & Ambos, 2009; Björkman et al., 2004) and ultimately affect parents' benefits from RKT (Ambos et al., 2006; Haas & Hansen, 2005). This implies that the effect of subsidiary age on parent's benefit from RKT critically depends also on the adoption of such

13

mechanisms. Thus, we link subsidiary age and socialization mechanisms to the literature on social capital (Coleman, 1988), and intra-firm trust and shared vision (Tsai & Ghoshal, 1998), and to the time compression diseconomies argument.

The social capital literature argues that social capital favors knowledge sharing and transfer, as it influences the willingness of individuals to dedicate time and effort to cooperate with others (Coleman, 1988; Grannovetter, 1985), and enables the development of a shared language and meanings that facilitate access to information and resources. In particular, trust helps to create confidence that the knowledge shared will not be appropriated or misused (Krackhardt, 1990; McEvily et al., 2003). Intra-firm communication based on interpersonal/face-to-face relationships is often associated with high levels of social controls (e.g., behavioral clues, non-verbal information and status cues) and, therefore, with higher levels of interpersonal trust (Wilson et al., 2006). Socialization mechanisms have been related to their ability to ease trusting relationships and support the creation of a shared vision, which lower internal information-processing costs (Gulati, 1995; Tsai & Ghoshal, 1998). Several studies have demonstrated that inhibiting factors in face-to-face communication, such as uncertain, anxious and critical feelings, or surface-level diversity, become less potent over time (e.g., Harrison et al., 2002), which results in an increase in the level of trust.

The time compression diseconomies also suggests that trust and similar resources accumulated through, for instance, on the job learning and training, display decreasing returns to the fixed factor time (Dierickx & Cool, 1989). That is, they develop over time when communication between sources and targets becomes more mature and task oriented (Tuckman, 1965; Wilson et al., 2006). The development of trust and social capital is a time-demanding processes and time is a scarce resource for young firms. High failure rates among young firms have been attributed to their lack of stable relationships with external partners (Baron & Markman, 2003; Singh et al., 1986). Accordingly, in parent-subsidiary

communication based on socialization mechanisms, trust levels should be higher between parents and older subsidiaries than between parents and younger subsidiaries, all other things equal. Therefore, we expect the transfer of knowledge through socialization mechanisms to have a greater effect on parent's benefits in the case of older subsidiaries.

H3. The use of socialization mechanisms positively moderates the relationship between parent's benefits from reverse knowledge transfers and subsidiary age.

4. Methods

4.1 *Sample*

We test our hypotheses on a dataset of 146 transfers of knowledge (i.e. our unit of analysis) from 84 foreign subsidiaries to their respective 41 parent companies, whose headquarter is in Italy. The dataset is obtained from a broader database that was the result of a survey on "Research on Innovation and Technology in Multinational Organizations", which was conducted in 2004-2005. 358 Italian MNEs served as the sample frame. These firms represented the population (at the beginning of 2004) of all Italian MNEs with the following characteristics: (i) 50 or more employees; (ii) active in manufacturing industries; and (iii) at least one majority-owned subsidiary located in developed countries and involved in R&D and/or manufacturing activities. The survey started in 2004 and the data were collected from December 2004 to July 2005 through face-to-face structured interviews which lasted 120-180 minutes each and involved six researchers. Parent companies' top managers were contacted by telephone and a personalized letter with the description of the project, assurances regarding the confidentiality of collected data and a formal request for a face-to-face interview were sent to each manager. During the interviews, respondents completed a pre-tested questionnaire and notes were taken by two interviewers to ensure accurate recording of the responses. Data collection was completed by the end of July 2005 and the resulting database covered 84 MNEs out of the 358 sampled Italian MNEs (response rate of about

24%). For each of the 84 MNEs, data about their majority-owned foreign subsidiaries –

regardless of their location – involved in manufacturing and/or R&D activities was collected,

which provided a total of 301 usable MNE parent company-foreign subsidiary dyads. Of the 84

respondent MNEs, 80% reported fewer than five subsidiaries. Longer interviews were

arranged with parent company managers for MNEs that reported five or more subsidiaries.

Non-response bias was tested by comparing the 84 MNE respondents with the non-

respondents within the overall sample frame of 358 MNEs in terms of size (class of number

of employees) and sector. In terms of size, there were no statistically significant

underrepresented dimensional classes. However, the two groups differed in terms of their

main sectors of operations. The tests indicated that low-tech sectors were underrepresented in

the sample, while there was an overrepresentation of MNEs in science-based and specialized

supplier sectors.[1] Accordingly, the generalization of results concerning low-tech industries

must be taken with some caution. The information gathered during the described data survey

covers MNE structure, intra-MNE communication mechanisms, knowledge transfers from

foreign subsidiaries to parent companies, subsidiaries characteristics, and parent companies'

benefits from the use of subsidiary knowledge.

For the scope of this study, from the 301 usable MNE parent company-foreign subsidiary

dyads, we extracted a dataset consisting in a sub-sample of all dyads where at least one

transfer of knowledge from the subsidiary to its parent company was reported. Specifically,

the database resulted from the survey shows evidence of RKT in 94 out of 301 parent

company-foreign subsidiary dyads, which correspond to an incidence rate of about 31%.[2]

However, for 10 of these, data on the parent company's perceived benefits from subsidiary

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[1] According to Pavitt (1984; 1990), five technological trajectories can be identified: supplier-dominated, specialized-supplier, science-based, scale-intensive and information-intensive. These different trajectories reflect differences in the main sources of technology. In the case of supplier-dominated sectors, like the packaging industry, technical change comes almost exclusively from suppliers.
[2] It is interesting to observe that within the MNE network about 69% of the sampled subsidiaries never transferred knowledge to their parents, although still in operation.

knowledge were not available. Therefore, our final dataset consists of 146 transfers occurred from 84 foreign subsidiaries to their 41 parent companies. Accordingly, we evaluate parent's benefits from RKT only "in areas where knowledge was transferred in the first place" (Ambos et al., 2006, p. 301). The choice of this dataset is coherent with the aim of the paper, which is to understand how specific characteristics of the subsidiary and its relationship with the parent company affect the parent's benefits from RKT. On average, when RKT occurred, the interviewed parent company managers reported 1.74 knowledge transfers per subsidiary. Transfers were assessed from the receiving unit's perspective, i.e., the perspective of the parent company. In line with Lord and Ranft (2000, p. 582), "this was done primarily because to try to measure knowledge transfer from the sender's perspective is inherently problematic – e.g., knowledge that is 'sent' is not always 'received' (Szulanski, 1996)".

4.2 Variables

Dependent variable

Parent's benefits from RKT are evaluated as the parent company managers' perceptions of the impact of subsidiary knowledge on parents' innovative capacity. Drawing on extant research (Ambos & Ambos, 2009; Ambos et al., 2006), the adoption of this perceptual measure allows us to account for the fact that not every knowledge transfer translates into added value and that it is not the mere replication of a sender's message by the recipient that is important, but the extent to which it can generate benefits for the recipient's operations. To operationalize this measure, subsidiary knowledge that was used by the parent company was first characterized on the basis of whether that know-how related to R&D, manufacturing and process, marketing/sales, logistic/distribution, purchasing, quality control, human resource management, or general management (Gupta & Govindarajan, 2000). Second, following a procedure similar to the one applied by Ambos et al. (2006), respondents were asked to evaluate how different aspects of the parent company's innovative capacity had benefited

from the use of knowledge transferred from the foreign subsidiary using the defined knowledge dimensions. Specifically, the respondents rated – on a 7-point Likert scale where 1 = "no impact at all" and 7 = "a very high positive impact" – the extent to which subsidiary knowledge affected the parent company's innovative capacity in terms of: (i) new product development, (ii) new technology development and (iii) patent activity. The variable *parent's benefits from RKT* is a single composite measure based on the loadings from a principal component factor analysis[3] of the three indicators of innovative capacity (Cronbach's alpha = 0.86).

Independent variables

- Subsidiary Age. The variable *subsidiary age* is operationalized as the difference between 2005 (the year when data collection was completed) and the year when the subsidiary became part of the Italian MNE, either as a result of a greenfield investment, acquisition or majority-owned joint venture. A similar variable has previously been used in studies on RKT by Håkanson and Nobel (2001), Yamin and Otto (2004) and Yang et al. (2008).

- Entry mode. Acquisitions and joint ventures have been recognized as entry modes commonly adopted by MNEs to access new capabilities and knowledge (e.g. Gupta & Govindarajan, 2000; Yang et al., 2008). In order to capture the effects of the entry mode on our dependent variable, we add the dummy variable *acquisition-jv* to our model which equals 1 for foreign subsidiaries that were acquired or created through a majority-owned joint venture, while it equals 0 for greenfield subsidiaries.

- Socialization mechanisms. Similarly to Ambos and Schlegelmilch (2004), Björkman et al. (2004) and Noorderhaven and Harzing (2009), in order to capture socialization mechanisms in parent-subsidiary relationships we focus on: (i) teamwork involving people from both the foreign subsidiary and the parent company, and (ii) visits and meetings between managers

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[3] Factor loadings: new product development = 0.905; new technology development = 0.947; patent activity = 0.801; Eigenvalue = 2.357; variance explained = 78.58%.

and/or professionals within the parent-subsidiary dyad. Respondents were asked to assess the intensity of the use of the two socialization mechanisms on a 7-point Likert scale (ranging from "used rarely" to "used very often"). The final measure of *socialization mechanisms* is a single composite measure based on the loadings from a principal component factor analysis[4] of the two items (Cronbach's alpha = 0.73).

Control variables

- Type of knowledge. Since the parent's benefits from RKT can stem from different knowledge domains that display different degrees of stickiness and complexity (Szulanski, 1996), we control for the type of knowledge that has been and can be potentially transferred from the subsidiary to the parent company. Specifically, the dummy variable *R&D knowledge* takes value 1 when R&D know-how has been transferred, 0 otherwise. The dummy variable *marketing/sales knowledge* takes value 1 when marketing and sales know-how has been transferred, 0 otherwise. The benchmark is know-how related to manufacturing and process, logistic/distribution, purchasing, quality control, human resource management, and general management.

Moreover, subsidiaries often create and develop knowledge exploiting their local embeddedness (Andersson et al., 2002; Santangelo, 2011). Therefore their knowledge can be context-specific and, as a result, potentially more difficult to transfer and be used by the parent company. We include a variable (*knowledge specificity*) which measures "to what extent the subsidiary's distinctive knowledge and competencies are context specific" (7-point Likert scale from "very high degree of local context specificity" to "very low degree of local context specificity").

- FDI motives. Foreign subsidiaries can be established for efficiency- and market-related motives as well as to source local knowledge (Dunning, 1977). Accordingly, parent's benefits

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[4] Factor loadings: teamwork = 0.887; visits and meetings = 0.887; Eigenvalue = 1.575; variance explained = 78.72%.

from RKT are likely to be higher when subsidiaries established by knowledge sourcing motives are involved in knowledge transfers. To account for this effect, we include in our model the variable *knowledge sourcing* which controls for whether the establishment of the focal foreign subsidiary was motivated by "getting access to localized knowledge and competencies" (percentage scale from 0 to 1).

- Subsidiary role. Subsidiaries with different roles behave differently in developing and transferring knowledge within their MNE (Birkinshaw et al., 1998; Cantwell & Mudambi, 2005; Rabbiosi, 2011), and it has been documented that the parent company's perceived benefit from local knowledge will depend on the role of the foreign subsidiary (Ambos et al., 2006; Iwasa & Odagiri, 2004; Yang et al., 2008). Accordingly, it is crucial to control for subsidiary role as this is a likely predictor of RKT effectiveness. Following Ghoshal (1986), we distinguish among "implementer subsidiary", "contributor subsidiary" and "innovator subsidiary". We also follow Nobel and Birkinshaw (1998), and Ambos and Schlegelmilch (2007), and apply a rather simple heuristic based on the nature of the subsidiary's activities. Respondents were asked to indicate whether the focal foreign subsidiary was devoted to "capability-augmenting" *or* "capability-exploiting" activities. The former are undertaken to create new products and/or new technologies, whereas the latter are directed towards significant and/or marginal product/process improvements. Those subsidiaries that are *neither* capability-augmenting *nor* capability-exploiting are called *implementers* – those that are capability-exploiting *but not* capability-augmenting are *contributors*, while those that are *also* capability-augmenting are labeled *innovators*.

- Size. The integration of subsidiary knowledge with the existing knowledge of a parent company can be affected by the number of individuals that might be involved in the process (Gupta & Govindarajan, 2000). Moreover, size and age are typically positively correlated, as firm size is often considered to be a proxy of the tangible and intangible resources owned by

the firm. Sørensen and Stuart (2000) recognized that research on the effects of aging on innovation assumes that size is held constant. Therefore, a failure to control for size is likely to yield biased estimates. We define *relative size* as the difference between the natural logarithm of the number of employees of the subsidiary and the natural logarithm of the parent company's number of employees in 2004.

- Subsidiary autonomy. Since vertical knowledge flows have been found to correlate with subsidiary autonomy (Ghoshal et al., 1994; Noorderhaven & Harzing, 2009; Schulz, 2001), we control for the degree of autonomy granted to each foreign subsidiary. Respondents were asked to indicate at which MNE level[5] each of the following three strategic decisions of the firm is taken (Ghoshal et al., 1994): (i) definition of R&D projects, planning and resources; (ii) introduction of new technologies; and (iii) changes in products/services. The variable *subsidiary autonomy* is a single composite measure based on the loadings from a principal component factor analysis[6] of the three strategic decisions (Cronbach's alpha = 0.79).

- Absorptive capacity. The ability of a firm to learn from another one depends on the similarity of both firms' knowledge bases and organizational structures (Lane & Lubatkin, 1998). Accordingly, in order to capture parent companies' ability to learn from their subsidiaries, we control for similarities between subsidiary and parent company in terms of their technological capabilities, and organizational cultures and practices. Following Ambos et al. (2006), respondents were asked to directly compare the subsidiary's (i) technological capabilities, and (ii) organizational culture and practices to those of the parent company (7-point Likert scale ranging from "very similar" to "extremely different"). Based on the

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[5] Following the operationalization by Ghoshal et al. (1994), we use a five-level 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"; and (5) "the subsidiary decides alone".

[6] Factor loadings: definition of R&D projects, planning, resources = 0.923; introduction of new technologies = 0.845; changes in products/services = 0.767; Eigenvalue = 2.154; variance explained = 71.81%.

respondent's perceived similarity, we define the variables *technological distance* and *organizational distance*, respectively.

- Cultural distance. Some factors, such as differing languages, cultures and institutional frameworks, generate a perception of "cultural distance" among knowledge receivers, which may hamper the knowledge transfer process (e.g. Håkanson & Nobel, 2001; Sunaoshi et al., 2005). We control for the cultural distance in the parent-subsidiary dyad by adding the variable *cultural distance* to the model, measured using Kogut and Singh's (1988) cultural distance index.

- Previous links. When subsidiaries are established through joint ventures and acquisitions, information asymmetries between partners can inhibit the effectiveness and success of knowledge transfers after the foreign investment (Dhanaraj et al., 2004). However, if merging firms have experience of prior collaborations with each other, we expect organizational problems related to lack of trust and conflicts of interest to be less severe. In order to control for this effect, we adopt a binary variable (*previous links*) equal 1 for foreign subsidiaries that experienced at least one of the following relationships with the parent company before their establishment: the subsidiary was a customer of the parent; the subsidiary was a supplier of the parent; the subsidiary and the parent have established a technological agreement; the subsidiary and the parent have established a non-technological agreement.

- Industry-specific effects. Different industries show different paces of environmental changes (Hannan & Freeman, 1984). In more dynamic industries, core technologies, structures and processes may quickly become obsolete (Sørensen & Stuart, 2000). Therefore, it is crucial to control for industry-specific effects. Using the taxonomy developed by Pavitt (1984), we define the dummy variable *high-tech*, which equals 1 if the subsidiary operates in "science-based" or "specialized suppliers" sectors, with the benchmark being subsidiaries operating in medium and low-tech industries.

We run a confirmatory factor analysis (CFA) to ensure the variables' construct validity. Since the CFA model needs to be identified, we included all, and only, the multi-items constructs considered in the empirical analysis. When maximum likelihood estimation techniques are used for non-normal data this can have serious effects on the output of the models. The assumption of normal distribution of all items was not verified; we implemented a bootstrap procedure to assess the parameter estimates and standard errors. Overall, the measurement model performed well with a CFI at 0.968, TLI at 0.948 and RMSEA at 0.075. The loadings for all measurements were significant at the $p < 0.001$ level.

4.3 Common method bias considerations

In order to examine whether common method bias augmented relationships, we performed the Harman's single-factor test on the items included in our econometric model (Podsakoff & Organ, 1986). If common-method bias exists in the data, a single factor will emerge from a factor analysis of all measurement items included in the study, or one general factor will account for most of the variance. The factor analysis reveals five factors with Eigenvalues greater than 1, the first of which (Eigenvalue = 2.47) explains 19.02% of the total variance. Therefore, the factor analysis does not indicate the presence of a single background factor and it therefore supports the validity of the data.

In addition, following Podsakoff et al. (2003), we checked for common method variance by introducing a *method variance factor* in our model. This factor is operationalized as the first unrotated factor identified when conducting an explorative factor analysis of the items derived from the survey and included in the present study. The method variance factor "is assumed to contain the best approximation of common method variance" (Podsakoff et al., 2003, p. 893). Therefore, when it is added to the model, its effect is partialled out and it is possible to determine whether the relationships between the variables of interest are still significant.

5. Results and discussion

The summary of the descriptive statistics and correlations for all variables considered in the econometric exercise are presented in Table 1. No variables appear to suggest correlation problems.

– INSERT TABLE 1 ABOUT HERE –

The results of the linear regression estimations are reported in Table 2. As we observe more than one knowledge transfer for a set of subsidiaries, an issue of possible non-independence among the observations may arise (Greene, 2000). Therefore, we use the Stata's cluster option to rule out firm-level effects and obtain a robust variance estimate that adjusts for within-cluster correlation (Williams, 2000). In this way, we are able to control for the fact that observations (i.e., knowledge transfers) occurring within the same parent-subsidiary dyad may not be independent.

Five models are presented in Table 2. In Model 1, we enter the control variables and the independent variables. In Model 2, we insert the first interaction term; in Model 3, we insert the second interaction term; in Model 4 we run the full model to test our three hypotheses. In each of the four models, we check for possible collinearity problems by calculating the variance inflation factors (VIF). The highest VIF value is 1.91 and it refers to the equations estimated in Models 2 and 4. This result suggests that multicollinearity is not an issue. Model 5 shows our findings controlling for common method variance. When the method variance factor is added to the model, all of the significant correlations remain significant. Accordingly, we conclude that common method variance does not play an important role in our findings.

– INSERT TABLE 2 ABOUT HERE –

With respect to the control variables, the coefficient of the variable *R&D knowledge* is, not surprisingly, positive and statistically significant at $p<0.01$, suggesting that parent

companies perceive a greater benefit when they use R&D know-how transferred from their foreign subsidiaries than when they use other types of knowledge. Although less prominent, also marketing knowledge plays a role in explaining parent companies' benefits from RKT ($p<0.1$).

The effect of subsidiary age on parent company's benefit from RKT is very clear and consistent. In all of the estimated models the variable *subsidiary age* shows a positive and significant coefficient, which supports Hypothesis 1. Older subsidiaries are perceived as senders with a relative greater stock of knowledge and capabilities than younger subsidiaries. Accordingly, knowledge that is transferred from older subsidiaries and used by parent companies is perceived by the receiving units as more valuable. Within the MNEs context, the liability of newness argument prevails over the argument of the liability of aging.

However, as suggested by Hypothesis 2, the strength of the impact of subsidiary age on parent companies' benefits from RKT can vary depending on the entry mode. In Model 4, the coefficient of the interaction term *subsidiary age × acquisition-jv* is negative and significant at $p<0.05$, supporting Hypothesis 2. The effect of subsidiary age on parent companies' benefits from RKT is reduced for subsidiaries established through acquisitions and/or majority-owned joint ventures. Or, said it differently, subsidiary age is even more important for greenfiled subsidiaries. Acquired subsidiaries, and subsidiaries resulted from joint ventures have had time to develop network relations, flourish mutual trust with local partners through repeat experience and engage in an interactive learning process that have shaped their stock of knowledge and capabilities at the time of their establishment (Håkanson & Nobel, 2001). Greenfield subsidiaries are at disadvantage: they need to gain reputation and legitimacy in the host country environment before starting benefit from it, and this takes time (Frost, 2001).

In Model 4, the coefficient of the interaction term *subsidiary age × socialization mechanisms* is positive and significant at p<0.05. This finding is in line with our theoretical predictions and supports Hypothesis 3. In keeping with the time compression diseconomies argument (Dierickx & Cool, 1989), the limited use of socialization mechanisms may lower the beneficial effects of RKT from older subsidiaries, which have had more time to cultivate and earn trusting relationships, and share common goals and values, factors that are acknowledged as facilitating inter-unit resource exchange and combination (Tsai & Ghoshal, 1998) and shaping inter-unit strategic linkages (Tsai, 2000). In line with other studies on intra-MNE knowledge transfer (e.g. Ambos et al., 2006; Schulz, 2001; Yang et al., 2008), our estimations also confirm that the direct effect of the independent variable *socialization mechanisms* is positive and statistically significant (p<0.01).

6. Conclusions

The study makes a number of theoretical contributions. First, our findings suggest that organizational ecology theory has much to offer IB theory. In particular, based on the organizational ecology arguments, we proposed incorporating subsidiary age into theories of intra-MNE knowledge transfer, rather than relegating subsidiary age to the simple role of a control variable. Our claim is based on the idea that subsidiary age captures the accumulation of knowledge and capabilities through the intensity of host country experience, and plays an important conceptual role as predictor of RKT.

Second, the study contributes to the literature on intra-MNE knowledge transfer in general, and on RKT in particular. Specifically, this study examines the extent to which parent companies' innovative capacities improve when parents internalize and use knowledge transferred from foreign subsidiaries in their activities. Despite the fact that many studies have investigated the RKT phenomenon, its effects on the receiving unit have usually been implicitly believed to be beneficial. In this perspective, knowledge transfers are beneficial to

the extent that the transferred knowledge is used (Björkman et al., 2004; Minbaeva et al., 2003). However, Doz (2006) has challenged this perspective by arguing that knowledge transfer *per se* does not imply that the knowledge is beneficial for the recipient. Along this line, there are few works that explicitly show the impact of RKT on the receiving unit's capabilities and performance (Ambos et al., 2006; Iwasa & Odagiri, 2004; Yamin & Otto, 2004). These studies embrace the view that transfers and benefits need to be analyzed as two separate dimensions (Ambos et al., 2006; Subramaniam & Venkatraman, 2001). We contribute to this literature by highlighting that parent companies believe that their innovative skills and capabilities benefit from the use of knowledge transferred from foreign subsidiaries, and that this benefit increases with subsidiary age.

6.1 Managerial relevance

The study has several practical implications for managers. Extant research on time compression diseconomies (e.g., Dierickx & Cool, 1989) argues that firms' competitive advantages depend on the accumulation of stocks of distinctive resources, resources that display decreasing returns to the fixed factor time. In the context of intra-MNE knowledge transfers, this implies that both the accumulation of stocks of these distinctive resources and capabilities by the subsidiary, and the development of trusted and shared values in the parent-subsidiary communication relationship are time dependent and cannot be compressed into short periods. Therefore, older subsidiaries are, to some extent, the reservoir of these types of resources and capabilities, which are a central concern in resource-based theory. Over time they have built up organizational capabilities; knowledge about products, markets, technologies and institutional contexts; and networks of contacts with peers, corporate headquarters, local customers, suppliers and competitors. This stock of knowledge is strategic for MNE management, as it is not tradable and needs to be internally accumulated. Unlike knowledge flows, knowledge stocks cannot be adjusted instantaneously and it takes a

consistent pattern of resource flows to achieve a desired change in this strategic asset stock.

Therefore, for example, MNE managers need to be aware that "crash" R&D or marketing

programs are less effective than programs in which annual R&D/marketing expenditures are

lower but spread over longer periods.

Moreover, for greenfield subsidiaries aging is crucial in order to source from the local

context and become independent knowledge creators. This has important implications in

terms of the expected future pace of the pay-offs of the greenfield investment.

Similarly, our study highlights the significance of extra investments aimed at better

defining mutual relations within the parent-subsidiary dyad by structuring and sharing

communication rules and opportunities in order to temporarily reduce inefficiencies that can

arise when knowledge is transferred from younger subsidiaries.

6.2 Limitations and future research

Our study is characterized by several limitations. First of all, we regard age as a proxy for

subsidiary experience which is extensively used in extant IB literature and recognized in the

resource based tradition as a primary source of organizational learning. Nonetheless, we face

the objective limitation that we are unable to measure directly knowledge accumulation. It is

however, worth mentioning that we share such a limitation with the organizational ecology

literature on which we drawn upon to build our theoretical framework. Second, we only

sampled subsidiaries established by greenfield, acquisitions or majority-owned joint ventures.

Therefore, our sample limits our understanding of the effect of subsidiary age on the parent's

benefits from RKT when other ownership status are considered. Moreover, since we sampled

only subsidiaries fully controlled by their parent companies, our data fail to account for

situations in which parent's participation in a foreign subsidiary has increased gradually, such

as through minority-owned joint ventures. Through incremental foreign expansion, parent

companies and subsidiaries have had the opportunity to know each other and knowledge

transfer's barriers may be reduced over time. We only partially controlled for this more favorable condition by including in our empirical specifications a variable capturing whether previous links existed between the parent company and subsidiaries established by acquisitions or majority-owned joint venture. In addition, the cross-sectional nature of our data prevent us from dealing with reverse causality issues concerning for example the relationships between benefits from RKT and the use of socialization mechanisms. A limit we share with extant research on RKT determinants. A further limitation of the study lies in the nationality of the MNEs, all of which are Italian. In these MNEs, management culture and knowledge management practices may be expected to be relatively more hierarchical and less collegially oriented than MNEs based in the US or northern Europe. Finally the majority of the MNEs analyzed in this study are small firms compared to the MNEs that are traditionally considered in the literature. On the one hand, this peculiarity makes a direct comparison with previous findings more difficult. On the other hand, focusing on a population of small/medium MNEs creates a possibility to examine knowledge transfers within parent-subsidiary dyads in more detail than would be possible for large, complex organizations. Despite these limitations, we believe that our analysis may provide suggestions for future research on intra-MNE knowledge sharing. In particular, our study suggests that subsidiary age is important in terms of vertical knowledge inflows. Our analysis could be replicated in the contexts of different types of intra-firm knowledge transfer, such as lateral transfers from subsidiaries to sister units (e.g. Gupta & Govindarajan, 2000; Noorderhaven & Harzing, 2009). The question of whether the underlying mechanisms explaining and driving these effects in our study also apply to lateral knowledge flows remains open. On the grounds of our results, future research should also aim to revisit the analysis of RKT in MNEs to account for the moderating effect of unit age on other well-recognized drivers.

References

Ambos, B., & Schlegelmilch, B. B. (2004). The use of international R&D teams: an empirical investigation of selected contingency factors. *Journal of World Business, 39*, 37-48.

Ambos, B., & Schlegelmilch, B. B. (2007). Innovation and control in the multinational firm: a comparison of political and contingency approaches. *Strategic Management Journal, 28*, 473-486.

Ambos, T. C., & Ambos, B. (2009). The impact of distance on knowledge transfer effectiveness in multinational corporations. *Journal of International Management, 15*, 1-14.

Ambos, T. C., Ambos, B., & Schlegelmilch, B. B. (2006). Learning from foreign subsidiaries: an empirical investigation of headquarters' benefit from reverse knowledge transfers. *International Business Review, 15*, 294-312.

Andersson, U., Forsgren, M., & Holm, U. (2002). The strategic impact of external networks: subsidiary performance and competence development in the multinational corporation. *Strategic Management Journal, 23*, 979-996.

Autio, E., Sapienza, H. J., & Almeida, J. G. (2000). Effects of age at entry, knowledge intensity, and imitability on international growth. *Academy of Management Journal, 43*, 909-924.

Bain, A. (1998). Social defenses against organizational learning. *Human Relations, 51*, 413-429.

Barkema, H. G., & Vermeulen, F. (1998). International expansion through start-up or acquisition: a learning perspective. *Academy of Management Journal, 41*, 7-26.

Barnett, W. R. (1990). The organizational ecology of a technological system. *Administrative Science Quarterly, 35*, 31-60.

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management, 17*, 99-120.

Baron, R. A., & Markman, G. D. (2003). Beyond social capital: the role of entrepreneurs' social competence in their financial success. *Journal of Business Venturing, 18*, 41-60.

Barron, D. N., West, E., & Hannan, M. T. (1994). A time to grow and a time to die: Growth and mortality of credit unions in New York City, 1914-1990. *American Journal of Sociology, 100*, 381-421.

Bartlett, C. A., & Ghoshal, S. (1989). *Managing across borders: the transnational solution*. Boston: Harvard Business School Press.

Benito, G. R. G., & Gripsrud, G. (1992). The expansion of foreign direct investments: discrete rational location choices or a cultural learning process? *Journal of International Business Studies, 23*, 461-476.

Birkinshaw, J., & Hood, N. (1998). Multinational subsidiary evolution: Capability and charter change in foreign-owned subsidiary companies. *Academy of Management Review, 23*, 773-795.

Birkinshaw, J., Hood, N., & Jonsson, S. (1998). Building firm-specific advantages in multinational corporations: the role of subsidiary initiative. *Strategic Management Journal, 19*, 221-241.

Birkinshaw, J., Nobel, R., & Ridderstrale, J. (2002). Knowledge as a contingency variable: Do the characteristics of knowledge predict organization structure? *Organization Science, 13*, 274-289.

Björkman, I., Barner-Rasmussen, W., & Li, L. (2004). Managing knowledge transfer in MNCs: the impact of headquarters control mechanisms. *Journal of International Business Studies, 35*, 443-455.

Bouquet, C., & Birkinshaw, J. (2008). Weight versus voice: how foreign subsidiaries gain attention from corporate headquarters. *Academy of Management Journal, 51*, 577-601.

Buckley, P. J., Clegg, J., & Tan, H. (2003). The art of knowledge transfer: secondary and reverse transfer in China's telecommunications manufacturing industry. *Management International Review, 43*, 67-94.

Cantwell, J. A., & Mudambi, R. (2005). MNE competence-creating subsidiary mandates. *Strategic Management Journal, 26*, 1109-1128.

Casillas, J. C., Acedo, F. J., & Barbero, J. L. (2010). Learning, unlearning and internationalisation: Evidence from the pre-export phase. *International Journal of Information Management, 30*, 162-173.

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective of Learning and Innovation. *Administrative Science Quarterly, 35*, 128-152.

Coleman, J. S. (1988). Social capital in the creation of human capital. *American Journal of Sociology, 94*, S95-S120.

Datta, D. K. (1991). Organizational fit and acquisition performance: Effects of post-acquisitions integration. *Strategic Management Journal, 12*, 281-297.

Dhanaraj, C., Lyles, M. A., Steensma, K. H., & Tihanyi, L. (2004). Managing tacit and explicit knowledge transfer in IJVs: the role of relational embeddedness and the impact on performance. *Journal of International Business Studies, 35*, 428-442.

Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science, 35*, 1504-1511.

Doz, Y. L. (2006). Knowledge Creation, Knowledge Sharing and Organizational Structures and Processes in MNCs (A Commentary on Foss N. "Knowledge and Organization in the Theory of MNC). *Journal of Management Governance, 10*, 29-33.

Dunning, J. H. (1977). Trade, location of economic activity and the MNE: a search for an eclectic approach. In B. Ohlin, P. O. Hesselborn & P. M. Wijkman (Eds.), *The international allocation of economic activity* (pp. 395-418). London: Macmillan.

Dyer, J. H., & Singh, H. (1998). The relational view: Cooperative strategy and sources of interorganizational competitive advantage. *Academy of Management Review, 23*, 660-679.

Eden, L. (2009). Letter from Editor-in-Chief: Reverse knowledge transfers, culture clashes and going international. *Journal of International Business Studies, 40*, 177-180.

Erramilli, M. K. (1991a). The Experience Factor in Foreign Market Entry Behavior of Service Firms. *Journal of International Business Studies, 22*, 479-502.

Erramilli, M. K. (1991b). The Experience Factor in Foreign Market Entry Behavior of Service Firms. *Journal of International Business Studies, 22*, 479-502.

Foss, N. J., & Pedersen, T. (2002). Transferring knowledge in MNCs: the role of sources of subsidiary knowledge and organization context. *Journal of International Management, 8*, 49-67.

Frost, T. (2001). The geographic sources of foreign subsidiaries' innovations. *Strategic Management Journal, 22*, 101-123.

Frost, T. S., & Zhou, C. (2005). R&D co-practice and 'reverse' knowledge integration in multinational firms. *Journal of International Business Studies, 36*, 676-687.

Galbraith, C. S. (1990). Transferring core manufacturing technologies in high technology firms. *California Management Review, 32*, 56-70.

Ghoshal, S. (1986). *The innovative multinational: a differentiated network of organizational roles and management processes.* Unpublished Ph.D Dissertation, Harvard Business School, Boston.

Ghoshal, S., & Bartlett, C. A. (1990). The multinational corporation as an interorganizational network. *Academy of Management Review, 15*, 603-625.

Ghoshal, S., Korine, H., & Szulanski, G. (1994). Interunit communication in multinational corporations. *Management Science, 40*, 96-110.

Grannovetter, M. (1985). Economic action and social structure: the problem of embeddedness. *American Journal of Sociology, 91*, 481-510.

Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal, 17*, 109-122.

Greene, W. H. (2000). *Econometric analysis* (IV ed.). Upple Saddle River, New Jersey: Prentice-Hall, Inc.

Gulati, R. (1995). Does familiarity breed trust? The implications of repeated ties for contractual choices. *Academy of Management Journal, 35*, 85-112.

Gupta, A. K., & Govindarajan, V. (1991). Knowledge flows and the structure of control within multinational corporations. *Academy of Management Review, 16*, 768-792.

Gupta, A. K., & Govindarajan, V. (2000). Knowledge flows within multinational corporations. *Strategic Management Journal, 21* 473-496.

Haas, M. R., & Hansen, M. T. (2005). When using knowledge can hurt performance: the value of organizational capabilities in a management consulting company. *Strategic Management Journal, 26*, 1-24.

Håkanson, L., & Nobel, R. (2000). Technology characteristics and reverse technology transfer. *Management International Review, 40*, 29-48.

Håkanson, L., & Nobel, R. (2001). Organization characteristics and reverse technology transfer. *Management International Review, 41*, 392-420.

Hannan, M. T., & Freeman, J. (1984). Structural inertia and organizational change. *American Journal of Sociology, 49*, 149-164.

Harrison, D. A., Price, K. H., Gavin, J. H., & Florey, A. T. (2002). Time, teams, and task performance: Changing effects of surface- and deep-level diversity on group functioning. *Academy of Management Journal, 45*, 1029-1045.

Haspeslagh, P. C., & Jemison, D. B. (1991). *Managing Acquisitions*. New York: Free Press.

Hunt, J. W. (1990). Changing pattern of acquisition behaviour in takeovers and the consequences for acquisition processes. *Strategic Management Journal, 11*, 69-77.

Iwasa, T., & Odagiri, H. (2004). Overseas R&D, knowledge sourcing, and patenting: an empirical studies of Japanese R&D investment in the US. *Research Policy, 33*, 807-828.

Johanson, J., & Vahlne, J. E. (1977). The internationalization process of the firm: a model of knowledge development and increasing foreign market commitments. *Journal of International Business Studies, 8*, 23-32.

Kogut, B., & Singh, H. (1988). The effect of national culture on the choice of entry mode. *Journal of International Business Studies, 19*, 411-432.

Kogut, B., & Zander, U. (1992). Knowledge of the firm, combinative capabilities, and the replication of technology. *Organization Science, 3*, 383-397.

Kogut, B., & Zander, U. (1993). Knowledge of the Firm and the Evolutionary-Theory of the Multinational-Corporation. *Journal of International Business Studies, 24*, 625-645.

Krackhardt, D. (1990). Assessing the Political Landscape: Structure, Cognition, and Power in Organizations. *Administrative Science Quarterly, 35*, 342-369.

Lane, P. J., & Lubatkin, M. (1998). Relative Absorptive Capacity and Interorganizational Learning. *Strategic Management Journal, 19*, 461-477.

Lane, P. J., Salk, J. E., & Lyles, M. A. (2001). Absorptive capacity, learning, and performance in international joint ventures. *Strategic Management Journal, 22*, 1139-1161.

Larsson, R., & Finkelstein, S. (1999). Integrating Strategic, Organizational, and Human Resource Perspectives on Mergers and Acquisitions: A Case Survey of Synergy Realization. *Organizational Science, 10*, 1-26.

Lavie, D., & Rosenkopf, L. (2006). Balancing exploraion and exploitation in alliance formation. *Academy of Management Journal, 49*, 797-818.

Leonard-Barton, D. (1992). Core capabilities and core rigidities: A paradox in managing new product development. *Strategic Management Journal, 13*, 111-125.

Li, L. (2005). The effects of trust and shared vision on inward knowledge transfer in subsidiaries' intra- and inter-organizational relationships. *International Business Review, 14*, 77-95.

Lord, M. D., & Ranft, A. L. (2000). Organizational learning about new international markets: exploring the internal transfer of local market knowledge. *Journal of International Business Studies, 31*, 573-589.

Luo, Y., & Peng, M. W. (1999). Learning to compete in a transition economy: experience, environment, and performance. *Journal of International Business Studies, 30*, 269-296.

Makino, S., & Delios, A. (1996). Local knowledge transfer and performance implications for alliance formation in Asia. *Journal of International Business Studies, 27*, 905-927.

March, J. G. (1991). Exploration and Exploitation in Organizational Learning. *Organization Science, 2*, 71-87.

McEvily, B., Perrone, V., & Zaheer, A. (2003). Trust as an organizing principle. *Organization Science, 14*, 91-103.

Minbaeva, D. B., Pedersen, T., Björkman, I., Fey, C., & Park, H. (2003). MNC Knowledge Transfer, Subsidiary Absorptive Capacity, and HRM. *Journal of International Business Studies, 34*, 586-599.

Monteiro, F. L., Arvidsson, N., & Birkinshaw, J. (2008). Knowledge flows within multinational corporations: Explaining subsidiary isolation and its performance implications. *Organization Science, 19*, 90-107.

Mudambi, R. (1998). The Role of Duration in Multinational Investment Strategies. *Journal of International Business Studies, 29*, 239-261.

Mudambi, R., & Navarra, P. (2004). Is knowledge power? Knowledge flows, subsidiary power and rent-seeking within MNCs. *Journal of International Business Studies, 35*, 385-406.

Nelson, R., & Winter, S. (1982). *An evolutionary theory of economic change*. Cambridge, MA: Harvard University Press.

Nobel, R., & Birkinshaw, J. (1998). Innovation in multinational corporations: control and communication patterns in international R&D operations. *Strategic Management Journal, 19*, 479-496.

Nonaka, I., & Takeuchi, H. (1995). *The Knowledge-Creating Company*. Oxford: Oxford University Press.

Noorderhaven, N., & Harzing, A.-W. (2009). Knowledge-sharing and social interaction within MNEs. *Journal of International Business Studies, 40*, 719-741.

Pavitt, K. L. R. (1984). Sectoral patterns of technical change: towards a taxonomy and a theory. *Research Policy, 13*, 343-373.

Pavitt, K. L. R. (1990). What we know about the strategic management of technology. *California Management Review, 32*, 17-26.

Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2003). Common method bias in behavioral research: a critical review of the literature and recommended remedies. *Journal of Applied Psychology, 88*, 879-903.

Podsakoff, P. M., & Organ, D. W. (1986). Self-reports in organizational research: problems and prospects. *Journal of Management, 12*, 531-544.

Prahalad, C. K., & Hamel, G. (1990). The Core Competence of the Corporation. *Harvard Business Review, 68*, 76-91.

Rabbiosi, L. (2011). Subsidiary Roles and Reverse Knowledge Transfer: An Investigation of the Effects of Coordination Mechanisms. *Journal of International Management, 17*, 97-113.

Ranger-Moore, J. (1997). Bigger may be better, but is older wiser? Organizational age and size in the New York life insurance industry. *American Sociological Review, 62*, 903-921.

Rothwell, R. (1978). Some problems of technology transfer into industry: examples from the textile machinery sector. *IEEE Transactions on Engineering Management, EM-25*, 15-20.

Santangelo, G. D. (2011). The tension of information sharing: The effect on subsidiary embeddedness. *International Business Review, forthcoming*.

Schulz, M. (2001). The uncertain relevance of newness: organizational learning and knowledge flows. *Academy of Management Journal, 44*, 661-681.

Schweiger, D. M., Ivancevich, J. M., & Power, F. R. (1987). Executive actions for managing human resources before and after acquisition. *Academy of Management Executive, 1*, 127-138.

Singh, J. (2005). Collaborative networks as determinants of knowledge diffusion patterns. *Management Science, 51*, 756-770.

Singh, J. V., Tucker, D. J., & House, R. J. (1986). Organizational Legitimacy and the Liability of Newness. *Administrative Science Quarterly, 31*, 171-193.

Sinkula, J. M. (1994). Market information processing and organizational learning. *Journal of Marketing, 58*, 35-45.

Smith, K. W., & Sasaki, M. S. (1979). Decreasing multicollinearity. *Sociological Methods & Research, 8*, 35-56.

Sørensen, J. B., & Stuart, T. E. (2000). Aging, Obsolescence, and Organizational Innovation. *Administrative Science Quarterly, 45*, 81-112.

Stinchcombe, A. L. (1965). Social structure and organizations. In J. March (Ed.), *Handbook of Organizations*. Chicago: Rand McNally.

Subramaniam, M., & Venkatraman, V. N. (2001). Determinants of transnational new product development capability: testing the influence of transferring and deploying tacit knowledge. *Strategic Management Journal, 22*, 359-378.

Sunaoshi, Y., Kotabe, M., & Murray, J. Y. (2005). How technology transfer really occurs on the factory floor: a case of a major Japanese automotive die manufacturer in the United States. *Journal of World Business, 40*, 57-70.

Szulanski, G. (1996). Exploring internal stickiness: impediments to the transfer of best practice within the firm. *Strategic Management Journal, 17*, 27-43.

Tsai, W. (2000). Social capital, strategic relatedness and the formation of intra-organizational linkages. *Strategic Management Journal, 21*, 925-939.

Tsai, W. (2001). Knowledge transfer in interorganizational networks: effects of network position and absorptive capacity on business unit innovation and performance. *Academy of Management Journal, 44*, 996-1004.

Tsai, W., & Ghoshal, S. (1998). Social capital and value creation: the role of intrafirm networks. *Academy of Management Journal, 41*, 462-476.

Tuckman, B. W. (1965). Developmental sequence in small groups. *Psychological Bulletin, 63*, 384-399.

Tushman, M. L., & Anderson, P. (1986). Technological discontinuities and organizational environments. *Administrative Science Quarterly, 31*, 439-465.

Vernon, R. (1966). International investment and international trade in the product cycle. *Quarterly Journal of Economics, 80*, 190-207.

Williams, R. (2000). A note on robust variance estimation for cluster-correlated data. *Biometrics, 56*, 645-646.

Wilson, J. M., Straus, S. G., & McEvily, B. (2006). All in due time: The development of trust in computer-mediated and face-to-face teams. *Organizational Behavior and Human Decision Processes, 99*, 16-33.

Yamin, M., & Otto, J. (2004). Patterns of knowledge flows and MNE innovative performance. *Journal of International Management, 10*, 239-258.

Yang, Q., Mudambi, R., & Meyer, K. (2008). Conventional and reverse knowledge flows in multinational corporations. *Journal of Management, 34*, 882-902.

Zhou, K. Z., & Wu, F. (2010). Technological capability, strategic flexibility, and product innovation. *Strategic Management Journal, 31*, 547-561.

Table 1 – Descriptive statistics

	Variable	Mean	S.D.	Min	Max	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
(1)	Parent's benefits from RKT	0.00	1.00	-0.78	2.91																
(2)	Marketing/sales knowledge	0.29	0.46	0.00	1.00	-0.32															
(3)	R&D knowledge	0.40	0.49	0.00	1.00	0.69	-0.52														
(4)	Knowledge specificity	5.08	1.76	1.00	7.00	-0.09	0.07	-0.14													
(5)	Knowledge sourcing	0.02	0.09	0.00	0.70	0.21	-0.03	0.11	0.04												
(6)	Contributor	0.22	0.42	0.00	1.00	-0.12	-0.19	-0.16	-0.18	-0.15											
(7)	Innovator	0.35	0.48	0.00	1.00	0.19	0.04	0.14	-0.21	0.35	-0.39										
(8)	Relative size	-1.54	1.13	-4.42	2.02	-0.05	-0.08	-0.11	-0.14	0.02	0.09	0.14									
(9)	Subsidiary autonomy	2.36	0.71	1.00	5.00	0.06	0.07	0.11	-0.03	0.09	-0.22	0.29	0.12								
(10)	Organizational distance	2.68	1.80	1.00	7.00	0.03	-0.07	-0.04	-0.38	-0.01	0.14	0.40	0.24	-0.01							
(11)	Technological distance	3.63	1.21	1.00	7.00	0.16	-0.16	0.19	-0.25	-0.01	-0.11	-0.15	-0.09	-0.06	0.22						
(12)	Cultural distance	1.16	0.96	0.00	2.96	0.11	0.08	0.14	0.24	0.01	-0.11	-0.28	-0.39	-0.11	-0.41	0.19					
(13)	Previous links	0.08	0.28	0.00	1.00	-0.03	-0.03	-0.04	0.03	0.07	0.14	0.09	0.03	-0.08	0.04	-0.18	0.05				
(14)	High-tech	0.28	0.45	0.00	1.00	0.27	-0.13	0.24	-0.40	0.31	0.00	0.50	0.01	0.11	0.31	0.11	-0.15	0.14			
(15)	Subsidiary age	10.03	5.90	2.00	31.00	-0.01	0.16	-0.11	-0.10	-0.10	0.08	0.01	0.02	-0.01	0.02	-0.24	-0.27	-0.16	0.02		
(16)	Acquisition-jv	0.54	0.50	0.00	1.00	0.10	-0.09	0.15	-0.10	0.20	-0.01	0.44	0.32	0.07	0.35	-0.13	-0.30	0.27	0.30	-0.09	
(17)	Person-based communication	0.00	1.00	-2.99	1.37	0.14	-0.06	-0.01	0.47	0.14	-0.21	0.02	0.05	0.10	-0.16	-0.02	0.18	0.16	-0.21	0.16	-0.28

Table 2 – Regression analysis of parent's benefits from RKT

	Model 1		Model 2	Model 3	Model 4	Model 5
Constant	-0.98	(0.64)	-1.05 (0.62)*	-1.08 (0.65)*	-1.18 (0.63)*	-4.45 (2.54)*
Marketing/sales knowledge	0.23	(0.13)*	0.24 (0.13)*	0.23 (0.13)*	0.23 (0.12)*	0.19 (0.12)
R&D knowledge	1.41	(0.15)***	1.42 (0.15)***	1.39 (0.15)***	1.39 (0.15)***	1.53 (0.19)***
Knowledge specificity	0.01	(0.04)	0.00 (0.05)	0.01 (0.04)	0.00 (0.05)	0.00 (0.05)
Knowledge sourcing	0.79	(0.71)	0.78 (0.69)	0.81 (0.76)	0.80 (0.74)	1.06 (0.79)
Contributor	0.27	(0.17)	0.27 (0.18)	0.31 (0.19)	0.31 (0.19)	0.38 (0.21)*
Innovator	0.22	(0.22)	0.20 (0.21)	0.29 (0.23)	0.27 (0.21)	0.77 (0.46)
Relative size	0.05	(0.05)	0.01 (0.06)	0.03 (0.05)	-0.02 (0.06)	-0.04 (0.06)
Subsidiary autonomy	-0.09	(0.11)	-0.10 (0.11)	-0.10 (0.11)	-0.11 (0.11)	1.09 (0.87)
Organizational distance	0.03	(0.05)	0.03 (0.05)	0.02 (0.05)	0.03 (0.05)	0.05 (0.05)
Technological distance	0.04	(0.08)	0.01 (0.08)	0.05 (0.08)	0.02 (0.08)	0.03 (0.09)
Cultural distance	0.04	(0.06)	0.05 (0.06)	0.04 (0.06)	0.05 (0.06)	0.06 (0.06)
Previous links	-0.11	(0.33)	-0.20 (0.33)	-0.11 (0.33)	-0.21 (0.33)	-0.21 (0.31)
High-tech	0.24	(0.20)	0.17 (0.19)	0.23 (0.20)	0.15 (0.19)	0.17 (0.19)
Subsidiary age	0.02	(0.01)*	0.04 (0.01)***	0.02 (0.01)**	0.04 (0.01)***	0.04 (0.01)***
Acquisition-jv	-0.24	(0.16)	-0.19 (0.14)	-0.23 (0.15)	-0.17 (0.13)	-0.07 (0.15)
Socialization mechanisms	0.23	(0.07)***	0.22 (0.06)***	0.20 (0.06)***	0.19 (0.06)***	0.24 (0.07)***
Subsidiary age[a]×acquisition-jv			-0.04 (0.02)*		-0.04 (0.02)**	-0.04 (0.02)*
Subsidiary age[a]×socialization mechanisms				0.02 (0.01)*	0.02 (0.01)**	0.02 (0.01)*
Method variance factor						-1.06 (0.76)
F-test	14.05***		12.94***	13.16***	13.05***	14.47***
R^2	0.575		0.587	0.625	0.617	0.611

[a] The variable has been centered around its mean value in order to avoid high correlations between the interaction term and the variable *subsidiary age* (Haas & Hansen, 2005; Smith & Sasaki, 1979).

Robust standard errors corrected for heteroscedasticity and cluster-correlated data are reported in brackets.

* $p < .10$; ** $p < .05$; *** $p < .01$ (two-tailed tests applied).