Knowledge Flows Within Multinational Corporations: Explaining Subsidiary Isolation and Its Performance Implications

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Applying a new theoretical and empirical approach to intrafirm knowledge transfers, this paper provides some initial insight to the little-researched phenomenon of why some subsidiaries are isolated from knowledge-transfer activities within the multinational corporation (MNC). Knowledge transfer is framed as a problemistic search process initiated by the recipient unit. We show that knowledge flows *from* units that are perceived to be highly capable *to* units that perceive themselves to be highly capable. Knowledge flows are also associated with existing levels of communication and reciprocity. Taken together, these findings suggest that knowledge transfers in MNCs typically occur between highly capable members of an "in crowd," and the isolated minority rarely, if ever, engages in knowledge-sharing activities. Finally, we show that the isolated minority underperforms other subsidiaries, suggesting the possibility of a "liability of internal isolation."

Key words: knowledge flows; multinational management; subsidiary performance; subsidiary isolation; perception gaps; behavioral theory of the firm

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Over the last several years, there has been widespread interest among scholars in the importance of knowledge management in organizations and, particularly, in multinational corporations (MNCs) (e.g., Eisenhardt and Santos 2002; Ghoshal and Bartlett 1988; Gupta and Govindarajan 2000; Schulz 2001, 2003; Szulanski 1996; Zander and Kogut 1995). The idea that MNCs create value from the internalization of their accumulated knowledge and from their knowledge "assets" (e.g., patents, trade secrets, and organizational routines) can be traced back to the pioneering work of Hymer (1960), Caves (1971), and Buckley and Casson (1976) among others. Today there is a broad consensus that an MNC is "an international network that creates, accesses, integrates and applies knowledge in multiple locations" (Almeida et al. 2002, p. 148). To respond effectively to its environmental heterogeneity, the MNC must differentiate the activities of its subsidiaries, but it must also integrate them (Ghoshal and Nohria 1989). As Schulz (2003) puts it, the integration of the knowledge of the MNC on a worldwide basis, although difficult, is what enables MNCs to reap the "incremental value of being multinational" (Kogut 1989a, p. 383).

The reality, however, is that knowledge integration within the MNC is far from perfect. There is ample evidence in the literature that knowledge is "sticky" and that leading-edge management practices do not flow rapidly and uneventfully from country to country (e.g., Chew et al. 1990; Leibenstein 1966; Szulanski 1995, 1996; Teece 1981). Prior research has examined the difficulties of transferring tacit and complex knowledge within the organization (e.g., Szulankski 1996, Zander and Kogut 1995), the importance of motivation and absorptive capacity for transferring knowledge (e.g., Gupta and Govindarajan 2000), and the relevance of central network positions in intraorganizational knowledge transfers (e.g., Tsai 2001).

An equally important but underexplored phenomenon is the tendency for some subsidiaries to be isolated from the knowledge-transfer activities within the MNC. Previous research (e.g., Gupta and Govindarajan 2000, Hansen and Lovas 2004) has implicitly indicated the existence of subsidiaries that are isolated from intrafirm inflows and outflows of knowledge. And our data, as described later, reveal the magnitude of this phenomenon: In our sample of 171 subsidiary units, 22% experienced inflows of new products or practices from

the MNC's headquarters (HQ) less than once per year, 42% participated in outflows of new products or practices less than once per year, and 13% experienced neither inflows nor outflows more than once per year. These isolated subsidiaries may well be underperforming in their local markets if they do not have access to the broader knowledge base of the MNC, and their existence may also be symptomatic of a more fundamental problem of knowledge sharing in the corporation.

However, there is practically no attempt to explain theoretically or empirically the reasons some subsidiaries are isolated from the knowledge-transfer activities within the MNC *or* the impact of internal isolation on subsidiary performance. Instead, most of the existing literature tends to focus on identifying the barriers and facilitators of knowledge transfers from the perspective of those subsidiaries that are already involved in knowledge-transfer activities—colloquially known as the "in crowd"—and disregards the group of subsidiaries that is simply isolated from any knowledge-transfer activity within the MNC. For instance, the very way Szulanski (1996) designed his research ensured that it took into account only those units that were already involved with a best-practice transfer. Even those studies (Gupta and Govindarajan 1991, 1994) that explicitly indicate that some subsidiaries (e.g., "local innovators") may not participate in the knowledge-sharing activities within an MNC fail to investigate the performance consequences of subsidiary isolation for the "isolated" subsidiaries (i.e., those that experience few, if any, intrafirm knowledge outflows or inflows).

We believe that it is important to advance the literature on intrafirm knowledge transfers by investigating the isolated subsidiary phenomenon and its performance consequences. Two questions guide our research. First, what explains the pattern of knowledge flows that give rise to subsidiary isolation? Second, what is the impact of subsidiary isolation on subsidiary performance?

Unlike Gupta and Govindarajan (2000), who used communication theory (p. 475), we address our first question by developing a demand-driven model of knowledge flow that builds on the behavioral theory of the firm (Cyert and March 1963). And unlike Gupta and Govindarajan (2000), who focused on the transmission of knowledge between sender and recipient, our relative emphasis is on the initiation of that process (Szulanski 1996, 2000). We focus on the recipients of knowledge flows as they engage in a process of problemistic search within the context of an MNC in which there is very limited awareness of where its useful knowledge resides. This framing suggests that the subjective evaluation of a subsidiary's capabilities by itself and by others drives the knowledge-flow process. As we will describe in detail, knowledge outflows are predicted by other units evaluating the focal subsidiary highly, whereas inflows are predicted by the focal subsidiary evaluating itself highly. Those units that are evaluated poorly by both themselves

and by others are likely to become isolated. We also suggest that the level of communication and the existence of reciprocity between units will further strengthen these patterns of knowledge flow, thereby exacerbating the phenomenon of subsidiary isolation. This pattern may result in some subsidiaries finding themselves in self-reinforcing spirals of knowledge sharing with others, while the self-reinforcing cycle is a downward spiral for the isolated subsidiaries that neither send nor receive knowledge flows.

Equally important in this paper is the examination of the performance of isolated subsidiaries vis-à-vis that of subsidiaries that participate in the knowledge-transfer activities within the MNC. We will argue that subsidiaries that are alienated from the knowledge-transfer activities within the firm not only fail to benefit from the specific knowledge of other units within the MNC (e.g., new products developed by another subsidiary), but they also end up not participating in an information network that is a vehicle for the rapid communication of news about opportunities and obstacles. We conjecture that, similar to the idea of liability of (external) unconnectedness (Powell et al. 1996), there is a liability of internal isolation, and we hypothesize that, all other things being equal, the isolated subsidiaries have a lower performance than those subsidiaries that regularly receive and send knowledge within the MNC.

In the body of the paper, we conduct an empirical test of these arguments, using nodal data, that focuses on the perceived capabilities, knowledge flows, and performance of subsidiary units. We should also note at this stage that we focus on one specific type of knowledge: marketing knowledge—know-how about new products, new services, and marketing best practices. Knowledge inflows are therefore the aggregate volume of know-how about new products, new services, and marketing best practices received either from other subsidiaries (horizontal inflows) or from the MNC HQ (vertical inflows) by the focal subsidiary; and knowledge outflows are the aggregate volume of know-how about new products, new services, and marketing best practices transmitted from the focal subsidiary to other subsidiaries (horizontal outflows) or to the HQ (vertical outflows).

Our data set consists of responses to questionnaires from the managers of 171 subsidiaries belonging to 6 large Swedish multinationals (Sandvik Steel, Coromant, Ericsson, Volvo, Pharmacia, and Alfa Laval Agri) plus evaluations of those same subsidiaries by their corporate HQ and their peers. We receive broad support for the arguments. In the final section of the paper, we discuss the implications of our findings for both theory and practice.

Theoretical Development and Hypotheses
What is the nature of knowledge flows in an MNC where knowledge is dispersed, sticky, and imperfectly evaluated? In this section, we develop a set of theoretical

arguments based on the behavioral theory of the firm (Cyert and March 1963) that leads to the development of specific hypotheses regarding the conditions under which we would expect to see knowledge flows into and out of the focal subsidiary.

Problemistic Search and Perception Gaps

The behavioral theory of the firm is rooted in the pioneering work of Herbert Simon and James March (March and Simon 1958, Simon 1947) and was formally introduced in Cyert and March's (1963) book *Behavioral Theory of the Firm*. The principles of this theory are now applied broadly in the organizational literature in such subfields as organizational learning, decision theory, and the internationalization of the firm (Johanson and Vahlne 1977). In this paper, we build on assumptions that managers are boundedly rational (i.e., they have significant cognitive limitations) and that they satisfice (i.e., they seek out an acceptable solution to a problem rather than an optimal one). We then focus on the process of *problemistic search*, that is, "search that is stimulated by a problem and is directed toward finding a solution to that problem" (Cyert and March 1963, p. 121). Problemistic search is assumed to be (1) *motivated* by a particular problem such as a failure to satisfy one of its goals; (2) *simple-minded*, meaning that it proceeds on the basis of a simple model of causality unless driven to a more complex one; and (3) *biased*, meaning that the search process is steered by the prior experiences and goals of the managers driving it (Cyert and March 1963, p. 121).

Consider these arguments now in the context of the MNC. We suggest that *knowledge transfer between units can be framed as a process of problemistic search on the part of the recipient*. Knowledge transfers, by definition, involve both a source and a recipient, but by framing the discussion in this way we are suggesting that a primary driver of the process is the perceptions of the recipient. Several academic studies, for example, have shown that attributes of the recipient are significantly associated with the level of knowledge flows (Gupta and Govindarajan 2000, Szulanski 1995) and others have explicitly focused on the recipients' search process (Hansen and Haas 2001). The broader literature on knowledge management has emphasized the value of a demand-driven approach to knowledge transfer (Stewart 1998, Davenport and Prusak 1998), and problem-driven search is also emphasized in the innovation literature (Adner and Levinthal 2001, Dosi 1988, Schmookler 1965). By framing our research this way, we are not in any way denying the importance of a motivated knowledge source or a well-managed process for achieving effective knowledge transfer (Szulanski 1995). Rather, we are simply suggesting that by better understanding the process of search the recipient pursues, we can generate useful insights into the patterns of knowledge flow we observe in reality.
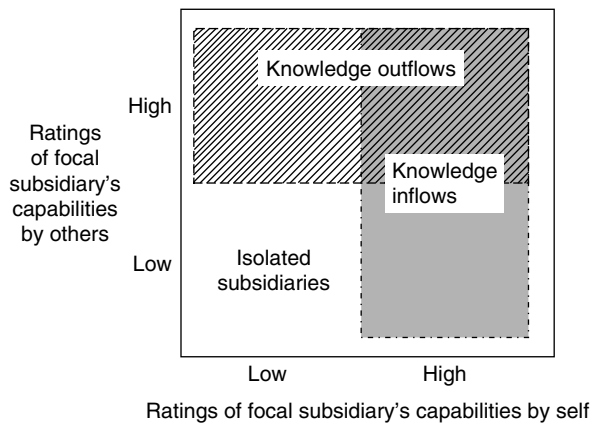
A knowledge flow in the MNC is therefore viewed as being motivated in large part by a specific problem that is facing a specific unit, such as a failure to meet profitability or productivity goals.[1] When faced with such a problem, the managers of the unit begin to search for a solution and, as predicted by the behavioral theory of the firm, their search proceeds in a "simple-minded" and "biased" way (Cyert and March 1963, p. 121). That is, they search on the basis of simple heuristics and typically through existing and easily available solutions rather than through an exhaustive evaluation of all possible solutions. Once an acceptable solution has been found, perhaps through a knowledge transfer with another unit of the MNC or an external relationship, the search process stops.

We argue that to understand subsidiary isolation we need to focus on the initiation stage of a knowledge transfer—i.e., the stage that comprises all events that lead to the decision to transfer (Szulanski 1996, p. 28)—and examine the heuristics that managers are likely to use to evaluate whether to engage in a process of internal knowledge transfer. We expect that an important determinant will be the perceptions (on the part of the potential recipients) of the whereabouts of valuable capabilities within the MNC. These perceptions may or may not be based on solid foundations, but from a problemistic search perspective they are likely to provide sufficient information for the managers in question to act.

However, as noted in the introduction, there is now considerable evidence that the evaluation of capabilities in the MNC is highly imperfect. Knowledge assets, by their nature, are hard to evaluate and are rarely given explicit attention (Galunic and Rodan 1998, Szulanski 1996). When combined with the sticky and dispersed nature of knowledge in the MNC, the result is often considerable disagreement between subsidiary units and between the subsidiary and HQ as to where valuable capabilities reside. For example, in the most comprehensive study of this subject to date, Denrell et al. (2004) found that the median correlation between the subsidiary's self-evaluation of its capabilities and the corresponding evaluation by HQ was just 0.28. Similarly weak levels of agreement have been found in other MNC studies (Birkinshaw et al. 2000) as well as in the analogous literature on supervisor/subordinate performance evaluations (Bommer et al. 1995, Harris and Schaubroek 1988).

We can expect, in other words, to see large differences in the evaluation of a focal subsidiary's capabilities, depending on who is asked. Yet, at the same time, we can also anticipate that these subjective evaluations will drive the knowledge-transfer process. This is, of course, the essence of problemistic search in that it is both simple minded (i.e., based on subjective evaluations rather than objective data) and biased (i.e., certain units

Figure 1   Capability Evaluations and Knowledge Flows

Ratings of focal subsidiary's capabilities by self

will likely end up getting higher evaluations for reasons that have nothing to do with their actual capabilities).

The matrix in Figure 1 provides a simple graphical depiction of the likely knowledge flows that follow from the problemistic search process described above. Recall that our analysis is focused on the subsidiary unit that is potentially either a source of knowledge flows to other parts of the MNC or a recipient of knowledge flows from other units. The matrix therefore considers how other units evaluate the focal subsidiary's capabilities versus how the subsidiary evaluates itself. If the focal subsidiary is the *potential source* of knowledge flows, we can expect it to be approached by other subsidiaries and the HQ when they evaluate its capabilities as high. These ratings do not have to be accurate and they need not align at all with the focal subsidiary's own ratings; rather, a high evaluation from others is sufficient to begin the knowledge-transfer process.

If the focal subsidiary is the *potential recipient* of knowledge flows, we expect that those rating their own capabilities *highly* will be the ones who tend to seek knowledge inflows regardless of what others think of them (note that this argument is somewhat counterintuitive; it is developed in detail below). Taken together, these arguments suggest that the subsidiaries that engage in knowledge transfer either rate themselves highly or are rated highly by others or both. These units become the "in crowd." Those subsidiaries that are rated low both by themselves and by others will tend toward isolation: They will not approach others, nor will they be approached. *This is the key line of argument that links the evaluation of subsidiary capabilities with the phenomenon of subsidiary isolation.*

There are, of course, many other factors that also affect the likelihood of a subsidiary unit to engage in internal knowledge flows. We would expect most of these factors to actually reinforce the hypothesized split between an "in crowd" of subsidiaries that engage in knowledge flows and an isolated minority. We focus in this paper on two likely factors: the frequency of

communication between units and their level of reciprocity in knowledge sharing. When these factors are high, the perceptions of capabilities among those units that are already interacting with one another is likely to rise, which will further reinforce the existing pattern of interaction.

Having developed the overarching logic for why the phenomenon of subsidiary isolation emerges, we will now build the argument leading up to the specific hypotheses in more detail.

Capability Perception and Subsidiary Isolation
Consider first the case where the focal subsidiary is the source of knowledge being transferred either to its peers or to HQ. Gupta and Govindarajan (2000) posited that we should expect higher knowledge outflows from units with more valuable knowledge. To a certain extent we subscribe to this proposition, but the problemistic search framing offers a slightly more nuanced perspective on the hypothesized relationship. Specifically, we would argue that the *recipient* of the subsidiary's knowledge (the corporate HQ or a peer subsidiary) *perceives* the focal subsidiary to have high capabilities and therefore sees that subsidiary as potentially being able to address the problem it faces. The difference between this argument and Gupta and Govindarajan's (2000) logic is not just semantic, because in our case knowledge flows are triggered by the perceptions of the potential recipients of the subsidiary's knowledge, whereas in the case of Gupta and Govindarajan (2000), knowledge flows are driven by absolute levels of subsidiary capability (and are measured as such). Our proposition is also consistent with the finding of Borgatti and Cross (2003, p. 434), at the individual level, that a knowledge seeker should positively evaluate the knowledge and skills of the person sought after in relation to the problem the seeker is attempting to solve. Thus, we propose formally that:

HYPOTHESIS 1A. *Higher rating of the focal subsidiary's capabilities by HQ is positively associated with a high frequency of* vertical *knowledge outflows.*

HYPOTHESIS 1B. *Higher rating of the focal subsidiary's capabilities by its* peer units *is positively associated with a high frequency of* horizontal *knowledge outflows.*

Consider now the case where the focal subsidiary is the recipient of knowledge inflows. Here, it is less clear how the perceptions of the focal unit's capabilities will influence vertical and horizontal knowledge inflows. One line of thought would be to predict that low self-ratings would be associated with higher knowledge inflows; i.e., units that assess their own capabilities as high would decide that they do not need more knowledge and so would engage in fewer knowledge inflows. In such cases, the logic of the receiving units being perceived as having

weak capabilities is consistent with the traditional logic where best practices flow from the most capable units to the less-capable ones (e.g., Chew et al. 1990, Leibenstein 1966).[2]

The behavioral perspective developed in this paper leads us to make exactly the opposite prediction. That is, we expect that *high self-ratings of capability will be associated with high knowledge inflows*. Two sets of arguments support this proposition. First, the subsidiary that rates its own capabilities highly is likely to be more motivated to engage in knowledge inflows. This argument builds on the concept of group efficacy—defined as a group's belief in its capability to perform a task objective (Bandura 1997; Gibson 1999, 2003; Lindsley et al. 1995)—which can be a high motivator in a team. Consistent with recent multilevel theorizing, we argue that group efficacy has origins at the individual level (Bandura 1986) and emergent properties at the group level (Kozlowski and Klein 2000), and we suggest that it could equally apply to the level of the subsidiary management team. Durham et al. (2000) showed that group efficacy positively affects information seeking. We suggest that subsidiaries with low group efficacy tend to be distracted by ruminations about perceived inadequacies and failures, which consume limited cognitive resources that are needed to process task demands effectively. Conversely, those subsidiaries with high group efficacy tend to be more focused on task requirements and less distracted by performance anxiety and off-task cognitions (Bandura 1991, 1997); therefore, they may be better able and motivated to seek, integrate, and interpret information (Brown et al. 2001).

The concept of group efficacy helps explain why the subsidiary that rates its own capabilities highly would also be engaging in problemistic search. Essentially, greater self-belief creates a motivation for the subsidiary to improve (and therefore fulfill that self-belief), which leads to a more explicit and self-critical assessment of the subsidiary's own strengths and weaknesses. This process is likely to expose aspects of the subsidiary's activities that are not as strong as managers would like; thus, they engage in a process of search to identify other units that can help them improve further.

Second, our prediction is also consistent with the literature on absorptive capacity (Cohen and Levinthal 1990, Lane and Lubatkin 1998, Zahra and George 2002). A focal unit that rates its capability as high is likely to be more able to recognize the value of other units' knowledge and its own capacity to assimilate that knowledge. Absorptive capacity is a measure of the overall stock of knowledge in a unit, and it has been shown in many contexts that absorptive capacity increases a firm's ability to access and make use of external knowledge (Cohen and Levinthal 1990, Zahra and George 2002). Lane and Lubatkin (1998) have further argued that absorptive capacity has a relational component so that the ability

to assimilate external knowledge is in part a function of the level of fit between the interacting parties. In other words, the knowledge gap between the teacher and the student must be at threshold levels for such knowledge flows to occur (Cohen and Levinthal 1990, Lane and Lubatkin 1998).

Taken together, these arguments suggest the following hypotheses:

HYPOTHESIS 2A. *Higher self-rating of its own capabilities by the focal unit is positively associated with a high frequency of vertical knowledge inflows.*

HYPOTHESIS 2B. *Higher self-rating of its own capabilities by the focal unit is positively associated with a high frequency of horizontal knowledge inflows.*

Reinforcing Subsidiary Isolation

The first two hypotheses focused on the demand-driven aspects of problemistic search that are the core of our argument. In this section, we argue that other elements of the problemistic search model (specifically, levels of communication and reciprocity) play an important role in reinforcing subsidiary isolation. It should be acknowledged that these hypotheses have already been considered in other studies. They are developed here because they contribute an important part to the overarching argument explaining the existence of isolated subsidiaries.

The pattern of knowledge flows seen in the MNC is likely to take on a path-dependent form (Dosi 1988, Nelson and Winter 1982) whereby the results of past searches for knowledge become the natural starting points for new searches, and subsidiary units end up relying on their own experience and established knowledge bases to determine what is important and useful (Rosenkopf and Almeida 2003, p. 752).[3] Viewed in this way, the relationships that form through knowledge flows are likely to lead to further interaction and a greater likelihood of further knowledge flows in the future. We expect this to occur through two mechanisms—communication and reciprocity.

First, the frequency of communication between two units makes managers in both units more aware of opportunities for leveraging competencies (e.g., Hansen et al. 1999, Hansen 1999, Hansen and Lovas 2004, Katz and Tushman 1979). Individuals may also find it easier to contact people who work in other units to the extent that they know them or at least know their colleagues. When units seeking knowledge understand the operations of potential knowledge providers, they are more likely to identify and retrieve relevant knowledge from them. For example, when a focal unit communicates frequently with its peers, it provides clues about its own operations, helping other units not only to assess if the knowledge of the focal unit may be useful for them but

also raising the awareness of those units of the potential relevance of their own knowledge for the focal unit (Schulz 2003, p. 447).

Second, over time we would expect knowledge outflows and knowledge inflows between any two units to be correlated with one another. The argument here is based on reciprocity, that is, the idea that those subsidiaries highly involved in sharing their knowledge with others will also be active recipients of knowledge (Axelrod 1984, Kim and Mauborgne 1991, Kogut 1989b, Schulz 2003). Reciprocity suggests an expectation on the part of the source unit that the favor it is providing to the recipient unit will one day be returned as well as a moral obligation on the recipient unit to uphold this implicit deal (Gouldner 1960). Schulz (2003) has shown that reciprocity plays a significant role in affecting the knowledge flows in an MNC setting. Taken together, these arguments suggest the following hypotheses:

HYPOTHESIS 3. *The frequency of communication with HQ is positively associated with the level of vertical inflows* (3A) *and outflows* (3B) *of knowledge; the frequency of communication with other subsidiaries is positively associated with the level of horizontal inflows* (3C) *and outflows* (3D) *of knowledge.*

HYPOTHESIS 4. *Higher frequency of vertical knowledge outflows to HQ is positively associated with higher frequency of vertical knowledge inflows from HQ* (4A), *and higher frequency of horizontal knowledge outflows from the subsidiary is positively associated with higher frequency of horizontal knowledge inflows to the subsidiary* (4B).

In sum, the four hypotheses suggest a number of factors that are likely to explain why subsidiary isolation tends to exist and persist. We also conjecture, although the cross-sectional nature of our data does not allow us to test specific hypotheses, that the patterns of knowledge flows that lead to subsidiary isolation seem to indicate that over time some subsidiaries will find themselves in self-reinforcing spirals of sending and receiving knowledge, while the self-reinforcing cycle is likely to be a downward spiral for the isolated subsidiaries that neither send nor receive knowledge flows.

Knowledge Flows and Subsidiary Performance
Our model suggests an overall pattern of knowledge flows that reinforces existing relationships and potentially leaves some subsidiaries isolated from the main flow of interactions in the MNC. We now examine the likely impact that this pattern will have on subsidiary performance. This is important because although most literature implicitly links knowledge transfer and performance, only a few studies (e.g., Brown and Eisenhardt 1997, Tsai 2001) actually measure performance. If there

is limited research shedding light on the relationship between internal knowledge transfers and performance, the impact of internal isolation on a unit's performance remains practically unexamined.

For instance, although Gupta and Govindarajan (1991, 1994) have indicated the existence of isolated subsidiaries, they seem to be agnostic about the performance implications of subsidiary isolation. More precisely, they proposed that those isolated subsidiaries have low knowledge outflows and inflows because they are "local innovators." These are subsidiaries that have complete local responsibility for the creation of know-how in all key functional areas, but this knowledge is seen as too idiosyncratic to be of use in other countries. Similarly, according to Gupta and Govindarajan (1991, 1994), given the idiosyncratic characteristics of their markets, knowledge from other units in the MNC is also not very useful to local innovators. Gupta and Govindarajan (1991, 1994), however, address neither theoretically nor empirically the relationship between knowledge transfers and performance, so we do not know whether subsidiaries with low levels of knowledge inflows and outflows are actually local innovators or simply are isolated from the rest of the MNC. It seems plausible to affirm that if those subsidiaries are local innovators, there should not be any significant difference between their performance and that of other subsidiaries.

We argue, however, that the isolated subsidiaries are in fact in a disadvantageous position within the MNC. They are not able to take advantage of the knowledge developed by other units within the MNC (e.g., new products or services). In addition, we suggest that the advantages of internal knowledge transfers derive not only from the knowledge inflow itself but also from the knowledge-transfer process, i.e., from the participation in an internal knowledge network. Powell et al. (1996, p. 142) found that biotech firms that do not engage in interorganizational collaboration agreements have a liability of unconnectedness and tend to have lower performance than those firms with larger, more diverse alliance networks. They argue that the development of absorptive capacity, the skill at managing collaborations, the increased awareness of new projects, and a reputation as a valuable partner are all serendipitous benefits of collaboration. We believe that similar mechanisms operate in knowledge-transfers among units belonging to the same MNC. Therefore, we propose that units participating in knowledge-transfer activities (both sending and receiving knowledge) within the MNC enjoy the serendipitous benefits described by Powell et al. (1996). Conversely, isolated subsidiaries also have a liability analogous to the idea of "liability of unconnectedness" (Powell et al. 1996) that we call "liability of internal isolation." More precisely, to be an isolated subsidiary, the focal unit

should be isolated both in terms of outflows and inflows both horizontally and vertically. Thus:

Hypothesis 5. *Higher frequency of knowledge inflows and outflows is associated with higher performance; in other words, isolated subsidiaries will underperform subsidiaries that are not isolated.*

Research Methodology

Empirical Setting
The study focused on the market-facing subsidiaries—units responsible for marketing and sales activities within a particular country—of large MNCs and, in particular, on their *marketing capabilities*—their skills in understanding and satisfying customers (Day 1994). We argue that market-facing units lend themselves well to the study of knowledge transfer within MNCs because they serve as corporate links between customers and the major value-adding activities of the MNC, and to facilitate worldwide value creation they are highly dependent on knowledge transfer within the organization (Schlegelmilch and Chini 2003). Moreover, market-facing units are sufficiently plentiful and diverse in age, origin, and geographic location; thus, they are likely to provide an appropriate context to examine the phenomenon of isolated subsidiaries.

Sample
We approached six large MNCs headquartered in Sweden to take part in the research. Once their support had been gained, we were given a lead contact—the corporate marketing manager or the equivalent—who provided us with a list of all marketing subsidiaries around the world. The main survey consisted of two parts. The first was sent to the managers of 204 marketing subsidiaries in the 6 participating MNCs (Sandvik Steel, Coromant, Ericsson, Volvo, Pharmacia, and Alfa Laval Agri). The overall average subsidiary response rate was 84% (171 responses) (see Table 1). No particular geographic region was over- or under-represented in the response by the

subsidiary managers. The second part of the survey was filled in by executives from corporate HQ. Our lead contact in each firm either filled in the survey himself or provided names of corporate managers with global or regional responsibility for marketing activities in the MNC. The average corporate response rate was 88%, i.e., 22 of 25 corporate/division managers. The two parts of the questionnaire yielded the quantitative data on which the hypotheses in this study are tested.

Measures
The bulk of the questions were attitudinal in that they asked respondents to assess the extent to which they agreed with each question on a 1–7 Likert scale.[4] In addition, we asked a number of factual questions such as the subsidiary's year of foundation or its number of employees. Finally, we also collected some data from secondary sources such as the geographic distance from HQ and the income per capita in each host country.

Knowledge Flows. We operationalized this construct by asking subsidiary managers about the frequency of transfers of marketing knowledge, more precisely, (1) transfers of know-how about new products and new services and (2) transfers of marketing best practices on a 1–5 Likert scale (1 = never; 2 = less than once a year; 3 = once or twice a year; 4 = around 3–6 times a year; 5 = more than 6 times a year). These questions were asked for four different sets of conditions: (1) inflows from peer subsidiaries (horizontal knowledge inflows); (2) inflows from the MNC headquarters (vertical knowledge inflows); (3) outflows to peer subsidiaries (horizontal knowledge outflows); and (4) outflows to the HQ (vertical knowledge outflows). For each of these knowledge flow directions, responses across the two items were averaged to yield composite measures. The means, medians, standard deviations, and Cronbach alpha values are shown in Table 2.

Subsidiary Performance. To avoid common method bias, we asked the corporate respondents (i.e., the sub-

Table 1 Subsidiary Response Rates—Overall and by Firm

	Number of units	Number of units per firm	Percent (%)
Initial mailing	204*	Coromant 31, Steel 39, Ericsson 46, Volvo 29, Pharmacia 26, Alfa Laval Agri 33	100
Nonresponses	33	Coromant 0, Steel 7, Ericsson 14, Volvo 4, Pharmacia 7, Alfa Laval Agri 1	16.2
Responses	171	Coromant 31, Steel 32, Ericsson 32, Volvo 25, Pharmacia 19, Alfa Laval Agri 32	83.8
Corporate responses	154**	Coromant 27, Steel 32, Ericsson 21, Volvo 25, Pharmacia 17, Alfa Laval Agri 32	75.5

*Two units were excluded from an initial sample because one of the MNCs was closing down its operations in these countries. There were few employees left, and their motivation to participate in the study was very low.

**19 corporate managers assessed those 154 subsidiaries.

Table 2 Factor Solutions—Knowledge Flows (The CALIS Procedure—SAS V8)

Exogenous variables	Manifest variables loadings and *t* values
f_si1: Vertical knowledge Inflows (VKI)	Inflows of know-how about new products and new services from the HQs 0.65 (*t* value = 7.75) Inflows of marketing best practices from the HQs 0.88 (*t* value = 10.12)
f_si2: Horizontal knowledge inflows (HKI)	Inflows of know-how about new products and new services from other subsidiaries 0.65 (*t* value = 8.25) Inflows of marketing best practices from other subsidiaries 0.95 (*t* value = 12.13)
f_si3: Vertical knowledge outflows (VKO)	Outflows of know-how about new products and new services to the HQs 0.72 (*t* value = 9.83) Outflows of marketing best practices to the HQs 0.97 (*t* value = 13.92)
f_si4: Horizontal knowledge outflows (HKO)	Outflows of know-how about new products and new services to other subsidiaries 0.66 (*t* value = 8.74) Outflows of marketing best practices to other subsidiaries 0.98 (*t* value = 13.81)

sidiary manager's boss) to rate the subsidiary's relative financial performance on three dimensions: overall sales revenue, overall market share, and operating profit (1 = much below average, 4 = average, and 7 = much above average). Responses on the three items were averaged to yield a composite measure of subsidiary performance. Reliability was moderate (0.69).[5]

Ratings of Focal Subsidiary Capabilities. We operationalized subsidiary capabilities as their market orientation, defined as the continuous collection of information about customers' needs and competitors' capabilities and the use of this information to create superior customer value (Jaworski and Kohli 1993, Slater and Narver 1995). We believe that the use of market orientation is particularly appropriate in this study because of our focus on the transfer of marketing knowledge (it certainly would not have been the best indicator of the subsidiary's capabilities if we were analyzing knowledge flows between R&D units, for instance). As we discussed above, we used three perceptual measures of market orientation: (1) the focal subsidiary's self-rating of its market orientation; (2) the corporate manager's rating of the focal subsidiary's market orientation; and (3) the peers' rating about the market orientation of the focal subsidiary. The focal subsidiary's self-rating was measured using Jaworski and Kohli's (1993) established index. The scale had high reliability ($\alpha = 0.81$). The corporate manager's rating of the focal subsidiary's market orientation was measured through a three-item scale, which asked corporate respondents to rate, using a 1–7 Likert scale (1 = much below average, 4 = average, and 7 = much above average), each subsidiary's expertise in (1) collecting market information; (2) distributing market information; and (3) analyzing and acting on market information ($\alpha = 0.92$).[6] The corporate respondents did not answer the questions on all 21 items because they were typically answering for 10 or more different

units, but we carefully explained these items to them before they assessed the subsidiary's market orientation. Finally, we measured the peers' rating of a focal subsidiary market orientation by asking each respondent unit to vote for the most capable subsidiary in (1) collecting market information; (2) distributing market information; and (3) analyzing and acting on market information. The peers' rating variable is the sum of all votes in the three items above received by a focal subsidiary.[7]

Isolated Subsidiaries. This is a dummy variable that took the value of 1 only when the focal subsidiary met *all* the following criteria: It experienced (1) vertical knowledge outflows less than once a year; (2) vertical knowledge inflows less than once a year; (3) horizontal knowledge outflows less than once a year; *and* (4) horizontal knowledge inflows less than once a year. Note that "less than once a year" is a score of 2 on the five-point knowledge-flow scale (see above), which seemed to be a reasonable level at which to define the concept of isolation (see Tables 2 and 3). However, as described below, we also tested Hypothesis 5 with alternative cut-off points as a way of assessing the robustness of our results.

Communication Frequency. Based on a simple frequency scale where 1 = daily and 7 = yearly or less (see

Table 3 Correlation Among the Four Knowledge-Flow Factors* (The CALIS Procedure—SAS V8)

	f_si1: VKI	f_si2: HKI	f_si3: VKO	f_si4: HKO
f_si1: VKI	—			
f_si2: HKI	0.56 (0.08)	—		
f_si3: VKO	0.43 (0.08)	0.37 (0.08)	—	
f_si4: HKO	0.31 (0.08)	0.55 (0.07)	0.66 (0.06)	—

*Standard errors are in parentheses.

Ghoshal 1986, Nobel and Birkinshaw 1998), this scale asked respondents to indicate often how they communicated with (a) HQ managers face-to-face to discuss operations, and (b) HQ managers through other means to discuss operations. The responses to these two items were averaged to yield a composite measure of communication with headquarters ($\alpha = 0.75$). The same questions were posed in relation to the communication with peer subsidiaries. Again, responses were averaged, and a composite measure of communication with peer subsidiaries was created ($\alpha = 0.74$). We reverse coded the communication items so that a higher number is associated with more frequent communication rather than vice versa.

Control Variables (*Tacitness of Knowledge*). We used Zander and Kogut's (1995) scale. Respondents answered the following questions about their knowledge based on a 1–7 Likert scale, where 1 = strongly disagree and 7 = strongly agree: (a) A manual describing how our activities are executed could be written; (b) new staff can easily learn how to perform the services that our local company offers by talking to skilled employees; (c) training new personnel is typically a quick and easy job for us; and (d) new personnel with a university education can perform the services that our local company offers. Reliability for these items was moderate ($\alpha = 0.67$). Tacitness items were reverse coded so that a higher number is associated with more tacit knowledge.

Host Country Economic Level. Different levels of economic development of the host country may affect knowledge flows from and to that subsidiary (Gupta and Govindarajan 2000). To control for these effects, for each host country, data on per capita income (gross national product per capita Atlas method) in 1998 (the year data for this study were collected) were obtained from the World Development Report (World Bank 2003).

Subsidiary Age. Older subsidiaries may have had more time to develop the mechanisms and relationships to share knowledge within the MNC (Birkinshaw et al. 2002). To control for this effect, we included a variable called "subsidiary age," which is the year when data for this study were collected (1998) minus the year of the subsidiary's foundation.

Subsidiary Size. Unit size may affect the frequency of intrafirm knowledge transfer (Birkinshaw et al. 2002, Hansen and Lovas 2004). We control for this effect by asking respondents to indicate the number of employees in the subsidiary, which we convert to a natural logarithm to dampen the high variability in size and achieve a more normal distribution.

Use of External Expertise. To control for the impact of external sources of knowledge (e.g., customers, suppliers,

competitors), respondents answered the following question about their use of external expertise on a 1–7 Likert scale, where 1 = strongly disagree and 7 = strongly agree: "We frequently draw on external expertise when we perform our activities."

Geographic Distance. We computed the geographic distance in kilometres between the hosting city of the focal subsidiary and the city in Sweden where the MNC's headquarters were located. To dampen the high variability in distance and achieve a more normal distribution, the natural logarithm of the geographic distance was used in our analyses.

Validity Checks. We used SAS V8 (Hatcher 1994, Lattin et al. 2003) to perform confirmatory factor analyses (CFA) to check the convergent validity (i.e., the degree to which specific items jointly load on their hypothesized constructs; Judge 1993) and discriminant validity (Bollen 1989, Long 1983, Judge 1993) of our multi-item constructs. Factor loadings varied considerably (from 0.41 to 0.98) but were all highly significant and corresponded to the hypothesized latent constructs.

We also computed the composite reliability for all our latent variables by dividing (a) the squared sum of the individual standardized loadings by (b) the sum of the variance of their error terms and the squared sum of the individual standardized loadings (Fornell and Larcker 1981). Overall, the values calculated for each of our latent variables exceeded the threshold value of 0.70 (Nunally 1978), which suggests that our measurement model demonstrates adequate internal consistency.[8] It is particularly important to report that our results show the discriminant validity of horizontal and vertical communications, confirming that they are two different constructs (the correlation between them is significantly less than 1.0) and that our two-factor model has a better fit than an alternative one-factor model. Akaike's information criterion (Boomsma 2000, Hu and Bentler 1999) was better (that is, smaller) for our two-factor model than for a one-factor model ($AIC_{2\text{-factors}} = 12.53$; $AIC_{1\text{-factor}} = 69.96$). More importantly, our four constructs, used to describe knowledge flows (vertical knowledge outflows, horizontal knowledge outflows, vertical knowledge inflows, and horizontal knowledge inflows), also have discriminant validity. As Table 3 indicates, the correlation among the four knowledge-flow factors ranged from 0.31 to 0.66, with standard errors ranging from 0.06 to 0.08, which means that they were all significantly less than 1.0, demonstrating adequate discriminant validity (e.g., Bagozzi et al. 1991, p. 436). In addition, a four-factor solution has a better fit than plausible rival models. AIC (Boomsma 2000, Hu and Bentler 1999) was better for our four-factor model than for the one- or two-factor models ($AIC_{4\text{-factors}} = 26.20$; $AIC_{2\text{-factors}} = 108.74$; $AIC_{1\text{-factor}} = 185.48$). A comparison of standardized loadings, composite reliabilities,

and average variances extracted between a four- and a two-factor model also confirmed the superiority of the former. Although this four-factor model of intrafirm knowledge flows has been used before in the literature (e.g., Gupta and Govindarajan 2000, Schulz 2001), to the best of our knowledge this is the first time that CFA is used to ascertain the discriminant validity of these measures.

Results

Before moving on to a discussion of the hypotheses, it is useful to discuss a few descriptive statistics associated with the questionnaire data. Tables 4 and 5 contain the descriptive and frequency statistics of the four knowledge-flow variables (vertical outflows and inflows and horizontal outflows and inflows). We confirmed that a significant number of subsidiaries (12.5%) was never or less than once a year involved in *any* of the four types of knowledge flows (see last column in Table 5): These are the isolated subsidiaries as defined above. The correlation matrix in Table 6 also shows, as predicted, the low correlations between the three perceptions (self, corporate, and peer) of a focal subsidiary's capabilities. The correlation between self-perception and corporate perception is 0.14 and between the former and peer perception is only 0.04. Peer perception and corporate perception about a focal subsidiary's capabilities show a stronger correlation (0.30), but it is still very far from 1.0.

Statistical Methods

We used ordinary least squares (OLS) to test our hypotheses. We used Stata 8.0's regression with robust standard errors to counter the effects of heteroscedasticity, and because multiple observations from the same host country may not be independent, we also used a robust clustering procedure as implemented in Stata 8.0 for all our models (Williams 2000, Wooldridge 2002).[9] To eliminate any spurious effects from unobserved differences among firms, we included fixed-firm effects by entering dummy variables for the six companies in the study.[10] To check for the effects of multicollinearity, we calculated the variance inflation factors (VIF), and they were all below 3.0, which is well below the common cut-off threshold of tolerance (Wooldridge 2002).[11]

Table 4   Descriptive Statistics—Knowledge Flows

	Vertical K-outflows	Horizontal K-outflows	Vertical K-inflows	Horizontal K-inflows
N valid	167	165	164	165
Mean	2.18	2.18	3.01	2.30
Median	2.00	2.00	3.00	2.00
Standard deviation	1.01	0.90	0.932	0.956
Cronbach alpha	0.82	0.79	0.73	0.77

Tests of Hypotheses. Hypotheses 1 and 2 refer to the association between perceptions of a focal unit's capabilities and knowledge outflows from and inflows to that unit. To test those hypotheses, we included in our models both the source's and the recipient's perceptions. More precisely, we posited in Hypothesis 1A that a higher frequency of vertical knowledge outflows would be associated with a high rating of the focal subsidiary's capabilities by HQ, and in Hypothesis 1B that a higher frequency of horizontal knowledge outflows would be associated with a high rating of the focal subsidiary's capabilities by its peer units. It is worth highlighting that we control for Gupta and Govindarajan's (2000) absolute measure of "value of knowledge stock" of a focal subsidiary by including in all our models the two most important proxies—subsidiary size and gross national income (GNI) per capita of the host country—used by them to operationalize this construct (2000, pp. 477, 478). In Table 7, Model 2, we see that HQ's rating of the focal subsidiary's capabilities is positively and significantly ($p < 0.01$) associated with vertical knowledge outflows, supporting Hypothesis 1A. Model 4 also shows support for Hypothesis 1B. Turning to Hypothesis 2, we predicted that a high self-rating of its capabilities by the focal unit is associated with high knowledge inflows both from the HQs (Hypothesis 2A) and from its peer units (Hypothesis 2B). Models 6 and 8 in Table 8 provide strong support for both hypotheses.

Hypothesis 3 posited that communication with HQs and with peers was positively correlated with knowledge outflows and inflows. Model 2 in Table 7 shows that Hypothesis 3A is not supported. Communication with HQ has the predicted sign; that is, it is positively associated with vertical knowledge outflows, but it is not significant. Model 4, in contrast, strongly supports the prediction that communication with other subsidiaries is associated with horizontal knowledge outflows, providing support for Hypothesis 3B. As Models 6 and 8

Table 5   Frequency Statistics—Knowledge Flows

Frequency of knowledge flows	Vertical K-inflows (%)	Horizontal K-inflows (%)	Vertical K-outflows (%)	Horizontal K-outflows (%)	All four types of knowledge flows (%)
Never or less than once a year	21.3	53.9	53.3	58.2	12.5
More than once a year	78.7	46.1	46.7	41.8	87.5

Table 6 Descriptive Statistics and Correlation Matrix

	N	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
1 Vertical outflow	167	2.18	2.03	1.00																						
2 Vertical inflow	164	3.01	1.86	0.39	1.00																					
3 Horizontal outflow	165	2.18	1.80	0.63	0.26	1.00																				
4 Horizontal inflow	165	2.30	1.91	0.30	0.45	0.44	1.00																			
5 Isolated subsidiaries	168	0.13	0.33	−0.38	−0.55	−0.38	−0.34	1.00																		
6 Performance	154	4.10	1.33	0.33	0.03	0.36	0.00	−0.14	1.00																	
7 Market orientation (corporate rating)	154	4.42	1.35	0.28	−0.07	0.29	−0.12	−0.07	0.65	1.00																
8 Market orientation (subsidiary rating)	171	4.41	0.73	0.15	0.21	0.28	0.32	−0.11	0.17	0.14	1.00															
9 Market orientation (peer rating)	171	0.90	2.52	0.20	0.10	0.20	−0.01	−0.10	0.33	0.30	0.04	1.00														
10 Communication with sub	169	2.95	1.19	0.09	0.10	0.24	0.20	−0.10	0.20	0.14	0.26	0.09	1.00													
11 Communication with HQ	169	3.41	1.34	0.14	0.13	0.09	0.07	−0.10	0.09	0.03	0.13	0.10	0.37	1.00												
12 Geographical distance (ln)	161	7.53	1.14	−0.29	−0.07	−0.29	−0.09	0.03	−0.35	−0.22	−0.09	0.12	−0.25	−0.07	1.00											
13 Age	154	27.63	23.06	0.27	0.15	0.26	0.07	−0.12	0.29	0.29	0.14	0.06	0.05	0.02	−0.18	1.00										
14 Tacitness	171	4.36	0.82	0.12	−0.08	0.13	−0.08	0.16	0.08	0.24	0.27	−0.05	0.04	−0.07	−0.20	0.04	1.00									
15 Use of external expertise	170	3.48	1.70	−0.07	−0.05	−0.10	0.01	0.02	0.04	0.10	0.03	0.01	−0.03	0.15	−0.02	−0.09	−0.05	1.00								
16 Size (ln employee)	166	3.96	1.50	0.27	−0.06	0.27	−0.05	−0.03	0.45	0.36	0.01	0.19	0.01	−0.04	−0.12	0.31	0.00	0.02	1.00							
17 GNI per capita host country	157	19,129.87	11,724.50	0.25	−0.03	0.19	−0.06	−0.08	0.47	0.45	−0.01	0.19	0.17	0.09	−0.37	0.26	0.06	−0.01	0.23	1.00						
18 dumsteel	171	0.19	0.39	0.02	0.05	−0.03	0.03	−0.14	−0.19	−0.06	0.04	−0.09	−0.20	−0.16	0.08	0.10	−0.02	0.11	−0.33	−0.06	1.00					
19 dumcorom	171	0.18	0.39	−0.05	0.25	−0.03	−0.10	−0.13	0.00	−0.03	0.02	−0.02	−0.06	−0.04	0.05	0.15	0.05	0.12	0.06	−0.01	−0.23	1.00				
20 dumerics	171	0.19	0.39	0.01	−0.05	−0.14	−0.17	0.05	0.13	0.04	−0.17	0.05	0.10	0.10	0.04	−0.23	−0.03	−0.08	0.13	−0.04	−0.23	−0.23	1.00			
21 dumvolvo	171	0.15	0.35	−0.09	−0.18	−0.02	0.10	0.15	−0.05	0.24	0.09	0.00	0.22	0.17	−0.13	−0.06	0.12	0.18	−0.06	0.09	−0.20	−0.19	−0.20	1.00		
22 dumpharm	171	0.11	0.32	−0.12	−0.30	0.06	−0.02	0.26	0.07	−0.04	−0.04	−0.10	−0.03	−0.24	−0.05	−0.11	0.00	0.08	0.30	0.03	−0.17	−0.17	−0.17	−0.15	1.00	
23 dumagri	171	0.19	0.39	0.20	0.15	0.18	0.17	−0.13	0.07	−0.14	0.06	0.30	0.04	0.14	−0.01	0.11	−0.10	0.16	−0.05	0.00	−0.23	−0.23	−0.23	−0.17	−0.17	1.00

Table 7   Results of Regression Analysis of Vertical and Horizontal Knowledge Outflows

Variable	Model 1 Vertical outflows	Model 2 Vertical outflows	Model 3 Horizontal outflows	Model 4 Horizontal outflows
Market orientation capabilities (corporate rating)	—	0.32** (0.14)	—	—
Market orientation capabilities (self-rating)	—	0.16 (0.20)	—	0.18 (0.21)
Market orientation capabilities (peer rating)	—	—	—	0.09** (0.04)
Communication with HQ	—	0.20 (0.13)	—	—
Communication with subsidiaries	—	—	—	0.50*** (0.12)
Ln geographic distance (from HQ)	—	−0.31** (0.14)	—	—
Age	0.00 (0.01)	0.00 (0.01)	0.01 (0.00)	0.01 (0.00)
Tacitness	0.26 (0.20)	0.36 (0.25)	0.22 (0.16)	0.22 (0.14)
Size (ln employee)	0.45*** (0.13)	0.38** (0.15)	0.30**	0.31*** (0.10)
GNI per capita (host country)	0.00 (0.00)	−0.00 (0.00)	0.00 (0.00)	−0.00 (0.00)
Use external expertise	−0.07 (0.10)	−0.08 (0.08)	−0.09 (0.09)	−0.16** (0.07)
_cons	−0.16 (1.32)	2.05 (2.28)	2.35 (1.29)	0.63 (1.16)
Firm effects (joint test)	**	*	Not significant	Not significant
F	3.29**	7.08***	6.13***	10.10***
ΔF	—	6.83***	—	10.55***
R^2	0.21	0.33	0.21	0.35
Adjusted R^2	0.15	0.24	0.15	0.28
Δ in adjusted R^2	—	0.09	—	0.13
N	138	119	136	136

Notes. Two-tailed tests. Robust standard errors between parentheses. Firm dummies included in all models but not shown.

   $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

in Table 8 show, neither Hypothesis 3C nor Hypothesis 3D, which predicted the association of frequency of communication with knowledge inflows, was supported. Hypotheses 4A and 4B predicted that the higher the knowledge outflows from a focal subsidiary, the higher the knowledge inflows to that subsidiary, at both the vertical and horizontal levels. Models 6 and 8 provide strong support to our hypotheses, suggesting that vertical and horizontal knowledge outflows are positively and significantly correlated to vertical and horizontal knowledge inflows, respectively.

Finally, Hypothesis 5 proposed that isolated subsidiaries have lower performance than subsidiaries that are not isolated. We tested this hypothesis by introducing a dummy variable (*isolated subsidiaries*) that took the value of 1 when the subsidiary has vertical *and* horizontal knowledge inflows *and* outflows less than once a year and the value of 0 otherwise, while controlling for all other variables in our model. We expected a negative and significant coefficient for that dummy variable. As Model 10 in Table 9 indicates, we found strong support for Hypothesis 5 ($p < 0.01$).[12]

Robustness Checks
We also performed a number of robustness checks on our results. For instance, we have run our models including measures of motivation and absorptive capacity similar to the ones used by Gupta and Govindarajan (2000), and our results remained qualitatively the same. We also tested Hypothesis 5 using a continuous variable (total knowledge flows = sum of the four types of knowledge flows) instead of the dichotomous variable. This variable is positively associated with subsidiary performance, although at a lower level of significance. We also tested Hypothesis 5 using different cut-off points to define the isolated subsidiaries dummy variable. For instance, we aggregated vertical knowledge inflows and horizontal knowledge inflows in one single variable (total inflows, $\alpha = 0.75$) and vertical knowledge outflows and horizontal knowledge outflows in another variable (total outflows, $\alpha = 0.83$), and used the cut-off of two (never or less than once a year) to define which subsidiaries were considered isolated. We found a significant negative effect ($p < 0.01$) of the isolated subsidiaries dummy. We also tried to use the medians in each type of knowledge flows as the cut-off point. As Table 4 indicates, the median in three types of knowledge flows was 2.0 (the same cut-off point previously used), but it was 3.0 in the case of vertical knowledge inflows. Once more, the isolated subsidiaries dummy had a negative association with subsidiary, but this time it is less significant ($p < 0.05$).

Table 8   Results of Regression Analysis of Vertical and Horizontal Knowledge Inflows

Variable	Model 5 Vertical inflows		Model 6 Vertical inflows		Model 7 Horizontal inflows		Model 8 Horizontal inflows	
Vertical outflow	—		0.28**	(0.10)	—		—	
Horizontal outflow	—		—		—		0.42***	(0.11)
Market orientation (corporate assessment)	—		−0.13	(0.22)	—		—	
Market orientation (self-assessment)	—		0.55**	(0.26)	—		0.61**	(0.18)
Market orientation (peer assessment)	—		—		—		−0.05	(0.06)
Ln geographic distance (from HQ)	—		−0.19†	(0.11)	—		—	
Communication with HQ	—		−0.02	(0.12)	—		—	
Communication with peer subsidiaries	—		—		—		0.09	(0.13)
Age	0.01	(0.01)	0.01	(0.01)	0.01	(0.01)	−0.00	(0.01)
Tacitness	−0.27	(0.19)	−0.36	(0.21)	−0.24	(0.15)	−0.52**	(0.14)
Size (ln employee)	−0.01	(0.14)	−0.25**	(0.12)	−0.10	(0.12)	−0.22*	(0.11)
Use of external expertise	−0.04	(0.10)	0.00	(0.09)	−0.10	(0.10)	−0.07	(0.07)
GNI per capita (host country)	−0.00	(0.00)	−0.00	(0.00)	−0.00†	(0.00)	−0.00*	(0.00)
_cons	7.28***	(1.05)	6.44***	(1.49)	6.64***	(1.08)	3.79**	(1.00)
Firm effects (joint test)	***		***		*		Not significant	
F	4.08***		6.27***		2.88**		5.75***	
ΔF	—		3.18*		—		12.66***	
R^2	0.18		0.35		0.13		0.37	
Adjusted R^2	0.12		0.25		0.06		0.29	
Δ in adjusted R^2	—		0.13		—		0.23	
N	135		116		136		133	

Notes. Two-tailed tests. Robust standard errors between parentheses. Firm dummies included in all models but not shown.

$†p < 0.10$, $*p < 0.05$, $**p < 0.01$, $***p < 0.001$.

Discussion

Overall, the findings of this study support the idea that knowledge transfers between units within an MNC tend to be influenced by a demand-driven process, initiated by problemistic search on the part of the recipient unit. Three broad sets of insights emerge from the research. First, we showed that not only do the three ratings (self, corporate, and peer) of a focal subsidiary's capabilities vary significantly (the pairwise correlations among them are quite low, ranging from 0.04 to 0.30), but also that they have different impact on knowledge outflows and inflows. In the knowledge-outflow models, our results supported our argument that what predicts knowledge outflows from a focal unit is *not* how good it believes itself to be, but rather how the *recipient* rates the knowledge source. In relation to knowledge inflows, both from HQs and from peer subsidiaries, it is again the recipient unit's perception that matters. Those units that perceive themselves as highly capable seem to have both the ability and the motivation to look more frequently for external knowledge than those units with lower self-ratings.

Second, this study provides empirical support for the importance of reciprocity in reinforcing existing knowledge-flow patterns. We found that knowledge tends to flow to those units that frequently share their knowledge with the rest of the organization. This is likely to end up creating a subgroup of units within the MNC that are frequently exchanging knowledge among themselves, while those subsidiaries that rarely act as sources of knowledge transfers are also unlikely to receive knowledge from other units. We found, however, only partial support for our hypotheses about the importance of communication to knowledge outflows and inflows. Communication with HQ does not seem to have a significant impact either on vertical knowledge outflows or on vertical knowledge inflows. In contrast, communication with peers has a significant association with horizontal knowledge outflows and horizontal knowledge inflows when we do not control for horizontal knowledge outflows.

Taken in conjunction with the reciprocity findings, these results seem to provide two interesting insights. A focal subsidiary that communicates frequently with HQ does not necessarily engage in more vertical knowledge flows. This may be because a certain frequency of communication with HQ is mandatory for the provision of routine information, but this is not necessarily the case with other subsidiaries. On the other hand, when it comes to relationships with peers, communication seems to be a good predictor of horizontal knowledge outflows. If we refer back to our demand-driven model, this may indicate that when a focal subsidiary communicates fre-

Table 9 Results from Regression Analysis of Subsidiary Performance

Variable	Model 9		Model 10	
Isolated subsidiaries dummy	—		-0.89^{**}	(0.33)
Market orientation (peer assessment)	0.17^{**}	(0.06)	0.17^{**}	(0.06)
Market orientation (subsidiary assessment)	0.17	(0.12)	0.13	(0.11)
Communication with HQ	-0.00	(0.07)	-0.02	(0.07)
Communication with peer subsidiaries	0.05	(0.09)	0.02	(0.09)
Age	0.00	(0.00)	$0.01^{\dagger}$	(0.00)
Ln geographic distance (from HQ)	$-0.16^{\dagger}$	(0.09)	$-0.16^{\dagger}$	(0.09)
Tacitness	0.12	(0.09)	$0.19^{\dagger}$	(0.11)
Size (ln employee)	0.20^{*}	(0.09)	$0.18^{\dagger}$	(0.09)
Use of external expertise	0.07	(0.06)	0.07	(0.06)
GNI per capita (host country)	0.00^{***}	(0.00)	0.00^{**}	(0.00)
_cons	$1.75^{\dagger}$	(0.91)	$1.78^{\dagger}$	(0.93)
Firm effects (joint test)	*		Not significant	
F	30.06^{***}		29.60^{***}	
ΔF	—		8.68^{**}	
R^2	0.49		0.52	
Adjusted R^2	0.42		0.44	
Δ in adjusted R^2	—		0.02	
N	120		119	

Notes. Two-tailed tests. Robust standard errors between parentheses. Firm dummies included in all models but not shown.

$^{\dagger}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$.

quently with its peers, it is somehow generating some demand for its knowledge.

Those results in conjunction suggest the possibility of a certain path dependence in knowledge transfers within MNCs: As units communicate more frequently and exchange knowledge, they recalibrate their understanding of their capabilities and knowledge. As they update their understanding of themselves as well as of the units they are interacting with, they positively affect their probability of interacting again in the future, creating a dynamic self-reinforcing system. With time, units may tend to be locked into a limited set of units with which they interact (Borgatti and Cross 2003, p. 442). It is worth noting that this argument is potentially at odds with Kogut and Zander's (1996) social identity argument, i.e., that one of the advantages of the firm in relation to markets is that the former provides the normative territory to which members identify.

Our argument, instead, is in line with a more nuanced view of social identity (Tajfel 1982, Tajfel and Turner 1986), namely, the optimal distinctiveness theory (Brewer 1993). According to this theory, the classification of self (in our case, an MNC unit) as a member of a highly inclusive superordinate category (e.g., belonging to Ericsson) is unlikely to satisfy most units' needs for differentiation. Hence, classification at that level may motivate attention to distinctions between themselves and other category members and an active search

for subgroup differentiation (Brewer 1993), resulting in some sort of in group/out group dynamic emerging (Tajfel 1982, Tajfel and Turner 1986). To the extent that this occurs, knowledge is more likely to be exchanged between those units that perceive themselves to belong to the same subgroup, leading to frequent knowledge exchanges among units belonging to one group of subsidiaries (the "in crowd"), while another group (that we labeled "isolated") remains alienated from these knowledge-sharing activities. Clearly, these arguments cannot be verified or falsified with the focus of the current research because we have no insights into the way individual subsidiary units identify with other units within the MNC. However, it is interesting to speculate that many of the same patterns of interaction that would be predicted by social identity theory can actually be generated through the problemistic search process. Additional research will be needed to shed light on the extent to which social identity and optimal distinctiveness have any real bearing on the patterns of knowledge flow observed here.

Third, another major goal of this study was to investigate the impact of internal isolation on the isolated subsidiary's performance. Evidence supported the theory that, all other things being equal, isolated subsidiaries seem to have lower performance than subsidiaries that are not isolated. We believe that those subsidiaries that are alienated from the knowledge-transfer activities within the firm not only do not have access to the knowledge of other units within the MNC (e.g., best practices developed by another subsidiary), but also they are alienated from an information network that is a vehicle for the rapid communication of news about opportunities and obstacles. We speculate that analogous to the idea of liability of (external) unconnectedness (Powell et al. 1996) there may be a liability of internal isolation. The causal relationship between isolation and performance is not clear, though. In fact, we believe that knowledge flows and performance may be self-reinforcing mechanisms; i.e., high-performing subsidiaries may have the slack resources that make them able to share their knowledge, while low-performing subsidiaries are fighting fires and have to concentrate on their own daily activities and not share any knowledge. Therefore, knowledge sharing provides opportunities for improved performance and improved performance provides slack resources for knowledge sharing.

Limitations and Future Research
This study represents an effort to explore a new theoretical and empirical perspective on knowledge transfers within MNCs. Notwithstanding the robustness of our results across models and the lack of obvious symptoms of biases, we can identify some limitations of this study that should be borne in mind for future research.

First, we conducted our examination at the nodal level of analysis (i.e., the subsidiary). This was useful as a means of identifying isolated subsidiaries, but it also created a problem because knowledge transfers are best observed at the level of the dyad or system (Gupta and Govindarajan 2000). For instance, although we control for the host country's GNI per capita, the lack of dyadic data prevented us from verifying how close the markets of two subsidiaries are in terms of their marketing and demographic characteristics, which could possibly be an alternate explanation for how often subsidiaries interact with each other. Future research could build on this study to develop more elaborate hypotheses that could be tested at the dyadic level of analysis.

Second, despite the fact that we collected some data from secondary sources (e.g., geographic distance from HQ and the income per capita in each host country), we used perceptual instruments to measure most of our variables, notably, the extent of knowledge outflows and inflows and subsidiary performance. We should also highlight that although our study makes an important contribution in ascertaining the convergent and discriminant validity of the four types of knowledge flows frequently used in the knowledge management literature (vertical knowledge inflows, vertical knowledge outflows, horizontal knowledge inflows, and horizontal knowledge outflows), the composite reliability (Fornell and Larcker 1981) of our knowledge tacitness and subsidiary performance factors are slightly below the desirable threshold, and additional research is needed to further develop scales that can adequately measure those constructs.

Finally, the test of hypotheses in a cross-sectional research design indicates association, not causality. This raises the problem of simultaneity, and we suggest the results of this study be interpreted with the necessary caution, avoiding strong causal inferences from them. It would be desirable if future research could investigate why some subsidiaries are isolated from the knowledge-transfer activities within the MNC using longitudinal data. A promising avenue for future research is to use longitudinal data to test if differences between "in crowd" and "out crowd" units tend to increase, stabilize, or diminish over time. According to the principle of learning substitution (Levinthal and March 1993, p. 99), for instance, and assuming that an MNC is a nested learning system where learning occurs at several different but interrelated units at the same time, one could expect that learning in one subsidiary would potentially be a substitute for learning at another (Levinthal and March 1993). If this is true, with time the highly capable units would be increasingly involved in knowledge outflows and inflows and would substitute for learning in low-capability subsidiaries, generating increasing disparities between the former and the latter. Hence, these "in crowd" subsidiaries would increasingly develop their

capabilities, releasing the pressure for the isolated units to adapt.

Although the tendency for certain subsidiaries to become isolated is evident in our findings, it is important to note that there are ways for MNC executives to break the cycle described above. From our research interviews, we identified a number of approaches that were used by some of the more effective MNCs to bring the more isolated subsidiaries back into the knowledge-sharing network, and these are described here. One was the systematic development of personal networks among subsidiary managers. Isolated subsidiaries were typically given an expatriate manager who was personally well connected and who was able to build the relationships with other units that subsequently led to knowledge sharing. A second approach was a careful recognition of language problems: One of the organizations in our sample noticed a complete lack of knowledge sharing between the large German subsidiary and its Scandinavian peers. On closer inspection, it became clear that the German boss was not confident in English so he never participated in the informal discussions that led to knowledge sharing. The solution was simply to put a proficient English speaking deputy to the German boss.

A third and very different approach was for corporate managers to keep detailed measures of how their subsidiaries were performing on process measures as well as on performance measures. These measures were used to overcome the gap between perceived and actual capability measures and, thereby, to facilitate the process of knowledge sharing. Alfa Laval Agri, for example, held quarterly meetings of all its subsidiary managers and required them to share performance along multiple dimensions so that each subsidiary manager could see how his or her unit was doing against its peers. This approach helped reduce the level of bias in internal evaluations of capability, and it opened up the knowledge-sharing processes to many more subsidiaries.

Conclusion

This study provided a fresh look at the issue of knowledge sharing in MNCs by focusing on the situation facing subsidiary units that are *not* involved in knowledge sharing to any meaningful degree. We proposed that the recipients of knowledge flows within the MNC engage in a process of problemistic search, where it is their own motivation and absorptive capacity (rather than the attributes of the source unit) and their *perceptions* about the capabilities of those units they are sourcing knowledge from that drive the process of knowledge transfers within MNCs. This knowledge-flow pattern is likely to be reinforced by a path-dependent behavior where subsidiary units tend to privilege those other units with which they have some communication and from which they can expect some reciprocity in terms of knowledge

flows. For MNCs concerned about how they might better manage their internal knowledge flows, isolated subsidiaries are a real priority and should therefore be the focus of far more attention than they have received to date.

Acknowledgments

Endnotes

[1] To be clear, this logic does not apply to those cases of HQ-mandated initiatives where the subsidiary has no option whether to conform. However, our sense from the research interviews we conducted for this study is that the sales and marketing subsidiaries in this study received relatively few HQ-mandated directives and had considerable degrees of freedom in the extent to which they engaged in corporate knowledge-sharing activities.

[2] This would also be consistent with findings in social psychology (e.g., Weiss and Knight 1980), where individuals with high self-esteem were reliant more on themselves than on their job environments for guidance in task-related behaviors.

[3] In a very interesting study that coincidentally cites some of the firms in our sample, Johanson and Vahlne (1977) used this same aspect of the behavioral theory of the firm (Cyert and March 1963) to explain why the decisions that constitute the internationalization process (e.g., starting a selling subsidiary or establishing export channels) are taken in a path-dependent way and are related to operations currently performed by the firm (Johanson and Vahlne 1977, p. 29).

[4] Concerned about the possibility of common method bias, we conducted factor analysis including all the attitudinal variables that were measured by subsidiary managers. The first factor accounted for only 44% of the variance, and four factors were necessary to explain 86% of the variance. If common method bias were a serious problem in our data, one factor accounting for most of the covariance in the independent and dependent variables should have emerged (Podsakoff and Organ 1986).

[5] We are aware that this reliability is slightly below the 0.70 minimum acceptable level. It should be taken into consideration, however, that Cronbach alpha values are quite sensitive to short scales (i.e., tend to be lower in scales with fewer than 10 items), and in this case we have only a three-item scale (Hair et al. 1998, p. 118).

[6] The first item (collecting market information) reflects Jaworski and Kohli's (1993) first dimension (intelligence generation), the second item (distributing market information) Jaworski and Kohli's (1993) second dimension (intelligence dissemination), and the third item (analysing and acting on market information) Jaworski and Kohli's (1993) third and fourth dimensions (response design and response implementation).

[7] For example, in Ericsson, we asked 25 subsidiaries to rate which of their peers was best on each of the three dimensions of marketing orientation, resulting in a number of votes between 0 (i.e., a subsidiary that did not receive any votes at all) and 12 for each country's subsidiary. The number of "votes" was then assigned to the subsidiary in question as the aggregate peer rating of their capability. While a more precise approach to operationalizing this construct would be possible in a dyadic research design (i.e., studying individual flows), we believe this is as precise as one could achieve with a nodal design.

[8] There are, however, two constructs (knowledge tacitness and subsidiary performance) that are slightly below that recommended threshold (composite reliability equal to 0.65 and 0.66, respectively). This seems to indicate that our measure of knowledge tacitness is not entirely satisfactory and that future research should probably adopt other scales to measure this construct. It is worth highlighting here that to check the robustness of our results, we have run all our models without the knowledge tacitness variable, and our results remained qualitatively the same. In the case of our subsidiary performance measure, we believe this low composite reliability seems to reflect the debate in the international business literature about the inherent difficulties of developing reliable scales for measuring subsidiary performance (e.g., Andersson et al. 2001).

[9] We have also run the models including one dummy variable for each of the host countries in the sample. This reduced drastically the degrees of freedom of the models, but the results were qualitatively the same as those presented in the next section.

[10] Although we acknowledge that a random effects model may in principle produce more efficient estimates, to obtain an unbiased estimation with such a model, it is assumed that the random error term of each cross-sectional unit is uncorrelated with any of the regressors. This is quite a strong assumption that in this specific case is more likely to be violated than not thus our choice of a fixed-effects model.

[11] The table with the VIF values for all variables in the models is available from the authors.

[12] To avoid common method bias (given that our performance measure was provided by corporate managers), we have not included in our performance models (Models 9 and 10) the corporate managers' rating of the focal subsidiary's capabilities. If included in the model, this variable is highly significant ($p < 0.001$) and our isolated variable remains significant, although less so ($p < 0.05$).

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