

KNOWLEDGE FLOWS WITHIN MULTINATIONAL CORPORATIONS

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Pursuing a nodal (i.e., subsidiary) level of analysis, this paper advances and tests an overarching theoretical framework pertaining to intracorporate knowledge transfers within multinational corporations (MNCs). We predicted that (i) knowledge outflows from a subsidiary would be positively associated with value of the subsidiary's knowledge stock, its motivational disposition to share knowledge, and the richness of transmission channels; and (ii) knowledge inflows into a subsidiary would be positively associated with richness of transmission channels, motivational disposition to acquire knowledge, and the capacity to absorb the incoming knowledge. These predictions were tested empirically with data from 374 subsidiaries within 75 MNCs headquartered in the U.S., Europe, and Japan. Except for our predictions regarding the impact of source unit's motivational disposition on knowledge outflows, the data provide either full or partial support to all of the other elements of our theoretical framework. Copyright © 2000 John Wiley & Sons, Ltd.

In recent years, researchers in organization theory (Levitt and March, 1988), economics (Nelson and Winter, 1982), as well as strategic management (Prahalad and Hamel, 1994; Schendel, 1996) have identified organizational learning as one of the most important subjects for scholarly inquiry. Aimed at further deepening our understanding of a key topic within this broad area viz., intra-firm flows of organizational knowledge, this paper reports the results of a theoretical and empirical investigation into the determinants of internal knowledge transfers within multinational corporations. The following four observations underlie the motivations for this study.

First, every firm constitutes a bundle of knowledge. As a corollary of the “resource-based view of the firm” (Barney, 1991; Penrose, 1959; Wer-

nerfelt, 1984), this observation is now so widely accepted as to have become almost axiomatic (Grant, 1996; Huber, 1991; Kogut and Zander, 1992; Nelson and Winter, 1982; Nonaka, 1994). In the context of this paper, it is particularly important to note that, of all possible resources that a firm might possess, its knowledge base has perhaps the greatest ability to serve as a source of sustainable differentiation and hence competitive advantage (Dierickx and Cool, 1989; Lippman and Rumelt, 1982).

Second, the primary reason why MNCs exist is because of their ability to transfer and exploit knowledge more effectively and efficiently in the intra-corporate context than through external market mechanisms. This “internalization of intangible assets” argument, originally advanced by Hymer (1960), has been subjected to numerous confirmatory empirical tests and is now widely accepted as the “received theory” on why MNCs exist (Buckley and Casson, 1976; Caves, 1971, 1982; Ghoshal, 1987; Kindleberger, 1969; Porter, 1986; Teece, 1981). Of course, external markets

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continue to become more open, efficient, and global on an ongoing basis. Notwithstanding the increasing sophistication of external markets, they remain relatively ineffective mechanisms for knowledge transfer on at least two grounds: one, bulk of the specialized knowledge of any firm exists in a tacit and thereby non-tradeable form; two, market-based transfers of knowledge are often associated with negative externalities such as involuntary expropriation and the risk of creating a new competitor.

Third, the notion that MNCs exist primarily because of their superior ability (*vis-a-vis* markets) to engage in internal knowledge transfer does not in any way imply that such knowledge transfers actually take place effectively and efficiently on a routine basis. In perhaps the only study to date on the actual costs of cross-border knowledge transfers, Teece (1981: 84) examined a sample of 26 technology transfer cases and reported that “[T]he resource cost of international transfer is nontrivial. Transfer costs ranged from 2.25 percent to 59 percent of total project costs with a mean of 19.16 percent.” The “tacitness” or “causal ambiguity” of knowledge is one of the most widely recognized barriers to its transfer and replication (Lippman and Rumelt, 1982; Polanyi, 1966; Zander and Kogut, 1995). Levinthal and March (1993), Simon (1991), Szulanski (1996) and others have suggested additional barriers to knowledge transfer e.g., barriers rooted in motivational dispositions and absorptive capacity.

Finally, notwithstanding the criticality of internal knowledge transfers within MNCs, with some notable exceptions (e.g., Ghoshal and Bartlett, 1988 and Zander and Kogut, 1995), very little systematic empirical investigation into the determinants of intra-MNC knowledge transfers has so far been attempted. As Ghoshal, Korine, and Szulanski (1994: 97) have observed, “A number of publications emphasize the importance of inter-unit communication for effective MNC management...but in none of them is the construct operationalized or measured, nor are the factors that influence such communication empirically explored.”

Building on these observations, the primary objective of this paper is to advance the state of our theoretical as well as empirical understanding of the determinants of intra-MNC knowledge transfers. Data for this study were collected directly from the presidents of 374 subsidiaries

belonging to 75 major MNCs headquartered in the U.S., Japan, and Europe. In order to ensure reliability, data on the most critical variables (pertaining to knowledge transfers) were collected also from the immediate HQ-level superiors of the presidents of a large subset of the sampled subsidiaries; further, the tests for the hypotheses were conducted after controlling for the possible effects of the parent corporation’s country-of-origin, the resource characteristics of the parent corporation’s industry, and the nature of the subsidiary’s operations.

THE PHENOMENON OF INTEREST

Because MNCs are complex multi-dimensional entities, knowledge flows within such enterprises occur not only along multiple directions but also across multiple dimensions, e.g., the flow of information pertaining to the Brazilian subsidiary’s financial performance over the last quarter to corporate headquarters, the transfer of packaging technology from a Swedish factory to one in India, or the transfer of customer service skills from a Japanese subsidiary to one in the U.S. In this study, we focus on the transfer of largely procedural types of knowledge (e.g., product designs, distribution know-how, etc.) but not on the transfer of largely declarative types of knowledge (e.g., monthly financial data). In other words, *this study focuses on the transfer of knowledge that exists in the form of “know-how” rather than on the transfer of knowledge that exists in the form of “operational information.”*

As Ghoshal and Bartlett (1990), Gupta and Govindarajan (1991), and Hedlund (1994) have suggested, knowledge transfers within the MNC take place within the context of an interorganizational “network” of differentiated units. Thus, flows of knowledge through the network can be studied from at least three different levels of analysis: nodal (i.e., a focus on the behavior of individual units), dyadic (i.e., a focus on the joint behavior of unit pairs), and systemic (i.e., a focus on the behavior of the entire network). Given the highly complex nature of the phenomenon under investigation and the relative dearth of previous empirical work on it, in this study, we have chosen to limit our investigation to the “nodal” level. More specifically, we focus on *individual subsidiaries only* and examine the determinants of knowledge flows in each of the following

four domains: (i) knowledge outflows to peer subsidiaries, (ii) knowledge outflows to the parent corporation, (iii) knowledge inflows from peer subsidiaries, and (iv) knowledge inflows from the parent corporation.

THEORY

An overarching theoretical framework

As Krone, Jablin, and Putnam (1987) have observed in their review of communication theory, even though different communication scholars have focused more (or less) heavily on different elements of the communication process, virtually all of them recognize the following as the basic elements of any two-person communication: a message, a sender, a coding scheme, a channel, transmission through the channel, a decoding scheme, a receiver, and the assignment of meaning to the decoded message. Consistent with these ideas from communication theory, we conceptualize knowledge flows (into or out of a subsidiary) to be a function of the following five factors: (i) value of the source unit's knowledge stock, (ii) motivational disposition of the source unit, (iii) existence and richness of transmission channels, (iv) motivational disposition of the target unit, and (v) absorptive capacity of the target unit. Barriers or facilitators to the transfer of knowledge can manifest themselves in any or all of these five factors:

- (a) *Value of source unit's knowledge stock.* Knowledge flows across units are not cost free (Teece, 1981). We also know that different resources have different levels of value (Barney, 1991). Thus, the greater the value of a subsidiary's knowledge stock for the rest of the MNC, the greater would be its attractiveness for other units. This idea is broadly consistent with the concept of "relative advantage" in the literature dealing with diffusion of innovations which has argued that the adoption rate of an innovation is positively related to its relative advantage (Rogers, 1995). This idea has not yet been applied to the examination of interunit knowledge transfers within multinational corporations. Within such corporations, we visualize the knowledge stock of any subsidiary as com-

posed of both duplicative as well as non-duplicative knowledge. The presence of non-duplicative knowledge is a necessary, although not sufficient, condition for such knowledge to be of value to other units. Thus, we would anticipate that knowledge outflows from a subsidiary are likely to be high when the subsidiary's knowledge stock is non-duplicative as well as relevant for the rest of the global network.

- (b) *Motivational disposition of the source unit.* As Cyert (1995) has suggested, an organizational unit with uniquely valuable know-how is likely to enjoy an "information monopoly" within the corporation. This reality coupled with the fact that power struggles are a ubiquitous phenomenon in any organization (Pfeffer, 1981) implies that at least some units will view uniquely valuable know-how as the currency through which they acquire and retain relative power within the corporation. Levitt and March (1988: 331) have observed similarly that "In many (but not all) situations...diffusion of experience has negative consequences for organizations that are copied." Therefore, we anticipate that factors which would enhance the motivational disposition of the source unit to share its knowledge with other units within the MNC are likely to counterbalance any "hoarding" tendencies and thereby to have a positive impact on the magnitude of knowledge outflows.
- (c) *Existence and richness of transmission channels.* As would be expected, and as demonstrated empirically by Ghoshal and Bartlett (1988) in the domain of MNCs, knowledge flows cannot occur without the existence of transmission channels. Beyond mere existence, we would expect other properties of transmission channels to also affect the extent of knowledge flows – the most notable such property would be the richness/bandwidth of communication links, as captured in aspects such as informality, openness, and density of communications (Daft and Lengel, 1986; Gupta and Govindarajan, 1991; Jablin, 1979; Tushman, 1977).
- (d) *Motivational disposition of the target unit.* The "Not-Invented-Here" (NIH) syndrome

is well-known and also has been the subject of scholarly inquiry (Katz and Allen, 1982). There are at least two drivers of the NIH syndrome: (i) ego-defense mechanisms (Allport, 1937; Sherif and Cantrill, 1947) which can lead some managers to block any information that might suggest that others are more competent than they are, and (ii) power struggles within organizations (Pfeffer, 1981) which can lead some managers to try to downgrade the potential power of peer units by pretending that the knowledge stock possessed by these peer units is not unique and valuable. In short, unless countervailing forces are present, the NIH syndrome can act as a major barrier to the inflows of knowledge into any focal unit. These countervailing forces can manifest themselves in several forms: the relative paucity of the focal unit's knowledge stock, incentives that increase subsidiary managers' eagerness to learn from peer units, or coercive pressures from corporate headquarters.

- (e) *Absorptive capacity of the target unit.* Even when exposed to the same environment and even when there are insignificant differences in the desire to acquire new knowledge, individuals and organizations may differ in their "absorptive capacity" i.e., in their "ability to recognize the value of new information, assimilate it, and apply it to commercial ends" (Cohen and Levinthal, 1990: 128). There are at least two reasons why absorptive capacity may differ across organizations: (i) the extent of prior related knowledge, and (ii) the extent of inter-unit homophily of the receiving unit vis-à-vis the sending unit. Prior related knowledge is important because it shapes the filters through which the organization differentiates between more vs. less relevant signals and also because it determines the organization's ability to internalize and assimilate the more valued signals (Cohen and Levinthal, 1990). On the other hand, homophily – i.e., "the degree to which two or more individuals who interact are similar in certain attributes, such as beliefs, education, social status, and the like" (Rogers, 1995: 18–19) – is important because when the

interacting individuals "share common meanings, a mutual subcultural language, and are alike in personal and social characteristics, the communication of new ideas is likely to have greater effects in terms of knowledge gain, attitude formation, and overt behavior change" (Rogers, 1995: 19; see also Lazarsfeld and Merton, 1964).

Figure 1 presents a schematic diagram of the overarching framework developed in this section. From the perspective of the "nodal" level of analysis being pursued in this study, this framework can be translated into the following six propositions:

Proposition 1: Ceteris paribus, the value of a subsidiary's knowledge stock will be positively associated with outflows of knowledge from that subsidiary.

Proposition 2: Ceteris paribus, the motivational disposition of a subsidiary to share its knowledge with other units will be positively associated with outflows of knowledge from that subsidiary.

Proposition 3: Ceteris paribus, the existence and richness of transmission channels linking a subsidiary to other units within the MNC will be positively associated with outflows of knowledge from that subsidiary.

Proposition 4: Ceteris paribus, the existence and richness of transmission channels linking a subsidiary to other units within the MNC will be positively associated with inflows of knowledge into that subsidiary.

Proposition 5: Ceteris paribus, the motivational disposition of a subsidiary to seek/accept knowledge from other units will be positively associated with inflows of knowledge into that subsidiary.

Proposition 6: Ceteris paribus, the capacity of a subsidiary to absorb incoming knowledge from other units will be positively associated with inflows of knowledge into that subsidiary.

In the rest of this section, we operationalize the constructs underlying these propositions and

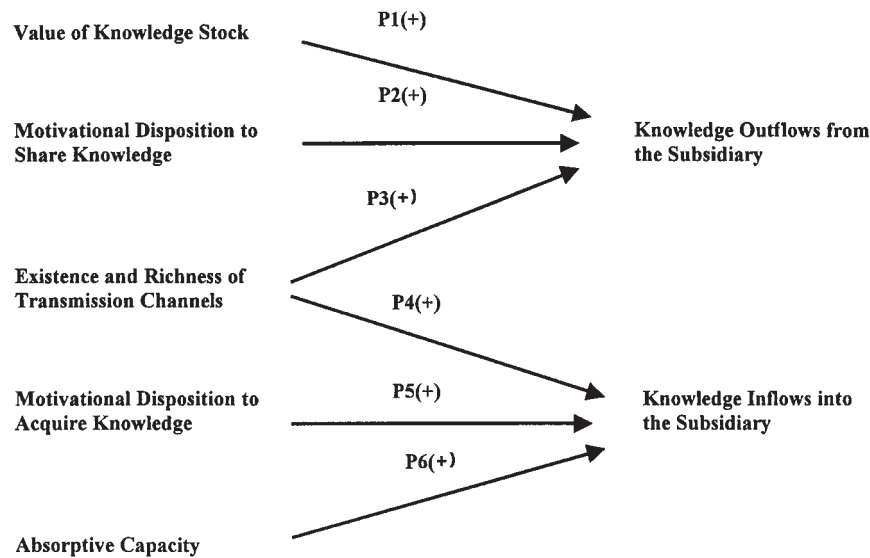


Figure 1. Determinants of intra-corporate knowledge outflows from and inflows to foreign subsidiaries: An overarching theoretical framework

develop more concrete and empirically testable hypotheses.

Value of source unit’s knowledge stock

We argued earlier that, in order for a source unit’s knowledge to be of value to other units, the source unit must (i) create non-duplicative knowledge on its own, and (ii) this non-duplicative knowledge must be of relevance for the rest of the global network. Based on this reasoning, we operationalize the construct of value of knowledge stock in terms of the following three variables: mode of entry, subsidiary size, and the economic level of the host country relative to that of the home country.

Mode of entry. As Caves (1982), Root (1987) and others have pointed out, an MNC may enter a foreign country through one of several modes – greenfield operations, strategic alliances, or acquisitions. Since our study focuses only on fully- or majority-owned subsidiaries, we examine here the impact of greenfield vs. acquisition modes only. At a general level, we can visualize every subsidiary to consist of three bundles of knowledge: duplicative knowledge, non-duplicative knowledge that is relevant only in the local environment, and non-duplicative knowledge that is relevant also for other units within the global network.

As the literature on foreign direct investment

has argued and demonstrated (Hennart and Park, 1993), the less the overlap between existing corporate know-how and the know-how required to succeed in a host market, the greater the probability of acquisition as the mode of entry. Thus, relative to greenfield subsidiaries, acquired subsidiaries on average can be expected to have a knowledge stock that is less duplicative vis-à-vis the knowledge stock of the rest of the corporation. It is true that only a subset of the non-duplicative knowledge would be of relevance for the global network. However, since the pool of non-duplicative knowledge would be higher for acquired subsidiaries as compared to greenfield subsidiaries, it is likely that acquired subsidiaries should have a larger pool of relevant knowledge to offer to the global network than greenfield subsidiaries. Based on these arguments, Proposition 1 can be operationalized in the form of the following two empirically testable hypotheses: *ceteris paribus, relative to greenfield operations, acquired subsidiaries will engage in greater knowledge outflows to peer subsidiaries (H1a) and to the parent corporation (H1a’).*

Subsidiary size. We anticipate that the typical MNC would discourage investment of a subsidiary’s resources in the reinvention of knowledge that exists elsewhere in the global network. Thus, we would expect that a subsidiary’s own resources would generally be directed at the creation of non-duplicative knowledge. Since larger

subsidiaries will have a greater pool of resources dedicated to the creation of new knowledge, it follows that subsidiary size should have a positive impact on the ability of the subsidiary to offer non-duplicative knowledge to the rest of the corporation. Clearly, not all of the non-duplicative knowledge generated by a subsidiary would have global relevance; however, a subset of such knowledge will. These arguments yield the following additional operationalizations of Proposition 1: *ceteris paribus, the larger the size of a subsidiary, the greater will be the knowledge outflows from that subsidiary to peer subsidiaries (H1b) and to the parent corporation (H1b')*.

Relative economic level. Countries differ in their levels of economic advancement. If we make the straightforward assumption that most, perhaps all, societies around the world strive to increase (rather than merely maintain or decrease) their levels of economic advancement, then it follows that, on average, more advanced countries are likely to serve as trend-setters and the sources of technological, marketing, as well as managerial know-how to a greater extent than less advanced countries. In other words, in the intracorporate context, on average, a focal unit is likely to view the knowledge stock of another unit located in an economically more advanced country relative to itself as more valuable than that of a unit located in a relatively less advanced country. These arguments also yield the following operationalization of Proposition 1: *ceteris paribus, the higher the level of the host country's economic development relative to the home country, the greater will be the knowledge outflows from that subsidiary to the parent corporation (H1c')*. Since our empirical study was conducted at the nodal level of analysis, we did not collect any data regarding knowledge flows between *specific* inter-subsidiary dyads. Accordingly, in the above hypothesis, we have focused only on the relative economic level of the focal subsidiary vis-a-vis the parent corporation and not on that vis-a-vis other *specific* subsidiaries. Thus, we neither advance nor test any inter-subsidiary hypotheses pertaining to relative economic level.

Motivational disposition of the source unit

We posit that the extent to which the subsidiary president is rewarded for improvements in the performance of a network of subsidiaries (rather

than just the focal subsidiary) would be a major determinant of motivation to share knowledge with other subsidiaries. Based on this reasoning, we operationalized the construct of motivational disposition in terms of the subsidiary vs. corporate focus (i.e., nodal vs. network optimization focus) of the incentive system for the subsidiary president.

Incentive focus. As Salter (1973) suggested and as Gupta and Govindarajan (1986) and Pitts (1974) demonstrated, the incentive bonus for a division/subsidiary general manager may be linked solely to the performance of the focal unit, solely to the performance of several units, or to some combination of the two. As these authors have argued, the greater the need to motivate a unit general manager to focus on system-wide optimization as distinct from local optimization, the better it is to link the incentives to the performance of a cluster of units. These arguments result in the following operationalizations of Proposition 2: *ceteris paribus, the greater the extent to which a subsidiary president's bonus is network-focused rather than subsidiary-focused, the greater will be the knowledge outflows from that subsidiary to peer subsidiaries (H2a) and to the parent corporation (H2a')*.

Existence and richness of transmission channels

As communications theory informs us (Daft and Lengel, 1986; Krone et al., 1987), transmission channels can be both formal and informal. Accordingly, we operationalize the construct of transmission channels in terms of two mechanisms: one formal (viz., formal integrative mechanisms) and one informal (viz., corporate socialization mechanisms).

Formal integrative mechanisms. Galbraith (1973) and Nadler and Tushman (1987) identified liaison positions, task forces, and permanent committees as some of the key formal structural mechanisms for integrating multiple units of an organization. It is easy to see that the greater the extent to which a subsidiary is linked to the rest of the global network through such integrative mechanisms, the greater would be the density of communication interface between the subsidiary and other units, thereby contributing positively to media richness (Daft and Lengel, 1986). Thus, focusing on knowledge *outflows* from the subsidi-

ary, we can now operationalize Proposition 3 in terms of the following concrete hypotheses: *ceteris paribus, the greater the reliance on formal mechanisms (liaison personnel, task forces, permanent committees) to integrate a subsidiary with the rest of the MNC, the greater will be the knowledge outflows from that subsidiary to peer subsidiaries (H3a) and to the parent corporation (H3a')*. Similarly, focusing on knowledge inflows into the subsidiary, we can also operationalize Proposition 4 in terms of the following testable hypotheses: *ceteris paribus, the greater the reliance on formal mechanisms (liaison personnel, task forces, permanent committees) to integrate a subsidiary with the rest of the MNC, the greater will be the knowledge inflows into that subsidiary from peer subsidiaries (H4a) and from the parent corporation (H4a')*.

Corporate socialization mechanisms. Corporate socialization mechanisms refer to those organizational mechanisms which build interpersonal familiarity, personal affinity, and convergence in cognitive maps among personnel from different subsidiaries (Edstrom and Galbraith, 1977; Van Maanen and Schein, 1979). Greater interpersonal familiarity and personal affinity can be expected to increase the openness of communication between the interacting parties. Further, as Daft and Lengel (1986) have suggested, personal and more open communication increases the richness of communication channels. Thus, we would argue that greater participation in corporate socialization mechanisms would have a positive impact on the richness of transmission channels between the focal subsidiary and other units.

In this study, we separate "lateral" from "vertical" socialization mechanisms. Examples of the former would be: job transfers to peer subsidiaries and participation in multi-subsidiary executive programs; similarly, examples of the latter would be: job transfers to corporate headquarters and participation in corporate mentoring programs (Ghoshal and Bartlett, 1988). Focusing now on knowledge outflows from the focal subsidiary, we can advance the following additional operationalizations of Proposition 3: *ceteris paribus, the greater the lateral socialization of a subsidiary president, the greater will be the knowledge outflows from that subsidiary to peer subsidiaries (H3b); further, ceteris paribus, the greater the vertical socialization of a subsidiary president, the greater will be the knowledge outflows from*

that subsidiary to the parent corporation (H3b'). Similarly, focusing now on knowledge inflows into the focal subsidiary, we can advance the following additional operationalizations of Proposition 4: *ceteris paribus, the greater the lateral socialization of a subsidiary president, the greater will be the knowledge inflows into that subsidiary from peer subsidiaries (H4b); further, ceteris paribus, the greater the vertical socialization of a subsidiary president, the greater will be the knowledge inflows into that subsidiary from the parent corporation (H4b')*.

Motivational disposition of the target unit

We argued earlier that a subsidiary's motivational disposition to acquire/accept knowledge from other units within the enterprise would be a function of (i) incentives that increase subsidiary managers' eagerness to learn, (ii) the relative paucity of the subsidiary's knowledge stock, and/or (iii) coercive pressures from corporate headquarters. Based on this reasoning, we operationalized the construct of motivational disposition of the target unit in terms of three variables: subsidiary vs. corporate focus of the incentives for the subsidiary president (a determinant of eagerness to learn), relative economic level (a determinant of the paucity of local knowledge stock), and HQ-subsidiary decentralization (a determinant of coercive pressures).

Incentive focus. Unlike the case of knowledge outflows where the required motivational disposition can be characterized as "eagerness to help others," in the case of knowledge inflows, the required motivation would be characterized as "eagerness to learn and to help oneself." We would argue that, other things being equal, subsidiary personnel would be more eager to learn in those contexts where the linkage between incentives and the subsidiary's own capabilities is tighter rather than weaker i.e., in contexts where incentives are linked more tightly to the focal subsidiary's own performance than to the performance of a cluster of subsidiaries. This is so because, unlike cluster-based incentives, which can create free-rider problems, subsidiary-based incentives would create a stronger disposition to learn from any and all sources. These arguments yield the following operationalizations of Proposition 5: *ceteris paribus, the greater the extent to which a subsidiary president's bonus is subsidi-*

ary-focused rather than network-focused, the greater will be the knowledge inflows into that subsidiary from peer subsidiaries (H5a) and from the parent corporation (H5a').

Relative economic level. Paralleling our discussion on this variable in the context of knowledge outflows, we expect that, other things being equal, the lower the level of economic advancement of the "host" country (i.e., where the subsidiary is located) vis-a-vis the "home" country (i.e., where the parent is located), the more eager subsidiary personnel would be to learn from the parent corporation. They are likely to perceive the knowledge stock of the parent as relatively more valuable and, thus, are likely to regard knowledge inflows as a potential source of competitive advantage against other players in the local market. Knowledge inflows into such subsidiaries may also be facilitated by explicit public policy regimes that mandate technology inflows as the condition for allowing MNCs access to the local market; as an example, this is illustrated well by the recent decisions of the Chinese government (Smith and Hamilton, 1995: 2). These arguments suggest the following additional operationalization of Proposition 5: *ceteris paribus, the lower the level of the host country's economic development relative to the home country, the greater will be the knowledge inflows into the subsidiary from the parent corporation (H5b')*. As discussed in the context of knowledge outflows, given our nodal level of analysis, we neither advance nor test any hypotheses pertaining to the relative economic levels of subsidiary pairs.

Headquarters-subsidiary decentralization. The concept of decentralization (or its obverse i.e., centralization) has had a long history of research in organization theory (see Ford and Slocum, 1977 for an extensive review). Even in the domain of research on MNCs, scholars have argued that centralization is "one of the fundamental dimensions of organization design" (Egelhoff, 1988: 129). Our expectations of a linkage between decentralization and knowledge inflows into a subsidiary parallel the broader arguments of DiMaggio and Powell (1983), echoed also by Levitt and March (1988), that coercion is one of the major (but not the sole) drivers of inter-organizational isomorphism. In the MNC context also, similar arguments have been advanced by many scholars (e.g., Gates and Egelhoff, 1986; Ghoshal and Bartlett, 1988).

These arguments yield the following additional operationalization of Proposition 5: *ceteris paribus, the lower the decentralization of decision-making authority to a subsidiary, the greater will be the knowledge inflows into that subsidiary from the parent corporation (H5c')*. Since the construct of decentralization pertains to parent-subsidiary relationships only, we advance no hypotheses pertaining to the impact of decentralization on knowledge inflows from peer subsidiaries.

Absorptive capacity of the target unit

We argued earlier that the absorptive capacity of a subsidiary would be a function of (i) its familiarity with the incoming knowledge, and (ii) interunit homophily. Based on this reasoning, we operationalized the construct of absorptive capacity in terms of the following two variables: mode of entry (a determinant of the subsidiary's ex-ante familiarity with the corporate-wide knowledge base) and the proportion of local nationals vs. expatriates within the subsidiary's top management team (a measure of the interunit homophily of subsidiary managers).

Mode of entry. Literature on foreign direct investment (see e.g., Hennart and Park, 1993) has argued theoretically and demonstrated empirically that the less the overlap between existing corporate know-how and the know-how required to succeed in a host market, the greater the probability of acquisition as the mode of entry. Thus, as we discussed earlier, relative to greenfield operations, acquired subsidiaries are more likely to have a non-duplicative knowledge base vis-a-vis the parent corporation. Building on Cohen and Levinthal's (1990) arguments regarding the determinants of absorptive capacity, it follows that, on average, the novelty of acquired subsidiaries' knowledge base should also imply a lower absorptive capacity for intra-corporate knowledge relative to the case with greenfield subsidiaries. Based on these arguments, we can now operationalize Proposition 6 in terms of the following concrete hypotheses: *ceteris paribus, relative to greenfield operations, acquired subsidiaries will engage in less knowledge inflows from peer subsidiaries (H6a) and from the parent corporation (H6a')*.¹

¹An anonymous reviewer has pointed out that, at first glance, the two hypotheses under H6 might appear inconsistent with

Proportion of local nationals in the subsidiary's top management team. Several studies have indicated that national background accounts for significant differences in managerial perspectives (e.g., Tung, 1982; Zeira, 1986). Accordingly, the greater the proportion of local nationals (i.e., the lower the proportion of expatriates) within the subsidiary's top management team (TMT), the lower would be the homophily between the subsidiary and the rest of the corporation. Building on Rogers' arguments (1995), we would expect that inter-unit homophily is likely to be positively associated with absorptive capacity. This is so because greater homophily implies a greater commonality in language systems as well as in the meanings assigned to the artifacts of communication. Thus, on average, subsidiaries with a greater proportion of local nationals within the TMT can be expected to have lower absorptive capacity for incoming knowledge from the rest of the corporate network. These arguments yield the following operationalization of Proposition 6: *ceteris paribus, the greater the proportion of local nationals within the subsidiary's top management team, the less will be the knowledge inflows into that subsidiary from peer subsidiaries (H6b) and from the parent corporation (H6b').*²

the two hypotheses under H1. In H1, we predicted that, because of their large non-duplicative knowledge base, acquired subsidiaries would exhibit high knowledge outflows; an implicit assumption underlying this prediction was that such knowledge would be absorbed by the receiving units. However, H6 argues that unfamiliarity with incoming knowledge would reduce absorptive capacity among the receiving units. Thus, H1 could not be true unless mode of entry has a different effect on flows from the subsidiary to the MNC than it does on flows from the MNC to the subsidiary. We believe this to be the case. The roots of this differing effect lie in the following two observations: One, the typical acquisition represents a *voluntary* event for the acquiring MNC but an *involuntary* event for the acquired subsidiary; thus, the willingness of the acquiring MNC to integrate the new knowledge of the acquired unit should, on average, be greater than the willingness of the acquired unit to integrate the new knowledge of the acquiring MNC. Two, the typical MNC would have much greater experience at acquiring and integrating new units than the typical unit would have in being acquired and integrated; accordingly, on average, the acquirer's ability to digest new knowledge should be greater than that of the acquired unit.

²We should note that nationality structure of a subsidiary's TMT has the potential to affect knowledge inflows not only through its impact on absorptive capacity but also through its impact on richness of transmission channels between the local subsidiary and the rest of the global network. It does appear likely that, on average, relative to local nationals, expatriates should have stronger and longer-tenured social ties with man-

Control variables

Country of origin. There already exists a large body of both theoretical and empirical literature dealing with the fact that country of origin has a major impact on the propensities of MNCs vis-a-vis the choice of global strategies, organizational structures and control systems, as well as internal corporate cultures (e.g., Bartlett and Ghoshal, 1989; Egelhoff, 1984; Franko, 1976; Porter, 1994; Yip, Roos and Johansson, 1994). Accordingly, all of our hypotheses were tested after controlling for the effect of country-of-origin of the MNC.

Industry resource characteristics. As discussed earlier, economic theory posits that MNCs come to be primarily because external markets are less effective and efficient at knowledge transfer than intracorporate mechanisms (Caves, 1982; Hymer, 1960; Kindleberger, 1969). Empirical tests of this theory have consistently shown that industries characterized by greater degrees of knowledge intensities (industries with higher R&D-to-sales-ratios and/or higher advertising-to-sales ratios) tend to be more global than other industries (e.g., Goedde, 1978; Grueber, Mehta, and Vernon, 1967; Horst, 1972). Accordingly, we deemed it important that, in testing our hypotheses, we control also for the potential effects of three resource characteristics of the MNC's industry: R&D intensity, fixed asset intensity, and advertising intensity (Collis and Ghemawat, 1994).

Nature of subsidiary's operations. It is well accepted that foreign subsidiaries will often vary in the scope of value chain activities included within their operations (Porter, 1986). The pres-

agers at corporate HQ and in other subsidiaries. In fact, as the correlations in Table I indicate, there does exist a strong negative correlation ($-0.59, p < 0.001$) between proportion of local nationals in the subsidiary's TMT and vertical corporate socialization. Thus, as pointed out by an anonymous reviewer and the consulting editor, the question arises as to whether, in the context of our study, TMT nationality might be a better proxy for another factor (such as richness of transmission channels) rather than absorptive capacity. We believe that this would indeed be a serious concern if we did not have any direct measures of socialization mechanisms as one of the hypothesized antecedents of knowledge inflows. However, as captured in H3b, H3b', H4b, and H4b', we do test for the direct effect of socialization mechanisms on knowledge inflows. Thus, in a *multivariate* regression context, any remaining impact of TMT nationality on knowledge inflows is likely to be due primarily to absorptive capacity rather than transmission channel considerations.

ence or absence of any particular activity within the subsidiary's operations can be expected to shape the nature of the subsidiary's interactions with the rest of the corporation and, thus, the nature of knowledge inflows into and outflows from the subsidiary. Accordingly, all of our hypotheses were tested after controlling also for the potential effects of two dummy variables: presence of a primary upstream activity (i.e., R&D and/or manufacturing) and presence of a primary downstream activity (i.e., marketing and sales).

METHOD

Sample

Data for this study were collected through a combination of questionnaire surveys and secondary sources. The following steps guided the development of the questionnaire instrument: (i) interviews with subsidiary presidents and corporate-level executives in six MNCs to understand and clarify the phenomenon of interest, (ii) a review of previous research to locate, wherever possible, measures that would appropriately capture the constructs under study, and (iii) a pretesting of the questionnaire for clarity and relevance through face-to-face interviews with four subsidiary presidents (two American and two non-American).

The pre-tested questionnaires were mailed to the heads (variously titled as presidents, managing directors, or general managers) of 987 foreign subsidiaries of major MNCs headquartered in the U.S. (407 subsidiaries of 19 MNCs), Japan (270 subsidiaries of 41 MNCs), and Europe (310 subsidiaries of 15 MNCs). Subsidiary presidents within Japanese MNCs received both an English and a Japanese language questionnaire; initial interviews with the European companies indicated that only the English-language questionnaire would suffice. The U.S. sample was drawn from the list of the largest U.S.-based MNCs contained in the International Directory of Corporate Affiliations (National Register, 1991); this was also the approach used for developing a list of subsidiaries for 9 out of the 15 European MNCs. In the case of the other 6 European MNCs, the list of subsidiaries was drawn up in cooperation with the senior-most corporate executive in charge of strategic planning, an approach also used in the case of all of the Japanese MNCs. Given the constraints of time and funding and given the

need to obtain access, it was not possible to use a random sample either from the entire universe of MNCs or from the entire subset of MNCs headquartered in the U.S., Europe, and Japan. Nonetheless, given the diversity of industries in which the sampled firms operate (food products, industrial machinery, computers, telecommunications, pharmaceuticals, automobiles, chemical production, electronics, consumer durables, consumer nondurables, etc.), there is no *prima facie* reason to expect any systematic bias in the findings from subsidiaries within these firms.

A personalized cover letter accompanying each questionnaire explained the purpose of the study and provided assurances regarding the confidentiality of collected data. In order to minimize response bias, the participants were also provided with pre-addressed envelopes to enable them to return the completed questionnaires directly to the researchers without any risk of perusal by others in their firms. A total of 374 questionnaires (38 percent) were returned—a response rate that compares very favorably with past survey-based research studies in the strategic management area. The number of respondents for U.S., Japan, and European MNCs were 117 (28 percent), 112 (41 percent), and 145 (46 percent), respectively. To test for inter-rater reliability on the most critical variables in the study (knowledge outflows and inflows), we were also able to get responses on these knowledge flow variables from the immediate corporate-level direct-report superiors of 89 of the responding subsidiary presidents.

For the sample, median worldwide revenues and median number of total employees for the parent firms were \$5.8 billion and 32,100 respectively; at the subsidiary level, the median number of employees per subsidiary was 350. These figures pertain to 1991, the year in which the survey data were collected.

Measures

A summary of how the independent variables as well as the control variables were measured is contained in the Appendix. Wherever possible, we used standard well-established research instruments with minor changes in wording to adapt the instrument to the multinational context. Given below are details pertaining to how the four variables central to this study – knowledge outflows to peer subsidiaries (KO-S), knowledge

outflows to the parent corporation (KO-P), knowledge inflows from peer subsidiaries (KI-S), and knowledge inflows from the parent corporation (KI-P) – were measured.

As stated earlier, in this study, we focus on the transfer of largely procedural types of knowledge (e.g., product designs, distribution know-how, etc.) but not on the transfer of largely declarative types of knowledge (e.g., monthly financial results). Knowledge flow data were collected on the following seven items: (1) marketing know-how, (2) distribution know-how, (3) packaging design/technology, (4) product designs, (5) process designs, (6) purchasing know-how, and (7) management systems and practices. For *each* of these seven items, the subsidiary president was asked to indicate on a 7-point scale (ranging from “not at all” to “a very great deal”) the extent to which the subsidiary engaged in transfers of “knowledge and skills” in *each* of the following four directions: (1) “provides knowledge and skills to sister subsidiaries,” (2) “provides knowledge and skills to parent corporation,” (3) “receives knowledge and skills from sister subsidiaries,” and (4) “receives knowledge and skills from the parent corporation.” For *each* of these knowledge flow directions, responses across the seven items were averaged to yield composite measures of KO-S, KO-P, KI-S, and KI-P. For these four variables, the means, the standard deviations, and Chronbach alpha values respectively were as follows: KO-S (2.36, 1.25, 0.89), KO-P (2.39, 1.20, 0.87), KI-S (2.21, 1.27, 0.92), and KI-P (3.75, 1.59, 0.89).

Given the 1-to-7 range of the 7-point scale used to measure knowledge flows, the mean values of the four types of knowledge flows in our sample (2.36, 2.39, 2.21, and 3.75) may at first glance appear low. However, as clarified above, it should be noted that this study has focused on the transfers of largely procedural knowledge (i.e., know-how) rather than on the transfers of largely declarative knowledge (e.g., operational data). Given the tacit rather than codified nature of much procedural knowledge, we would expect the mean levels of knowledge transfers in this arena to be on the lower rather than higher side. It also should be noted that, as would be expected in the case of hierarchical organizations, pairwise t-tests revealed that knowledge inflows from the parent to focal subsidiaries (KI-P) were significantly greater (at

$p < 0.001$) than each of the other three types of knowledge flows.

Given the perceptual nature of these knowledge flow measures and given their centrality for our study, we deemed it critical that they be tested also for inter-rater reliability. Towards this goal, we were able to get responses on the same knowledge flow variables from the immediate corporate-level direct report superiors of 89 of the subsidiary presidents. Each superior completed a *separate* questionnaire containing the subsidiary’s name for *each* of the sampled subsidiaries reporting to him/her. This questionnaire used exactly the same seven dimensions of knowledge. For each of these seven items, the superior was asked to indicate on a 7-point scale (ranging from “not at all” to “a very great deal”) the extent to which he/she expected the named subsidiary to engage in transfers of “knowledge and skills” in each of the following two directions: (1) “provides knowledge and skills to the rest of the corporation,” and (2) “receives knowledge and skills from the rest of the corporation.” For *each* of these two knowledge flow directions, responses across the seven items were averaged to yield composite measures of expected “knowledge outflows from the subsidiary” (Chronbach alpha = 0.82) and expected “knowledge inflows into the subsidiary” (Chronbach alpha = 0.81) respectively. For these 89 subsidiaries, this corporate-level measure of expected knowledge outflows from the subsidiary correlates at 0.23 ($p < 0.05$) with the average of KO-S and KO-P; similarly, the corporate-level measure of expected knowledge inflows into the subsidiary correlates at 0.38 ($p < 0.001$) with the average of KI-S and KI-P. Given these positive correlations in the data from subsidiary presidents and their immediate superiors, in a context where they are typically separated by a geographic distance of thousands of miles, we believe that our measures of KO-S, KO-P, KI-S, and KI-P can be deemed as reliable.

Table 1 contains the matrix of zero-order correlations among these and all other variables utilized in this study. As this table indicates, the average correlation among the four knowledge flow variables is 0.32 implying that the four types of knowledge flows are distinct, albeit related, variables not only conceptually (Gupta and Govindarajan, 1991) but also empirically.

Table 1 Zero-order correlation coefficients among all variables under study

	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆	X ₇	X ₈	X ₉	X ₁₀	X ₁₁	X ₁₂	X ₁₃	X ₁₄	X ₁₅	X ₁₆	X ₁₇
X ₁ KO-S	***																
X ₂ KO-P	0.54	***															
X ₃ KI-S	0.58	0.33	***														
X ₄ KI-P	0.00	0.19	0.25	***													
X ₅ R&D Intensity	*	-0.12	-0.07	-0.15	0.15	***											
X ₆ Fixed Asset Intensity	-0.04	-0.03	0.02	-0.15	-0.28	***	***										
X ₇ Advertising Intensity	***	**			***	***	***										
X ₈ Upstream Activities ¹	0.20	0.14	0.07	-0.02	-0.21	-0.39	***										
X ₉ Downstream Activities ²	0.14	0.08	0.05	-0.08	-0.16	0.06	0.08	***									
X ₁₀ Mode of Entry ³	0.25	0.22	0.13	-0.06	-0.05	0.03	0.06	0.27	***								
X ₁₁ Subsidiary Size	0.09	-0.03	0.01	-0.32	-0.12	0.02	0.04	0.16	0.04	***	*						
X ₁₂ Relative Economic Level	0.22	0.14	0.01	0.06	-0.20	-0.00	-0.00	0.37	0.09	0.03	***						
X ₁₃ Incentive Focus ⁴	0.08	0.15	-0.05	-0.36	-0.22	0.10	0.13	0.04	0.03	0.35	0.06	***					
X ₁₄ Formal Integ Mechanisms	0.08	0.02	0.12	0.06	0.13	-0.05	-0.04	-0.01	0.01	-0.12	-0.02	-0.18	***				
X ₁₅ Lateral Socializn Mech.	0.29	0.24	0.22	0.21	-0.06	-0.03	-0.01	0.01	-0.01	-0.12	0.09	-0.02	0.15	***			
X ₁₆ Vertical Socializn Mech.	0.25	0.15	0.21	0.14	-0.12	-0.08	0.11	0.13	0.20	-0.08	0.22	-0.11	0.15	0.21	***		
X ₁₇ HQ-Sub	-0.22	-0.14	-0.25	0.25	0.21	-0.19	-0.20	-0.09	-0.08	-0.21	0.06	-0.18	0.08	0.00	0.03		
X ₁₈ Local Nationals in TMT	0.06	-0.06	-0.04	-0.13	-0.17	0.06	0.13	0.25	0.04	0.11	0.16	0.03	-0.13	-0.05	0.08	-0.06	***
	0.19	0.14	0.22	-0.14	-0.14	0.18	0.23	0.22	0.22	0.08	0.02	0.12	0.10	0.01	0.06	-0.59	0.12

¹1 = Subsidiary has an upstream activity (R&D and/or manufacturing); 0 = Subsidiary has no upstream activity.

²1 = Subsidiary has a downstream activity (marketing and sales); 0 = Subsidiary has no downstream activity.

³Mode of entry: 1 = Acquisition; 0 = Greenfield.

⁴Higher values signify that the incentive system is more network, rather than subsidiary, focused.

*one-tail p < 0.05; **one-tail p < 0.01; ***one-tail p < 0.001

RESULTS

We have four dependent variables (KO-S, KO-P, KI-S, or KI-P) and a set of hypotheses pertaining to each of these variables. Each set of these hypotheses was tested through a series of multivariate OLS regressions: first, we entered the four control variables pertaining to country-of-origin; second, we entered the three control variables pertaining to industry resource characteristics; third, we entered the two control variables pertaining to nature of subsidiary operations; finally, we entered the independent variables hypothesized as the determinants of that particular type of knowledge flows. Tables 2 through 5 contain the results of these regression analyses.

Knowledge outflows to peer subsidiaries

Table 2 presents the results of regression analyses to test our predictions regarding the impact of value of knowledge stock (P1), motivational disposition (P2), and transmission channels (P3) on knowledge outflows to peer subsidiaries.

Value of knowledge stock. In the context of knowledge outflows to peer subsidiaries, we operationalized this construct in terms of mode of entry and subsidiary size. The results in Table 2 (equation 4) support both of the resulting hypotheses. More specifically, knowledge outflows to peer subsidiaries are higher in the case of (i) subsidiaries that were acquired rather than set up as greenfield operations (beta for “mode of

Table 2. Determinants of knowledge outflows to peer subsidiaries
dependent variable = Knowledge outflows to peer subsidiaries (KO-S)

Independent Variables	Hypothesized Relationship	Standardized Beta Coefficients			
		Equation 1	Equation 2	Equation 3	Equation 4
Japan		-0.233***	-0.244***	-0.184**	-0.153**
U.K.		0.041	0.003	-0.003	-0.061
Sweden		-0.046	-0.031	-0.043	-0.080
Finland		0.065	-0.058	-0.045	-0.019
R&D Intensity			-0.069	-0.046	0.032
Fixed Asset Intensity			-0.086	-0.078	0.001
Advertising Intensity			0.128*	0.130*	0.155*
Upstream Activities ¹				0.070	0.005
Downstream Activities ²				0.195***	0.187***
<i>P1: Value of Knowledge Stock</i>					
Mode of Entry ³	H1a (+)				0.127**
Subsidiary Size	H1b (+)				0.169**
<i>P2: Motivational Disposition</i>					
Incentive Focus ⁴	H2a (+)				-0.003
<i>P3: Transmission Channels</i>					
Formal Integrative Mechanisms	H3a (+)				0.256***
Lateral Socialization Mechanisms	H3b (+)				0.100*
R ²		0.072	0.095	0.139	0.256
d.f.		4,335	7,332	9,330	14,325
F		6.50***	4.99***	5.91***	8.00***
ΔR ²		0.072	0.023	0.043	0.117
d.f.		4,335	3,332	2,330	5,325
F		6.50***	2.84*	8.33***	10.27***

¹1 = Subsidiary has an upstream activity (R&D and/or manufacturing); 0 = Subsidiary has no upstream activity.

²1 = Subsidiary has a downstream activity (marketing and sales); 0 = Subsidiary has no downstream activity.

³Mode of entry: 1 = Acquisition; 0 = Greenfield.

⁴Higher values signify that the incentive system is more network, rather than subsidiary, focused.

*p < 0.05

**p < 0.01

***p < 0.001 For t-tests, these are one-tail values.

Table 3. Determinants of knowledge outflows to the parent corporation
Dependent variable = Knowledge outflows to the parent corporation (KO-P)

Independent Variables	Hypothesized Relationship	Standardized Beta Coefficients			
		Equation 5	Equation 6	Equation 7	Equation 8
Japan		-0.127*	-0.141*	-0.095	-0.088
U.K.		0.089	0.062	0.063	-0.038
Sweden		0.018	0.035	0.030	-0.021
Finland		0.020	-0.092	-0.079	-0.135
R&D Intensity			-0.043	-0.031	-0.002
Fixed Asset Intensity			-0.089	-0.081	-0.063
Advertising Intensity			0.120	0.120	0.129*
Upstream Activities ¹				-0.002	-0.033
Downstream Activities ²				0.181***	0.174***
<i>P1: Value of Knowledge Stock</i>					
Mode of Entry ³	H1a' (+)				-0.063
Subsidiary Size	H1b' (+)				0.121*
Relative Economic Level	H1c' (+)				0.169**
<i>P2: Motivational Disposition</i>					
Incentive Focus ⁴	H2a' (+)				-0.018
<i>P3: Transmission Channels</i>					
Formal Integrative Mechanisms	H3a' (+)				0.208***
Lateral Socialization Mechanisms	H3b' (+)				-0.073
R ²		0.033	0.054	0.084	0.162
d.f.		4,322	7,319	9,317	15,311
F		2.75*	2.58**	3.23***	4.02***
ΔR^2		0.033	0.020	0.030	0.078
d.f.		4,322	3,319	2,317	6,311
F		2.75*	2.30	5.28**	4.84***

¹1 = Subsidiary has an upstream activity (R&D and/or manufacturing); 0 = Subsidiary has no upstream activity.

²1 = Subsidiary has a downstream activity (marketing and sales); 0 = Subsidiary has no downstream activity.

³Mode of entry: 1 = Acquisition; 0 = Greenfield.

⁴Higher values signify that the incentive system is more network, rather than subsidiary, focused.

*p < 0.05

**p < 0.01

***p < 0.001 For t-tests, these are one-tail values.

entry" = 0.127, $p < 0.01$; thus, H1a is supported), and (ii) subsidiaries that are larger in size (beta for "subsidiary size" = 0.169, $p < 0.01$; thus, H1b is supported).

Motivational disposition. In the context of knowledge outflows to peer subsidiaries, we operationalized this construct in terms of the network vs. subsidiary focus of the incentive system for the subsidiary president. The results in Table 2 (Equation 4) do not support the resulting hypothesis (H2a).

Transmission channels. In the context of knowledge outflows to peer subsidiaries, we operationalized this construct in terms of formal integrative mechanisms and lateral socialization mechanisms. The results in Table 2 (Equation 4) support both of the resulting hypotheses. More

specifically, knowledge outflows to peer subsidiaries are higher in the case of (i) subsidiaries that are integrated more tightly with the rest of the corporation through formal mechanisms (beta for "formal integrative mechanisms" = 0.256, $p < 0.001$; thus, H3a is supported), and (ii) subsidiaries whose presidents have been involved in lateral socialization mechanisms with peer subsidiaries to a greater extent (beta for "lateral socialization mechanisms" = 0.100, $p < 0.05$; thus, H3b is supported).

Knowledge outflows to the parent corporation

Table 3 presents the results of regression analyses to test our predictions regarding the impact of

Table 4. Determinants of knowledge inflows from peer subsidiaries
dependent variable = Knowledge inflows from peer subsidiaries (KI-S)

Independent Variables	Hypothesized Relationship	Standardized Beta Coefficients			
		Equation 9	Equation 10	Equation 11	Equation 12
Japan		-0.333***	-0.362***	-0.349***	-0.231**
U.K.		-0.087	-0.166**	-0.164**	-0.169**
Sweden		-0.064	-0.084	-0.084	-0.087
Finland		-0.088	-0.216**	-0.212**	-0.195**
R&D Intensity			-0.202***	-0.200***	-0.164**
Fixed Asset Intensity			-0.098	-0.095	-0.062
Advertising Intensity			0.029	0.030	0.032
Upstream Activities ¹				-0.017	-0.026
Downstream Activities ²				0.063	0.055
<i>P4: Transmission Channels</i>					
Formal Integrative Mechanisms	H4a (+)				0.167***
Lateral Socialization Mechanisms	H4b (+)				0.110*
<i>P5: Motivational Disposition</i>					
Incentive Focus ³	H5a (-)				0.015
<i>P6: Absorptive Capacity</i>					
Mode of Entry ⁴	H6a (-)				0.071
Local Nationals in TMT	H6b (-)				0.101
R ²		0.085	0.115	0.119	0.167
d.f.		4,341	7,338	9,336	14,331
F		7.90***	6.29***	5.04***	4.73***
ΔR ²		0.085	0.030	0.004	0.048
d.f.		4,341	3,338	2,336	5,331
F		7.90***	3.88**	0.69	3.80**

¹1 = Subsidiary has an upstream activity (R&D and/or manufacturing); 0 = Subsidiary has no upstream activity.

²1 = Subsidiary has a downstream activity (marketing and sales); 0 = Subsidiary has no downstream activity.

³Higher values signify that the incentive system is more network, rather than subsidiary, focused.

⁴Mode of entry: 1 = Acquisition; 0 = Greenfield.

*p < 0.05

**p < 0.01

***p < 0.001 For t-tests, these are one-tail values.

value of knowledge stock (P1), motivational disposition (P2), and transmission channels (P3) on knowledge outflows to the parent corporation.

Value of knowledge stock. In the context of knowledge outflows to the parent corporation, we operationalized this construct in terms of mode of entry, subsidiary size, and relative economic level. The results in Table 3 (Equation 8) support two of the resulting three hypotheses. More specifically, knowledge outflows to the parent corporation are higher in the case of (i) subsidiaries that are larger in size (beta for “subsidiary size” = 0.121, p < 0.05; thus, H1b’ is supported), and (ii) subsidiaries that are located in countries with a higher level of economic advancement relative to the country of the parent corporation (beta for “relative economic level” = 0.169, p < 0.01; thus, H1c’ is supported). There was no

support for our prediction regarding the impact of mode of entry on KO-P (H1a’).

Motivational disposition. In the context of knowledge outflows to the parent corporation also, we operationalized this construct in terms of the network vs. subsidiary focus of the incentive system for the subsidiary president. The results in Table 3 (Equation 8) do not support the resulting hypothesis (H2a’).

Transmission channels. In the context of knowledge outflows to the parent corporation, we operationalized this construct in terms of formal integrative mechanisms and vertical socialization mechanisms. The results in Table 3 (Equation 8) support one of the two resulting hypotheses. More specifically, knowledge outflows to the parent corporation are higher in the case of subsidiaries that are integrated more tightly with the rest of

Table 5. Determinants of knowledge inflows from the parent corporation
dependent variable = Knowledge inflows from the parent corporation (KI-P)

Independent Variables	Hypothesized Relationship	Standardized Beta Coefficients			
		Equation 13	Equation 14	Equation 15	Equation 16
Japan		-0.020	-0.042	-0.062	-0.073
U.K.		-0.245***	-0.278***	-0.276***	-0.086
Sweden		-0.077	-0.044	-0.040	0.011
Finland		-0.319***	-0.501***	-0.506***	-0.256***
R&D Intensity			-0.052	-0.063	0.014
Fixed Asset Intensity			-0.151**	-0.153**	-0.095
Advertising Intensity			0.205**	0.206**	0.168**
Upstream Activities ¹				-0.046	-0.009
Downstream Activities ²				-0.039	-0.033
<i>P4: Transmission Channels</i>					
Formal Integrative Mechanisms	H4a' (+)				0.182***
Vertical Socialization Mechanisms	H4b' (+)				0.119*
<i>P5: Motivational Disposition</i>					
Incentive Focus ³	H5a' (-)				-0.097*
Relative Economic Level	H5b' (-)				-0.209***
HQ-Subsidiary Decentralization	H5c' (-)				-0.086*
<i>P6: Absorptive Capacity</i>					
Mode of Entry ⁴	H6a' (-)				-0.165***
Local Nationals in TMT	H6b' (-)				-0.009
R ²		0.120	0.180	0.184	0.298
d.f.		4,325	7,322	9,320	16,313
F		11.11***	10.10***	8.01***	8.31***
ΔR^2		0.120	0.060	0.004	0.114
d.f.		4,325	3,322	2,320	7,313
F		11.11***	7.83***	0.74	7.28***

¹1 = Subsidiary has an upstream activity (R&D and/or manufacturing); 0 = Subsidiary has no upstream activity.

²1 = Subsidiary has a downstream activity (marketing and sales); 0 = Subsidiary has no downstream activity.

³Higher values signify that the incentive system is more network, rather than subsidiary, focused.

⁴Mode of entry: 1 = Acquisition; 0 = Greenfield.

*p < 0.05

**p < 0.01

***p < 0.001 For t-tests, these are one-tail values.

the corporation through formal mechanisms (beta for "formal integrative mechanisms" = 0.208, $p < 0.001$; thus, H3a' is supported). There was no support for our prediction regarding the impact of vertical socialization mechanisms on KO-P (H3b').

Knowledge inflows from peer subsidiaries

Table 4 presents the results of regression analyses to test our predictions regarding the impact of transmission channels (P4), motivational disposition (P5), and absorptive capacity (P6) on knowledge inflows from peer subsidiaries.

Transmission channels. In the context of knowledge inflows from peer subsidiaries, we operationalized this construct in terms of formal

integrative mechanisms and lateral socialization mechanisms. The results in Table 4 (Equation 12) support both of the resulting hypotheses. More specifically, knowledge inflows from peer subsidiaries are higher in the case of (i) subsidiaries that are integrated more tightly with the rest of the corporation through formal mechanisms (beta for "formal integrative mechanisms" = 0.167, $p < 0.001$; thus, H4a is supported), and (ii) subsidiaries whose presidents have been involved in lateral socialization mechanisms with peer subsidiaries to a greater extent (beta for "lateral socialization mechanisms" = 0.110, $p < 0.05$; thus, H4b is supported).

Motivational disposition. In the context of knowledge inflows from peer subsidiaries, we operationalized this construct in terms of the net-

work vs. subsidiary focus of the incentive system for the subsidiary president. The results in Table 4 (Equation 12) do not support the resulting hypothesis (H5a).

Absorptive capacity. In the context of knowledge inflows from peer subsidiaries, we operationalized this construct in terms of mode of entry and proportion of local nationals in the subsidiary's top management team. The results in Table 4 (Equation 12) do not support the resulting hypotheses (H6a and H6b).

Knowledge inflows from the parent corporation

Table 5 presents the results of regression analyses to test our predictions regarding the impact of transmission channels (P4), motivational disposition (P5), and absorptive capacity (P6) on knowledge inflows from the parent corporation.

Transmission channels. In the context of knowledge inflows from the parent corporation, we operationalized this construct in terms of formal integrative mechanisms and vertical socialization mechanisms. The results in Table 5 (Equation 16) support both of the resulting hypotheses. More specifically, knowledge inflows from the parent corporation are higher in the case of (i) subsidiaries that are integrated more tightly with the rest of the corporation through formal mechanisms (beta for "formal integrative mechanisms" = 0.182, $p < 0.001$; thus, H4a' is supported), and (ii) subsidiaries whose presidents have been involved in vertical socialization mechanisms with corporate HQ to a greater extent (beta for "vertical socialization mechanisms" = 0.119, $p < 0.05$; thus, H4b' is supported).

Motivational disposition. In the context of knowledge inflows from the parent corporation, we operationalized this construct in terms of the network vs. subsidiary focus of the incentive system for the subsidiary president, relative economic level, and HQ-subsidiary decentralization. The results in Table 5 (Equation 16) support all three of the resulting hypotheses. More specifically, knowledge inflows from the parent corporation are higher in the case of (i) subsidiaries whose presidents operate under more subsidiary-focused, rather than network-focused, incentives (beta for "incentive focus" = -0.097, $p < 0.05$; thus, H5a' is supported), (ii) subsidiaries that are located in countries with a lower level of eco-

nomical advancement relative to the country of the parent corporation (beta for "relative economic level" = -0.209, $p < 0.001$; thus, H5b' is supported), and (iii) subsidiaries that are given less decision-making autonomy by corporate headquarters (beta for "HQ-subsidiary decentralization" = -0.086, $p < 0.05$; thus, H5c' is supported).

Absorptive capacity. In the context of knowledge inflows from the parent corporation, we operationalized this construct in terms of mode of entry and proportion of local nationals in the subsidiary's top management team. The results in Table 5 (Equation 16) support only the first of the two resulting hypotheses. More specifically, knowledge inflows from the parent corporation are higher in the case of subsidiaries that were set up as greenfield operations rather than acquired (beta for "mode of entry" = -0.165, $p < 0.001$; thus, H6a' is supported).

DISCUSSION

Pursuing a nodal level of analysis, this study has investigated both theoretically and empirically the determinants of intra-MNC knowledge flow patterns. While previous studies have focused more narrowly on selected facets of intra-MNC knowledge transfer e.g., tacitness of know-how (Tece, 1977; Zander and Kogut, 1995), and normative integration and inter-subsidiary communication (Ghoshal and Bartlett, 1988), this study has advanced and adopted a more comprehensive theoretical approach. Building on communication theory, we have argued that a complete mapping of the knowledge transfer process requires attention to all of the following five major elements: (i) value of the knowledge possessed by the source unit, (ii) motivational disposition of the source unit regarding the sharing of its knowledge, (iii) the existence, quality, and cost of transmission channels, (iv) motivational disposition of the target unit regarding acceptance of incoming knowledge, and (v) the target unit's absorptive capacity for the incoming knowledge.

Further, unlike previous studies on intra-MNC knowledge transfers, we have conducted separate examinations of knowledge flows that occur *laterally* among peer subsidiaries and those which occur *hierarchically* between a subsidiary and the parent corporation. Given the ongoing devolution

of authority and responsibility from the center to the subsidiaries and the ability of information technology to enable direct communication among subsidiaries, we would agree with Bartlett and Ghoshal (1989), Hedlund (1994), Martinez and Jarillo (1989), and others that direct inter-subsidiary interactions are becoming increasingly important.

Utilizing the overarching theoretical framework and the broad propositions depicted in Figure 1, we advanced a set of hypotheses for each of the following four types of knowledge transfer contexts: (i) knowledge outflows to peer subsidiaries, (ii) knowledge outflows to the parent corporation, (iii) knowledge inflows from peer subsidiaries, and (iv) knowledge inflows from the parent corporation. These hypotheses were tested with data collected from the presidents of 374 subsidiaries of 75 MNCs headquartered in the U.S., Europe, and Japan. All hypotheses were tested after controlling for the effects of country-of-origin, the resource characteristics of the MNC's industry, and the nature of the subsidiary's operations.

Commentary on the results

As can be seen from Tables 2–5 (across-table comparisons of R^2 and ΔR^2 values as well as the number of significant beta coefficients), our data had the greatest success in uncovering the determinants of KI-P i.e., knowledge inflows to focal subsidiaries from the parent corporation. In this context, it may be useful to recall our earlier observation that, for the sample as a whole, of the four types of knowledge flows, the magnitude of KI-P was significantly greater than that of each of the other three types of flows. These two empirical observations lead us to draw the following conjectures: (i) Of the four types of knowledge flows examined in this study, the typical MNC has perhaps had the longest experience in undertaking knowledge outflows from the center to the units; (ii) Notwithstanding the fact that MNCs are indeed becoming "heterarchies" (Hedlund, 1994) i.e., integrated complex networks with significant devolution of authority and responsibility to the subsidiaries, the parent corporation continues to serve as the most active creator and diffuser of knowledge within the corporation; and (iii) MNCs' greater experience in managing knowledge outflows from the parent

to the subsidiaries has also made them more "systematic" (as distinct from "stochastic" or "experimental") in managing these particular types of knowledge flows.

Focusing now on the empirical validity of our overarching theoretical framework, we also note from Tables 2–5 that the results support our expectations regarding the importance of four of the five main constructs underlying this framework. More specifically, the results provide either complete or partial support to our predictions regarding the impact of value of knowledge stock and transmission channels on knowledge outflows; similarly, they also provide either complete or partial support to our predictions regarding the impact of transmission channels, motivational disposition to acquire knowledge, and absorptive capacity on knowledge inflows. However, they do not provide any support to our predictions regarding the impact of motivational disposition to share knowledge with other units on knowledge outflows. There are at least two possible explanations for this lack of support: (i) a subsidiary's motivational disposition to share knowledge may depend not only on the incentive system but also on other variables not examined in this study, and/or (ii) in the knowledge transfer process, the motivation of the target unit to acquire knowledge may be far more important than the motivation of the source unit to share its knowledge. An examination of the validity of any of these or other possible explanations must await future research.

At a more micro-level, a closer examination of the 8 hypotheses (out of the total of 23 hypotheses) that were not supported reveals that 3 pertained to "incentive focus," 2 to "mode of entry," 2 to "proportion of local nationals in subsidiary's TMT," and 1 to "vertical socialization mechanisms." Alternatively stated, results failed to support 3 out of the 4 hypotheses dealing with incentive focus, 2 out of the 4 dealing with mode of entry, 2 out of the 2 dealing with proportion of local nationals in subsidiary's TMT, and 1 out of the 2 dealing with vertical socialization mechanisms. There are at least three possible explanations for this lack of support: (i) logical errors in developing the hypotheses, and/or (ii) substitution effects among the independent variables, and/or (iii) irreducible noise in the data. Our conjecture at this stage would be that the last two explanations represent the

more likely scenario. Nonetheless, any definitive explanations for the lack of support also must await future research.

Limitations of the study

We can identify three major limitations of this study. First, since every MNC is a network (Ghoshal and Bartlett, 1990), all intra-MNC knowledge transfers take place in the context of the network. As contrasted with “dyadic” or “systemic” approaches to the examination of network-related phenomena, we conducted our examination at the “nodal” level of analysis – the simplest level feasible. In the next subsection focusing on directions for future research, we identify some of the important questions that were not explored by us but which can be examined through future work that looks at knowledge transfers from a dyadic or a systemic perspective.

Second, despite the fact that, in this study, we focused on largely procedural types of knowledge which, on average, tends to be more tacit than declarative knowledge, we neither measured nor explored the impact of degrees of tacitness. Notwithstanding the pioneering studies of Teece (1977), Zander and Kogut (1995), and others, empirical research into how degrees of tacitness affect the knowledge transfer process is still in its infancy.

Finally, the third major limitation of this study has to do with the use of perceptual instruments to measure the extent of knowledge outflows and inflows. Barring the case of certain types of codifiable technology transfers (as in the case of technology licenses), this is a methodological challenge that researchers have yet to overcome. In our view, researchers face at least two hurdles in measuring the extent of knowledge transfers through objective data: (i) Unlike transfers of codified knowledge, the transfers of tacit knowledge leave at best partial objective traces that could be measured by an external researcher; and (ii) Because transfers of tacit knowledge tend to be slow, any real-time investigation of this phenomenon would often require the researcher to undertake a multi-year study of each transfer; by way of example, note that Zander and Kogut (1995) reported that, in their sample, the median time to transfer was five years and, without correcting for censored observations, the average was eight years. It is also instructive to note that,

notwithstanding their excellent access to the MNCs being studied, even Ghoshal and Bartlett (1988: 382) felt compelled to observe: “Collecting objective level measures for the relatively large number of variables for meaningful statistical analysis represented enormous and, for us, insurmountable practical problems.”

Directions for future research

As we observed at the beginning of the paper, the creation, diffusion, and absorption of knowledge by organizations in general and, by MNCs in particular, constitutes one of the most important subjects for research in the fields of organization theory (Levitt and March, 1988; Huber, 1991), strategic management (Prahalad and Hamel, 1994), evolutionary economics (Nelson and Winter, 1982), and international business (Buckley and Casson, 1976; Ghoshal and Bartlett, 1988; Kogut and Zander, 1993; Teece, 1977). Conceptual work in this area is still in the early stages and empirical work is almost literally at the stage of infancy. Thus, although we view the contributions of this study as important, in light of future possibilities, we view them as at best modest. There are several promising directions for future research.

First, we believe that the payoffs from future investigations at the dyadic and/or systemic levels are likely to be high. At the *dyadic* level of analysis, at least two of the important issues to investigate would be: (i) the impact of bilateral homophily (Lazarsfeld and Merton, 1964) on dispositions to engage in outflows and inflows, and (ii) the importance of reciprocity i.e., is A’s disposition to share its knowledge with B dependent on B’s disposition to share its knowledge with A? At the *systemic* level of analysis, some of the important issues would be: (i) the impact of a unit’s network centrality on the extent of knowledge outflows as well as knowledge inflows, (ii) the impact of network density on the overall magnitude of knowledge flows through the network, and (iii) the impact of global competitive intensity faced by the MNC on the magnitude and the directionality of knowledge flows.

A second line of productive inquiry would be to compare and contrast what we would term as “complementary” vs. “substitutive” knowledge transfer contexts. By complementary contexts, we refer to the transfer of knowledge along different

stages in the company's value chain e.g., the transfer of technical knowledge from the development laboratories to the factories and the marketing units and the transfer of market knowledge from the field back to the factories and the laboratories; in these instances, knowledge transfers occur in contexts where the source and the target units possess complementary knowledge stocks. In contrast, substitutive knowledge transfer contexts can be said to exist when the source and the target units engage in identical or similar activities (e.g., two laboratories, or two factories, or two sales units) and the transfer involves the imposition of the source unit's superior knowhow over that of the target's allegedly inferior knowhow. We would expect that the motivational dispositions of both the source and the target units are likely to be radically different in the case of complementary vs. substitutive knowledge transfers.

A third line of productive inquiry would be a deeper application and examination of the overarching framework advanced in this paper. There are many other possible determinants of the value of a source unit's knowledge stock e.g., the resource base of the unit, the internal organization of the unit, and the competitive environment in the host country. Similarly, there are many other possible determinants of motivational dispositions to engage in inflows or outflows e.g., personal characteristics of subsidiary managers such as age or locus of control, their organizational commitment, and so forth. This is also true for the other elements in our model viz., transmission channels and absorptive capacity. In the case of transmission channels, the impact of communication mechanisms including the use of electronic media is an obvious topic for future research. Similarly, future investigations into how absorptive capacity of a receiving unit is affected not merely by its existing knowledge stock but also by its internal organization are likely to yield valuable insights. For example, building on Cohen and Levinthal (1990), it should be useful to examine the impact of intra-subsidiary communication as well as a subsidiary's activism at knowledge creation on its capacity to absorb incoming knowledge.

A fourth line of productive inquiry would be to go deeper into the question of tacitness. It seems to us that, while the conceptual literature on how the tacitness of knowledge affects its transfer is notable for its abundance, systematic

empirical investigations into how tacit knowledge gets transferred and the extent to which its transfer does or does not require ex ante codification is all too rare. Thus, our advocacy would be to urge greater efforts towards empirical rather than conceptual studies on the topic of tacitness.

Finally, a productive line of inquiry would also be to examine the joint (i.e., interactive) effects of capability, motivation, and transmission channels on knowledge flow patterns. Given that research on knowledge flows within MNCs is still in its infancy, in this study, we focused exclusively on the main effects of these constructs. Nonetheless, since the results of this study lend support to the validity of our framework, a logical next step would be to develop and test more complex theoretical models.

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APPENDIX

Measurement of variables

Independent variables

Mode of entry. Subsidiary presidents were asked to indicate whether their subsidiary became a part

of this corporation as a result of an acquisition/merger (coded as 1) or whether the subsidiary was created as a greenfield operation (coded as 0). Summary statistics on this variable are: mean = 0.42, s.d. = 0.49).

Subsidiary size. This variable was measured in terms of the number of employees in the subsidiary (mean = 908, s.d. = 1552). In order to dampen the high variability in size and achieve a more normal distribution, the natural logarithm of the number of employees was used to indicate subsidiary size in our analyses.

Relative economic level. This variable was computed by dividing the per capita income for the "host" country (where the subsidiary is located) by that for the "home" country (the country-of-origin of the parent corporation). For each country, data on per capita income (i.e., gross national product per capita adjusted for purchasing power parity) were obtained from the World Development Report (World Bank, 1995). Summary statistics on this variable are: mean = 0.81, s.d. = 0.39.

Incentive focus. Based on Gupta and Govindarajan (1986) and Salter (1973), the following question was posed to the subsidiary presidents: "Your annual incentive bonus may depend solely on your subsidiary's performance or solely on the performance of a group of subsidiaries or some combination of both. Please indicate below how your incentive bonus was actually determined for the most recent year. Your answers should total 100%: (1) percentage of your incentive bonus that was based on your subsidiary's performance; (2) percentage of your incentive bonus that was based on the performance of a cluster of subsidiaries." Responses to the second item were used as a measure of the extent to which the incentive system was network-focused rather than subsidiary-focused (mean = 17.55, s.d. = 30.67).

Formal integrative mechanisms. Based on Galbraith (1973), Nadler and Tushman (1987), and Miller, Kets de Vries, and Toulouse (1982), this variable was measured through a 3-item Likert-type 7-point scale (ranging from "used rarely" to "used very frequently") that asked respondents to indicate the extent to which their subsidiary used liaison personnel, temporary task forces, and permanent teams to coordinate decisions and actions with sister subsidiaries. The final measure was a weighted average of

responses to the three items where the most complex mechanism (permanent teams) was given a weight of 3, the intermediately complex mechanism (temporary task forces) was given a weight of 2, and the least complex mechanism (liaison personnel) was given a weight of 1. Summary statistics on this variable are: mean = 2.92, s.d. = 1.53.

Lateral socialization mechanisms. This measure was adapted from Ghoshal and Bartlett (1988). Respondents were asked to provide "yes" or "no" answers to the following two questions: (1) "Have you worked for one or more years in other subsidiaries of this corporation?" and (2) "Have you participated in executive development programs involving participants from several subsidiaries?" For each respondent, the total count of "yes" responses was treated as a measure of participation in lateral socialization (mean = 1.08, s.d. = 0.77).

Vertical socialization mechanisms. This measure also was adapted from Ghoshal and Bartlett (1988). Respondents were asked to provide "yes" or "no" answers to the following two questions: (1) "Have you worked for one or more years at corporate headquarters in this corporation?" (2) "Do you have a mentor at corporate headquarters?" For each respondent, the total count of "yes" responses was treated as a measure of participation in vertical socialization mechanisms (mean = 0.95, s.d. = 0.84).

Headquarters-subsidiary decentralization. Following Vancil (1980), each respondent was provided with the following list of nine strategically relevant decisions: (i) formulation of your subsidiary's annual budget; (ii) discontinuing a major existing product or product line; (iii) investing in major plant and equipment to expand capacity for existing products; (iv) developing a major new product line; (v) increasing (beyond budget) the level of expenditure for advertising and promotion; (vi) changing the selling price on a major product or product line; (vii) increasing (beyond budget) the level of expenditure for research and development; (viii) buying from an outside vendor when the items required could be supplied by another unit of the country; and (ix) increasing (beyond budget) the number of personnel employed by your subsidiary. Using an approach similar to Hofstede (1967), for each of these decisions, each respondent was asked to indicate, on the following 5-point Likert scale,

the typical influence that they had in affecting the outcome of the decision: (1) your opinion not asked but decision is explained to you; (2) proposal by superior, your opinion is asked and it carries little weight; (3) proposal by superior, your opinion is asked and it carries a lot of weight; (4) proposal by you, decision made jointly by you and your superior; and (5) proposal by you, followed by consultation with superior, with your opinion prevailing. Responses on the 9 questions were averaged to create an index of headquarters-subsidiary decentralization (Chronbach alpha = 0.86). Higher values on this measure indicate higher decentralization (mean = 4.04, s.d. = 0.74).

Proportion of local nationals in the subsidiary's top management team. For managers heading each of seven positions, the subsidiary presidents were asked to indicate the nationality of each particular person on a four-point scale: "local national," "home country expatriate," "third country expatriate," and "not applicable" implying that there was nobody heading such a position. The instrument also explained the precise meanings of these terms. The seven positions were: "subsidiary president," "head of marketing," "head of manufacturing," "head of R&D," "head of finance," "controller," and "head of human resources." The percentage of *applicable* positions that were headed by local nationals was regarded as a measure of the extent to which the subsidiary top management team was localized (range = 0 to 100; mean = 63.87; s.d. = 38.48).

Control variables

Country-of-origin. Each MNC in this sample was headquartered in one of the following five countries: U.S., Japan, U.K., Sweden, and Finland. Treating the U.S. as the base case, dummy variables were created for each of the other four countries of origin. For example, in the case of Japanese MNCs, the variable "Japan" was given a value of 1; in the case of non-Japanese MNCs, this variable was given a value of 0. A similar approach was followed for U.K., Sweden, and Finland.

Industry resource characteristics. For each subsidiary, measures of industry resource characteristics were computed at the level of the parent corporation's dominant industry group along three dimensions: R&D intensity (i.e., R&D expenses to sales ratio), fixed asset intensity (i.e., net physical plant and equipment to sales ratio), and

advertising intensity (i.e., advertising expenses to sales ratio). All raw data were obtained from Standard & Poor's Compustat PC+ Database and were averaged for two years: 1990 and 1991. Utilizing these raw data, the three measures of industry resource characteristics were computed as follows. First, we identified the dominant industry group at the 2-digit SIC code level for the parent corporation. Second, utilizing industry-level data, for each 2-digit industry group, we computed the proportion of revenue contributed by each 4-digit industry segment within that industry group. Third, for each of these 4-digit industry segments, we computed measures of R&D intensity, fixed asset intensity, and advertising intensity. Finally, using the proportion of revenues contributed by each 4-digit industry segment to its 2-digit industry group as weights, we then computed weighted average measures of these three resource characteristics at the 2-digit industry group level. These measures, computed at the level of the parent MNC's dominant industry group, were then applied to all of the subsidiaries in our sample belonging to that particular MNC. For the sample, summary statistics on these three industry resource characteristics are: R&D intensity (mean = 0.03, s.d. = 0.02), fixed asset intensity (mean = 0.36, s.d. = 0.21), and advertising intensity (mean = 0.03, s.d. = 0.02).

Nature of subsidiary operations. We measured subsidiary operations through two dummy variables: "upstream activities" and "downstream activities." The variable "upstream activities" was coded as "1" if the subsidiary performed a primary upstream operation (R&D and/or manufacturing); otherwise, this variable was coded as "0." Similarly, the variable "downstream activities" was coded as "1" if the subsidiary performed a primary downstream operation (marketing and sales); otherwise this variable was coded as "0." The raw data for these two variables were obtained by asking each subsidiary president to provide "yes" or "no" answers to the following three questions: (i) "Does your subsidiary have one or more research and development facilities?"; (ii) "Does your subsidiary have one or more manufacturing facilities?"; and (iii) "Does your subsidiary have one or more marketing and sales facilities?" Summary statistics on the two dummy variables are: upstream activities (mean = 0.75, s.d. = 0.43) and downstream activities (mean = 0.84, s.d. = 0.37).