

Knowledge development in MNC subsidiaries: The influence of MNC internal and external knowledge and control mechanisms

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Sumelius, J. and Sarala, R. (2008), Knowledge development in MNC subsidiaries: The influence of MNC internal and external knowledge and control mechanisms. *Thunderbird Int'l Bus Rev*, 50: 245–258.

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Abstract:

In this study, we examine the influence of control mechanisms and internal and external knowledge on multinational company (MNC) subsidiary knowledge development. Previous research stresses the importance of these factors for subsidiary behavior, but nonetheless they remain underexplored in the context of subsidiary knowledge development. The study is based on questionnaire data from 161 MNC subsidiaries in China and Finland. The results indicate that MNC internal and external knowledge, as well as decision-making autonomy of MNC subsidiaries, positively influence knowledge development in MNC subsidiaries. Conversely, the importance of knowledge development as a performance evaluation criterion did not show any influence on MNC subsidiary knowledge development.

Keywords: multinational company (MNC) | knowledge development | foreign subsidiaries | subsidiary behavior | subsidiary knowledge

Article:

INTRODUCTION

Foreign subsidiaries are increasingly seen as important contributors to the development of firm-specific advantage in multinational companies (MNCs; Almeida & Phene, 2004; Birkinshaw, Hood, & Johnsson, 1998; Holm, Holmström, and Sharma, 2005). A prerequisite for this is that subsidiaries develop knowledge that can be transferred to and used by other subsidiaries around the world. This raises the question of how various factors in the subsidiary's internal and external context contribute to the development of subsidiary knowledge.

Andersson, Forsgren, and Holm (2002) argue that subsidiary knowledge develops in interplay with actors in the internal and external environment of the MNC. Scholars have called for additional work examining the role of both internal and external knowledge in connection with subsidiary knowledge development (Almeida & Phene, 2004; Schmid & Schurig, 2003). Thus, building on past research concerning knowledge development through the recombination of existing knowledge (Kogut & Zander, 1992), we suggest that MNC subsidiaries develop knowledge through involvement in the MNC internal and external environment.

Furthermore, we argue that subsidiary knowledge development is likely to be influenced by how the subsidiary is controlled by MNC headquarters (Ghoshal & Westney, 1993). Foss and Pedersen (2002, 2004) posit that some types of control are likely to have a stimulating and encouraging effect on subsidiary knowledge development and suggest a further exploration of control in this context. We argue that two aspects of headquarters control mechanisms are of particular importance: (1) to what extent they facilitate the subsidiary in its knowledge development and (2) to what extent they motivate the subsidiary in its knowledge development. Consequently, we examine two types of control mechanisms previously studied within agency theory—subsidiary decision-making autonomy and the importance of knowledge development as a performance evaluation criterion—and suggest that both of these control mechanisms contribute to the development of subsidiary knowledge.

With this study, we contribute to the discussion on knowledge development in MNCs in several ways. Based on a dual-country data set, we empirically test a model that includes variables relating to MNC internal knowledge, knowledge from the external environment, and control mechanisms. A notable feature of our model is that it includes both internal and external knowledge, which sets us apart from previous studies in the field, which, with a few notable exceptions (Almeida & Phene, 2004; Foss & Pedersen, 2003; Manopoulos, Papanastassiou, & Pearce, 2005), have commonly focused on either internal or external knowledge but rarely on both. Further, while control mechanisms have been previously studied in the MNC context, the main focus has been on headquarters' choice between different control mechanisms rather than on the actual impact of these control policies on the development of subsidiary knowledge. Our study offers empirical support for the relationship between control mechanisms and subsidiary knowledge development by linking subsidiary decision-making autonomy to innovative behavior in the context of the MNC.

The structure of the article is as follows. First, we discuss subsidiary knowledge development and develop our hypotheses. Subsequently we describe our sample and method of data collection, as well as the operationalization of our variables. Finally, we present the results of our empirical analysis and conclude with a discussion on the contribution and implications of our study.

SUBSIDIARY KNOWLEDGE DEVELOPMENT

A central idea according to the view of the differentiated MNC is that certain subsidiaries develop knowledge that is subsequently transferred to other subsidiaries around the world where it is used. These kinds of subsidiaries have sometimes been termed centers of excellence (CoE) (Holm & Pedersen, 2000; Moore & Birkinshaw, 1998). In order to gain this status it is necessary

that (1) the subsidiary develops specialized knowledge and (2) this knowledge is also used by other units in the MNC (Forsgren, Johanson, & Sharma, 2000). In this article, we focus on the first of these conditions—developing specialized knowledge, which constitutes the basis for the subsidiary's further development into a center of excellence.

Birkinshaw et al. (1998) suggest that if specialized subsidiary knowledge is combined with knowledge elsewhere in the MNC, this can become part of the MNC's firm-specific advantage, which then again has the potential to lead to competitive advantage. In line with Birkinshaw et al. (1998), we define specialized knowledge as knowledge that is superior to knowledge available else-where in the organization. Following Kogut and Zander (1992), we define knowledge development as “the recombination of existing knowledge.”

The subsidiary has a special role as a link between its own local environment and the rest of the MNC. Access to knowledge from two distinct environments—the internal MNC environment and the external local environment—enables the subsidiary to develop its knowledge in a unique way. Combining internal and external knowledge allows it to contribute to the MNC's total body of knowledge. Kogut and Zander (1992) argue that the recombination of knowledge sourced from different locations is one of the most important functions of the MNC, while Galunic and Rodan (1998) maintain that combining knowledge sourced in alternative ways is an important driver of firm innovation.

Previous research aiming at explaining knowledge development in an MNC subsidiary context has analyzed the influence of both internal and external factors. Some re-search has been conducted on the influence of internal knowledge on subsidiary knowledge development. Some of the central themes discussed previously include the subsidiary as a user and provider of MNC knowledge (Gupta & Govindarajan, 2000), subsidiary roles (Jarillo & Martinez, 1990), and competence-building patterns (Rugman & Verbeke, 2001), as well as the influence of interdependencies between the subsidiary and other parts of the MNC on subsidiary knowledge development (Foss & Pedersen, 2003).

A number of studies have also looked at the influence of the external environment on knowledge development. For instance, Cantwell (2002) examined the importance of location attractiveness, and Almeida (1996) focused on the sourcing of local knowledge. In their study on the impact of control mechanisms on external embeddedness, Andersson, Björkman, and Forsgren (2005) also examined the influence of subsidiary embeddedness in the local environment on the level of knowledge creation and found support for this effect.

A few studies have focused on the influence of both internal and external knowledge. Almeida and Phene (2004) studied the effect of MNC internal as well as external local knowledge on innovation in MNC subsidiaries and found that linkages to the external environment were more likely to result in innovation than were link-ages to other parts of the MNC. Similarly, Holm et al. (2005) argued that the subsidiary's ability to develop specialized knowledge was more strongly associated with knowledge from the external local environment than from the internal MNC environment. Foss and Pedersen (2002, 2003) focused on the role of internal and external knowledge sources and organizational context on the development and transfer of subsidiary knowledge. How-ever, Foss and Pedersen (2002) analyzed the impact of internal and external

knowledge on knowledge transfer, not knowledge development. Foss and Pedersen (2003), on the other hand, did focus on the relevance of internal and external knowledge for knowledge development but examined how the use of external knowledge affects the use of internal knowledge in knowledge development rather than the individual impact of internal and external knowledge on subsidiary knowledge development.

In addition to examining the influence of MNC internal and external knowledge, we study how subsidiary knowledge development can be encouraged and stimulated through the use of certain control mechanisms (Foss & Pedersen, 2002, 2004). The control mechanisms we focus on are decision-making autonomy and knowledge development as a performance evaluation criterion. Past research on these two control mechanisms in connection with subsidiary behavior has been conducted largely within the frame of agency theory (Roth & O'Donnell, 1996). Agency theory argues that headquarters can try to align the interests of the subsidiary with those of headquarters through the use of behavioral and outcome-based control mechanisms (Eisenhardt, 1989; Jensen & Meckling, 1976). However, contrary to studies with an agency perspective, which focus on headquarters' choice between different control mechanisms in order to avoid an agency problem, we examine the impact of different control mechanisms on the development of subsidiary knowledge.

It is important to acknowledge the subsidiary's con-current position in both the internal MNC environment and the external local environment, which provides it with the possibility of accessing knowledge from both sources for the benefit of its own knowledge development. This is why we hypothesize about both internal and external knowledge in our model. Regarding the internal MNC environment and the external local environment, we draw mainly on literature on the MNC as a differentiated network of dispersed operations that emphasizes the use of both MNC internal and external knowledge in pursuit of competitive advantage (Dyer & Singh, 1998; Gu-lati, Nohria, & Zaheer, 2000).

We argue that learning from the internal and external environment enhances subsidiary knowledge development, but in addition to this subsidiary knowledge development is also impacted by the control policies of MNC headquarters. We argue that two aspects of headquarters control—decision-making autonomy and knowledge development in performance evaluation—are of particular importance, which is why we include them in our model. The extent of decision-making autonomy given to the subsidiary is an indication of how headquarters can facilitate subsidiary knowledge development through its control policies, while the emphasis placed on knowledge development when evaluating subsidiary performance is away to motivate the subsidiary in its knowledge development. We draw on literature related to innovation and managerial attention to develop two hypotheses related to control. We will now go on to argue in greater detail for each of our hypotheses.

Knowledge from the Internal MNC Environment

One important source of knowledge in the context of the MNC subsidiary is the corporate MNC knowledge base. The inflow of knowledge from other parts of the MNC to the subsidiary is a valuable way to get input into the development of the subsidiary's own knowledge base. This is a central idea in the concepts of the geocentric firm (Perlmutter, 1969), Hedlund's heterarchy

(1986), and what Bartlett and Ghoshal (1989) call the *transnational corporation*, which posit that knowledge generated in all parts of the MNC is shared across the entire corporation, including headquarters and its foreign subsidiaries.

Thus, rather than just providing an exchange of existing information, inward knowledge transfer is likely to contribute to the development of knowledge within the subsidiary (Nahapiet & Ghoshal, 1998). Also, if inward knowledge transfer involves mimicking the practices of other MNC units, it is likely that such mimicking will result in knowledge development since firms seeking to mimic other firms tend to do so imperfectly, which results in the generation of innovations (March, 1994). Further-more, in addition to providing access to what is already known within the MNC, knowledge transfer from other parts of the MNC has the potential to contribute to the subsidiary's absorptive capacity. Absorptive capacity implies that what an organization is able to learn is influenced by what it already knows (Cohen & Levinthal, 1990). Access to existing knowledge within the MNC is likely to provide a stronger base for the subsidiary to absorb and consequently apply new knowledge from its external environment and allows the subsidiary to concentrate on developing specialized knowledge. Against this background, we propose the following hypothesis:

Hypothesis 1: A greater level of inward knowledge transfer from other MNC units will be positively associated with the development of specialized subsidiary knowledge.

Knowledge Through Embeddedness in the External Local Environment

In addition to having access to knowledge from the internal MNC environment, the subsidiary has access to external knowledge in its local environment. Holm et al. (2005), among others, argue that the subsidiary's ability to develop specialized knowledge is strongly associated with its connection to actors in the external local environment. Whereas the internal environment of the MNC, at least in principle, is common to all subsidiaries of the corporation, the external local environment is a source of differentiation.

Foss and Pedersen (2003) use the term network-based knowledge to describe knowledge that has been accumulated from long-lasting interaction with, for instance, customers and suppliers in the external environment, and then used to develop the subsidiary's activities further. A related and more widely used concept in this regard is external embeddedness (Andersson et al., 2001, 2002). External embeddedness refers to the extent of an organization's involvement in its external local environment and is argued to constitute a strategic resource of the organization (Andersson et al., 2002; Gulati, 1999).

Because each subsidiary in the MNC is embedded in its own unique local network, it is also exposed to new knowledge, ideas, and opportunities in different ways (Andersson et al., 2002; Holm et al., 2005; McEvily & Za-heer, 1999; Schmid & Schurig, 2003). The subsidiary's embeddedness in a certain external environment thus constitutes an advantage when it aspires to develop specialized knowledge. Embeddedness may also pose certain risks for the subsidiary—for instance, being forced to adapt to the wants and needs of important actors in the local environment and to develop knowledge that does not coincide with the rest of the MNC in order to satisfy external counterparts. However, such risks are likely to be minimal compared with the

potential benefits from in-depth involvement in the local environment on the ability of the subsidiary to develop specialized knowledge.

Thus, we propose that external embeddedness will have a positive influence on the development of specialized knowledge. As the subsidiary's external actors cause adaptations to its practices, learning occurs as new practices develop, which in turn will have a positive impact on the subsidiary's knowledge development. Along the above line of reasoning, we hypothesize as follows:

Hypothesis 2: A greater level of external embeddedness will be positively associated with the development of specialized subsidiary knowledge.

Subsidiary Decision-Making Autonomy

There are several reasons why subsidiary decision-making autonomy is likely to have a positive effect on subsidiary knowledge development. First, headquarters' lack of knowledge of the host-country environment limits the capacity to make decisions regarding how to best augment the capabilities of the unit. The subsidiary possesses unique knowledge that enables better decision making in these situations (Nohria & Ghoshal, 1994) and is thus likely to contribute to more efficient subsidiary knowledge development. Second, decision-making autonomy gives the subsidiary the freedom to experiment that is necessary for innovation and knowledge development (Flood, Ramamoorthy, & Liu, 2003). Hence, autonomy is likely to increase the possibility of discovering unexpected opportunities and to increase subsidiary flexibility in acquiring, relating, and interpreting information (Nonaka, 1994). Third, autonomous subsidiaries are less likely to be restricted by taken-for-granted views prevailing in the MNC parent organization. Fourth, autonomous subsidiaries are more likely to have motivation to engage in particularly innovative activities (Aghion & Tirole, 1997).

Previous empirical research offers support for the positive impact of autonomy on subsidiary knowledge development. At a general level, Chandy and Tellis (2000) observed that firms that had set up autonomous units within their structures were more likely to stay innovative. In the subsidiary context, Birkinshaw et al. (1998) concluded that subsidiary autonomy was strongly associated with the subsidiary's contribution to the development of firm-specific advantages of the MNC. Similarly, Ghoshal and Bartlett (1988) showed that more autonomous subsidiaries create more innovations than less autonomous ones. On this basis, we formulate the following hypothesis:

Hypothesis 3: Greater decision-making autonomy will be positively associated with the development of specialized subsidiary knowledge.

Knowledge Development as a Criterion for Subsidiary Performance Evaluation

We suggest that it is in the subsidiary's interest to develop knowledge if it feels that this will be compensated for when its performance is being evaluated. In other words, if the subsidiary perceives that MNC headquarters emphasizes knowledge development as a performance evaluation criterion, it will be more motivated to develop knowledge than if it perceives that

knowledge development is not rewarded and only distracts the subsidiary from its day-to-day business.

Our argument is in line with attention-based theory, according to which firm behavior depends on what issues the decision makers focus their attention on (March, 1999). The issues the decision makers focus on depend on the firm's rules and resources (March, 1994; Ocasio, 1997), but also, in the context of the subsidiary, we argue that the criteria based on which subsidiary performance is evaluated will determine the attention paid to different subsidiary activities. The attention paid to knowledge development, in turn, will result in increased subsidiary knowledge development since the managerial attention is likely to send a signal throughout the subsidiary of the importance of knowledge development. As Nahapiet and Ghoshal (1998) argue, a vital condition for knowledge development is that those involved in it feel it is a worthwhile activity. Therefore, we present the following hypothesis:¹

Hypothesis 4: The greater the importance of knowledge development as a subsidiary performance evaluation criterion, the more specialized knowledge the subsidiary will develop.

RESEARCH METHODS

Sample and Data Collection

Data collection for this study was carried out during 2000–2002. Our target group consisted of Western MNCs located in Finland and China. Originally, we targeted the 150 largest foreign-owned subsidiaries in Finland and 300 in China. The resulting sample was 164 subsidiaries, 89 of which were located in Finland and 75 in China. The response rate was 59% for Finland and 25% for China. The difference in response rates between these two subsets of data was due to better access to companies located in Finland than in China. After controlling for missing values, our final dataset consisted of 161 subsidiaries.

The data were collected using a structured interview technique. In the first stage of the process, a letter was sent to subsidiary presidents, describing the project and underlining the confidentiality of the responses. Then respondents were contacted by telephone to agree on a suitable date and time for the face-to-face interviews. Although conducting face-to-face interviews is both costly and time-consuming, it is compensated by the higher reliability of the resulting data as opposed to data collected—for instance, by using a mail survey (Andersson, Forsgren, & Holm, 2001). The length of each structured face-to-face interview was 45–120 minutes, during which time the respondent and the researchers went through a pretested questionnaire together. The questionnaire was available only in English, but when needed, Finnish, Swedish, or Mandarin was used during the interviews in order to clarify certain terms or expressions. This was however rarely necessary, since the respondents generally had a good command of English and as general managers of foreign subsidiaries they were used to international communication (Welch, Marschan-Piekkari, Penttinen, & Tahavanainen, 2002).

Since our main focus is on knowledge development in foreign subsidiaries rather than in the MNC as a whole, our data were gathered at the subsidiary level. The use of multiple respondents offers advantages in terms of improving the quality of response data and thereby the validity of

the reported relationship (Yang, Wang, & Su, 2006). However, due to the practical reason that it was extremely difficult to gain access to multiple respondents within each subsidiary, our sample consists of single respondents. Consequently, we followed the example of previous studies (Foss & Pedersen, 2002) and chose to target the president of each subsidiary for interviews in which we used perceptive measures to obtain their subjective views. This choice was motivated by the fact that subsidiary presidents are directly involved in the subsidiary's operations and, as the key decision makers, can be expected to have the best overall view of the subsidiary, while lower-level managers might have a more restricted view.

Since our independent and dependent variables were both drawn from the same source, we checked for common method bias related to our measures by conducting Harman's single-factor test. The basic assumption of this technique is that if a substantial amount of common method variance is present, either a single factor will emerge from the factor analysis or one general factor will account for over 50% of the variance (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Our unrotated factor solution resulted in ten factors. The largest factor explained 16.5% of the variance. Based on Harman's test, we concluded that there was no serious common method variance present in our data.

Dependent Variable

Subsidiary Knowledge Development

To measure the development of subsidiary knowledge, we asked respondents to "*rate the extent to which the subsidiary has developed knowledge that is superior compared to that of other units in the business area during the last three years.*" Respondents answered this question separately for each of the following functions: general management, manufacturing, marketing/sales, service, and research and development (R&D).² We used a seven-point Likert scale where 1 = "very much lower" and 7 = "very much higher" compared with other subsidiaries. The sum of these questions represents the overall level of subsidiary knowledge development compared to other MNC subsidiaries.

Independent Variables

We included the following independent variables in our model. As they vary in terms of how many items are included in each construct, we standardized the independent variables before entering them into the regression model.

Inward Knowledge Transfer

In order to determine the subsidiary's access to internal knowledge, we measured the transfer of corporate knowledge from the MNC and other units to the subsidiary. Similarly to Schulz (2001), inward knowledge transfer to the subsidiary was determined by asking respondents to "*rate the extent to which the subsidiary has used the distinctive competence of other corporate units within the corporation during the last three years.*" We used a seven-point Likert scale where 1 = "not at all" and 7 = "very much." The respondents answered separately for the following activities: general management, manufacturing, marketing/sales, service, and R&D. An explorative factor analysis showed that general management, marketing/sales, and service loaded on one factor while manufacturing and R&D loaded on another factor. Therefore, we

empirically distinguished between “inward transfer of business knowledge” and “inward transfer of technical knowledge.” The Cronbach’s alpha values for the constructs were 0.69 and 0.65.³

External Embeddedness

We used the subsidiary’s external embeddedness as a proxy for determining its access to external knowledge. According to Uzzi (1997), embeddedness consists of both a technical and a social dimension. Although some previous studies have concentrated only on technical embeddedness (Andersson, 2003), we built on the operationalization of Andersson et al. (2002) that takes into account both technical and business aspects of embeddedness.⁴ Thus, we operationalized external embeddedness by asking respondents the following: “Think about your most important external business relationships. To which extent have they caused adaptations concerning: product technology, production technology, standard operating procedures, and business practice?” The respondents answered separately for each of the four aspects on a seven-point Likert scale, where 1 = “very little” and 7 = “very much.” The sum of these variables represented the overall external embeddedness of the subsidiary. Cronbach’s alpha coefficient for this construct was 0.76.

Decision-Making Autonomy

To operationalize decision-making autonomy, we followed ideas—if not the exact operationalizations—derived from previous studies (Birkinshaw et al., 1998; Roth & Morrison, 1992). The subsidiary’s decision-making autonomy was determined by asking respondents to “*estimate the relative overall influence of the subsidiary and its parent company in deciding on the following issues: strategic subsidiary goals, strategy of the subsidiary, budget for the next year, market area supplied by the subsidiary, product range supplied by the subsidiary, product pricing, product design, advertising & promotion, R&D, production, and purchasing.*” Each aspect was measured on a five-point Likert scale: 1 = “decided mainly by the parent company or regional head-quarters without consulting with or seeking the advice of the subsidiary,” 2 = “decided mainly by the parent company or regional headquarters after consulting with or seeking the advice of the subsidiary,” 3 = “decided jointly with equal weight being given to the views of subsidiary and headquarters,” 4 = “decided mainly by the subsidiary after consulting with or seeking the advice of the parent company or regional headquarters,” and 5 = “decided mainly by the subsidiary without consulting with or seeking the advice of the parent company or regional head-quarters.” The answers to these questions were summed up to represent the overall level of decision-making autonomy of the subsidiary. The construct obtained a Cronbach’s alpha value of 0.79.

Importance of Knowledge Development as a Performance Evaluation Criterion

To determine the importance of knowledge development in the subsidiary’s performance evaluation, we asked respondents the following question: “*How important do you perceive that knowledge development is when subsidiary performance is evaluated by the business area/parent company?*” Respondents answered each question on a seven-point Likert scale ranging from 1 = “not at all important” to 7 = “very important.”

Control Variables

Subsidiary Location

Since our sample consisted of two subsamples, one in Finland and the other in China, we controlled for a possible home-country effect. The Chinese and the Finnish contexts can be expected to be quite different. Hence, we controlled for the home-country effect by using a dummy variable, in which the value 0 was given to Finnish subsidiaries and the value 1 to Chinese subsidiaries.

Entry Mode

Acquired as opposed to greenfield subsidiaries can from the start be expected to possess knowledge that is less duplicative to that of the rest of the MNC (Gupta & Govindarajan, 2000; Hennart & Park, 1993). We argue that the nonduplicative nature of subsidiary knowledge in acquired units may offer an advantage in developing specialized knowledge. Along this line of reasoning, we controlled for the effect of entry mode on knowledge development. Respondents were asked whether the subsidiary had been established through acquisition or greenfield investment. The answers were coded into a dummy variable in which acquisitions received the value 1 and greenfield investments the value 0.

Profitability

Profitability can be used as an indicator of successful operation. We argue that profitable units are likely to be allocated more resources and, thus, be able to develop more knowledge. We measured profitability over the last 12 months on a seven-point Likert scale where 1 = “poor” and 7 = “excellent.” We used self-reported performance measures because there is evidence supporting their general reliability (Venkatraman & Ramanujam, 1986).

Subsidiary Size

Cohen and Levin (1989) assert that it is conventional to control for firm size when analyzing innovation output—even though no consensus exists as to what the actual impact of size is. Gupta and Govindarajan (2000) maintain that larger subsidiaries have a greater pool of resources dedicated to the creation of new knowledge. Thus, the size of the subsidiary could have a positive impact on its ability to create specialized knowledge. Following Gupta and Govindarajan (2000), we measured subsidiary size by taking the natural logarithm of the number of employees in the subsidiary. We used the natural logarithm to dampen the high variation in size and achieve a more normal distribution for the variable.

Importance of Financial Performance Evaluation

The more importance financial performance is accorded in performance evaluation in relation to knowledge development, the more likely the subsidiary is to focus its attention on short-term financial performance and day-to-day business, which may divert resources from longer-term objectives, such as subsidiary knowledge development. Thus, we controlled for the importance of financial performance in subsidiary performance evaluation to see if it had a negative impact on knowledge development. We measured this by asking the managers: “*How important do you perceive that net/operating profits are when subsidiary performance is evaluated by the business area/parent company?*” Respondents answered the question on a seven-point Likert scale ranging from 1 = “not at all important” to 7 = “very important.”

RESULTS

We used multiple regression analysis as the analysis method in our study because it provides a means for objectively assessing the degree and character of the relationship between dependent and independent variables by forming the variate of independent variables (Hair, Anderson, Tatham, & Black, 1998). Regression analysis, thus, enabled us to assess the magnitude and direction (positive or negative) of our hypothesized relationships. The statistical program used was SPSS 12.0.

Table 1 provides descriptive statistics and correlations for the variables in this study. The descriptive statistics are based on unstandardized variables. Of the 161 subsidiaries in our final dataset, 588 were from Finland and 73 from China. There were altogether 90 subsidiaries that had been started as a greenfield investment, whereas 71 were acquisitions. Some interesting correlations are worth noting. In our sample, greenfield investments were more numerous in China and acquisitions in Finland, as shown by the negative correlation co-efficient between establishment mode and subsidiary home country. The negative correlation between subsidiary location and subsidiary size shows that Chinese subsidiaries were smaller on average than Finnish ones. In a similar vein, the positive correlation between subsidiary size and entry mode indicates that subsidiaries established through acquisition were larger than subsidiaries established through greenfield investment in our sample.

We examined the correlation matrices to identify possible collinearity between the variables in our model, since the inclusion of dummy variables can create a situation of high multicollinearity (Hair et al., 1998). However, there were no correlations of .90 or above in our models to suggest a serious collinearity problem (Hair et al., 1998). This finding is supported by the low values for variance inflation factors (VIFs), ranging from 1.060 to 1.812 (see Table 2). Hence, we detected no significant multi-collinearity in the model.

Table 2 presents the results of the ordinary-least-squares (OLS) regression analyses. To separate the effects of control variables and independent variables, we estimated two models. Model 1 is the baseline model in which we included only the control variables. Model 2 adds the set of independent variables to the control variables: inward knowledge transfer, subsidiary external embeddedness, autonomy of decision making, and importance of knowledge development as a performance evaluation criterion. We will report the results of Model 2 that showed substantial improvement ($\Delta F=12.935, p < 0.001$; $\Delta R^2= 0.195, p < 0.001$) over Model 1.

In Hypothesis 1, we suggested that a greater level of inward knowledge transfer from other MNC units will be positively associated with subsidiary knowledge development. We tested the hypothesis separately for inward transfer of business knowledge and inward transfer of technical knowledge, as these were empirically distinct constructs. The results showed that inward transfer of technical knowledge was positively associated with subsidiary knowledge development ($\beta = 0.422,^6 p < 0.001$). However, regarding inward transfer of business knowledge, there was no significant association. We found strong support for Hypothesis 2, proposing a positive association between a greater level of external embeddedness and subsidiary knowledge development ($\beta = 0.246, p < 0.01$). As for Hypothesis 3, in line with what we suggested, decision-making autonomy was found to be positively associated with subsidiary knowledge development ($\beta = 0.189, p < 0.01$). Finally, we tested Hypothesis 4, which suggested that the importance of knowledge development as a performance evaluation criterion would contribute to

knowledge development in MNC subsidiaries. We found no significant positive association ($\beta = 0.086, p > .10$), which means Hypothesis 4 was not supported.⁷

TABLE 1 Means, Standard Deviations, and Pearson Correlations

Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10
1 Subsidiary location (Finland = 0, China = 1)	0.45	0.50										
2 Entry mode (Greenfield = 0, Acquisition = 1)	0.44	0.50	-0.46***									
3 Profitability	5.00	1.65	-0.06	-0.06								
4 Subsidiary size (log-transformed)	2.16	5.87	-0.28***	0.22**	0.03							
5 Importance of financial performance in performance evaluation	6.30	1.00	-0.24**	0.08	0.22**	0.07						
6 Inward transfer of business knowledge	11.28	3.95	0.03	-0.06	0.13+	-0.07	0.01					
7 Inward transfer of technical knowledge	6.75	3.74	0.37***	-0.12+	-0.04	0.13+	-0.07	0.3***				
8 Subsidiary external embeddedness	16.69	5.39	-0.09	0.00	0.15+	0.03	0.11+	-0.06	0.04			
9 Autonomy of strategic decision-making	35.19	8.45	0.05	0.21**	-0.05	0.16*	0.08	0.02	0.20**	0.12+		
10 Importance of knowledge development in performance evaluation	4.73	1.51	0.13+	0.00	0.11+	-0.05	-0.024	0.11+	-0.03	0.20**	0.24**	
11 Knowledge development	19.28	5.47	0.06	0.03	0.13+	0.09	0.05	0.10	0.41***	0.33***	0.31***	0.24**

+ $p < .10$, * $p < .05$, ** $p < 0.01$, *** $p < .001$.
All one-tailed tests.

TABLE 2 Regression Models

	Model 1: Control only			Model 2: Full model		
	Beta	t	Sig.	Beta	t	Sig.
Control Variables						
Subsidiary location (Finland = 0, China = 1)	0.144	1.543	0.125	-0.09	-0.992	0.323
Entry mode (Greenfield = 0, Acquisition = 1)	0.075	0.831	0.407	0.07	0.085	0.932
Profitability	0.130	1.600	0.112	0.112	1.572	0.118
Subsidiary size (log)	0.108	1.308	0.193	-0.027	-0.363	0.717
Importance of financial performance in performance evaluation	0.040	0.487	0.627	-0.006	-0.080	0.936
Independent variables						
Inward transfer of business knowledge				-0.041	-0.553	0.581
Inward transfer of technical knowledge				0.422***	5.144	0.000
Subsidiary external embeddedness				0.246**	3.453	0.001
Autonomy of decision-making				0.189*	2.541	0.012
Importance of knowledge development in performance evaluation				0.086	1.17	0.244
Model statistics						
R	0.199			0.575		
R square	0.040			0.33		
Adjusted R square	0.009			0.285		
R square change	0.040			0.291***		
F	1.275			7.352		
F change	1.275			12.935***		
N	161			161		

+ p < .10, * p < .05, ** p < 0.01, *** p < .001

All one-tailed tests.

Data in the table present standardized beta coefficients.

All control variables were insignificant in both Models 1 and 2. This suggested that there was no significant difference in subsidiary knowledge development based on subsidiary location, entry mode, profitability, subsidiary size, or importance of net/operating profits in performance evaluation.

DISCUSSION

This study examined the influence of control mechanisms and internal and external knowledge on MNC subsidiary knowledge development. The results concerning knowledge from the internal MNC environment are in line with previous findings (Nahapiet & Ghoshal, 1998; Schmid & Schurig, 2003). However, the current study expands on previous studies by empirically distinguishing between the inward transfer of business knowledge and technical knowledge. Our results show that transfer of technical knowledge contributes to subsidiary knowledge development, whereas transfer of business knowledge has no significant effect on subsidiary knowledge development. This implies that transfer of business knowledge to subsidiaries may be more important for headquarters' control purposes than for the purpose of subsidiary knowledge development. This finding also illustrates that transfer of technical knowledge to a subsidiary does not simply result in the duplication of knowledge but rather constitutes a valuable ingredient for the development of specialized subsidiary knowledge. As a result, the competence of the subsidiary as well as of the entire MNC is up-graded (Andersson et al., 2002; Foss & Pedersen, 2002).

Regarding the external local environment, we found a clear positive association between external embedded-ness and subsidiary knowledge development. This result suggests that the subsidiary is able to successfully learn from its environment, and also highlights the important role of external partners in subsidiary knowledge development. Our finding is in accordance with previous studies (Cantwell, 2002; Schmid & Schurig, 2003), which emphasize the importance of the external environment in generating new knowledge, ideas, and opportunities.

In addition to knowledge from the internal and external environment, we examined the influence of control mechanisms on subsidiary knowledge development. Consistent with Ghoshal and Bartlett (1988) and Birkinshaw et al. (1998), we found a positive relationship between decision-making autonomy and subsidiary knowledge development. This suggests that autonomy in decision-making benefits subsidiary knowledge development and that if the subsidiary is to play an innovative role and contribute to corporate knowledge development, it has to enjoy sufficient autonomy. Concerning subsidiary performance evaluation criteria, we found no relationship between the importance of knowledge development as a subsidiary performance evaluation criterion and specialized subsidiary knowledge. One possible explanation for this could be that this criterion is too vague and that it consequently does not constitute an effective incentive for increasing the level of subsidiary knowledge development.

When interpreting the results of our study, the cultural and institutional context needs to be considered. For example, it is feasible that an autonomous management style is less compatible in national cultures characterized by a high level of collectivism and power distance, which results in managers and employees who are more accustomed to an authoritative management style. This may be the case in China. An autonomous management style may be easier to implement in Finland, which is characterized by a relatively low level of collectivism and power distance. Furthermore, due to the collectivistic nature of the Chinese culture, it may also be easier for the subsidiary managers in China than those in Finland to grasp the importance of networks and embeddedness. The complex and dynamic institutional environment in China, characteristic to transitional economies, makes external embeddedness particularly important but also challenging in China. Finally, the lower level of economic development in China may have increased the importance of inward transfer of technical knowledge compared to business

knowledge, since many subsidiaries in China are production-oriented. The opposite is likely to be true for Finland, because the subsidiaries are more service-oriented, reflecting the higher level of economic development in Finland. Our results suggest that it is particularly the transfer of technical knowledge that contributes to subsidiary knowledge development.

Like any research, the current study has certain limitations. First, we acknowledge the problem of drawing inferences about causality with cross-sectional data—an inherent problem in these types of studies. Second, due to data access reasons, our data are based on the subjective responses of single respondents. This may have caused a common method bias even though the statistical tests showed no signs of serious common method problems. Third, in our operationalizations, we chose not to separate between the development of different types of knowledge since we wanted to focus on the subsidiary's overall knowledge development. Nevertheless, we acknowledge that our findings may vary to some extent depending on the type of knowledge that is being developed. Finally, our study may contain some bias, as we only studied Western MNCs.

The limitations of this study open up ideas for future research. First, future studies could explore the influence of decision-making autonomy on subsidiary knowledge development, with special attention on the network role of the subsidiary. It would also be fruitful to investigate the specific mechanisms through which autonomy benefits subsidiary knowledge development. Furthermore, while the current study did not compare subsidiary knowledge development in Finland and China, it is feasible that there is some variation between these specific country contexts due to cultural and institutional differences, as well as to the different levels of economic development of these nations. More research is needed in order to determine if the large cultural distance between China and Western MNCs renders the transfer of business and technical knowledge to subsidiaries in China more difficult since the MNCs in this case have to overcome higher national cultural differences than in regard to Finland. It could also be interesting to examine if transfer of business and technical knowledge to Western MNC subsidiaries in China results in the subsidiary gaining access to more valuable knowledge due to the possible value embedded in national cultural differences.

Finally, this study also has some clear managerial implications. Our results point to the importance of the transfer of technical knowledge in subsidiary knowledge development. This implies that it is important for the managers to introduce mechanisms and create systems that support the transfer of technical knowledge in particular. In addition, the importance of decision-making autonomy implies that subsidiaries should be given enough autonomy if they are expected to contribute to knowledge development within the MNC. However, the need for autonomy from the knowledge development perspective needs to be balanced with the MNC headquarters' requirements of control and coordination. If the subsidiary is granted a high level of decision-making autonomy, other control mechanisms, such as a higher level of social control, may be needed to ensure that the subsidiary's actions are in accordance with the goals of the MNC. Also, headquarters needs to have control mechanisms in place that guarantee that the knowledge developed is the type of knowledge beneficial to the entire MNC, not only to the subsidiary itself.

Furthermore, subsidiary managers should note that both the internal MNC environment and the external local environment are of major importance and contribute significantly to knowledge development in MNC subsidiaries. The subsidiary constitutes a link between its own external local environment and the rest of the MNC. This makes it important for the subsidiary manager to encourage cooperative efforts with its partners both in the internal MNC and in the external local environment, as this is crucial for developing subsidiary knowledge.

ACKNOWLEDGEMENTS

We would like to thank Ingmar Björkman, Ulf Andersson, Ulf Holm, Eero Vaara, and two anonymous reviewers for their helpful comments. In addition, we would like to extend our gratitude to Liikesivistysrahasto and the Hanken Foundation for financial support.

NOTES

1. However, most subsidiaries are evaluated based on multiple criteria. Therefore, in our model, we controlled for the use of financial performance evaluation criteria in order to tease out the effects of knowledge development as a subsidiary performance evaluation criterion.

2. Although there is no theoretical argument as to why the different functions should constitute one construct, we nonetheless decided to examine them as one variable since they do co-vary empirically. In our sample, this is indicated by the fact that all functions load on the same factor and have a Cronbach's alpha of 0.69.

3. If all five different functions had been combined to constitute one construct, the Cronbach's alpha value would have been slightly lower (0.63).

4. Following Andersson et al. (2002), we first differentiated between business and technical embeddedness and measured the former by the extent to which the subsidiary's most important external business relationships had caused adaptations in standard operating procedures and in business practices. The latter was measured by the extent to which the subsidiary's most important external business relationships caused adaptations in product technology and in production technology. However, the obtained measures were strongly correlated and clearly loaded on one single factor, and so this distinction was dropped and a single measure of embeddedness was adopted.

5. The original dataset contained 164 subsidiaries. We controlled for missing values by excluding three cases with missing values on our scales. There were no outliers above the recommended threshold of 1.96, the critical t value at the .05 confidence level (Hair et al., 1998). Therefore, no cases were deleted as outliers.

6. We report standardized beta coefficients.

7. In addition to hypothesis testing, we tested for the possible interactions between the independent variables. The results of these tests were insignificant.

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