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Subsidiary Embeddedness and Competence Development in MNCs — A Multi-level Analysis*

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Abstract

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Recent research on the competitive advantage of multinational corporations (MNC) has emphasized the importance of the ability of subsidiaries to assimilate new knowledge from their external environment. Such an ability is important for the individual subsidiary's own performance as well as for the possibility it affords the MNC to combine and use resources from different parts of the corporate system.

This paper explores the nature of business embeddedness at the subsidiary level and its role at the corporate level. It is suggested that the subsidiaries' embeddedness in a network of business actors can explain why certain subsidiaries demonstrate higher achievements than others, both in terms of their market performance and regarding their importance for competence development within the MNC. It is argued that the closer a subsidiary's external business relationships with suppliers and customers the easier it will be to assimilate new knowledge from outside, the more it will be able to innovate and therefore the more it will be able to advance its performance in the local market. Further, because embeddedness influences the innovative capacity of subsidiaries, it is also claimed to be a decisive factor in explaining which subsidiaries will contribute to competence development at the corporate level.

Hypotheses concerning the relationships between a subsidiary's external technical embeddedness, market performance and the subsidiary's importance for competence development at the level of the MNC are formulated and tested in a LISREL model. Data is used from 97 subsidiaries belonging to 20 global divisions of 13 Swedish multinational corporations. The results indicate that a subsidiary's external technical embeddedness can be a strong predictor of both its own expected market performance and its role as a provider of competence to other MNC units.

The paper concludes with a discussion about the role that a subsidiary can play as a bridgehead between external and internal units of an MNC and the negative impacts that might occur if a subsidiary's business network is too embedded.

Descriptors: subsidiary embeddedness, absorptive capacity, subsidiary market performance, MNC competence development

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Introduction

The competitive strength of a multinational corporation (MNC) depends on many factors, such as production costs, managerial competence, R&D

investments, etc. However, research has shown that the ability of the different subsidiaries of an MNC to assimilate new knowledge from their local business environments can also constitute a crucial advantage (Ghoshal 1986; Ghoshal and Nohria 1989; Cantwell 1990; Ghoshal and Bartlett 1990; Gupta and Govindarajan 1991; Rosenzweig and Singh 1991; Almeida 1996; Birkinshaw and Morrison 1996; Dunning 1996; Malnight 1996; Taggart 1998). There are two ways in which the assimilation of new (local) knowledge by subsidiaries influence the competitive strength of the MNC as a whole. First, it strengthens the competitive advantages and performances of subsidiaries in their own market places (Powell et al. 1996; Bierly and Chakrabarti 1996), and thus, indirectly, the competitive strength of the whole corporation. Second, by transferring externally acquired knowledge from one subsidiary to other corporate units, the competence of the whole MNC is upgraded (Zander and Kogut 1995; Szulanski 1995, 1996).

The processes behind competence development within an MNC are located at three different levels. The first is the business relationship level. This focuses on the extent to which interactions between the subsidiary and individual customers, suppliers and other business counterparts serve as sources of new knowledge for the subsidiary. The second level — the subsidiary itself — is concerned with how the subsidiary manages not only to assimilate knowledge from the environment but also to commercialize it to achieve increased market performance. At the third level — the corporation — competence is transferred within the corporation, from one subsidiary to other units, thereby upgrading the competence of the whole MNC.

The three levels are interrelated. The transfer of knowledge between subsidiaries is dependent on the ability of the individual subsidiary to assimilate and commercialize new knowledge. The characteristics of the individual business relationships pursued by the subsidiary is a decisive factor.

Based on the concept of absorptive capacity (Cohen and Levinthal 1990; Lane and Lubatkin 1998; Van den Bosch et al. 1999; Hansen 1999), this paper focuses on the interplay between the three levels. More specifically, the purpose of this paper is to explore how relationships with specific customers and suppliers influence the subsidiary's market performance and its involvement in the transfer of competence within the MNC. In the next section, the concept of embeddedness is introduced and its importance for the subsidiary's absorptive capacity is discussed. Then hypotheses are formulated concerning the relationship between embeddedness, the subsidiary's expected market performance and the importance of the subsidiary for competence development within the whole MNC. The hypotheses are tested empirically in a LISREL model by applying data from Swedish multinationals. A final section discusses the results from the empirical testing and possible tracks for future research about embeddedness, absorptive capacity and competence development in MNCs.

Level 1: The Relationship Level and the Determinants of Absorptive Capacity

The ability of an organization to recognize new information and assimilate it has sometimes been labelled absorptive capacity (Cohen and Levinthal 1990). This capacity is crucial for the long-term competitive advantage of the MNC in terms of product development, adaptation to changes in market conditions, etc., helping to position it nearer or at the forefront.

What determines a subsidiary's ability to identify and assimilate new information from its environment? According to Cohen and Levinthal (1990: 128) this ability is largely a function of the level of prior related knowledge. Prior related knowledge confers an ability to recognize and utilize new information. Learning is cumulative, but is greatest when the object of learning is related to what is already known. Acquisition of new information, therefore, is not only dependent on the existence of the information as such, but also on the subsidiary's knowledge about areas or problems similar to, or related to, the new information. The more a subsidiary knows about a domain, the greater the likelihood of it scanning for new ideas within that domain.

Lane and Lubatkin (1998) have suggested a somewhat different conceptualization of absorptive capacity. Although basing their reasoning on Cohen and Levinthal (1990), Lane and Lubatkin (1998: 461) argue that assimilation of knowledge from the environment is mainly a question of inter-organizational learning. Their basic reason for focusing on inter-organizational relationships has to do with difficulties in transferring complex knowledge. As long as knowledge is codified and easy to understand, it is relatively easy to transfer it from one organization to another. However, when knowledge is non-codified and tacit, strong and established ties are required between the parties concerned before that knowledge can be transferred (Szulanski 1996; Lane and Lubatkin 1998; Hansen 1999). Strong ties allow for a two-way interaction between the units. This is often necessary, as the recipient is unlikely to acquire the non-codified knowledge completely during the first interaction, needing, instead, multiple opportunities to assimilate (Hansen 1999: 85). This is similar to what Lane and Lubatkin call 'interactive learning' (Lane and Lubatkin 1998: 462). The more two units interact, the more they can learn from each other. Consequently, a subsidiary does not have an equal possibility of learning from all organizations in its environment. The possibility to assimilate new information is related to what sort of relationships it has with these organizations.

It has been argued that the ability to assimilate non-codified, tacit knowledge is especially crucial for an organization's innovation activities (Hansen 1999: 83). However, as we focus on the subsidiary's and the MNC's competence development in this paper, in line with the reasoning above, we will concentrate our analysis on the relationship level. More specifically, we will focus on the subsidiary's relationships with specific customers and suppliers as a source of new knowledge.

This approach is in line with applying the concept of embeddedness in busi-

ness networks (Polanyi 1957; Granovetter 1985, 1992; Zukin and Di Maggio 1990; Grabher 1993; Andersson and Forsgren 1996, 2000; Andersson et al. 2001; Uzzi 1996, 1997). The business network constitutes a firm's most important interface with the environment. It is mainly through these relationships that the exchange of information with the environment is handled. Therefore, a firm's relationships can be looked upon as an investment that will influence its future capacity to identify and assimilate new information. Embeddedness can be defined as closeness in a relationship, and reflects the intensity of information exchange and the extent to which resources between the parties in the dyad are adapted. The stronger the embeddedness, the more difficult it will be for the counterparts to change to other partners, at least in the short run. The weaker the embeddedness, the more the relationship will have an arm's-length character (Grabher 1993; Uzzi 1996).

Some relationships in a subsidiary's network will develop over time from more arm's-length relationship to a higher degree of embeddedness (Johanson and Mattsson 1987; Håkansson 1989; Ford 1997; Uzzi 1997). Consequently, a subsidiary's network will consist of relationships with different degrees of embeddedness, and the networks of different subsidiaries may vary in their average degree of embeddedness.

Most writings about embeddedness recognize that, in business networks, it has to do with the content of the firm's individual relationships as well as the firm's position within the whole network of relationships. The first aspect refers to the closeness of a firm's set of direct, dyadic relationships, while the second aspect deals with the centrality of the firm in its business network, including indirect, connected relationships. Although overlapping, the first has been called *relational embeddedness*, while the second has been labelled *structural embeddedness* (see e.g. Gulati 1998; Dacin et al. 1999; Rowley et al. 2000). In this paper, we focus on relational embeddedness.

Bearing in mind that strong ties are crucial for transferring non-codified, tacit knowledge, we posit that an organization's network embeddedness positively influences its absorptive capacity, because closeness in relationships is what embeddedness is all about. This conclusion is, of course, also relevant for subsidiaries belonging to MNCs. The more the focal subsidiary has deep and extensive relationships with suppliers and customers in its business environment, the higher its ability to assimilate complex knowledge from the environment.

The depth of the relationship has to do with factors such as mutual adaptation of resources and activities as well as the existence of trust in the relationship. The breadth of the relationship has to do with the number of areas or functions in which the counterparts are related.

The depth and the breadth of an inter-organizational relationship can vary, depending on the type of embeddedness. For instance, a subsidiary can have old and mutual relationships with a certain customer in terms of, for example, sales volume, but not in terms of technical development or other activities. As technical development has been seen as one of the most

important factors for a firm's competitive advantage, (see e.g. Bartlett and Ghoshal 1990) we will focus in the following on the subsidiary's network of specific customers and suppliers in terms of technical embeddedness.

Technical embeddedness is related to one specific area, the development of products and production processes. It reflects the fact that some of the counterparts in the subsidiary's business network are more important than others for the subsidiary's technical development. A high degree of technical embeddedness means that the two organizations are highly interdependent in terms of activities related to technical development. The development of new products in the subsidiary will be based on intensive information exchange with another organization, and the development activities will be adapted to similar processes in the other organization. The interface between the subsidiary and the other organization will also be broad in terms of the number of functional areas and people involved.

In the following two sections, we will build up a model of the causal links between a subsidiary's technical embeddedness, its performance in its own market place and its role in the transfer of knowledge within the MNC. In a subsequent section, the model will be put to the test, using data from Swedish multinationals.

Level 2: The Subsidiary Level — Embeddedness and Market Performance

It has been argued that one of the key factors for a firm's performance is its ability to innovate new products and production processes (Mansfield 1968; Bartlett and Ghoshal 1990; Dosi et al. 1988; De Mayer 1992; Hitt et al. 1996). In line with the reasoning above, it has also been argued that the innovative capacity of a firm is contingent on its ability to absorb new knowledge from the environment. This ability is positively related to the exchange of complex knowledge through relationships with specific actors in the environment. For instance, it has been demonstrated that a unit's level of innovation is positively influenced with how much information it shares with other units (Tsai and Ghoshal 1998). Powell et al. (1996) found empirical support for a positive relationship between rates of growth and network relationships among biotechnology firms. Zaheer et al. (1998) found a positive connection between inter-organizational trust and performance in a sample of 107 buyer-supplier interfirm relationships in the electrical equipment manufacturing industry. In a study of 23 entrepreneurial firms, it has been argued that performance increases with the use of embedded ties with network partners (Uzzi 1997). Blankenburg Holm et al. (1999) have demonstrated that closeness in a relationship, in terms of interdependence and commitment, leads to value creation in the firms involved.

Consequently, it is reasonable to argue that if a subsidiary's set of relationships with customers and suppliers is characterized by a high degree of technical embeddedness this will have a positive influence on its abil-

ity to develop new products or production processes, and therefore on its market performance. However, we would expect there to be a time lag between embeddedness and performance. Close relationships are built up gradually and can be looked upon as investments in terms of adaptation and trust. Its present embeddedness will influence the future prospects of a subsidiary, and we would therefore maintain that it is the *expected* performance of the subsidiary rather than its present performance that is affected. The following hypothesis can thus be formulated:

H1: The higher the external technical embeddedness of a subsidiary, the higher its expected market performance.

Level 3: The Corporate Level — Subsidiary Embeddedness and Competence Development

Subsidiaries have important, though different roles within the competence development of the MNC as a whole. Even though the performance of an individual subsidiary in its own marketplace also contributes to the performance of the MNC as a whole, a crucial question is to what extent does the subsidiary contribute to the competence development of other corporate units.

In general, it is reasonable to argue that the higher the expected performance of the individual subsidiary, the more likely it is that it will also play a significant role in developing the competence of other MNC units. High expected performance will attract the interest of sister units, creating an incentive for them to learn from that subsidiary about product development or marketing efforts, for example. It has been argued that such organizational learning among certain organizations occurs either when success is expected or when it is taken for granted among other organizations (Levitt and March 1988, Haveman 1993, Haunchild and Miner 1997). Consequently, the following hypothesis can be formulated:

H2: The higher the expected market performance of a subsidiary, the more important it is for the competence development of other MNC units.

We have argued above that a subsidiary's technical embeddedness has a positive impact on its innovative capacity and, consequently, on its market performance. Differences in embeddedness between an MNC's subsidiaries create differences in their level of competence, which in its turn create differences in the roles the subsidiaries can play within the corporate system. It is often argued that transfer of knowledge is easier to accomplish within organizations than between them (Grant 1996b; Zander and Kogut 1995) and that the main competitive advantage of MNCs is the possibility to transfer and combine knowledge among subsidiaries located in different countries and contexts (Kogut and Zander 1992, 1996, Malnight 1996). This assumption implies that, within an MNC, knowledge flows from sub-

subsidiaries with high levels of competence to those with low levels of competence. Some subsidiaries will be givers while others will be receivers. We posit that, although knowledge flows within an MNC depends on many factors, such as the administrative devices employed (Galbraith 1973; Edström and Galbraith 1977; Egelhoff 1988), the existence of shared values in the MNC (Bartlett and Ghoshal 1989; Ghoshal and Nohria 1997) and international strategy (Harzing 2000), which subsidiaries will be givers and play an important role in the competence development of other MNC units, will depend on their degree of technical embeddedness. Consequently, the following hypothesis can be formulated:

H3a: The higher the external technical embeddedness of a subsidiary, the more important it is for the competence development of other MNC units.

However, several authors have pointed out that it is difficult to transfer knowledge within organizations. This is due not only to the knowledge itself, but also to the characteristics of the sender, the recipient and the relationship between them. For instance, it has been argued that idiosyncratic, specific, tacit, and/or non-codified knowledge is difficult to transfer from one unit to another, due to the problem of separating such knowledge from the unit that carries the knowledge and adding it to another actor's knowledge base (Grant 1996a; Jensen and Meckling 1992; Kogut and Zander 1992; Zander and Kogut 1995; Hansen 1999; Spender 1996; Szulanski 1995, 1996). Other problems are related to the recipients' ability or willingness to absorb new information (Cohen and Levinthal 1990; Szulanski 1996; Allen 1977; Hayes and Clark 1985; Porter 1985), or to the willingness of a unit to share information with other units (Porter 1985; Szulanski 1996; Forsgren 1997).

In a differentiated MNC, one type of barrier to knowledge transfer is especially interesting. The complex, idiosyncratic, interaction processes between the subsidiary and its counterparts in its external business network create a competence that cannot easily be used in the business contexts of other corporate units. This type of knowledge development is context-specific, or even relation-specific, and it is a specificity that is positively correlated with the ability to create new knowledge. For instance, an extensive, long-term co-operation with a specific customer or supplier will improve the subsidiary's problem-solving capacity, and its ability to create new knowledge. However, the more context-specific the solutions are, the more difficult it will be to apply that knowledge within the business context of another corporate unit (Forsgren et al. 2000). Consequently, if we assume that subsidiary network embeddedness is positively related to competence development, but also to context specificity, we can also argue that there is a trade-off between embeddedness and the possibility to transfer knowledge to other corporate units.

One can argue that the context-specificity problem is reflected in the degree of embeddedness of a subsidiary's network. The more a subsidiary is engaged in deep and intensive interaction with specific counterparts in its

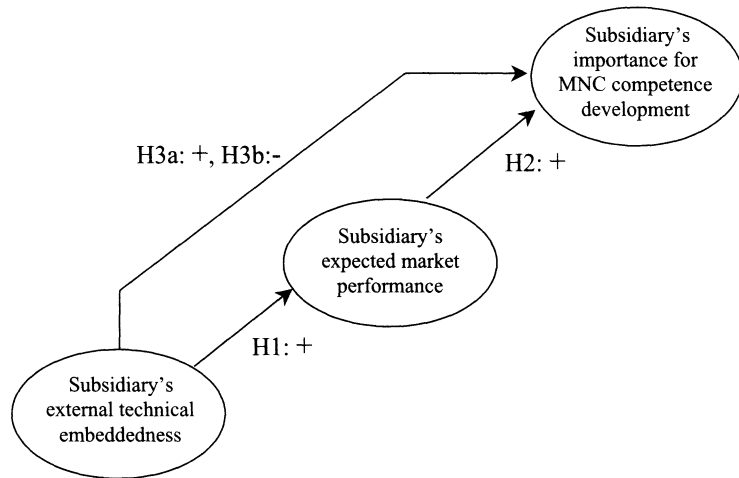
business context, the stronger the context specificity of the relationships, and the more resources will be deployed in relation-specific activities. It is reasonable to assume that this trade-off problem is especially relevant for the subsidiary's development activities. For instance, the more the local subsidiary is involved in product development cooperation with specific external customers or suppliers, the more context-specific these activities will be.

Therefore, the following alternative hypothesis can be formulated:

H3b: The higher the external technical embeddedness of a subsidiary, the less important it will be for the competence development of other MNC units.

Hypotheses 1–3 are summarized in Figure 1 below.

Figure 1
The Hypothesized Model



This model will be tested on a sample of subsidiaries belonging to product divisions of Swedish MNCs.

The Data

Data have been collected from 97 subsidiaries which, together, maintain 405 important relationships with external customers and suppliers. The subsidiaries belong to 20 divisions/business areas within 13 Swedish MNCs. All the divisions/business areas have headquarters located in Sweden. Of the subsidiaries, 92 are situated in Europe and 5 in North America. The sample represents a wide spectra of Swedish industry and includes large and well-known companies in industries such as gas applications, hard material tools, industrial equipment, management training, petrochemicals, power distribution, pulp and paper, software and telecommunications equip-

ment. The subsidiaries included are among the largest and most important in their respective divisions. On average, the subsidiaries in the sample account for over 50 percent of the divisions' combined operations, measured in terms of number of employees. In 25 percent of the divisions, the subsidiaries investigated account for more than 80 percent of the divisions' total operations, whilst they account for between 10 and 60 percent in the remaining divisions. The subsidiaries vary in size from 50 to over 5,000 employees.

To enhance the possibility of reaching general conclusions from the data gathered, we enlisted the help of the divisions' headquarters to select subsidiaries considered as representative of the business activities of those divisions. The average number of employees in the divisions was 5,850, varying from between 300 to more than 27,000. The turnover of these divisions ranged from 0.6 to 23 billion Swedish crowns (the exchange rate at that time was: 1 US dollar = approx. 8 Swedish crowns) with an average of about 6 billion Swedish crowns. All divisions were highly international with, on average, more than 50 percent of their employees living outside Sweden. Taken together, the divisions had more than 100,000 employees and an annual turnover exceeding 100 billion Swedish crowns.

The subsidiaries investigated had their own production and sales. The development of products and of the production process was therefore an important activity in every subsidiary. The subsidiaries studied have a mixture of business relationships with both external and corporate suppliers and customers. In this paper, we have excluded the corporate counterparts in order to get a clear-cut picture of the subsidiaries' external embeddedness and importance within the corporate system.

Data Gathering

To increase validity and reliability in the assessment of the subsidiaries' relationships with customers and suppliers, two different managers in each subsidiary were interviewed, the sales manager and the manager responsible for purchasing. They were asked to describe and assess the three most important relationships with customers and with suppliers. The managers were then asked to characterize these relationships by completing a standardized questionnaire.

After interviewing the subsidiary managers in one division, we turned to the headquarters and personally interviewed the divisional manager, using the same type of standardized questionnaire. Through these interviews, we gathered information about the headquarters' view of each subsidiary's future market performance and their importance for the development of sister units. The headquarters' knowledge about each subsidiary's specific business relationships was also checked. This can be seen as a further validation of the questionnaire and as a confirmation of the reliability of the respondents' answers. The study involved personal interviews with more than 200 managers from leading positions in both the subsidiaries and the divisional headquarters. Each personal interview lasted for about one -and-

a-half hours, including explanations and discussions to solve any conceptual problems and interpretations of the questionnaire. By allowing time for this, the data collected is clearly more reliable than when it is collected by, for example, mail survey.

A significant feature of this research is that the global divisional managers judge the two dependent variables — the expected market performance of the subsidiary and the subsidiary's importance for MNC competence development — while the subsidiary managers assess the independent variable — a subsidiary's external technical embeddedness. This design means that we avoid the potential bias that would arise in the data if the same person estimated both the dependent and the independent variables. The idea behind separating the assessment is also to get a more reliable measure of the expected market performance of each subsidiary and the subsidiary's importance for MNC competence development, by asking somebody outside the subsidiary in question to evaluate this. There is reason to believe that the divisional managers, rather than the subsidiaries themselves, are in a better position to judge both a subsidiary's performance in the market place, and its relative importance in the division's competence development.

Constructs and Indicators

In the hypothesized model shown in Figure 1, three constructs are included. For each construct, observable indicators have to be selected. Below, we will describe the operationalization of each construct and also provide descriptive statistics regarding the indicators used (see Table 1).

Expected Market Performance of Subsidiaries

There is a long tradition in the literature of measuring market performance. However, because firms are reluctant to provide information about their transfer pricing practices, tax considerations and other financial transactions inside the MNC, the traditional financial measures seem questionable and inappropriate when it comes to subsidiary performance. Instead, measures such as profitability, sales volume and increases in market share seems more appropriate as measures of market performance.

How to measure performance has been thoroughly discussed in the literature (Chakravarthy 1986; Chowdhury 1992; March and Sutton 1997). While Wexley et al. (1980) imply that perceived performance in manager-subordinate dyads does not converge with more objective measures, others have found that perceptual measures tend to have a high correlation with objective, accounting-based measures (Dess and Robinson 1984; Geringer and Hebert 1991). In the literature on joint venture (JV) performance, several researchers have turned to perceptual measures of performance because of concerns about the ability of objective measures to capture performance; Blanchot and Mayrhofer (1997), for example, lists 24 studies that apply perceptual measures of JV performance.

To assess the perception of expected subsidiary performance, managers of

the divisional headquarters were asked to estimate the expected increase in profitability (PROF), sales volume (SALVOL) and market share (MASHARE) of each subsidiary. Apart from the advantage of separating the responses relating to technical embeddedness from those concerning performance, the measure also has the virtue of giving divisional headquarters the possibility of making comparisons across subsidiaries and countries. A 5-point Likert-type scale (1 = very small to 5 = very high) has been used to separate the answers. There is very little difference between the indicators of the construct *Subsidiary Expected Market Performance*, which have an average ranging from 3.30 (MASHARE) to 3.58 (SALVOL). About 70 percent of the respondents assess a high increase (4) or increase to some extent (3) for all three indicators on the scale. The three indicators are also fairly similar considering standard deviations, 0.86 to 1.04 (see Table 1).

Table 1
Descriptive
Statistics of
Observed
Variables

Statistics	Subsidiary's Expected Market Performance			Subsidiary's Importance for MNC Competence Development		Subsidiary's External Technical Embeddedness		
	SAL-VOL	MA-SHARE	PROF	PTDEV	PNDEV	APTT	APNT	FUNCA
Mean	3.58	3.30	3.34	2.82	2.29	2.66	2.22	3.50
Std. Dev.	0.90	0.86	1.04	1.25	1.27	0.92	0.90	0.93
Median	4.00	3.00	3.00	3.00	2.00	2.80	2.20	3.50
Minimum	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.20
Maximum	5.00	5.00	5.00	5.00	5.00	4.50	4.50	5.70

Importance of Subsidiaries for MNC Competence Development

To receive valid and reliable measures of a subsidiary's importance for competence development, we have used indicators reflecting the subsidiary's importance for the technical development of sister units in terms of product (PTDEV) and production development (PNDEV), based on the divisional management's assessment. A 5-point Likert type scale (1 = very small to 5 = very high) was used. The average scores for the indicators range from 2.29 for the importance of a subsidiary for MNC production development to 2.82 for its importance for product development. This indicates that subsidiaries are a little bit more important to their sister units' product development compared with their production development. Of the subsidiaries, 56 percent are regarded as being rather important (value three on the five-point Likert-type scale) for the sister units' product development and 34 percent as being somewhat important. The standard deviation is 1.25 for product development and 1.27 for production development. Although, of all the indicators, these two have the highest standard deviation, it is still not very high (see Table 1).

External Technical Embeddedness of Subsidiaries

To investigate the external embeddedness of a subsidiary, we gathered data about the subsidiary's own estimation of its technological adaptation to customers and suppliers and used this as a proxy for the degree of embed-

dedness. This means that the counterparts' adaptation to the subsidiary is not included in our measurement, which may lead to an under-estimation of the subsidiary's degree of embeddedness in its business network. However, this problem should not be overstated, since it has been shown elsewhere that adaptation from one side of the relationship is a demonstration of reciprocal commitment and trust (Hallén et al. 1991: 34).

It is important that the adaptation of the subsidiary should reflect the value of a business relationship in terms of the subsidiary's capacity to absorb new technology. It is often argued that technological development is reflected, above all, in a company's development of new products and/or production processes (see, e.g., Mansfield 1968). As two indicators of embeddedness in external technical development activities, we have therefore chosen subsidiary adaptation in developing new products and production processes. As embeddedness should also reflect the breadth of the relationship, we have used a number of functional areas, in terms of sales, purchasing, production, R & D, administration and subsidiary top management functions involved in each relationship as a third indicator. Together, these three indicators will mirror both the depth and the breadth of the subsidiary's external technical embeddedness.

To measure this, the subsidiary's sales- and purchasing managers were asked to assess to what extent a specific external customer or supplier relationship has caused the subsidiary to develop products (APTT) as well as production processes (APNT). For these two measures, a 5-point Likert-type scale, from 1 = not at all to 5 = very much, was used. The same managers also estimated the number of functional areas (FUNCA) directly involved in each relationship, in answers that can vary between 1 and 6 functional areas. By simply adding the scores of each of the subsidiary's relationships and then dividing the score by the number of subsidiary relationships investigated, three indicators were created reflecting the average technical embeddedness of a subsidiary's external network. In this sample, the average number of external relationships was 4.2, which means that 70 percent of the subsidiaries' six most important relationships with customers and suppliers are external to the MNC. In seven percent of the subsidiaries in this study, only two of their six most important customers and suppliers are external of the MNC, and none of them have less than two. On the other hand, in as much as 44 percent of the subsidiaries, five or more of their most important counterparts are external to the MNC, and, in 17 percent, all of their six most important suppliers and customers are external to the MNC.

It should also be pointed out that, in the interviews with subsidiary managers, it was the subsidiary's most important product or group of products that was emphasized. This means that all questions about business relationships, adaptation, product development and production development refers to a specific product/market area, rather than to the total activity of the subsidiary. This will certainly increase the relevance of our indicators and also improve the reliability of the answers given by subsidiary managers. The averages for the indicators regarding adaptation are 2.22 for pro-

duction technology and 2.66 for product technology, and the standard deviation ranges from 0.90 to 0.92. The indicator reflecting the breadth of the relationships, i.e. the number of functional areas involved in direct relation to the counterpart has a higher average — 3.50 — than the other two indicators. This is not surprising, though, as this scale ranges from 1 to 6 instead of 1 to 5. The standard deviation is 0.93. This means that, on average, more than three functional areas are involved in the subsidiaries' most important relationships with suppliers and customers (see Table 1).

Method of Analysis

The hypothesized model in (Figure 1) was empirically tested in a LISREL model (Figure 2). The validity of LISREL models is estimated from the validity of the entire model, i.e. the nomological validity. Chi² and degrees of freedom, and, a probability estimate (*p*-value) evaluate the nomological validity, which is a test of the non-significant distance between the data and the model. The *p*-value should be higher than 0.05 for significance at the 5 percent level. However, before estimating the nomological validity of the model with the specified causal relations, it is important to judge the homogeneity of the constructs included in the model, i.e. the convergent validity, and the discriminant validity, that is, to what extent the constructs are separated from each other. The different forms of validity will be evaluated by analyzing a so-called measurement model, where there are no causal relationships between the constructs.

In Table 2 below, convergent validity is judged by the *R*²-values, measuring the strength of the linear relationships, the *t*-values, a significance test of each relationship in the model, and the factor loading for each indicator (Jöreskog and Sörbom 1993). All the constructs in this LISREL model have good convergent validity i.e., they are homogenous constructs. As can be seen in Table 2, all *R*² values are above 0.23, showing strong linear relations between the construct and the indicator (Jöreskog and Sörbom 1993). The *t*-values for each indicator are highly significant (the lowest *t*-value is 4.58) and the factor loadings are strong.

To assess discriminant validity, a measurement model is created to test that not more than one construct measures a single indicator. As key statistical estimates show lack of uni-dimensionality, our set of latent constructs has high discriminant validity. In one case, though, the variation of one of the indicators, sales volume (SALVOL), which is significantly indicated by the construct *Subsidiary's Expected Market Performance*, is also explained to a limited degree by the construct *Subsidiary's Importance for MNC Competence Development*. This negatively affects the discriminant validity of these two constructs. However, between the two constructs, which are built up by five indicators, only sales volume, (SALVOL), has this problem. Further, the convergent validity is good and each of the indicators assigned to the construct *Subsidiary's Importance for MNC Competence Development* has a stronger relationship with this construct than the sales volume indicator, (SALVOL). The discriminant validity is also strengthened

Table 2
The Constructs
and Their
Indicators

Indicator	Factor Loading	<i>t</i> -value	<i>R</i> ² -value
Subsidiary's Expected Market Performance			
How does the HQ judge this subsidiary's potential for increasing its sales volume? (SALVOL)	0.90	8.67	0.82
How does the HQ judge this subsidiary's potential for expanding its market share? (MASHARE)	0.82	8.04	0.67
How does the HQ judge this subsidiary's potential for increasing its profitability? (PROF)	0.49	4.71	0.24
Subsidiary's Importance for MNC Competence Development			
To what extent is this subsidiary important to other divisional units' product development? (PTDEV)	0.68	5.15	0.47
To what extent is this subsidiary important to other divisional units' production development? (PNDEV)	0.81	5.06	0.66
Subsidiary's External Technology Embeddedness			
To what extent has the relationship with this counterpart led to adaptations in the subsidiary's product development? (APTT)	0.91	8.77	0.82
To what extent has the relationship with this counterpart led to adaptations in the subsidiary's production development? (APNT)	0.72	6.96	0.52
Number of Functional Areas involved in direct contacts with people from this counterpart? (FUNCA)	0.48	4.58	0.23

by the fact that correlation between the construct indicators is not close or equal to one (see Appendix). Moreover, the indicator is the strongest one in the construct *Subsidiary's Expected Market Performance*. Therefore, we will proceed with the analysis without omitting this indicator.

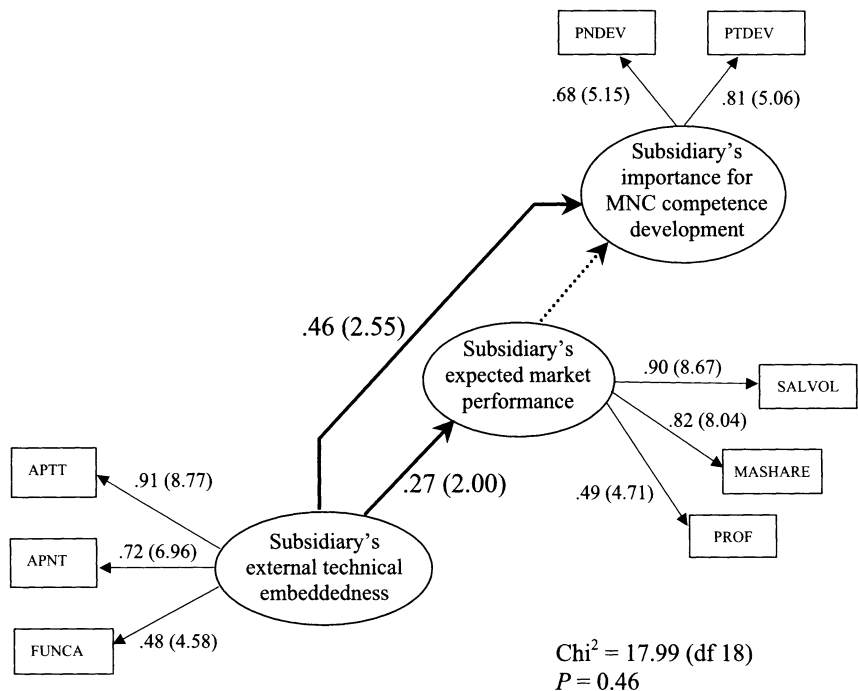
The second step in the analysis is to form the structural model by specifying the causal relations in accordance with the three hypotheses. In the following, we test single causal relations with *t*-values and factor loading between the constructs in the model. We assess the entire model's nomological validity by Chi² and degrees of freedom, and, a probability estimate (*p*-value) (Jöreskog and Sörbom 1993).

Results

Through repeated iterations, a LISREL analysis proceeds by fine-tuning the model further and by representing the empirical data in a more coherent manner. For our model, the first step is to test all three hypothesized causal relationships simultaneously. This results in a significance for the overall model of Chi² = 16.10_(df=17), *p* = 0.52, but it also reveals only two significant paths between the three constructs. The first one is between the subsidiary's external technical embeddedness and its expected market performance, and

the second one is between subsidiary's external technical embeddedness and its importance to the competence development of the MNC. Thus, in the next test, we omitted the insignificant path between expected market performance of the subsidiary and its importance for MNC competence development ($H2$), which had a factor loading of 0.19 and an insignificant t -value of 1.56. This test included a test to confirm Hypotheses 1 and 3 and the statistical output revealed a significant fit for the overall model ($\text{Chi}^2_{(df18)} = 17.99, p = 0.46$). The paths between the constructs were also significant: subsidiary external technical embeddedness and subsidiary expected market performance (factor loading = 0.27, $t = 2.00$), subsidiary external technical embeddedness and the importance of the subsidiary for MNC competence development (factor loading = 0.46, $t = 2.55$).

Figure 2
The Final Model



The resulting model is based on two relations. The first is a significant and positive relation between subsidiary external technical embeddedness and subsidiary expected market performance, thereby supporting Hypothesis 1. However, although the relation between subsidiary expected market performance and subsidiary importance for competence development is positive, and had a moderately positive t -value (1.56), Hypothesis 2 is not supported. Of the two competing Hypotheses, 3a and 3b, Hypothesis 3a is supported, because there is a positive and significant relation between a subsidiary's external technical embeddedness and its importance for MNC competence development.

The overall result indicates that technical embeddedness is a relevant pre-

dicator of a subsidiary's market performance. The data support the view that close relationships with external customers and suppliers in terms of product and production process development have a positive impact on the success of a subsidiary in its own market place. To the best of our knowledge, this is the first time it has been possible to demonstrate empirically that an MNC subsidiary's external network constitutes an important part of its core competence, with direct consequences for its expected market performance. Furthermore, the result indicates that a subsidiary's technical embeddedness also predicts its role as a contributor to competence development in other MNC units, thereby supporting Hypothesis 3a. Expressed differently, the subsidiary's ability to contribute to other units' competence development is not counterbalanced by the problem of transferring knowledge from one subsidiary to other subsidiaries due to context specificity. Finally, as predicted by Hypothesis 2, the market performance of a subsidiary does not seem to have a significant impact on its importance for competence development in other units; a subsidiary's future prospects in its own market place can be good, without the subsidiary influencing other units' competence development.

Concluding Remarks

The result indicates that an analysis at the relationship level is necessary to understand processes at the subsidiary and corporate levels within an MNC. A subsidiary's embeddedness at the relationship level seems to have explanatory power for the subsidiary's expected market performance. It also confirms the proposition that embeddedness has a positive rather than a negative impact on the subsidiary's importance for knowledge transfer at the corporate level, as the results supported Hypothesis 3a, not 3b. Finally, there seems to be no indication that subsidiary market performance *per se* is important for the subsidiary's role in the knowledge transfer process within the MNC.

However, it should be pointed out that our analysis has its limitations, both empirically and theoretically. Specifically, there are three problems. First, even if external relationships usually dominate a subsidiary's network, for our model, we have to consider the role of relationships with corporate units, i.e. corporate embeddedness. These relationships can have the same characteristics as the external ones. Therefore, we have reason to assume that the more the subsidiary is involved in business relationships with other corporate units, the greater the possibility that competence developed in the subsidiary, due to external relationships, will be transferred and used in these units. Consequently, corporate embeddedness can be seen as a variable that modifies the negative effects of context specificity and the lack of motivation to participate in knowledge transfer within the MNC.

This line of thought can be carried a bit further. An MNC subsidiary often functions as a link between competence development in the external environment and in the corporate environment. The assimilation and commer-

cialization of new knowledge is carried out through the relationships with both external and corporate counterparts. In such a subsidiary, there is no immediate contradiction between deploying resources in relationships with external customers and suppliers and relationships with corporate units. First of all, new competence is not developed in exchange for external actors and then (hopefully) transferred to other corporate units. Rather, it is developed in a constant and simultaneous interplay with external and corporate units. In these cases, Hypothesis 3b is less relevant.

Second, our model implies a unidirectional causality, from technical embeddedness at the external relationship level, to market performance at the subsidiary level, and to competence development at the MNC level. However, a more advanced model would include multidirectional causalities, because processes at different levels can co-evolve with each other (Lewin and Volberda 1999: 527). Development of a subsidiary's external business network affects development processes at the corporate level, but can also be a response to changes at that level. For instance, a subsidiary's co-operation with an external supplier regarding product development can stimulate attempts by sister units to develop better products. However, such a co-operation can also originate from and be affected by the product development processes of sister units.

Third, the model does not explicitly consider the role of corporate headquarters in the knowledge transfer process within the MNC. Several authors have pointed out that there are integrative devices that can be used by the headquarters to stimulate co-operation and co-ordination between sub-units, including competence development (Galbraith 1973; Edström and Galbraith 1977; Hedlund 1986; Ghoshal and Bartlett 1988, 1990; Grant 1996a). The more successful these devices are in stimulating co-operation and knowledge sharing between subsidiaries with different business contexts and interests, the less powerful Hypothesis 3b will be. Expressed differently, the negative impact of context specificity on a subsidiary's importance for competence development in other units can be reduced or eliminated due to successful knowledge management by the corporate or divisional headquarters.

To sum up, the results indicate that network embeddedness matters when the focus is on performance and competence development in MNCs. However, this does not imply that all relationships in a subsidiary business network have to be highly embedded, but rather that some of them must have these characteristics. The possibility of a business network becoming too embedded and tightly structured has also been pointed out by several scholars (for a discussion of this problem see e.g. Granovetter 1973; Christensen and Bower 1996; Håkansson and Snehota 1998). Some research seems to indicate that over a certain threshold, embeddedness can be counterproductive, because such a network can blind the firm to what is happening outside the network (Uzzi 1996, 1997). This problem reflects the fact that the need for absorption of knowledge and the need for flexibility and links to a wider network work against each other. The absorption process is governed by access to deep and mutual relationships with exter-

nal actors, built up over a long period of time. The subsidiary has invested a lot of resources in these relationships, and an important outcome is the possibility of transferring tacit knowledge between the counterparts. However, if the subsidiary's network consists only of highly embedded relationships, there is a risk that it will be closed off from new and innovative processes, because there are hardly any non-redundant links to outside members (Burt 1992; Uzzi 1996). An important managerial implication would be that the optimal network is composed of both highly embedded relationships with suppliers and customers, etc., and a number of arm's-length relationships. More research is needed to explore further how the optimal network is, or should be, composed.

Appendix

Correlation Matrix of Construct Indicators

	Subsidiary's Expected Market Performance			Subsidiary's Importance for Competence Development in MNCs		Subsidiary's External Technical Embeddedness		
	SAL-VOL	MA-SHARE	PROF	PT DEV	PN DEV	APTT	APNT	FUNCA
SALVOL	1.00							
MASHARE	0.74	1.00						
PROF	0.44	0.40	1.00					
PTDEV	0.15	0.02	0.10	1.00				
PNDEV	0.27	0.09	0.04	0.56	1.00			
APTT	0.22	0.19	0.08	0.31	0.33	1.00		
APNT	0.20	0.25	0.06	0.13	0.27	0.65	1.00	
FUNCA	0.05	0.11	0.03	0.12	0.09	0.44	0.37	1.00

Note

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