

# 195

MOTIVES TO  
RESTRUCTURE  
INDUSTRIES –  
FINNISH  
EVIDENCE OF  
CROSS-BORDER  
AND DOMESTIC  
MERGERS AND  
ACQUISITIONS

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## **ABSTRACT**

We have estimated a multilogit model for the probabilities that a firm will acquire or become a target in different M&A categories, which are defined according to the location of an acquiring firm with respect to a target. We discovered that such firm characteristics of an acquiring firm that can be regarded as an indication of a good capacity to monitor a target or to internalise the potential synergies of M&A increase the probability of distant M&As at the expense of close M&As. Respectively, such factors that ease the monitoring of the target firm's value increase the probability that such a firm becomes a target which is located far from an acquiring firm.

Key words: Mergers and acquisitions, home bias, monitoring

JEL codes: D8, G34, R30

## **TIIVISTELMÄ**

Tämä tutkimus tarkastelee yrityskauppojen syntyä Talouselämä -lehdestä kootun aineiston avulla. Yrityskaupat on tyypitelty ostajan ja kohteen keskinäisen sijainnin mukaan seutukunnan sisäisiin, seutukuntien välisiin sekä kansainvälisiin yrityskauppoihin. Yritysjärjestykset muodostuvat neljänneen yrityskaupparyhmän silloin, kun analysoidaan kaupan kohteeksi joutumista. Tutkimuksessa on estimoitu malli suhteellisille todennäköisyyksille, että yritys tulee ostajaksi joko seutukuntien välisiin kauppoihin tai kansainvälisiin kauppoihin, kun vertailuryhmänä pidetään seutukuntien sisäisiä kauppia. Sama analyysi tehdään myös todennäköisyydelle, että yritys tulee kaupan kohteeksi. Myös tuolloin vertailuryhmänä on seutukunnan sisäiset kaupat. Tutkimustulokset tuovat esille niitä tekijöitä, jotka vaikuttavat edellä mainittuihin suhteellisiin todennäköisyyksiin. Tuloksista voidaan näin päätellä, mitkä tekijät lieventävät tilastollisestikin todistettua taipumusta ostaa toinen yritys hyvin läheltä, mieluummin samasta seutukunnasta.

Tulosten mukaan ostajayritys, jonka henkilökunta on korkeasti koulutettua (joko teknisesti tai muuten) on taipuvainen ostamaan muita yrityksiä myös seutukunnan ulkopuolelta. Koulutustason nousu lisää erityisesti kansainvälisten yrityskauppojen todennäköisyyttä. Samansuuntainen on T&K-panostuksen vaikutus. Näiden tulosten voidaan tulkita kuvastavan sitä,

että henkilökunnan koulutustason myötä ostajayrityksen kyky arvioida sellaistakin kohdeyritystä, joka sijaitsee etäällä, on parantunut. Tulos voi myös kuvata sitä, että henkilökunnan koulutus auttaa ostajayritystä sisäistämään yrityskaupan luomia mahdollisuuksia synergiaetuihin, vaikka kohdeyritys sijaitsisi etäällä. Sen, että kansainvälisiä yrityskauppoja tehneet ostajayritykset ovat myös investoineet muita enemmän T&K:hon, voidaan myös ajatella kuvastavan sitä, että ostajan ja kaupan kohteen välinen suuri etäisyys ei rajoita T&K:lla luodun tietopääoman yhteistä käyttöä uudessa laajentuneessa omistuksessa. Samaa ei voida sanoa kiinteään pääoman yhteiskäytöstä. Kiinteän pääoman osuuden noustessa yrityksen taseessa alttius kansainvälisiin yrityskauppoihin vähenee.

Analyysi yrityskaupan kohteeksi joutumisesta taas paljasti, että koulutustason vaikutus erityyppisten kauppojen syntyyn on verraten erilainen kuin ostajaksi tulemisessa. Henkilökunnan korkean tason koulutus – jonkinlaisena inhimillisen pääoman indikaattorina – näytti vähentävän seutukuntien välisen tai kansainvälisten yrityskauppojen todennäköisyyttä seutukuntien sisäisiin kauppoihin nähden. Tämän tuloksen voidaan tulkita kuvastavan sitä, että kohdeyrityksen inhimillisen pääoman arvoa on vaikea arvioida kaukaa. Yrityskaupan syntyminen näyttää edellyttävän verraten tarkkaa arviota kohteen arvosta. Yrityskaupan kohteen T&K-intensiteetti kuitenkin lisäsi suhteellista todennäköisyyttä tulla ulkomaisen yrityksen ostamaksi. Tätäkin tulosta voidaan taas selittää tietopääoman arvon helpohkolla arvioitavuudella tai sillä, että kaupan osapuolten on mahdollista hyödyntää syntynyttä tietopääomaa yhteisesti riippumatta ostajan ja kohteen sijainnista.

## **1. INTRODUCTION**

In this empirical study we focus on mergers and acquisitions (M&As) in Finland and consider why a certain firm is involved in a certain type of M&A. Focusing on the motives of different types of M&As we stress the regional aspects of M&A flows. We believe that the geographical distance between an acquirer and a target firm plays a big role. The distance impairs the quality of the information which an acquirer has about a target firm. As a consequence of this, information about a target company is asymmetrically distributed over potential acquirers according to their locations. When acquirers make bids about a target, the informational disadvantage can be relieved by increasing the monitoring of a target. But this is costly, and so the acquirers which are located far from the target are, in any case, in a comparably poor situation. We also discuss more closely why poor

information has an effect on the likelihood of acquiring. We also think that the utilisation of the potential synergies of distant M&As may also be hampered by the communication gap between a target and an acquirer and that this gap is narrowed with the educational level of the acquirer's staff.

In examining the importance of distance in this study, M&As are classified as belonging to different categories. M&A is intra-regional when an acquirer (a target) is located in the same domestic region as a target (an acquirer). M&A is inter-regional when an acquirer (a target) is located in another domestic region than a target (an acquirer) and it is cross-border when an acquirer (a target) is located in another country than a target (an acquirer). Analysing the probability that a firm becomes a target, we also consider a fourth group of M&As, called rearrangements, in which the ownership change is associated with outsourcing or a firm's internal restructuring.

In the empirical analysis we explain the probabilities that an acquisition – either from an acquirer's point of view or then from a target's point of view – belongs to any of the defined M&A categories. Asymmetric information about a target's value creates a so-called home bias, according to which the firms which locate close to each other tend to merge. In fact, it was already shown by Böckerman and Lehto (2003) that the home bias is also characterised by the Finnish M&As which we consider in this study. But there exist, however, such firm-specific factors that have an impact on the relevance of the distance between an acquirer and a target firm. We think that the distance does not matter so much if an acquirer's capacity to accurately evaluate the value of the target firm even from afar is strengthened. Respectively, the factors which make a target transparent so that its value is easily evaluated are supposed to increase the probability of such M&As in which the distance between a target and an acquirer is long. To investigate the validity of the above hypothesis related to the accuracy of monitoring, it is highly important in the empirical analysis to specify such variables that describe the monitoring capacity of an acquirer and the ease of monitoring the target.

There are also some other reasons that may favour the M&As of firms which are located close to each other. Being close to each other, both an acquirer and a target share the same "language" in communicating with tacit messages (in the sense described by Breschi and Lissoni, 2001). We hypothesise that the effect of this communication gap is alleviated when the staff's education level rises, and so the internalising of potential synergies also becomes easier. In M&A firms may also internalise synergy gains through a common use of assets possessed either by an acquiring or by a target company. But the geographical restrictions

associated with common use may then favour the M&As of closely located firms. So we also examine whether the possession of such assets whose common use may increase profits and whose utilisation may have geographical limits plays any role in M&As. We also think that distant M&As are more risky because they are based, on the average, on more imprecise information than close M&As. From this and the imperfections of the financing market it would follow that the indebted acquirers tend to buy closely located targets.

We estimate a multilogit model which explains the relative likelihood of M&As in certain categories. Our findings tell us that, in particular, the firms which are involved in cross-border M&As are, in many respects, different from other firms. It is typical of the firms – which have been involved in cross-border M&As – for staff to be highly educated and for the firms to have invested in R&D. We also discovered that the share of fixed assets on the acquiring firm's balance sheet increases the probability of intra-regional M&As. This implies that a long distance may hinder the common use of fixed assets.

## **2. PREVIOUS EMPIRICAL LITERATURE**

The empirical literature on the geography of M&As has tested the existence of home bias. Ellison and Glaeser (1997) found that domestic mergers play an important role in the concentration of economic activity within industries. Green and Gromley (1984), Green (1987) and Green (1990) investigate the U.S. pattern and Green and McNaughton (1989), and Aliberti and Green (1999) investigate the Canadian pattern in takeovers across regions. These studies discovered that a short distance is an important factor which promotes takeover activities.

A great number of empirical studies which consider a regional aspect of M&As estimate a gravity model. In analysing M&A flows, these studies then focus on the sizes of the regions and on the characters of the regions in which the firms are located. Ashcroft et al. (1994), for example, use a gravity approach in their analysis on takeover activity in the UK. Consistent with the gravity equation of inter-regional interaction, the M&A flows between the regions were found to be positively related to their size and negatively related to distance (in two out of the three years considered). Rodriguez-Pose and Zademach (2003) also focus on the regional dimension of M&A within a single country. Their study on the determinants of M&As, which is based on aggregated information about the background characteristics of the German regions in the 1990s, found that the distance between an

acquiring firm and its target plays an important role in the dynamics of M&A activity, when estimated in conjunction with agglomeration.

Rather few studies have considered the factors that have an effect on the importance of distance between a target firm and an acquirer. Di Giovanni (2003) estimated a gravity model in which cross-border merger flows are explained by the country level aggregate variables which also capture the effect of the bilateral distance and the costs of transmitting information (proxied by telephone traffic). Portes and Rey (1999) also explained cross-border equity flows by telephone traffic. These authors consider that the cost of acquiring the necessary information for the purchase decision is an increasing function of the distance on transactions.

All in all, one can say that the empirical literature on the spatial aspect of merger flows has been extensive. Most studies have been based on aggregated data, and hardly has any study focused on the firm characteristics in analysing the regional aspects of M&As. Our study, which analyses the Finnish data, however, uses the micro-level approach and therefore provides a rather new perspective to analyse M&As. By also considering cross-border M&As, we extend the earlier research of Böckerman and Lehto (2003), which examined only the merger flows within a country.

### **3. WHY DOES DISTANCE MATTER?**

#### **3.1. Some theoretical explanations**

Theory does not provide many explanations for the relevance of short distance in M&As. One motivation for short distance is based on the implications of competition. In the market in which product differentiation depends on the distance between a customer and a firm, the merger of the nearby firms eases competition more than the merger of distant firms, as Levy and Reitzes (1992) show. It is then more likely that nearby firms – being in horizontal competition with each other – are merged. On the other hand, the target or an acquiring firm may possess such an asset whose common utilization increases efficiency and profits. The common use in question may, however, have geographical limits. One can imagine that this concerns human capital and many kinds of tangible assets in network industries and various service industries. This topic is discussed more closely in Böckerman and Lehto (2003).

### **3.2. On the existence and implications of asymmetric information**

Before considering the implications of asymmetric information we consider why distance impairs the quality of information. According to recent empirical findings (see Jaffe et al. (1993), Grünfeld (2002), Keller (2002), Maurseth and Verspagen (2002) and Greuntz (2003)) geographical proximity increases the positive impact of external knowledge on the firm's outcome. According to this, a firm's ability to absorb the knowledge, which is located far away, is difficult. As far as M&As are concerned, the above findings hint that it also becomes more difficult to evaluate the value of a target when it is located far from an acquirer.

Theoretical explanations of the validity of geographical proximity in knowledge spillovers lean on the tacitness of knowledge. According to a popular explanation, other firms' R&D has a positive impact insofar as these firms are located close to a firm considered, because the absorbed knowledge is tacit – being person-embodied and context-dependent – and can be transmitted only in face-to-face contacts and through other mechanisms which require spatial proximity (see, for example, Morgan, 2004). According to Morgan (2004) and Nonaka and Takeuchi (1995), the virtual proximity of digital technology does not remove the relevance of tacit knowledge, despite the fact that ICT expands the capacity to codify knowledge and transmits it to distant locations.<sup>1</sup> It is straightforward that if tacitness weakens the absorption of distant knowledge it also impairs the ability to monitor a distant target and to evaluate its value. For the same reason tacitness also deteriorates the actual accomplishments in internalising the potential synergies of M&As.

Next, we consider why an imprecise monitor creates a home bias in M&As. In the earlier literature it has been argued that the geographical closeness between acquiring and potential target companies improves monitoring or at least decreases the monitoring costs and should therefore have a substantial positive impact on the scale of inter-regional merger flows (see, for example, Green, 1990; Ashcroft et al., 1994). It is not, however, obvious that a more precise assessment of the value of the target actually matters, as far as the location of the target firm is concerned, insofar as firms are risk-neutral.

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<sup>1</sup> Recent studies have also approached the concept of tacit knowledge and its implications for the geographical proximity from a different angle. Breschi and Lissoni, 2001, have suggested that there exist epistemic communities whose communication in the exchange of technical and scientific messages is tacit and which therefore act as exclusionary devices. The proximity of this community would then also explain the proximity of external knowledge flows.

Actually, the theoretical research has also focused on the existence of asymmetric information between investors in different countries and its implications in terms of geography. Gehrig (1993) considers a situation in which domestic risk-averse investors observe the payoffs of domestic firms with higher precision than risk-averse foreign investors. The foreigner's estimate of the expected return is unbiased, but the large variance around the mean makes a foreign target risky. This model produces the home bias in equity transfers so that the investments abroad are in an equilibrium much less than what optimal diversification of the investment portfolio would suggest. The home bias, however, requires that investors are risk-averse. As far as acquisitions are concerned, the decision-makers are the firms and not the single investors, and so the assumption of the actor's risk-averseness is no longer well founded.

Gordon and Bovenberg (1996) explain the home bias puzzle in the setting in which risk-neutral foreign investors buy shares from the risk-neutral domestic owners. They rely on the assumption, according to which such a firm-specific output shock arises which only the domestic owners learn about afterwards. Owing to this asymmetry, only the targets that yield the lowest returns are offered to foreigners who, being aware of this, however, may find it profitable to buy foreign firms, if the foreign discount rate is below the domestic rate.

We next consider the implications of asymmetric information on the acquisition likelihood in an instructive model in which a target firm is sold to one from three potential acquirers. One of the acquirers is assumed to be uninformed. We share the assumption of Gordon and Bovenberg (1996) in that the poor information appears as a bias between the actual value and the expected value. Gordon and Bovenberg (1996), however, considered the condition upon which a domestic owner sells the firm's shares to a foreign investor. Then only the buyer makes a bid and the seller accepts this bid, if it exceeds the net present value of the firm to the owner. In this setting the better-informed domestic owner does not have to be aware about the informativeness of the potential purchaser, and because the owner does not bid, it does not have to take into consideration the bidding strategy of the foreign purchaser. In our approach with possibly two or three potential acquirers, it is highly important that each party is aware about the information which the other party possesses and about the bidding strategy which the opponent party is going to follow at least, if the target is equally valuable to all potential acquirers.

### 3.3. The implications of asymmetric information in an auction mechanism

Let us consider situations in which a long distance impairs the ability to monitor the value of potential targets. Several potential acquirers – of which one (firm A) is uninformed – are making an offer for a target firm. More specifically, we consider a framework with one from three potential acquirers: firm A, firm B and firm C. The firms' valuations of the target, labelled by  $v_A$ ,  $v_B$  and  $v_C$  lie on the range  $[-c,1]$  ( $c \geq 0$ ) and are uniformly distributed. Firm A is located far from a target firm and therefore knows only the distribution of  $v_A$  but not its exact value. Both firm B and firm C are perfectly informed about  $v_B$  and  $v_C$ . All the firms are also fully conscious of that information which the other firms possess. The firms are risk-neutral and they participate, if the expected returns are positive. The owners of the target firm will sell only at a positive price.

We consider the bidding behaviour when the potential acquirers' valuations of the target are the same (common-value model) or, alternatively, these valuations are independent. The target is sold to the firm which bids the highest price (in an ascending- or descending-bid auction<sup>2</sup>). If the bidding process is an ascending auction, B's bid  $b_B$  then tells firm A that  $b_B \leq v_B \leq 1$ .

Consider first a situation in which only firm A is interested in buying a target. Firm A would then buy if the expected value  $Ev_A = \int_{-c}^1 (v_A - b_A) dv_A > 0$  when  $b_A$  is firm A's bid.

This presumes that  $c < 1$ . Only then is firm A able to buy without suffering losses. If  $c \geq 1$  firm A would buy only if some other benefit, independent of  $v_A$ , accrued from synergy or from some natural advantage, compensated for the losses from poor information. Actually this is the case considered by Gordon and Bovenberg (1996). They showed that the poorly informed foreign investors might find it profitable to buy a firm, if the foreign discount rate is below the domestic rate, even if only the targets that yield the lowest returns are offered to outsiders. In all, the above analysis shows that the terms under which the firms buy depend very much on  $c$ . When  $c = 0$ , all the firms buy. When  $0 \leq c < 1$ , firm A buys more often than the informed firms B and C. When  $c > 1$ , firm A does not buy at all (when no compensating benefit exists).

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<sup>2</sup> In an ascending auction, the price is successively raised until only one bidder remains. In a descending auction, the auctioneer (the target firm's owners) start at a very high price and that firm wins who first calls out that it will accept the current price.

We then consider a situation in which two or three firms bid the target. We first assume that the target is equally valuable for all potential acquirers (firm A, firm B and firm C.) When only firm A and B are bidding and follow pure strategies<sup>3</sup>, neither an ascending nor a descending (or the first-price-sealed-bid) auction would lead to equilibrium. In an ascending auction firm B would continue bidding until  $b_B$  (B's bid) is  $v_B$ . Uninformed A can win only if  $v_A \leq b_A (=b_B)$  which shows that by bidding continuously above  $b_B$ , firm A cannot make profits. As a consequence of this, firm A does not bid at all. Bidding  $b_B = v_B$  when A does not bid at all is clearly not equilibrium, because lowering  $b_B$  would then increase B's profits. In the first-price-sealed-bid auction (being equivalent to the descending auction) firm B could bid  $\frac{1}{2}(1-c)$  when  $v_B > \frac{1}{2}(1-c)$ , zero when  $v_B < 0$  and, according to  $0 < b_B < v_B$ , when  $0 < v_B \leq \frac{1}{2}(1-c)$ . In this way, B could guarantee that firm A's expected value would always be non-positive. As a consequence of this firm A would not bid at all. The strategy pair (B follows the above strategy and A does not bid) is not, however, Nash equilibrium (in behaviour strategies), because B could increase its profits by lowering its bid just above zero (when  $v_B > 0$ ), given that A does not bid. Suppose that B then sets  $b_B = \varepsilon$  when  $\varepsilon$  is some arbitrarily small positive real number. The strategy in which B bids  $\varepsilon$ , on the other hand, would encourage firm A to bid somewhere between  $\varepsilon$  and  $\frac{1}{2}(1-c)$ . In this 2-by-2 game, with no equilibrium in behaviour strategies, minmax strategy would, however, lead to bidding in which firm B bids high values (to guarantee at least positive returns) and A decides not to bid. But one may doubt whether this is a sensible prediction of actual behaviour. Wilson (1967) in his classical paper considers a similar situation and shows that if firm A randomizes its bidding<sup>4</sup> the static auction would make firms follow equilibrium strategies which also ensure positive returns to firm A. If the support for the valuations were  $[0,1]$  (with uniform distribution), firm B's expected profits would be manifold in comparison to A's profits and B would win the auction with a probability of 62%.<sup>5</sup> This suggests that superior information helps a firm, above all, to increase its profits. But because the uninformed firm will bid very cautiously, the winning probability for it would also in this case be low.

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<sup>3</sup> In the mixed strategy a purchaser randomizes his or her bidding strategy. The strategy which does not include this random experiment (and is a map from information set to action set) is a pure strategy.

<sup>4</sup> Then firm A chooses its bid  $b_A$  via with density function  $g(b_A)$ .

<sup>5</sup> Following Wilson (1967) (an easy example) one could calculate that firm B (with superior information) wins with the probability of  $\alpha/(1+\alpha) \approx 62\%$ . ( $\alpha=1.618$ ).

Let us then assume that a third firm, firm C, being fully informed of its valuation, will also participate. In this situation firms B and C would bid (in an ascending auction) until the bid equates their valuation. The outcome is not different in a sealed-bid auction. In this situation the target firm obtains maximum revenue, and there is no chance for uninformed A to win and obtain non-negative payoff (see also Wilson 1992). Firm A, being uninformed, does not then bid at all.

When firm A's and B's valuations are not correlated, firm B's bid does not inform firm A about  $v_A$ . Firm A does not bid when  $c \geq 1$ , because then it could buy a target only at a loss.

When  $c < 1$ , A bids just below  $\frac{1}{2}(1-c)$  and firm B, being aware of this, bids  $\frac{1}{2}(1-c)$  when  $v_B > \frac{1}{2}(1-c)$ . Firm B also acquires then. Actually, A acquires with a probability of 0.5 and so does B when  $c < 1$ . If  $c \geq 1$ , A will not acquire at all, and B acquires, if  $v_B > 0$ . Then B will bid just above zero and firm B obtains all the (social) surplus for itself. The increase in the number of informed bidders would inevitably raise the winning bid above  $\frac{1}{2}(1-c)$  as a result of which, there would no longer be any chance for firm A to bid without incurring a loss.

The above analysis shows that the firm that has an information advantage is more likely to make an acquisition. We also considered (in Lehto, 2004) a case in which firm A enjoys a natural advantage of size  $n_A > 0$  when it buys a target firm. A natural advantage maybe related to A's location. It was shown that things change dramatically in the common value case, if the uninformed firm is favoured by a natural advantage. The informed firm will then acquire, if  $v_A = v_B > 0$  or, on the other hand,  $v_B \leq 0$ . If the firms' valuations are independent and  $n_A > 0$  firm A acquires when  $v_B < n_A$  and firm B acquires when  $v_B \geq n_A$ . The natural advantages may explain why distant M&As also occur. But because there is no reason to assume that a natural advantage is enjoyed only by distant acquirers, the natural advantage cannot remove the home bias which is generated by asymmetric information.

### **3.4. Mergers and acquisitions (M&A) as a means to increase a shareholders wealth**

M&A as a means to accumulate shareholders' wealth works through lessening of competition and through internalising scale economies or other types of synergy. But these aims can in many situations be promoted by other mechanisms than M&A. When a firm acquires another firm there must be good reasons for it. Lehto and Lehtoranta (2002) and (2003) found that technology transfers play a big role in M&As. In many situations technology can, however, be transferred by contractual schemes such as licensing. If the profit stream generated by the licensed object cannot, however, be unambiguously defined so that the economic outcome of the licensed object is not a contractible variable, a licensing agreement is ruled out. Alternatively, firms may trade in technology in the market. Insofar as knowledge capital is human-embodied and context-dependent, the knowledge cannot, however, be loosened and traded. The transfer mechanism of knowledge spillovers is often based on trust and reciprocity (see, Nonaka and Takeuchi, 1995). Appropriation uncertainties and opportunism, however, often hamper involuntary transfers of knowledge in technology networks, as is noticed by DeBresson and Amesse (1991). M&A as a means to transfer knowledge may be a response to all incidences mentioned above. In addition, M&A may be a useful means to internalise scale economies and to utilize common physical assets. Trading in physical assets alone is not easy, if there are remarkable physical obstacles in moving these assets.

Could patents then have an impact on the geography of M&As? One can imagine that it is relatively easy to evaluate the value of patents even if a potential acquirer (evaluator) is located far from their location. Our previous discussion about the monitoring capacity and ease in monitoring a target would suggest that distant M&As could also be common as a means to transfer the knowledge included in patents. But why use M&As when trade in patents or licensing agreements on them are so useful. This would suggest that the monitoring capacity of the purchaser and the transparency of the asset are valid as factors which have an impact on the geographical (and technological) dimension of M&As only insofar as the asset is, by nature, such that its transfer or common use does not succeed in more common pecuniary or contractual means.

#### **4. DATA SET, THE SELECTION OF VARIABLES AND TESTABLE HYPOTHESIS**

The data set on mergers and acquisitions is gathered from the *Talouselämä* magazine. The magazine contains all M&As in which the majority share of a Finnish firm is acquired or in which a Finnish firm acquires a majority share of another firm. All M&As in which the turnover of both parties exceeds 0.5 million euros are included. The data also included such transactions in which only one section of a target firm is bought. In the vast majority of cases the identification of an acquirer and a target and their locations is unambiguous.

Concerning the acquirers we define three M&A categories: intra-regional, inter-regional and cross-border. The data includes only such acquirers that are old firms. The targets are classified as being intra-regional, inter-regional, cross-border or rearrangement. By intra-regional is meant a domestic M&A in which both an acquirer and an acquired firm are located in the same NUTS4 region. The so-called NUTS4 regions consist of commuting areas and the number of these regions in Finland is 85. Location in the same sub-region is chosen as a criterion of geographical closeness.<sup>6</sup> In the inter-regional M&As an acquiring firm and a target firm are then located in different NUTS4 regions. In the cross-border M&As a Finnish firm is bought by a foreign firm (an acquirer's viewpoint) or a foreign firm buys a Finnish firm (a target's viewpoint). To the fourth category for targets, called rearrangements, belong those ownership arrangements as a consequence of which a new firm is created and in which an old business ID changes into a new ID. Management buy-outs and such divestitures in which the ownership changes and a new firm is created typically belong to this group. In this group the target firm is then not necessarily obtained by another firm. Also in a few combination mergers in which a new firm is founded (being an acquirer) and in which the location of a target with respect to an acquirer is unclear, the old firms are classified as rearranged targets. In internal rearrangements the distance between a target and a purchaser is non-existent, and in the rest of these cases the distance is unclear.

For the multilogit-analysis, we form a dichotomous outcome variable which classifies each firm so that it belongs only to one M&A category. The classification is hierarchical in the

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<sup>6</sup> A sub-region consists of several municipalities and is often concentrated around some large city. It is a travel-to-work area and also a natural space within which people go shopping and perform their other daily business. For these reasons, we regard a sub-region as an appropriate area with which to define geographical closeness in our study. In sparsely populated areas in eastern and northern Finland, sub-regions are larger than in southern Finland. But in those areas people – at least those who are active in working life – travel every day more than people in more densely populated areas do.

sense that the outcome is always cross-border when an acquirer or target has been a part of a cross-border M&A. An outcome is inter-regional when a firm has been involved in an inter-regional M&A and not in a cross-border M&A. An outcome is intra-regional when a firm, in addition to being part of an intra-regional M&A, has not been a part of an inter-regional or a cross-border M&A. When a target is classified as a rearrangement it cannot have been a part of any other type of M&A. The hierarchical nature of classification is used, because it is thought that the firm-specific requirements of being part of an M&A become stricter when the distance between an acquiring firm and a target firm lengthens. Such incidences in which a firm has purchased several targets within a year are classified as being one outcome. The same concerns the incidences in which a target company or its share has also been bought more often than once during a year.

The classification of M&As as outcomes and the linking of the M&A data set to other data sets of Statistics Finland decreases the number of M&A incidences. The linked data includes 1400 acquirers (1479 targets) in years 1989–2000. The structure of these incidences for acquirers (targets) in our data is the following: 384 (390) intra-regional, 616 (664) inter-regional, 390 (237) cross-border and (188) rearrangements. The inclusion of R&D variable still reduces the number of observations so that the data includes 1129 acquirers and 1013 targets.

Comparing the frequencies of different incidences we can conclude that in domestic M&As Finnish firms have been targets more often than acquirers, and that in cross-border M&As the situation is reversed. It seems that the capital net-flow outside Finland has been partly implemented through M&A activity.

We also experimented in applying another approach in defining the M&A categories. In this approach the set of explained incidences consists of all M&As despite the fact a single firm may have been involved in different types of M&As. Then an incidence in which a firm buys another firm in the same region is an observation separate from another incidence in which the same firm buys a foreign firm. The data – which is constructed following the above principles – is called data set B. The estimation results obtained from the data B were mostly similar to the results obtained in the hierarchical classification, and so we report only some divergent results which are obtained from the data set B.

Of the matched data sets the Business Register provides information about the turnover, industry-levels and other firm characteristics as the firm's age. Actually, we specify the industries to which each firm belongs by using the Finnish (two-digit) TOL2 classification.

In our new classification industries are divided into 18 separate groups. The number of different industry-levels is limited, because of the small number of M&A incidences in some TOL2 groups. The defined industry codes are used to control the impact of industry-specific factors.

From Financial Statements Data we obtained information about the firm's indebtedness, gross profit-ratio and the size of the fixed tangible assets. Information about the personnel's education is obtained from Employment Statistics, which is also maintained by Statistics Finland. The patent variables originated from the comprehensive registers of the National Board of Patents and Registration of Finland and the information about R&D expenditures that is used to calculate firms' R&D stock is obtained from the R&D Survey of Statistics Finland. The data size of linked data is restricted by the Financial Statements Data.

The variables used in the empirical investigation are documented in Table 1. In deriving the hypotheses stated below one should notice that in many ways the firm's actual geographical space can enlarge. Every domestic firm is specified to be located in one region. But each firm's actual geographical presence enlarges with the firm's size, proxied by the TURNOVER variable and especially with the number of the firm's establishments (MULTI). The MULTI variable is a proxy of the firm's geographical cover only in Finland. The export dummy (EXPORT) and the dummy for foreign ownership (FOREIGN) tell us about a firm's presence or at least about its connections to foreign countries.

The relative probabilities to be considered are probabilities in relation to the probability for intra-regional M&A. In this study, which considers only M&A-active firms, the explanatory variables capture the following types of characteristics:

*The acquiring firm's ability to make accurate monitors.* When actual geographical space enlarges the firm's ability to monitor other firms, that are located far away, strengthens. For this reason, MULTI is assumed to raise the relative acquiring probability in the inter-regional category. EXPORT is expected to increase the relative probability for cross-border M&As. FOREIGN is not, however, expected to increase the relative probability for cross-border M&As, because a foreign-owned firm in Finland is not such an independent actor which would autonomously buy other foreign firms. The firm's size (TURNOVER) can also be interpreted as decreasing the relevance of distance. The larger the firm is, the more expertise it has to make accurate monitors about the target firm and also make cross-border M&As possible. TURNOVER is expected to raise the relative acquiring probability for inter-regional and cross-border M&As. In our analysis the EDU1 variable measures the

**Table 1. Description of the variables.**

<i>Variables</i>	<i>Definition/measurement</i>
AGE	The age of a firm is measured in years. The variable is the employment-weighted average of the ages of the firm's plants.
MULTI	The company consists of several establishments = 1, otherwise = 0.
FOREIGN	The majority share is in foreign ownership = 1, otherwise = 0.
EXPORT	The firm has exported=1, otherwise = 0.
TURNOVER	A log of the turnover of a firm
PROFITS	Gross margin divided by the turnover of a firm
DEBT	Short- and long-term debts divided by the total assets of a firm
FIXED	Fixed tangible assets divided by the total assets of a firm
EDU1	The share of highly educated with technical qualifications of the total number of employees in a firm
EDU2	The share of highly educated (excluding the number of highly educated with technical qualifications) of the total number of employees in a firm
RDINT	A log of [(R&D stock +1)/turnover]. <sup>7</sup> R&D stock of a company that is estimated based on the previous R&D expenditures (see Lehto and Lehtoranta 2003).
PATENTS1	The number of domestic patents that the firm currently owns
PATENTS2	The number of U.S. registered patents that the firm currently owns
NUMBER	A log of the number of firms whose turnover is over 0.5 million euros <sup>8</sup> in the same region
INDUSTRY	18 industry levels
YEARS	12–1

share of those with a high technical education and the EDU2 variable describes the share of those who have another type of high education. EDU1 and EDU2 are also believed to improve a firm's monitoring capacity as a consequence of which the probability of distant M&As increases at the expense of the probability for intra-regional M&As. The evaluated R&D-intensity of the firm (RDINT) may also be a proxy of monitoring capacity. It is well known that the firms who have invested in R&D have also increased their absorptive capacity to use new knowledge. We assume that the absorptive capacity also describes a firm's ability to monitor the value of the knowledge capital possessed by the target firm.

<sup>7</sup> Transformation R&D stock + 1 is used, because some of the firms have not invested in R&D and the stock is zero.

<sup>8</sup> This restriction is the same restriction as the one used by the *Talouselämä* magazine in its listings of mergers.

*Ease with which to monitor the target.* The easier it is to evaluate the value of the target, the more accurate is the monitor, even if the target firm is located far from the acquiring company. The age of a company (AGE variable) is directly related to the available information. Older firms are often listed and there is more public information available about them. This means that in the light of theoretical considerations based on monitoring, domestic takeovers of younger firms should be more common within the same regions. The possession of tangible assets in relation to total assets (FIXED), the value of which is relatively easy to monitor may also increase the probability of distant M&As. However, monitoring is more difficult when the personnel of the target company consist of highly educated workers with specific skills. Therefore, it is expected that mergers that consists of target companies with highly educated workers – described by the variables EDU1 and EDU2 – are more likely to occur within the same region. It is more difficult to hypothesise the ease in monitoring the value of cumulated R&D (RDINT). If the knowledge is in codified form, its value is relatively easy to evaluate, but being incorporated in human capital, the evaluation tends to be inaccurate. The value of patents (PATENTS1 and PATENTS2 variables) which the target firm possesses is, on the other hand, easy to evaluate from far, too. But their monitor is not necessarily relevant for M&As.

*Potential to internalise synergies.* The communication gap between a target and an acquirer increases in distance and in the importance of the human embodied knowledge. On the other hand, we believe that this gap is narrowed by the educational level. We assume that particularly the educational level of an acquirer's staff tends to decrease the importance of distance in this respect.

*The utilization of common assets.* There might be geographical limits to the extent to which an acquirer (or a target firm) can utilize the assets of the target firm (an acquiring firm) in a merger. One may expect that the common utilization of R&D capital or patents possessed by either party of an M&A does not reach the geographical limits so easily as the common utilization of fixed capital or human capital. For these reasons RDINT is expected to increase both the relative probability that a firm acquires and the probability that a firm is acquired in distant M&A categories. But, on the other hand, as we have argued, owing to the tradability of patents, the possession of them can hardly be a reason for M&A.

*Agglomeration.* The M&As are more likely within regions that contain a great number of firms. Therefore we also control the number of firms that are located in the same region (NUMBER). It is self-evident that the number of the firms in the region concerned increases the frequency and probability of intra-regional M&As at the expense of other M&As.

*A firm's financial condition and financial market aspects.* We also consider the impact the firm's profit-ratio (PROFITS) and debt-ratio (DEBT) on the M&A activity. If cross-border or inter-regional M&As are considered as being more risky than intra-regional M&As, it is also evident that this has impact on the price of external finance or on its availability. For these reasons one could expect that the firm which acquires remote domestic firms or foreign firms should have a strong balance sheet with low indebtedness and good profitability. It is more difficult to say beforehand how a target's profitability and indebtedness affect the likelihood that it will fall into a specific M&A category. One reason for this prediction is that the financial statements of a firm can also be read in any places, and far away, too.

To control the impact of technological and regulatory shocks – which Andrade et al. (2001) consider as a major reason for the occurrence of mergers – we also include 18 “TOL2-based” industry level dummies into the models under consideration. Owing to the inclusion of these dummies, the focus is concentrated on the variation within industries. Because the industry dummies, on the other hand, also remove that kind of inter-industry variation which is explained by the factors which are important for this study, we decided to report the results about regressions with industry dummies and without them.

Above, we have taken logs of turnover and R&D stock. The impact of these variables turned out to be log-linear. The results would have been qualitatively the same even if RDINT were replaced by  $\log(\text{R\&D stock}+1)$ .<sup>9</sup>

## 7. METHOD

We estimate the multinomial logit model (multilogit) (see Greene, 2000). Consider outcomes 1,2, ..., m which describe the type of M&A. Let  $m = 3$ . Let  $y$  then be an outcome variable so that  $y = 1, 2$  or  $3$  and let  $X$  denote explanatory variables. In the multilogit model we estimate coefficients  $\beta_i$  – which correspond to each category  $i = 1, 2$  and  $3$  – in the probabilities

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<sup>9</sup> Replacing RDINT by  $\log(\text{R\&D-stock}+1)/\text{total assets}$  and TUROVER by  $\log(\text{total assets})$  would change results concerning the analysis of targets to some extent.

$$\text{Prob}(y = 1) = \frac{1}{1 + e^{X\beta_2} + e^{X\beta_3}}$$

$$\text{Prob}(y = 2) = \frac{e^{X\beta_2}}{1 + e^{X\beta_2} + e^{X\beta_3}}$$

$$\text{Prob}(y = 3) = \frac{e^{X\beta_3}}{1 + e^{X\beta_2} + e^{X\beta_3}}.$$

Above, we have set  $\beta_1 = 0$ , and so coefficients  $\beta_2$  and  $\beta_3$  measure the change relative to  $y = 1$  group. This kind of normalization is necessary to remove the indeterminacy in the model. Group  $y = 1$  is called a comparison group or a base group.

The relative probability of  $y = 2$  is then  $\frac{\text{Prob}(y = 2)}{\text{Prob}(y = 1)} = e^{X\beta_2}$ .

Interpreting the results one must then take into consideration which group is chosen as a base group. In the case considered, for example, coefficient vector  $\beta_2$  tells of the impact of  $X$  on the probability that  $y = 2$  occurs instead of  $y = 1$ .

Because the same firm can fall into several M&A-categories in several periods, the data set analysed includes observations which are not independent. We therefore adjusted the standard errors using the Huber and White robust estimator of variance.

## 8. RESULTS

We estimate a multilogit model for firms which have been a part of M&A as an acquiring firm or as a target firm. We first estimate the basic model which includes variable RDINT. Then we replace RDINT by PATENTS variables by which the number of observations increases, because the R&D survey no longer limits the size of data. The robustness of the results is tested by estimating all models with and without industry-level dummies. The results are reported as marginal effects and the time period is 1989–2000. All models include unreported year dummies. In all estimations, the intra-regional group is the comparison group. The descriptive statistics of the data is given in Tables A4 and A5 in Appendix. Let us first focus on the results concerning the probability that a firm acquires.

**Table 2. Multinomial logit model for acquirers.**

Model 1: Pseudo  $R^2 = 0.2098$ , Model 2: Pseudo  $R^2 = 0.2428$   
 Number of observations = 1129

	<i>Inter-regional</i>		<i>Cross-border</i>	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
TURNOVER	0.346** (3.32)	0.272** (2.66)	0.808** (7.91)	0.787** (7.26)
NUMBER	-0.636** (-9.28)	-0.663** (-8.63)	-0.530** (-6.34)	-0.499** (-5.43)
EDU1	-0.023 (-0.02)	-0.290 (-0.28)	2.932** (2.65)	2.908** (2.47)
EDU2	1.510 (0.99)	1.807 (1.09)	3.840* (1.66)	3.755 (1.45)
RDINT	0.234** (2.18)	0.168 (1.57)	0.562** (4.92)	0.425** (3.43)
FIXED	-0.362 (-0.71)	-0.637 (-1.13)	-1.562** (-2.10)	-1.807** (-2.24)
DEBT	0.846** (1.96)	0.844* (1.86)	-0.968* (-1.78)	-1.142* (-2.06)
PROFITS	-0.531** (-2.15)	-0.466** (-2.12)	-0.543* (-1.88)	-0.500* (-1.88)
AGE	-0.021 (-1.22)	-0.013 (-0.73)	0.005 (0.23)	0.003 (0.12)
FOREIGN	0.441 (1.46)	0.279 (0.93)	-1.056** (-2.18)	-1.276** (-2.70)
MULTI	0.341 (1.44)	0.353 (1.42)	-0.417 (-1.46)	-0.430 (-1.42)
EXPORT	0.072 (0.35)	0.083 (0.35)	1.295** (5.05)	1.162** (3.99)
INDUSTRY	Not included	Included	Not included	Included

Notes: z-stat in parentheses. \*\* (\*) indicates that the parameter estimate is statistically significant at the 5 (10) per-cent significance level.

The estimation results about the model which includes RDINT are reported in Table 2 and those about the model which includes PATENTS variables are reported in Table A1. The results obtained that concern TURNOVER and NUMBER correspond to expectations. It is not surprising either that the number of the firm's establishments (MULTI) increases the relative probability of inter-regional M&As (Table A1). This result is not, however, obtained in the model of Table 2.

The most interesting results are, however, related to education and RDINT variables. To acquire a foreign firm instead of a domestic firm from the same region requires staff to be highly educated (EDU1 and EDU2) or R&D intensity to have been high. Concerning the impact of RDINT and EDU1 on the relative probability of cross-border M&As these results are robust (see Tables 2 and A1). In addition, it looks as if RDINT increases the relative

probability of inter-regional M&As at the expense of intra-regional M&As. These results indicate that the firm whose staff is highly educated or who has invested heavily in R&D has a relatively good ability to monitor the target or to internalise the potential synergies of distant M&As and is therefore able to acquire firms far away, too. It is also possible that firms, whose R&D intensity is high possess knowledge capital whose common utilization does not reach geographical limits.

The negative coefficient of DEBT variable for a cross-border M&A – obtained in all regressions – hints that financing risky foreign purchases is not possible for heavily indebted firms. For an unprofitable acquirer the likelihood of distant M&As seems to increase (Table 2). This unexpected result is, however, not robust (see Table A1). This finding maybe attributed to M&A waves which also occurred in Finland in the late nineties, especially in the ICT-service industry. Clearly, some firms chose a strategy to enlarge themselves at the expense of short-run profits, and the easiest way to expand is to buy other firms which are often located in other regions and foreign countries.

The results obtained also show that firms who have exported (EXPORT) are inclined to become involved rather in cross-border M&As than in intra-regional M&As. This is natural, because export firms' knowledge of foreign markets and of the firms which operate there must be better than average. The fact that a Finnish firm whose majority is owned by some foreign company has a small likelihood to buy foreign firms (FOREIGN) only reflects the Finnish affiliate's position as a subsidiary which does not make strategic decisions.

The possession of patents (PATENTS1 and PATENTS2) has no impact on the geographical structure of M&As (Table A1). This result really hints at the fact that a patent is not such an asset whose transfer through M&A is practical. Fixed assets (FIXED), on the other hand, have zero or negative impact on the probability of distant M&As. This result can be interpreted to state that an M&A can be motivated by the common use of fixed assets (FIXED), and that there is, however, some geographical limit in this.

We then analyse the incidences in which a firm has been a target for some kind of M&A. The base group is still intra-regional. The estimation results are reported in Tables 3 and A2. In Table A3 we report results obtained from the data set B. The firm's size, measured by TURNOVER, seems to increase the probability of cross-border M&As and rearrangements at the expense of domestic intra-regional and inter-regional M&As. As far as rearrangements are concerned, this result reflects the fact that a couple of large companies – which have been targets in an arrangement in which a new firm has been

founded – have been classified as rearrangements. We expected that MULTI could also have increased the likelihood of inter-regional M&As. But this impact turned out to be zero. A firm's age (AGE) has, against our expectations, hardly any impact on the relative probabilities under consideration. As we expected, the coefficient of NUMBER is negative in all M&A categories of Table 3.

According to a weak evidence (Table A2) , it is easier for a foreign firm to buy a Finnish firm that has exported (EXPORT) is also natural. The export firm is, in some sense, present in the foreign market and the home bias related to poor information about a distant buyer is therefore relieved. For the same reason, such a firm that is owned by a foreign firm (FOREIGN) also becomes easily acquired by a foreign firm, instead of a domestic firm.

RDINT, being a proxy of knowledge capital, increases the relative likelihood of cross-border M&As. The positive impact either implies that it is fairly easy to monitor the value of the target firm even from far away or that the common use of the knowledge possessed by the target firm has no geographical limits. We obtained no evidence, unlike Böckerman and Lehto (2003), that the target firm's R&D increases the likelihood of an inter-regional M&A in relation to the likelihood of an intra-regional M&A.

**Table 3. Multinomial logit model for target firms.**

Model 1: Pseudo  $R^2 = 0.1400$ ; Model 2: Pseudo  $R^2 = 0.1606$   
 Number of observations = 1013

	<i>Inter-regional</i>		<i>Cross-border</i>		<i>Rearrangement</i>	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
TURNOVER	0.054 (0.60)	0.029 (0.30)	0.339** (3.08)	0.360** (3.13)	0.240** (2.30)	0.214** (2.00)
NUMBER	-0.606** (-8.27)	-0.566** (-7.15)	-0.497** (-5.50)	-0.436** (-4.43)	-0.453** (-5.05)	-0.402** (-4.13)
EDU1	-1.111 (-1.45)	-1.153 (-1.42)	0.791 (0.85)	1.130 (1.12)	-0.117 (-0.09)	-0.156 (-0.11)
EDU2	-1.699 (-1.10)	-1.822 (-1.15)	-4.235 (-1.35)	-2.781 (-0.90)	0.659 (0.24)	1.737 (0.69)
RDINT	0.148 (1.57)	0.139 (1.37)	0.273** (2.43)	0.232* (1.93)	0.084 (0.75)	-0.028 (-0.23)
FIXED	0.160 (0.32)	-0.171 (-0.31)	-0.381 (-0.57)	-0.937 (-1.25)	-0.047 (-0.07)	-0.041 (-0.06)
DEBT	0.392 (1.19)	0.383 (1.07)	-0.269 (-0.57)	-0.385 (-0.75)	-0.285 (-0.58)	-0.434 (-0.06)
PROFITS	-0.628** (-2.16)	-0.593** (-2.04)	-0.943** (-3.14)	-0.962** (-3.23)	-0.822** (-2.48)	-0.848** (-2.57)
AGE	-0.005 (-0.27)	-0.009 (-0.51)	-0.008 (-0.34)	-0.016 (-0.63)	-0.012 (-0.49)	-0.013 (-0.52)
FOREIGN	-0.276 (-0.90)	-0.262 (-0.83)	2.009** (6.53)	1.915** (5.86)	0.055 (0.14)	-0.078 (-0.19)
MULTI	0.102 (0.46)	0.182 (0.81)	0.017 (0.06)	0.006 (0.02)	0.166 (0.57)	0.261 (0.87)
EXPORT	0.212 (0.94)	0.216 (0.83)	0.493 (1.64)	0.242 (0.72)	0.492 (1.61)	0.443 (1.29)
INDUSTRY	Not included	Included	Not included	Included	Not included	Included

Notes: z-stat in parentheses. \*\* (\*) indicates that the parameter estimate is statistically significant at the 5 (10) percent significance level

When RDINT is also controlled, EDU2 decreases or has no impact on the relative probability of cross-border M&As (Tables 3 and A3). EDU1 has then a zero or a negative impact on the likelihood of inter-regional M&As. The negative impact associated with the staff's educational levels then states that it is difficult to evaluate the value of human capital, if the distance is long. When RDINT is omitted, the coefficient of EDU1 in the category of cross-border M&As becomes positive (Table A2). The interpretation for a positive impact is partly the same as for the discovered positive impact of the RDINT variable in cross-border M&As. EDU1 can then be interpreted to act as a proxy of knowledge capital.

Patents (PATENTS1 and PATENTS2) in the possession of a target firm have no impact on the relative probabilities in Table A2. This only confirms our hypothesis according to which

a patent, due to its tradability, is not such an asset that could attract potential acquirers. The evidence about the effect of fixed assets (FIXED) on the relative probabilities under consideration is mixed. In most regressions, the impact is zero, but there is weak evidence that FIXED decreases the relative probability of cross-border M&As as an indication of geographical limits in the common use of tangible assets.

Indebtedness (DEBT) does not seem to have any impact on the relative probabilities concerning the target firm. Poor profitability, on the other hand, may add a likelihood of other M&A incidences at the expense of intra-regional M&As. This result is not, however, very robust.

## **9. CONCLUSIONS**

Our approach to the study of the geography of M&As is new in the literature. In our hypotheses concerning the geographic structure of M&As we have stressed the important role of asymmetric information in the utilization of synergies, and geographical limits in the use of common assets. We also noticed that an M&A as a device to internalise potential synergies is a device such that is useful only if the other means, such as trade on assets or various cooperative schemes, prove to be useless.

When we consider acquirers, we think that there arises a home bias because the acquirers, being located far from a potential target, have poorer information of the target's value than an acquirer which is located close to the target. The inadequate ability to internalise the potential synergies of distant M&As may also have an effect in this direction. In these circumstances an increase in the acquirer's monitoring or communication capacity, however, alleviates the importance of a short distance.

To test the derived hypotheses we have estimated a multilogit model for the probabilities that a firm will acquire or become a target in different M&A categories, which are defined according to the distance between an acquiring firm and a target. According to the central findings of this study, the firm characteristics of an acquiring firm such as the high educational level of the staff, which can be regarded as an indication of a good monitoring capacity or ability to internalise the potential synergies of distant M&As, increase the probability of cross-border M&As at the expense of domestic M&As. A firm's R&D stock,

which may signal a good monitoring ability, increases the probabilities for distant M&As at the expense of the probability for intra-regional M&As.

The interpretation of our results is complicated by the presence of other types of effects. Each asset in an acquirer's possession can also be considered as an asset that can also be utilized by a target company after an M&A. Therefore, for example, a result which shows that possession of R&D stock increases the probability of cross-border and inter-regional M&As may also indicate that this specific asset can be commonly utilized even if an acquirer is located far from the target.

Concerning the probability that a firm becomes a target of an M&A, we apply the concept of ease with which to monitor the target. Naturally, the evaluation of a target's value becomes more difficult when the distance between a target and an acquirer increases. This effect is, however, alleviated, if monitoring of the target becomes easy. We discovered that the highly educated staff of a target firm decreases or has no effect on the probability of distant M&As compared with the probability of an intra-regional M&A. This result indicates that the human capital that is possessed by a target makes it more difficult to assess the target's value, as a consequence of which the likelihood of a distant M&A decreases. But the target firm's R&D increases the relative probability of a cross-border M&A. This result is related to the easiness with which to monitor the knowledge capital. It may also state that the common use of the knowledge capital is possible, even if the M&A parties are located far from each other.

## APPENDIX. AUXILIARY RESULTS AND THE DESCRIPTIVE STATISTICS

**Table A1. Multinomial logit model for acquirers.**

Model 1: Pseudo  $R^2 = 0.2098$ , Model 2: Pseudo  $R^2 = 0.24827$   
 Number of observations = 1400

	<i>Inter-regional</i>		<i>Cross-border</i>	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
TURNOVER	0.130** (2.28)	0.129** (2.18)	0.391** (4.91)	0.516** (6.22)
NUMBER	-0.590** (-9.97)	-0.604** (-9.08)	-0.535** (-7.17)	-0.454** (-5.47)
EDU1	0.903 (1.14)	0.624 (0.76)	5.150** (6.16)	4.209** (4.73)
EDU2	-0.343 (-0.39)	-0.441 (-0.49)	2.781** (2.93)	1.709* (1.67)
PATENTS1	-0.015 (-0.21)	-0.005 (-0.10)	0.017 (0.24)	0.018 (0.32)
PATENTS2	0.306 (1.17)	0.233 (1.02)	0.310 (1.18)	0.230 (0.99)
FIXED	-0.238 (-0.55)	-0.688 (-1.43)	-1.587** (-2.46)	-2.459** (-3.45)
DEBT	0.497 (1.40)	0.485 (1.30)	-1.655** (-3.45)	-1.657** (-3.30)
PROFITS	0.020 (0.92)	0.014 (0.64)	-0.063** (-2.41)	-0.085** (-3.03)
AGE	-0.029** (-2.07)	-0.022 (-1.51)	-0.001 (-0.05)	0.001 (0.00)
FOREIGN	0.321 (1.36)	0.279 (1.15)	-1.087** (-2.81)	-1.172** (-2.92)
MULTI	0.435** (2.19)	0.371* (1.78)	-0.230 (-0.92)	-0.373 (-1.42)
EXPORT	0.127 (0.73)	0.104 (0.53)	1.712** (7.47)	1.500** (6.12)
INDUSTRY	Not included	Included	Not included	Included

*Notes:* z-stat in parentheses. \*\* (\*) indicates that the parameter estimate is statistically significant at the 5 (10) percent significance level.

**Table A2. Multinomial logit model for target firms.**Model 1: Pseudo  $R^2 = 0.1547$ ; Model 2: Pseudo  $R^2 = 0.1729$ 

Number of observations = 1479

	<i>Inter-regional</i>		<i>Cross-border</i>		<i>Rearrangement</i>	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
TURNOVER	-0.066 (-1.25)	-0.081 (-1.48)	0.109 (1.58)	0.163** (2.17)	0.174** (2.80)	0.201** (3.05)
NUMBER	-0.631** (-10.97)	-0.628** (-10.27)	-0.44** (-6.18)	-0.404** (-5.17)	-0.483** (-6.55)	-0.438** (-5.43)
EDU1	-0.181 (-0.32)	-0.152 (-0.26)	1.482** (2.21)	1.582** (2.20)	0.538 (0.66)	0.238 (0.22)
EDU2	-0.942 (-1.01)	-1.036 (-1.02)	-0.077 (-0.07)	0.502 (0.45)	1.075 (0.87)	1.182 (0.95)
PATENTS1	0.001 (0.09)	0.000 (0.01)	0.027 (1.31)	0.023 (1.47)	-0.000 (-0.02)	-0.005 (-0.34)
PATENTS2	0.006 (0.19)	0.009 (0.28)	-0.036 (-0.72)	-0.040 (-0.88)	0.006 (0.22)	0.000 (0.01)
FIXED	0.441 (1.09)	0.438 (0.99)	-0.394 (-0.72)	-0.521 (-0.84)	-0.161 (-0.28)	0.008 (0.01)
DEBT	0.039 (0.14)	-0.002 (-0.01)	-0.358 (-1.04)	-0.519 (-1.40)	-0.332 (-0.90)	-0.475 (-1.30)
PROFITS	0.117 (1.28)	0.121 (1.14)	-0.045 (-1.23)	-0.139 (-1.57)	-0.015 (-0.28)	-0.006 (-0.10)
AGE	-0.004 (-0.28)	-0.005 (-0.38)	0.001 (0.06)	-0.002 (-0.12)	-0.008 (-0.40)	-0.010 (-0.51)
FOREIGN	-0.162 (-0.66)	-0.157 (-0.63)	2.304** (9.19)	2.255** (8.54)	0.102 (0.30)	0.058 (0.17)
MULTI	0.216 (1.22)	0.279 (1.55)	-0.040 (-0.17)	-0.066 (-0.26)	0.234 (0.93)	0.299 (1.17)
EXPORT	0.167 (0.99)	0.153 (0.79)	0.454** (2.08)	0.113 (0.46)	0.518** (2.22)	0.441 (1.63)
INDUSTRY	Not included	Included	Not included	Included	Not included	Included

Notes: z-stat in parentheses. \*\* (\*) indicates that the parameter estimate is statistically significant at the 5 (10) percent significance level

**Table A3. Multinomial logit model for target firms. Data set B.**Model 1: Pseudo  $R^2 = 0.1546$ ; Model 2: Pseudo  $R^2 = 0.1755$ 

Number of observations = 1163

	<i>Inter-regional</i>		<i>Cross-border</i>		<i>Rearrangement</i>	
	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>	<i>Model 1</i>	<i>Model 2</i>
TURNOVER	0.044 (0.48)	0.026 (0.27)	0.312** (3.02)	0.335** (3.24)	0.226** (2.81)	0.219** (2.61)
NUMBER	-0.738** (-10.72)	-0.731** (-10.23)	-0.370** (-4.38)	-0.326** (-3.75)	-0.404** (-4.80)	-0.356** (-4.17)
EDU1	-1.787** (-2.41)	-1.550** (-1.98)	0.097 (0.11)	0.739 (0.80)	-1.002 (-0.84)	-1.359 (-0.98)
EDU2	-2.472 (-1.56)	-2.523 (-1.52)	-6.640** (-1.98)	-5.276* (-1.66)	-0.247 (-0.10)	0.243 (0.10)
RDINT	0.156 (1.43)	0.123 (1.05)	0.276** (2.46)	0.211* (1.85)	0.159* (1.80)	0.022 (0.22)
FIXED	0.162 (0.33)	0.0384 (0.15)	0.146 (0.22)	-0.416 (-0.56)	0.217 (0.36)	0.275 (0.40)
DEBT	0.304 (1.08)	0.254 (0.90)	-0.255 (-0.60)	-0.489 (-1.07)	-0.127 (-0.36)	-0.357 (-1.03)
PROFITS	-0.292 (-1.13)	-0.306 (-1.12)	-0.554** (-2.38)	-0.616** (-2.60)	-0.339 (-1.14)	-0.412 (-1.38)
AGE	-0.017 (-1.01)	-0.020 (-1.13)	-0.012 (-0.56)	-0.028 (-1.19)	-0.022 (-1.00)	-0.025 (-1.07)
FOREIGN	-0.229 (-0.80)	-0.226 (-0.76)	1.921** (6.56)	1.842** (5.91)	0.153 (0.43)	0.025 (0.07)
MULTI	0.199 (0.91)	0.250 (1.13)	-0.043 (-0.14)	-0.063 (-0.20)	0.485* (1.73)	0.517* (1.83)
EXPORT	0.328 (1.52)	0.174 (0.71)	0.461 (1.58)	0.026 (0.08)	0.420 (1.51)	0.385 (1.28)
INDUSTRY	Not included	Included	Not included	Included	Not included	Included

Notes: z-stat in parentheses. \*\* (\*) indicates that the parameter estimate is statistically significant at the 5 (10) percent significance level

**Table A4. Statistics for acquirers, data set which includes RDINT**

Number of observations = 1129

	<i>Mean</i>	<i>Std. dev</i>	<i>Min</i>	<i>Max</i>
TURNOVER	17.44	2.08	11.98	22.74
NUMBER	7.29	1.66	3.40	9.15
EDU1	0.08	0.11	0	0.75
EDU2	0.03	0.06	0	0.70
RDINT	-16.17	1.67	-22.32	-9.97
FIXED	0.24	0.19	0	0.94
DEBT	0.57	0.22	0	1.30
PROFITS	0.04	0.53	-8.58	0.87
AGE	13.83	5.78	1	25
FOREIGN	0.08	0.28	0	1
MULTI	0.78	0.41	0	1
EXPORT	0.59	0.72	0	1

**Table A5. Statistics for target firms, data set which includes RDINT**

Number of observations = 1013

	<i>Mean</i>	<i>Std. dev</i>	<i>Min</i>	<i>Max</i>
TURNOVER	16.69	2.22	11.21	22.81
NUMBER	6.93	1.62	3.22	9.15
EDU1	0.07	0.12	0	1
EDU2	0.02	0.06	0	0.73
RDINT	-15.71	1.59	-22.14	-10.11
FIXED	0.25	0.21	0	0.96
DEBT	0.62	0.26	0	3.54
PROFITS	0.03	0.47	-7.68	0.71
AGE	14.56	5.79	1	25
FOREIGN	0.13	0.34	0	1
MULTI	0.62	0.49	0	1
EXPORT	0.69	0.46	0	1

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