

Böckerman, Petri; Lehto, Eero

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Does geography play a role in takeovers? Theory and Finnish micro-level evidence

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ABSTRACT

This study explores domestic mergers and acquisitions across regions. The study is based on the comprehensive public data on domestic mergers and acquisitions that is matched to the micro-level data sources maintained by Statistics Finland in order to obtain variables that help to characterize the companies involved. The Finnish evidence reveals that geographical closeness matters a great deal for mergers and acquisitions within a single country. This means that a great number of domestic takeovers occur within narrowly defined regions. In other words, there is a strong home bias in domestic mergers and acquisitions. In addition, domestic merger flows substantially reinforce the core-periphery dimension. The results from matched data show that the strong ability by an acquiring company to monitor the target (measured by the knowledge embodied in human capital) is able to support mergers that occur across distant locations, other things being equal. Geographical closeness and proximity across industries are not related, based on the Finnish evidence.

**Labour Institute for Economic Research, Pitkäsillanranta 3A, 00530 Helsinki, Finland. E-mails: petri.bockerman@labour.fi and eero.lehto@labour.fi

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1. Introduction

Companies play an important role in the reallocation of resources. The geography of mergers and acquisitions (M&As) in Finland is particularly interesting, because regional disparities are sharp. As the European Union average is standardized as 100, the level of gross domestic product per capita is 141 in the province of Uusimaa, which includes the region around the Helsinki metropolitan area in Southern Finland, where roughly a third of the total economic activity of the Finnish economy is located. In contrast, by using the same measure, the level of GDP per capita is 75 in Eastern Finland (Behrens, 2003). This means that the dynamics of inter-regional merger flows is relevant from the regional policy perspective in Finland.

The aim of this study is to investigate the previously unexplored pattern of domestic inter-regional mergers in Finland during the last decade. This study contributes to the literature on domestic inter-regional mergers by using matched data. This means that the study is based on the comprehensive public data on domestic mergers that is matched to the micro-level data sources maintained by Statistics Finland in order to obtain variables that help to characterize the companies involved. By doing this, this study is able to characterize the geographical closeness of mergers and acquisitions more deeply than the previous empirical studies that have applied aggregate data.

The rest of the study is organized as follows. The second section provides theoretical considerations for the importance of geographical closeness in domestic M&As. The third section includes a survey of the empirical literature. The fourth section contains a description of the matched data. The fifth section documents that geographical closeness is a matter of great importance for domestic takeovers in the Finnish regions. The sixth section provides the estimation results for the firm-level factors that help to characterize the geographical closeness of domestic mergers and acquisitions. The last section concludes.

2. Theoretical considerations

There are several theoretical reasons for the relevance of geographical closeness in domestic mergers and acquisitions. The first explanation stems from the consequences

of product differentiation that has been explored in detail in the earlier literature. The second explanation considers asymmetric information. Poor monitoring from afar cannot distinguish a good target from an average target. This gives an information advantage for the potential acquirer who is located close to the target firm. In addition, poor information of the target that is associated with a long distance, may have a negative effect on the firm's ability to internalise the potential synergies associated with takeovers. The third explanation relies on increasing returns. This study considers a case in which the firms – which are located close to each other – are jointly able to take advantage of a common asset.

2.1. Spatial competition

In certain industries the distance between the client and the firm is an important component of product quality or the firm's costs. Because firms' locations vary, products become differentiated. In the spatial competition models the impact of geographical closeness on the M&As is highly contingent on the assumed nature of conjectures which describe how the other firms respond to a unit change in the output of a firm considered. Cournot conjecture implies no response in terms of output. In Bertrand competition, firms compete in setting prices, and then output responses diverge. Levy and Reitzes (1992) show that a merger of nearby companies – which eases competition – increases the merged firms' profits in the spatial Bertrand price competition.¹ This means that there is an incentive for nearby companies to form coalitions in spatial price competition. In contrast, Mathushima (2001) shows that a merge of nearby companies, however, produces a decline in the merged companies profits in the standard non-cooperative Cournot competition. These results show that the role of geographical closeness in the determination of domestic mergers and acquisitions cannot be solved by theoretical considerations based on the traditional frameworks of industrial organization.

2.2. Asymmetric information

Asymmetric information may be an important reason for the phenomenon, according to which the parties of M&As tend to be located close to each other. The literature on knowledge spillovers stresses that the tacit and human-embodied nature of knowledge

has a central role in knowledge transfers (see e.g. Nonaka and Takeuchi 1995; Morgan 2004). The transmission of tacit knowledge presumes face-to-face contact or other mechanisms which require spatial proximity (von Hippel 1994; Morgan 2004). For this reason, it is logical to assume that the geographical restrictions which govern the transmission of knowledge also have an impact on the assessment of the value of a target by a potential acquirer. This implies that an increase in the distance between a target and an acquirer impairs the ability of an acquirer to monitor the value of the target.

Jaffe et al. (1993), Keller (2002), Maurseth and Verspagen (2002), Greuntz (2003), among others, document the fact that knowledge and technology flows are dampened by geographical distance. Grünfeld (2002) stresses that one interpretation of this regularity is that more resources are needed to enable learning from innovations that are undertaken at a geographical distance. According to this, a firm's ability to absorb knowledge from regions, which is located far away, is difficult. Concerning M&As, the findings above hint that it becomes more difficult to evaluate the value of a target when it is located far from an acquirer.

In the empirical literature it has been, in fact, 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 e.g. Green 1990; Ashcroft et al. 1994).² It is not, however, obvious that a more precise assessment of the value of a target actually matters insofar as firms are risk-neutral. The following reasoning gives an explanation why the presence of asymmetric information can indeed promote mergers and acquisitions between firms which locate close to each other and why more accurate monitoring by acquiring companies could alleviate the problem raised by distance.

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 it has a large variance around the mean which makes a foreign target risky. This model for cross-border equity transfers explains the home bias phenomenon, according to which, the amount of investments abroad are empirically observed to be much less than the optimal

diversification of investment portfolio would suggest. Concerning acquisitions, the decision-makers are firms and not single investors. For this reason, the assumption of the actor's risk-averseness is no longer particularly well founded. Gordon and Bovenberg (1996) explain 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 afterwards. Due to this asymmetry, only the targets which 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.

Lehto (2004) has presented an instructive model in which a target firm is sold to one from three potential acquirers. Another acquirer is assumed to be better informed. Lehto (2004) then shares the assumption of Gordon and Bovenberg (1996) according to which the poor information appears as a bias between the actual value and the expected value. Gordon and Bovenberg (1996) considered, however, the condition on 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 is not be aware about the informativeness of the potential buyer and because the owner does not bid, it has not to take into consideration the bidding strategy of the foreign buyer. Lehto (2004) considered a situation in which possibly two or three potential acquirers bid for a target. One bidder is uninformed and knows only the distribution about the target's possible values. Other two bidders are fully aware of the target's value for them. In the situation under consideration each party is also 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. Lehto (2004) then shows that it is highly unlikely that an uninformed bidder will buy the target. Only if an uninformed acquirer obtains some additional advantage from the acquisition – which the other bidders do not obtain – will it take over.

The long distance between a target and an acquiring company may also imply that a target firm and an acquiring firm have communication problems and that these firms do not “share the same language” in the sense defined by Breschi and Lissoni (2001). This would also restrict the opportunities to internalise the potential synergies of an M&A,

and give one explanation to observed home bias in M&As. We believe that, in particular, an increase in the educational level of an acquirer's staff improves the willingness to communicate and abilities to understand each other. This alleviates the obstacles in internalising the potential synergies.

2.3. Sharing common assets

In an enlarged version of this study, we consider a situation in which the parties of the merger may jointly use the assets which the new parent firm possesses after the merger.³ Owing to this, the scope for profitable mergers may widen in the limited geographical area. More closely, our analysis is based on the model which is not too far from the model analysed by Perry and Porter (1985). We have assumed that the inverse of demand function is linear in output and that the technology is determined from Cobb-Douglas so that $q_k = \sqrt{L_k K_k}$ where q_k denotes firm k's output, K_k is firm k's capital input and L_k is firm k's labour input. Unlike Perry and Porter (1985), or Farrell and Shapiro (1990) in the more general framework, we assume that the capital input is also a decision variable. Assuming that the joint use of K_k lowers the capital costs, the prospects for profitable mergers widen. Then not only in duopoly as in Salant et al. (1983) but also in the market of several firms there arises an opportunity for profitable mergers.

To obtain costs savings through a merger in this setting requires that the merger does not remove the pre-merger production sites. In some cases too long distance between the merged firms may hinder the use of these common assets. In any kind of network industries the location of the tangible assets which belong to the network may determine the area under which the joint utilization of the network is possible. This especially concerns many service industries. The location of the depots, the warehouses and the various supporting activities can limit the geographical scope of cooperation and M&As in the wholesale trade and the transport industries and in other services. In addition, after the merger the utilization of human capital – and the technological and managerial knowledge which is incorporated in human capital – can also, to some extent, be shared by those production sites which were independent firms before the merger. For earlier

discussed reasons the distant location of a production site may be a handicap that produces extra costs for companies involved.

3. Previous related studies

There has been extensive empirical literature on various direct and indirect effects of merger flows on regional economies (see e.g. Ashcroft and Love, 1993). However, there have been a limited number of empirical studies that aim to characterize the economic fundamentals that have an influence on merger flows across regions within countries. In addition, these studies have been based on aggregated data. The following investigation that is based on the Finnish data is able to provide a previously neglected micro-level perspective on this important issue.

The earlier empirical studies have applied aggregate data on U.S., Canadian, UK and German inter-regional merger flows. Ellison and Glaeser (1997) observe that only a very small portion of the total geographic concentration is attributable to intrafirm agglomeration in the U.S. manufacturing industries. This pattern means that there is an important role for domestic merger flows in the concentration of economic activity within industries. In other words, the pace of inter-firm reallocation may have an important influence on the magnitude of agglomeration. Green and Gromley (1984), Green (1987) and Green (1990) investigate the U.S. pattern in takeovers across regions. They discover that distance is indeed an important factor in the determination of regional takeovers as suggested by the famous gravity equation of inter-regional interaction. In addition, Sorenson and Stuart (2003) point out that geographical proximity matters a great deal for venture capital investments in the U.S. states via transmission of information about the potential investment opportunities.

Green and McNaughton (1989), and Aliberti and Green (1999) provide empirical evidence from Canada. They conclude that the acquisition process across regions is reinforcing the core-periphery nature of Canada's urban system. In particular, domestic merger activity is heavily concentrated in four major concentrations of economic activity that are Toronto, Montreal, Vancouver and Calgary. In addition, Green and Lisle (1991) investigate the inter-regional merger flows in Canada by using the Markov chain models. The results show that there is strong empirical evidence for the distance

decay effect. This pattern is highlighted in the feature that only a limited number of cities made acquisitions in cities other than their own.

Ashcroft et al. (1994) provide the available UK empirical evidence. The sectoral coverage of the study is limited, because their study excludes banking, insurance, finance and other services. The study discovers that the estimation of gravity equation provides an appropriate framework for the empirical investigation of regional takeover activity in the UK. Consistent with the famous gravity equation of inter-regional interaction, there is a decrease in the total volume of takeovers as there is an increase in the distance between regions, and an increase in the total number of inter-regional takeovers as there is an increase in the size of regional economic potential measured by the value of domestic product.

Rodriguez-Pose and Zademach (2003) have concluded that M&As has resulted in a major concentration of firms and economic activity in the main German metropoli. The study on the determinants of M&As is based on aggregated information about the background characteristics of the German regions in the 1990s. Rodriguez-Pose and Zademach (2003) discover that proximity plays an important role in the dynamics of M&A activity, when estimated in conjunction with agglomeration.

4. The data

4.1. The selection of variables

The matched data is created in order to obtain variables that can be used to characterize the geographical closeness of domestic mergers and acquisitions. This matching is made possible by the inclusion of the unique identification codes for the population of firms used in different registers maintained by Statistics Finland. Most of the included variables can be interpreted from the point of monitoring and available information. Some variables can also be interpreted to reflect the possession of the assets whose common use may face geographical restrictions.

The variables used in the empirical investigation are documented in Table 1. The age of a company 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 feature that a company consists of several establishments loosens the importance of geographical closeness. The reason for this is that multi-establishment companies are able to gather and process information from a broader geographical scope. Lehto and Lehtoranta (2003) already provided evidence that an increase in the scale of a potential acquirer company measured by the turnover positively contributes to the likelihood that a firm acquires. Geographical closeness can play some role in this feature. In addition to this, large companies equipped with better monitoring capacity may be able to overcome geographical boundaries more easily than small companies. The ease of monitoring a target is impaired when the size of the target company measured by turnover (or by the number of employees) increases. This suggests that the takeovers of large firms should be more likely within the same region, other things being equal.

(Table 1, Page 22)

Based on the earlier theoretical considerations, it can be argued that the education structure of the companies involved is an important factor for the spatial structure of mergers. An acquiring company that consists of highly educated workers or is characterized by extensive knowledge capital is better equipped to monitor targets. This feature tends to downplay the role of geographical distance. In other words, it provides support to the inter-regional mergers that occur across distant locations within a single country. 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 and acquisitions that consists of target companies with highly educated workers are more likely to occur within the same region.

The role of knowledge capital generated by R&D investments may also have remarkable effects on the geography of M&As. We believe that the utilization of merged knowledge capital do not meet geographical limits so easily. In addition, the geographical limits of M&As can be relived by the fact that the monitoring of target's knowledge capital that is not human-embodied is evidently relatively easy from afar, too. As noticed by Lehto and Lehtoranta (2003) an acquirer's R&D capital seem to

strengthen an acquirer's absorptive capacity and to increase therefore the likelihood of acquisitions. We think that an acquirer's R&D capital reflects, to some extent, an acquirer's ability to monitor the target and therefore it could increase the relative probability of distant M&As. We also consider the implications of the possession of patents. The ease to monitor the quality of a patent also from afar and a good opportunities to utilize the contents of a patent – which a target possesses – despite the distant location of a target suggest that the possession of patents would lengthen the distance between an acquirer and a target, other things being equal. On the other hand, because of the tradability of patents and vast opportunities to make license agreements on them, there are more convenient mechanisms to transfer the knowledge included in patents than M&As.⁴ For this reason, we do not expect that the possession of patents would necessarily have an effect on the domestic geography of M&As.

The size of regions should be important for mergers. The amount of geographical clustering is measured by the number of firms that are located in the same region. It is expected that mergers and acquisitions are more likely within regions that contain a great number of firms. In addition, there is a dummy variable that captures the mergers in which the acquiring and the target company are in the same industry. This means that it is possible to investigate the connection between geographical closeness and proximity across industries by using the matched data.

According to Jensen (1988), better performing companies – measured by indebtedness or by profitability – are more willing to acquire. It is interesting to see whether there is any spatial dimension in this respect. Fixed tangible assets of the companies involved are chosen to capture the possibilities to take advantage of common assets. These possibilities can often be utilized across distant locations because monitoring is more easy with them.

4.2. Mergers

The data on mergers and acquisitions is gathered from the *Talouselämä* magazine, which is published on a weekly basis. The magazine contains all mergers in which either an acquiring or an acquired firm is a Finnish one, or in which either an acquiring or an acquired firm is owned by a Finnish company. This means that the data is truly

comprehensive in terms of domestic mergers. The merger data covers the period from 1989 to 2001. Because some variables are not available from 2001, most of the analysis covers the period 1989–2000. The total number of mergers is 5126 (including non-domestic mergers) during this period of investigation (Table 2). The sub-population of mergers that consists of the cases where existing companies change their organizational form without the involvement of other companies is excluded from the study of domestic merger flows, because there fails to be, for obvious reasons, a discrepancy of location in terms of the acquiring and the target company for these particular mergers. The *Talouselämä* magazine contains the list of the names of the companies that have been involved in the transactions. This means that it is possible to manually link the firm codes to those names of the companies listed by the magazine.

(Table 2, Page 24)

4.3. Financial status of companies

The information about domestic mergers is linked to the Business Register and Financial Statements Data by the firm codes. The VINTAGE, the MULTI, the TURNOVER, the PROFITS, the DEBTS, and the FIXED variables are obtained from the Business Register and Financial Statements Data.

4.4. Information about the personnel of companies

This matched data is then linked to Employment Statistics also maintained by Statistics Finland, which compiles information on the economic activity of individuals and their background characteristics (such as the education of an employee). Employment Statistics contains a piece of information (i.e. firm code) on the employee's employer in the last week of each year. This makes it possible to link the Employment Statistics to the Business Register in order to create linked longitudinal employer-employee data. Employment Statistics effectively covers the whole population.⁵ The variables that capture the size of the company measured by the number of employees and the educational structure of the companies involved are obtained from Employment Statistics.

4.5. Knowledge capital

The number of patents that capture a perspective on the knowledge capital are obtained from the comprehensive registers of the National Board of Patents and Registration of Finland. The information about R&D expenditures that is used to calculate the R&D stock of the companies involved can be obtained from R&D surveys of the Finnish companies, 1989, 1991–2000.⁶ Matching is made possible by the fact that R&D surveys by Statistics Finland contain the same firm codes as the Business Register, Financial Statements Data and Employment Statistics.

4.6. Geographical closeness

The *Talouselämä* magazine contains information about the geographical location of the targets classified in terms of the Finnish municipalities. This measure of location is a plant-level measure. This information about the location of targets can then be aggregated to various geographical divisions of Finland (including the so-called NUTS regions by the European Union).⁷ Most acquiring companies have only one site. In those cases the definition of the location is unambiguous. But when acquiring companies have many sites the location is defined according to the site which has the largest number of personnel. The geographical location of acquiring companies is obtained from the Business Register by Statistics Finland as it contains the home municipality of the Finnish companies. First, the geographical closeness is defined as a case when acquiring and acquired companies are located in the same region. Second, the geographical closeness is measured as a distance between acquiring and acquired companies. The distance is measured in kilometres based on the location of acquiring and acquired companies at the municipality level.⁸

5. Stylized features

The geographical pattern of domestic mergers and acquisitions is interesting in Finland.⁹ Table 3 shows that a great number of domestic mergers occur within narrowly defined regions. For instance, about 38% of the total number of domestic mergers occur within the same provinces. In contrast, roughly 31% of domestic mergers and acquisitions occur within the same industry by using the 2-digit industry classification

by Statistics Finland. The Kernel density estimate of distance decay function based on the Finnish municipalities further underlines the important role of geographical closeness (Figure 1).¹⁰ Thus, the volume of domestic mergers substantially declines as there is an increase in the distance between the acquiring and the target company provided that a domestic merger has occurred in the first place.

(Table 3, Page 25)

(Figure 1, Page 27)

The information provided in Table 3 and Figure 1 suggests that geographical closeness is very important for domestic M&As. However, it may also reflect the fact that most firms are located in the Helsinki metropolitan area (a NUTS4 region) – which is a part of the Uusimaa province (a NUTS3 region) – or in a few other NUTS4 regions. To take explicitly into account the density of firms in various sub-regions, we have compared the actual share of intra-regional mergers with the hypothetical probability for the intra-regional mergers in a situation in which the acquiring firm chooses the target firm randomly, given the existing locations of the firms in Finland. This probability is denoted by $p(n)$. Its derivation is presented in Appendix 1. Using the data on the number of firms in various sub-regions (their turnover is above FIM 3 million and they are included in the Business Register by Statistics Finland), we have computed $p(n)$. The share of actual intra-regional acquisitions of all acquisitions for the NUTS4 regions and derived $p(n)$ are presented in Figure 2. The share of actual intra-regional acquisitions is well above $p(n)$ over the period of investigation supporting the conclusion that the acquiring firms tend to locate geographically close to the target firms.

(Figure 2, Page 28)

The share of the Finnish provinces in the total volume of takeover activity by acquiring companies shows the overwhelming dominance of Uusimaa, which is the heaviest populated area in Finland (Figure 3). Although the share of Uusimaa in the total volume of takeover activity by target companies is also high, it is not as high as the share of

takeover activity by acquiring companies.¹¹ This means that the firms located in the province of Uusimaa are gradually gaining control of firms located in the rest of the Finnish regions in net terms by conducting mergers and acquisitions. The losers of control seem to be fairly evenly distributed across the other NUTS3 regions, including provinces such as Varsinais-Suomi, Pohjois-Savo and Pohjois-Pohjanmaa. This feature means that domestic mergers and acquisitions substantially reinforce the core-periphery dimension of the Finnish economic geography in an interesting way. In this sense, the situation is the same as in Canada.

(Figure 3, Page 29)

6. Explaining geographical closeness

An important feature in the interpretation of the findings is that a number of variables are able to capture the monitoring capacity of an acquiring company and the potential of an acquiring company to obtain economics of scope and complementarities from a merger. Moreover, a number of variables that characterize the target companies are able to capture the possibilities to monitor a target company and complementarities from a merger. The most important finding from matched data is that the strong ability by an acquiring company to monitor the target (measured by the educational level of the staff) is able to support mergers that occur across distant locations, other things being equal. The same pattern applies to knowledge capital of an acquiring company measured by the R&D stock. This observation is consistent with the earlier theoretical considerations for the role of distance in inter-regional mergers and acquisitions within a single country.

The findings are reported in Table 4. (Additional results are reported in Appendix 2-3.) A number of interesting patterns emerge despite the fact that a substantial number of domestic mergers and acquisitions is lost in the construction of the matched data. The results from Table 4 show that the likelihood that a domestic merger occurs within the same municipality decreases as the age of the target company increases. This pattern is in line with the feature that the activities of older companies are easier to monitor for acquiring companies. As a result, the young target companies are more likely to be located geographically near the acquiring company. Geographical closeness matters less for acquiring companies that consist of a number of establishments. In addition, the likelihood

that a domestic merger will occur within the same municipality decreases as the turnover of the acquiring company increases.¹² This means that the larger companies are able to overcome the geographical boundaries of municipalities more easily. The results show that the agglomeration of companies matters a great deal for the pattern of domestic mergers. Thus, mergers are substantially more likely to occur within regions that contain a great number of companies. The variables that capture patents of the companies involved are not statistically significant and the insignificant coefficient of the SAMEINDU variable shows that geographical closeness and proximity across industries are not related. These results are robust across models.

(Table 4, Page 26)

The findings for the DISTANCE variable reveal an interesting pattern according to which the high share of highly educated employees with technical qualifications in an acquiring company is able to support mergers that occur across distant locations. The explanation for this is that those particular acquiring companies have more capacity to monitor the target companies. In contrast, the coefficient of the EDU2 variable for the target company implies the same pattern as explaining the PROXIMITY variable for NUTS5 regions. Our reading of this evidence is that difficulties to monitor the target companies tend to compress the distance between the acquiring and the target company as suggested by the earlier theoretical notions.

The results from the estimation of models that include financial variables are reported in Appendix 2. The indebtedness (DEBT) of a target firm or an acquiring firm seems to have no impact on the geographical dimension of domestic mergers and acquisitions. The reported results concerning the impact of the PROFITS variable give some evidence that those targets which are in good shape in terms of profitability can be monitored across distant locations. This increases the share of those domestic mergers in which the target firm is located in another area than an acquiring firm. The fixed tangible assets of the target firm (FIXED) negatively contribute to the geographical closeness between a target firm and an acquiring firm. This feature may reflect the fact that it is easy to monitor the quality of fixed tangible assets. Therefore, the target company can locate in a location that is distant from an acquiring firm.

Finally, the impact of R&D stock on the economic geography of domestic mergers and acquisitions is considered. The number of observations substantially decreases due to the size of the R&D survey data by Statistics Finland. The findings that are reported in Appendix 3 reveal that an increase in the R&D stock of acquiring companies decreases the likelihood of mergers that occur within the same regions. As stressed earlier, this feature may reflect the strengthened monitoring capacity of acquiring companies, but it may also hint that the acquiring firms possess knowledge capital of which joint utilization is not geographically restricted after a merger. In this respect, it is noteworthy that the R&D stock of the target firm has no impact on the geographical dimension of domestic takeovers.

7. Conclusions

This study explored mergers and acquisitions from the regional perspective. The Finnish evidence reveals that geographical closeness matters a great deal for inter-regional mergers and acquisitions. This means that a great number of domestic mergers occur within narrowly defined regions. In other words, there is a strong home bias in domestic mergers and acquisitions. In addition, domestic merger flows substantially reinforce the core-periphery dimension in Finland. In particular, firms in the province of Uusimaa, where most of the economic activity is located, are gradually gaining control of firms located in the rest of the Finnish regions in net terms by conducting mergers and acquisitions across regions.

This study investigated domestic inter-regional mergers by using matched data. This means that the study was based on the comprehensive public data on domestic mergers that was matched to the micro-level data sources maintained by Statistics Finland in order to obtain variables that help to characterize the companies involved. The most important finding from matched data is that the strong ability by an acquiring company to monitor the target (measured by the educational level of the staff) is able to support mergers that occur across distant locations, other things being equal. This result is consistent with the theoretical considerations according to which ability to monitor by acquiring company that deteriorates with an increase in distance provides an explanation for geographical closeness of mergers and acquisitions. In addition, an increase in the R&D stock of acquiring companies decreases the likelihood of mergers that occur within the

same regions. This feature may reflect the strengthened monitoring capacity of acquiring companies, but it may also hint that the acquiring firms possess knowledge capital of which joint utilization is not geographically restricted after merger or acquisition.

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Table 1. Description of the variables.

| Variables | Definition/measurement |
|---|--|
| Financial status of companies: | |
| VINTAGE | The age of a firm is measured in years. The variable is the employment-weighted average of the ages of firm's plants (Source: Business Register by Statistics Finland). |
| MULTI | Company consists of several establishments=1, otherwise 0 (Source: Business Register by Statistics Finland). |
| TURNOVER | A log of the turnover of a firm (Source: Business Register by Statistics Finland). |
| PROFITS | Gross margin divided by the turnover of a firm (Source: Financial Statements Data by Statistics Finland). |
| DEBTS | Short- and long-term debts divided by the total assets of a firm (Source: Financial Statements Data by Statistics Finland). |
| FIXED | A log of fixed tangible assets (Source: Financial Statements Data by Statistics Finland). |
| Information about the personnel of companies: | |
| SIZE | A log of the size of a firm measured by the number of employees (Source: Employment Statistics by Statistics Finland). |
| EDU1 | The share of highly educated with technical qualifications of the total number of employees in a firm (Source: Employment Statistics by Statistics Finland). |
| EDU2 | The share of highly educated (excluding the number of highly educated with technical qualifications) of the total number of employees in a firm (Source: Employment Statistics by Statistics Finland). |
| Knowledge capital: | |
| PATENTS1 | The number of domestic patents that firm owns currently (Source: the National Board of Patents and Registration of Finland). |
| PATENTS2 | The number of U.S. registered patents that firm owns currently (Source: the National Board of Patents and Registration of Finland). |
| R&D | R&D stock of a company that is estimated based on the previous R&D expenditures (see Lehto and Lehtoranta 2003). |
| Geographical closeness: | |
| PROXIMITY | Acquiring and acquired companies are located in the same NUTS-region=1, otherwise 0 (Source: <i>Talouselämä</i> magazine and Business Register by Statistics Finland). |
| DISTANCE | A log of distance is defined as a distance in |

| | |
|--------------------------|---|
| Geographical clustering: | kilometres between acquiring and acquired companies (Source: Statistics Finland based on GIS). |
| AGGLOMERATION | A log of the number of firms whose turnover is over FIM 3 million in the same region (Source: Business Register by Statistics Finland). The variables are separately calculated for the locations of acquiring and target companies. This restriction of FIM 3 million is the same restriction as the one used by the <i>Talouselämä</i> magazine in its listings of mergers. |
| Additional variables: | |
| YEARS | 12-1 |
| SAMEINDU | The acquiring company and the target company are in the same 2-digit industry as classified by Statistics Finland=1, otherwise 0. |

Table 2. The data about mergers in Finland 1989–2000 (Source: *Talouselämä* magazine).

| Definition | Number of mergers |
|---|-------------------|
| All mergers listed by the magazine (1989-2000) | 5126 |
| The acquiring company is located in a foreign country | 880 |
| The target company is located in a foreign country | 685 |
| Internal reorganization of a domestic firm | 589 |
| Domestic mergers used in the analysis | 2972 |

Table 3. The share of domestic mergers in which the acquiring company and the target company are located in the same region of Finland 1989–2000 (i.e. the values of the PROXIMITY variable) (Sources: *Talouselämä* magazine and Business Register by Statistics Finland).

| Regional division: | Share (%) |
|-----------------------------|-----------|
| NUTS5-regions (446 regions) | 20.3 |
| NUTS4-regions (85 regions) | 32.9 |
| NUTS3-regions (21 regions) | 38.2 |

Table 4. The estimation results (with t-statistics), 1989–2000. The results for Probit models are reported as marginal effects. The models include unreported year dummies.

| | Probit Model | t-statistics | Probit model | t-statistics | Probit model | t-statistics | Tobit model | t-statistics |
|---|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|---------------|
| | (dependent | | (dependent | | (dependent | | (dependent | |
| | variable: | | variable: | | variable: | | variable: | |
| | PROXIMITY | | PROXIMITY | | PROXIMITY | | DISTANCE) | |
| | for NUTS5- | | for NUTS4- | | for NUTS3- | | | |
| | level) | | level) | | level) | | | |
| VINTAGE (acquirer) | 0.001606 | 0.7 | 0.004273 | 1.31 | 0.004729 | 1.41 | -1.71475* | -1.84 |
| VINTAGE (target) | -0.00865** | -3.87 | -0.00375 | -1.2 | -0.00501* | -1.58 | 0.528337 | 0.59 |
| MULTI (acquirer) | -0.07268** | -2.38 | -0.18319** | -4.26 | -0.15085** | -3.51 | 17.7116 | 1.46 |
| MULTI (target) | -0.03618 | -1.06 | -0.01833 | -0.38 | -0.04901 | -1.01 | 32.78766** | 2.42 |
| TURNOVER (acquirer) | -0.0185** | -2.09 | -0.03583** | -2.85 | -0.01698 | -1.38 | 9.129417** | 2.71 |
| TURNOVER (target) | 0.011698 | 1.4 | 0.030547** | 2.58 | 0.001107 | 0.09 | -1.56039 | -0.48 |
| EDU1 (acquirer) | -0.03747 | -0.4 | -0.2543* | -1.88 | -0.21657* | -1.52 | 106.4833** | 2.66 |
| EDU1 (target) | 0.019036 | 0.19 | 0.039877 | 0.29 | -0.06638 | -0.45 | 20.17847 | 0.49 |
| EDU2 (acquirer) | 0.376527** | 2.48 | -0.13606 | -0.62 | 0.083448 | 0.33 | -112.422* | -1.52 |
| EDU2 (target) | 0.358769** | 2.5 | 0.272824 | 1.21 | 0.129245 | 0.53 | -131.6* | -1.84 |
| PATENTS1 (acquirer) | 0.0037133 | 1.08 | 0.000541 | 0.09 | 0.000673 | 0.13 | 0.434065 | 0.5 |
| PATENTS1 (target) | 0.003196 | 0.33 | 0.001222 | 0.34 | 0.001412 | 0.35 | -0.12253 | -0.12 |
| PATENTS2 (acquirer) | 0.0147224 | -1.32 | -0.01197 | -0.75 | -0.01678 | -1.19 | -1.5167 | -0.77 |
| PATENTS2 (target) | 0.0070497 | -0.51 | -0.00398 | -0.57 | -0.00323 | -0.43 | -0.62791 | -0.32 |
| AGGLOMERATION (acquirer) | | | 0.109836** | 8.53 | 0.105696** | 5.63 | -7.50257** | -2.17 |
| AGGLOMERATION (target) | .. | .. | 0.149847** | 12.09 | 0.205489** | 11.14 | -42.0703** | -12.27 |
| SAMEINDU | 0.0247529* | 1.74 | 0.051463 | 1.48 | 0.00052 | 0.01 | 5.861413 | 0.6 |
| Pseudo R ² for Probit models | 0.08 | | 0.36 | | 0.22 | | .. | |
| Number of observations | 1057 | | 1057 | | 1057 | | 1056 | |

Notes: ** (*) indicates that the parameter estimate is statistically significant at the 5 (10) per cent significance level.

Figure 1. The estimated distance decay function based on the distances between acquiring and target companies at the municipality level of the Finnish regions 1989–2000.

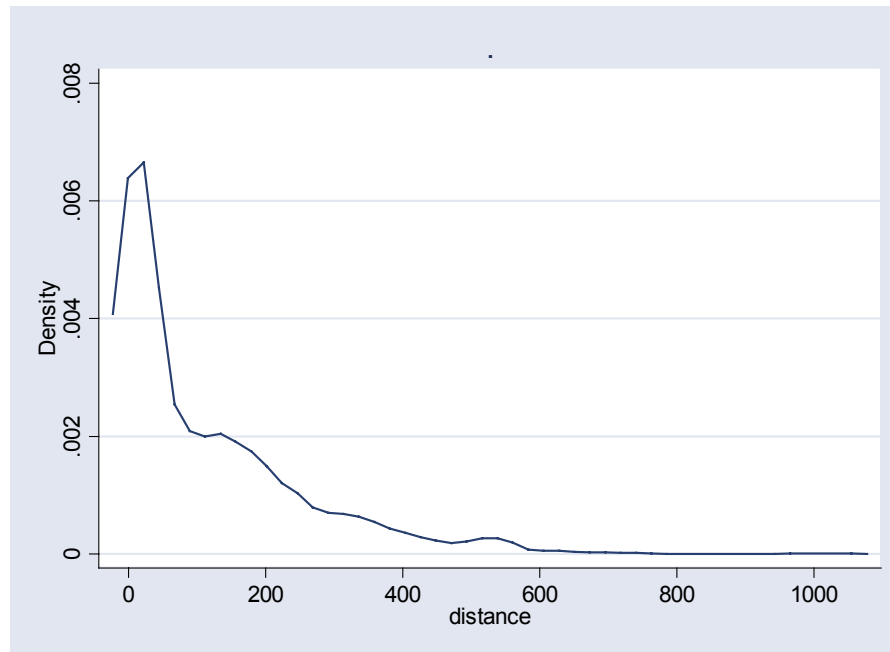


Figure 2. The computational probability of an intra-regional merger and the value of the PROXIMITY variable for the NUTS4-regions 1989–2000.

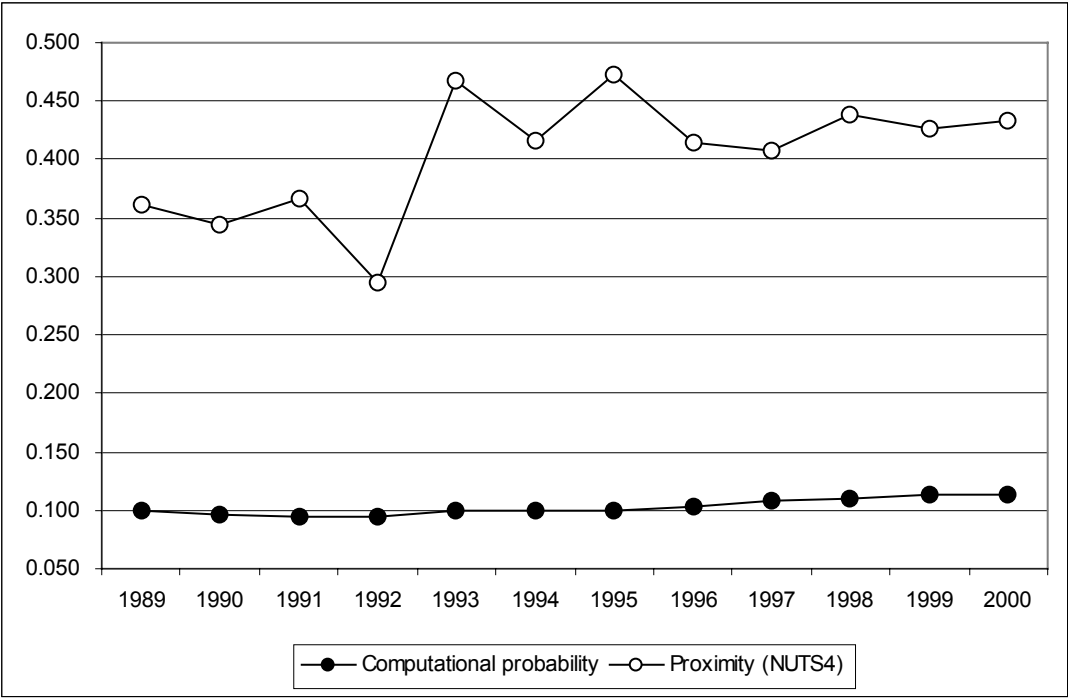
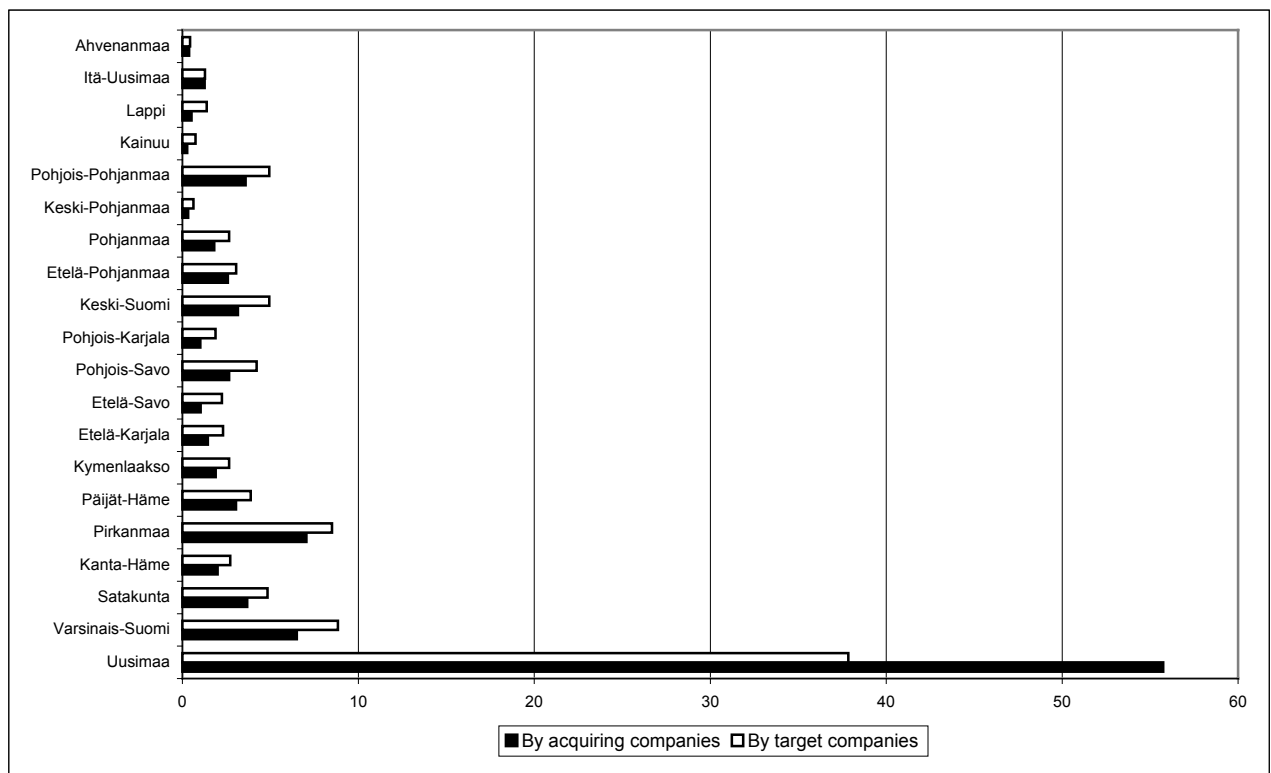


Figure 3. The share of the Finnish provinces in the total volume of takeover activity by acquiring and target companies 1989–2000 (Source: *Talouselämä* magazine).



Appendix 1. The calculation of computational probability of an intra-regional merger.

Suppose there are N firms in the whole country, and that the number of firms in the sub-region i is n_i . Then $\sum_i n_i = N$. The number of intra-regional combinations of two firms in sub-region i is then $\binom{n_i}{2}$ which is denoted by $c(n_i)$. The total number of combinations in the population is $\binom{N}{2}$. This figure is denoted by $c(N)$. The computational probability, denoted by $p(n)$, for such random acquisitions in which both parties locate in the same sub-region can be approximated by the formula

$\frac{\sum_{i=1}^k c(n_i)}{c(N)}$. We have calculated $p(n)$ annually. The larger the number of sub-regions is

and the more asymmetrically the firms are distributed over the sub-regions, the lower $p(n)$ is. At the highest $p(n)$ approaches 0.5 (when there are only two sub-regions of equal size and the number of firms is large). Calculating $p(n)$, we have taken into account all those firms of which turnover exceeds FIM 3 million (the same limit which is valid in our M&A-data) in all sub-regions of Finland.

Appendix 2. The estimation results (with t-statistics), 1989–2001. The results for Probit models are reported as marginal effects. The models include unreported year dummies.

| | Probit Model | t-statistics | Probit model | t-statistics | Probit model | t-statistics | Tobit model | t-statistics |
|---|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|---------------|
| | (dependent | | (dependent | | (dependent | | (dependent | |
| | variable: | | variable: | | variable: | | variable: | |
| | PROXIMITY | | PROXIMITY | | PROXIMITY | | DISTANCE) | |
| | for NUTS5- | | for NUTS4- | | for NUTS3- | | | |
| | level) | | level) | | level) | | | |
| MULTI (acquirer) | -0.02653 | -0.86 | -0.05448 | -1.28 | -0.09267** | -2.23 | 32.66166** | 2.66 |
| MULTI (target) | -0.08361** | -0.28 | -0.03277** | -0.82 | -0.03876** | -0.99 | 15.26331 | 1.35 |
| TURNOVER (acquirer) | -0.03296** | -3.41 | -0.05063** | -3.76 | -0.04145** | -3.17 | 11.44529 | 2.99 |
| TURNOVER (target) | 0.04593** | 4.44 | 0.03820** | 2.79 | 0.03733** | 2.76 | -10.4392 | -2.62 |
| DEBT (acquirer) | -0.02497 | -0.49 | -0.04550 | -0.65 | -0.09612 | -1.39 | -1.93905 | -0.1 |
| DEBT (target) | -0.04813* | -1.57 | -0.00369 | -0.88 | -0.00629 | -0.16 | 2.916385 | 0.26 |
| PROFITS (acquirer) | -0.00043 | -0.15 | -0.00306 | 0.70 | -0.00008 | -0.02 | -0.74789 | -0.59 |
| PROFITS (target) | -0.00982** | -2.45 | -0.07509* | -1.98 | -0.06965* | -1.78 | 3.550034* | 1.74 |
| FIXED (acquirer) | 0.003104 | 0.41 | 0.01368 | 1.27 | -0.01097 | 1.04 | -5.58167* | -1.84 |
| FIXED (target) | -0.03769** | -5.01 | -0.02439** | -2.42 | -0.02327** | -2.37 | 6.087698** | 2.07 |
| AGGLOMERATION (acquirer) | .. | .. | 0.045174** | 4.11 | 0.027261* | 1.71 | 3.51344 | 1.13 |
| AGGLOMERATION (target) | .. | .. | 0.193173** | 16.67 | 0.264568** | 16.18 | -54.4194** | -17.06 |
| Pseudo R ² for Probit models | 0.06 | | 0.34 | | 0.24 | | .. | |
| Number of observations | 1330 | | 1330 | | 1330 | | 1330 | |

Notes: ** (*) indicates that the parameter estimate is statistically significant at the 5 (10) per cent significance level.

Appendix 3. The estimation results (with t-statistics), 1989–2000. The results for Probit models are reported as marginal effects. The models include unreported year dummies.

| | Probit Model | t-statistics | Probit model | t-statistics | Probit model | t-statistics | Tobit model | t-statistics |
|---|-------------------|--------------|-------------------|--------------|-------------------|--------------|-------------------|---------------|
| | (dependent | | (dependent | | (dependent | | (dependent | |
| | variable: | | variable: | | variable: | | variable: | |
| | PROXIMITY | | PROXIMITY | | PROXIMITY | | DISTANCE) | |
| | for NUTS5- | | for NUTS4- | | for NUTS3- | | | |
| | level) | | level) | | level) | | | |
| VINTAGE (acquirer) | 0.000878 | 0.35 | 0.001567 | 0.4 | 0.004851 | 1.15 | -2.69061** | -2.19 |
| VINTAGE (target) | -0.00526** | -2.35 | -0.0053* | -1.54 | -0.01176** | -3.06 | 1.679965* | 1.53 |
| MULTI (acquirer) | -0.01295 | -0.42 | -0.14347** | -2.92 | -0.20265** | -3.84 | 23.84076* | 1.59 |
| MULTI (target) | -0.00253 | -0.07 | -0.0207 | -0.35 | -0.10479* | -1.68 | 49.63836** | 2.75 |
| TURNOVER (acquirer) | -0.00861 | -0.86 | -0.00838 | -0.53 | 0.004121 | 0.24 | 2.601524 | 0.53 |
| TURNOVER (target) | 0.000719 | 0.08 | 0.020969* | 1.5 | 0.014368 | 0.93 | -7.60571* | -1.73 |
| R&D (acquirer) | -0.0245** | -2.02 | -0.05416** | -3.1 | -0.07741** | -4.09 | 14.83996** | 2.83 |
| R&D (target) | -0.00372 | -0.28 | -0.01665 | -0.87 | -0.03042 | -1.43 | 6.416652 | 1.08 |
| AGGLOMERATION1 (acquirer) | 0.003193 | .. | 0.106538 | 7.6 | 0.130849** | 5.74 | -7.68372* | -1.84 |
| AGGLOMERATION1 (target) | .. | .. | 0.14367 | 10.11 | 0.215447** | 9.35 | -44.0449** | -10.14 |
| SAMEINDU | 0.003193 | 0.12 | 0.007889 | 0.19 | -0.04449 | -0.99 | 21.60481* | 1.7 |
| Pseudo R ² for Probit models | 0.06 | | 0.39 | | 0.27 | | .. | |
| Number of observations | 678 | | 678 | | 678 | | 678 | |

Notes: ** (*) indicates that the parameter estimate is statistically significant at the 5 (10) per cent significance level.

¹ Deneckere and Davidson (1985) have shown earlier that the coalition formation can be profitable for its members in the Bertrand competition, because the rest of the companies raise their prices in response to a price increase by the merged companies.

² In case of so-called 'mergers of equals' monitoring can be considered to be mutual by its nature. This case is, however, beyond the scope of the presentation.

³ See Böckerman and Lehto (2003).

⁴ As noticed by Lehto and Lehtoranta (2002), M&A is an appropriate mean to transfer knowledge when trading or contractual mechanisms are ruled out.

⁵ The primary data of Employment Statistics is gathered altogether from 22 different sources. The observation unit of Employment Statistics is a person. The Central Population Register is one of the basic registers in the Employment Statistics system. The information on employment relationships is obtained from several different sources. The Central Pensions Security Institute provides all the available data on employment relationships within the private sector in the Finnish economy. In particular, it lists all employment relationships lasting over one month during the one-year period.

⁶ The procedure to calculate the R&D stock variable is explained in detail in Lehto and Lehtoranta (2003).

⁷ The regional divisions of Finland are based on the various NUTS regions stipulated by the European Union. All in all, there are three kinds of NUTS regions in this study. The NUTS5

regions correspond to the Finnish municipalities (the total number of these regions is 446). The so-called NUTS4 regions consist of commuting areas. The number of these regions is 85. In addition, there are NUTS3 regions that correspond to the provinces of Finland. The number of these regions is 21.

⁸ The point of location of a firm within a municipality is based on the concentration of economic activity within that particular municipality as defined by Statistics Finland. For this reason, for instance, the distance between the municipalities of Vantaa and Helsinki is twelve kilometres despite the fact that these municipalities are located near to one another and they share elements of common borders.

⁹ Grinblatt and Keloharju (2001) report that geographical distance matters for stockholding in Finland. In particular, investors in various municipalities in Finland prefer to hold and trade stocks headquartered in nearby locations to those in more distant locations.

¹⁰ The Epanechnikov is the applied kernel density estimate. It has the property that it is the most efficient in minimizing the mean integrated squared error. DiNardo and Tobias (2001) provide a survey of nonparametric density and regression estimation. The non-parametric smoothing of the observations by the Kernel density estimate explain the small negative values for the distance observed in the left-hand side of the figure.

¹¹ An important feature of the data is that *Talouselämä* magazine contains a description of plant-level measure of targets. However, the unreported results based on the firm-level measure that are obtained from the Business Register by Statistics Finland carry the same conclusion.

¹² There are two ways to measure the scale of the involved companies. The results remain the same if the scale of a company is measured by the SIZE variable instead of the TURNOVER variable.