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Technology sourcing through acquisitions: Do high quality patents attract acquirers?

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TECHNOLOGY SOURCING THROUGH ACQUISITIONS – DO HIGH QUALITY PATENTS ATTRACT ACQUIRERS?

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ABSTRACT: This study analyses how patent quality impacts the likelihood of acquisition. If a firm owns high quality or valuable patents, other firms may be interested in buying the firm to obtain the ownership of these patents. To proxy the quality of patents, we use both forward and backward citations. Moreover, our data enables us to distinguish between cross-border and domestic targets. Multinomial logit estimations show that owning patents correlates with becoming a target for a foreign firm. The same does not apply to targets for domestic firms. However, we do not find evidence that the quality of patents impacts the likelihood of becoming target for a domestic or a foreign firm.

KEY WORDS: Acquisition, M&A, patent, quality, value, target, likelihood.

JEL-CODES: F21, F23 ja G34

ALI-YRKKÖ, Jyrki. **TEKNOLOGIAN HANKINTA YRITYSKAUPOILLA – HOUKUTTELEVATKO LAADUKKAAT PATENTIT YRITYSOSTAJIA** Helsinki, ETLA, Elinkeinoelämän Tutkimuslaitos, The Research Institute of the Finnish Economy, 2006, 16 s. (Keskusteluaiheita, Discussion Papers; ISSN 0781-6847; no. 1025).

TIIVISTELMÄ: Tutkimuksessa tarkastellaan, miten patenttien laatu vaikuttaa todennäköisyyteen, että yrityksestä tulee yrityskaupan kohde. Jos yritys omistaa laadukkaita/arvokkaita patentteja, muut yritykset voivat kiinnostua ostamaan yrityksen saadakseen patentit itselleen. Tässä tutkimuksessa patenttien laatua mitataan käyttämällä patenttiviittauksia. Tutkimuksen keskeiset empiiriset tulokset ovat seuraavat. Ensiksi, patenttien omistaminen korreloi sen kanssa, että kyseisen yrityksen ostaa joku ulkomainen yritys. Sen sijaan patenttien omistus ei vaikuta todennäköisyyteen, että kotimainen yritys ostaa patenttien haltijayrityksen. Tutkimuksen toinen keskeinen tulos on se, että patenttien laadulla ei ole vaikutusta todennäköisyyteen tulla yrityskaupan kohteeksi. Tulos pysyi samana koskien sekä kotimaisten yritysten kohteita että ulkomaisten yritysten kohteita.

AVAINSANAT: yrityskauppa, fuusio, patentti, laatu, yrityskauppakohde, todennäköisyys.

1 INTRODUCTION

The recent empirical evidence indicates that technology-driven foreign direct investments have recently increased (e.g. Jungmittag, Meyer-Krahmer & Reger 1999). While the dominant purpose of overseas technology development is still to adapt products and production processes to suit the local market conditions (Patel and Vega 1999), multinational companies increasingly invest in foreign R&D in order to get access to technology or knowledge held by firms and individuals in a given country (Neven & Siotis 1996, Florida 1997). In addition to in-house foreign R&D, cross-border M&As (mergers and acquisitions) offer an alternative route to get access to foreign knowledge. Similarly, also domestic deals offer firms a route to acquire external knowledge inside the national economy. Even though both domestic and cross-border M&As can be used for the same purposes, informational asymmetries (Gioia & Thomsen 2002) and different corporate governance systems (Rossi and Volpin 2004) can potentially explain why a firm is targeted either by a domestic or foreign acquirer.

The economic literature gives two broad rationales for our question: why firms buy other firms? The first suggests that the market for corporate control displaces the non-value-maximising practices of management of the target companies (see e.g Manne 1965). The second class suggests that mergers and acquisitions (M&As) are purposed to create synergist benefits achieved by combining two existing companies (Bradley, Desai and Kim 1983). To our knowledge, only a few studies have analysed M&As as a means of acquiring technology. Granstrand and Sjölander (1990) elaborate on the economic effects of acquisitions of small technology-based firms and conclude that acquired firms grew faster than non-targets. Ali-Yrkkö, Hyytinen and Pajarinen (2005) analysed how patenting affects the probability of being acquired. They conclude that the number of patents owned by a firm is positively correlated with the probability that the firm is acquired by a foreign firm. However, patent counts are known to be an imperfect measure for the value of patent or knowledge capital (Hall, Jaffe and Trajtenberg 2001b and Gallini 2002).

In this study, we extend the existing literature by analysing the impact of patent quality on M&As. The specific purposes of this study are two-fold. The first purpose is to examine how the patent quality measured by patent citations impacts the likelihood of acquisition. Our second purpose is to investigate whether the impact of patent quality on the likelihood

of becoming a target differs between domestic and cross-border deals. Our data is a unique firm-level dataset of more than 1350 firms covering the period from 1998 to 2004.

The remainder of this study is organised as follows. The next section outlines the model of takeover likelihood employed. In section 3 we describe our data. Section 4 provides the results of our empirical analyses and section 5 concludes.

2 LIKELIHOOD MODEL

This study employs a multinomial logit model to estimate the likelihood that a firm is acquired by another firm. Our model specifies the probability, P_{ij}, that firm *i* belongs to outcome *j*, where *j* = 0 if the firm is not acquired, *j* = 1 if it is acquired by a domestically owned firm, and *j* = 2 if it is acquired by a foreign-owned firm.

Following the previous analyses (see Powell 1997), the model is specified as follows:

$$P_{ij} = \frac{\exp(\beta_j' X_i)}{1 + \sum_j \exp(\beta_j' X_i)} \qquad (1)$$

where β_j is a vector of parameters to be estimated and X_i a vector of target-specific explanatory variables. As usual, to identify the parameters of the model, the normalisation $\beta_0 = 0$ is imposed.

3 DESCRIPTION OF THE DATA

3.1 Sample construction

Our dataset is a combination of three different types of data: M&A-data, financial statements data and patent data. The M&A-data are originally collected by *Talouselämä* (Finnish financial magazine) which aims at reporting all M&As in Finland in which the net sales of the target company exceed EUR 0.5 million. The financial statements data are from the database of Balance Consulting Ltd. (a commercial vendor of financial statement data). Finally, our patent data are from the European Patent Office.

The data comprises a sample of targets and non-targets over the seven-year period from 1998 to 2004. The initial group of target firms consists of 1461 firms acquired during the period[1]. From this group of targets, 776 firms are excluded either because the lack of

[1] We focus on deals where the whole firm or subsidiary is acquired. Thus, we exclude the acquisitions of business units and divisions.

the required financial statements data (545 firms) or because they belong to the financial services sector or they are classified as outliers.

Following the earlier literature (see Powell 1997), we construct a random sample of non-target firms as follows: From the population of non-target firms available to us, we draw a random (but industry-matched) sample in each year between 1998 and 2004[2]. The number of non-targets selected for each year equals the number of targets (with financial statements) for that year. Of these non-targets those with the required financial statement data and those that do not belong to the financial services sector, are included eventually as non-targets each year. As a result of this sample construction process[3], our final estimation sample includes 1375 observations (see Table 3.1 below)[4].

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[2] There are 10,368, 11,514, 12,759, 13,160, 12,995, 12,069 and 11,229 firms in 1998, 1999, 2000, 2001 and 2002, 2003 and 2004 respectively, in the "population" of non-targets available to us.

[3] Our sample includes all targets but only a random selection of non-targets. As Palepu (1986) has noted a sample like this is choice-based and not representative of the true population. However, the bias introduced by this choice-based sampling is not a serious concern, for in the logit model the bias is only limited to the parameter estimate of the constant term (Maddala 1983). The model is estimated in standard fashion using maximum likelihood methods.

[4] To control the potential bias caused by outliers, we used a method proposed by Hadi (1994) to identify and exclude outliers.

Table 3.1. Composition of the Estimation Sample

	Targets						Non-targets			Total
	Number identified	Financial statements	Sample excl. financials	Meet all criteria + outliers removed	Domestic	Cross-border	Population	Random sample	Meet all criteria (financials and outliers excl.)	
1998	183	126	125	100	71	29	10368	125	106	206
1999	233	178	177	143	103	40	11514	177	138	281
2000	317	228	222	191	134	57	12759	222	173	364
2001	234	105	103	77	49	28	13160	103	85	162
2002	206	137	136	78	56	22	12995	136	99	177
2003	176	91	91	60	39	21	12069	91	58	118
2004	112	51	50	36	29	7	11229	50	31	67
Total	1461	916	904	685	481	204	84094	904	690	1375

Note: Sources of data are *Talouselämä*, a major Finnish financial magazine, which aims at reporting all M&As in Finland in which the net sales of the target company exceed EUR 0.5 million. The financial statements data are from the database of Balance Consulting Ltd. The patent data are from the European patent office, EPO.

3.2 Definition of variables

Acquisition: Our dependent variable is TARGET equalling 0 if the firm is not acquired; 1 if it is acquired by a domestically owned company; and 2 if it is acquired by a foreign-owned company.

Patents and patent quality: There are a number of reasons why patenting potentially increases the likelihood of being acquired. *First*, patent applications and grants disclose inventions to the public (Gallini 2002) and reveal the knowledge level of the inventor to competitors and other potential buyers. *Second*, the patents owned by a firm block other firms from using the patented technology without the patentholder's permission (O'Donoghue, Scotchmer and Thisse 1998). *Third*, new technologies can serve as a source of potential competition to the incumbent's internally developed products (Gans and Stern 2000).

We use two measures of patenting activity. First, PATENT_DUM dummy variable gets the value one if a firm has been granted patents, otherwise zero. Second, to proxy the quality of firms' patents (for firms with PATENT_DUM=1), we follow the existing patent literature and use forward citations as an indicator of quality (see Harhoff, Scherer and Vopel 1999). As Hall, Jaffe and Trajtenberg (2001a) note, forward citations suffer truncation bias meaning that a patent granted for example in 1998 can receive citations in our data just from patents granted up to 2004. However, the patent will also be potentially cited by patents in later years, but we do not yet observe them. To take into account the truncation bias and variation by technological fields (Hall *et. al.* 2001a), we calculate forward citations (F_CITATIONS) by first taking the number of citations received by a given patent and dividing it by the corresponding year-field mean presented in the appendix (Table A1, for details, see Nikulainen, Palmberg and Pajarinen 2005), and then we add up forward citations (calculated in this way) of all patents owned by the firm. We expect that patent quality increases the likelihood that the firm will be acquired.

Inefficient management: Management discipline motive suggests that M&As serve as a mechanism where inefficient management is replaced with more efficient management. Even though several studies have suggested poor financial performance to be a characteristic of targets (e.g., Dickerson, Gibson and Tsakalotos 2002), some other studies have found

profitability to be an insignificant determinant of targets (e.g, Palepu 1986, Powell 1997). To proxy managerial performance we use the return on capital employed (ROCE). Jensen's (1986) free cash flow theory implies that firms with a high free cash flow tend to waste the money rather than distribute free cash to shareholders. In this paper, we use the ratio of cash flow to total assets, denoted FREECASH, to proxy the free cash flow.

Firm size: Earlier studies (e.g. Palepu 1986 and Powell 1997) suggest that the transaction costs of M&A increase with the firm size indicating that the likelihood of acquisition decreases with the firm size. In contrast to this result, Dickerson, Gibson and Tsakalotos (2002) report that the likelihood (non-linearly) increases with the size. Thus, no conclusion can be drawn on the impact of firm size. In this study, we use the logarithm of total assets, denoted LSIZE, to measure firm size.

Ratio of tangible assets to total assets: The study by Stulz and Johnson (1985) suggest that the acquirer can use the target's assets as collateral for debt financing of the takeover. To control this effect we calculate the ratio of fixed assets to total assets. The variable is denoted TANGIBLE.

Growth-resource imbalance: Previous literature suggests that high growth firms with low resources and low-growth firms with high resources are potential targets of companies with the opposite balance (Palepu 1986). To control this, we construct a dummy (denoted IMBALANCE) equalling one for the combinations high growth – low liquidity - high leverage and low growth – high liquidity – low leverage; and is zero otherwise. In this study, growth is measured as annual sales growth, leverage as ratio of long-term debt to total assets and liquidity as the ratio of marketable securities and cash to total assets. Each of the variables is defined as 'high' if its value for a firm exceeds the sample average, otherwise it is defined as 'low'.

4 EMPIRICAL RESULTS

4.1 Univariate analysis

First, we consider descriptive statistics by targets and non-targets (Table 4.1). The comparison suggests that targets are more frequently patent owners (PATENT_DUM) than non-targets (*t*-value = -3.5). However, when we compare the quality of patents measured by the number of forward citations (F_CITATIONS) and backward citations (B_CITATIONS) of those firms that have patents, we do not find statistically significant differences between targets and non-targets. These differences potentially indicate that patenting, in general, increases the probability of being acquired but the impact of the patents' quality is uncertain. The comparison also suggests that non-targets are smaller than targets (*t*-value = -7.3) and in relative terms non-targets have more tangible assets than have targets (*t*-value = 1.72).

Table 4.1 Descriptive Statistics for Targets and Non-Targets, (two-tailed *t*-tests in means)

	Non-targets		Targets		*T*-test for means	
	Mean	S.D	Mean	S.D	*t* stat.	*p*-value
ROCE	0.281	0.307	0.270	0.317	0.659	0.510
LSIZE	0.888	1.547	1.538	1.753	-7.296	<0.001
TANGIBLE	0.282	0.224	0.262	0.221	1.721	0.086
FREECASH	0.119	0.118	0.110	0.117	1.470	0.142
IMBALANCE	0.265	0.442	0.258	0.438	0.288	0.774
PATENT_DUM	0.019	0.136	0.054	0.226	-3.497	0.001
F_CITATIONS	0.066	0.725	0.394	0.126	-2.561	0.011
B_CITATIONS	0.044	0.614	0.395	3.218	-2.814	0.005
Firms with PATENT_DUM=1						
F_CITATIONS	3.490	4.148	6.755	12.087	-0.951	0.346
B_CITATIONS	2.344	3.973	6.767	11.723	-1.328	0.190

Note: S.D. = standard deviation. Sources of data are *Talouselämä*, a major Finnish financial magazine, which aims at reporting all M&As in Finland in which the net sales of the target company exceed EUR 0.5 million. The financial statements data are from the database of Balance Consulting Ltd. The patent data are from the European patent office, EPO.

Next, we consider differences between domestic and cross-border targets (Table 4.2). In terms of patenting, the comparison indicates that domestic targets patent less frequently than cross-border targets (significant at better than 0.01% level). Even though the patents' quality of cross-border targets is, on average, higher than the patent's quality of domestic targets, for firms with PATENT_DUM=1 the differences measured by F_CITATIONS and

B_CITATIONS are not statistically significant (t-values 0.11 and 0.14). The table also indicates that compared to domestic targets, cross-border targets are bigger (*p*-value 0.001) and their financial performance better (*p*-value 0.08). Furthermore, the ratio of tangible assets is smaller in cross-border targets than in domestic counterparts. The remaining tests for the difference in means are statistically insignificant.

Table 4.2. Descriptive Statistics for Domestic (TARGET = 1) and Cross-Border (TARGET = 2) Targets

	TARGET=1		TARGET=2		*T*-test for means	
	Mean	S.D	Mean	S.D	*t* stat.	*p*-value
ROCE	0.256	0.302	0.303	0.348	-1.772	0.077
LSIZE	1.396	1.631	1.873	1.975	-3.278	0.001
TANGIBLE	0.271	0.224	0.239	0.211	1.716	0.087
FREECASH	0.111	0.116	0.108	0.119	0.234	0.815
IMBALANCE	0.252	0.434	0.275	0.447	-0.627	0.531
PATENT_DUM	0.037	0.190	0.093	0.291	-2.965	0.003
F_CITATIONS	0.027	0.162	0.083	0.277	-3.315	0.001
B_CITATIONS	0.152	1.617	0.968	5.315	-3.051	0.002
Firms with PATENT_DUM=1						
F_CITATIONS	3.546	7.168	9.660	14.832	-1.631	0.111
B_CITATIONS	3.857	7.392	9.401	14.265	-1.518	0.137

Note: S.D. = standard deviation. Sources of data are *Talouselämä*, a major Finnish financial magazine, which aims at reporting all M&As in Finland in which the net sales of the target company exceed EUR 0.5 million. The financial statements data are from the database of Balance Consulting Ltd. The patent data are from the European patent office, EPO.

4.2 Basic regressions

In Table 4.3, we present the results of the multinomial logit model. Our right-hand side (RHS) variables are those defined in section 3. To control the annual variations and industry-specific factors of the M&A-activity, yearly time dummies and industry dummies are included in the model.

In columns (a) and (b), we display the results for domestic targets (TARGET=1) and cross-border targets (TARGET=2), respectively. The numbers displayed are coefficients and associated robust standard errors. A positive sign on a parameter indicates that an increase of the variable increases the probability of takeover (domestic or cross-border).

Table 4.3. Multinomial Logit Estimates for TARGET

	a)		b)	
	Coef.	Std. Err.	Coef.	Std. Err.
ROCE	-0.160	0.310	0.747	0.434*
LSIZE	0.245	0.046***	0.472	0.062***
TANGIBLE	-0.871	0.361**	-1.032	0.513**
FREECASH	0.194	0.794	-1.106	1.120
IMBALANCE	0.028	0.141	0.220	0.190
PATENT_DUM	0.480	0.417	0.941	0.472**
F_CITATIONS	-0.016	0.038	0.033	0.030
Observations		1375		
Wald Chi^2		126.72		
significance		<0.001		
Log likelihood		-1291		
R^2_{Pseudo}		0.06		
Joint tests (df)				
INDUSTRY (p-value)	10.45	(0.88)	25.34	(0.08)
YEAR (p-value)	5.43	(0.49)	5.49	(0.48)
PATENTS (p-value)	1.33	(0.51)	7.58	(0.02)
Other controls (p-value)	33.97	(<0.001)	60.29	(<0.001)

Notes: Dependent variable: TARGET. *=significant at 10% level, **=significant at 5% level, ***=significant at 1% level. The dependent variable=0, if a firm is not a target, =1 if the firm is a target of domestic (Finnish) acquirer, =2 if the firm is a target of foreign acquirer. Joint tests (df) for the joint significance of the indicated variables: 'PATENTS' tests the joint significance of PATENT_DUM and F_CITATIONS. 'Other controls' tests the joint significance of ROCE, LSIZE, TANGIBLE, FREECASH, and IMBALANCE.

The estimation provides us with six main findings. *First,* patenting matters in foreign M&As. The coefficient of PATENT_DUM is positive and statistically significant (*p*-value= 0.046) in deals with a foreign acquirer. In domestic deals, PATENT_DUM is not statistically significant. This finding means that owning patent(s) is correlated with cross-border deals. Even though we cannot be sure that a causal relationship exists, the results imply that foreign acquirers are particularly interested in targets with patents supporting the technology sourcing motive. *Second,* the coefficient of F_CITATIONS is statistically insignificant in both domestic and foreign M&As (*p*-values 0.67 and 0.28, respectively) suggesting that the quality of patents does not increase the probability of being acquired. Thus, the likelihood of a takeover is the same for firms with low quality patents and firms

with high quality patents, other things being equal. The joint test for PATENT_DUM and F_CITATIONS indicates that the two variables are jointly different from zero (*p*-value=0.02) in the equation for cross-border targets, but jointly *not* significant (*p*-value=0.51) in the equation for domestic targets.

Third, the larger the firm, the more likely it is to be acquired. The size increases the likelihood of acquisition both in domestic and foreign deals. *Fourth*, the ratio of tangible assets to total assets has a negative impact on the probability of a takeover. This result is opposite to the view that firms with a high amount of tangible assets enabling greater debt capacity are more likely to be acquired. *Fifth*, financial performance matters in cross-border deals. The higher the return of capital employed, the more likely the company is to be acquired by a foreign-owned firm. Hence, our results concerning the financial performance of targets do not support the hypothesis that M&As are used to replace inefficient management with a more efficient management team. *Sixth*, insum our results provide evidence that the targets' characteristics of domestic firms differ from targets' characteristics of foreign firms. We tested (not reported in Table 4.3) the coefficients of all RHS variables (except industry and year dummies) in column (a) against the corresponding coefficients in column (b). The statistic of this joint test is statistically significant at better than 0.001% level.

4.3 Alternative specifications and robustness tests

Next, we perform a number of robustness tests. To save space we do not report these tests in detail.

Robustness test 1:

To test the sensitivity of our results to the using method of forward citations, we repeat the estimation employing alternative using of forward citations. Following Trajtenberg (1990), we used forward citations weighted patent counts as an alternative measurement for the patents' quality. Each patent *x* is weighted by the number of year-field corrected forward citations (denoted by C_x). For a firm *i* an index of weighted patent counts (WPC_t^i) in a year *t* is calculated by: $WPC_t^i = \sum_{x=1}^{n}(1+C_x)$. The results of this estimation echoed our previous results. The coefficient of PATENT_DUM for the targets of foreign firms is positive and statistically significant (*p*-value=0.05) and the coefficient of patent quality measured

by citations weighted patent counts is *not* statistically significant (*p*-value 0.29). For the targets of domestic firms, both coefficients remained statistically insignificant.

Robustness test 2:

Are our results an artifact of the multinomial logit model? To test this, we ran a binomial logit model where the dependent variable equals one if the firm is acquired by a foreign firm and zero otherwise. The results of this new estimation show that our basic results hold. First, the coefficient of PATENT_DUM is positive and statistically significant at better than 10% level. Second, the coefficient of F_CITATIONS is not statistically significant (*p*-value=0.23).

Robustness test 3:

To test to what extent our results depend on the decision to use forward citations reflecting patent quality, we re-run the regressions in Table 4.3 by using an alternative measurement for patent quality. The results of Harhoff, Scherer and Vopel (1999) suggest that the number of backward citations correlates positively with the value of the patents. Following this line, we re-ran our model by using backward citations as an indicator of patent quality. The results of this estimation again echo our previous findings. For the targets of foreign firms, the coefficient of PATENT_DUM remains statistically significant (*p*-value=0.06) and the coefficient of patent quality measured by backward citations does not deviate statistically significantly from zero. Moreover, both these coefficients were statistically insignificant for the targets of domestic firms.

5 DISCUSSION AND CONCLUSIONS

This study analysed the impact of patent quality on M&As using data on Finnish firms during 1998-2004. Our large dataset (1375 observations) consisted of firms that are mostly small and private. We contributed to the existing M&A literature by analysing how the patent quality impacts the likelihood of acquisition. Furthermore, we distinguished the targets acquired by a foreign firm and domestic firm.

To define patent quality, we have used the citations of the firms' patents registered in the European Patent Office. Our results show that the ownership of patents increases the likelihood that the firm is acquired by a foreign-owned firm, but the same does not hold for the probability that the firm is acquired by a domestic firm. However, we do not find evidence that owning high quality patents increases the likelihood of acquisition. This result remained in the targets of both domestic and foreign firms.

Our results have several implications. *First,* our findings imply that the characteristics of the targets of cross-border and domestic deals differ. It seems that foreign-owned firms are particularly interested in targets with patents supporting the hypothesis that some firms use M&As as a means of sourcing technology. There are at least two potential reasons for this. On the one hand, M&As can serve as a mechanism whereby the companies with inefficient intellectual property management are attractive acquisition targets. On the other, combining the intellectual properties of target and acquirer potentially creates synergist benefits. *Second,* our results provide evidence that patent quality does *not* increase the likelihood of becoming the target of domestic nor foreign firms. It is a bit difficult to interpret our finding that the ownership of patents increases the likelihood of becoming a target for a foreign firm, but that the quality of the owned patents does not matter. One potential reason for this is that citations are an imperfect proxy for the quality of patents because there are at least two reasons why patent B applicant cites patent A. First, citing potentially implies that patent A includes some crucial knowledge or technology related to patent B. Second, the firm applying for patent B may cite patent A in order to argue that patent A is not relevant in this field but that the applicant is aware that patent A exists[5]. This controversial role of forward citations is worthy of further investigation in the future.

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[5] The author wishes to thank Olli Martikainen for this point.

6 APPENDIX

Table A.1 Mean Citations Received by Grant Year and Technology Field

	Electrical engineering	Instruments	Chemicals	Process engineering	Mechanical engineering	Consumer goods and civil eng.
1991		10.60	4.14	3.77	2.28	0.83
1992	2.83	9.82	7.18	3.89	3.29	4.46
1993	2.18	5.42	7.10	2.90	2.37	3.11
1994	4.80	7.63	3.67	3.25	2.97	2.32
1995	5.04	2.82	7.66	3.34	2.42	2.78
1996	7.52	7.50	4.88	3.80	2.42	2.08
1997	5.97	6.13	5.90	3.31	2.03	3.03
1998	5.44	5.18	4.37	2.42	2.78	2.88
1999	5.67	4.32	6.51	3.16	2.44	1.87
2000	4.69	6.10	6.26	3.13	3.26	2.57
2001	6.08	9.06	5.40	2.74	1.49	1.25
2002	5.59	3.26	2.38	2.20	1.51	1.38
2003	5.08	1.97	3.47	1.48	1.03	1.02
2004	5.30	1.42	2.87	1.28	0.72	0.58

Source: Nikulainen, Pajarinen and Palmberg (2005)

Table A.2. Correlation matrix

	ROCE	LSIZE	TANGIBLE	FREECASH	IMBALANCE	PATENT_DUM	F_CITATIONS
ROCE	1						
LSIZE	-0.285	1					
TANGIBLE	-0.255	0.2696	1				
FREECASH	0.6968	-0.1728	0.0962	1			
IMBALANCE	0.1146	-0.1464	-0.1069	0.0769	1		
PATENT_DUM	-0.0562	0.2744	0.051	-0.0093	-0.0538	1	
F_CITATIONS	-0.0118	0.2173	0.0143	0.0116	-0.0417	0.4956	1

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