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Postprint / Postprint
Zeitschriftenartikel / journal article

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European Market Integration
Through Technology-Driven M&As

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Abstract

Merger and acquisitions (M&As) have been an important tool for reorganizing the European market since the establishment of European Economic and Monetary Union. This paper suggests that European integration helped and encouraged European firms to source technology across national borders in Europe, establishing European innovative firms. The figures confirm that, once barriers impeding the free movement of capital, goods and labor had fallen, European firms used M&As intensively to enter foreign European markets. Enhancing technology competencies is found to be one of the main motives for cross-border acquisitions in the 1990s but is not a factor in domestic acquisitions over the same period.

Keywords: **M&A, cross-border M&As, technological relatedness, market relatedness**

JEL-Classification: C25, G34, O32, O33, O34

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1 Introduction

The entry into force of the Maastricht Treaty in 1993 was an important step for strengthening the European Economic Union. The treaty paved the way for European Monetary Union and set up the transition of the European Community towards a single integrated market. Most existing technical, regulatory, legal, bureaucratic, and protectionist barriers were eliminated to make way for the free movement of goods, capital and labor. One of the expected benefits of the common market and single currency was to spur innovation and to foster the emergence of innovative firms which operate across European borders. Mergers and acquisitions (M&As) across borders were an important way for firms to respond to the incentives set by the establishment of the integrated market. This paper investigates how innovativeness affected merger activity in the European market after 1993.

Economically, the deepening of the European Economic Union and the agreement on a roadmap for monetary union can be seen as a shock to the economic environment as it changed the optimal factor allocation in European markets. The dismantling of barriers to the free movement of goods, capital and labor made some assets less productive in their current use than they would be in an alternative use. M&As are an important and fast means of rearranging productive assets towards equilibrium (Hall, 1988a; Jovanovic and Rousseau, 2002, 2004). M&As were therefore, unsurprisingly, central in the European restructuring process following the implementation of the various single market directives. Subsequent national and European Union (EU) deregulation measures made national borders increasingly obsolete (WIR, 2000; Kleinert and Klodt, 2000; Sleuwaegen and Valentini, 2006; Torstensson, 1999).

This paper contributes to the debate by empirically investigating merger activity in Europe in the first few years after the adoption of the Maastricht Treaty in 1993, which laid the groundwork for economic and monetary union in the EU. We especially assess whether the developments are likely to have reinforced European firms' technological position and thus spurred innovation in the medium and long term. Our results confirm that, once barriers to the free movement of capital, goods and labor had fallen, European firms used M&As intensively to enter other European markets. Enhancing technology competencies is found to be one of the main motives for cross-border acquisitions in the 1990s but was not a factor for domestic acquisitions over the same period.

The remainder of the paper is organized as follows. Section 2 reviews related literature. Section 3 describes the data and shows descriptive statistics. Section 4 presents our empirical approach, and Section 5 shows the empirical results. Section 6 concludes.

2 Literature Review

With merger activities growing in terms of numbers, value and geographical scope, and competition being increasingly based on technical inventions (Amable and Verspagen, 1995), the relationship between M&As and technologies has received increasing attention in the academic literature. Veugelers (2006) provides an overview of recent advances in the fields of economics and management. Her survey shows that empirical contributions investigating the relationship between M&As and technologies are scarce for Europe (Veugelers, 2006). This is particularly the case for cross-border M&As

(Bertrand and Zuniga, 2006). This section reviews the existing literature on M&A and innovation and derives implications for cross-border acquisitions.

The industrial organization literature identifies enhances in market power by means of increasing barriers to entry (Comanor, 1967) and efficiency enhancements by reducing transaction costs (Williamson, 1975) as incentives for mergers. Those effects can be carried forward to explain motives for technology-related M&As. Merging partners can profit from economies of scale and scope in technology creation (Cassiman et al., 2005); and the level of spillovers from research and development (R&D) investment is expected to increase with collaboration (D'Aspremont and Jacquemin, 1988; Arrow, 1962). A merger provides the opportunity to reorganize and integrate both firms' research units (Banal-Estanol and Seldeslachts, 2005), hence enabling duplication of research to be avoided (Veugelers, 2006). Technology M&As for market power reasons aim at reducing technology competition (Arrow, 1962; Reinganum, 1983) and pre-empting competition in technology markets (Grimpe and Hussinger, 2008).

From a more managerial perspective, technology-motivated acquisitions can enable the acquiring firm to gain or regain contact to the research frontier in their field of competence (Kamien, 1992). Overlapping research fields can necessitate the ownership of patents to continue research activities (O'Donoghue et al., 1998). M&As can enable one firm to acquire the patent portfolio of a rival (Lerner et al., 2003; Giuri et al., 2006[2]). Further, firms can use M&As to enter new technology fields in order to reduce risk through technological diversification. A certain degree of technological diversification is

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[2] Giuri et al. (2006) find that 20% of the patent applications at the European Patent Office (EPO) are filed to block competitors.

necessary to keep up with rapid technology advances. Knowledge in non-core technologies helps firms to understand emerging technological opportunities and to jump onto promising new technology trends (Granstrand and Sjölander, 1990, Cantwell et al., 2004). Technological knowledge in ancillary fields on top of distinctive core competencies enables firms to adopt and integrate technologies developed by external suppliers and competitors. Given the growing importance of timing in innovation and fierce technology competition it is not always possible for firms to build up their own competencies within a convenient time frame. Hence, M&As appear to be an important instrument for securing a competitive advantage or for catching up with current technology standards. The opening up of European markets gave firms a unique opportunity to search beyond national borders for promising M&A partners in order to strengthen their position in technology competition at home and abroad.

Keeping in mind that knowledge flows tend to be significantly stronger within countries than across borders (Jaffe et al., 1993; Eaton and Kortum, 1999; Branstetter, 2001), M&As are held to be of particular importance for cross-border technology acquisitions. Global technology sourcing has been found to be crucial for securing competitive advantages (Driffield and Love, 2005; Sofka, 2005) as firms can realize significant technology spillovers from industrialized economies (van Pottelsberghe de la Potterie and Lichtenberg, 2001; Love, 2003; Driffield and Love, 2005; Sofka, 2005). M&A as one way of foreign direct investment (FDI) is an effective instrument to access foreign technological capabilities and knowledge (Neary, 2004; Kuemmerle, 1999). The opening of European markets stimulated engagement in FDI (Petroulas, 2007) and hence M&As. In a recent study, Bertrand and Zitouna (2008),

however, fail to find differences between European cross-border M&As and domestic M&As with respect to profits and productive efficiency. They attribute these findings to European integration.

Arguing that technology sourcing could have been the key factor for European cross-border M&As, our study explores a sample of European M&As over the 1994-2000 period. To the best of our knowledge, there is no firm-level evidence on the importance of technologies for the formation of cross-border acquisitions. For the industry level, Bertrand and Zuniga (2006) find that cross-border mergers stimulate R&D activities in targets' home countries for OECD countries. This suggests that cross-border M&As impact on firm-level R&D as well and hence underlines the need for a firm-level investigation in order to improve our understanding of the role of technologies in cross-border acquisitions.

3 Data Description and Descriptive Statistics

Our main source of data is Thomson Financial's SDC Global Mergers and Acquisitions database, which provides information on M&As valued at $1 million or more announced worldwide. Thomson collects information on M&A and the financial assets of the firms involved from a variety of sources such as financial newspapers, Reuters Textline, the Wall Street Journal, Dow Jones and others. Our sample contains the EU-15 countries, Norway and Switzerland. Missing information on total assets and intangible assets was supplemented from the Amadeus firm database maintained by Bureau van Dijk Electronic Publishing, Brussels, which contains financial information for European firms.[3]

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[3] The Amadeus database contains financial information on public and private companies in 41 European countries.

To obtain information on the technology portfolios of the merging firms, we linked the firm data to the European Patent Office's (EPO) patent database, which contains every patent application since the EPO was founded in 1977. The patent data includes names and addresses of patent applicants as well as the application date and the technology classes a patent contributed to according to the International Patent Classification (IPC) system. The link between the databases was supported by a computerized text-based search algorithm using information on firm names and addresses (street, zip code, city and country). Each match suggested by the program was checked manually.

We restrict our sample to public firms as the Thomson merger database does not guarantee a complete listing of private firms involved in M&As. A second reason for our exclusive focus on public firms is that our empirical model requires financial information that is often not available for small and private firms. The restricted sample is intended to cover a major share of patenting firms involved in M&As as large firms are responsible for the majority of patent applications (Giuri et al., 2006).

The final sample consists of 420 M&A deals in the 1994-2000 period in which both M&A partners are European public firms. The descriptive statistics presented in Table 1 reveal some interesting insights regarding the variables of interest. First of all, in terms of total assets, buying firms are, on average, three times as large as acquisition targets. The average difference between acquirers and targets in terms of intangible assets[4] over total assets is, by contrast, relatively small. Intangible assets can increase the attractiveness of a potential

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[4] Intangible assets are defined by Thomson SDC Platinum as: Value of assets having no physical existence, yet having substantial value to the firm, including goodwill, patents, trademarks, copyrights, franchises and costs in excess of net book value of businesses acquired, as of the date of the most recent financial information prior to the announcement of the transaction.

target for acquiring firms as they may include important trademarks, copyrights and franchises. A significant part of the mergers 59% (36%, 26%) occur between firms affiliated with the same industry sector at the two-(three-, four-) digit SIC level, indicating the importance of product markets for M&As.

Furthermore, 23% of the merger deals occur between innovative firms, in the sense that both firms applied for an EPO patent at least once in the pre-merger period. Based on patent information, we calculate technological proximity T_{ij} of the patent portfolios of the M&A partners i and j as the uncentered correlation measure introduced to the patent literature by Jaffe (1986):

$$T_{ij} = \frac{F_i'F_j}{\sqrt{(F_i'F_i)(F_j'F_j)}}. \tag{1}$$

The acquiring and target firms' technology portfolios are described by F_i and F_j. T_{ij} assume values somewhere between 0 (geometrically, the vectors are rectangular) and 1 (the vectors span an angle of 0 degrees), where 1 corresponds to a 100% overlap of the technology fields in which the merging partners are active. The patent portfolios are proxied by the firms' patent stocks in different technology classes:

$$PS_{it} = PS_{i,t-1}(1-\delta) + patent\_applications_{it}. \tag{2}$$

The constant depreciation rate of knowledge δ is set to 0.15, as is common in the literature (e.g. Hall, 1990). Based on the Fraunhofer patent classification, we distinguish 30 patent stocks in 30 different technology classes for acquiring firms i, $F_i = (PS_{i1}, PS_{i2}, ..., PS_{i30})$ and acquisition targets j, $F_j = (PS_{j1}, PS_{j2}, ..., PS_{j30})$. In order to assure that size differences of the patent

portfolio do not bias the proximity measure, we measure the patent stocks per technology class as a percentage of the total patent stock of target and acquirer.

Table 1 shows that acquiring firms have a significantly larger average patent stock than acquisition targets. There is little difference between domestic and cross-border M&As in the average value of the proximity measure. However, 24% of the cross-border deals occur between firms with a technological overlap in patent portfolios larger than zero, whereas at 17% this share is smaller for cross-border deals.

Insert Table 1 here

In total, the share of cross-border mergers in our sample is 38%.[5] Figure 1 shows that the percentage of announced cross-border M&As in our sample increased after 1994, but did not vary significantly over the following years. This pattern of our sample of public firms only reflects the development of all M&As, including M&As among private firms, in the countries of our interest (EU-15, Norway and Switzerland) registered in Thomson Financial, as is shown by Figure 2; this figure also indicates a slight increase in the number of M&As in the early 1990s, and a decrease in M&A activities after 1999.

Insert Figure 1 here

Insert Figure 2 here

Table 2 in the Appendix shows the distribution of M&As in our cross-country sample. Of 420 M&A deals, 96 took place between public firms in the UK, 40 between French, 30 between German and 20 between Italian firms. With respect to cross-border deals, Table 2 shows that public firms in the UK, France and Germany were also most active in acquiring foreign public firms and most

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[5] The share is even larger if we account for M&As between European and non-European firms.

of the acquisition targets were from those countries. According to Table 1, almost 70% of all M&As and 20% of the cross-border deals took place in between countries with the same language. Sharing the same language facilitates M&A negotiations and post-merger integration and reduces the costs of running a business (DiGiovanni, 2005). Further, geographical distance between M&A firms is likely to correlate with the distance in corporate culture. The distance between two countries can also be seen as a measure for the physical costs of trade (DiGiovanni, 2005). We proxy geographical distance by the distance between the capital cities of both M&A partners' home countries. In addition to a dummy for cross-bordership, a common language indicator and a distance measure, we use macroeconomic indicators to account for relative country advantages of the target's countries over the acquiring firm's country that potentially help explain cross-border mergers:[6]

- GDP (at current prices) measures the size of the target firm's national market.

- Average unit labor costs (ULC) in the manufacturing sector are an indication of the target firm's production cost in its local market.

- R&D spending over GDP accounts for the target firm countries' technology intensity. On the one hand, R&D-intensive countries can be attractive for technology sourcing firms eager to learn. On the other hand, R&D intensive firms might acquire targets in countries with a relatively low R&D intensity in order to siphon off profits from their technologies (Dunning, 1988).

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[6] Most data is from the OECD. However, tax information is taken from the European Commission (2005). For Switzerland, Norway and Greece, tax data is provided by Chris Edwards of the Cato Institute, based on KPMG data. Http://www.cato.org/research/fiscal_policy/facts/tax_charts.html

-   The openness of an economy is defined as the sum of its exports and import volume over GDP, hence indicating its accessibility by trade.

-   Lastly, the top statutory tax rates on corporate income account for the tax advantages of the target's home country over the acquirer's home country.

All country variables are measured relative to the acquiring firm's home country in order to control for comparative advantages of the target's home market. Table 1 shows that the mean values of the relative country characteristics are close to one, which means that there is little difference between the countries of the acquiring and target firm with respect to those variables. T-tests, however, show that the means are statistically significantly different from one at the 1% level of statistical significance; for relative UCL, at the 5% level. This indicates that the target firm's country is, on average, larger, more R&D-intensive, more expensive in terms of labor costs and taxes and more open than the acquiring firm's home country.

4 Empirical Model

As it is difficult to assess the direct impact of M&As on innovation behavior (Veugelers, 2005)[7], our empirical model investigates the expected value from acquiring technological assets (Hall, 1988a). We analyze the decision to acquire a certain firm depending on its assets and characteristics.

Following Hall (1988a), firms are defined in a hedonic way as bundles of their assets, characteristics and relative home country (dis-)advantages X. The value of a target firm V is a function of X. In the presence of efficient markets and full information, $V(X_i)$ equals the price at which i's asset bundle is traded.

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[7] For example, a post-merger increase in R&D can indicate duplicated research efforts in the integration phase or exploitation of synergies; and decreases in post-merger R&D can indicate an efficiency or a market power effect. In addition, those effects are transitory and it is even more difficult to identify lon-term effects of M&As.

Acquisitions, however, take place at a significant positive premium over pre-announcement stock value (Jensen and Ruback, 1983) indicating that some agents place a higher value on a firm's assets bundle X_i than the market. The acquiring firm is assumed to act as a bidder. A new bid above the current trading price occurs because the acquiring firm has revealed new information about the value of the potential acquisition target's assets. It is, further, assumed that an acquiring firm j can acquire any other firm i. If an acquisition occurs, the increment to the value of firm j is $V_j(X_i)$. Thus, j acquires i if j's net gain from the acquisition of i is positive and larger than the net gain from a merger with any other potential target k:

$$V_j(X_i) - P_i > 0$$
$$V_j(X_i) - P_i > V_j(X_k) - P_k, \ \forall \ k \ \in \ C. \tag{3}$$

P_j denotes the price of i's assets and C refers to the entire pool of firms.

An advantage of the model is that prices are endogenous in the sense that the price paid for a certain target varies depending on the potential acquirer. The price at which firms value the target is assumed to be a function of the target firm's characteristics $V(X_i)$. Separating j's net profit from the acquisition into observable and unobservable components yields:

$$V_j(X_i) - P = f(X_i, X_j) + \varepsilon_{ij}, \tag{4}$$

Assuming that the error terms ε_{ij} are independent and homoscedastic, (4) can be estimated by a conditional logit model:

$$\text{P}(j \text{ buys } i | C) = \frac{\exp(f(X_i, X_j))}{\sum_{k \in C} \exp(f(X_k, X_j))}, \tag{5}$$

where the value function f is specified as the difference between the valuation of the acquiring firm v_j and the equilibrium price v at which the firm's assets will be traded:

$$f(X_i, X_j) = (v_j(X_i) - v(X_i)).\qquad(6)$$

Small letters correspond to the observable components of V and V_j. The value function $f(X_i, X_j)$, including the characteristics of the acquiring and target firm and the distance between them in characteristics space, is specified as:

$$v_j(X_i) - v(X_i) = b_1 X_i + b_2 \left| X_j - X_i \right|.\,^8\qquad(7)$$

The vector of characteristics X includes the target's total assets and intangible assets, the difference in total assets and intangible assets over total assets between the M&A partners, a control variable for being in the same two-, three and four-digit SIC industry and relative country characteristics as defined in the previous section. In addition, the patent stock of acquisition targets and the overlap of the merging firms' technology portfolios account for the attractiveness of innovative assets and the effect of technological relatedness on the conditional probability of becoming acquired. Technological proximity is taken into account separately for domestic and cross-border deals in order to test whether the importance of technology assets differs between domestic and cross-border acquisitions.[9]

The estimation of the model above is problematic because it is assumed that an acquiring firm can choose the acquisition target from a huge pool of possible acquisition targets including every public firm in Europe. This huge set of choices causes technical problems for the estimation. For this reason, a subset

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[8] Harrison (2006) uses a similar model to investigate hospital merger formation.

[9] The assets and characteristics of the acquiring firm cancel each other out through the econometric implementation of the model.

of alternative targets is chosen as a random subsample of the unchosen alternative M&A targets (McFadden, 1978). For our application, we draw groups of thirty alternative targets[10] for every year from a sample of public firms in Europe which is taken from the Amadeus database.[11] M&A firms that were involved in a merger in that same year are excluded from the pool of potential acquisition targets. The final data set contains the actual targets as well as thirty alternative targets for each M&A deal: 420 actual M&A deals plus 420 x 30 control transactions.

Lastly, a valid application of a conditional logit model requires independence of irrelevant alternatives (IIA), i.e. that the relative odds ratios between any two decision outcomes are independent of the number and nature of other alternatives being simultaneously considered. In the present context, IIA implies that adding firms to or subtracting them from the pool of acquisition targets does not influence the actual choice of the M&A partner. In order to test whether IIA is valid, we apply a Hausman test for the null hypothesis that the estimated coefficients of the model do not differ systematically if only a subsample of 20 alternative M&A targets is considered. The null hypothesis cannot be rejected and the conditional logit can be applied in our context (see bottom of Table 3 for the test results).

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[10] Hall (1988b) investigates how the size of the control group affects the outcome of conditional logit models. She finds that an increase in the number of observations from 7 to 50 leads to an efficiency gain of about 30 percent based on a comparison of the standard errors.

[11] As the number of public limited companies per country provided by the Amadeus database does not match the stock exchange statistics provided by the World Federation of Exchanges, we put the restriction on our sampling routine to randomly draw a percentage of firms from every country according to the stock exchanges' overall figures.

5 Estimation Results

The estimation results of the conditional logit model for the choice of the acquisition target are presented in Table 3. The coefficients describe how the target's assets and characteristics affect the probability of being acquired. In order to show that our results are robust with respect to the randomly drawn control group of alternative M&A targets, we present the regression results for two different control groups of alternative acquisition targets. The estimated coefficients are robust for the different control groups.[12]

With respect to technological assets, the regression results show that the expected net gain from an acquisition decreases the larger the patent stock of the acquisition target is. This finding is in line with Hall (1988a), who finds a negative impact of the R&D intensity on the probability of being acquired. A possible explanation is that firms with a large patent stock are more expensive than comparable firms without patents. The net value of an acquisition of an inventive firm for the acquiring firm is hence likely to be relatively low compared to the net value of firms with few or no patents if the acquiring firm is not explicitly aiming for the target's technologies. Another possible explanation is that patents might facilitate market-based technology licensing rather than firm acquisitions.

Focusing on the attractiveness of cross-border targets in an integrated market, our results show that acquisitions across borders are more attractive than domestic M&As. As expected, this effect is larger for M&A targets in countries that share the same language and decreases in inverse proportion to the distance between the countries. Speaking the same language and having a

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[12] We also estimated a nested logit model as an additional robustness check. The results were very similar.

related corporate culture reduces the expected costs of running a business. The coefficients for the relative country characteristics of acquiring firms' and target firms' home countries show the expected signs. Acquiring firms are interested in accessing relatively large (in terms of GDP) national markets. Furthermore, countries with relatively high taxes and relatively open economies are less attractive than others. This suggests that as open economies can be served by exports, it is not always necessary to acquire national firms in order to obtain market access. There is no robust effect for the relative R&D intensity of the target country.

To test whether acquisitions across borders have a technology/related motivation, we introduce two variables for technological relatedness of the patent portfolios of the merging partners: one for domestic M&As and one for cross-border deals. The results show that foreign firms with related patents are even more attractive than cross-border acquisitions in general. Related patents and expertise strengthen the technology competencies of the merged entity, and the merged firm can benefit from economies of scale and scope in technology and internalize spillovers. The integration of technology departments can be very fruitful wherever the technology portfolios are similar because both firms should have the necessary specific absorptive capacity to make use of each other's knowledge. Moreover, a target firm in the same technology field can be attractive as the acquiring firm can gain access to important intellectual property rights, which can be necessary to continue research on a particular technology or to gain or regain contact to the research frontier through M&As.

Technology relatedness is, however, only important for cross-border M&As, whereas it is not a factor in domestic M&As. This suggests that national M&As

are not intended to strengthen technology competencies in the first place in that period. One reason might be that domestic technology markets are already largely consolidated and that firms take advantage of the newly launched integrated market in the 1990s to strengthen their position in international technology competition through acquisitions. Moreover, domestic M&As fall under the jurisdiction of national competition authorities, who have the right to prohibit proposed mergers if the market share of the merged firm exceeds the thresholds of national merger guidelines, which are typically below those set by European competition authorities. Although market shares are defined with respect to product markets rather than technology markets, firms with related technologies are likely to also be active in the same product markets. Another reason why related technologies are not important for domestic M&As may be found in national/regional rivalries. Firms in fierce national competition are more likely to expand their capabilities through foreign acquisitions in order to defend their national market shares than to collaborate.

Thus, the empirical finding that technological relatedness is important for cross-border mergers but not for domestic M&As illustrates the importance of technologies for reorganizing the integrated European market in the 1990s.

Insert Table 3 here

With respect to the control variables it turns out that firm size as measured in logarithms of total assets (Log(A)), for example, has a significant positive impact on the probability of becoming acquired. This reflects the fact that the 1994-2000 period saw growth in the number and value of M&A deals (Sleuwaegen and Valentini, 2006) and is referred to as a period of "mega mergers" for Europe (Kleinert and Klodt, 2000). The positive relationship

between firm size and the probability of becoming acquired can reflect not only market power objectives but also better access to refinancing from banks and international capital markets. A large gap between the acquiring firm and the target firm in terms of size, defined as the difference between their log total assets ($\Delta logA$), reduces the likelihood of a merger. Further, there is no robust, significant effect of the target's intangible assets over total assets (I/A) and the distance in that ratio between acquirer and target ($\Delta I/A$). Lastly, not surprisingly, the regression results show the importance of output market relatedness for the acquisition decision (Hall, 1988a; Cassiman et al. 2005). Firms in the same two-digit SIC industry sector are more likely to become acquired than firms in another industry. The effect is even larger when the target is active in the same more narrowly defined industry sector, such as in the same three-digit and four-digit SIC industry. Hence, there were no tendencies to form conglomerates through M&As in the 1990s, unlike in the 1980s.

6 Discussion

Following the establishment of European Economic and Monetary Union, M&As across European borders became an important tool for reorganization of the European market (WIR, 2000, Kleinert and Klodt, 2000, Sleuwaegen and Valentini, 2006). The figures confirm significant cross-border M&A activities by European public firms in the 1994-2000 period, after the Maastricht Treaty had significantly reduced existing barriers between European countries and put a concrete face on the single European currency. We find cross-border M&As to be more attractive than domestic firm acquisitions in that period, for which the new opportunities of the integrated European market may serve as an explanation. Involvement in M&A activity, however, varies significantly across

countries, and national differences in corporate cultures, capital markets and other economic conditions play a major role in M&A formation. This hints at further potential for integration in Europe.

Another aim of the establishment of the European Economic and Monetary Union was to spur innovation and to foster the emergence of European innovative firms in order to enhance Europe's ability to compete with the US and Asia. Our results suggest that European firms enhanced their technological competencies across European borders through firm acquisitions in the 1994-2000 period. European economic harmonization and the facilitation of the emergence of European innovative firms thanks to monetary union, thereby making Europe more competitive, are two possible reasons.

A limitation of this study is that we cannot compare M&A activities after 1993 with earlier periods since we do not have access to time series of sufficient length. However, we can refer to previous studies that showed an increase in cross-border mergers in the 1990s (e.g. WIR, 2000) and an increase in FDI after the introduction of the euro (Petroulas, 2007). We are also unable to show whether a shift in acquisition strategies took place following the opening up of markets. Lastly, it would be interesting to see if European integration has a positive effect on R&D activities, as the expected benefits might not match the actual benefits (Stoneman, 1978).

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Appendix

Insert Table 2 here

Tables and Figures

Table 1: Summary Statistics

	Acquiring Firms (420 observations)		Target Firms (420 observations)	
	Mean	(Std. dev.)	Mean	(Std. dev.)
Total assets	7,213.33	(16,466.12)	1,761.96	(4,735.63)
Intangible assets over capital assets*100	4.49	(8.86)	3.05	(9.07)
Patent stock	132.41	(772.41)	20.46	(15.14)
Relations Between Target Firms and Acquirer Firms				
	Mean		(Std. dev.)	
Both firms have patents	0.23		(0.40)	
Same industry Two-digit SIC	0.59		(0.49)	
Same industry Three-digit SIC	0.36		(0.48)	
Same industry Four-digit SIC	0.26		(0.44)	
Technological proximity	0.10		(0.26)	
Cross-border	0.38		(0.49)	
Technological proximity (domestic deals)	0.06		(0.20)	
Technological proximity (cross-border deals)	0.05		(0.18)	
Relations Between Target Countries and Acquirer Countries				
	Mean		(Std. dev.)	
Same language	0.69		(0.46)	
Distance between capitals	235.65		(373.97)	
Relative ULC	1.00		(0.11)	
Relative GDP	2.15		(6.14)	
Relative R&D/GDP	1.02		(0.31)	
Relative tax	1.02		(0.23)	
Relative openness	1.01		(0.31)	

All financial variables are measured in US$ million and are of the most recent date available prior to the announcement of the transaction.

Figure 1: Share of Cross-Border M&A in Our Sample
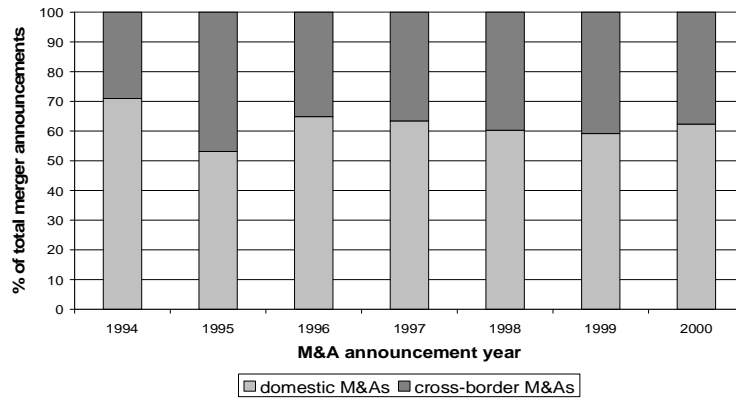
Figure 2: Development of the Number European Cross-Border and Total

M&A According to Thomson Financial (3-year moving average)[13]

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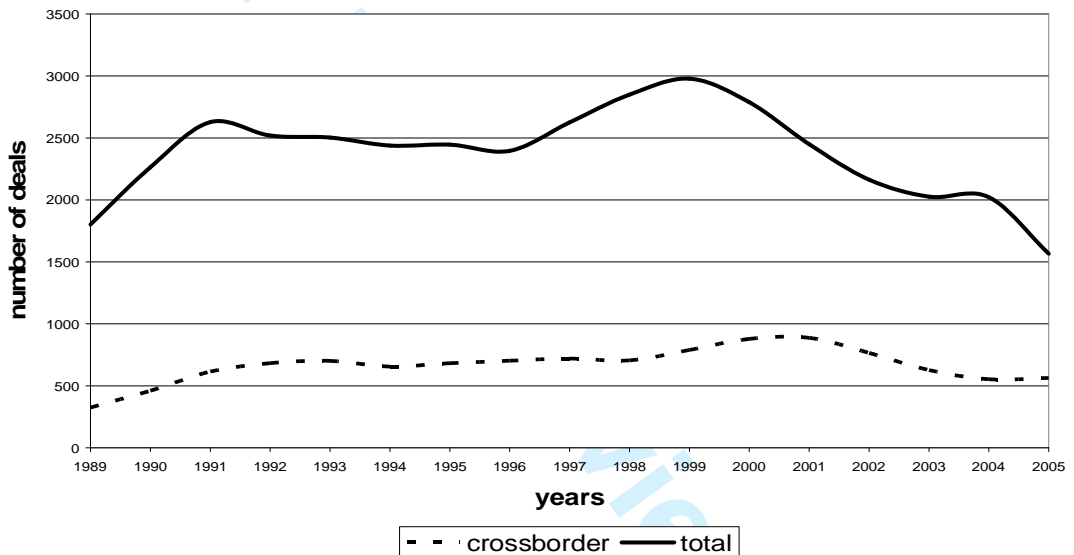
[13] A 3-year moving average is used to account for the volatility of merger activities. For this reason we lose two years of observation. Furthermore, we omit the years 1982-1986 because the number of M&A reported by Thomson Financial seems to be incomplete for these years.

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Table 2: Distribution of M&As Across Countries

Country	Domestic deals	Cross-border deals	
		Acquiring firms	Acquisition targets
AT	3	4	5
BE	2	6	4
CH	4	11	6
DE	30	21	27
DK	6	4	2
ES	4	6	11
FI	6	9	7
FR	40	24	14
GR	17	2	1
IE	2	10	1
IT	20	9	7
LU	0	1	0
NL	8	9	10
NO	3	4	10
PT	7	3	7
SE	13	16	17
UK	96	20	30
# of firms	2*261	159	159

Table 3: Conditional Logit Estimation for the Acquisition Choice

	Control Group 1		Control Group 2	
	Coefficient (std. err.)		Coefficient (std. err.)	
ΔLog(A)	-0.68	***	-0.64	***
	(0.10)		(0.10)	
Δ(I/A)	-0.65		-6.81	**
	(2.43)		(3.27)	
Log(A)	0.63	***	0.82	***
	(0.09)		(0.10)	
I/A	0.61		6.86	**
	(2.25)		(3.03)	
Same industry (2dgt-SIC)	2.38	***	1.98	***
	(0.28)		(0.30)	
Same industry (3dgt-SIC)	0.68		1.25	***
	(0.44)		(0.50)	
Same industry (4dgt-SIC)	2.41	***	1.15	*
	(0.62)		(0.60)	
Patent stock/100	-0.004	***	-0.007	***
	(0.001)		(0.001)	
Cross-border	7.01	***	8.92	***
	(1.59)		(1.79)	
Tech. proximity Cross-border	4.37	***	3.44	***
	(0.81)		(0.73)	
Tech. proximity Domestic	2.48		0.25	
	(1.68)		(1.75)	
Log(distance)	-1.24	****	-1.69	***
	(0.46)		(0.29)	
Same language	1.60	***	1.04	**
	(0.46)		(0.49)	
Relative ULC	-0.06		-1.27	
	(1.08)		(4.25)	
Relative R&D/GDP	-0.58	**	0.20	
	(0.33)		(0.37)	
Relative GDP	0.08	**	0.07	
	(0.05)		(0.05)	
Relative tax	-4.89	***	-3.77	***
	(0.61)		(0.65)	
Relative openness	-3.40	***	-3.87	***
	(0.42)		(1.53)	
LR-X^2 statistic	2,372.66		2,449.70	
Log L	-255.94		-217.42	
observations	13,020		13,020	

Hausman test for the validity of IIA

H_0: the estimated coefficients of the model with 30 alternative M&A targets do not differ systematically from an estimation of the model based on only 20 alternatives

X^2-stat=7.41	X^2-stat=17.10

All variables which are not interaction terms or relative measures map the characteristics of the **target** firms.

Financial variables are measured in US$ million and are of the most recent date available prior to the announcement of the transaction.

***, **, * indicate statistical significance at the 1%, 5%, 10% level.