Mergers, acquisitions and technological regimes: the European experience over the period 2002- 2005

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Abstract

Comparisons by countries and by sectors of mergers and acquisitions have usually been performed in separate fields of research. A first group of studies, focusing on international comparisons, has explored the role of corporate governance systems, investor protection laws and other countries' regulatory institutions as the main determinants of takeovers around the world. A second group of contributions has attributed a central role to variations in industry composition, documenting that, in each country, mergers occur in waves and within each wave clustering by industry is observed. This paper aims to integrate both perspectives and to make comparisons by countries and by sectors, thus exploring the role of various driving forces on takeover activities.

It also intends to consider the specific influence that technological regimes and their innovation patterns may exert in reallocating assets and moving capital among sectors. This will be done by examining the European experience of the last few years (2002-2005). We found that even in countries where transfer of control is a frequent phenomenon, mergers are less frequent in those sectors where innovation is a cumulative process and where takeovers may be a threat to the continuity of accumulation of innovative capabilities.

JEL. Classifications: G34; 030; L60

Keywords: Mergers and Acquisitions; Corporate Governance; Technological Regimes

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"It is hardly necessary to point out that competition of the kind we have now in mind acts not only when in being but also when it is merely an ever-present threat. It disciplines before it attacks."

(Schumpeter, 1943, p. 85)

1: Introduction[1]

Comparisons by countries and by sectors of mergers and acquisitions (M&A) have usually been performed in separate fields of research[2]. A first group of studies, focusing on international comparisons, has explored the role of corporate governance systems, investor protection laws and other countries' regulatory institutions as the main determinants of takeovers around the world (see, for instance, Rossi and Volpin, 2004). The underlying claim of these studies is that, in better-regulated systems, it is easier and less expensive to raise capital and to finance corporate acquisitions.

A second group of contributions (Andrade et. 2001, Mitchell and Mulherin, 1996; Jovanovic and Rousseau, 2001, 2002) has attributed a central role to variations in industry composition, documenting that, in each country, mergers occur in waves and within each wave clustering by industry is observed. In this field of research, industry-level shocks (due to technological and regulatory changes) play a central role in explaining takeovers and their evolution in time.

This paper aims to integrate both perspectives and to make comparisons by countries and by sectors, thus exploring the role of various driving forces on takeover activities. The hypothesis to be tested is the following: economies with higher investor protection are more financially developed and have more liquid stock markets. Thus, "they can discipline poor management and restructure failing companies more easily than can economies that do not have these means at their disposal" (Jovanovic Rousseau, 2001, p. 28). This need may come to the fore when shocks occur and poorly managed firms fail to react.

We also intend to consider the specific influence that technological regimes and their innovation patterns may exert in reallocating assets and moving capital among sectors.

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[2]One exception is the study by Martynova and Renneboog (2006), in which comparisons by countries and by sectors are performed in the European context for the period 1993-2001.

Thus, the main contribution intends to be a multidimensional analysis in which both technological factors and institutional and sectoral determinants are integrated in a unified perspective. Indeed, as we show below, our empirical strategy is to analyze the frequency of merger transactions at a sectoral level, controlling for the roles of country and institutional variables and focussing on those sectoral disparities associated with distinct technological regimes.

As recently emphasized by Cassiman and Colombo (2006a, p. 1), mergers and innovation "are a central piece of today's competitive strategy development" and the integration between these two issues may offer a key contribution. One potential implication is that the main differences that characterise sectors in terms of innovation and which determine the existence of two distinct regimes, the *entrepreneurial* and *routinised* sectors, may have an effect on their merger experiences.

In the first regime, also called Schumpeter Mark I, innovation is radical, investment projects are short-lived, capital depreciation is rapid and knowledge and competences are general; thus, for this regime, one can expect mergers and acquisitions to be frequent and that they may be an efficient way to grow and obtain synergies in R&D expenditure. The opposite may be true for the other, routinised regime, also known as Schumpeter Mark II, in which innovations are incremental along the existing technological trajectory, investments are long-term oriented and human capital and skills are firm-specific. (Malerba and Orsenigo, 1996)[3]. In this context, one can expect less frequent reallocations by the acquisition of other firms.

Thus, the well-known hypothesis, according to which mergers can remove excess capacity and correct faulty internal governance mechanisms (Jensen, 1993), can be reviewed in a new perspective. Indeed, these transactions may be more frequent and turn out to be more powerful in differing technological contexts. These hypotheses suggest integrating cross-country and cross-sector analysis by focussing on the specific influence that technological regimes and their innovation patterns may exert in reallocating assets and moving capital among sectors.

To better clarify our intentions to explore the various dimension of takeover activities, let us consider two cases: a country and a firm. The country case is that of Germany.

[3] A technological regime is identified by the full set of conditions in which innovative activities take place (Nelson and Winter, 1982). Recent evolutionary studies have focused on relevant aspects of these activities and have made a distinction between two different patterns of innovation, originally pointed out by Schumpeter. Henceforth, by 'technological regimes', we mean the two sectoral models of innovation called SMI and SMII.

In this economy, takeovers and hostility are quite rare - a common fact usually explained by specificities of its governance system, where insider protection is higher and where corporate governance fosters long-term cooperation and encourages firm-specific investments by lenders, employees and large shareholders (Schmidt, 2003). But Germany, a typical system of 'patient capitalism' where enduring relations are pervasive, is also a country with a more stable population of innovative firms (Breschi et al. 2000) and, in comparison with other European economies, it also "emerges as a typical Schumpeter Mark II country" (Malerba and Orsenigo 1996, p.464). This may partly explain why Germany has a lower incidence of takeover activities.

Now let us consider the history of a company, Cisco, during the 1990s:

> *Cisco was one of the success stories in the exploding high-technology area of the New Economy. Cisco began by selling basic Internet routers to corporate customers. Cisco evolved from a single-product company in routers to become a complete data networking solutions provider. What is most relevant for our subject is that, between September 21 1993, and October 26 1999, Cisco engaged in more than 50 acquisitions. Most of the acquisitions were of relatively small size... Its acquisition strategy was defined by four main criteria: shared vision, beating competitors to the market, innovation, and chemistry. Chemistry or culture, as explained by Michael Volpi, Cisco's vice President of business development, is of key importance. He points out that technology in their industry lasts only 18 months, so continued innovation is a necessity."* (Weston, Mitchell and Mulherin, 2004, p. 104-105).

All the main ingredients to explain the incidence of takeovers are present in the Cisco story: the role of a corporate governance system, like that typical of the US, with a well-developed stock market that favouring financing of 50 acquisitions, mainly of small companies; shackling technology shocks that stimulate a firm to become a 'networking solutions provider', the specific feature of a sector in which technology lasts no more than a year and half! These factors will appear in our study, which intends to evaluate on empirical grounds the *combined* influence that alternative *technological regimes*, different systems of *corporate governance* and *industry shocks* can play on takeover activities. This will be done by taking into account the European experience of the last few years (2002-2005) which seems to mark a new wave in M&A activities.

This comprehensive analysis is another step along the lines suggested by Hall and Soskice (2001), two authors who have shown that the industry specialization of each country may be seen in its complementarities with its institutional framework.

Until now, these complementarities between *production regimes* and *varieties of capitalism* have not been fully explored in terms of the role of the market *for corporate control*. The present paper intends to be a first attempt at filling this gap. By adopting this integrated perspective, in the following sections we explore in which systems and sectors mergers are more frequent and can be expected to play a role as remedies to faulty governance and/or represent crucial strategies to exploit innovative synergies in *entrepreneurial* industries.

The work is organized as follows. Section 2 illustrates the database and clarifies some methodological issues of our estimation strategy. Section 3 presents the main findings obtained by performing comparisons by countries, by sectors and by technological regimes. Section 4 offers some conclusions and signals potential fruitful lines of research.

2. Data description

Our database of mergers and acquisitions comes from Datastream and additional information is from Lexis and Nexis. M&A deals refer to eight countries, whose activities in the 1990s represented nearly 80% of the European market for corporate control[4]: Denmark, France, Finland, Germany, Italy, Norway, Sweden and the United Kingdom. Data on M&A are collected from "Capital Issues and Changes" Datastream reports and only transactions related to takeovers and involving a change in corporate control are selected. Completed and not completed takeovers, financial and non-financial sectors are included in our database and total 802 deals, for the period 2002-2005.

In order to make comparisons of mergers by sectors and to explore the influence of differing technological regimes, we aggregated company data at different levels.

First, we aggregated the data into 39 four-digit sectors and then into 10 two-digit sectors (both classifications are those used by Datastream). These aggregation criteria are those provided by the Industry Benchmark Classification (IBC), a system for listed companies managed by FTSE and Dow Jones Indexes (2004)[5]. Table A1 in the

[4] See Martynova and Renneboog (2006).

[5] IBC has six levels of classification, the lowest is the sub-sector and the highest the whole market. Each company is allocated to that sub-sector whose definition most closely describes the nature of its business and fits the source of its revenue, or the majority of its revenue. The basic sources of information used for the classification are audited accounts and directors' reports. A company which operates in two or more sub-sectors is allocated to that sub-sector which provides the largest part of the revenue, as indicated by the latest available reports and accounts. A company engaged in three or more sub-sectors that are in two or more industries

Appendix shows how the 39 four-digit sectors were converted into the 10 two-digit industries.

In the second step, manufacturing sectors[6] (which form a subset of 26 out of the 39 four-digit sectors) were classified and grouped into technological regimes. Three groups were obtained: i) Schumpeter Mark I (SMI); Schumpeter Mark II (SMII); a residual group, termed Other manufacturing. Table 1 shows the mapping classification of four-digit sectors into their corresponding technological regimes[7].

INSERT TABLE 1

In order to clarify how to achieve the mapping classifying shown in Table 1, some preliminary information is useful. First of all, it is convenient to recall how the classification into technology regimes was originally obtained (Malerba and Orsenigo, 1993, 1996). The relevant dimension is innovation activity, and the authors use, as proxies, patent data from the European Patent Office (EPO) and consider 49 technological classes. These classes are created on the basis of the classification provided by the International Patent Classification (IPC) (which in turn relies on specific applications for patents considered by the World International Patent Office (WIPO).

Further elaborations result in the classification into technological regimes. In particular, Malerba and Orsenigo (1996) consider four main aspects: i) concentration and asymmetries of innovation activity among firms; ii) size of innovating firms; iii) evolution over time in the ranking of innovators; iv) comparative importance of new innovators with respect to old ones. These four indicators were considered for each of

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is classified in the sub-sector Diversified Industrials, which in turn belongs to General Industrials.

[6] Note, however, that our data, as shown in Table 1, also include some service sectors: i) software and computer-related services; ii) oil equipment-related services; iii) support services. The first two groups are not separated from manufacturing activities by the IBC used here, and must be included in our database; the third group comprises business sectors closely related to production.

[7] It must be noted that in our analysis computer and telecommunications have been distinguished, respectively, into Hardware (SMII) and Software Computer Industry (SMI) and Fixed (SMII) and Mobile Telecommunications (SMI), whereas these distinctions were not operated in the original study by Malerba and Orsenigo (1996). Note, also, that new methodological refinements yield for the ICT sectoral system, "a more articulated Schumpeter Mark I pattern, in which new innovators do not necessarily generate high turbulence in the industry, high innovative entry coexists with a certain level of concentration, and in which a variety of sources of knowledge coexists with innovations focused on a few technologies." (Corrocher et al., 2007, p. 429).

the 49 classes, so that this analysis maps the classes into two distinct technological regimes: SMI and SMII.

In our context, it is necessary to adopt a mapping classification to convert our 26 four-digit sectors into the two distinct technological regimes. Unfortunately, official guidelines for mapping the IPC and IBC classification systems do not exist. However, as stressed by WIPO (2006), in the IPC database "…technical subjects of inventions may represent products, processes or apparatus (or the way these are used or applied), and these terms should be interpreted in the widest sense…" (p. 22). Similar concerns for products or industrial processes are used in IBC, a similarity that favours matching between the two systems. Moreover, the patent data used in Malerba and Orsenigo (1993, 1996, 1997) to obtain technological groupings are gathered for the same countries considered here. In addition, a concordance table similar to that used here (Table A2 in the Appendix) was adopted in another study (Van Dijk 2000). This table permits mapping classification of technological classes, technological regimes, and four-digit sectors[8].

Lastly, quantitative information on R&D expenditure and innovative activity are gathered by Eurostat, providing detailed documentation at country level. Concerning R&D expenses, the average values of business enterprise R&D expenditure in the period 2002-2005, as a percentage of GDP, are obtained. Information on innovative activity is also drawn from the Fourth Community Innovation Survey (Eurostat) for the period 2002-2004, and refers to the percentage of enterprises which introduced significant product or process innovations. For both series (R&D expenditure and innovation), Eurostat gathers statistical information for the NACE Rev. 1.1 classification at three-digit level and rearranges the data by establishing six technological intensity classes. Four classes refer to the technological intensity of manufacturing industries, and two to the knowledge intensity of service sectors. Note that this statistical information, which does not match our four-digit IBC industries, needs concordance mapping, like that shown in the Appendix, Table A3. It was constructed by assigning to each four-digit sector a weight proportional to its incidence

[8]Only four-digit IBC sectors and IPC sub-classes are shown in Table A2, but we also processed lower levels of disaggregation with the main aim of operating a finer adaptation and of testing the matching criterion adopted here. In any case, it is worth noting that we do not actually need strict binary correspondence between pairs of classes, because our analysis only focuses on two large groups, i.e., the two technological regimes, which embrace almost all the manufacturing sectors, thus avoiding strong distortions in reclassification.

in the respective Eurostat technological intensity class. To sum up, the different aggregation levels are shown in Figure 1.

INSERT FIGURE 1

3 The European merger experience for the period 2002-2005: main findings

A convenient starting point is a comparison of the number of deals obtained in our study for the period 2002-2005 with the figures recorded in the previous M&A wave, fully explored in Martynova and Renneboog (2006), one the main contributions for the European context[9]. Table 2 offers some interesting information; in particular, it reveals minor changes in the distribution of M&A activity between 1993-2001 and 2002-2005, as shown by the ranking orders (in brackets). The UK is still top, followed at some distance by France and Germany. The Italian market for corporate control looks more active than in the past, reaching the ranking position that Sweden had occupied in the previous years[10]. A small increase also affected the share of deals for Denmark.

INSERT TABLE 2

However, simple standardisation of absolute figures shows some significant reversals among countries in rankings by incidence of takeovers. Indeed, Figure 2 offers better comparison of geographical patterns: for each country, the absolute number of deals is normalized to the total number of firms included in the Datastream database.

[9] Both databases refer to transactions involving changes in corporate control, but in Martynova and Renneboog (2006) only domestic and intra-European cross-border deals are taken into account, while our data set also include extra-European acquisitions. A different database was studied by Jackson and Miyajima (2007), covering M&A deals from the Thomson Banker One 'Deals' over the period 1991-2005; the study examines transactions of substantial stakes of publicly listed and private firms of three European countries (France, Germany, UK) and of Japan and the US. One of the main findings is "the catching up of M&A in Japan, France and Germany"…and "some functional equivalence in promoting corporate restructuring" (Jackson and Miyajima, 2007, p. 24).

[10] An interesting investigation of the Italian case, over the period 1991-1994, has been performed by Benfratello (2001). The author, by using the Italian and European Union Competition authorities data, analyzes three different groups of transactions: privatizations, acquisition of independent firms by foreign multinationals, leveraged and management buyouts. The study examines their respective performances before and after the change in control and finds that the latter group performs better than the control sample.

INSERT FIGURE 2

Additional information is obtained when all transactions are grouped by sectors, and can reveal if merger activity clusters significantly in a particular industry: Table 3 displays the sectoral variation of deals from our Datastream database for the eight pooled countries for the period 2002-2005. Data by target firms in each two-digit industry are collected and volume activity is measured.

INSERT TABLE 3

In terms of percentages of deals out of total number of firms of each sector one obtains the results shown by Figure 3.

INSERT FIGURE 3

Our data clearly confirm that takeovers tend to group in industries and the highest performance, in absolute terms, of Consumer Services is worth noting (see Table 3). In relative terms, we find Telecommunication (see Figure 3) as the frequency of transactions out of the total number of firms reaches its highest value in this sector, almost ten points above the average value of the total number of deals. For Telecommunications, despite the low number of deals involving change of control, relatively speaking, the result is that one-fifth of companies were the target of takeovers during 2002-2005.[11] Furthermore, merger activity in Telecommunications is not a new phenomenon, since a first round of consolidation in the sector occurred in the 1990s and was driven by the need to compete with American providers (OECD, 2001). Thus, a sector classified in the SMII regime on the basis of the 1980s database recorded one the highest incidence of takeovers in Europe during the 1990s[12] and following years, a striking finding that seems to contradict our claims. But some caveats are important.

[11] Other sources indicate that mergers activities were notable not only in number of deals, but also in value: the share market fluctuated from 7% to 11% (Thomson Financial 2002, 2003; 2004; 2005). Just to name a few cases, let us recall that Olivetti's acquisition in 2003 of the remaining 46% interest in Telecom Italia for $28 billion was by far the largest deal in Europe. In the second position we find Telefonica's planned tender offer for O2 (UK), the second largest deal announced for 2005 (Thomson Financial, 2003, 2005).

[12] See Martynova and Renneboog (2006).

First of all, the presence of various business segments grouped into a single sector but no longer sharing the same features in terms of innovation properties, such as material production and telecommunications services, must be taken seriously into account.[13] These considerations suggest reconsidering mobile telecommunication as a sector whose innovation activities are similar to those belonging in SMI regime, as examined in recent studies (Corrocher et al. 2007). In any case, mobile and fixed telecommunications exhibit marked differentials. A disaggregated analysis of the three top markets for corporate control, Consumer Services (CS), Telecommunications (TC) and Utilities (U), at a four-digit sectoral level, is shown in Figure 4.

INSERT FIGURE 4

Some other data qualifications are also important. In considering technological regimes, it must be noted that, across countries, not all the different economic sectors can be classified in the same technological pattern and country-specific effects may be present. Some portions of technological classes, even if they are in the minority, do not fall in the same regime in different countries.[14]

Secondly, it must be noted that not only technological reasons may count on merger activities. *Market relatedness* and *organizational synergies* are complementary explanations that, with *technological* reasons, may concur to explain merger deals. This variety of motivations is well represented by some instructive merger stories offered from the US, as well as from the European scene. These case studies show that telecommunications are the best example of a sector in which technological developments and regulatory changes force and enable firms to found new corporate alliances and "to seek new partners across *national* and *technical borders*" (Johansson and Kang, 2000, p.24).

[13] It must be added that very often firms diversify their activities, and not all of them may be in the same technological regime. In empirical investigations, this problem is solved by simply allocating the company to that sector whose definition most closely describes the nature of its business; thus some unexpected relations between takeover activities and technological regimes are simply the outcomes of diversification, since company mergers may have occurred in none prevailing business areas.

[14] By classifying technological classes, Malerba and Orsenigo (1996, p. 464-465) find, for a panel of six industrialized countries, that only a majority belongs to the same technological regime in different countries (34 out of 49 technological classes). Similar results, 18 out of 26 in a sample of three countries, were obtained by Breschi et al. (2000, p. 399).

For instance, our first case study concerns the AT&T and BellSouth deal. This was a response to the cable industry to be a 'triple player' in communications. Thus, the scope of the merger was not only a reduction in operating services, but also the complementarities that make it possible for a unified corporation to sell a "bundle" of services, from fixed, to mobile telephony, to broadband internet and television. The acquisition turned out to be successful, and not by chance: it occurred when the two companies, AT&T and Bellsouth, had already started to build fast fibre-optic networks and had reached well-matching competences and capabilities![15]

Let us now consider our data and look at a cross-border intra-European deal. Here, the story is that of the Spanish Telefonica bid for Britain's O2 in 2005, and the merger represented a potential strategy for entering *new markets* and selling *new products*. [16] It happened at a crucial moment, when the big incumbent European firms had to face two main challenges: a continent-wide wave of consolidation in an enlarged European market, and product innovations, since mobile and wireless technology was increasingly becoming a substitute for fixed calls. These two main challenges were clearly identified by César Alierta, Telefonica's chairman, who explaining the proposed acquisition as "a way of broadening the firm's reach across different *markets* and *technologies*"[17].

Additional evidence and detailed reports show that "technological advances and regulatory reform are changing the traditional borders of who is doing what and where". In addition, competition, stimulated by regulatory reform, has meant that "the incumbent former monopolies need to respond to customer needs and shareholder demands" (Johansson and Kang, 2000, p. 24). Mergers and acquisitions, as well corporate alliances, are some of the responses to these structural changes.

But some other sectors play an active role in the European market for corporate control. Consumer Services and Utilities have been the second and third most active markets for corporate control: 18.97% and 14.40% of companies were targets of M&A, respectively, as Figure 4 shows. The growing importance of service sectors in advanced economies, combined with the success of Information and Communication

[15] See *The Economist*, 31/11/2006, issue 8468.

[16] At the time of the acquisition, Telefónica's business sectors comprised both fixed and mobile telephony, while O2 was only active in mobile telephony. Some complementarities arose from their respective geographical location, since Telefónica provides its services in Spain and the Czech Republic, whereas O2 was active in the UK, Germany and Ireland.

[17] See *The Economist*, 11/5/2005, Vol. 377, issue 8451.

Technologies, the introduction of the Euro, and the interest of manufacturing firms in services such as retail and wholesale trade, probably boosted merger activity in these industries. Unlike Utilities, deals in Consumer Services were larger in number terms (178 was the largest absolute number of deals in industries for the 2002-2005 period) but not in value (see Thomson Financial, 2002; 2003; 2004; 2005)[18].

The basic sources of industry shocks in two of the three sectors displaying a more intense change in control (telecommunications and utilities) may be at least partially attributed to privatization and liberalization, as already detected for 2000-2001 by the European Commission (2001)[19]. Thus, the prediction that bursts of merger activity concentrate in industries which are undergoing shocks of significant magnitude seems to be confirmed in our database.

In our analysis, as already mentioned, we group sectors by technological regime. As discussed in Section 1, technological regimes may constitute a context in which to observe systematic differences in takeover frequencies. In particular, the specific knowledge-based system characterising the SMII regime, centred on higher investments on R&D, may raise structural barriers and limit the market for corporate control, an expectation that finds some support from our dataset, as seen below.

To conclude, a binomial test was performed to evaluate the significance of the differences between frequencies of M&A by countries, by sectors, and by technological regimes. The differences between frequencies and their statistical significance are shown in Table 4.

INSERT TABLE 4

[18] Manufacturing sectors also played an important role. The relative frequencies of takeovers in the sectors of Industrial and Consumer Goods were nearly equal to the average: 12.64% and 12.34% respectively (see Table 4); in terms of value, Thomson Financial estimated a share market ranging from 7% to 11% for Industrial and from 3 to 6% for Consumer Goods, for 2002-2005. Lastly, it is worth noting that, over the 1990s, a considerable number of deals in industries such as plastics, metals, machinery, food, textile, chemicals, was detected by the European Commission (2001). In particular, this number has remained more stable during the last decade, responding less to the evolution of the economic cycle, in both upswing and downturn (European Commission, 2001).

[19] As reported in December 2001 by the Directorate-General for Economic and Financial Affairs,"…as a consequence of privatization and liberalization, the number of cases in the network industries continues to increase steeply, as it has done since 1995. In 2000-2001, post and telecommunications accounted for over 11% of all cases, while electricity and gas accounted for a further 5% (European Commission, 2001, p. 17).

As shown by Table 4, differences by countries, sectors and technological regimes exist and are statistically significant.

The positive values of the first column of Table 4 (Panel A) confirm that the UK is the most active player in the market for corporate control, and show a positive and significant difference (at the 1% level) of the relative incidence of deals with respect to that observed in all the other countries of our database (Panel A, column 1). The opposite is obtained for Germany (Panel A column 3), where the gap is negative and significant (at the 1% level). The results also indicate that, in most cases, the null hypothesis that M&A is uniform across sectors can be rejected: inter-industry variations also seem to be confirmed for the European experience of the last few years (Panel B). Lastly, the activity of the market for corporate control in SMI sectors was significantly higher than in almost all other industries classified as SMII sectors (Panel C): the relative frequency of takeovers within manufacturing sectors included in SMI (13.10%) is significantly higher than in SMII (9.77%).

These results give raise to many questions. For instance, the dispersed ownership structure prevailing in the UK, which may require discipline exerted by raiders, can be advocated to explain the high incidence of takeovers there. But how to interpret the high incidence of takeovers, at least in relative terms, recorded in Italy? Or, conversely, the low number of deals in Finland? Why, in the UK, are higher figures recorded in mobile rather than fixed telecommunications? How to disentangle the role of deregulation, as happened for utilities, from the impact of R&D expenses featuring biotechnologies?

A further step is to identify some main determinants of M&A and to test their role by econometric estimates.

4. Determinants of merger activities and results

Frequencies of M&A activities are estimated by considering three dimensions: country and institutional variables, sectoral factors and technological regimes. The following section offers a brief discussion aimed at identifying a set of variables for our estimates.

4.1 Country and institutional variables

A) Wealth

It is important to control for differences in macroeconomic conditions across countries and the first factor to be considered is the country's wealth, which is proxied by the logarithm of the per capita GDP. But, as shown in Figure 5, divergences in geographical patterns are only partially explained by considering the GDP weights of

each single country[20]. Clearly, additional causes are required to explain why some countries have a lower number of operations than those expected from the size of their economies. Germany, France, and Italy itself are good examples.

By comparing the economic weight of each country with its M&A activity, the top up position of the UK is confirmed (Figure 5).

INSERT FIGURE 5

B) Ownership and control

A second factor to be considered is corporate ownership and control. Countries in which ownership is heavily concentrated may be involved in very few takeovers, since large shareholders have enough incentives and power to exert control over managers; they are also in a stronger position to adopt defensive strategies aimed at impeding hostile bids. However, the impact that ownership and control structure may exert on takeovers is controversial, since the benefits of large shareholders in facilitating takeovers may be significant (Grossman and Hart, 1980; Shleifer and Vishny, 1986). Indeed, in a widely held corporation, a serious free-riding problem exists: in a context of dispersed shareholders, where control is a *public good*, internalization of the benefits of collective action is hindered by the tendency of individual shareholders to avoid monitoring costs and take advantage of monitoring activities performed by other shareholders (Grossman and Hart, 1980).[21] The presence of a large (minority) shareholder, not allied with management, provides a partial solution to the Grossman-Hart problem, since this owner is able as well as motivated to initiate or favour other parties to undertake a takeover deal. Hence, as Shleifer and Vishny (1986) show on theoretical and empirical grounds, concentrated ownership and the presence of a large shareholder lead to the possibility of overcoming the free-riding problems of dispersed possession. Hence, a positive correlation between the structure of ownership and takeovers activity may reasonably be obtained, as in the cross-country comparisons performed by Rossi and Volpin (2004). By contrast, following Shleifer and Vishny (1997), it is also possible to argue that expropriation activity by controlling

[20] Italy, for instance, has shown an M&A share of 6.4%, while having a 12.7% weight in terms of GDP.

[21] In fact, 'if a shareholder thinks that the raid will succeed and that the raider will improve the firm, he will not tender his shares, but will instead retain them, because he anticipates a profit from their price appreciation' (Grossman and Hart, 1980). It must be added that the effectiveness of a market for corporate control is not ensured when competitive conditions are not prevailing in product and financial markets, and share prices are not good signals of firm performance. This implies that good corporate governance must be accompanied by pro-competition and anti-trust legislation.

shareholders, adopting self-dealing strategies at the expense of minority shareholders, may discourage investors and obstruct hostile bids. The net balance between opposite predictions is ambiguous and must be tested by econometric estimates.

C) Investor protection

The relation between concentration and takeover activities may also be the outcome of a systematic relation between ownership concentration and legal factors. Indeed, La Porta et al. (1998, 1999) argue that better protection increases shareholders' willingness to invest and encourages a more dispersed ownership structure[22]. It is only by controlling for investor protection that one can disentangle the two effects. The problem is ultimately empirical and will be tested with econometric estimates.

Indeed, a cross-country comparison explicitly considering the role of laws and regulations offers complementary insights. Investor protection laws and other countries' regulatory institutions may be crucial determinants explaining why firms are owned and financed so differently in different countries, as argued in La Porta et al. (1998). The authors make considerable efforts to elaborate accurate indicators for shareholders' rights, and have recently revised the original index for investor protection, the so-called anti-director rights, thus offering a new and more accurate measure (revised anti-director rights), which better distinguish between enabling rules and mandatory or default provisions.[23]The revised index is also based on laws and regulations updated to May 2003 and is more useful for our purposes.

In our perspective, one must ask whether better legal rules, by improving the functioning of financial markets, end by favouring merger and takeover activities and allowing corporate assets to be directed toward their best possible use. Two main channels must be considered: i) shareholders' protection permits liquid stock markets

[22] A group of papers (La Porta et al. 1997, 1998, 1999), by large cross-sections of countries indicators, show that legal origin is correlated with the size of stock markets, ownership concentration and other indicators of financial systems. However, many criticisms have been raised on this classification. Rajan and Zingales (2003) show that the correlation of legal origin and the development of financial markets did not hold at the beginning of the 20th century and document a 'great reversal' by historical trends. Roe (2003) claims that the correlation between classifications of corporate law and ownership concentration is spurious and misleading, since it fails to captures the influence of missing variables. More scepticism on causality arguments, between legal origin and financial indicators is obtained by considering individual countries' experiences for Western and Eastern European countries (see, respectively, Becht, 1999, and Pistor, 2004).

[23] The authors also propose new indexes of the strength of minority shareholder protection against self-dealing by the controlling block-holder (*anti-self-dealing* index) for a group of 72 countries. For a methodological explanation of these new indicators, see Djankov et al. (2008, tab. I).

and lowers the financial costs of takeovers; ii) it impedes or makes more difficult takeover defences adopted by management or other large incumbents. Both effects are conducive to a more developed market for corporate control.

Some qualifications must be mentioned. First of all, not all measures affording shareholders' protection have a direct and positive impact on takeovers. Let us consider one of the five provisions concerning voting rights attached to shares. In principle, one can argue that "investors may be better protected when dividend rights are tightly linked to voting rights" (La Porta 1998, p. 1126). However, deviations from the clause 'one share –one vote' reduce the number of share transfers necessary to obtain a change in control and may make it less difficult to finance takeovers, a well known claim advanced by Grossman and Hart (1980) and Harris and Raviv (1988).

Takeover regulation may be an important determinant of transfers of control, since it affects the costs and benefits of these transfers, as extensively analyzed by Bebchuk (1994). For instance, when ownership is highly concentrated, a law that allows sharing of the control premium may tend to align the interest of controlling and minority shareholders and thus it prevents value-destroying takeovers which only ensure private benefits of control to the dominant block-holder.

Instead, in widely held firms, legal provision of squeeze-out rights solves free-riding problems caused by dispersed possession. Indeed, each individual shareholder, anticipating that the post-takeover share price will exceed the offered price, prefers not to tender. The squeeze-out rule, giving the controlling shareholder the right to force minority shareholders to sell their shares, solves free-riding problems and thus allows raiders to make value-increasing acquisitions (Burkart and Panunzi, 2004).

All these and other provisions have been recently harmonized for the European Union member states by EU Directive 2004/25, and the debate as to whether uniform national legislation produces identical effects in countries with heterogeneous corporate governance regimes is still ongoing (Goergen, Martynova and Renneboog, 2005). In any case, it should be noted that some of the member states of our database, which covers the period 2002-2005, only brought the provisions of the Directive into force in 2006, and that the Directive leaves some discretionality to national legislators. Thus, in a heterogeneous legislative environment like that typical of European countries, it is convenient the test the role of different takeovers rules on merger deals. One explanatory variable of our estimates is thus a synthetic index that captures the role of different measures: i) mandatory bid rule; ii) and iii) squeeze-out and sell-out

rules; iv) ownership and control transparency; v) passivity rule in terms of board neutrality with respect to anti-takeover defences; vi) break- through rule[24] (see Table 5).

INSERT TABLE 5

It should be noted that other factors, such as enforcement of law, or accounting standards, are important to our analysis. For instance, in Italy there is a weak governance regime, notwithstanding the legal reforms and improvements undertaken in 1998, and the quality of enforcement remains unsatisfactory[25]. Thus, the same increase in 'formal' shareholders' rights translates into lower effective improvement, and one can obtain a lower impact on M&A activities by econometric estimates, as shown for the Italian case in Rossi and Volpin (2004, pp. 283-286). Indeed, the index for the quality of the legal system, which includes judicial independence, the impartiality of courts, and protection of intellectual property rights (see Manchin, 2004) has the lowest score in Italy (Table 6).

Additional important determinants are accounting standards that allow information to be gathered on potential target firms and ensure greater transparency. Unfortunately, the update measures of this last indicator for the eight countries selected in our database are not available, and have been omitted in our estimates.

Summing up, a wide spectrum of factors, covering the structure of ownership, shareholders' rights, the quality of the legal system and takeover regulation may play a significant role. Table 6 presents a picture of some of the various indicators for the eight European countries selected in our analysis.

INSERT TABLE 6

In Europe, the polarization between two opposite situations (UK and Germany) clearly reflects some well-known differences between two distinct regimes of corporate

[24]Additional information on the criteria adopted to obtain the index of takeover regulation adopted here is available upon request.

[25] For recent corporate governance reforms in France, Italy and Germany, see Enriques and Volpin (2007).

governance, which a huge literature has compared in many surveys[26]. Indeed, as recently reviewed by Morck, Wolfenzon and Yeung (2005), there is a sharp segmentation between ownership patterns in continental Europe and in the UK[27], revealed by comparing the average ownership of the three largest shareholders, as shown by La Porta et al. (1998) for the ten largest firms of each country[28] (first column of Table 6 of this paper). The lower concentration figures are in the UK, while the highest in Italy and Germany. Similar results by Faccio and Lang (2002) for a different dataset, which included medium and small financial and no-financial companies, show that widely held firms have the highest incidence in the UK (63% of firms) and the lowest in Germany (10.37%).

As well observed by Goergen and Renneboog (2003, p. 141) "Not only does the concentration of control differ between these countries, but so does the nature of ownership: Germany is characterized by inter-corporate equity relations and family control whereas institutional shareholders hold most of the voting rights in the UK. Also, German firms are on average more than 50 years old when they are floated, whereas UK IPOs are only 12 years old"[29]. Thus, for Germany, often named as an 'insider' system, stable ownership, a strong role for banks and inter-firm relations[30], the active role played by employees can explain the implementation of long-term relationships and the lesser importance of a market for corporate control.

However, Table 6 also shows that European shareholder capitalism is quite heterogeneous, as indicated by the dataset for concentration, as well as the discrepancy between ownership and control.[31] Confirmation of these heterogeneities comes from enforcement of shareholders' rights. Table 6 shows not only the high quality of legal protection afforded in the common law country (UK), but also the

[26]See, among others, Prowse (1995), Maher and Andersson (1999), Allen and Gale (2000), Gugler (2001), Becht, Bolton and Roell (2003) and Denis and McConnell (2003).

[27] See the main studies by La Porta et al. (1998), Barca and Becht (2001) and Faccio and Lang (2002).

[28] The study by La Porta et al. (1998) refers to a larger dataset which includes 49 countries.

[29] For a comparison between the German stakeholder model and the UK shareholder model, see Chilosi and Damiani (2007).

[30] As shown in Prowse (1995), in Germany the percentage of common stocks owned by other non-financial enterprises has been estimated at more than 40% of all stocks, with respect to only 1% recorded for the UK.

[31] As found by Faccio and Lang (2002), in the Scandinavian countries and Finland the cash flow rights of the largest ultimate owners are lower than those observed in Germany, but higher than the corresponding figures recorded in the UK. The authors document values of 30.96, 31.47 and 37.43% for Sweden, Norway and Finland, respectively (Faccio and Lang, 2002, p. 389).

various scenarios offered by Continental Europe where, for example, Italy and Denmark have a different quality of legal systems. In the various cases, ownership structures may be predicted to exert a differential impact on the functioning of the market for corporate control. We shall see later if these predictions are confirmed by econometric estimates.

4.2 Sectoral factors

Concerning the sectoral dimension, our aim is twofold: i) to detect the role of industry factors on takeover frequencies; ii) to discover their reallocation properties and to test the neoclassical hypothesis that sees these transactions as efficient restructuring strategies.

Following Manne (1965), it is well known that mergers and acquisitions may be valuable strategies that improve corporate governance. The reason, provided in Manne's seminal paper, is that "...the lower the stock price, relative to what it could be with more efficient management, the more attractive the takeover becomes to those who believe that they can manage the company more efficiently" (Manne, 1965, p.113). These statements, advanced at firm level, must be considered in a sectoral perspective.

Here, the neoclassical theory of mergers offers a refinement of the original, firm-level analysis, and sees these transactions as an efficiency-improving response to various *industry shocks*. On one hand, the basic hypothesis is that technological shocks occurring at industry level (Jovanovic and Rousseau, 2001, 2002) and antitrust policy or deregulation (Mitchell and Mulherin, 1996) cause a high degree of dispersion of the firms' opportunities. The different Q-ratios achieved by the different firms induce the acquisition of bad performers by more successful ones, thus promoting efficient selection. Thus, an intense takeover activity signals a capital reallocation faster process and more efficient than that obtained by higher flows of entry and exit of firms (Jovanovic and Rousseau, 2001, 2002).

On the other hand, however, the managerial literature gives a less optimistic view. As explored at a firm level of analysis, many disadvantages may be associated with takeovers, since they represent not only an efficient way to correct agency problems,

but also manifest agency problems themselves. [32] An extension of these models at a sectoral level must face the hard task of reconciling two stylized and contemporaneous facts, not fully consistent with the neoclassical approach: industry merger waves and poor profitability for acquirer firms.

This challenge motivates a second group of models focussing on inefficiencies and offering a view dominated by *managerial* or *market* failures. Indeed, merger waves may be explained by a sort of 'race for firm size' adopted by self-interest and rational managers who intend to increase the firm's size and thus reduce the probability of acquisitions by other firms (Gorton et al. 2005). Thus 'eat' is an escape 'to be eaten'[33], a value-destroying strategy capable of explaining both merger clustering and low returns of bidder firms. But a chain reaction may also be the outcome of *hubris* (Roll, 1986) and *herding*, which cause a propagation of errors and generate the wave phenomenon. Hence, in this perspective, *rational* and *less than rational* managerial strategies are conducive to inefficiencies and misallocation of corporate resources. According to this second group of models, one may expect the limited influence of low pre-bid share price performance as a determinant of changes in control[34].

In a different line of research, market failures are considered and a complementary hypothesis, advanced by Shleifer and Vishny (2003), considers a scenario dominated by *rational managers* in environments featuring *irrational financial markets.* Here, the dispersion of the ratio of market to book values between firms reflects erroneous evaluations by markets, not a real difference in their efficiency. In such circumstances, equity prices deviate from fundamental values, as happens in bull markets, and the management of over-evaluated firms use their equities to buy the undervalued assets of the other ones. On their part, target managers, adopting self-interest and short-term strategies, prefer to sell stocks, even when they know their firm will be worth more in the long run. Thus, executives reap gains from mispricing, and mergers become "a

[32] Executives choose to buy target firms in order to increase their power and to divert free cash flows (Jensen, 1986), instead of returning it to investors; therefore acquisitions may be used for managerial empire building (Marris, 1964) or represent a diversification device of the managers' human capital risk (Amihud and Lev, 1981). Other behavioural motivations grounded on agency problems, such as management *entrenchment* (Shleifer and Vishny, 1989; Edlin and Stiglitz, 1995) imply that executives over-invest in manager-specific projects that make it costly for the firm to replace the incumbent manager.

[33]"Eat Or Be Eaten: A Theory of Mergers and Merger Waves" is the title of the study by Gorton et al. (2005).

[34]Shleifer and Vishny (2003) have shown that, in bull market episodes characterized by irrational financial markets, the observed dispersion of stock prices between firms does not reflect a real difference in their efficiency, but simply erroneous evaluations and mispricings.

form of arbitrage by rational managers operating in inefficient markets." (Shleifer and Vishny, 2003, p. 296)

To summarize, *ex-ante* low values of the Tobin's Q of the target firms may be a sign of their inefficient management or a manifestation of errors in pricing; in any case it is a significant explanatory variable that probably triggers sectoral acquisitions.

By contrast, under the alternative assumption advanced by the managerial literature mentioned above, *ex-ante* Tobin's Q market values have a moderate influence, and the seriousness of agency costs of acquiring firms may become important[35]. Additionally, efficiency-related reasons, due to economies of scale or scope, or attempts to create market power, may play some role, and sole attention to industry shocks and mismanagement has a poor interpretative role.

According to this brief discussion, and following Mitchell and Mulherin (1996), we take into account industry shocks, whatever the various sources underlying them, by introducing abnormal industry performances. Lastly, for each sector we added the average values of the ratio of market to book values of target firms.

4.3 Technological regimes

One expected hypothesis of our analysis is that countries and sectoral patterns may also be explained by the main differences that characterise sectors in terms of innovation processes. Thus the existence of two distinct regimes, the *entrepreneurial* and *routinised* sectors, may have a significant impact on mergers.

As already mentioned, the first regime, type of SMI, reveals the lower stability of the hierarchy of innovators, a lower concentration ratio of the more innovative firms, and a higher proportion of new innovators with respect to the old ones (Audretsch, 1996; Dosi, 1988; Malerba and Orsenigo, 1993, 1996).[36]

In this more turbulent environment, mergers and acquisitions are expected to be more frequent, and may be an efficient way of growing and obtaining synergies in R&D

[35] For instance, the evidence obtained for the UK by Franks and Mayer (1996) shows that the UK market for corporate control "does not function as a disciplinary device for poorly performing companies"(Frank and Mayer, 1996, p.180). Indeed, the authors do not find significant differentials in terms of performances between acquired and bidder firms. The "free cash flow" motivation of bidder management, as well as the entrenched behaviour of target management, who resist takeover bids, are they two main drawbacks arising in the market for corporate control.

[36] Other main references are Nelson and Winter (1982), Kamien and Schwartz (1982), Malerba and Orsenigo (1997) and Breschi et al. (2000).

expenditure. The opposite may be true for the other, routinezed, regime, SMII. Here, innovations are incremental along existing technological trajectories and a less frequent reallocation process by acquisitions of other firms may be expected since the newly hired workforce has to spend time and effort in order to operate efficiently in specialised routines.

Some qualifications are needed here, since recent contributions offer a finer classification of sectors and suggest the adoption of the broader notion of the sectoral system of innovations - a different entity which only partially overlaps that of technological regimes. Indeed, according to this multi-dimensional approach, more attention has been paid to the *source* of knowledge, degree of *application*, pervasivity of innovations, and finally, the role of *actors*, not only firms, interacting with each other with *market* and *non-market* relations[37]. An instance is the role of public sector organizations, or the various institutions that have promoted the creation of new protocols and favoured the adoption of standards and coordination in telecommunications, as shown in Edquist (2004). Another good example comes from a country belonging to our database and from the role played by the National Telecommunication Council, created in Sweden in 1990. Without mentioning other paradigmatic cases for a country not present in our database, like the US; here, a prominent example is offered by ARPANET, the earliest forerunner of the Internet, which originated from public grants by the US Defence Advance Research Project Agency (Edquist, 2004). Thus, a further step for future research might be the adoption of this more comprehensive approach, more suitable for identifying the proper role that various national (public) institutions play in each sectoral system of innovation[38].

In the present study, in any case, one important point to be explored is whether innovation activities and R&D processes are driving factors capable of explaining the occurrence of M&A, and whether potential synergies are conditioned by the technological regime in which the corporate transaction is operated.

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[37] As Malerba writes, the notion of the sectoral system of innovation "… departs from the traditional concept of sector used in industrial economics because it examines other agents in addition to firms, it places a lot of emphasis on non market as well as on market interactions, and focuses on the processes of transformation of the system…"(Malerba, 2002, p.250).

[38] A second qualification refers to the adoption of technological class, the unit of analysis used here to identify patterns of innovations. An improvement on this ground should be represented by the adoption of new indicators that better identify the degree of *opportunity applications* of each sectoral system of innovation (Corrocher et al., 2007). For instance, in the ICT field, the selection of information from patent abstracts, in terms of recurrence of keywords is useful in identifying ICT applications and may reveal a methodological improvement to be extended to other sectoral fields.

The challenging theme of knowledge and innovation-enhancing strategies represented by corporate acquisitions has been the focus of some recent studies. The main intent of this literature is to inquire if the innovation performance of acquiring firms is influenced not only by the technological base (measured in absolute and relative terms) of the companies involved, but also by the degree of relatedness of those knowledge bases. An overall evaluation of methodologies and findings in this field of research is beyond the scope of the present paper, but it should be noted that the non-linear impact on the innovation performance of acquisitions emerges: a moderate level of relatedness proves superior to high and low levels of relatedness. This result was originally found for the chemicals industry by Ahuja and Katila (2001) and later extended to other technological sectors by Clodt, Hagedoorn and Van Kranenburg (2006). At the same time, Cassiman et al. (2005), Cassiman and Colombo (2006b) reported similar results for a more variegate sectoral sample: firms that are in *complementary* technological fields exploit the beneficial effects of mergers, whereas the combination of firms that have *similar* innovation projects is not conducive to significant advantages from economies of scale in R&D.

In our empirical research, more than asking what can happen *ex-post*, in terms of innovation capabilities, we inquire what *ex ante* is the actual propensity to merge associated with various innovation regimes. For instance, for chemicals, a sector characterized by large firms, continuity in innovative processes, and cumulativeness of firms' capabilities, a lower incidence of M&A is expected.

Instead, in sectors characterized by creative destruction, R&D processes and efforts are probably less serious obstacles for corporate acquisitions. In sum, in our perspective, what is explored is the overall question of whether R&D inputs result in the lower probability of occurrence of M&A in environments of *creative accumulation.* Here innovations are incremental along existing technological trajectory, and for this regime one can expect a less frequent reallocation process by acquisitions of other firms, since newly hired workforce has to spend time and effort to operate efficiently in specialised routines.

At first glance, this expected hypothesis seems to be confirmed by our dataset, since takeovers frequencies are negatively correlated with R&Ds in SMII, while the negative association is less significant in SMI.

INSERT FIGURE 6

INSERT FIGURE 7

Some final remarks concern the combined role of technology and R&D costs with agency costs. In an *ex-post* perspective, as shown by Hitt et al. (1996), one can verify if some of the potential synergies accruing from takeovers are dissipated when top executives consume energies in undertaking effort-consuming acquisitions, or when long-term investments in innovation are postponed for fear of hostile acquisitions. In our *ex-ante* approach, what is important is to test whether firms (or, rather, their 'agents') follow an active acquisition strategy as a 'substitute for internal innovation' (Hitt et al., 1996, p. 1089). More precisely, we intend to ascertain if this substitution mechanism is more frequent as the probability of disruption of the established routines falls, thus, mainly in business sectors where innovation patterns can be typified as SMI. Indeed, in this regime of *creative destruction*, where the opportunities for external synergies are higher, managers may adopt an acquisition strategy as a sort of 'short cut' to allow them to be free riders of innovation efforts undertaken by target firms. After all, for a given level of managerial failures spreading across various countries, it is perhaps not by chance that, in more than 800 deals found in our database, takeovers only involve five chemical firms[39]!

This finding, apparently, seems to conflict with other evidence that shows, in a long-term perspective, that even the chemical industry has solved its overcapacity problems, suffering, for instance, during the interwar period, both with mergers and acquisition, as well as with corporate alliances, such as the nitrogen cartel between IG Farbel and ICI. These were not unique events but phenomena which were repeated in the 1980s, whenever acquisitions, and therefore greater market shares, allowed a balance between slower demand growth and a decline in profits (Cesaroni et al. 2004, pp. 131-132). But what is still remarkable is that, in a sector designed as SMII, such as the chemical industry, these corporate deals occurred in situations of diminishing opportunities for product innovation, not in phases of technological change and innovation. This is one relevant qualification for our estimation strategy.

[39] Interesting insights are obtained by considering two of these five deals: the cases of Degussa in Germany and the British transaction targeting British Vita.

4.4 Estimates

In this section we evaluate the volume of M&A activity and the determinants of various patterns observed by countries and by sectors. Table 7 shows the results of our regressions on the determinants of takeover activity.

The dependent variable is the percentage of companies, included in the Datastream database, that are targets of mergers or acquisitions in each country and in each four-digit sector for the whole period 2002-2005[40] (see Section 2 and Table A5 in the Appendix, for a description of dependent and explanatory variables).

Note that the dependent variable in our regressions is merger intensity (frequencies of industry-country deals) and that, for this variable, we have encountered the problem that there were no mergers in many industry-countries. In fact, the maximum number of observations is 312 (39 four-digit sectors times 8 countries), but our database does not contain companies in all 312 sector-countries but only in 286 sector-countries; furthermore, mergers and acquisition deals do not occur in all sectors. Indeed, our market for corporate control (completed and not completed deals occurring in the period 2002-2005) concerns only 175 country-four digit sectors. Moreover, for country-sectors not observed data, the regressors are also lost and we have a typical truncated data problem (some observations on both dependent and independent variables are lost).

Assuming that the dependent variable y_i is a continuous random variable and that $\mathbf{x}_i$ is the vector of regressors, we randomly draw ($\mathbf{x}_i$, y_i) from a sample of 286 four-digit sectors. The selection rule consequently takes the following form:

$s_i=1[y_i>0]$, where 0 is the truncation point

If $y_i>0$ we observe both y_i and $\mathbf{x}_i$; if $y_i = 0$, we do not observe either y_i or $\mathbf{x}_i$. and we have a truncated random variable model. It is known (see Wooldrige, 2001, and Greene 2003), that in this case ordinary least squares (OLS) estimates are inconsistent. We estimate the parameters of the truncated regression model by applying a maximum likelihood estimation method[41].

The estimated model is the following:

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[40] Unfortunately, we do not have variables structured in panel data because the number of sectors in which M&A occur changes from one year to another. For this reason, we carried out a cross-section analysis on pooled data for the period 2002-2005.

[41] All estimates were performed with the STATA9 package. The dataset and routines used are available upon request.

$$M\ \&\ A_{ij} = \beta_0 + \sum_{m=1}^{5} \beta_{1m} I_{i.m} + \sum_{n=1}^{2} \beta_{2n} S_{ijn} + \sum_{l=1}^{2} \beta_{3l} TEC_{ijl} + \sum_{z=1}^{2} \beta_{4z} (TEC_{ijz}\, TR_z) + \varepsilon_{ij}$$

where:

i=1,…8	*Countries*
j=1,…39	*Four-digit Sectors*
m=1,…5	*Institutional variables (I)*
n=1,2	*Sectoral variables (S)*
l=1,2	*Technological variables (TEC)*
z=1,2	*Technological Regimes dummy variables (TR)*

Table 7 presents results for three different set of estimates, which test, respectively, the role of institutional, sectoral and technological factors.

The first three columns (columns *a*, *b, c*) include country variables and permit to control for differences in institutional conditions. More precisely, the main independent variables are the economic wealth of each country, ownership concentration, takeover regulation, and other legal factors. In details, the first country variable is captured by GDP per capita, whereas two different indices are considered for ownership concentration: the average equity stake held in each country by the three largest owners (column *a*), and the percentage of firms widely held (column *b*). Legal variables and investor protection are represented by takeover regulation (column *a* and *b*), or by anti-director rights (column *c*), updated to 2003 and revised by Djankov et al. (2008). We have also included in each specification the market to book values of targets, to capture efficiency potential improvements. All the specifications are augmented sectoral dummies introduced to capture the role of specific industry effects. Another estimate (column *d*) tests also the role of sectoral reallocations triggered by industry shocks. This effect may be captured by deviations between a particular industry's added value growth with respect to the average values across all 39 industries.

The third set of estimates, columns *e, f, g, h*, evaluates also the role of innovation and technological regimes. We tested the null hypothesis that R&D and innovation activities, and their differential patterns, do not play an autonomous role in merger deals. The sectoral volume of R&D expenses, standardized to value added (column *e*), and the incidence of innovation (column *g*) are firstly included as total aggregate, not differentiated by technological regimes. The other estimates (respectively, columns *f* and *h)* include the same variables, differentiated into the two regimes.

Table 7 reports the coefficients obtained with truncated regressions.

INSERT TABLE 7

Our econometric estimates confirm the importance of institutional and country-level factors as significant determinants of mergers and acquisitions and extend some of the conclusions, already reached for the 1990s by Rossi and Volpin (2004), in the last few years.

First, the statistical significance of both the coefficients of ownership structure, measured by the two different indices included in the specifications, support the prediction that concentration helps to alleviate the free-riding problems that impede takeovers in cases of fragmented ownership rights. This finding, obtained when shareholder protection variables are included, confirms that ownership may exert an autonomous and direct impact, not simply due to its 'endogenous' and legally determined nature. Thus, by disentangling the effects of ownership and investor protection, clearer results are obtained.

Second, our estimates show that efficient regulation aimed at facilitating these deals and at reducing takeover defences is correlated with a more active market for mergers and acquisitions. By contrast, legal shareholder protection, measured by the anti-director rights index, updated and revised by Djankov et al. (2008), does not seem to be significant (column *c*). Hence, the hypothesis that better investor protection is correlated with a more active market for mergers and acquisitions, as reported by Rossi and Volpin (2004), does not find clear confirmation for the last few years, even when the new updated index is used.[42]

Additional estimates show that industry changes have an influence in explaining takeovers when we control for R&D expenses. This finding suggests that mergers are not an unequivocal response to technological or regulatory shocks occurring at industry level which promote massive reallocation of resources.

[42]In our estimates, the role of anti-director rights is not significant, even when the updated (not revised) index is introduced; no significant results are also obtained when this indicator (revised or not) is weighted with the quality of the legal system. In addition, legal families, and the presumed associated features on qualities of legal institutions, do not play a significant role on the volume of M&A. All these results, not reported in Table 7 for reasons of space, are available upon request.

Although these findings encourage us to be confident in the role of institutional model, they represent a further incentive to deepen analysis of the role played by sectoral dimension.

Note that all our estimates confirm the role of the sectoral values of Tobins' Q: the e*x-ante* Q values of the target firms, as shown in Table 7, are always statistically significant. This is a robust finding, and the proxy for Tobin's Q, included in all the specifications reported in the table, significantly improves the goodness of fit. However, explaining this finding is controversial and difficult. As already mentioned, one plausible interpretation, according to agency theory, is the 'underperformance hypothesis', according to which sectors that exhibit low market valuations relative to real assets also record higher frequencies of acquisitions. If these takeovers are aimed at restructuring poorly performing firms, the result, as claimed by Jovanovic and Rousseau (2002, p.198), is that "mergers are a channel thorough which capital flows to better projects and better management." Instead, we cannot discard the hypothesis that low sectoral values reflect not poor performances, but erroneous market evaluations, along the lines suggested by Shleifer and Vishny (2003). Further study, considering alternative performance indicators, independent of stock market valuations, and properly selecting and filtering out firm-level and industry-wide causes, should make our interpretations more convincing. Similar improvements could be obtained by considering acquirer as well as target performances, and by introducing additional explanatory variables to specify the different role of cash or equities methods of payments, since the mispricing hypothesis of Shleifer and Vishny (2003) only explains acquisitions with (overvalued) stocks.

The last set of estimates seems to reject the null hypothesis that R&D costs and the incidence of innovators play the same role on M&A, irrespective of the sectors in which they are actually spent. The polarization of sectors into two distinct technological regimes may also exert an autonomous and significant impact on merger deals.

One related implication is that the maintained hypothesis of a vast body of literature, according to which "the takeover route is often the least-cost method to alter industry structure" (Mitchell and Mulherin, 1996, p. 196) must be reconsidered and partially revised. Indeed, both the functions performed by merger activity[43], 'contraction'

[43] See the detailed analysis of Andrade and Stafford (2004), who explore the distinct roles of takeovers in terms of expansion and contraction. The authors illustrate how the contractionary

(downsizing driven by negative industry shocks and excess capacity) and 'expansion' (increase in firm size triggered by positive shocks and alternative to internal investments) may produce differential benefits when technological and innovation processes are taken into account[44]. A further investigation of these issues seems appreciable at a time of intense debate on the role of mergers and when some authors (Foster et al., 2002, Blanchard, 2006) claim that most of the productivity gains obtained in the American economy (in some sectors more than 90%) were due to *inter-firm* reallocation, rather than efficiency improvements with a *given firm.* The European economies, which still have to remove obstacles that impede takeovers, also have to discover in which sectoral fields of specialization merger activity produces more beneficial effects and in which it turns out to be detrimental to their varieties of capitalism.

5 Conclusions

By studying deals in eight European countries, we find that integrated analysis is useful in explaining takeover activity, and some main conclusions can be reached: country characteristics are important; ownership and regulation may influence country patterns; firm market valuations, and thus pre-bid performances between target and acquired companies, are significant all over sectors; technological regimes are important.

Indeed, evaluation of a wide range of institutional country variables clearly indicates that ownership concentration is not a real impediment to takeovers, since some, perhaps friendly, acquisitions may occur even in countries where block-holders are present, but where the overall quality of institutions are not conducive to those failures represented by private benefits of control. The Nordic countries are good examples.

In addition, evaluation of some other institutional country variables shows the significant role of takeover regulation, whereas investor protection has a lower impact, one result which is still controversial. Future research would gain by the availability of updated alternative institutional variables; for instance, updating of accounting standards by countries could improve analysis, since these variables, by allowing

role in the US was restricted to the 1970s and 1980s, whereas expansionary waves were typical of the 1990s.

[44] Not by chance, two typical examples of contraction and expansion waves, reported by Mitchell and Mulherin (1996), to be the steel industry and the banking sector, both refer to a regime not marked as SMII.

information to be gathered on potential target firms, would ensure more transparency, reduce expropriations by large incumbents and make the adoption of takeover defences more difficult.

In any case, one robust finding is the role of pre-bid performances: the pre-bid Tobin's Q of target firms is a driving force, since it exerts a significant impact in all our estimates. Monitoring functions or erroneous market evaluations? Efficient deals or hubris and managerial self-interest strategies? These are matters for further research, in which additional evidence on post takeover restructuring processes should help to discriminate between the opposite hypotheses of correction of managerial failures, on one hand, and redeployment of assets, on the other.

Lastly, our estimates suggest that barriers to takeover activities are not only represented by institutional impediments, but may have an alternative and structural explanation: the regime which qualifies the innovation process.

Two sectoral patterns of innovation were observed, and our findings show their differential behaviour in terms of takeover activity. In the first, characterized by *creative destruction,* where the ranking orders of innovators are unstable and entry rates of innovators are high, takeovers are more frequent, since innovation follows a *widening* pattern. In the second, featuring *creative accumulation* and the stability of a core of leading innovators, external acquisitions are less frequent, since they represent a break in the continuity of *deepening* innovation processes. Thus, even in countries where transfer of control is a frequent phenomenon, we found that mergers in those sectors where innovation is a cumulative process are less frequent. In these sectors, takeovers may be a threat, not only to bad management, but also to the continuity of accumulation of innovative capabilities. In these cases, higher investments in R&D may represent an intrinsic obstacle limiting merger activities and thus impeding the destruction of *deepening* patterns of innovation. Hence, takeovers do not always represent, for all sectors, the main mechanism for reducing corporate inefficiencies and mitigating agency costs. The evidence collected for the UK, which is the most active market for corporate control and where 80% of mergers involve sectors not marked as SMII, is significant. It confirms that a comprehensive framework, where complementarities between institutional settings and industrial fields of specialization are taken into account, is useful for better understanding of those varieties of capitalism observed around the world.

However, in this multi-dimensional perspective, further steps should be taken and a careful examination of post-takeover performances should be empirically undertaken. More precisely, two additional questions should be posed: in which corporate governance system does merger activity improve shareholder return rather than private managerial benefits? in which technological regime does it turn out to be a profitable strategy? The first question has animated the *value creation* and *value destruction* debate on takeovers[45]. The second one has never been asked.

It is undeniable that recent studies report that "the corporate takeover market acts as a *court of last resort*, that is, it is an external source of discipline applied when internal control mechanisms are relatively weak or ineffective."(Kini et al. 2004) This means that hostile takeovers do not always represent the main mechanism capable of reducing corporate inefficiencies and mitigating agency costs. What is left to discover is that this *court of last resort* is even less desirable when it represents not only a 'breach of trust' but also a 'breach of knowledge'.

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TABLES

Table 1: Technological Regimes and Industries

SMI	SMII	Other Manufacturing
Food producers	Aerospace & Defence	Mining
Beverages	Oil and Gas Producers	Forestry & Paper
Tobacco	Oil Equipment & Services	General Industrials
Household Goods	Chemicals	Automobiles & Parts
Personal Goods	Pharmaceuticals, Biotechnology	Support Services
Construction & Materials	Healthcare Equipment	
Industrial Engineering	Electronic, Electrical Equip.	
Industrial Metals	Fixed Line Telecommunications	
Industrial Transportation	Technology Hardware & Equip.	
Leisure Goods		
Mobile Telecommunications		
Software & Computer Services		

Source: Our elaborations from FTSE and Dow Jones Indexes (2004) and from Malerba and Orsenigo (1996).

Table 2: Mergers and Acquisitions by target country in eight European countries, 1993-2005

	1993-2001		2002-2005	
Countries	*Number M&A*	*% M&A*	*Number M&A*	*% M&A*
United Kingdom	932	47.53 (1)	475	59.23 (1)
France	308	15.71 (2)	106	13.22 (2)
Germany	269	13.72 (3)	57	7.11 (3)
Sweden	150	7.65 (4)	43	5.36 (5)
Norway	95	4.84 (5)	40	4.99 (6)
Italy	83	4.23 (6)	45	5.61 (4)
Finland	73	3.72 (7)	11	1.37 (8)
Denmark	51	2.60 (8)	25	3.12 (7)
Total	1,961	100.00	802	100.00

Sources: 1993-2001 Thomson Financial, SDC, see Martynova and Renneboog (2006); 2002-2005, our elaborations on Datastream and Lexis-Nexis database; the ranking order of the frequencies is shown in parenthesis.

Table 3: M&A activity by sectors in eight European countries, 2002-2005

Sectors	*Number of target firms*	*Number of total firms*	*% of target firms*
Oil & Gas (O&G)	19	154	12.33
Basic Materials (BM)	31	318	9.75
Industrials (I)	168	1,329	12.64
Consumer Goods (CG)	89	721	12.34
Healthcare (H)	40	358	11.17
Consumer Services (CS)	178	938	18.97
Telecomm.(TC)	21	98	21.43
Utilities (U)	18	125	14.40
Financial (F)	152	1,481	10.26
Technology (T)	86	876	9.82
Total	802	6,398	12.54

Source: our elaborations on Datastream database

Table 4: Results of Binomial Tests for differences between relative frequencies of M&A

Panel A-Differences between relative frequencies of M&A by countries							
	UK	*FR*	*GE*	*IT*	*SW*	*DK*	*NW*
UK							
FR	7.14***						
GE	12.88***	5.74***					
IT	3.05***	-4.09*	-9.83***				
SW	7.61***	0.47	-5.27***	4.56***			
DK	4.97***	-2.17***	-7.91***	1.92	-2.64		
NW	4.89***	-2.25**	-7.99***	1.84	-2.72*	-0.08	
FN	9.88***	2.74***	-3.00***	6.84***	2.28*	4.92**	4.99***

Panel B- Difference between frequencies of M&A by two-digit sectors									
	O&G	BM	I	CG	H	CS	TC	U	F
O&G									
BM	1,94								
I	-0,80	-2,74							
CG	-0,65	-2,59	0,15						
H	0,51	-1,42	1,32	1,17					
CS	-7,18**	-9,12***	-6,38***	-6,53***	-7,70***				
TC	-9,74***	-11,68***	-8,938***	-9,08***	-10,26***	-2,56**			
U	-3,51	-5,45***	-2,71***	-2,86**	-4,03**	3,67***	6,23*		
F	1,21	-0,7245	2,02**	1,87	0,70	8,40***	10,96***	4,73*	
T	1,87	-0,0689	2,68***	2,53**	1,35	9,05***	11,61***	5,38**	0,65

Panel C- Difference between frequencies of M&A by Technological Regimes			
Tehnological Regimes	No. Target firms	No. Total Firms	% target firms
SMI	264	2,015	13.10
SMII	109	1,116	9.77
Difference SMI - SMII			3.33***

***Significant at the 1% level; ** Significant at the 5% level; * significant at the 10 % level.

Table 5: Takeover regulation - the legislative framework in eight countries in the period 2002-2005

	Mandatory bid rule (a)	Squeeze out rule (% of stocks) (b)	Sell out rule (% of stocks) (c)	Transparency (% of stocks) (d)	Break through rule (e)	Passivity rule (f)
UK	30	90	90	3	no	yes
FR	33.33	95	95	5	no	yes
GE	30	95	95	5	no	yes
IT	30	98	90	2	yes	yes
SW	40	90	90	5	no	yes
DK	33.33	90	90	5	no	yes
NW	40	90	90	5	no	yes
FN	66.67	90	90	5	no	yes

Legenda: a) percentage of shares that makes compulsory the tender offer to all the shareholders; b) percentage of equities that gives the controlling shareholder the right to force the minority shareholders to sell their shares; c) the threshold above which the remaining shareholders have the right to sell their shares at a fair price; d) the threshold above which the ownership of voting rights have to disclosed; e) the rule that permits a bidder to break through the existing voting arrangement and to exercise control as in a context of one share-one vote; f) the rule that requires board neutrality in case of anti-takeovers measures and that make compulsory the approval by the shareholders meeting. See Appendix, Table A4 for legislative sources.

Table 6: Ownership, shareholders protection and legal systems in eight European countries

Country	Ownership concentration	Widely held firms	Anti-director rights (revised index)	Legal system	Takeover regulation
United Kingdom	0.19	63.08	5.0	8.80	5
France	0.34	14.00	3.5	7.66	2
Germany	0.48	10.37	3.5	8.95	2
Italy	0.58	12.98	2.0	7.10	5
Sweden	0.28	39.18	3.5	8.78	3
Denmark	0.45	-	4.0	9.08	4
Norway	0.36	36.77	3.5	8.86	3
Finland	0.37	28.68	3.5	9.16	3
Average	0.38	29.30	3.56	8.55	3.37

Legenda: Ownership concentration: The average percentage of common shares owned by three largest shareholders in the 10 largest non financial, privately owned domestic firms of a given country (Djankov et al. 2008 Tab. XIII and La Porta et al. 1998, Tab.7); Widely held firms: percentage of companies that do not have shareholder controlling, at least 20% of votes, in a sample of 5,232 publicly traded financial and non financial corporations (Faccio and Lang 2002, Tab. 3); Anti-director rights: the revised index by Djankov et al. (2008); this index measures the quality of the legal system and takes into account judicial independence, impartiality of courts, protection of intellectual property, military interference in the rule of law and integrity of the legal system (see Manchin, 2004); takeover regulation: the index is obtained from Table 5 and it scores from 1 to 6. Higher values correspond to a legislation that favours takeovers.

Table 7: Estimates of takeover frequencies: the role institutional, sectoral and technological factors

	Obs. 175	Obs. 162	Obs. 175	*Obs 175*	*Obs. 175*	*Obs. 175*	*Obs. 175*	*Obs. 175*
Dependent Variable: M&A frequency	*Column a*	*Column b*	*Column c*	*Column d*	*Column e*	*Column f*	*Column g*	*Column h*
Log GDP per capita	0.717***	0.780***	0.200	0.679***	0.700***	0.663***	0.650***	0.608***
	(0.185)	*(0.251)*	*(0.151)*	*(0.172)*	*(0.161)*	(0.151)	*(0.133)*	*(0.146)*
Concentrated Ownership	0.547**		0.394	0.570**	0.526**	0.439**	0.500***	0.507**
	(0.236)		*(0.455)*	*(0.228)*	*(0.215)*	*(0.214)*	*(0.197)*	*(0.210)*
Widely held firms		-0.005**						
		(0.002)						
Takeover regulation	0.121***	0.162***		0.114***	0.111***	0.104***	0.101***	0.100***
	(0.030)	*(0.049)*		*(0.027)*	*(0.025)*	*(0.024)*	*(0.021)*	*(0.023)*
Antidirector Rights (index revised)			-0.009					
			(0.061)					
Market to Book value of Equity (PBR)	-0.028***	-0.033***	-0.035***	-0.029**	-0.025**	-0.022**	-0.017*	-0.023**
	(0.012)	*(0.012)*	*(0.013)*	*(0.012)*	*(0.012)*	*(0.013)*	*(0.010)*	*(0.011)*
Shock in the sectoral growth rate				0.011	0.012*	0.013**	0.008	0.009
				(0.007)	*(0.007)*	*(0.006)*	*(0.006)*	*(0.006)*
R&D					-0.441*			
					(0.260)			
R&D *SMI						-0.340		
						(0.309)		
R&D *SMII						-10.472***		
						(2.940)		
Innovation							-0.017***	
							(0.006)	
Innovation * SMI								-0.010*
								(0.006)
Innovation* SMII								-0.102***
								(0.029)
Sectoral Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	-2.79***	-2.724***	-0.757	-2.648***	-2.673***	-2.501***	-2.385***	-2.342
	(0.736)	(0.973)	(0.655)	(0.670)	(0.627)	(0.587)	(0.522)	(0.570)
Chi2 Test (Prob>Chi2)	0.0112	0.0114	0.130	0.009	0.002	0.001	0.000	0.001

***Significant at the 1 % level; ** Significant at the 5 % level; * significant at the 10 % level. Robust standard errors are reported in parentheses. Note that the number of observations of estimates reported in column *b* is only 162 since the indicator for widely held firms, introduced in the specification, is not available for Denmark.

FIGURES

Figure 1: Classifications of M&A data

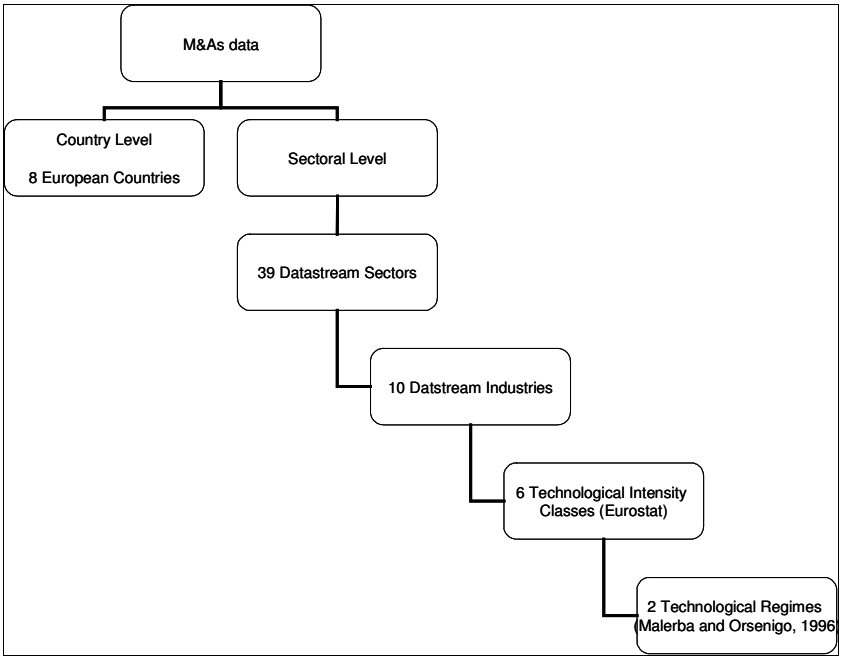
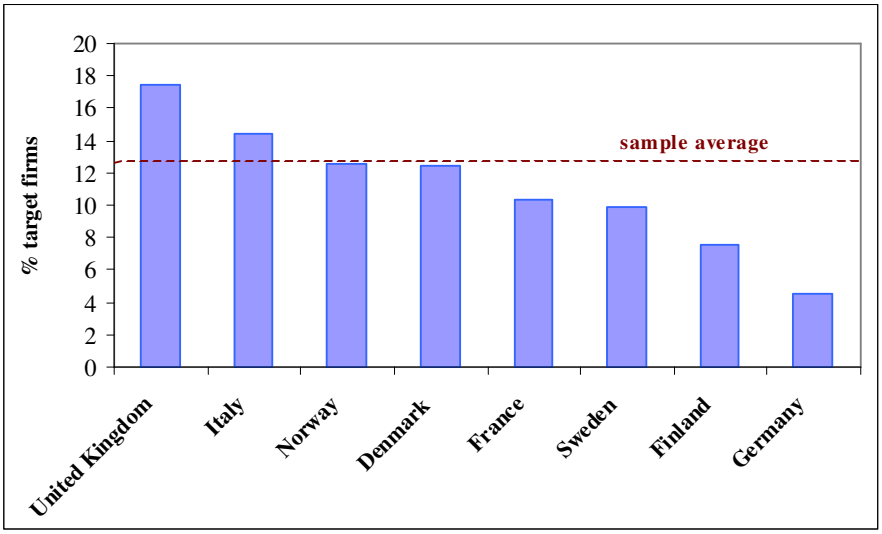


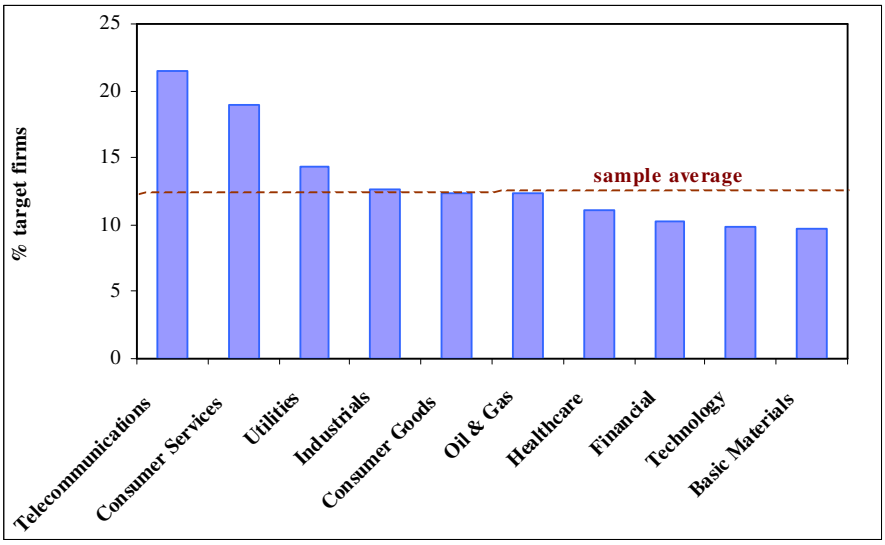
Figure 2: The geographical patterns of the market for corporate control in eight European countries, 2002-2005



Source: our elaborations on Datastream database

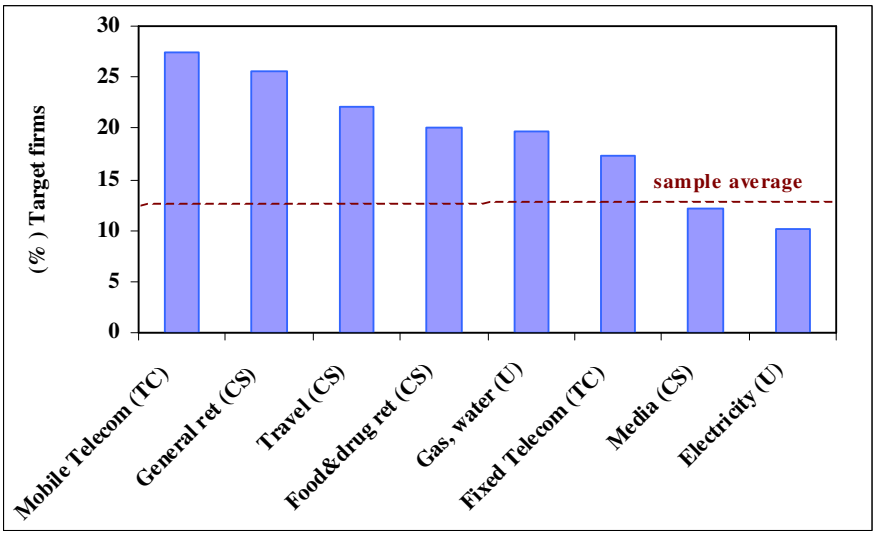
Figure 3: M&A activity in eight European countries: incidence of takeovers by two digit sectors

(% incidence of deals on the total number of firms for each sector)



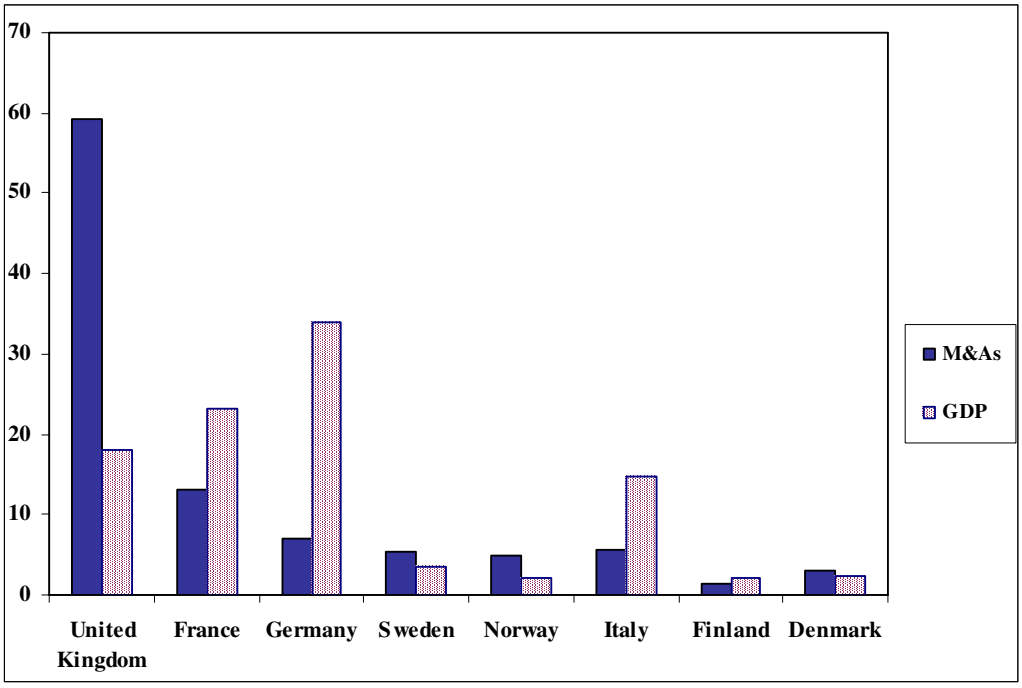
Source: our elaborations on Datastream database

Figure 4: The top markets for corporate control in eight European countries: frequency of M&A by four digit sectors, 2002-2005



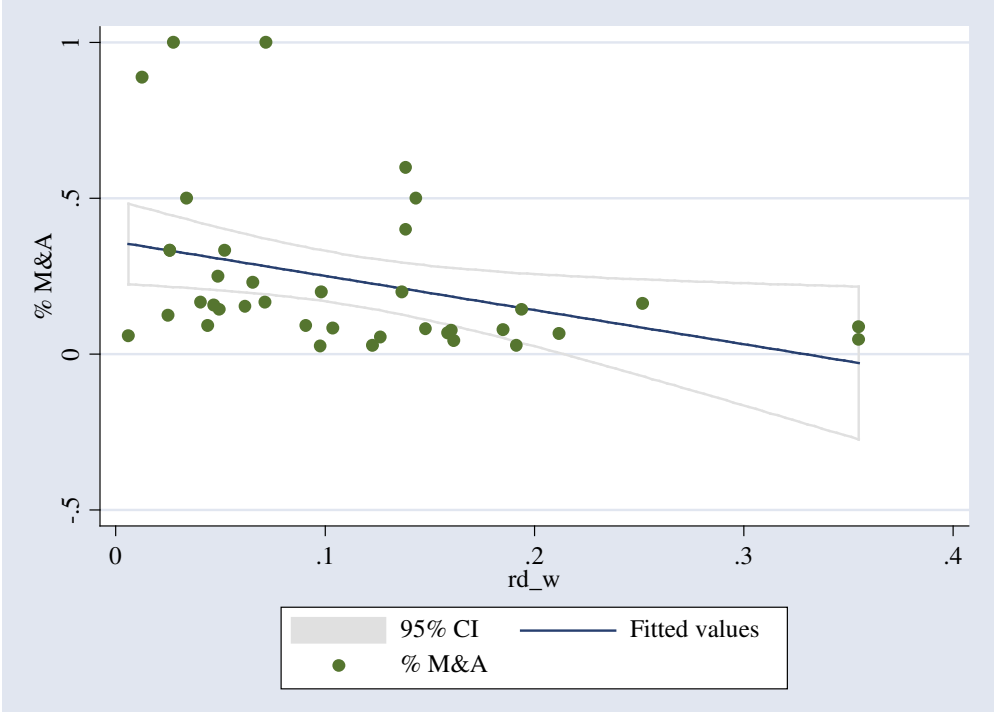
Source: our elaborations on DataStream database

Figure 5: Distribution of M&A activity and GDP weights in eight European countries, average 2002-2005



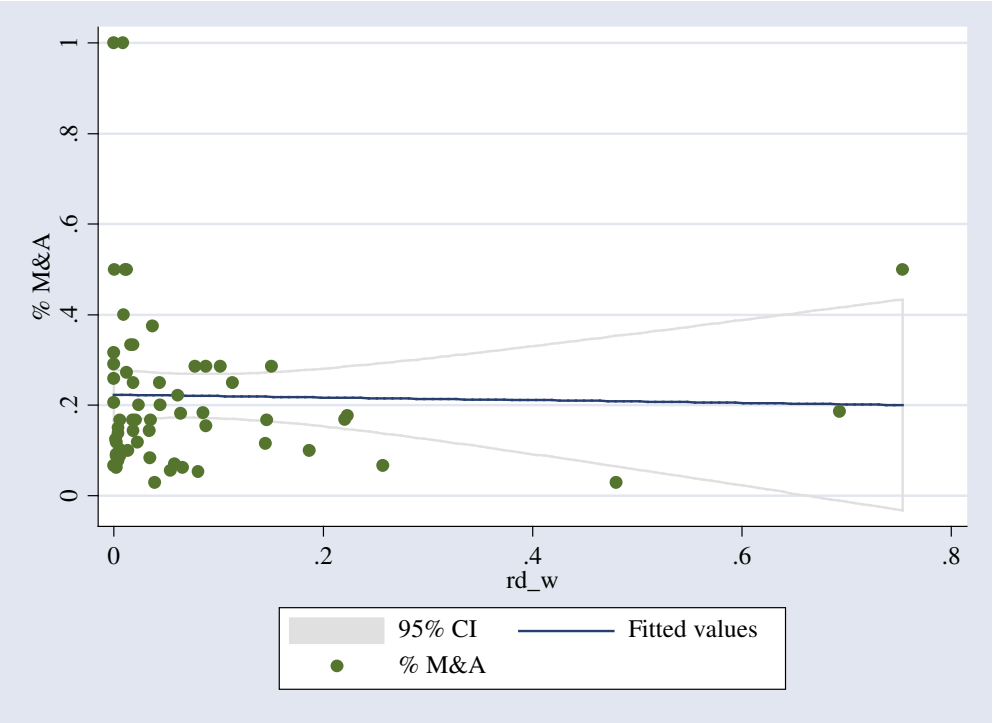
Source: our elaborations on DataStream database

Figure 6: Incidence of M&A and R&D in eight European countries (2002-2005): SMII sectors (Correlation coefficient = -0.31[a])



Source: our elaborations on DataStream database; [a] the correlation coefficient, calculated by excluding outliers, is significant at the 10% level.

Figure 7: Incidence of M&A and R&D in eight European countries (2002-2005):SMI sectors (Correlation coefficient =-0.14 [a])



Source : our elaborations on DataStream database: [a] the correlation coefficient, calculated by excluding outliers, is not significant.

APPENDIX

Table A1: IBC two-digit and four-digit sectors

Two-digit sectors	Four-digit sectors	Two-digit sectors	Four-digit sectors
Oil & Gas	Oil and Gas Producers		Media
	Oil Equipment & Services	**Consumer Services**	Travel & Leisure
Basic Materials	Chemicals		Food & Drug Retailers
	Industrial Metals		General Retailers
	Mining		
	Forestry & Paper		
Industrials	Construction & Materials	**Telecommunications**	Fixed Line Telecommunications
	Industrial Transportation		Mobile Telecommunications
	Aerospace & Defence		
	Electronic, Electrical Equip.	**Utilities**	Electricity
	Industrial Engineering		Gas, Water & Multi-utilities
	Support Services		
	General Industrials	**Financials**	Banks
Consumer Goods	Food producers		Equity Investment Instruments
	Beverages		General Financials
	Tobacco		Life Insurance
	Household Goods		Non equity Invest. Instruments
	Personal Goods		Non Life Insurance
	Leisure Goods		Real Estate
	Automobiles & Parts		
Healthcare	Pharmaceuticals, Biotech.	**Technology**	Technology Hardware & Equip.
	Healthcare Equipment		Software & Computer Services

Source: Datastream

Table A2: Concordance between four digit sectors, technological classes, technological regimes

Techn. Regimes	Four digit sectors (IBC)	Technological Classes (IPC)
Schumpeter Mark I	Food producers	(4) Agriculture
	Beverages	(16) Chemical Processes for Food and Tobacco
	Tobacco	(4) Chemical, Analytical and Physical Processes
	Household Goods	(3) Furniture; (34)Household Electric appliance;
	Personal Goods	(2) Clothing and Shoes; (14) Medical Preparations
	Construction & Materials	(30) Civil Engineering and Infrastructure
	Industrial Engineering	(29) Material Handling Apparatus; (24) Industrial Machinery and Equipment; (32) Mechanical Engineering; (35) Lighting Systems; (33) Mechanical and Electric Technologies; (36) Measurement and control Instruments; (23) Industrial Automation
	Industrial Metals	(22) Machine Tools
	Industrial Transportation	(28) Railways and Ships
	Leisure Goods	(46) Sport and Toys; (49) Others
	Mobile Telecommunications	
	Software & Computer Services	
Schumpeter Mark II	Aerospace & Defence	(27) Aircraft; (47) Ammunition and Weapons; (48) Nuclear Technology
	Oil and Gas Producers	(6) Gas, Hydrocarbons and Oil
	Oil Equipment & Services	(31) Engines, Turbines and pumps
	Chemicals	(8) Organic Chemicals; (9) Macromolecular Compounds
	Pharmaceuticals, Biotechnology	(12) Biochemical, Bio and Genetic Engineering
	Healthcare Equipment	(37) Laser Technology; (38) Optics and Photography
	Electronic, Electrical Equip.	(42) Electronic Components; Multimedia Systems
	Fixed Line Telecommunications	(44) Telecommunications
	Technology Hardware & Equip.	(39) Computers; (40) Other Office Equipment
Other Manufacture	Mining	(5) Mining
	Automobiles & Parts	(26)Vehicles, Motorcycles
	General Industrials	
	Forestry & Paper	

Source: Datastream; Malerba and Orsenigo (1996)

Table A3 Classification of four-digit sectors by technological intensity and knowledge

Manufacturing sectors and technological intensity			
Hi- Tech	Medium Hi-Tech	Medium Low-Tech	Low-Tech
Aerospace & Defense	Chemicals	General Industrials	Forestry & Paper
Pharmaceuticals, Biotechnology	Automobiles & Parts	Oil and Gas Producers	Food producers
Fixed Line Telecommunications	Industrial Transportation	Industrial Metals	Beverages
Mobile Telecommunications	Industrial Engineering	Construction & Materials	Tobacco
Technology Hardware & Equipement			Household Goods
Healthcare Equipment			Personal Goods
			Leisure Goods
Service sectors and knowledge			
High Knowledge		Low Knowledge	
Software & Computer Services		Media	
Support Services		Travel & Leisure	
Oil Equipment & Services		Food & Drug Retailers	
Banks		General Retailers	
Equity Investment Instruments		Electricity	
General Financials		Gas, Water & Multi utilities	
Life Insurance			
No- equity Invest. Instruments			
Non Life Insurance			
Real Estate			

Source: Our elaborations on FTSE and Dow Jones Indexes (2004), Eurostat

Table A4: Sources for takeover regulation

UK	The Panel on Takeovers and Mergers (2002), The Takeover Code
Sweden	The Swedish Financial Supervisory Authority's Regulations Governing Rules of Conduct on the Securities Market (2002) Tude B., "Swedish Securities Council Issues Statement on Mandatory Bids", International Financial Law Review, 2000
Finland	Himonas D., "The Financial Supervision Authority Imposes New Guidelines", International Financial Law Review, 2000 Securities Market Act 26.5.1989/495
Norway	Act on Securities Trading, Act no. 79 , 19th June 1997
Germany	Roos M. – Cornett C. (2002), *Takeover season in Germany*, AltAssets Schmid F.A. – Wahrenburg M. (2002), *Mergers and Acquisition in Germany*, The Federal Reserve Bank of St. Louis, Working Paper Series 2002- 027A
France	Décret n. 2003-1109 du 21 Novembre 2003 Relatif à l'Autorité des Marchés Financiers Règlement général de l'Autorité des marchés financiers, 2006
Italy	Testo Unico Finanziario, Decreto Legislativo 24 febbraio 1998, n. 58 , "Testo unico delle Disposizioni in Materia di Intermediazione Finanziaria, ai sensi degli Articoli 8 e 21 della Legge 6 febbraio 1996, n. 52"

Table A5: Description of variables included in our estimates and their sources

	Dependent Variable: M&A frequency	Percentage of traded firms at sectoral level in the period 2002-2005 that have been targets of completed and not completed M&A. Source: Datastream.
	Regressors:	
Institutional and country variables (I)	Concentrated Ownership	The average percentage of common shares owned by three largest shareholders in the 10 largest non financial, privately owned domestic firms of a given country. Source: La Porta et al. (1998).
	Widely held firms	Percentage of companies that do not have shareholder controlling at least 20% of votes. Source: Faccio and Lang (2002)
	Takeover regulation	Index that captures the role of different measures that favours takeovers (see Table 5 above). It scores from 1 to 6; higher values correspond to a legislation that favours takeovers.
	Anti-director Rights revised	The index for shareholder rights, that updates and corrects the original measure of La Porta et al (1998). Source: Djankov et al. (2008).
	Log GDP per capita (average 2002-2005)	The logarithm of per-capita GDP, proxy for the countries' wealth. Source: Eurostat.
Sectoral variables (S)	Shock in the sectoral growth, 2002-2005	The deviation of value added of each four-digit sector from the annual average GDP growth. Source: Eurostat.
	Market to book value of equity	Average sectoral level of company's Price to Book Ratio for the 3 years before the deal. Source: companies' balance sheets (Datastream).
Technological variables (TEC)	Sectoral R&D intensity	Sectoral R&D expenditure out the country's GDP. Source: Eurostat.
	Percentage of innovative firms	Percentage of firms at sectoral level that undertake innovative activities. Source: Eurostat, Fourth Community Innovation Survey.