What drives European public and private merger waves?

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1. Introduction

What drives merger waves? Harford 2005 argues that mergers are an efficient response to economic shocks to an industry, whereas Rhodes-Kropf, Robinson & Viswanathan 2005 argues that merger waves are driven by overvaluation of the acquiring firm, and to a lesser extent, the target firm. Both papers are based on empirical analyses of listed US firms. This paper presents additional evidence of merger waves in the European Union (EU). The use of European data allows a more detailed analysis, since firm level data is available for both listed as well as private transactions. This analysis reveals significant differences between driving forces for listed firms and for private firms. For public or listed firms mergers and acquisitions are primarily driven by overvaluation or behavioural factors, whereas private transactions are driven by economic factors.

The *economic shock* view claims that shocks to the economic fundamentals of individual industries create opportunities for a profitable restructuring of industry assets (McGowan 1971), leading to industry merger waves if sufficient capital is available (Harford 2005). The *market driven* view asserts that relative increases in merger activity are caused by increases in market valuations, which allow overvalued bidders to swap expensive equity for the relatively inexpensive equity of target firms if target shareholder control is poor (Shleifer & Vishny 2003) or target managers have less information on potential synergy gains than bidders (Rhodes-Kropf & Viswanathan 2004). Jensen 2004 proposes that there are *agency costs of overvaluation*. In short, when a period of high industry growth is met with a short-term decline, self-serving managers are authorized by the board to conduct acquisitions in an

attempt to hit previously stated growth targets. Evidence on publicly held firms offers support for each of the 3 theories[1].

Private transactions offer a unique possibility for testing these theories. If the economic shock theory is the driving force behind all transactions, then there is no difference between merger waves involving public acquirers and private transactions, both sets of firms are affected by the same basic economic conditions or shocks. The evidence presented suggests that this is not the case since there is no significant overlap between merger waves for the two types of firms. However, this does not reject the economic shock theory since transactions by the two types of firms may be driven by different motives.

For private firms it is difficult to imagine behavioural theories as a major driving force. Private firms have no explicit share values that they can trade, and finding undervalued firms that are willing to sell is a costly affair. Since most private firms have few owners and often owner-managers they are not likely to part with their own shares cheaply. The empirical analyses support these contentions: only variables representing economic shocks are significant in explaining private firm merger waves, whereas behavioural variables show limited significance. Thus private merger transactions represent (optimal) responses to economic shocks and behavioural theories do not play a major part.

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[1] Evidence has offered the importance of the economic shock view (Mitchell & Mulherin 1996; Mulherin & Boone 2000; Andrade, Mitchell & Stafford 2001; Harford 2005), the market driven view (Ang & Cheng 2003; Dong, Hirschleifer, Richardson & Teoh 2006; Rhodes-Kropf & Viswanathan 2005) or the agency cost perspective (Moeller, Schlingemann & Stulz 2005)

Since private transactions represents responses to economic shocks and there is not overlap between the merger waves for public and private firms, the obvious hypothesis is that public transactions are driven by overvaluation of behavioural factors. The empirical analysis supports this contention, since few of the economic shock variables are significant, while the behavioural variables explain a significantly larger part of the public firm merger waves.

The rest of the paper proceeds as follows: The second section summarizes existing theory and evidence on the cause of the merger wave of the 90s. The third section argues the role of corporate ownership in merger wave theory. The fourth section identifies industry merger waves for the ownership sub-samples and tests timing differences across them. The fifth section presents empirical hypotheses and the proxy variables. The sixth section offers evidence on the drivers of merger activity in the sub-samples. Interpretations of the results are offered. The seventh section concludes.

2. The merger wave of the 90s and merger wave theory

Figure 1 shows that the aggregate merger activity in the US and EU-15[2] reported by the

Thomson Financial's SDC Platinum database. There is in both economies a clear merger

wave in 1995 to 2001 (as noted by Sudarsanam 2003 among others), with a distinctive peak in

1999-2000[3]. We notice that the oft-cited co-movement between merger activity and stock

market levels holds true for the EU-15. The correlation between EU-15 merger activity and

the average market-to-book ratio is 0,82.

< Insert Figure 1 here >

2.1 Explaining the US public firm merger wave of the 90s

The correlation between stock market levels and aggregate merger activity has been noted in

reference to all of the 5 great US merger waves (Weston 1953, Nelson 1959, Gort 1969,

Golbe & White 1988, Jovanovic & Rousseau 2002 among others). Both the public firm

merger waves of the 80s and 90s experienced an increase in the use of stock financing

compared with non-wave periods (Andrade, Mitchell & Stafford 2001). Shleifer & Vishny

2003 argue that these observations indicate that knowledge stock bidders take advantage of a

sustained market mispricing caused by an irrational stock market by exchanging their

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[2] These countries represent the established countries in Western Europe bound together by a) a free market, b) a partly shared regulatory agency to mitigate anti-competitive mergers, and c) (for ca. 80% of their collective GDP) a shared economic monetary system. European economic unification has been building up in the 1990s and was affirmed with the implementation of the 'Eurozone' monetary area on the 22nd December 1998, which brought together 12 countries under one currency and one central bank, while 3 members (United Kingdom, Sweden and Denmark) maintained independent monetary systems.

[3] Among the European countries, UK merger market is by far the most active, accounting for roughly 29% of acquirers and targets. Controlling for economy size, the UK market has even surpassed the US over the past 25 years. This is also the case with regards to industry takeover frequency (Powell & Yawson 2005).

expensive capital units for the capital units of relatively undervalued firms. Knowledgeable bidders are able to take advantage of this mispricing when target managers wish to 'sell out' or are paid for their consent. Rhodes-Kropf & Viswanathan 2004 offer that target managers may instead be less knowledgeable of the general market mispricing, leading them to underestimate the extent of overvaluation (vis-à-vis the deal synergy) present in a stock offer, and hence, increasing their proclivity for stock offers over cash offers during times of overvaluation. Both simple overvaluation proxies and more complicated renditions show that a short-run deviation from the true stock value increases the chances of being a bidder – especially a stock bidder – in the past two merger waves (Rhodes-Kropf, Robinson & Viswanathan 2005, Dong, Hirschleifer, Richardson & Teoh 2006 and Ang & Cheng 2003). In addition, Dong et al 2006 also finds that characteristics of bids by highly valued bidders match the predictions of the market driven view quite well. Furthermore, Dong et al argue that the evidence of the market driven view is most persuasive in the 90s merger wave.

Jensen 2004 argues that the overvaluation of the 90s further increased the agency costs related to the separation of ownership and control. Specifically, the stock market overvalued the 'newness' of the 90s, leading to a period of over-inflated stock prices, in which firms were unable to fulfil the growth required through value-creating investments. Apparently to meet the stock market expectations, the boards allowed managers to pursue value destroying investments such as acquisitions. Though the agency costs of overvaluation have not been directly empirically linked to aggregate or industry merger activity, Jensen 2004 and Moeller, Schlingemann & Stulz 2005 argue that the large shareholder losses incurred in 1998-2001 by acquisitive firms were caused by these forces and the subsequent re-evaluations of firm policies. Numerous papers add that the long-term decline in the market value of stock

acquirers in merger waves supports behavioural conjectures, though this piece of evidence

does not facilitate a distinction between competing behavioural theories.

Several authors have shown that the merger activity of the 80s and 90s varies significantly

across industries (Mitchell & Mulherin 1996, Andrade et al 2001 among others). Arguably,

the industry clustering is mostly apparent in the 90s. McGowan 1971 and Mitchell &

Mulherin 1996 argue that industry-level motives are necessary to explain industry clustering,

since general financial conditions do not vary enough across industries. Changes in the

economic fundamentals of industry value creation lead to profitable industry restructuring

opportunities, to which M&A is an end (Mitchell & Mulherin 1996, Weston 2001, Harford

2005). These changes may constitute various kinds and combinations of the PEST (Political,

Economic, Social and Technical) factors (Sudarsanam 2003), and the motives may be

synergistic and/or disciplinary in nature. Mergers are an 'adaptive phenomenon' (McGowan

1971), and often the cheapest method of restructuring in response to these industry economic

changes (Mitchell & Mulherin 1996) – and more so the larger the shock – in part due to the

ability to avoid excess capacity (McGowan 1971, Mitchell & Mulherin 1996, Lambrecht

2004). Numerous papers note the link between various individual shocks and industry merger

activity (see Bruner 2003 for an anecdotal overview). This economic shock view[4] attributes

the observed stock market overvaluation to increased growth opportunities caused by the

potential for industry reorganization and the decrease in the cost of capital. Harford 2005

finds that the timing of US industry merger waves in the 80s and 90s is related to the size of

the combined economic industry shocks and ease of financing within the US economy,

leaving no explanatory power to measures related to stock market levels. However, Rhodes-

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[4] A related strand of literature – often referred to as the Q-hypothesis of takeovers (see for instance, Jovanovic & Rousseau 2002) – argues a similar, but broader efficiency perspective. We treat them as synonymous.

Kropf, Robinson & Viswanathan 2005 show that a more direct measure of industry time-series overvaluation univariately explains the timing of US industry merger waves. Stock and accounting evidence on the short and long run performance of mergers in merger wave provides conflicting evidence on the existence of synergy and acquirer gains, which is arguably due to the effect of exogenous and endogenous industry changes on the relevant (unobservable) benchmark (Sudarsanam 2003).

3. Merger wave theory and corporate ownership

According to the SDC database, the proportion of public firm mergers held constant around 23-27% during the 5th US merger wave. It is clear that these mergers covered the bulk of the wave's transaction value. On the other hand, only 7-11% of the wave's EU-15 mergers were public firm mergers. The bulk of these are due to the UK, which also provides approx. 35% of EU-15 listings. If anything, this difference between the US and the EU explains why we need to explain private firm merger waves. Outside of the US and the UK, we really have no evidence on what drives observed merger activity.

3.1 Merger waves of publicly held firms

In essence, existing merger wave theories of public firm merger clustering are based on synergy or deviations from rationality by decision-makers and financial markets. The market driven view argues that synergistic gains owing to continuous firm and industry adjustments may lead to a reasonably constant degree of merger activity, but that the peaks in merger activity are caused by an increase in stock swap mergers. Notably, this requires a well-informed acquirer manager and a less-informed or self-interested target management team. The agency theory of overvaluation argues likewise that the stock market may sustain

irrationally high stock prices before reverting to true values. However, this theory requires self-interested managers who are insufficiently controlled by their boards (perhaps themselves self-centred or irrational) and the shareholders. On the other hand, the economic shock view focuses on the synergy gains available to firms which can instil a shareholder rational manager and which cannot dupe the efficient capital markets. We could argue that the present state of the evidence on public merger waves points to the possibility that both synergistic and behavioural views coincide around periods of economic shocks, particularly in the 90s. Barring the influence of corporate governance differences between the EU-15 and the US, we expect this to carry over to the public firm European merger wave of the 90s.

3.2 Merger waves of privately held firms

However, whereas the economic shock view translates seamlessly to private firms, the behavioural view does not. Accepting the potential for these market inefficiencies, we argue that three influential factors are critically different in private firms – the informational environment, ownership structures and the behaviour of target shareholders.

In the case of the market driven view, the Rhodes-Kropf & Viswanathan 2004 model is technically independent of the organization of firm ownership due to its assumptions of bidder and target firm knowledge. However, the premise for its sweeping assumptions is the informational climate of a well-developed stock market. However, private firms don't have stock prices, and while multiples are often used to calculate bid premia, the agreed price is not likely to reflect the mostly overvalued public deals – but most probably the average public merger price instead. In other words, the chance of realizing the same sort of advantage over a same-industry private target should be somewhat lower. Furthermore, even if there were

potential gains to overvaluation, it is not clear that a potential bidder would find it ex-ante

profitable to go in search of a suitable target firm, since the search costs and information

asymmetries are greater for private firms. Given the lack of an informational environment, it

is likely that the deal intermediaries (such as investment banks) play a more important role in

the matching of firms. However, while it is entirely likely that their role may be value-

destroying in general, as described in connection with the agency cost perspective below, it

seems less likely that they could present and sustain opportunities to take advantage of stock

mispricing. In Shleifer & Vishny 2003, the focus is shifted towards target managers'

incentives to accept a bloated bid, since the acquirer and target manager are assumed to be

fully knowledgeable. Like public target managers, private target managers may also accept an

overvalued stock offer if it provides a private gain through a favourable realization of his/her

own target stock holdings, a substantial payout, or alternatively, an improved job position

within the continuing firm. While these private gains could well match that of a public bidder

offer, we argue that the active ownership implied by the large private shareholders allows the

target manager much less discretionary control over a private firm. It is also more likely that

private firms have an owner-manager.

In addition, private bidders have a similar distaste for stock payment, since it can contribute to

a significant control loss for large shareholders. This has been confirmed empirically by

Faccio & Masulis 2005.

The above argumentation on private target incentives is trivially applied to publicly held firms

purchasing privately held targets. From the viewpoint of the public bidder, a private target

requires a more extensive search than public targets, and therefore, it is ceteris paribus less

probable that a public firm manager would attempt and succeed in taking advantage of public targets. Floegel, Gebkin & Johanning 2005 provides US evidence that private bidders are purchased lately in industry merger waves.

In relation to Jensen's agency costs of overvaluation, ownership structure is the key issue. Numerous studies imply that agency costs in general are higher in large, publicly held firms due to the increased monitoring of larger shareholders in smaller, private firms. It is also likely that large shareholders have a much longer investment horizon than that of public firm shareholders, leading them to discourage quick growth 'fixes' such as acquisitions. The lack of a 'naïve' stock market which demands the accomplishment of short and medium term growth estimates (Jensen 2004) is also a significant factor. Altogether this means that private shareholders are less likely to crave short term growth, and that the large-shareholder-dominated board is less likely to condone it. On the other hand, we could argue that the significant role of deal intermediaries in company strategy – especially in times of business prosperity – may in fact lead to the maintaining of some overvaluation effects. Specifically, the intermediaries' role strengthens the institutional effects within the individual industry and the economy (Auster & Sirower 2002). Intermediaries and media coverage etc. legitimize growth through acquisitions, which leads private firm boards and shareholders to view these strategies more favourably. Hence, it is likely that the agency costs of overvaluation affect private firms to some degree, although we would still expect these costs to be somewhat lower compared with public firms.

In summary, our baseline expectation is that the synergistic rationales, caused by economic shocks, explain industry merger waves of private firms, whereas it is likely that publicly held firms are influenced by the behavioural factors.

4. The timing of industry merger waves

We mentioned above that recent evidence shows that aggregate merger waves have a strong industry merger wave. Therefore, we analyse the cause of industry merger waves. In the sense that the variables related to behavioural issues move at an aggregate level, it will become prevalent in our industry level data.

4.1 The European merger wave sample

Our sample covers completed, control shifting transactions from January 1st, 1995 to December 31st, 2004 involving a country from the EU-15 (obtained from the SDC Platinum database) – a sample of 23.157 mergers. We drop observations relating to newly created joint ventures, mutual fund activity and government mergers. Unlike previous studies, we maintain both public and private mergers regardless of transaction size[5].

We define 47 industry groups (from hereon: industries) on the basis of SIC codes, using the Fama & French 1997 definitions[6]. To allocate merger activity to these industries, we use a procedure which takes into consideration the use of pyramidal ownership structures in the EU.

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[5] Excluding deals without a reported value would remove approx. 56% of our sample. If we were to exclude deals below a value of $50 million (as in Harford 2005), only 17% of our sample would remain. The removable of deals without a reported value and a transaction size below $50 million would impact the number of private mergers much harder than mergers involving public firms (roughly 78% of transactions above $50 million involve a public acquirer or target), which is probably due to the smaller size of private firms and their lower informational requirements.
[6] There are initially 48 industry groups relating to non-governmental corporations – we remove the 'Miscellaneous' industry, as it serves as a residual industry.

Specifically, we need to take into account those instances in which a higher level legal entity engages in activity on the part of a lower-level firm. Therefore, we construct a three-level procedure. Firstly, if the primary industries of the acquirer and target firm match up, we allocate this as a merger within the shared industries. If this is not the case, we compare the secondary industries of the acquirer with the primary industries of the target, allocating the merger to the shared industries if there is a match. Lastly, we compare the secondary industries of the firms, allocating the merger to the industries in which we find the most overlaps, if any. If there is no match on either level, we define the merger as unrelated and allocate it to both the industry of the acquirer and the target.

4.2 Identifying merger waves

Following Harford 2005, we define a potential industry merger wave as the highest 24-month concentration of merger activity within our 10 year sample. We then use the simulation method in Harford 2005 to ascertain whether these merger waves are statistically significant. Specifically, we simulate 1000 distributions of the actual number of mergers within each industry in the 10 year period, and determine the highest 24-month concentration of activity in each simulation. This leaves us with 1000 simulated industry merger waves for each industry. For each potential industry merger wave, we then compare the 95th percentile of the 1000 *simulated* 24-month concentrations of industry merger activity with the *actual* 24-month concentration. We carry out this procedure on the full sample, the sample of public firm mergers and the private firm sample.

4.3 Differences between private and public ownership

Tables 1a-c show the placement and significance of the potential waves for each industry. Significant industry merger waves are depicted for whole, private and public samples (table 1a), followed by depictions of the potential and significant merger waves of the private and public firm sample respectively (tables 1b-c). There are 35 significant waves in the whole sample, and 25 and 26 in the private and public samples respectively.

< Insert tables 1a-c here >

Interestingly, the private and public waves are only simultaneously significant on 9 occasions. If we observe the potential industry merger waves in these sub-samples, we see that there are obvious differences in many industries. While the mean industry difference is quite low, there is substantial variation around this mean. Homogeneity tests confirm that the three sub-samples are all significantly different from each other (χ^2 probabilities < 0,001).

In all, we find differences between samples that cannot be dismissed as lagged, aggregate effects. In the following sections, we will test whether these differences can be attributed to the varying influence of synergistic and behavioural factors.

5. Empirical predictions

5.1 Hypotheses

The propositions in the literature introduced in section 3 can be summarized as follows: The economic shock view advocates that industry merger waves will be more likely when economic industry shocks are larger (Mitchell & Mulherin 1996), and when capital liquidity is loose compared to tight (Harford 2005). However, periods of low capital liquidity will incapacitate the industry's ability to adjust to industry shocks through mergers (Harford 2005), thereby making the occurrence of an industry merge wave independent of the combined economic shock.

The market driven view postulates that stock market levels, as well as the intra-industry dispersion of these are correlated with the timing of industry waves (Shleifer & Vishny 2003, Rhodes-Kropf & Viswanathan 2004). On the other hand, the agency costs perspective links industry merger waves to declining industry growth rates during periods of prolonged overvaluation (Jensen 2004).

5.2 Predictive variables

5.2.1 Economic shocks

Our economic shock data is retrieved from the Bureau van Dijk AMADEUS database, which contains accounting data on all active and inactive private and publicly held firms dating at least back to 1990. However, AMADEUS does not offer accounting data on banks and financial services firms, so we drop the Bank industry from our analyses. Each firm-year

accounting observation is assigned to one of the remaining 46 industry groups based on their

primary SIC code, giving us approx. 1,4 million industry memberships[7].

In defining our measures of economic industry shocks, we take into consideration the

proliferation of the pyramidal corporation structure. Instead of relying on the accounting data

in the consolidated accounts, we use the unconsolidated accounts of the firm[8]. These firms are

mainly single business entities, and their accounting numbers provide precise data on the

fundamental economics of the industry.

We construct 6 accounting measures variables – cash flow margin, return on assets, sales

growth, employee growth, asset turnover and capital expenditures[9]. Calculating the absolute

change in each of these variables from period t-1 to t, we define our economic shock variables

as the medians of these changes within each industry population of firms. In the accounting

variables which follow, we therefore also restrict our focus to the operations. Unlike Harford

2005, the profitability measures use the profits from operations to avoid the influence of other

lower or higher level companies in the firm pyramid. Following Harford 2005, we define a

combined economic industry shock variable that encompasses the variation of the above 6

shock variables. Specifically, we calculate the first principal component of the covariance

matrix, and create a linear combination of the shock variables using the weights of the

principle component. This measure captures roughly 80% of the variation in the variables.

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[7] Some firms change their industry membership within the period – this means that they will be counted once per industry membership.
[8] We limit our accounting sample to firms with more than 50 employees in at least one year within the period 1992-2005
[9] Harford 2005 includes data on research and development expenses, which is rarely reported by private firms and hence, not reported by AMADEUS. We therefore exempt this shock variable.

5.2.2 The ease of financing

We implement the capital liquidity factor pioneered by Harford 2005 – the spread between the average interest rate on commercial and industrial loans and the central bank rate – which supposedly captures the 'ease of financing' within an economy. When the measure is high, it means that capital liquidity is low, i.e. financing is expensive.

The measure is not trivially operationalized for the EU-15 countries. In fact, a commercial bank lending rate similar in purpose to the average lending rate on commercial and industrial loans published by the Federal Reserve was only initiated in January 2003 upon the successful implementation of the harmonization of interest rate statistics[10]. For 2003-2005, we construct a GDP-weighted average bank lending rate given the rates for the Eurozone and the 3 non-Euro countries. Pre-2003, we substitute the Eurozone rate for a synthetic version constructed by Datastream.

With regards to the central bank rate, we use a GDP-weighted average of the ECB marginal lending rate and the rates offered by the UK, Danish and Swedish national banks (available from www.eurostat.com). For the years prior to the inception of the Euro – i.e. post-1999 – we simply construct a weighted average of all national banks' marginal lending rates, readjusting the weighting in the few places where Eurostat displays missing values.

The changes in interest rate definitions will invariably create some noise in the capital liquidity proxy. Figure 2 below shows the relationship between aggregate EU-15 merger activity, the EU-15 market-to-book ratio and the rate spread. The rate spread has been

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[10] These rates are collected from appointed *monetary financial institutions (MFIs)* to be used in future ECB monetary policy analyses (Christoffersen & Jakobsen 2003 among others).

mirrored at the vertical axis and all values have been raised by the value of the highest

observation (2,39% in 1996). While it is clearly more volatile than the market to book ratio,

there seems to be a co-movement with EU-15 merger activity (the correlation is only -12,3%,

but the correlation of the absolute changes is -52,8%).

< Insert Figure 2 here >

5.2.3 Valuation factors

We retrieved stock data for all active and inactive publicly held firms 1989-2005 from

Datastream and allocate each firm year to the industry of its primary SIC code. Having

removing those firm industry memberships which provide less than 3 consecutive years of

data, we are left with 4.859 firm industry memberships. Our stock market variables are the

industry median 1 and 3 year stock returns, the median market-to-book ratio at the year end,

and the intra-industry standard deviations of these series for each industry group. However, in

light of the results of Rhodes-Kropf & Viswanathan 2005, we also include their industry time-

series error variable (specifically, the second of their 3 valuation models) as an industry

overvaluation variable. We use the fitted values technique described in their paper to calculate

the cross-sectional and time-series valuation error for each firm year. The valuation errors are

calculated on the basis of 12 sectors (as defined by Fama & French[11]). Having achieved cross-

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[11] The sectors are 'Consumer nondurables', 'Consumer durables', 'Manufacturing', 'Energy', 'Chemicals', 'Computers, software etc.', 'Telephone and TV', 'Utilities', 'Wholesale', 'Medical', 'Finance', 'Everything else' (definitions are available on http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

sectional and valuation errors for all firm years, we define the industry times series error (defined by our 46 industry groups) as the average firm times series error in a given industry.

To test Jensen's overvaluation theory, we use the product of short-term (1 year) ex-ante industry growth and ex-ante stock returns.

Some industries have very few public firms. We exclude industries having less than 5 firms providing stock return data in a sample year, which means that we drop 'Coal', 'Ships', 'Defs', and 'Gold' industry groups.

6. Empirical results

This section provides evidence on which ex-ante synergistic and behavioural factors which can explain the timing of private and public industry merger waves.

For all predictive variables, we rank each industry year into quartiles, and then calculate the mean quartile rank of the years preceding industry merger waves. Table 2 provides the mean rank value of the predictive variables preceding an industry merger wave observation for each sub-sample, as well as for the whole sample.

< Insert Table 2 here >

The private merger waves are preceded by statistically significant high values of the individual economic shock variables, as well as the economic shock index itself. Notably, all economic shocks – related to profitability, sales and investment intensity – are above 3. The corresponding rank values concerning the public waves are considerably lower and much less significant. While the efficiency and profitability measures are significantly above 2,5, sales growth and employee growth are insignificant. Employee growth is even below 2,5. While the combined economic shock is significantly high for the private firm sample (3,17), it is insignificant for the public firm sample at 2,78. Hence, both the individual and combined shocks have a lower influence on public firm merger waves.

Both versions of the agency factor are all insignificant, though the mean rank values are below 2,5 as expected for the public firm sample. The interaction between industry growth and the industry times-series error is weakly significant at ca. 13%. Regarding the classic market driven factor – the market-to-book-ratio – it is above 2,5 in both sub-samples. However, while it is only marginally so for the private firm sample, it is very high (and significant) in the public firm sample, in which it is 3,22. Turning to the stock returns, we see that both 1 year and 3 year stock returns are significantly higher preceding public firm merger waves – especially the 1 year returns (at 3,09). Interestingly, the 1 year stock returns are below 2,5 for private merger waves, but neither the 1 or 3 year returns are significant. While the standard deviations of the 1 and 3 year stock returns are less significant for the public firm sample, they are surprisingly high in the private merger sample, especially the deviation of the 3 year returns. Despite the significance of the other overvaluation measures, the time series error is insignificant in both samples, albeit being above 2,5.

The marked differences in the sign and significance of the market-driven variables between two sub-samples are also evident in the mean rank of the capital liquidity factor. Whereas it is below 2,5 for the private firm sample (as expected) – but insignificant – it is very high for the public firm sample (3,26). The latter goes counter to the economic shock theory, which argues that capital liquidity is a necessary condition to facilitate the reorganization of industry assets through M&A. However, in the case that public firms are driven by overvaluation theories, it is clear that the capital liquidity variable is of no (or at least less) importance. Therefore, this further cements our public firm evidence in favour of the behavioural theories, especially the market driven view.

On the public firm merger wave of the 80s and 90s, Harford 2005 conducts that same tests on the mean rank values and finds result similar to our European public firm sample. However, we find a much higher significance for the 1 and 3 year stock returns, whereas he finds stronger evidence for the economic shock factors.

The mean rank values for the whole sample are mostly similar to the private firm sample – especially regarding the economic shock factors – which confirms that the remaining activity (such as private/public, public/private and deals involving subsidiaries) can be explained by the economic shock view. However, the 3 years stock returns and the market to book ratio are significantly higher than 2,5, implying that stock market levels at least have an indirect effect, if not a more comprehensive one. As regards the market to book ratio, however, we can argue that it serves as a proxy for industry growth opportunities. Therefore, it can be seen as both a behavioural and synergistic factor, and we should not be that surprised at its persistent effect.

The capital liquidity factor is neutral, which is surprising, but this is most probably due to the influence of its high rank value in the public firm sample.

In all, these results confirm our theoretical predictions and the initial statistics on merger wave timing in section 4. It is clear that the difference in timing (and significance) of private firm and public firm merger waves is caused by a deeply rooted difference in the driving forces. While the immediate correlation between aggregate merger wave activity and the market to book ratio seemed to indicate that the entire merger wave was timed according to stock market levels, our industry level analysis has exposed these differences between the timing and cause of private firm and public firm industry merger waves.

7. Conclusion

By analyzing the timing of private firm and public firm industry merger waves we have uncovered significant differences between the two types of merger waves. In fact, they make up two distinct components of the European merger wave of the 90s. Specifically, we conclude that economic shocks explain the clustering of private firm merger waves. This implies that these merger waves are fundamentally driven by the existence of synergistic gains caused by shifts in industry economics. Conversely, we conclude that public firm mergers are most heavily influenced by measures of stock market overvaluation, signifying that these mergers are caused by the market timing of acquisitions by public acquirers. Our evidence also shows that it is much less likely that agency costs related to stock market overvaluation are at play in either sub-sample, or in the whole economy in general.

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Figure 1: Completed merger activity and the average market-to-book ratio 1991-2005
Merger activity is sampled from the Thomson Financial SDC Platinum database, and contains all completed control-shifting transactions, though not newly created joint ventures, mutual fund activity and government mergers. Mergers are maintained regardless of transaction size, and they are allocated to the year of the announcement date. Following the later use of industry median market-to-book values in our empirical investigation, this measure is defined as the yearly average of those values, lagged one period.

Figure 2: Merger activity, the average market-to-book ratio, and capital liquidity 1991-2005
Merger activity and the market to book ratio are defined as in figure 1. The rate spread is the yearly average of monthly interest rates on commercial and industrial loans less the central bank rate, calculated as the GDP-weighted average across EU-15 countries. In this graph, the rate spread has been mirrored at the vertical axis and all values have been raised by the value of the highest observation (2,39% in 1996). Hence, the 1996 value is zero. Both the market-to-book ratio and the inverted rate spread use the right y-axis, but their axis values indicate percentages for the latter.

Table 1a: The timing of statistically significant industry merger waves within the EU-15 1995-2004
Industry merger waves and their statistical significance are defined in section 4.2. Significant industry merger waves are depicted for the whole sample and the private firm and public firm sub-samples. The black rectangles signify significant waves in the full sample, while the dark and light greys signify private firm and public firm significant waves respectively. The four columns on the right note the specific starting and ending point of the potential industry merger waves, whether this wave exceeds the 95% cut-off or not, and lastly, the number of mergers within the entire period.

Industry	Sample	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	Merger start	Merger end	95% s.s.	# Mergers
Aero	All											Jun/95	Jun/97	Y	68
	Private-private											Apr/95	Apr/97	Y	4
	Public-public											Jun/99	Jun/01	N	6
Agric	All											Feb/00	Feb/02	N	102
	Private-private											Oct/99	Oct/01	Y	33
	Public-public											Jan/03	Jan/05	N	4
Autos	All											Jan/99	Jan/01	Y	273
	Private-private											Aug/97	Aug/99	N	29
	Public-public											Apr/97	Apr/99	Y	34
Bank	All											Mar/99	Mar/01	Y	993
	Private-private											Mar/99	Mar/01	Y	141
	Public-public											Mar/99	Mar/01	Y	169
Beer	All											Feb/99	Feb/01	N	231
	Private-private											Jan/01	Jan/03	N	37
	Public-public											Aug/00	Aug/02	N	28
BldMt	All											Jun/98	Jun/00	Y	689
	Private-private											Oct/99	Oct/01	N	98
	Public-public											Jun/98	Jun/00	Y	72
Books	All											Jul/99	Jul/01	Y	580
	Private-private											Jul/96	Jul/98	Y	136
	Public-public											Apr/99	Apr/01	Y	24
Boxes	All											May/95	May/97	Y	71
	Private-private											Nov/96	Nov/98	Y	14
	Public-public											Jul/98	Jul/00	N	6
BusSv	All											Jul/99	Jul/01	Y	3965
	Private-private											Dec/99	Dec/01	Y	676
	Public-public											Nov/99	Nov/01	Y	257
Chems	All											May/97	May/99	Y	366
	Private-private											Sep/96	Sep/98	N	31
	Public-public											Aug/97	Aug/99	Y	37
Chips	All											Jun/99	Jun/01	Y	441
	Private-private											Mar/00	Mar/02	N	38
	Public-public											Dec/98	Dec/00	Y	44
Clths	All											Nov/99	Nov/01	Y	113
	Private-private											Mar/00	Mar/02	N	30
	Public-public											Apr/00	Apr/02	N	11
Cnstr	All											Dec/98	Dec/00	Y	474
	Private-private											Mar/95	Mar/97	Y	59
	Public-public											Mar/99	Mar/01	Y	51
Coal	All											Mar/95	Mar/97	Y	27
	Private-private											May/95	May/97	Y	14
	Public-public											Jan/03	Jan/05	Y	1
Comps	All											Jan/99	Jan/01	Y	215
	Private-private											Sep/99	Sep/01	Y	20
	Public-public											Jun/00	Jun/02	N	23

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Table 1a: The timing of statistically significant industry merger waves within the EU-15 1995-2004 (continued – page 2)

Industry	Type	Start	End	Sig	N
Defs	All	Mar/98	Mar/00	N	21
	Private-private	Jan/01	Jan/03	N	3
	Public-public	Jan/03	Jan/05	N	0
Drugs	All	May/99	May/01	N	268
	Private-private	Jan/03	Jan/05	N	34
	Public-public	Dec/98	Dec/00	Y	55
ElcEq	All	Sep/99	Sep/01	N	203
	Private-private	Feb/01	Feb/03	N	21
	Public-public	Jun/00	Jun/02	N	26
Enrgy	All	Mar/96	Mar/98	N	268
	Private-private	Jan/99	Jan/01	Y	6
	Public-public	Dec/97	Dec/99	Y	43
Entmt	All	May/99	May/01	Y	394
	Private-private	May/99	May/01	Y	65
	Public-public	Oct/00	Oct/02	N	30
FabPr	All	Oct/98	Oct/00	N	73
	Private-private	May/99	May/01	Y	12
	Public-public	May/00	May/02	Y	4
Fin	All	Jun/99	Jun/01	Y	4435
	Private-private	Sep/99	Sep/01	Y	1067
	Public-public	Dec/98	Dec/00	Y	161
Food	All	Feb/99	Feb/01	Y	447
	Private-private	Jun/99	Jun/01	Y	109
	Public-public	Feb/99	Feb/01	Y	42
Gold	All	Sep/02	Sep/04	Y	32
	Private-private	Jan/03	Jan/05	N	0
	Public-public	Jan/03	Jan/05	N	8
Hlth	All	Apr/00	Apr/02	N	118
	Private-private	Aug/97	Aug/99	N	19
	Public-public	Sep/96	Sep/98	Y	9
Hshld	All	Sep/99	Sep/01	Y	318
	Private-private	Sep/99	Sep/01	N	45
	Public-public	Feb/98	Feb/00	N	39
Insur	All	Feb/96	Feb/98	Y	610
	Private-private	Jul/99	Jul/01	N	85
	Public-public	Oct/96	Oct/98	Y	71
LabEq	All	Oct/99	Oct/01	N	158
	Private-private	Oct/99	Oct/01	N	19
	Public-public	Jan/99	Jan/01	N	18
Mach	All	Mar/95	Mar/97	Y	617
	Private-private	Feb/99	Feb/01	Y	82
	Public-public	Jul/99	Jul/01	Y	42
Meals	All	Dec/98	Dec/00	Y	292
	Private-private	Mar/99	Mar/01	N	45
	Public-public	Jul/99	Jul/01	Y	40
MedEq	All	Dec/99	Dec/01	Y	145
	Private-private	May/01	May/03	Y	18
	Public-public	May/99	May/01	Y	28
Mines	All	Sep/99	Sep/01	N	87
	Private-private	Jan/99	Jan/01	Y	10
	Public-public	Oct/98	Oct/00	N	14

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Table 1a: The timing of statistically significant industry merger waves within the EU-15 1995-2004 (continued – page 3)

Industry	Type	Start	End	Sig	N
Misc	All	Mar/95	Mar/97	N	58
	Private-private	Feb/99	Feb/01	N	5
	Public-public	Jan/03	Jan/05	N	2
Paper	All	Mar/99	Mar/01	Y	278
	Private-private	Mar/99	Mar/01	Y	37
	Public-public	Jul/97	Jul/99	N	29
PerSv	All	Aug/98	Aug/00	Y	291
	Private-private	Jan/98	Jan/00	Y	182
	Public-public	May/98	May/00	N	5
Rlest	All	Feb/99	Feb/01	Y	477
	Private-private	Sep/99	Sep/01	N	68
	Public-public	Aug/97	Aug/99	Y	79
Rtail	All	Jan/99	Jan/01	Y	570
	Private-private	Dec/99	Dec/01	N	107
	Public-public	Jul/97	Jul/99	Y	55
Rubbr	All	Sep/98	Sep/00	Y	167
	Private-private	Dec/98	Dec/00	Y	22
	Public-public	Oct/99	Oct/01	N	11
Ships	All	Mar/95	Mar/97	Y	35
	Private-private	Mar/00	Mar/02	N	5
	Public-public	Sep/97	Sep/99	Y	1
Smoke	All	Dec/98	Dec/00	N	33
	Private-private	Jan/03	Jan/05	N	0
	Public-public	Aug/99	Aug/01	Y	6
Soda	All	Jan/97	Jan/99	Y	122
	Private-private	Sep/96	Sep/98	N	18
	Public-public	Sep/98	Sep/00	N	8
Steel	All	Sep/98	Sep/00	Y	272
	Private-private	Apr/01	Apr/03	N	35
	Public-public	Nov/97	Nov/99	N	37
Telcm	All	Aug/99	Aug/01	Y	729
	Private-private	Sep/99	Sep/01	Y	76
	Public-public	Dec/98	Dec/00	Y	68
Toys	All	Mar/95	Mar/97	N	108
	Private-private	Feb/00	Feb/02	Y	18
	Public-public	May/99	May/01	N	9
Trans	All	Sep/99	Sep/01	Y	887
	Private-private	Sep/00	Sep/02	N	129
	Public-public	Jul/99	Jul/01	N	43
Txtls	All	Mar/98	Mar/00	Y	166
	Private-private	Feb/99	Feb/01	Y	35
	Public-public	Jun/98	Jun/00	N	21
Util	All	Aug/99	Aug/01	Y	721
	Private-private	Sep/95	Sep/97	Y	59
	Public-public	Mar/98	Mar/00	Y	68
Whsl	All	Sep/98	Sep/00	Y	1125
	Private-private	Aug/99	Aug/01	Y	206
	Public-public	Apr/98	Apr/00	Y	59

Table 1b: The timing of statistically significant private firm industry merger waves within the EU-15 1995-2004

Industry merger waves and their statistical significance are defined in section 4.2. Significant industry merger waves are depicted for the whole sample and the private firm and public firm sub-samples. The black rectangles signify significant waves in the full sample, while the dark and light greys signify private firm and public firm significant waves respectively. The four columns on the right note the specific starting and ending point of the potential industry merger waves, whether this wave exceeds the 95% cut-off or not, and lastly, the number of mergers within the entire period.

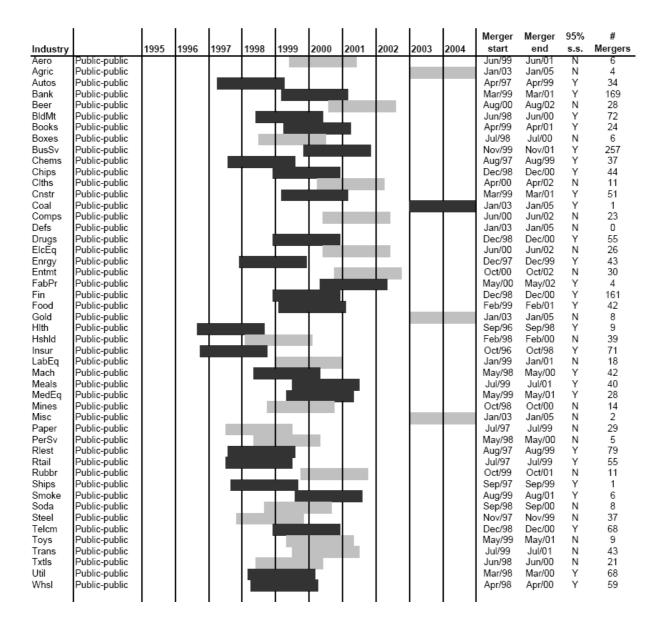| Industry	Sample	Merger start	Merger end	95% s.s.	# Mergers
Aero	Private-private	Apr/95	Apr/97	Y	4
Agric	Private-private	Oct/99	Oct/01	Y	33
Autos	Private-private	Aug/97	Aug/99	N	29
Bank	Private-private	Mar/99	Mar/01	Y	141
Beer	Private-private	Jan/01	Jan/03	N	37
BldMt	Private-private	Oct/99	Oct/01	N	98
Books	Private-private	Jul/96	Jul/98	Y	136
Boxes	Private-private	Nov/96	Nov/98	Y	14
BusSv	Private-private	Dec/99	Dec/01	Y	676
Chems	Private-private	Sep/96	Sep/98	N	31
Chips	Private-private	Mar/00	Mar/02	N	38
Clths	Private-private	Mar/00	Mar/02	N	30
Cnstr	Private-private	Mar/95	Mar/97	Y	59
Coal	Private-private	May/95	May/97	Y	14
Comps	Private-private	Sep/99	Sep/01	Y	20
Defs	Private-private	Jan/01	Jan/03	N	3
Drugs	Private-private	Jan/03	Jan/05	N	34
ElcEq	Private-private	Feb/01	Feb/03	N	21
Enrgy	Private-private	Jan/99	Jan/01	Y	6
Entmt	Private-private	May/99	May/01	Y	65
FabPr	Private-private	May/99	May/01	Y	12
Fin	Private-private	Sep/99	Sep/01	Y	1067
Food	Private-private	Jun/99	Jun/01	Y	109
Gold	Private-private	Jan/03	Jan/05	N	0
Hlth	Private-private	Aug/97	Aug/99	N	19
Hshld	Private-private	Sep/99	Sep/01	N	45
Insur	Private-private	Jul/99	Jul/01	N	85
LabEq	Private-private	Oct/99	Oct/01	N	19
Mach	Private-private	Feb/99	Feb/01	Y	82
Meals	Private-private	Mar/99	Mar/01	N	45
MedEq	Private-private	May/01	May/03	Y	18
Mines	Private-private	Jan/99	Jan/01	Y	10
Misc	Private-private	Feb/99	Feb/01	N	5
Paper	Private-private	Mar/99	Mar/01	Y	37
PerSv	Private-private	Jan/98	Jan/00	Y	182
Rlest	Private-private	Sep/99	Sep/01	N	68
Rtail	Private-private	Dec/99	Dec/01	N	107
Rubbr	Private-private	Dec/98	Dec/00	Y	22
Ships	Private-private	Mar/00	Mar/02	N	5
Smoke	Private-private	Jan/03	Jan/05	N	0
Soda	Private-private	Sep/96	Sep/98	N	18
Steel	Private-private	Apr/01	Apr/03	N	35
Telcm	Private-private	Sep/99	Sep/01	Y	76
Toys	Private-private	Feb/00	Feb/02	Y	18
Trans	Private-private	Sep/00	Sep/02	N	129
Txtls	Private-private	Feb/99	Feb/01	Y	35
Util	Private-private	Sep/95	Sep/97	Y	59
Whsl	Private-private	Aug/99	Aug/01	Y	206

Table 1c: The timing of statistically significant public firm industry merger waves within the EU-15 1995-2004

Industry merger waves and their statistical significance are defined in section 4.2. Significant industry merger waves are depicted for the whole sample and the private firm and public firm sub-samples. The black rectangles signify significant waves in the full sample, while the dark and light greys signify private firm and public firm significant waves respectively. The four columns on the right note the specific starting and ending point of the potential industry merger waves, whether this wave exceeds the 95% cut-off or not, and lastly, the number of mergers within the entire period.

Industry		Merger start	Merger end	95% s.s.	# Mergers
Aero	Public-public	Jun/99	Jun/01	N	6
Agric	Public-public	Jan/03	Jan/05	N	4
Autos	Public-public	Apr/97	Apr/99	Y	34
Bank	Public-public	Mar/99	Mar/01	Y	169
Beer	Public-public	Aug/00	Aug/02	N	28
BldMt	Public-public	Jun/98	Jun/00	Y	72
Books	Public-public	Apr/99	Apr/01	Y	24
Boxes	Public-public	Jul/98	Jul/00	N	6
BusSv	Public-public	Nov/99	Nov/01	Y	257
Chems	Public-public	Aug/97	Aug/99	Y	37
Chips	Public-public	Dec/98	Dec/00	Y	44
Clths	Public-public	Apr/00	Apr/02	N	11
Cnstr	Public-public	Mar/99	Mar/01	Y	51
Coal	Public-public	Jan/03	Jan/05	Y	1
Comps	Public-public	Jun/00	Jun/02	N	23
Defs	Public-public	Jan/03	Jan/05	N	0
Drugs	Public-public	Dec/98	Dec/00	Y	55
ElcEq	Public-public	Jun/00	Jun/02	N	26
Enrgy	Public-public	Dec/97	Dec/99	Y	43
Entmt	Public-public	Oct/00	Oct/02	N	30
FabPr	Public-public	May/00	May/02	Y	4
Fin	Public-public	Dec/98	Dec/00	Y	161
Food	Public-public	Feb/99	Feb/01	Y	42
Gold	Public-public	Jan/03	Jan/05	N	8
Hlth	Public-public	Sep/96	Sep/98	Y	9
Hshld	Public-public	Feb/98	Feb/00	N	39
Insur	Public-public	Oct/96	Oct/98	Y	71
LabEq	Public-public	Jan/99	Jan/01	N	18
Mach	Public-public	May/98	May/00	Y	42
Meals	Public-public	Jul/99	Jul/01	Y	40
MedEq	Public-public	May/99	May/01	Y	28
Mines	Public-public	Oct/98	Oct/00	N	14
Misc	Public-public	Jan/03	Jan/05	N	2
Paper	Public-public	Jul/97	Jul/99	N	29
PerSv	Public-public	May/98	May/00	N	5
Rlest	Public-public	Aug/97	Aug/99	Y	79
Rtail	Public-public	Jul/97	Jul/99	Y	55
Rubbr	Public-public	Oct/99	Oct/01	N	11
Ships	Public-public	Sep/97	Sep/99	Y	1
Smoke	Public-public	Aug/99	Aug/01	Y	6
Soda	Public-public	Sep/98	Sep/00	N	8
Steel	Public-public	Nov/97	Nov/99	N	37
Telcm	Public-public	Dec/98	Dec/00	Y	68
Toys	Public-public	May/99	May/01	N	9
Trans	Public-public	Jul/99	Jul/01	N	43
Txtls	Public-public	Jun/98	Jun/00	N	21
Util	Public-public	Mar/98	Mar/00	Y	68
Whsl	Public-public	Apr/98	Apr/00	Y	59

Table 2: Mean rank values of the predictive variables preceding significant industry merger waves within the EU-15 1995-2004

Mean rank values (with significance in brackets) are reported for the whole sample and the sub-samples. Ranks are based on quartiles constructed using the sample times series of each variable. Significance is based on the t-test of the null hypothesis that mean rank = 2,5.

Variables	Definition	Mean rank: Private firms	Mean rank: Public firms	Mean rank: All firms
Economic shock	(All median absolute changes)			
Cash flow margin	Operational profit$_t$ / Sales$_t$	3,39*** (<0,001)	2,96* (0,052)	3,39*** (<0,001)
Asset turnover	Sales$_t$ / Total assets$_{t-1}$	3,08*** (0,003)	2,91** (0,049)	3,19*** (<0,001)
Return on assets	Operational profit$_t$ / Total assets$_t$	3,17*** (<0,001)	2,91** (0,049)	3,26*** (<0,001)
Employee growth	(No. of employees$_t$ – No. of employees$_{t-1}$) / No. of employees$_{t-1}$	3,00*** (0,007)	2,48 (0,929)	3,00*** (0,002)
Sales growth	(Sales$_t$ – Sales$_{t-1}$) / Sales$_{t-1}$	3,22*** (<0,001)	2,83 (0,159)	3,42*** (<0,001)
Cap. expenditures	Capital expenditures$_t$ / Total assets$_{t-1}$	3,31*** (<0,001)	2,70 (0,322)	3,26*** (<0,001)
Economic shock index	First principal component of L_CFM, L_ROA, L_EMPG, L_ASTO, L_SG	3,17*** (<0,001)	2,78 (0,225)	3,32*** (<0,001)
Capital liquidity	Average rate on commercial and industrial loans - the central bank rate	2,35 (0,390)	3,26*** (0,002)	2,51 (0,240)
Market driven				
1 year returns	Median industry 1- year cumulative returns	2,35 (0,519)	3,09*** (0,007)	2,71 (0,284)
3 year returns	Median industry 3-year cumulative returns	2,78 (0,188)	2,87* (0,054)	3,13*** (<0,001)
Dispersion in 1 year returns	Intra-industry dispersion of the 1-year cumulative returns	2,96* (0,061)	2,22* (0,079)	2,81 (0,103)
Dispersion in 3 year returns	Intra-industry dispersion of the 3-year cumulative returns	3,26*** (0,002)	2,58 (0,225)	2,97** (0,013)
Market to book	Market capitalization$_{t-1}$ to Shareholder Equity$_{t-1}$	2,61 (0,646)	3,22*** (<0,001)	3,23*** (<0,001)
Dispersion in market to book	Intra-industry dispersion in market-to-book values	2,52 (0,924)	2,78 (0,207)	2,58 (0,665)
Industry time series error	Version 2 of the time series error in Rhodes-Kropf et al 2005	2,65 (0,503)	2,74 (0,247)	2,71 (0,187)
Agency costs				
Agency_RKV	The product of SG and TSE	2,35 (0,485)	2,17 (0,126)	2,29 (0,255)
Agency_3YR	The product of SG and 3YR	2,57 (0,714)	2,30 (0,367)	2,48 (0,923)