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Contents

Introduction

This thesis analyses three economic aspects of mergers and acquisitions with empirical methods.

The first article is jointly written with Prof. Klaus Gugler and Prof. Dennis Mueller. A similar version has appeared as ZEW-discussion paper number 08-076 (Mannheim) under the same title. In this article, some different theories about the reasons for merger waves are discussed and then tested by hypotheses derived from those theories. It is not possible to align some of the theories with the wave pattern of mergers over time and with the observation from several studies that mergers are on average have a negative impact on profitability. These patterns and other derived hypotheses, though, can be confirmed when managerial discretion, imperfections in the valuation on the stock market, and over-optimism are allowed for.

Whereas the first article takes the observation of underperformance of merging firms as given, the second article takes up this issue. Other studies use comparison firms for merging firms often from the same country, or within a similar size group or from the same industries. But this article is to my knowledge the first one that implements the propensity score method to evaluate the effect of a merger. This is an improvement over existing studies as the counterfactual is clearer defined and selected with taking into account many possible factors and carefully balancing them. The findings are in line with other studies that mergers have a negative impact on firm performance, and show a tendency of even a larger negative effect than when traditional methods are applied. With higher negative effects being estimated, the theme of the first article is reinforced that merger wave explanations should allow for negative consequences for performance.

Finally, in the third article, which is jointly written with Prof. Klaus Gugler, current economic developments are picked up to analyse the important question of merger effects

from a different viewpoint. The second article relies on balance sheet data for the evaluation of performance. In this third article, we look at stock market prices of firms as a function of their mergers- and acquisitions-history. For the average M&A-expense undertaken in each of the five years prior to the economic crisis, there is a negative influence on the share price of the acquiring firm during the economic crisis, which is significantly different from the drop of non-acquiring firms. This can be interpreted as revelation of the corporate governance problems often inherent in firms that make acquisitions, evaluated by the market in the environment of the economic crisis, when investors refocus the evaluation of firms on fundamental values.

The Determinants of Merger Waves: An International Perspective

Co-authors: Klaus Gugler, Dennis C. Mueller

Mergers have been a topic of considerable interest in the United States for at least a century. Following the first great merger wave that began at the end of the 19th century, several studies tried to explain its causes and effects.[1] An "impelling force" behind the mergers was "a wave of frenzied speculation in asset values" (Markham, 1955). Perhaps unsurprisingly, therefore, the average merger during the wave proved to be unprofitable (Hogarty, 1970). Subsequent US merger waves have also coincided with strong stock market advances, and this pattern can be regarded as a major regularity in aggregate merger data.[2] Less consensus exists over whether mergers during subsequent waves have been profitable or not.[3]

Merger waves have also occurred in the United Kingdom.[4] Outside of the United States, the United Kingdom and a few other Anglo-Saxon countries little research has been done on mergers, and essentially no studies exist on whether merger waves also occur in non-Anglo-Saxon countries, and if so, whether their causes are the same as in the Anglo-Saxon countries. This paper seeks to fill this void by examining merger activity in the United States, the United Kingdom and Continental Europe over the period 1991-2004.

While much research has been done on the causes and effects of mergers, surprisingly little exists on the causes of *merger waves*. Recently, however, several theories have appeared that claim to account for merger waves. Two of these make the standard assumptions of neoclassical economics – managers maximize shareholder wealth, capital

[1] See, for example, Dewing (1921), National Industrial Conference Board (1929), Livermore (1935), and discussion in Markham (1955) and Hogarty (1970).

[2] Ralph Nelson (1959, 1966) was the first to document the link between merger activity and share prices, and numerous subsequent studies have confirmed this finding. See, for example, Melicher, Ledolter and D'Antonio (1983), Geroski (1984) for the US, and Geroski (1984) and Clarke and Ioannidis (1996) for the UK.

[3] One difficulty in answering this question arises, because most studies of mergers' effects on profits or shareholder wealth do not concentrate on mergers during wave years.

[4] See, Hannah and Kay (1977), Resende (1999) and Gärtner and Halbheer (2007).

markets are efficient.[5] The other theories might best be characterized, however, as *behavioral* in that they relax one or more of these standard assumptions.[6] The behavioral theories take into account the psychology of stock markets and, thus, give explanations for both why merger waves occur, and why they tend to coincide with stock market booms.

There is reason to expect that mergers may be less frequent in Continental Europe than in the United States and the United Kingdom, and that they may have different causes. Because of widely dispersed share ownership in the United States and the United Kingdom, a "market for corporate control" exists in both countries where one company can buy a majority of another company's shares and merge it into itself, even if the managers of the target company oppose the merger. In contrast, share ownership is much more concentrated in Continental Europe making it difficult for two companies to merge, if the major shareholders of one are opposed to the deal. This difference between institutions in Continental Europe and in Anglo-Saxon countries may lead to differences in both aggregate merger activity and its causes.

This article uses a natural way to discriminate between the effects of "real" changes in the economy, like technological advances, and the effects of pure stock market phenomena, like overvaluation, on merger activity, by looking at both, listed and unlisted acquirers. If real changes in the economy determine merger activity, as the neoclassical theories claim, we would expect that both types of firms are equally affected. Moreover, unlisted firms cannot be overvalued, at least not by the stock market, and they cannot trade their overvalued stocks for less overvalued stocks, as one of the behavioral theories argues. Thus, similar patterns in the two types of mergers are also inconsistent with this theory.

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[5] See, Jovanovic and Rousseau (2002); and Harford (2005). Rhodes-Kropf and Viswanathan (2005); and Shleifer and Vishny (2003).

[6] Rhodes-Kropf and Viswanathan (2004); Shleifer and Vishny (2003); and Gugler, Mueller and Yurtoglu (2007).

We present evidence that merger waves occurred in all three areas at the end of the 20th century – the USA, UK and Continental Europe. These waves were almost exclusively confined to companies listed on stock exchanges in all three areas, which gives support to the behavioral hypotheses' claim that merger waves are driven by stock market bubbles. We present regression results, which offer further support for these hypotheses.

The plan of the article is as follows. We first present evidence that merger waves did indeed occur in each of the three areas. In Section II, we review some hypotheses, which claim to explain merger waves. Section III presents regression results that are consistent with two behavioral theories of merger waves. Some conclusions are drawn in the final section.

I. The Pattern of Merger Activity, 1991-2004

A. Data Sources

The information on mergers comes from "Worldwide Mergers & Acquisitions," produced by Thomson Financial Securities Data (TFSD). It includes all corporate transactions involving at least 5 per cent of the ownership of a company with a transaction (deal) value of at least 1 million US dollars. Public and private transactions are covered. In total, for the period 1978 to June 2005, TFSD records 100,233 deals for the five European countries that we have examined: Austria, Germany, Italy, France and United Kingdom.

A necessary task was to combine the transactions with the financial data available from the Amadeus database from Bureau van Dijk. To this end, we applied an approximate string matching algorithm, matching via company names for each country. All of the automatic matches below a certain similarity threshold were checked manually, amounting to about 24,000 deals. We could match 52.6 per cent of all transactions to an Amadeus company. Data restrictions reduce the sample available for estimation considerably (see Table 1 below). Besides the financial data, we also used information on the largest

shareholder from Amadeus when available. To obtain financial information for the US sample, we combined TFSD data with the Global Vantage database (GV). GV contains financial information for listed companies. TFSD lists 193,015 US deals. Once again, the number of deals we could use was to a large extent predetermined by data restrictions. Table 1 shows the number of deals in TFSD, the share of deals matched and the reasons for reducing the number of deals as originally reported in TFSD.

A possible difficulty in constructing our sample is that we introduce a sample selection bias, because we cannot match all companies that merged to the Amadeus data. In particular, one worries that we might systematically under represent unlisted companies, because accounting data are less-readily available for them. To determine whether such a bias has been introduced, we ran a probit regression to see whether the probability of a match was related to whether the acquirer was listed or not. We also included in the equation the log of the acquirer's total assets, ln(A), the deal value to measure the target's size, D, a control variable to distinguish continental Europe from the UK, and year dummy variables. Ignoring the coefficients on the control variable for continental Europe and the year dummies, we obtained the following results (*t* statistics are under the coefficients):

$$\pi_m = \underset{0.47}{5.2 \cdot e^{-06}} D \; \underset{0.95}{-0.009} \ln(A) \; \underset{0.05}{-0.010} \text{List}, \qquad n = 4{,}263, \text{ pseudo } R^2 = 0.038$$

The probability of a match is insignificantly related to whether an acquirer was listed or not, and to the sizes of both the acquirer and target company. Our approach to matching companies in the two data bases does not seem to have introduced any sample selection bias. The reason is that Amadeus covers hundreds of thousands predominantly unlisted companies.

We calculate the price-earnings (P/E) ratio using GV. The result is a single number for every year (1991-2004) and every country in our sample (Austria, France, Germany, Italy, UK, USA). It was derived for all companies where data were available for a particular year

on the variables "income before extraordinary items" (inc) and "market value" (mv) (P/E=mv/inc). Each observation is calculated as a weighted sum of the individual P/E ratios, with market values as weights.

B. Merger Patterns

Figures 1-3 present the numbers of completed mergers and total deal values for the USA, UK and Continental Europe over the period 1991 to 2004. The numbers of mergers for each year are given along the left vertical axes, with total deal values along the right axes. Both represent the population of Mergers and Acquisitions that is included in the TFSD, i.e. prior to any selection for our estimation sample. It is readily apparent that all three areas experienced merger waves at the end of the 1990s.[7] Table 2 presents the numbers of domestic and cross-border mergers for the three areas. Waves in both types of mergers are again readily apparent.

The behavioral hypotheses discussed in the next section link merger waves to the psychology and optimism in the stock market. Figures 4-6 present the curves indicating the total deal values of acquisitions by listed and unlisted companies in each area, and weighted averages of company P/E ratios using company market values as weights. The time series are represented as indices to ease comparison between the groups. Once again, the deal values series are constructed from the TFSD population of M&A activity. Mergers by listed companies peak in all three areas near the peaks of the weighted average P/E ratios. *No* waves are visible for mergers by unlisted companies in the UK and Continental Europe, however, and only a small blip in acquisitions by unlisted firms occurred in the USA, and its peak lagged the peak for listed companies by about two years.

[7] Gärtner and Halbheer (2007) present econometric evidence establishing that the merger activity in the USA and UK at the end of the 1990s was indeed a wave – that is a statistically significant surge in mergers compared to earlier years.

That there was no wave for unlisted acquirers but only for listed acquirers is also evident in mean statistics. For example, the total of deal values of acquisitions by listed firms increases 4-fold (USA), 4.5-fold (UK) and 6(!)-fold for Continental Europe in wave as compared to non-wave years. This compares to only modest increases for unlisted firms. Moreover, if common shocks either to specific industries or to the whole economy were responsible for the observed wave pattern of merger activity, one would expect a large *correlation* between listed and unlisted firm merger activity *particularly during wave years* (since the common shock caused it). Table 3 presents evidence to the opposite. The correlation coefficients between (quarterly) listed and unlisted firm merger activity *decrease* in wave years, most markedly in the USA from 0.8 in non-wave years to 0.06 in wave years (UK: from 0.4 to 0.1; CE: from 0.24 to 0.2). Thus, there is a complete decoupling of merger activity between listed and unlisted acquirers during waves!

As we shall see in the next section, these patterns are inconsistent with the predictions of two neoclassical theories of merger waves, but are precisely what one anticipates from the behavioral hypotheses.

II. Theories of Merger Waves

In this section we discuss the main hypotheses that have been put forward to explain merger waves and whether or not they are consistent with the patterns of mergers presented in Section I. In the next section, we present regression results testing the different hypotheses. We first discuss two neoclassical theories of merger waves and then the behavioral theories.

A. The q-Theory of Mergers

Jovanovic and Rousseau (2002a) (hereafter J&R) extend the *q*-theory of investment to mergers, and claim that this extended *q*-theory can account for merger waves. They liken

mergers to the purchase of used plant and equipment, and argue that the gap between the *q*s of potential acquiring firms and targets increases at particular points – as during a stock market boom – and this widening difference leads managers to favor purchasing other firms over used capital equipment thus creating a merger wave.

Under the *q*-theory of *investment*, when a firm's return on its capital stock exceeds its cost of capital, $q > 1$, and it expands its capital stock. A straightforward extension of the theory to mergers would imply that firms with *q*s > 1 can profitably expand by acquiring assets either in the form of capital investment or other firms.[8] Since q measures returns on a firm's *existing* assets, it would seem that the *q*-theory would only allow one to explain *horizontal* mergers, i.e., additions to existing capital stock.

An alternative interpretation of the *q*-theory would be that $q > 1$ does not necessarily imply that a firm can profitably expand by acquiring more assets in its base industry, but that it is well managed and could profitably expand in any direction.[9] Tobin's q under this interpretation is not a measure of the quality of a firm's assets, but of its management. A stock market boom represents a massive revaluation of the talents of managers, which produces a merger wave.

An obvious question raised by this explanation for merger waves is what caused the market to change its beliefs about the talents of managers? In other work J&R (2002b) argue that stock market booms are caused by major technological advances like the invention of the automobile. The late-1990s stock market boom was a result of innovations in information technology that also led to increased opportunities for profitable mergers. Although this seems like a plausible explanation for both stock market booms and their accompanying

[8] See Andrade and Stafford (2004), and Erard and Schaller (2002).

[9] See, for example, Chappell and Cheng (1984), Andrade and Stafford (2004), and Jovanovic and Rousseau (2002).

merger waves, it is difficult to reconcile this interpretation of the *q*-theory to the merger patterns shown in Section I. Major technological changes affect *all* companies in an economy, not just those listed on stock exchanges. If the rise in stock prices at the end of the 20th century reflected an increased potential for making profitable acquisitions due to common, underlying technological factors, then *all* firms, not just listed companies, should have experienced merger waves. This is particularly true for Continental Europe, since a much larger fraction of its economic activity is conducted by unlisted firms.

Still another explanation for why *q*s might be related to merger waves would be that a general rise in market values follows some macroeconomic event, like a decrease in the discount rate. Such an event could then lead to a simultaneous reevaluation of the talents of all managers. If the event led to an upward reevaluation of the market values of both potential acquirers and targets, it would not necessarily make mergers more profitable and precipitate a wave, however. In our regression work, we explicitly include a measure of aggregate borrowing costs.

B. The Industry Shocks Theory

Where J&R's explanation for merger waves appears to rest on an assumed, underlying common technological shock, Harford's (2005) theory assumes the existence of numerous *different* shocks – some technological, some regulatory, and some taking on still other forms. At certain times these shocks buffet several industries simultaneously and produce a merger wave across the entire economy. Harford's "neoclassical explanation of merger waves" is thus vulnerable to the same criticism as the *q*-theory – any industry shocks should hit listed and unlisted firms alike and produce merger waves across both types of companies.

C. The Managerial Discretion Theory

Under the managerial discretion theory, managers get utility from their firms' growth either because their incomes are tied to growth, or because they get "psychic income" from managing a larger firm.[10] The constraint on the pursuit of growth is the threat of takeover, which is inversely related to *q*. Thus, managers' utility can be expressed as a function of the growth of their firms, *g* and *q*, $U = U(g,q)$, where $\partial U/\partial g > 0$, $\partial^2 U/\partial g^2 < 0$, $\partial U/\partial q > 0$, and $\partial^2 U/\partial q^2 < 0$.[11] Defining *M* as the amount of assets acquired through mergers, and setting $g = g(M)$, we can maximize $U(g,q)$ with respect to *M* to determine the utility maximizing level of growth through mergers. This yields the following first order condition:

$$(\partial U / \partial g)(\partial g / \partial M) = -(\partial U / \partial q)(\partial q / \partial M) \qquad (1)$$

Since $\partial U/\partial g > 0$, $\partial g / \partial M > 0$, and $\partial U/\partial q > 0$, (1) cannot be satisfied if $\partial q/\partial M > 0$. For any merger that increases *q* *no tradeoff* between growth and security from takeovers exists. Growth-maximizing managers undertake *all* mergers that *increase q.* Their behavior differs from managers who maximize shareholder wealth only with respect to mergers that *decrease q*. Figure 7 depicts the relationship in eq. 1 for mergers that lower *q*. When no mergers of this type are undertaken, *q* is at its maximum and the risk of takeover is minimized. When the relationship between *q* and *M* yields a $-(\partial U/\partial q)(\partial q/\partial M)_N > 0$, a utility-maximizing manager undertakes M_N of value destroying mergers.

During stock market booms the degree of optimism in the market rises dramatically. As Galbraith (1961, p. 8) observed, an "indispensable element of fact" during stock market

[10] Robin Marris (1964, 1998) was the first to posit growth as an objective for managers, and Mueller (1969) applied the theory to explain the conglomerate merger wave of the late 1960s. For recent evidence linking managerial income to growth through mergers, see Khorana and Zenner (1998).

[11] A further justification for including *q* in the managers' utility function would be that managers own shares in the firm.

bubbles is that individuals "build a world of speculative make-believe. This is a world inhabited not by people who have to be persuaded to believe but by people who want an excuse to believe." These excuses to believe take the form of "theories" as to why share prices should rise to unprecedented levels, why the economy has entered a "new era" (Shiller, 2000, Ch. 5). Prominent among these are "theories" about wealth increases from mergers. The market begins to believe that certain types of mergers – by conglomerates in the 1960s, media companies in the 1990s – will generate synergies and the announcement of these types of mergers is greeted favorably. Managers are free to undertake such mergers without fear of their company's share price taking a steep fall.

Thus, merger announcements, that would under normal conditions result in large *declines* in acquirers' share prices, produce only modest declines during a stock market boom, or even share price increases. This shifts $-(\partial U/\partial q)(\partial q/\partial M)$ to the right, as in Figure 7. The firm acquires more assets through mergers, M_B, since q does not drop by as much or *perhaps even rises* when a merger is announced. Under the managerial discretion theory, merger waves occur during stock market booms, because the optimism prevailing in the market allows growth-seeking managers to undertake more wealth-destroying mergers than they safely can under normal conditions. This is not the case for unlisted firms, since for them the takeover constraint and/or the monitoring intensity by the owners of closely-held companies are not affected by temporary stock market booms.

D. The Overvalued Shares Theory

Shleifer and Vishny (2003) (hereafter S&V) retain the neoclassical assumption that managers maximize shareholders' wealth (at least as far as the acquiring firms are concerned), but relax the assumptions that mergers create wealth and of capital market efficiency. Some firms' share prices become *overvalued* during stock market booms. Their

managers know their shares are overvalued, and wish to protect their shareholders from the wealth loss that will come when the market lowers its estimates to their warranted levels. They accomplish this by exchanging their overvalued shares for the real assets of another company. Targets' managers are assumed to have short time horizons, so they too gain by "cashing in" their stakes in their firms at favorable terms. Merger waves occur, because the number of overvalued companies increases during a stock market boom.

Rhodes-Kropf and Viswanathan (2004) also predict merger waves during stock market booms, but offer a different explanation for why target managers accept overvalued shares. They claim that the optimism in the market during a boom makes it difficult for target managers to judge whether the price of a bidder's shares is high due to over optimism, or because it reflects the expected synergies from the merger, and thus they mistakenly become willing partners in mergers that do not generate synergies.

Neither version of the overvaluation theory can explain the merger activity of unlisted firms, however. Their shares cannot be overvalued, at least not by the stock market, and they cannot trade overvalued stocks for less overvalued stocks.

III. Tests of the Theories

The behavioral theories rest on assumptions about the optimism or over optimism in the stock market. They thus predict different patterns of merger activity for companies listed on stock exchanges and unlisted companies. We have already observed such differences in aggregate merger patterns in Section I, in this section we present additional evidence by estimating models of the assets acquired by individual companies. The key prediction is that the amount of assets acquired by listed companies is sensitive to the aggregate P/E ratio, which we treat as a measure of the degree of optimism in the market, while the amount of assets acquired by unlisted companies does not depend on the aggregate P/E.

As a second macroeconomic variable, we include the spread between the federal/national interest rate (Spre) (Austria, Germany, Italy, until 1998: discount rate; France, until 1998: main refinancing rate; Austria, Germany, France, Italy, from 1999: ECB main refinancing rate; UK: official bank rate; US: federal funds rate) and industrial loan rates (Austria, France, Germany, UK: corporate bond yield, US: commercial and industrial loan rate, Italy: lending interest rate). Since unlisted companies find it harder to issue shares to make acquisitions, their merger activity should be more sensitive to their ability to raise funds by borrowing.[12] We thus predict a negative coefficient on Spre, which is larger for unlisted than for listed companies.

The managerial discretion theory assumes the existence of an Anglo-Saxon institutional structure – specifically widely dispersed share ownership. As the fraction of shares held by the largest shareholder increases, the cost to him of wealth-destroying mergers increases. The managerial discretion theory thus predicts a negative relationship between the fraction of shares held by the largest shareholder and the assets a company acquires.

The overvaluation theory makes the opposite prediction. The more shares the largest shareholder of an overvalued company has, the greater is her personal gain from trading them for the assets of another company. Thus, the overvaluation theory should predict a positive coefficient on the largest shareholder's shareholdings for listed companies, and a zero coefficient for unlisted companies, since the market places no value on them. If we assume that the managers of unlisted companies might also be empire-builders, then a negative coefficient for the largest shareholders' of ownership stake can also be expected.

[12] Unlisted firms may make an IPO and/or raise funds via a capital increase from private investors. This, however, entails much larger transaction costs than for listed firms, thus we expect a larger sensitivity to interest rates for unlisted firms.

For a firm that overinvests, the marginal return on investment is below its neoclassical cost of capital. Raising funds externally will seem more expensive than using internal cash flows. Cash flows have, therefore, been a key variable in the literature for distinguishing between the managerial discretion and neoclassical theories of the determinants of investment and R&D.[13] Cash flows are thus included in our model, as an additional way to discriminate the managerial discretion theory from the others.[14]

The bigger a firm is, the more expensive it is to take it over and replace its management. Thus, managers of large companies have more discretion to pursue their own goals and the managerial discretion theory predicts a positive coefficient on firm size. None of the other theories makes a prediction for this variable, although one might also simply think of it as a control variable. We also include leverage as an additional control variable. Since debt is one source of finance for mergers, one might predict a negative coefficient on debt – the higher a company's debt, the more constrained it is in financing acquisitions by issuing debt. On the other hand, high leverage may be due to past mergers and may signal a growth-oriented management. This logic predicts a positive coefficient on debt.

The basic model estimated thus looks as follows:

$$M_{it} = a + bP/E_t + cSpre_t + dS_{it} + eCF_{it-1} + fln(A)_{it} + gLev_{it} + \mu_{it} \qquad (2)$$

where M_{it} is the assets acquired relative to the acquirer's total assets in year *t* by firm *i*, P/E_t is the weighted average P/E in *t*, Spre is the interest rate spread in *t*, S_{it} is the fraction of outstanding shares held by firm *i*'s largest shareholder, CF_{it-1} is *i*'s lagged cash flows, $ln(A)_{it}$ is the natural log of total assets, Lev_{it} is leverage, and μ_{it} is the error term. Eq. 2 is estimated

[13] See, Grabowski and Mueller (1972), Vogt (1994), Hay and Liu (1998), and Gugler, Mueller and Yurtoglu (2004).

[14] To our knowledge Schwartz (1984) is the only study testing the MDH for mergers. He does not link his results to merger waves, however.

separately for the United Kingdom and Continental Europe with separate coefficients estimated for each variable for listed and unlisted companies.

Unfortunately, our data source did not provide data on acquisitions by unlisted US companies, so the model could only be estimated for listed firms. We present these estimates for the United States for comparison purposes, although they do not allow us to discriminate between the different theories as well as when we have data for both types of companies. Since all US companies are listed, we are also able to include Tobin's *q* in the equation. The managerial discretion, overvaluation and *q*-theories all predict a positive coefficient.

Table 4a presents the means of the variables used in the regression analysis except that we have presented mean total assets rather than mean log of assets, which is the variable in the regressions. A –L next to a variable indicates that it is a mean for listed companies. An NA prior to a variable indicates a mean for non-acquiring companies, which serve as the control group. The average size of an acquisition by a listed company is largest for Continental Europe and smallest for the UK. Largest shareholder's fraction of ownership is largest for Continental Europe and smallest for the USA. Unsurprisingly, the largest shareholders of listed companies have smaller holdings than for unlisted companies. Cash flows as a fraction of total assets do not vary greatly except for the USA, where acquirers' cash flows average more than double those of non-acquirers. Listed companies are generally bigger than unlisted companies, acquirers are bigger than non-acquirers. Acquirers have higher *q*s than non-acquirers.

Our models might be estimated twice, once as a probit regression to determine the probability that a company undertakes an acquisition, and a second time as a Tobit regression to take into account differences in target sizes. Both probit and Tobit regressions were estimated, but only the Tobit results are reported, because they differ from the probit results only with respect to the sizes of the coefficients on different variables – the same variables

that explain *whether or not* a firm undertakes a merger in a particular year explain the *amount* of assets acquired. The close similarity between the probit and Tobit results also implies that there was little to be gained from adopting Heckman's (1976) two-stage estimation procedure for censored data.

Table 5 presents the regression results. In the left side of the table appear the results for the full sample of companies, listed and unlisted. The numbers in the first column, labeled Unlisted Companies, are the coefficients on the respective variables, with *t*-values given below the coefficients for a comparison with zero. In the second column, labeled Listed Differences, are the coefficients on the respective variables and *t*-values for a test of whether the coefficient for listed companies is significantly different from that for the unlisted companies. The third column combines the two coefficients and gives the implied coefficient for the listed companies. The numbers in this column may not always equal the sum of the coefficients in the other two columns, because the sum was made using estimates to more decimal places. The column of numbers on the far right are estimates from regressions limited to acquirers and non-acquirers that were both listed companies. The estimated coefficients need not equal those in the third column on the left side of the table, because the control group of non-acquirers differs.

The coefficient on the weighted average P/E ratio for unlisted companies in the UK is -0.018 and is significant at the one per cent level. Unlisted companies actually buy *fewer* assets through mergers when share prices are relatively high. This may be because the prices of possible targets rise during a stock market boom making the purchase of other companies more expensive.[15] The coefficient on the P/E ratio is both significantly greater for listed companies and positive as predicted by both the managerial and overvaluation theories.

[15] Evidence of this for the United States is presented in Gugler, Mueller and Yurtoglu (2007).

As expected, the coefficient on the interest rate spread is negative and much larger for unlisted than for listed companies. Indeed, the implied coefficient for listed companies in the full sample is slightly positive. In the regression limited to listed companies, Spre picks up a negative and significant coefficient, albeit one that is considerably smaller than for unlisted companies in the full sample.

The shares held by the largest shareholder in the UK are negatively related to assets acquired with the coefficient for listed companies being roughly four times larger than for unlisted companies. This result is consistent with the managerial discretion hypothesis, but contradicts the overvaluation hypothesis. If the motivation behind mergers is to trade overvalued shares for real assets, then one would expect large (controlling) shareholders to be more eager to make acquisitions, the larger their own shareholdings are.

Cash flows, size and leverage are all positively related to assets acquired for the UK, with the coefficient on cash flows being twice as large for listed companies. These results are consistent with the managerial discretion hypothesis, and suggest that in the UK leverage is associated with aggressive managements, which have undertaken mergers in the past. When the sample is restricted to listed companies, and Tobin's q is added, all variables retain the same signs as before and are significant. Tobin's q picks up a positive and significant coefficient in the sample of listed companies.

The results for the two key variables in the model – the P/E ratio and largest shareholder's holdings – are quite similar for Continental Europe. Unlisted companies are less active buying other companies when share prices are high, listed companies are more active. Merger activity falls as the largest shareholder's ownership stake rises.

The interest rate spread is again negative and much larger for unlisted than for listed companies with the implied coefficient for listed companies in the full sample again being

slightly positive. In the regression limited to listed companies, Spre picks up a negative but insignificant coefficient.

Size continues to have a positive influence on assets acquired in Continental Europe, but cash flows actually pick up negative coefficients, although only the coefficient for the listed companies is statistically significant. Leverage has a negative and significant coefficient for both listed and unlisted firms with the difference between them being insignificant. Thus, in Continental Europe, where access to equity markets is more limited than in the UK and USA, high leverage appears to inhibit acquisitions. Finally, Tobin's q again has a positive and significant coefficient when the sample is limited to listed companies.

All coefficients in the US regression are statistically significant, with the sign pattern being consistent with the managerial discretion hypothesis. Higher cash flows and market optimism lead to the acquisition of more assets, while higher ownership of the largest shareholder reduces the amount of assets acquired. US companies' merger activity is much more sensitive to lending conditions than in either the UK or Continental Europe.

The comparison of two point estimates illustrates the magnitude of the effects of the P/E ratio. Column 1 of Table 6 shows the expected values for merger activity in our samples. It is denoted as E(y|x) to indicate that it is for the censored outcome. Because we have large comparison groups of non-merging companies, they are not high: 0.013 per cent, 0.104 per cent and 2.75 per cent for Continental Europe, UK and the US, respectively. The expected value for the truncated outcome, E(y|y>0,x), provides the average value of assets acquired, given an acquisition was undertaken. For listed firms, the conditional expected value for Continental Europe is 17.3 per cent at a P/E of 15 compared to 14.0 per cent for unlisted firms. The effect of a rise in the P/E ratio to 30, a reasonable number during the stock market boom, on listed firms is striking – the difference is almost three percentage points for listed

firms, whereas the expectation *declines* by almost one percentage point for unlisted firms. The same pattern can be observed for the UK and the result for the sample of listed US-firms is also consistent with this interpretation.

Also in Table 6 are the partial effects of changes in P/E, $\partial E(y|x)/\partial(P/E)$. In the Tobit model, they are not constant, are much higher for listed firms than for unlisted firms, and are largest for listed firms in a stock market boom at a P/E of 30. The decomposition of the partial effects, as presented in McDonald and Moffitt (1980), shows that for listed firms the relative contributions of acquisition size and number of acquisitions do not change dramatically during stock market booms. (For Continental Europe, the contribution of acquisition size increases from 10 per cent to 13 per cent, when the P/E ratio increases from 15 to 30.) Thus, the main explanation for merger waves is the dramatic increase in the number of acquisitive firms during stock market booms, not an increase in the size of acquisitions. The results are similar for the UK and the US, although the fact that relatively more firms are above the threshold (i.e. making acquisitions) puts more weight on the change attributed to increases in the size of the acquisitions.

IV. Caveats

One possible difficulty with our estimations is that the fraction of shares held by the largest shareholder might be endogenous to companies' merger activity. To check for this we re-estimated the basic model using a lagged measure of the fraction of shares held by the largest shareholder, S. Data for this variable are not available on an annual basis, so we used the most recent value of lagged S in our data set.

Table 7 presents the results for the same regressions as run for Table 5, but with S replaced by lag S. The results for lag S are similar to those for S. In the UK and Continental Europe, assets acquired decline as the size of the largest shareholder's stake in a company

increases, and the decline is steeper for listed than for unlisted companies. The coefficient on lag S in the equation for listed companies in the USA is negative as it was for S, but now is insignificant. Increasing the size of the largest shareholder's stake in a company reduces agency problems and the company's acquisition of other companies' assets. The effects are larger in the UK and Continental Europe, where the stakes of the largest shareholder are larger.

Replacing S with lag S reduces the number of observations available in each sample, and may explain why some coefficients on the other variables change when lag S is substituted for S. The basic patterns of results for the P/E ratio and cash flows remain unchanged, however. In the Continental European sample, the coefficient on cash flow for listed firms now becomes positive as predicted, although it remains insignificantly different from the coefficient for unlisted firms and from zero.

We also experimented with using lagged values of the interest rate spread. This substitution had no substantive effect on the basic results.

Our rejection of the neoclassical explanations for merger waves rests heavily on the assumption that unlisted companies should respond to external shocks that make mergers more profitable just as listed companies do. One might object to this reasoning on the grounds that unlisted firms, because of their inability to access the equity market, face more severe financial constraints than listed companies, and thus may not be able to respond to external shocks that make mergers more profitable. We do not accept this line of argument, however. The tighter financial constraints that unlisted companies face might well lead them to undertake fewer mergers overall than listed companies. When mergers become more profitable, however, they should respond as listed companies do by undertaking more mergers, although perhaps to lesser degree. Returning to Table 6, we see from the $E(y|x)$ column that unlisted companies do have lower propensities to acquire assets during normal

times (P/E = 15). In Continental Europe the difference in propensities is 0.234 versus 0.018, a multiple of 13. In the United Kingdom, the propensity of listed companies to acquire other companies' assets is 15 times greater than for unlisted firms (2.47 versus 0.16), when the P/E is 15. When the P/E rises to 30, however, unlisted firms not only do not increase the volume of their acquisitions, they *reduce* it.

V. An Illustrative Example

A pair of recent acquisitions in Continental Europe nicely illustrate the nature of our results.

Continental AG (hereafter Conti), a leading tires and auto parts producer, had a share price of 24 euro in mid-2004. From that point its share price steadily rose to a high of around 109 euro in the summer of 2007 (see Figure 8). At that point in time it chose to acquire a division of Siemens specializing in auto parts including electronic systems for automobiles, Siemens VDO. Conti paid 11.4 billion euro in cash for VDO, valueing it at a P/E ratio of around 25 (!). At the time, Conti's outstanding shares alone had a market value of 17.8 billion, so the merger arguably created a company worth roughly 30 billion euro.

On July 25, 2007, the Chairman of the Executive Board of Conti, Manfred Wennemer, justified the acquisition with the claims that the merged company would "become a market leader in certain mushrooming sectors," that the two companies were a "perfect fit," and by listing still other synergies from the merger.[16] Thus, if one believed the Chairman of Conti's Executive Board, the acquisition was kind of wealth-creating merger that fits one of the neoclassical theories. The dramatic rise in Conti's share price over the

[16] Remarks made in Hanover on 25th of July, 2007. Several numbers presented in this section are drawn from Wennemer's presentation, see: http://www.conti-online.com/generator/www/com/de/continental/portal/themen/presse_services/acq/download/praes_de.pdf. Others are taken from public sources.

prior three years might be taken as an indicator of the market's confidence in Conti's management, as posited by the *q*-theory of mergers.

Alternatively, the dramatic rise in Conti's share price might be assumed to have greatly increased the discretion Conti's managers had to pursue wealth-destroying mergers. Since VDO was not a listed company, and Conti paid for it with cash, the acquisition does not fit the overvaluation theory of mergers.

As so often happens with mergers, Conti's share price began to fall almost immediately after the acquisition. By September of 2008, it had reached 50 euro – less than half of its value little more than a year earlier when it acquired VDO. At this point, Schaeffler, a German machinery manufacturer and supplier to the automobile industry, makes a successful bid for Conti's shares at 75 euros a share. Schaeffler is an unlisted, family-controlled firm with sales of 8.9 billion euros compared to combined Conti/VDO sales of 25 billion euro. Schaeffler's purchase was made with cash. The privately held firm, Schaeffler, was able to buy the combined Conti/VDO in September, 2008, for 12.15 billion euros (at a P/E of around 12) – less than a billion more than Conti paid for VDO alone, little more than one year earlier.

These two mergers are consistent with the hypotheses put forward in this article. Conti, a listed company, undertakes a merger following a dramatic run-up in its share price – a merger which proves to be a dismal failure. While it is still too early to judge the success of Schaeffler's acquisition, it clearly acquired far more assets for its euros than did Conti, thus seems far more likely to prove to be a success.

VI. Conclusions

Merger waves occurred in the United States, United Kingdom and Continental Europe at the end of the 20th century. In all three areas, the peaks of the waves coincided more or

less with the peaks of stock market booms. In the United Kingdom and Continental Europe, the merger waves were confined exclusively to companies listed on the major stock exchanges. Although a modest wave (ripple) in acquisitions by unlisted companies was observed in the United States, it was dwarfed by the wave in listed companies' acquisitions, and was out of phase with both the stock market boom and the wave in listed company mergers. These patterns are inconsistent with the neoclassical theories of merger waves that posit some underlying common shock to the entire economy driving a merger wave, or a set of simultaneous shocks to a group of industries, since such shocks should produce similar merger patterns for both listed and unlisted companies.

Additional evidence in favor of the behavioral theories was found in the regression results. These results were quite similar for listed companies in the United States and United Kingdom. The aggregate P/E, cash flows, size, leverage and Tobin's q all had positive and significant coefficients in these two countries for listed firms, while the shareholdings of the largest owners of the acquirers were negatively related to the amount of assets acquired. This last result was also observed for Continental Europe and seems to favor the managerial discretion over the overvaluation hypothesis. Growth oriented managers with large controlling shareholders in their companies should be less free to undertake wealth-destroying mergers. The overvaluation hypothesis assumes that acquirers' managers are trying to protect their shareholders from future declines in their companies' share prices. Under this hypothesis, managers with large personal stakes in their firms should be more eager to make acquisitions.

The results for Continental Europe differed in some respects from those for the two Anglo-Saxon countries. Leverage does appear to be a signal of the aggressiveness of managers in pursuing growth in Continental Europe, and assets acquired are unrelated to cash flows for unlisted companies, and either negatively or unrelated for listed firms. This latter

result contradicts the managerial discretion hypothesis. On the other hand, the coefficients on the aggregate P/E, largest owners' shareholdings, size and Tobin's q are all consistent with the managerial discretion theory. Thus, even for Continental Europe we think that the managerial discretion theory offers a better explanation for the merger wave than either of the two neoclassical theories or the overvaluation hypothesis. The Conti/VDO acquisition certainly fits the theory.

Despite the differences in regression results between Continental Europe and the two Anglo-Saxon countries, we think that the similarities across the three areas outweigh the differences. Merger waves occurred in all three areas at the end of the 20th century, when stock markets were booming. Managers took advantage of the optimism in the stock market to acquire other companies. In all three areas, however, the enthusiasm of managers for mergers was dampened, if their company was not listed on a stock exchange and/or there was a large shareholder in the company.

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Figure 1: Number and Total Deal Values of all Mergers for the US

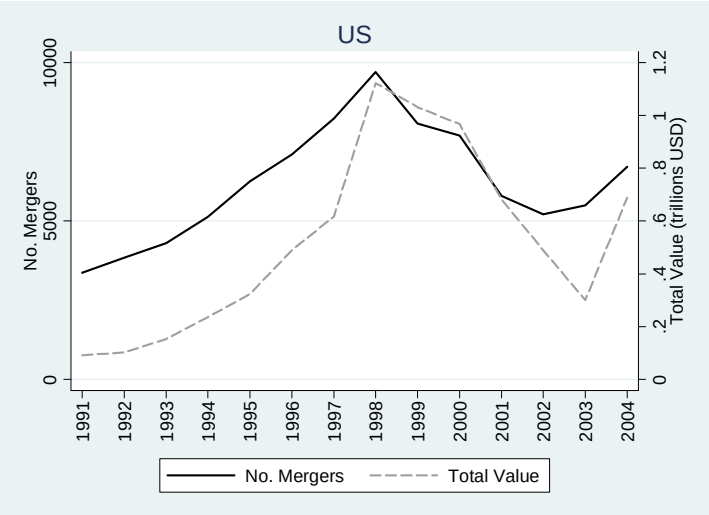

Figure 2: Number and Total Deal Values of all Mergers for the UK

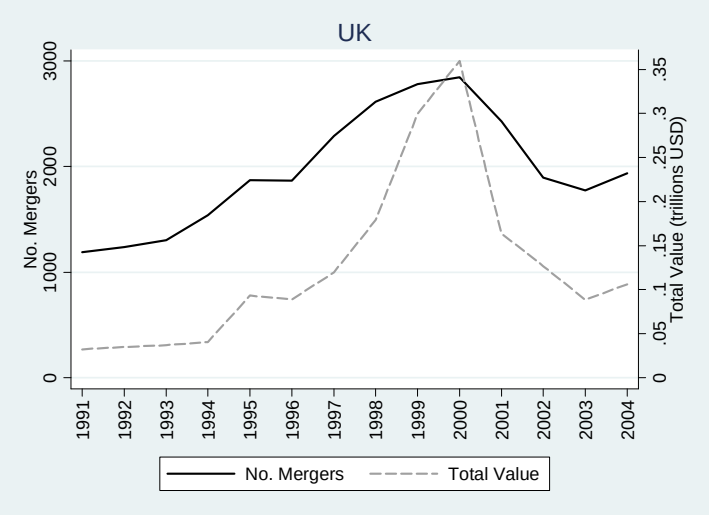

Figure 3: Number and Total Deal Values of all Mergers for Continental Europe

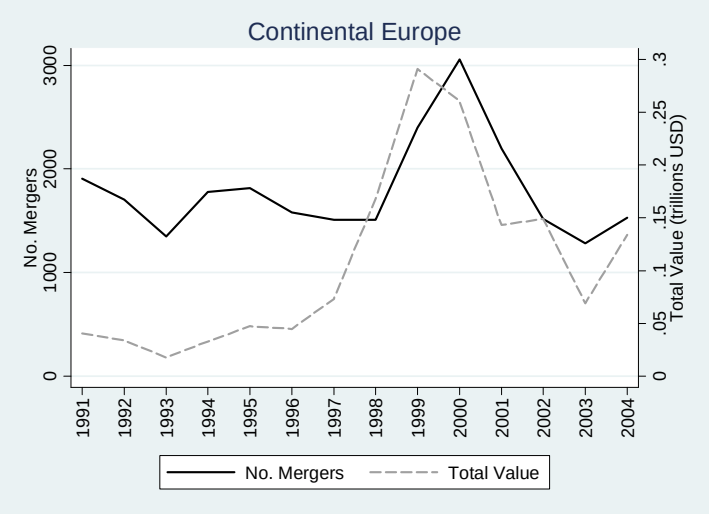

Figure 4: Total Deal Values of listed vs. not-listed acquirers, and P/E for the US

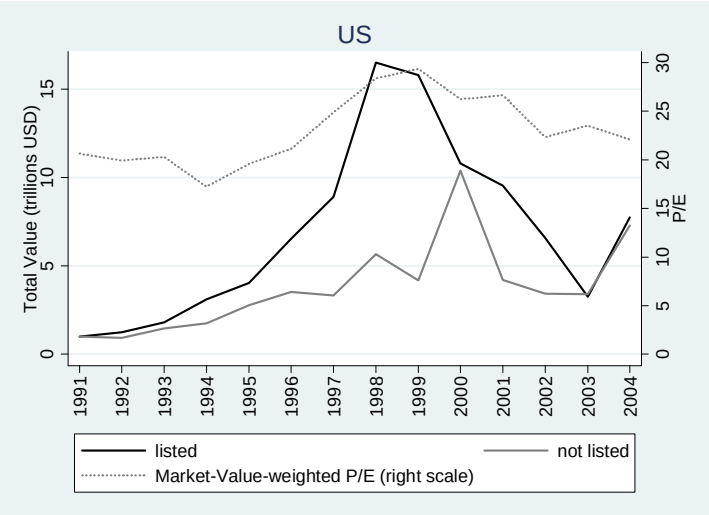

Figure 5: Total Deal Values of listed vs. not-listed acquirers, and P/E for the UK

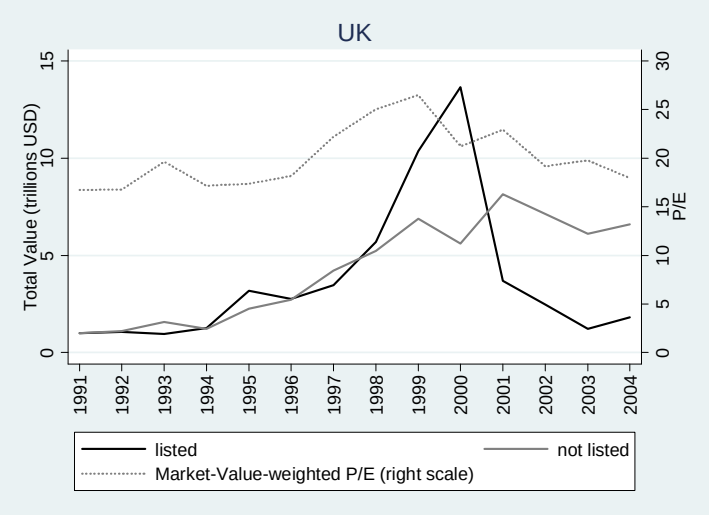

Figure 6: Total Deal Values of listed vs. not-listed acquirers, and P/E for Continental Europe

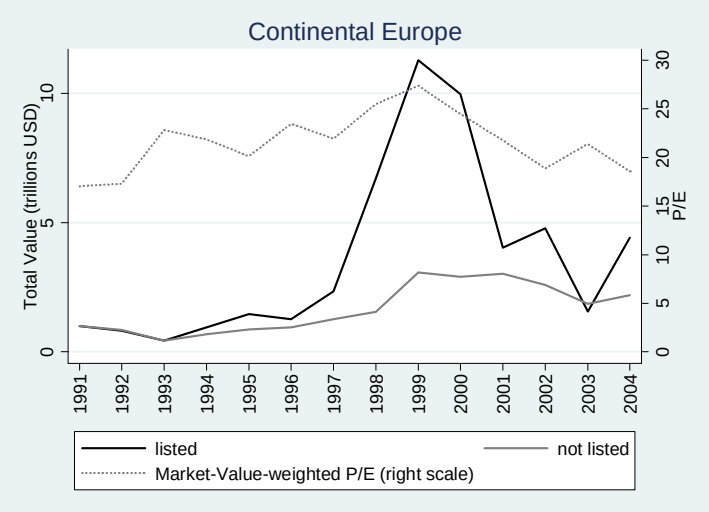

Figure 7: The Managerial Trade-off

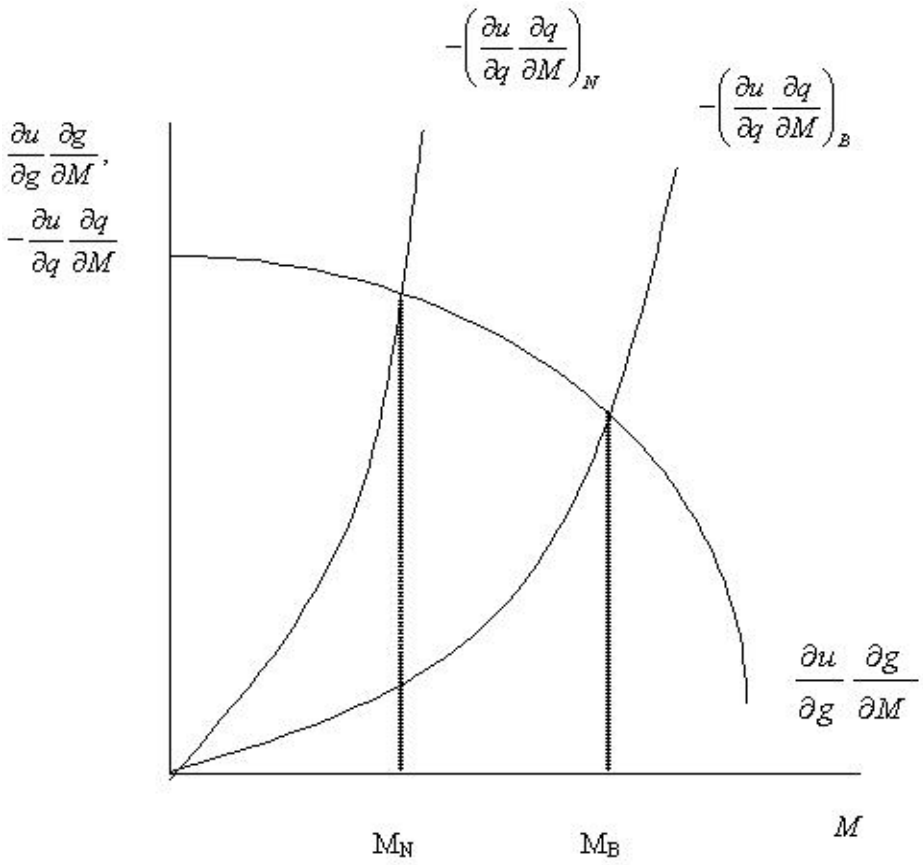

Figure 8: Share Price of Continental AG

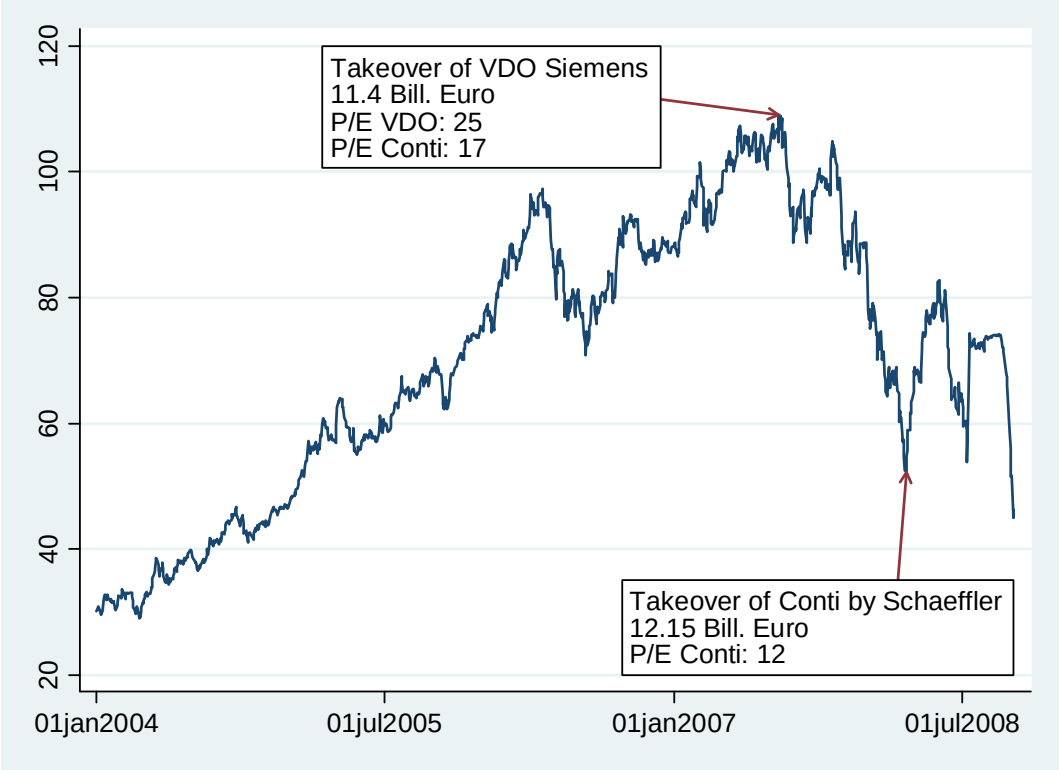

Table 1: Deals from Europe (Austria, Germany, France, Italy, UK), matched to Amadeus for 1991-2004, and deals from the US, matched to Global Vantage for 1991-2002

Deals		Restriction	Share Available	
Europe	US		Europe	US
100,233	193,015	TFSD deal matched to Amadeus/GV	0.526	0.241
52,727		1978<= year <= June 2005 (rest: no year)	0.783	
41,268		1991<= year <= 2004 [(1)]	0.855	
35,290	37,867	one deal (largest) per year & company [(2),(3)]	0.651	0.526
22,997	19,914	deal value available	0.514	0.635
11,821	12,648	necessary financial data in Amadeus	0.631	0.839
7,457	10,612	share of largest owner available	0.430	0.241
3,207	2,560	final sample		

[(1)] Sample for US ends 2002
[(2)] Europe: Yearly deals per company: min=1, max=25, average=1.53
[(3)] US: Yearly deals per company: min=1, max=86, average=1.90
TFSD: Thompson Financial Securities Data
GV: Global Vantage Database

Table 2: Domestic vs. Cross-border Mergers

	domestic			cross-border		
	US	UK	CE[(1)]	US	UK	CE[(1)]
1991	2991	884	1490	371	305	417
1992	3392	975	1341	443	262	362
1993	3780	1021	1054	527	280	295
1994	4495	1208	1371	634	332	407
1995	5447	1476	1349	800	395	466
1996	6140	1448	1172	964	420	409
1997	7109	1805	1089	1132	483	418
1998	8277	2087	957	1423	528	551
1999	6866	2118	1531	1218	661	869
2000	6387	2143	1969	1313	701	1087
2001	4835	1844	1401	947	584	796
2002	4535	1538	1037	671	359	480
2003	4813	1411	884	682	364	398
2004	5734	1474	1103	982	464	426

[(1)] CE: Continental Europe

Table 3: Correlation coefficients between total deal values by listed acquirers and total deal values by not-listed acquirers

	wave	**non-wave**
US: listed,not-listed	0.0597	0.8061
	(0.7629)	(0.0000)
UK: listed,not-listed	0.1040	0.3972
	(0.6625)	(0.0076)
Cont. Eur: listed,not-listed	0.2041	0.2329
	(0.3880)	(0.1282)

Note: p-values in parentheses. Quarterly data was used to calculate these correlations.
wave-period: UK and CE, 1997q1-2001q4; US, 1995q1-2002q4.
non-wave period: UK and CE, 1989q1-1996q4 and 2002q1-2004q4;
US, 1989q1-1994q4 and 2003q1-2004q4.

Table 4a: Variable Means Wave/Non-Wave

		UK	Cont.Eur.	USA
M	*non-wave*	52.3	149.66	
	wave	63.43	131.97	
M-L	*non-wave*	118.31	379.98	159.89
	wave	270.23	585.54	450.50
S	*non-wave*	89.72	79.65	
	wave	89.88	75.93	
S-L	*non-wave*	18.10	46.20	19.51
	wave	17.05	43.83	18.17
NA S	*non-wave*	91.08	74.53	
	wave	88.96	73.73	
NA S-L	*non-wave*	33.38	60.93	22.00
	wave	30.81	61.05	21.68
CF	*non-wave*	0.094	0.071	
	wave	0.094	0.062	
CF-L	*non-wave*	0.09	0.073	0.053
	wave	0.097	0.073	0.057
NA CF	*non-wave*	0.074	0.063	
	wave	0.078	0.063	
NA CF-L	*non-wave*	0.064	0.073	0.009
	wave	0.070	0.072	0.011
A	*non-wave*	785.76	2655.87	
	wave	535.04	2706.86	
A-L	*non-wave*	2353.15	10057.30	5426.89
	wave	2173.71	5339.32	8120.11
NA A	*non-wave*	210.70	128.29	
	wave	210.86	101.77	
NA A-L	*non-wave*	1152.91	1410.12	1682.34
	wave	875.02	655.45	2160.25
Lev	*non-wave*	0.21	0.24	
	wave	0.21	0.22	
Lev-L	*non-wave*	0.19	0.22	0.24
	wave	0.22	0.22	0.26
NA Lev	*non-wave*	0.15	0.16	
	wave	0.14	0.15	
NA Lev-L	*non-wave*	0.18	0.18	0.24
	wave	0.16	0.19	0.24
q-L	*non-wave*	1.14	0.89	1.55
	wave	1.58	1.92	1.82
NA q-L	*non-wave*	1.05	0.85	1.53
	wave	1.29	1.57	1.72

Note: Wave and non-wave periods, and variable abbreviations are explained in Table 4b.

Table 4b: Sample periods and variable definitions for Table 4a

	UK	Cont.Eur.	US
sample-period	1991-2004	1991-2004	1991-2002
wave-period	1997-2001	1997-2001	1995-2002

Variables	
M	deal value (in millions USD)
S	percentage of largest shareholder
CF	cash flow over total assets (lag 1)
A	total assets (in millions USD)
Lev	leverage (= non-current liabilities / *A*)
Q	Tobin's q (= (market capitalization + non-current liabilities) / A)
-L	[Variable] for listed firms
NA	[Variable] for non-acquirers

Table 5: Regression Results

	UK Full Sample			**UK** Listed Firms Only	**US** Listed Firms Only
	Unlisted Companies	Listed Difference	Listed		
P/E	-0.018	0.025	0.007	0.004	0.003
	(-9.1)	(14.4)	(4.3)	(1.9)	(1.7)
Spre	-0.049	0.054	0.005	-0.019	-0.191
	(-9.2)	(9.5)	(1.2)	(-3.6)	(-8.8)
S	-0.0007	-0.0027	-0.0034	-0.0017	-0.0005
	(-3.3)	(-9.5)	(-20.0)	(-5.5)	(-2.1)
CF	0.251	0.220	0.471	0.142	0.138
	(5.4)	(3.6)	(11.7)	(3.2)	(5.3)
ln(A)	0.037	-0.007	0.029	0.023	0.034
	(13.4)	(-2.3)	(13.2)	(8.8)	(15.8)
Lev	0.099	0.042	0.141	0.074	0.147
	(5.2)	(1.4)	(6.2)	(2.7)	(6.9)
q				0.032	0.029
				(9.5)	(10.3)
Const.		-0.734		-0.528	-0.310
		(-16.4)		(-8.5)	(-5.2)
Obs.		113,576		5,112	16,622
Psd-R^2		0.4584		0.0944	0.0611

	CE Full Sample			**CE** Listed Firms Only	**US** Listed Firms Only
	Unlisted Companies	Listed Difference	Listed		
P/E	-0.010	0.026	0.016	0.006	0.003
	(-4.5)	(10.2)	(7.3)	(2.8)	(1.7)
Spre	-0.055	0.062	0.006	-0.019	-0.191
	(-4.1)	(3.6)	(0.5)	(-1.4)	(-8.8)
S	-0.0008	-0.0020	-0.0028	-0.0016	-0.0005
	(-2.5)	(-4.3)	(-8.7)	(-4.9)	(-2.1)
CF	-0.081	0.096	0.014	-0.239	0.138
	(-0.7)	(0.6)	(0.1)	(-2.2)	(5.3)
ln(A)	0.132	-0.016	0.116	0.077	0.034
	(21.4)	(-2.6)	(21.3)	(15.5)	(15.8)
Lev	-0.113	0.016	-0.097	-0.042	0.147
	(-2.4)	(0.2)	(-1.8)	(-0.9)	(6.9)
q				0.032	0.029
				(6.1)	(10.3)
Const.		-2.468		-1.474	-0.310
		(-24.7)		(-14.4)	(-5.2)
Obs.		198,493		5,983	16,622
Psd-R^2		0.370		0.183	0.061

Note: t-values in parentheses. Variables abbreviated as in Table 4b.

Table 6: Expected Values and Marginal Effects

at:	**E(y|x)**	**E(y|y>0,x)**	$\frac{\partial E(y\|x)}{\partial (P/E)}$	**McDonald-Moffitt decomp.** increased size of acq.	**McDonald-Moffitt decomp.** increased number of acq.
Cont. Eur.					
means	0.013	13.67			
means,P/E=15, listed=1	0.234	17.31	0.021	10.3	89.7
means,P/E=30, listed=1	0.840	20.09	0.066	13.2	86.8
means,P/E=15, listed=0	0.018	13.99	-0.001	-7.1	-92.9
means,P/E=30, listed=0	0.006	12.99	-0.0005	-6.2	-93.8
UK					
means	0.104	10.98			
means,P/E=15, listed=1	2.47	16.80	0.106	19.3	80.7
means,P/E=30, listed=1	4.52	19.11	0.171	23.5	76.5
means,P/E=15, listed=0	0.164	11.49	-0.025	-10.4	-89.6
means,P/E=30, listed=0	0.013	9.23	-0.0024	-7.1	-92.9
US					
means	2.75	18.26			
means,P/E=15, listed=1	2.51	17.93	0.074	19.0	81.0
means,P/E=30, listed=1	3.24	18.86	0.107	20.5	79.5

Table 7: Regression Results with Shareholder Lagged by one Year

	UK Full Sample			**UK** Listed Firms Only	**US** Listed Firms Only
	Unlisted Companies	Listed Difference	Listed		
P/E	-0.018	0.026	0.008	0.005	0.006
	(-8.4)	(13.8)	(4.4)	(2.6)	(5.2)
Spre	-0.050	0.047	-0.003	-0.018	-0.186
	(-8.6)	(7.3)	(-0.7)	(-3.4)	(-8.4)
S-Lag	-0.0005	-0.0029	-0.0034	-0.0015	-0.0003
	(-1.8)	(-9.2)	(-17.9)	(-4.8)	(-1.1)
CF	0.265	0.220	0.485	0.152	0.185
	(5.2)	(3.3)	(11.1)	(3.4)	(6.8)
ln(A)	0.037	-0.007	0.030	0.024	0.034
	(12.5)	(-2.0)	(12.5)	(9.0)	(16.4)
Lev	0.095	0.048	0.143	0.056	0.158
	(4.6)	(1.5)	(5.9)	(2.1)	(7.7)
q				0.033	0.030
				(9.6)	(10.8)
Const.		-0.768		-0.565	-0.396
		(-15.8)		(-9.3)	(-7.5)
Obs.		97,987		5,033	16,901
Psd-R^2		0.450		0.097	0.073

	CE Full Sample			**CE** Listed Firms Only	**US** Listed Firms Only
	Unlisted Companies	Listed Difference	Listed		
P/E	-0.008	0.024	0.015	0.008	0.006
	(-3.4)	(8.5)	(6.6)	(3.5)	(5.2)
Spre	-0.059	0.059	0.000	-0.017	-0.186
	(-3.7)	(3.0)	(0.0)	(-1.3)	(-8.4)
S-Lag	-0.0011	-0.0014	-0.0025	-0.0015	-0.0003
	(-3.0)	(-2.8)	(-7.2)	(-4.5)	(-1.1)
CF	-0.113	0.262	0.149	-0.213	0.185
	(-0.9)	(1.4)	(1.1)	(-1.9)	(6.8)
ln(A)	0.137	-0.015	0.123	0.079	0.034
	(20.1)	(-2.2)	(20.4)	(15.4)	(16.4)
Lev	-0.131	0.058	-0.073	-0.034	0.158
	(-2.6)	(0.8)	(-1.3)	(-0.7)	(7.7)
q				0.033	0.030
				(6.1)	(10.8)
Const.		-2.557		-1.550	-0.396
		(-23.5)		(-14.4)	(-7.5)
Obs.		171,016		5,663	16,901
Psd-R^2		0.374		0.201	0.073

Note: t-values below coefficients. Variables abbreviated as in Table 4b.

Using Matching to Evaluate Mergers

I. Introduction

It is often criticised that merger effects studies use comparison groups which do not capture well what the prospects of the merging firm would have been in absence of the merger. At the heart of this lies what is sometimes called a “missing data problem”: we can naturally not observe a firm making a merger (or acquisition) and not making it at the same time. A choice must be made then how the comparison group is constructed. In a traditional regression framework all firms where data is available will usually qualify to form the control group. But not all firms are similar to merging firms with respect to the relevant characteristics. Although having many observations is desirable from the viewpoint of statistical efficiency, it can have the disadvantage of being sensitive to the functional form assumptions imposed on the estimated relationship if there are many control observations that are very different from the merging firms. One possible solution to this problem of severe differences of many control observations is to block on certain characteristics (covariates): for example one can group the data by centiles of firm size, or by industries, and estimate the relationship for every group, and average over them to find the average merger effect over all mergers. Some poorly suiting control observations may then drop automatically. Doing this, though, will give rise to the “curse of dimensionality” even with few variables to block on. This curse arises with the problem that the pool of control firms is always exhausted quickly when the data are divided along several dimensions. Propensity score matching provides a tool to avoid the curse of dimensionality in the construction of a control group. We will describe and discuss the framework used in the next Section. Additionally, we shortly refer to the use of traditional methods to estimate the merger effect. Section III describes the variables used in the estimations. The comparison of different methods permits to judge whether propensity score matching has a large impact on the estimation of the effect. Presentation of the results follows in Section IV, and certain robustness checks are discussed in Section V.

II. Methods and Framework

First, a description of the statistical framework that is applied to implement the propensity score is provided, together with some linkages to those methods used for comparison. We draw on Imbens (2004) and Wooldridge (2002) to introduce the framework: The framework is frequently referred to as the "Rubin causal model of inference", a label attached by Holland (1986), who summarises the model.

A. Statistical Model

A sample of N units is randomly drawn from the population of firms. There are two potential outcomes of the variable of interest, which here will be profitability, measured as return on assets, by which the effect of the merger is measured. In such a framework of potential outcomes the event for which the effect is measured is usually called the "treatment", and its effect straightforwardly is referred to as the "treatment effect". Therefore, we use "merger", "merger or acquisition" and "treatment" synonymously. For each unit (firm) i there are two potential outcomes according to treatment status being either treated, which is denoted by W_i=1, or not treated, denoted by W_i=0. Potential outcome Y is therefore a function of individual treatment status: $Y_i(W_i)$. $Y_i(0)$ is the value of the outcome if the firm makes no merger, and $Y_i(1)$ is the value of the outcome when unit i does make a merger. Eventually, every firm i will only experience W_i=1 or W_i=0 exclusively, but in the causal model the effect of the merger is defined against its latent counterpart, which is $Y_i(1\text{-}W_i)$. Moreover, each unit is described by a vector X_i of firm characteristics, usually termed "covariates" in this literature. Therefore, for every i the triple (X_i, W_i, Y_i) is observed, where Y_i is the realised outcome.

One important measure of interest is the average difference in outcomes between treated and untreated units for the whole population of firms, τ_P, called the population average treatment effect and defined as

$$\tau_P = \mathrm{E}\big(Y(1) - Y(0)\big).$$

The sample analogue is the sample average treatment effect and is calculated as

$$\tau_S = \sum_{i=1}^{N} (Y_{\mathrm{i}}(1) - \mathrm{Y_i}(0)).$$

Looking only at the treated units, the population average treatment effect for the treated is

$$\tau_{P,T} = \mathrm{E}(Y(1) - Y(0)|W = 1).$$

Its sample analogue is the focus of interest here:

$$\frac{1}{\sum_{i=1}^{N} W_i} \sum_{i=1}^{N} W_i\big(Y_i(1) - Y_i(0)\big).$$

How can estimates of these be obtained? When treatment is statistically independent of the outcome, as usually achieved by randomised assignment of treatment in controlled experiments, then it holds that

$$\mathrm{E}\big(Y(1)\big) = \mathrm{E}(Y|W = 1).$$

This means that the expected value of those that receive treatment is identical to what the expected outcome would be for any unit in the population. Analogously, this holds for the untreated:

$$\mathrm{E}\big(Y(0)\big) = \mathrm{E}(Y|W = 0).$$

Therefore one can consistently estimate $\mathrm{E}\big(Y(0)\big)$ and $\mathrm{E}\big(Y(1)\big)$ by the means of the respective sample subgroups and obtain an estimate for the population difference by the difference in the two means. Moreover, because treatment status and outcome are independent, the expected differences for the treated and untreated are the same:

$$\mathrm{E}(Y(1) - Y(0)|W = 1) = \mathrm{E}\big(Y(1) - Y(0)\big).$$

Mergers are not randomly assigned. Although one can choose a random sample of firms that make mergers and firms that do not, they self-select into the two groups dependent on the idiosyncratic outcome pair $\big(Y_i(0), Y_i(1)\big)$ they expect. These latent outcome pairs are different because firms are different with respect to observable and potentially also to unobservable characteristics. The following assumption, which is crucial for identification under self selection, is introduced:

Conditional on *X*, *W* and $\big(Y_i(0), Y_i(1)\big)$ are independent. (1)

This means that a rich set of observable characteristics that possibly influence the potential outcome is crucial. Moreover, merging and non-merging firms must have the same distributions concerning their unobserved characteristics.

Several different labels are used for assumption (1) in economics and statistics: ignorability of treatment given *X*, ignorable treatment design, conditional independence assumption, selection on observables, unconfoundedness (Imbens, 2004, Wooldridge, 2002). With this assumption made, estimation within a simple regression framework can be implemented, estimating

$$\mathrm{E}\big(Y(W)\big) = \gamma W + \alpha + X\beta. \quad (2)$$

This is a standard way to estimate the treatment effect γ except that identification is explicitly secured by the introduction of the conditional independence assumption. Rosenbaum and Rubin (1983) show that alternatively to conditioning on *X* it is sufficient to condition on the probability of treatment, called the propensity score, $p(X)$, in order to remove bias due to all covariates *X* under assumption (1). The propensity score is defined as

$$p(X) = \Pr(W = 1|X),$$

and their central theorem in Rosenbaum and Rubin (1983, Theorem 1), is

Conditional on $p(X)$, *W* and *X* are independent. (3)

When estimated by a linear probability model, the regression

$$\mathrm{E}\big(Y(W)\big) = \gamma W + \alpha + \beta_0 p(X).$$

will yield the same estimate for γ as regression (2). So the propensity score summarises all the information about the merger determinants contained in X.

Together with the assumption

$$0<p(X)<1, \tag{4}$$

the expected difference between two observations with different treatment but the same propensity score equals the average treatment effect:

$$\mathrm{E}(Y(1)|p(X), W = 1) - \mathrm{E}(Y(0)|p(X), W = 0) = \mathrm{E}\big(Y(1) - Y(0)\big).$$

Given this, the aim is to find control observations the same ("very similar") propensity scores as the treated units, and that observations have to fulfill assumption (4), which means that for every observation with characteristics $X=x$, the probability of treatment must be positive, and must not be certain. Otherwise, there could not be a unit from the opposite group with the same characteristics.

B. Implementation, Robustness

Implementation consists of the following steps:

1. Choose determinants: All variables that influence the merger decision should be included. The next Section is devoted to a discussion about which variables are used as determinants.

2. Estimate the propensity score: A Logit model is used to estimate the propensity score for the full sample.

3. Check overlap: Merging firms with propensity scores above that of all non-merging firms are excluded. Due to a lack of comparison units with the same propensity score, the merger effect cannot be estimated for those.

4. Matching: While there are many different matching algorithms to control for the propensity score of treated and control units, results typically do not vary widely, and we only

apply one-to-one matching based on the closest control unit with respect to each treated unit's propensity score.

5. Check balancing property: One central aspect of the appropriateness of a particular matching algorithm must be that the conditional independence assumption holds in the matched sample. The assumption states, in other words, that the distribution of $Y(0)$ must be the same conditional on $W=0$ and $X=x$ as its distribution conditional on $W=1$ and $X=x$. Analogously, the two conditional distributions must be the same for $Y(1)$. To check if the covariate (marginal) distributions of generated control compared to comparison group can be considered "close enough", plots of the Kernel density estimates of the distribution functions are examined. This is not sufficient to detect inequalities in the joint distributions of X, but it is a necessary implication of Rosenbaum and Rubin's theorem, equation (3) above. To have a measure of when closeness of empirical distributions is reached we could use, for example, a *t*-test of group means and a Kolmogorov-Smirnov test for equality of population distributions. But as Imai, King and Stuart (2008) point out, this does not make sense. It is not the goal of the "test" to check if two samples (the two groups) come from the same population; the goal is to balance the covariate distributions in the sample, and hypothesis tests are irrelevant. Even if the X distributions are close enough to conclude that the two samples come from the same population, the differences could be too large for an influential variable.[1]

III. Determinants and Effects of Mergers

A. Determinants of Mergers

Many different hypotheses about the determinants of mergers have been formulated, and the model should not be constrained to a single one. Therefore, variables are included that

[1] Another undesirable property of using test statistics highlighted in Imai, King and Stuart (2008) by examining the behaviour of the t-test when the number of observations decreases in the treatment group is not of concern here, because in one-to-one matching and with a fixed number of treated, the sizes of the groups do not change.

influence the merger decision based on different objectives and assumptions. Doing so, we will follow some of the strategies in Gugler, Mueller and Weichselbaumer (2008).

A wave-like pattern is typical for merger activity over time. Our data encompasses the period 1992 to 2003 and therefore also a merger wave. The aim of this article is not to explain why there are waves explicitly. Merger waves may have determinants that differ strongly from other merger determinant explanations. An easy way to account for the wave pattern is the inclusion of a linear and a quadratic time trend in the estimation of the determinants.

One aspect of recent merger waves theories that is taken into account explicitly is the association with the stock market, and stock market booms. This may be associated with economic fundamentals (as in the *q*-theory formulated by Jovanovic and Rousseau, 2002), or may be due to overvaluation (as in the model of stock market driven acquisitions by Shleifer and Vishny, 2003) or driven by the exploitation of market optimism by managers (as in the approach by Gugler et al., 2008). All predict strong differences for listed firms and non-listed firms. Therefore, a dummy variable is included to differentiate between the two groups of listed and non-listed.

Corporate governance structures play a potential role for more than one reason. When ownership is not concentrated and monitoring difficult, management's goals are worse aligned with that of shareholders and there is more room for discretionary behaviour. For managers, creating a larger firm by a merger is desirable even if it decreases profitability. Therefore, the ownership share of the largest shareholder is included and expected to decrease merger activity of firms, given that mergers are bad for profitability but pursued by poorly monitored managers (i.e., no large owner).

Besides that, shareholder protection differs between countries or legal systems. Findings indicate that Anglo-American legal systems have better protection (La Porta, Lopez-de-Silanes, Shleifer and Vishny, 1998) and this could influence the merger decision, either

positively if mergers are expected to be profitable, or negatively if mergers are expected to be harmful. Thus, an indicator for legal system is employed, differentiating between Continental Europe, and Great Britain, which represents the Anglo-Saxon legal origin.

Cash flow is an important variable in the managerial discretion hypothesis. For cash flow, discretionary use is easiest for the management. On the other hand, lagged profitability should also have a place in the covariates. From the perspective of the *q*-theory or neo-classical theories more generally, higher profitability can indicate higher ability of the management, which could increase merger propensity of profit oriented managers when poorly managed firms exist. Complementary, low profitability should have a negative effect as a merger determinant as for these firms it may be harder to finance the transaction when they have to rely on external sources, and when management already has below-average success with the own firm. Concerning cash flow and profitability, a problem arising is that they are highly correlated. So only profitability is used. Nevertheless, due to the high correlation, it still functions as a control for the determinants associated with cash flow.

The size of the company can be a control variable for many reasons. Possibilities are easier access to finance, e.g. when the company is too big to fail, or through an internal capital market when it has several subsidiaries. Given that it is more difficult to acquire a target the larger it is, larger firms can choose from a larger pool of accessible targets. For the same reason, managerial discretion can be larger, because the large firm is less likely to be taken over. Besides total assets, the number of employees is controlled for. This is a straight-forward alternative size measure when firms vary in capital-intensity and labour-intensity.

Debt is another control variable which may serve as a channel of influencing the merger decision for more than one reason. A high debt level may indicate that it is more difficult to get additional loans. Opposed to that, it could also mean that a company is growth-

oriented and more willing to make mergers. Lastly, the age of the firm also serves as a control variable.

B. Effects of Mergers

Given the efficient market hypothesis, using an event study with stock returns is an appealing strategy to measure the effects of mergers. We do not want to exclude non-listed firms for which there is no stock market data. It would exclude a large share of acquisitions, and it would preclude judgement over the question whether the two groups, listed and non-listed, can be compared at all within our propensity score matching framework.

Instead, balance sheet data is used to calculate the return on assets (*ROA*), given as total assets over after-tax profits. The evaluation is measured by *ROA* from one year after the merger until four years after the merger. The effect is measured for each year, and *ROA* then cumulated for all years. So the outcome measure one year after the merger is ROA_{t+1}, give a merger in *t*. For the second year, we look at (ROA_{t+1}+ROA_{t+2}), and so on. The year of the merger is not considered and left as a consolidation period. As our sample shows, many firms make more than one M&A within our sample period. Firm-years of merging firms are excluded where another merger happens in the evaluation year. So when an M&A occurs in *t*, and no further M&A in *t*+1, then *ROA* of *t*+1 of a firm is included in the treatment group. The same strategy applies to all four periods after the merger.

C. Data

The information on mergers comes from "Worldwide Mergers \& Acquisitions," published by Thomson Financial Securities Data (TFSD). It includes all corporate transactions with a transaction (deal) value of at least one million US dollars. Public and private transactions are covered. The following countries have been selected: Austria, Germany, Italy, France and United Kingdom.

It was necessary to combine the transactions with the financial data available from the Amadeus database from Bureau van Dijk. An approximate string matching algorithm was applied, matching via company names for each country. All of the automatic matches below a certain similarity threshold were checked manually. 52.6 per cent of all transactions could be matched to an Amadeus company. Data restrictions reduced the sample available for estimation considerably. Besides the financial data, the information on the largest shareholder from Amadeus is used when available.

IV. Methods Applied

The methods that are used for obtaining the estimated effect of a merger, and compared, are: (A) simple difference in means (DIM), (B) ordinary least squares (OLS), (C) propensity score estimation and matching. For each method balance checks for the covariates of the treatment and control group for the elicited sample are presented.

A. Difference in Means

Having data from random sampling at hand where the variable of interest is assigned randomly, one could obtain a valid estimate of this variable's effect by just comparing the difference in means. This is not plausible, given that the merger decision is not made at random but is a deliberate action of the management. But it is useful as a comparison to what is gained by the more complex estimators and to point out where the problem lies by examining the empirical distributions for the variables selected.

In the first four rows of results in Table 1 the *t*-tests results are presented for the difference in means between merging and non-merging firm-years of *ROA*, cumulative over the respective number of years after the merger. A significant and negative effect of 0.7 percentage point is found for the first year, increases by about half a percentage point in year two, but very little further in year three, where the cumulative estimated effect is insignificant.

In year four, a further increase of almost one percentage point below the average of the control group is measured, amounting to a total negative cumulative effect after four years of 2.3 percentage points, which is marginally insignificant.

But looking at the Kernel densities of the selected covariates for the two groups, it becomes clear that merging firms differ markedly from the control group. These variables are: ln(*TA*) is the log of total assets and ln(*Emp*) log of the number of employees, *Sh*.1 the size of the largest shareholder, firm age is years since incorporation, leverage is long term debt over total assets, *Listed* and *GB* are dummy variables for being listed on a stock exchange and being British, respectively, *ROA* stands for the lag of the outcome measure. It must be emphasised that all variables that vary over time are lagged by one period to avoid the influence of the merger on those variables. Figure 1 shows that in its left-hand-sides: merging firms are larger both in terms of total assets and the number of employees, have more largest shareholders at lower levels but lower densities starting at fifty percent ownership, and have higher pre-merger ROA than control firms. Merging firms are also a little older and a bit more leveraged, but the differences look less pronounced. Figure 2 shows the discrepancy of the two groups for the binary variables: more are from Great Britain (i.e. Anglo-Saxon legal background) and a higher share is listed. Besides that, an Amadeus peculiarity is that many firms have only unconsolidated data, and this fraction is larger for non-listed firms. Table 2 confirms this for the sample means and standard deviations of the two groups (columns "merger", compared to the "DIM, OLS"-column of the control columns).

B. OLS

OLS is the most common and obvious extension to the potentially flawed difference in means estimate. The following specification is made to account for the differences in variables that influence profitability:

$$ROA_{i,t+k} = b_0 + b_1 Merger_{i,t} + b_2 \ln(TA_{i,t-1}) + b_3 \ln(Emp_{i,t-1}) + b_4 Sh.1_{i,t-1} + b_5 ROA_{i,t-1} + b_6 Leverage_{i,t-1} + b_7 GB_i + b_8 Listed_i + b_9 Consolidated_i + b_{10,j} SIC_{i,j} + u_{i,t}$$

Merger is a dummy variable that captures the effect of a M&A in *t* on *ROA* in *t*+*k*, *k*=1,2,3,4. *SIC* stands for a full set of two-digit SIC-code-dummy variables, where dummy-variable $SIC_{i,j}$ is one if firm *i* is in industry *j*. The second set of four rows of Table 1 show the merger effect estimated: starting at 94 basis points, it is about 30 percent higher for the years *t*+1 to *t*+3. In *t*+4, it is only slightly higher than the simple difference-in-means estimate, but now significant. So by making regression adjustments, all the estimates become significant and are now larger. Table 3 shows the results for all coefficients in the four OLS regressions.

Balancing Property: To improve comparability between the three methods, all observations where data for the some of the covariates were missing for the OLS estimations have been excluded from the DIM-estimation. Therefore, the left-hand-sides of Figure 1 and Figure 2 also represent the OLS-sample. This illustrates, that, as far as the marginal distributions are concerned, there are differences in the two groups which can give rise to sensitivity to the specification. The differences in means and standard deviations of the covariates are also given by columns four and five (Control: DIM, OLS) in Table 2.

C. Propensity Score Matching

Propensity score matching is intended to obtain balance on the covariates without having to block on every single covariate. As described in Section II, under the assumption of conditional independence, controlling for the propensity score will achieve this. First, we estimate the propensity score with a Logit-model with the specification:

$$\Pr(W_{i,t} = 1) = c_0 + c_1 \ln(TA_{i,t-1}) + c_2 \ln(Emp_{i,t-1}) + c_3 Sh.1_{i,t-1} + c_4 ROA_{i,t-1} + c_5 Leverage_{i,t-1} + c_6 GB_i + c_7 Listed_i + c_8 Consolidated_i + c_9 Age_i + c_{10} t + c_{11} t^2 + v_{i,t}$$

The left-hand-side is the probability of a merger, which is modelled. On the right-hand-side are a constant, the log of total assets, the log of the number of employees, the ownership share of the largest shareholder, *ROA* from before the merger, leverage, a dummy for being a British firm, another dummy for firm *i* being listed on a stock exchange, and one for consolidated data form, age is a firm's age in terms of years since incorporation, a trend variable *t* which is set to 1 in 1991, and a quadratic time trend, t^2.

Table 4 contains the estimates for this equation. Based on that, predicted probabilities of treatment can be obtained both for controls and for the actually treated. It must be checked if all merging firms can be matched to control firms with a similar propensity score. A simple rule is applied to identify the common support region, where matches can be found: all treatment units above the highest and below the lowest estimated propensity score of controls are discarded. Both conditions are fulfilled for all merging firms: the estimated propensities lie in the interval [0.0016, 5625] for the merging firms and this is a subset of the range [0.0003, 0.5927] of the control firms. Therefore all observations can be used in the matching algorithm. The left panel of Figure 3 shows the empirical densities of the estimated scores.

Based on these estimated treatment probabilities, every treated firm is matched to one control firm with the most similar imputed value. This is done by matching with replacement from the pool of control firms. The treatment effect is obtained by calculating the difference in mean outcome between the two groups. The final four rows of Table 1 show the results: now the estimated effect is higher for all four periods, and is significant for the first three and marginally insignificant for the fourth post-merger year. Whereas the difference is not so large in the first post-merger year, the effect is one third larger with propensity score

matching in the second period, and almost 60 percent larger in year three. This strategy to find a careful balance between control and treated based on the determinants for the merger changes the estimate of the effect decisively.

Balancing Property: Conditioning on the empirical propensity score does not guarantee that the covariates are balanced in the matched sample. But Figure 1 and Figure 2 show that the balance is very well established with respect to the samples' (empirical) marginal distributions. Means and standard deviations given in Table 2 confirm this. Moreover, the empirical distributions of the propensity scores in the matched sample (right panel of Figure 3) seem almost identical in comparison to the whole sample (left panel of Figure 3).

V. Robustness Checks

Several points can be raised against the validity of the way that propensity score matching is implemented here. Three of them that seem important and can be well examined are addressed in the robustness checks of this section: blocking on the industry classification; treatment effect estimation on lagged outcome, where one predicts from the statistical framework adopted that the effect of a merger must disappear if we look at a period before the merger; and a flexible estimation of the propensity score, to see how strongly the effect estimated depends on the functional form of the determinants equation.

A. Blocking on Industries

A check for robustness can be done by looking at each industry separately to find a control firm. Even with a large pool of control variables it is difficult to end up with balance of matched and control over all industries automatically, that is without strict matching on industries. Therefore, we match exactly on the industry of the merging firm, implying balance of industries represented both in treated and control. Only control firms in the same industry qualify for being a nearest neighbour, in terms of propensity score.

In lines 2 to 5 of Table 5 it is shown that the effects for each year lie somewhere in between the OLS and matching estimates of Table 1: year 1 is very close to Table 1 and significant; years 2 and 3 are not significant anymore, but year 4, while smaller than before, is significant and still very large with 3.1 percent cumulative difference.

B. Lagged Outcome

Does the change in ROA really come from the merger? The connection between cause and effect becomes more credible after checking if a treatment effect is also found when one looks at outcome before the treatment (Imbens, 2004). In this check, merging firms and their matched controls are evaluated by looking at a time period before the merger, where, given the assumptions, it is clear that there cannot be a merger effect, that is, the estimates before the merger took place should be zero. Otherwise, it cannot be argued that those characteristics responsible for the negative effect have been controlled for.

Line 3 of Table 5 shows a negative, but insignificant estimate for the difference of ROA in *t*-2 and *t*-1 between firms that make a merger in *t* and the control group. It is also insignificant for *t*-2 and *t*-3, once positive and once negative. Taken together, there is no pattern and no significance in the differences between the two groups before the merger takes place in the merger group, and thus is evidence on the usefulness of our interpretation of the merger effect.

C. Flexible Estimation of the Propensity Score

When the set of characteristics that should be controlled for to estimate the propensity score is correct but there is uncertainty what the correct specification for the Logit is, it is important to see how sensitive the results are to the specification of the Logit. This is done by including all interactions between the variables and all quadratic terms of the variables.

The last set of four lines in Table 5 contains the result. For all years except the second, the effect is larger now. Similarly to blocking on the industry, only the first and the fourth year's estimate is significant, but as compared to the lagged outcome test, the second and third year are not having very small *t*-values, and the pattern of consistently negative effects after the merger is remaining. From this perspective, the estimates in Table 1 do not seem very sensitive to the specification of the Logit estimation.

VI. Conclusion

Merger effects are often estimated to be negative, but the result is disputed. Critics argue that the group of merging firms is inherently different from non-merging firms and this raises questions about the validity of such an incorrect sample of controls even after controlling for the covariates in a regression.

Our analysis shows that for our set of determinant variables for mergers, the group of merging firms actually does differ strongly. Accepting that a regression-type adjustment for these differences may not suffice, we construct a control group by estimating and matching on the propensity score. Evidence is found that a nearest-neighbour matching algorithm actually balances the samples with respect to their distributions.

The results exhibit a clear pattern of increasingly negative post-merger cumulative *ROA* when compared to the matched control group. This pattern is robust to blocking on industries and a flexible estimation of the propensity score, as well as in passing a lagged outcome test. There is also a tendency that the negative effect of mergers is more negative when estimated after matching as compared to a simple difference in means and OLS-control of the covariates. This is especially true for the first and last year evaluated in our sample.

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Table 1: Estimates of Cumulative ROA Effect after a Merger

		Coeff.	*t*-value	Mergers	Controls
DIM	*t*+1	-0.0072	(-2.6)	1,693	198,927
	t+2	-0.0122	(-2.3)	1,264	154,254
	t+3	-0.0137	(-1.6)	934	117,082
	t+4	-0.0230	(-1.9)	668	87,521
OLS	*t*+1	-0.0094	(-3.7)	1,693	198,927
	t+2	-0.0154	(-3.2)	1,264	154,254
	t+3	-0.0185	(-2.5)	934	117,082
	t+4	-0.0259	(-2.4)	668	87,521
PS-Match.[1,2]	*t*+1	-0.0108	(-3.4)	1,693	1,637
	t+2	-0.0209	(-2.6)	1,264	1,233
	t+3	-0.0294	(-3.4)	934	913
	t+4	-0.0404	(-1.9)	668	652

[1] *t*-value from bootstraped standard error, obtained by the procedure described in Becker and Ichino (2002).

[2] The matched control sample used for inference consists of a number of controls equal to that of mergers. A deviation of controls and mergers in this table means that some controls have been assigned to more than one merging firm.

Table 2: Sample Means of Determinant Variables

	Mergers		Control			
			DIM, OLS		PSM	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Ln(*TA*)	11.382	1.64	10.253	1.40	11.393	1.73
Ln(*Emp*)	5.976	1.68	4.932	1.44	5.929	1.67
Sh. 1	68.960	33.74	78.443	26.40	71.064	32.44
ROA	0.050	0.11	0.036	0.10	0.048	0.09
Age	42.172	28.57	36.756	22.90	44.254	31.25
GB	0.546	0.50	0.343	0.48	0.580	0.49
Listed	0.310	0.46	0.021	0.14	0.305	0.46
Leverage	0.161	0.19	0.137	0.18	0.158	0.19
n	1,693		198,927		1,693	

Table 3: OLS Merger Effects Estimation (Dep. Var.: $ROA_{i,t+k}$, k=1,2,3,4)

	t+1	t+2	t+3	t+4
Merger	-0.0094	-0.0154	-0.0185	-0.0259
	(-3.7)	(-3.2)	(-2.5)	(-2.4)
ln(*TA*)	-0.0018	-0.0044	-0.0072	-0.0112
	(-8.0)	(-10.6)	(-11.2)	(-12.1)
ln(*Emp*)	-0.0005	-0.0009	-0.0014	-0.0019
	(-2.6)	(-2.3)	(-2.4)	(-2.2)
*Sh.*1	0.00002	0.00002	0.00002	0.00004
	(2.2)	(1.2)	(0.7)	(0.9)
ROA	0.4592	0.8433	1.1915	1.5079
	(201.0)	(191.2)	(168.0)	(144.0)
Leverage	-0.0087	-0.0208	-0.0344	-0.0463
	(-6.3)	(-7.9)	(-8.2)	(-7.6)
GB	0.0054	0.0139	0.0227	0.0347
	(9.8)	(13.8)	(14.4)	(15.4)
Listed	-0.0015	0.0028	0.0105	0.0139
	(-0.9)	(0.9)	(2.4)	(2.2)
Consolidated	-0.0078	-0.0184	-0.0316	-0.0453
	(-8.2)	(-10.3)	(-11.3)	(-11.3)
Constant	0.0352	0.0830	0.1373	0.2035
	(17.9)	(22.8)	(24.3)	(25.1)
F-test: SIC-2	11.1	14.4	16.4	16.6
N	200,620	155,518	118,016	88,189
R^2	0.185	0.216	0.225	0.229

Table 4: Logit Merger Determinants Estimation (Dep. Var.: Pr ($W_{i,t} = 1$))

	Coeff.	z-value
ln(*TA*)	0.158	(8.2)
ln(*Emp*)	0.147	(8.0)
Sh.1	-0.002	(-2.1)
ROA	1.133	(4.6)
Leverage	-0.057	(-0.4)
GB	0.542	(10.0)
Listed	2.293	(29.1)
Consolidated	0.394	(5.6)
Age	-0.002	(-2.2)
Year	0.317	(3.8)
Year^2	-0.017	(-4.1)
Constant	-8.936	(-21.0)
N		200,620
Psd.-R^2		0.134

Table 5: Estimates of Merger Effect from PS-Matching for Robustness Checks

		Coeff.	*t*-value	Mergers	Controls
SIC-2	*t*+1	-0.0106	(-2.3)	1,667	1,580
	t+2	-0.0197	(-1.6)	1,246	1,187
	t+3	-0.0210	(-1.6)	923	882
	t+4	-0.0313	(-2.2)	661	631
Lagged	*t*-1	-0.0040	(-0.7)	1,749	1,666
Outcome	*t*-2	0.0020	(0.4)	1,348	1,283
	t-3	-0.0038	(-1.2)	999	962
Flexible	*t*+1	-0.0122	(-2.2)	1,693	1,617
PS-Estimation	*t*+2	-0.0193	(-1.6)	1,264	1,222
	t+3	-0.0323	(-1.6)	934	907
	t+4	-0.0502	(-2.1)	668	649

All *t*-values are from bootstraped standard error (see Becker and Ichino, 2002).

Figure 1a-1f: Kernel Densities of the Continuous Covariates, Full Sample (left) vs. Matched Sample ("PSM", right)

Figure 1a: Log of Size (TA, Total Assets)

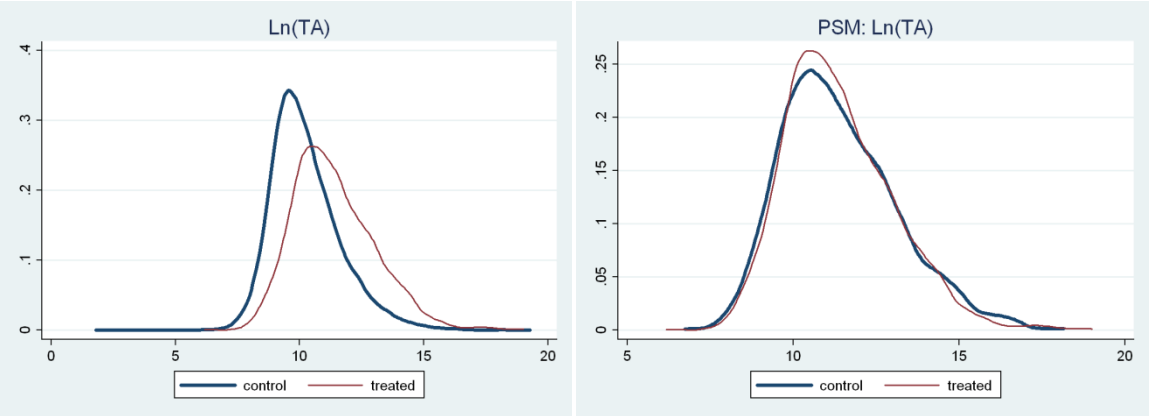


Figure 1b: Log of the Number of Employees

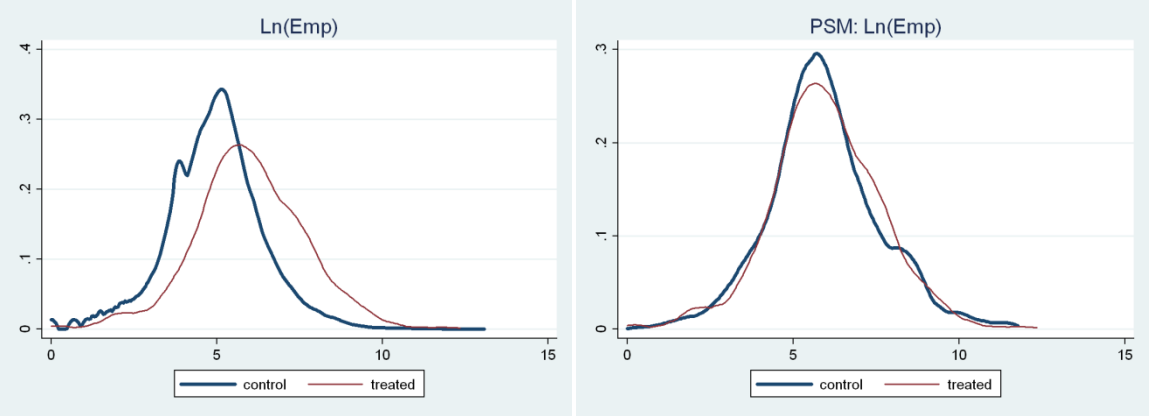


Figure 1c: Size of the Largest Shareholder

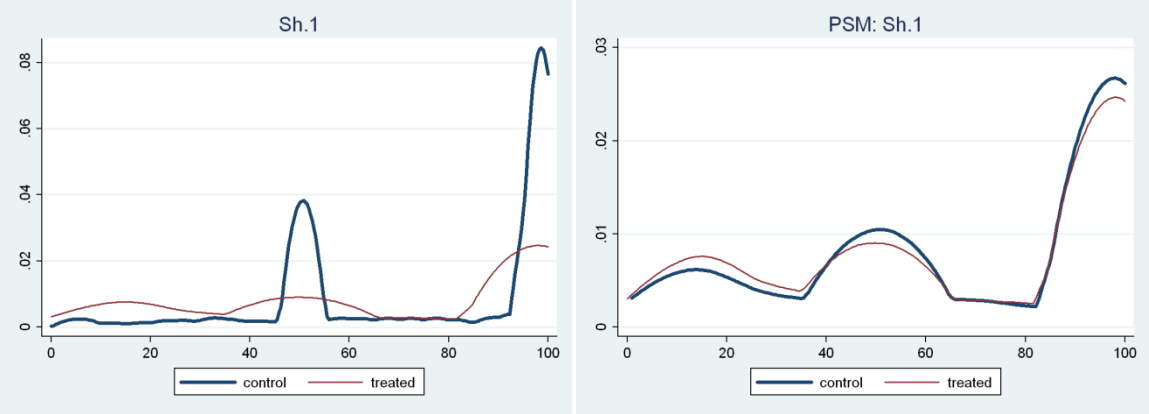


Figure 1d: Return on Assets

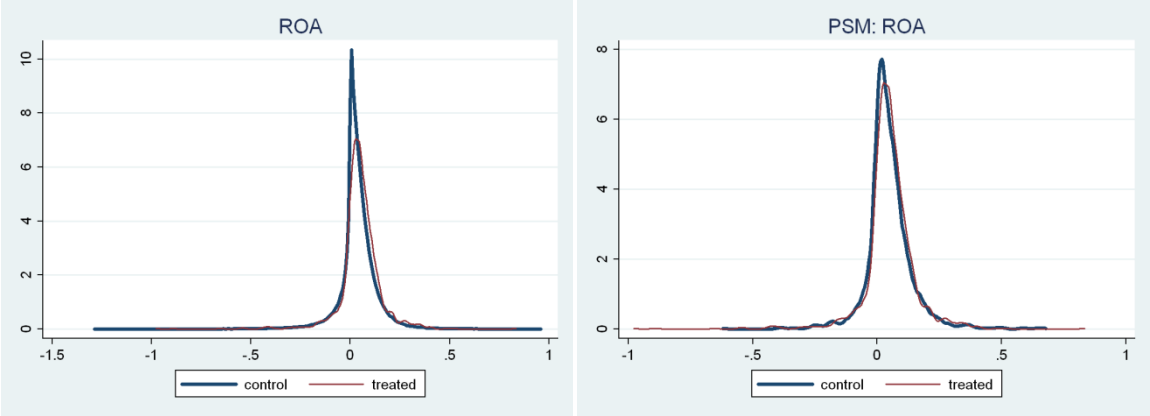


Figure 1e: Firm Age

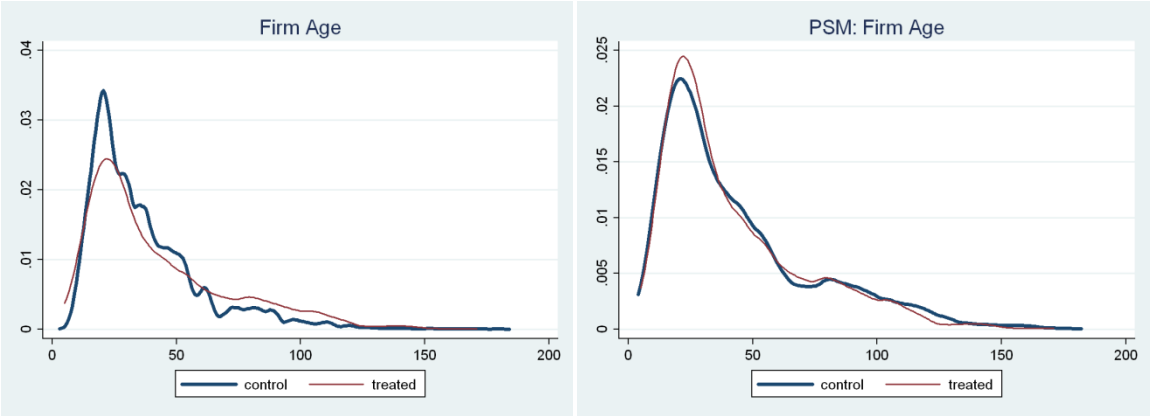


Figure 1f: Leverage

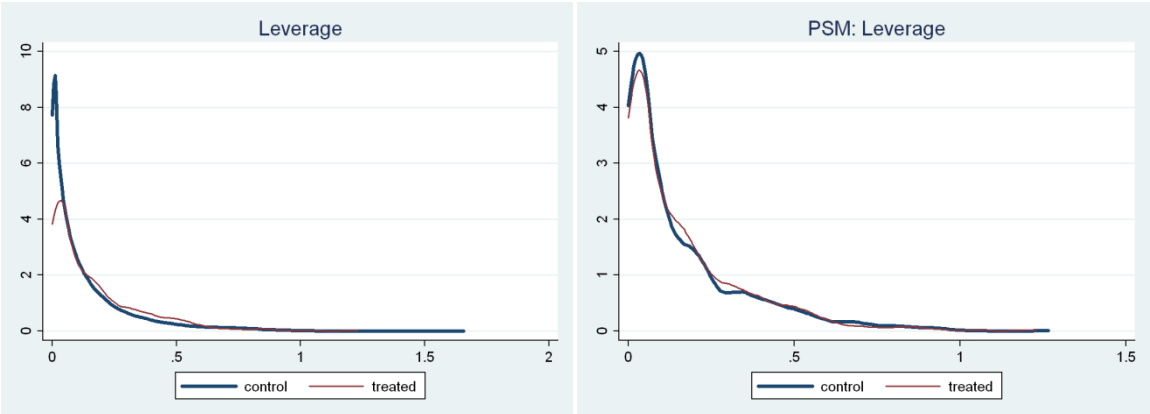


Figure 2a-2c: Histograms of the Binary Covariates, Full Sample (left) vs. Matched Sample ("PSM", right)

Figure 2a: Fraction of British Firms (GB)

Figure 2b: Fraction of Listed Firms

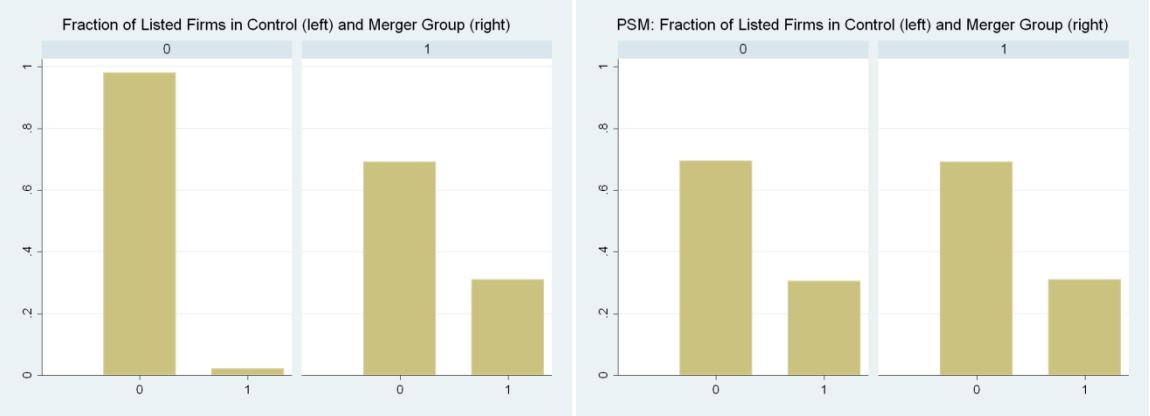


Figure 2c: Fraction of Consolidated Firms

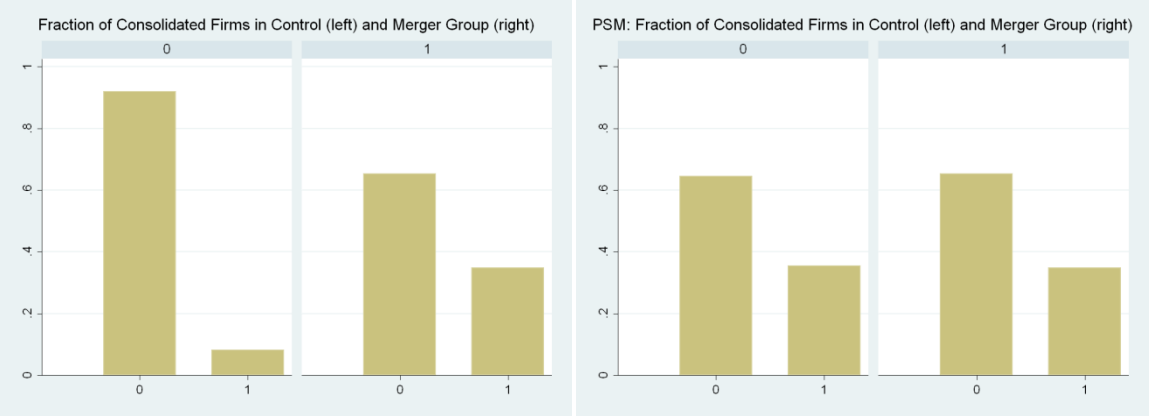
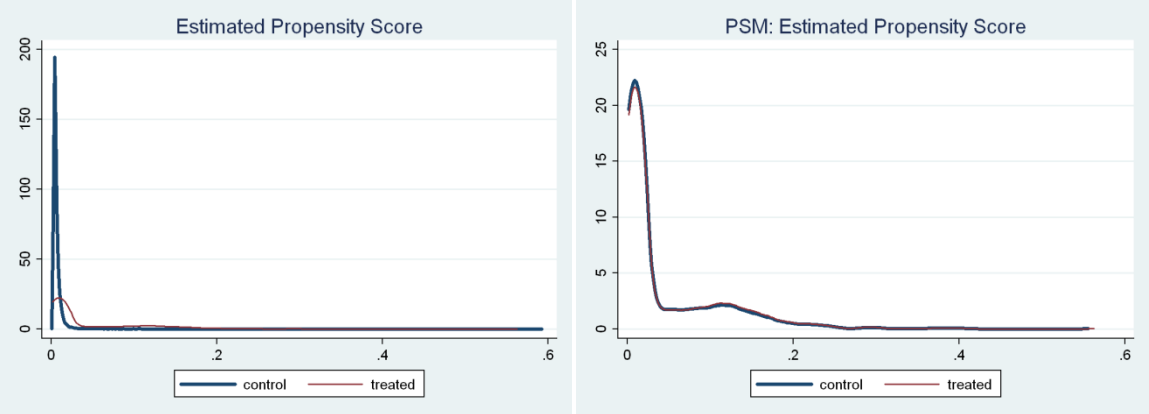


Figure 3: Kernel Densities of the Estimated Propensity Score, Full Sample (left) vs. Matched Sample ("PSM", right)



The Effects of Mergers in the Current Economic Crisis

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1. Introduction

There is an ongoing controversy as to the effects of mergers on acquirers in the economic literature. Most balance sheet ex post and long run event studies find negative effects on acquirers and/or their targets, while most short run event studies find positive effects for the combined value. For example, Ravenscraft and Scherer (1987) for the United States conclude that the profitability of acquired firms declined after they were acquired. Gugler et al. (2003) attribute most gains if any to market power effects. On the other hand, Healy et al. (1992) found a significant increase in the pre-tax cash flows of the companies involved in the 50 largest mergers between 1979 and 1984. Concerning stock price performance, Moeller et al. (2005) find that acquiring-firm shareholders lost 12 cents around acquisition announcements per dollar spent on acquisitions for a total loss of $240 billion from 1998 through 2001. Most wealth losses are incurred by large merger deals. More generally, Agrawal and Jaffe (2000) conclude that long-run performance is negative following mergers, though performance is non-negative (and perhaps even positive) following tender offers, and cash-financed mergers do better than stock-financed mergers (see also Loughran and Vijh, 1997). In contrast, Andrade et al. (2001) find that over their 1973 to 1998 sample period, the announcement-period stock market response to mergers is positive for the combined merging parties, suggesting that mergers create value on behalf of shareholders.

This paper tries to clarify the issue whether mergers completed in the years before the current economic crisis created value or contributed to its severity. The current giant economic crisis – somewhat cynically – provides a unique testing ground for economists. For sure, the events in the years 2007-2009 can be regarded as exogenous to merger investment decisions in the years 2006 and before. Although some economists warned of the bubbly nature of asset prices (e.g. house prices: Robert J. Shiller) before the crisis unfolded, financial markets in 2006 or earlier did not foresee the collapse of subprime mortgage markets in early

2007,[1] nor the bank run on Northern Rock, a British bank, in mid-September 2007, nor the fire sale of Bear Stearns in March 2008 to JPMorgan Chase to avoid bankruptcy, nor the collapse of Lehman Brothers on September 12, 2008, nor the bail out of American International Group (AIG), etc., etc.[2] Indeed, the Dow Jones Industrial Average closed above 14,000 for the first time in its history on July 19, 2007, half a year after the mortgage crisis began!

This paper utilizes the current crisis to get a truly (to the merger decision) exogenous ex post measure of performance: the share price drop of the acquiring firm during the economic crisis. We define two measures (1) the percentage share price drop from 1 January 2007 until end of March 2009 ("2007-Model") and (2) a post Lehman drop from 15 September 2008 until end of March 2009 ("Lehman-Model"). We put together a unique database of more than 20,000 mergers worldwide since 2002. For both measures we find that mergers completed in the five years before the onset of the crisis significantly exacerbated the share price drop of a company in the crisis. Stock-financed mergers also destroyed value but fared better than cash-financed mergers, and mergers in the financial sector are worse than mergers in the non-financial sector. Firms from the Anglo-Saxon legal system and firms from countries with a low anti-self dealing index were harder hit than other firms. Our results are robust to the inclusion of leverage as an explanatory variable. Thus mergers by creating less efficient corporate organisations than before had a - distinct from leverage - negative effect on the share price performance of acquiring companies in the crisis.

Many culprits of the current crisis were named by politicians and economists mostly concerning macro regulation, such as lenient financial regulation and lax monetary policy. While we believe that these are valid points, our results point to another, hitherto neglected,

[1] In February 2007, HSBC, one of the world's largest banks, wrote down its holdings of subprime-related MBS (mortgage backed securities) by $10.5 billion, the first major subprime related loss to be reported.

[2] For an early account of the crisis see Brunnermeier (2008).

weakness in our economic system, one of securities laws and micro regulation, namely bad corporate governance. Corporate control of managers of large public corporations suffers from severe shortcomings and resulting bad merger decisions exacerbated the current crisis.

The rest of the paper is organized as follows. Section 2 describes the data base. Section 3 presents our main regressions, and Section 4 concludes.

2. The Data

Our dataset was formed by combining the Mergers and Acquistions database SDC Platinum with Datastream, both from Thomson Reuters. M&As included in the regressions are for the years 2002 to 2007. Eighty percent of the 32,987 transactions with deal value available could be matched to 11,369 different acquiring firms in Datastream. Thus, on average acquiring firms made 2.9 acquisitions in that period. These consist of six different forms of M&A: full mergers (26%), acquisitions of assets (39%), of partial interest (16%), of majority interest (12%), of remaining interest (6%), and of certain assets (1%). The remaining, non-merging Datastream firms form the comparison group. We correct each firm's share price series for re-investment of dividends and stock splits. After taking into account all data availability restrictions, the final sample consists of 25,697 non-merging firms and 9,932 merging firms.

Table 2 presents summary statistics on the variables used in the regressions (for the variable descriptions, see Table 1). As can be seen in Panel A, on average share prices dropped by 35% post 2007 and 29% post Lehman, and merging firms experienced much larger losses in value than non-merging firms, 43% versus 31% post 2007 (35% versus 27% post Lehman). Figure 1 visualizes the share price performance since 1 January 2007 until end of March 2009 for merging firms versus non-merging firms. The wedge in performance of merging versus non-merging firms opened quite early after the onset of the crisis, and regained momentum after the Lehman collapse (see red vertical line). Financial firms as well

as firms from Anglo-Saxon and Scandinavian legal systems were particularly hard hit. Panel B of table 2 reports the increase in merger activity in the years before the crisis: while in 2002 only 0.8% of own market value was taken over on average calculated over all firms (12.5% taking only merging firm years), these numbers go up to 3.1% (27.1%) in 2007. Financial firms display more stable merger activity, with 17%-19% of own market value taken over in the years under consideration. Around a third of merger expenditures is financed using own stock.

3. Results

The rationale of our regression analysis is as follows. If mergers create value for shareholders on average, e.g. via economies of scale or scope but also via increased market power, merging firms should fare better during the economic crisis than non-merging firms. If they in contrast result in less efficient organisations, e.g. because motives behind mergers are not only driven by shareholder value maximization objectives, the reverse should hold. Importantly, we control whenever possible (see below) for leverage: if mergers mainly increase the leverage of companies, it may be this increased leverage in the crisis than drives our results and not the mergers.

Tables 3a and 3b present our main results. We regress the share price drop variables (*D-2007* and *D-Lehman*) on a run-up variable in share prices until 2006 and until Lehman (*R-2007* and *R-Lehman*) to capture mean reversion of share prices, size measured by market value, and yearly merger activity variables from 2002 until 2006 ("2007-Model") or 2007 ("Lehman-Model"). In Table 3a we additionally include a full set of ICB-Subsector[3] and country dummies. LaPorta et al. (1997, 1998) sparked a large literature on the effects of country level shareholder rights and legal systems on the performance of companies. In short, their hypothesis is that the Anglo-Saxon legal system is more protective of shareholders than

[3] Industry Classification Benchmark of Dow Jones Indexes and FTSE, http://www.icbenchmark.com.

other legal systems, such as the Germanic or French legal system. Therefore, in columns 1 and 2 of Table 3b we include instead of the country dummies the anti-self dealing index of Djankov et al. (2008) measuring country level shareholder rights as well as three legal system dummies in addition to the constant term, which measures the Anglo-Saxon average effect. In columns 3 and 4 of Table 3b we include leverage as an additional explanatory variable.[4] As said, one point of critique may be that mergers simply proxy for firm leverage, and it is mainly leverage and not mergers that drives down share prices in the face of a near shut down in external capital markets, e.g. because of the increased cash constraints or even bankruptcy risk associated with leverage. We report the results on pre-crisis long term debt over total assets, results for total debt (long term plus short term debt over total assets) are similar but weaker.

As can be seen, all merger related coefficients are negative: mergers before the onset of the crisis significantly worsened the share price collapse during 2007-2009. Effects are particularly severe for the 2007-Model, but are also present in the Lehman-Model. Reassuringly, the effects taper off as we move further and further back in time: more recent mergers in 2006/2007 had a worse effect on share price performance during 2007-2009 than mergers in 2002/2003. The line *ØAA* at the bottom of the table measures the average effect over the five years of merger activity. The economic effects are substantial: for example, the coefficient of -0.188 (Table 3b, column 2) implies that share prices would have dropped by 5 percentage points less, had acquiring firms not made a merger pre-crisis, i.e. had they reduced their merger activity by 27 percentage points.

Our results are not driven by mergers simply increasing the leverage of acquiring firms. While the leverage variables take on the expected negative signs, thus exacerbating share price drops in the crisis, the results on mergers are not affected (see columns 3 and 4).

[4] We do not include leverage in all regressions, since we lose one third of the observations (mainly the financial firms such as banks and insurance companies), if we include leverage variables.

Interestingly, the coefficient on leverage becomes particularly negative and significant in the Lehman-model, when the financial crisis dramatically exacerbated.

The table's other results are also worth mentioning: while the run-up and market value variables do not bring consistent results, firms in countries with better shareholder protection as measured by the anti-self dealing index of Djankov et al. (2008) did better during the crisis. Finally, Anglo-Saxon firms did worse than firms from other legal systems. Thus, it appears that shareholder rights are better directly measured as by the anti self-dealing index than by legal systems.

Tables 4a and 4b dig deeper into the question which mergers were particularly detrimental to crisis performance. It disentangles stock-financed mergers from cash-financed mergers (Table 4a), and mergers by financial firms from non-financial firms (Table 4b). Looking at the average effects at the bottom of the table, stock mergers did better than cash mergers and financial firm mergers did worse than non-financial firm mergers (the latter particularly so post-Lehman!). The first result, which is contrary to most findings in the literature, may be explained by the larger need to take on debt in a cash merger than in a stock merger, since some of the cash usually comes from issuing debt, and during the crisis leveraged firms were particularly severely punished. The latter result may be explained by the fact that the crisis originated in the financial sector, in part because of bad merger decisions.

4. Conclusions

This paper utilizes the current economic crisis to assess which effects mergers had on acquiring firms and whether bad mergers contributed to the severity of the crisis. We find strong evidence that mergers exacerbated the share price declines of firms in the crisis, thus aggravating it. We propose – besides more prudent macro regulation – more prudent micro regulation, particularly in corporate governance.

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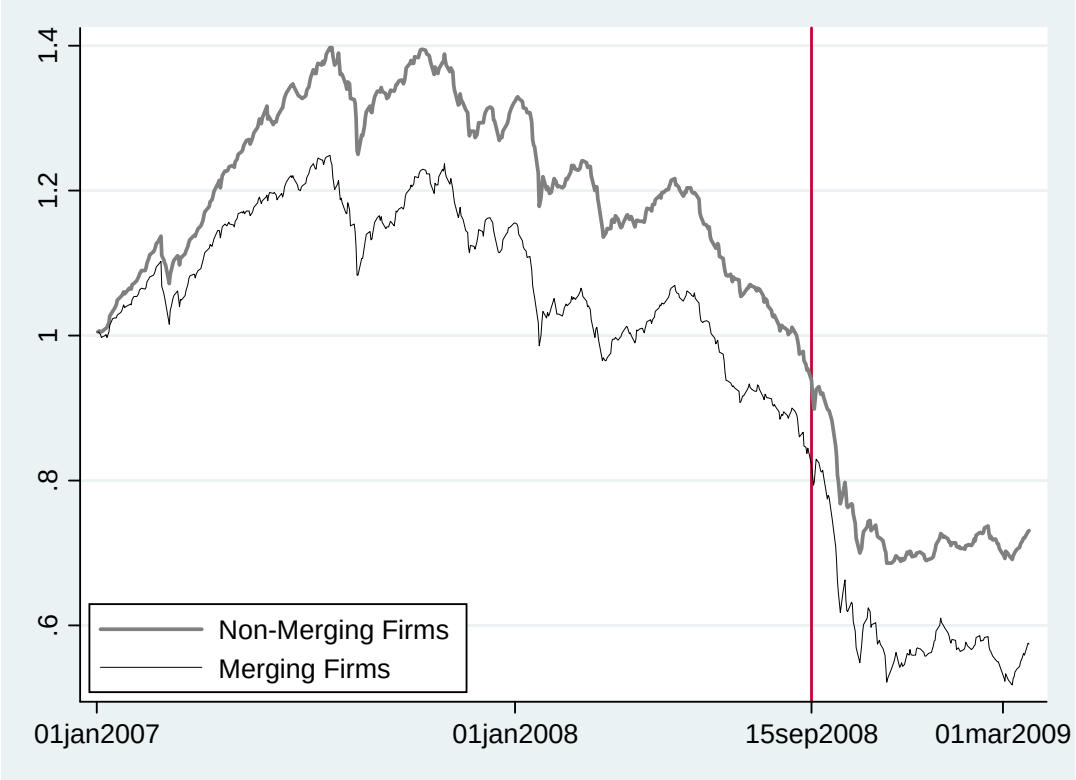
Figure 1: Total Return Index, Merging vs. Non-Merging Firms, from 1 January 2007 until end of March 2009



Note: The vertical red line denotes the Lehman collapse

Table 1: Variable Explanations

TRI	Total Return Index from Datastream, firm-specific
D	% change in *TRI*, starting from 12 Sept. 2008 in the "Lehman-Model" (*D-Lehman*), and from 1 Jan. 2007 in the "2007-Model" (*D-2007*), until 24 Mar. 2009
R	Run-up of *TRI*, % change of *TRI* from 1 Jan. 2006 to 12 Sep. 2008 in the "Lehman-Model" (*R-Lehman*), and to 31 Dec. 2006 in the "2007-Model" (*R-2007*)
MV	Market Value in Billion USD on 12 Sep. 2008 in the "Lehman-Model", and on 1 Jan. 2007 in the "2007-Model"
Lev	Non-Current Liablities over Total Assets
AA	Acquired Assets, in % of *MV*
AA St	*AA* financed by stock
AA Fin	*AA* by firms in the financial industry
ASDI	Anti-Self-Dealing Index (Djankov et al., 2008)

Table 2: Summary Statistics

Panel A	**All firms**		**Merging firms**		**Non-merging firms**	
	mean	median	mean	median	mean	median
D-Lehman	-.29	-.32	-.35	-.38	-.27	-.29
D-2007	-.35	-.47	-.43	-.53	-.31	-.45
R-Lehman	.13	-.09	.06	-.12	.16	-.08
R-2007	.26	.10	.25	.13	.27	.09
MV	1.34	.07	3.21	.22	.61	.05
Lev	.19	.12	.22	.18	.17	.10
N		35,629		9,932		25,697

Panel B: Acquired Assets for All and Merging Firms, % Stock Financed and Mergers of Financial Firms

	2002	**2003**	**2004**	**2005**	**2006**	**2007**
AA All firms	.008	.007	.013	.019	.026	.031
AA Merging firms	.125	.113	.154	.198	.235	.271
% of AA Stock-financed	.332	.276	.287	.297	.275	.273
AA Financial firms	.006	.006	.012	.016	.021	.027
AA Financial merging firms	.129	.130	.175	.206	.242	.293

Table 3a: Regression Results

	Lehman	**2007**
R	-.0015	-.0406***
	(-.88)	(-9.85)
MV	.0004	.0002
	(1.70)	(.49)
AA 02		-.066
		(-1.16)
AA 03	-.011	-.021
	(-.44)	(-.36)
AA 04	-.067***	-.138***
	(-3.74)	(-3.49)
AA 05	-.065***	-.173***
	(-4.53)	(-5.19)
AA 06	-.082***	-.225***
	(-6.96)	(-7.14)
AA 07	-.080***	
	(-7.62)	
Constant	-.194	-.141
	(-1.11)	(-.45)
Ø AA	-.061***	-.125***
	(-9.12)	(-6.47)
Country, Industry	Y	Y
R-squared	.271	.177
N	31789	35075

* p<.05, ** p<.01, *** p<.001

Table 3b: Regression Results

	Lehman	**2007**	**Lehman**	**2007**
R	.0172***	-.0038	.0196***	.0013
	(9.82)	(-.89)	(1.03)	(.27)
MV	.0002	-.0005	.0009***	.0009
	(1.05)	(-1.24)	(3.68)	(1.92)
AA 02		-.143*		-.108
		(-2.37)		(-1.67)
AA 03	-.017	-.073	.011	-.064
	(-.65)	(-1.17)	(.40)	(-.95)
AA 04	-.067***	-.169***	-.056**	-.129**
	(-3.49)	(-4.03)	(-2.65)	(-2.65)
AA 05	-.086***	-.237***	-.063***	-.18***
	(-5.64)	(-6.66)	(-3.88)	(-4.69)
AA 06	-.107***	-.316***	-.093***	-.264***
	(-8.44)	(-9.47)	(-6.95)	(-7.50)
AA 07	-.102***		-.091***	
	(-9.07)		(-7.54)	
ASDI	.582***	.710***	.625***	.865***
	(44.28)	(27.77)	(42.79)	-3.08
French	.255***	.506***	.271***	.539***
	(33.51)	(35.33)	(31.05)	(32.26)
German	.362***	.341***	.387***	.418***
	(71.64)	(33.97)	(68.74)	(36.75)
Scandinavian	.213***	.160***	.245***	.258***
	(17.09)	(6.39)	(17.56)	(9.25)
Lev			-.082***	-.010
			(-8.05)	(-.50)
Constant	-.782***	-.899***	-.813***	-1.052***
	(-79.37)	(-46.99)	(-69.86)	(-45.79)
Ø AA	-.076***	-.188***	-.058***	-.149***
	(-1.73)	(-9.25)	(-7.61)	(-6.74)
Country, Industry	N	N	N	N
R-squared	.156	.053	.194	.071
N	31583	34826	24086	24800

* p<.05, ** p<.01, *** p<.001

Table 4a: Regression Results, Stock Acquisitions

	Lehman	**2007**
R	.0197***	.0014
	(-1.09)	-.28
MV	.0009***	.0009
	(3.64)	(1.91)
AA 02 N-St		-.145
		(-1.64)
AA 03 N-St	-.0146	-.074
	(-.41)	(-.86)
AA 04 N-St	-.0396	-.137*
	(-1.55)	(-2.09)
AA 05 N-St	-.0796***	-.194***
	(-3.84)	(-4.00)
AA 06 N-St	-.1137***	-.267***
	(-7.02)	(-6.29)
AA 07 N-St	-.1059***	
	(-7.25)	
AA 02 St		-.068
		(-.67)
AA 03 St	.022	-.043
	(.48)	(-.36)
AA 04 St	-.034	-.115*
	(-.84)	(-1.29)
AA 05 St	-.030	-.145*
	(-1.07)	(-2.15)
AA 06 St	-.031	-.229***
	(-1.18)	(-3.32)
AA 07 St	-.029	
	(-1.21)	
ASDI	.626***	.866***
	(42.87)	(3.1)
French	.272***	.539***
	(31.16)	(32.28)
German	.387***	.418***
	(68.85)	(36.76)
Scandinavian	.243***	.258***
	(17.61)	(9.25)
Lev	-.0789***	-.009
	(-7.72)	(-.44)
Constant	-.814***	-1.052***
	(-7.01)	(-45.82)
Ø AAN- St	-.071***	-.163***
	(-7.39)	(-5.64)
Ø AA St	-.020	-.120***
	(-1.38)	(-3.02)
Diff. Ø AA	.050***	.043
	(2.66)	(.83)
R-squared	.194	.071
N	24110	24804

* p<.05, ** p<.01, *** p<.001

Table 4b: Regression Results, Financial Firms

	Lehman	**2007**
R	.0173***	-.0036
	(9.88)	(-.85)
MV	.0002	-.0005
	(-1.10)	(-1.23)
AA 02 N-Fin		-.159*
		(-2.46)
AA 03 N-Fin	.015	-.036
	(.53)	(-.51)
AA 04 N-Fin	-.056	-.173***
	(-2.63)	(-3.74)
AA 05 N-Fin	-.067***	-.224***
	(-4.04)	(-5.86)
AA 06 N-Fin	-.094***	-.303***
	(-6.87)	(-8.39)
AA 07 N-Fin	-.094***	
	(-7.58)	
AA 02 Fin		-.035
		(-.20)
AA 03 Fin	-.119	-.219
	(-2.02)	(-1.59)
AA 04 Fin	-.110	-.141
	(-2.46)	(-1.42)
AA 05 Fin	-.180***	-.307**
	(-4.79)	(-3.26)
AA 06 Fin	-.172***	-.388***
	(-5.33)	(-4.52)
AA 07 Fin	-.131***	
	(-5.09)	
ASDI	.582***	.710***
	(44.28)	(27.76)
French	.255***	.506***
	(33.53)	(35.33)
German	.361***	.341***
	(71.60)	(33.95)
Scandinavian	.213***	.160***
	(17.10)	(6.39)
Constant	-.781***	-.898***
	(-79.39)	(-46.98)
Ø AA N-Fin	-.143***	-.218***
	(-9.44)	(-4.45)
Ø AA Fin	-.059***	-.179***
	(-7.52)	(-8.06)
Diff. Ø AA	-.083***	-.039
	(-4.96)	(-.73)
R-squared	.157	.053
N	31583	34826

* p<.05, ** p<.01, *** p<.001

Abstract

This thesis consists of three articles, which are concerned with three different investigations about mergers and acquisitions using empirical methods. Corresponding to that, each of the three paragraphs below summarises one of the articles.

One of the most conspicuous features of mergers is that they come in waves that are correlated with increases in share prices and price/earnings ratios. We use a natural way to discriminate between pure stock market influences on firm decisions and other influences by examining merger patterns for both listed and unlisted firms. If “real” changes in the economy drive merger waves, as some neoclassical theories of mergers predict, both listed and unlisted firms should experience waves. We find significant differences between listed and unlisted firms as predicted by behavioral theories of merger waves.

It is often criticised that M&A effects studies use comparison groups which capture poorly what the prospects of the acquiring firm would have been absent the merger. Finding firms similar to merging firms with respect to characteristics relevant for the merger decision would be desirable, but suffers from the “curse of dimensionality”. We present in this paper a choice of comparable non-merging firms based on the propensity score, which reduces the problem of matching treatment to control units to proximity on this one-dimensional scale. These refined estimates for merger evaluation are also compared to OLS estimates. Our results show that merger effects remain as strongly negative as estimated with OLS, even when only a control group of one percent is selected based on the propensity score.

We put together a unique database of more than 20,000 mergers worldwide since 2002 and estimate their effects on the share price drop of firms during the current economic crisis. Mergers of the five years before the onset of the crisis significantly exacerbated this drop, stock-financed mergers also destroyed value but fared better than cash-financed mergers, and mergers in the financial sector are worse than mergers in the non-financial sector. Firms from

the Anglo-Saxon legal system and firms from countries with a low anti-self dealing index were harder hit than other firms.

Zusammenfassung

Diese Dissertation besteht aus drei Artikeln, die drei verschiedene Fragestellungen zum Thema „Fusionen und Übernahmen“ mit empirischen Methoden behandelt. Dem entsprechend stehen die drei nachstehenden Absätze für die Zusammenfassung jeweils eines der Artikel.

Eines der auffälligsten Merkmale von Fusionen ist die Beobachtung, dass sie in Wellen stattfinden und mit einem Anstieg der Aktienpreise und der Preis-Gewinn-Verhältnisse korrelieren. Um zwischen direkten Ursachen des Aktienmarktes auf die Entscheidungen die Firmen betreffend und anderen Einflüssen zu unterscheiden untersuchen wir börsennotierte und nicht notierte Unternehmen als zwei verschiedene Gruppen. Wenn, wie von manchen neoklassischen Fusionstheorie vorhergesagt wird, Fusionswellen von realen wirtschaftlichen Veränderungen ausgelöst werden, dann sollten sowohl börsennotierte als auch nicht börsennotierte Firmen eine parallele Intensivierung der Fusionstätigkeit durchlaufen. Im Widerspruch dazu lassen sich deutliche Unterschiede zwischen den beiden Firmengruppen entdecken wie sie von verhaltensorientierten Theorien vorhergesagt werden.

Häufig wird an Studien über die Effekte von Fusionen und Übernahmen (F&Ü) kritisiert, dass die Vergleichsgruppe, die notwendig ist, um den Effekt identifizieren zu können, eine schlechte Abbildung dafür darstellt, wie es der übernehmenden Firma ohne der Transaktion ergangen wäre. Am besten wäre es, Vergleichsfirmen ohne F&Ü zu finden, die den übernehmenden Firmen hinsichtlich der für die Transaktion relevanten Charakteristika möglichst ähnlich sind. Allerdings ist das bei mehreren Dimensionen von Charakteristika und mit zunehmender Firmenanzahl nur mit unrealistisch großen Stichprobenumfängen („Curse of Dimensionality“). In diesem Artikel wird die Auswahl von vergleichbaren Firmen ohne F&Ü mittels der (geschätzten) Wahrscheinlichkeit, eine Transaktion durchzuführen („Propensity Score“) beschrieben. Dadurch reduziert sich die Verbindung von Kontrollgruppenfirmen mit

den übernehmenden Firmen auf eine einzelne Dimension. Beim Vergleich mit der Einfachen Kleinste-Quardrate-Methode („OLS“) zeigt sich, dass das Muster von durch die F&Ü negativ beeinflusste Profitabilität nicht nur erhalten bleibt sondern sogar stärker negativ geschätzt wird. Dieses Ergebnis ist robust gegenüber alternativen Implementierungen der Propensity Score.

Aus Basis eines Datensatzes mit über 20.000 Fusionen und Übernahmen (F&Ü) weltweit seit 2002 schätzen wir ihren Effekt auf das Absinken der Aktienkurse während der Wirtschaftskrise. F&Ü der fünf Jahre vor der Krise verschlimmern den Aktienkursverlust signifikant. Dies trifft auch bei Aktien-finanzierten F&Ü zu, aber in schwächerem Maße als auf Barmittel-finanzierte F&Ü. Weiters haben F&Ü im Finanzsektor einen stärkeren negativen Einfluß auf die Aktienkursentwicklung in der Krise. Die Aktienkurse von Firmen mit angelsächsischem Rechtssystem und solche von Ländern mit einem niedrigen „Anti-Self-Dealing-Index“ verloren stärker als andere Firmen.

Curriculum Vitae

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10-2002 - 09-2004	Research assistant at the Institut für höhere Studien, Vienna, Department for Economics and Finance, Health Econonmics

Teaching experience

Introduction to Microeconomics

Introduction to Macroeconomics

Corporate Strategy

Economics

Published and unpublished reports and articles

Determinants of merger waves: an international perspective, 2008, ZEW Discussion paper 08-076, Mannheim (joint with Klaus Gugler and Dennis C. Mueller)

The impact of Austria's EU-accsession on the health sector labour market, 2004, Wirtschaftspolitische Blätter, 1, (gemeinsam mit Maria M. Hofmarcher)

Efficiency analysis of the intramural sector, II (Effizienzanalyse im intramuralen Bereich II), 2003, Project report of the Institut für höhrere Studien, Vienna (joint with Maria M. Hofmarcher, Christine Lietz and Alexander Schnabl)