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ECONOMIC CONSEQUENCES OF PRIVATE EQUITY INVESTMENTS ON THE GERMAN STOCK MARKET

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ABSTRACT

This paper investigates the wealth effects of private equity (PE) investor purchases of shares in German quoted companies. It is the first study to analyze these effects for the German market which is particularly interesting due to its distinct characteristics with regard to the ownership structure of publicly listed companies and the protection of minority shareholders. We find that PE investors generate positive wealth effects for target shareholders of 5.90% around the event day (t = -1 to t = 0). In addition, we find that the wealth effects of PE investor involvement in Germany are positively related to the target's tax liabilities and degree of undervaluation and negatively related to the target's leverage and the shareholding of the second largest ownership block. The latter effect can be interpreted as a supplementary monitoring effect of the management or a monitoring effect of the largest shareholder through which private benefits of control are reduced.

1 INTRODUCTION

In recent years, private equity investments on public capital markets have gained importance which is partly due to an increasing number of public to private transactions. According to the Centre for Management Buyout Research, there has been a significant increase in public to private transactions in the US, UK and continental Europe since the early 1980s. The first peak occurred in the mid-to-late 1980s with the second one coming around the year 2000 with another upward trend from 2003, CMBOR (2007). A number of explanations have been proposed for this increase including, for example, the gaining of the support of existing shareholders through irrevocable commitments, Wright, Weir and Burrows (2007) and the feeling that smaller quoted companies tend to be ignored by institutional investors, Weir et al (2007). A further important factor has been the presence of private equity investors that have been willing to finance deals. For example, in a US study, Cotter and Peck (2001) found that 62.5% of their sample of buyouts involved private equity investors. Data provided by the Centre for Management Buyout Research, covering the period 1998-2006, show that 63% of going private transactions in the UK involved a private equity investor.

In the context of the increasing relevance of private equity investments on public capital markets, we provide the first analysis of the impact of private equity investors on the shareholders' wealth of a continental European country, namely Germany. An understanding of the impact of private equity share purchases is important because they account for 25% of the deals in which at least a 25% stake was bought.

The German capital market has different characteristics to those of the US and the UK. The key differences involve the development of public equity markets, patterns of ownership structure, and minority shareholder protection. In contrast to other major economies, such as the US, the UK, and Japan, the number of exchange listed German companies is comparatively low. As a consequence, banks and other financial institutions act as the primary suppliers of external capital for corporations. In addition, the typical market listed German firm is characterized by a small number of large shareholders. Franks and Mayer (2001) observe that "85% of the largest quoted companies have a single shareholder owning more

than 25% of the voting shares"[1] (based on 171 companies in 1990). This percentage seems to be stable over time (at least for non-financial companies). In a study based on all non-financial companies listed on the 'official' trading segment of the Frankfurt stock exchange between 1997 and 2004 (264 companies), Andres (2007) states that the percentage observed by Franks and Mayer (2001) is strikingly consistent with ownership patterns 15 years later, "with 84.5% of the firms featuring a shareholder with a stake of more than 25%."

According to the law and finance literature, the protection of shareholders' rights and interests is crucial for the development of a country's financial markets. This view is based on the rationale that outside investors are willing to pay more for financial assets if their rights are better protected by the law. La Porta, Lopez-Silanes, Shleifer and Vishny (2002) state that the degree to which equity investors in Germany are protected by the law is comparatively low. On the other hand, creditors are better protected, which contributes to the view of Germany as a bank-based economy. If shareholder rights are not well protected by the law, ownership by large investors can be an effective way of protecting shareholders' interests. Due to their large stake, these investors both have the power and the incentives to monitor management.[2] However, concentrated ownership can also imply potential drawbacks. Large shareholders can use their control rights in order to maximize their own utility, which might, through the extraction of private benefits, come at the expense of other shareholders. In line with these arguments, Bebchuk (1999) shows in a theoretical model that in corporate governance systems such as Germany, in which private benefits of control are significant, the ownership structure is characterized by larger blockholders who extract those private benefits of control.

In addition, Thomsen, Pedersen and Kvist (2006) find a negative effect of blockholder ownership on firm value in continental Europe. With the exception of founding families, Andres (2008) finds that blockholders affect firm performance adversely or at least do not have a positive performance effect (depending on the type of blockholder) on German firms. However, empirical evidence suggests that firms with a second influential blockholder suffer less from the extraction of private benefits through large shareholders. Edwards and Weichenrieder (2004) show empirically that the equity stake of a second largest shareholder

[1] According to the German Stock Corporation Act (AktG), a stake of 25% provides a blocking minority and allows the blockholder to prevent far reaching decisions of the general shareholders' meeting, like issues of new shares.

[2] Shleifer and Vishny (1986) show that large investors provide a solution to the free-rider problem.

increases firm value and interpret their findings as evidence in favour of a monitoring effect of the largest shareholder.

These arguments indicate that institutional characteristics may play an important role in the investment decisions of private equity firms and should be included in an empirical examination. The German market is also of interest because, despite of its smaller size compared to the UK market, Andres, Betzer and Weir (2007) show that Germany has the second largest European leveraged buyout market in terms of value.

Our paper makes a number of contributions to the academic literature. First, a number of recent papers have analysed the workings of the German capital markets, for example, Bessler (1999) who found a significant equity premium and Franzke (2004), Bessler and Kurth (2007) and Bessler and Thies (2007) who investigated the performance effects of venture-backed German IPOs. This study is the first to investigate the wealth effects of private equity investor purchases of shares in German quoted companies. In their role as buyout specialists, private equity firms provide a degree of expertise that will result in more active monitoring, Wright and Robbie (1998) and Cotter and Peck (2001). In addition, private equity investors have been shown to improve post-buyout performance which indicates more effective monitoring, Kaplan (1989b). The question remains whether these effects also occur when private equity firms invest in publicly listed companies. Our study is the first to analyze these effects for the German market which is particularly interesting due to its distinct characteristics with regard to the ownership structures, the development of its equity market and the legal protection of equity holders.

Second, it identifies factors that explain the extent of shareholder wealth effects in Germany. Third, we investigate the extent to which the conflict of interest between large and small shareholders is more severe than the conflict between management and shareholders in Germany. The German capital market is characterized by large blockholders which tend to be either families or other quoted companies, Franks and Mayer (2001), Andres (2008). Franks and Mayer (2001) find empirical evidence for Germany in favour of significant private benefits of control for large blockholders. In addition, Erhardt and Nowak (2003) as well as Andres (2008) show that family owners of companies listed on the German stock market often want to extract private control rights.

Our sample is representative of the German public equity market with 83% of our firms having one or more shareholders owning a stake of more than 25%, and in 42% of the companies, either a family or a private individual holds at least a blocking minority. We find that private equity investors generate positive wealth effects for target shareholders of 5.90% around the event window, t=-1 to t=0. This figure is consistent with 5.95% over the same t=-1 to t=0 event window for continental European takeovers, Goergen and Renneboog (2004). We find that the short term gains persist with CARs of 14.95% over the period t=-20 to t=+20.

As hypothesised, we find that the wealth effects of private equity investor involvement in Germany are greater the higher the target's tax liabilities, suggesting greater potential tax savings. Wealth effects are also positively related to the extent of the target's undervaluation. Undervaluation makes companies particularly attractive to private equity investors because they can bring their expertise to bear to improve the performance of the company by, for example, improving efficiency, divesting poorly performing parts of the business and setting higher performance targets. Private equity investor expertise will enable them to identify undervalued firms, which suggests that they might have private information about the company and its intrinsic value.

Our results also support Barclay and Holderness (1989) and Zingales (1994) who report that large shareholders may use their voting power in order to generate private benefits of control. This can particularly be true in our sample where 83% of the sample firms are controlled by a large shareholder. Furthermore, Edwards and Weichenrieder (2004) find empirical evidence for Germany that the equity holdings of the second largest shareholder increase the shareholder value of large German corporations. They interpret their finding as either a supplementary monitoring effect of the management or a monitoring effect of the largest shareholder and thereby reducing their private benefits of control. Consistent with the above, we find that wealth gains are lower the higher the shareholding of the second largest ownership block.

The paper proceeds as follows. Section 2 presents possible sources of wealth effects by PE investors and develops testable hypotheses. Section 3 describes the data sources used in our study and, in addition, presents key descriptive statistics of our dataset. Section 4 then lays out the methodology and the key results of our event study. Section 5 presents the results

of the regression analysis. The determinants of the cumulative abnormal returns are described, then the robustness checks are presented. Section 6 concludes the paper.

2 POSSIBLE SOURCES OF WEALTH EFFECTS AND TESTABLE HYPOTHESES

A number of studies have evaluated the shareholder wealth impacts of buyouts. First, from the perspective of cumulative average abnormal returns and second in terms of the premium paid. In the US, positive returns to shareholders have been found by DeAngelo, DeAngelo and Rice (1984), Lehn and Poulsen (1989), Frankfurter and Gunay (1992) and Travlos and Cornett (1993). Positive returns were reported for Europe, Andres, Betzer and Weir (2007) and for the UK, Renneboog, Simons and Wright (2007). In relation to the premium paid, significant premiums were found in US studies by DeAngelo, DeAngelo and Rice (1984), Kaplan (1989a) and Easterwood, Singer, Seth and Lang (1994). Weir, Laing and Wright (2005) reported significant results for the UK and Betzer (2006) for Europe. However, there has been no study that has specifically analysed the impact on shareholder wealth of private equity investors purchasing a significant ownership holding on the German Stock Market.

PE investors are specialists in the buyout market and are associated with bringing greater managerial discipline to firms they become involved with, Wright and Robbie (1998) and Cotter and Peck (2001). The purchase of a significant ownership stake, one which is above the threshold for disclosure, is an important signal to management, and the market, that there are potential gains to be realised. Therefore, private equity investors' decisions to buy a significant ownership stake in a company may have an impact on the wealth of shareholders. We analyse the following effects that may occur as a result of an investment by a private equity investor: control effects (linked to the free float, the presence of another single large shareholder and the relative size of large shareholdings); the reduction of agency costs as a result of incentive realignment; firm undervaluation; how far financial restructuring can improve performance (measured by company debt, the share price, tax liability and the stability of cash flows).

The German capital market is characterised by highly concentrated ownership. Franks and Mayer (2001) report that 85% of the largest companies have a single shareholder owning more than 25% of the voting shares with Andres (2007) finding the figure to be 84.5%. These

figures show that German share ownership is much more concentrated that other countries such as the US and the UK which have a more dispersed ownership, Shleifer and Vishny (1986). The impact of such a concentrated ownership on the wealth of target companies is investigated in relation to two hypotheses, monitoring and incentive realignment.

2.1 Monitoring Hypotheses:

Our first monitoring hypothesis argues that individual shareholdings in excess of 25% represent a sufficient incentive to overcome the free rider problem. The problem, identified by Grossman and Hart (1980), shows that effective monitoring will not occur if ownership is widely held. This is because monitoring will incur substantial costs for relatively small rewards in the case of small shareholder undertakings. In contrast, the inactive shareholders collectively gain much more but provide no input into the process, hence they free ride.

Families or institutions will undertake effective monitoring because of the financial incentives involved. The German equity market is characterized by large shareholders controlling the majority of a company's equity capital. Shleifer and Vishny (1997) argue that those large shareholders provide an effective solution to the free rider problem because the benefits of improved monitoring should outweigh the costs. Support for this comes from Renneboog, Simons and Wright (2007) who find that wealth gains are lower in UK going private transactions the more concentrated the external ownership. In addition, Andres, Betzer and Weir (2007) report that wealth gains are higher in European LBOs when ownership is more diffuse.

Franks and Mayer (2001) argue that there is an active market in share blocks and that the gains tend to accrue to the large block holders. Indirect support for this comes from Wright, Weir and Burrows (2007) who find that irrevocable commitments are important for the success of going private transactions. In addition, Franks and Mayer (2001) find that the premium paid to blockholders is lower than to non-blockholders in the UK. We argue that private equity investors prefer to buy equity stakes from large blockholding investors. This will reduce transactions costs and achieve the desired ownership stake much more quickly. If the objective is to buy control, the backing of significant shareholders also sends a signal to the market that the private equity investor has the support of these blockholders.

We measure the variable *stake1* as the equity stake of the largest equity holder. We expect that the wealth effects will be negatively related to large individual shareholdings and therefore the first hypothesis is:

H1 (stake1): *The abnormal returns are lower for firms with an active investor such as a family or another corporation.*

On the other hand, Barclay and Holderness (1989) and Zingales (1994) find empirical evidence that large shareholders may use their voting power in order to generate private benefits of control. This can be particularly true in our sample where 83% of the sample firms are controlled by a large shareholder. Furthermore, Edwards and Weichenrieder (2004) find empirical evidence for Germany that the equity holdings of the second largest shareholder increase the shareholder value of large German corporations. They interpret their finding as either a supplementary monitoring effect of the management or a monitoring effect of the largest shareholder and thereby reducing their private benefits of control.

Therefore, there will be fewer gains to be made when the private equity investor buys a stake in such a company and hence wealth effects will be lower. The second hypothesis is:

H2 (stake2): The larger the equity stake of the second largest shareholder, the lower are the private benefits of the largest shareholder. Therefore, we expect the share price reaction to be negatively correlated with the equity stake of the second largest shareholder.

2.2 Incentive Alignment Hypothesis:

Jensen and Meckling (1976) argue that the separation of ownership and control leads to a conflict of interests between managers and owners. Managers aim to maximise their utility and shareholders want to maximise their wealth. Low managerial shareholdings mean that discretionary behaviour is more attractive to management than company performance because the rewards gained by better performance do not accrue to the management but to shareholders. As a consequence, low managerial ownership causes incentive misalignment and leads to higher agency costs. Alternatively, higher managerial shareholdings create greater financial incentives to pursue wealth maximising policies because it reduces the incentive to shirk, Weir and Laing (1998). Support for this comes from Maupin (1987) who

found that management buyouts (MBOs) had higher managerial shareholdings. Renneboog, Simons and Wright (2005) find the wealth effects in UK public to private transaction are negatively related to managerial ownership.

Therefore, if private equity investors buy into firms with large managerial shareholdings, there will be less scope for incentive realignment and lower wealth gains. In contrast, private equity investors buying into a firm with low managerial shareholdings will result in significant positive wealth effects because of the higher agency costs. In this case, there will be considerable opportunities for the private equity investors to bring pressure to bear on the firm's management to improve performance. Weir, Wright and Scholes (2008) find that private equity firms are significantly more likely to be involved in firms with lower board ownership. This suggests private equity firms can address agency problems in this type of ownership structure. The third hypothesis is:

H3 (management): *Higher managerial ownership before the announcement of the private equity investment leads to smaller abnormal returns.*

However, in contrast to the Jensen and Meckling (1976) convergence-of-interest model discussed above, a number of studies document a non-linear relationship between managerial stockholdings and firm performance suggesting that managers might be entrenched at higher ownership stakes. These studies include Morck, Shleifer and Vishny. (1988) and McConnell and Servaes (1990) for the US and Short and Keasey (1999) and Weir, Laing and McKnight (2002) for the UK. We therefore control for a possible nonlinear relationship by including a squared term.

Based on our data on blockholdings, we only employ managerial shareholdings in excess of 5% in our analysis because of data restrictions. The expected coefficient of the variable *management* is negative while the coefficient of $management^2$ is expected to be positive. We therefore hypothesise:

H4 (management2): The relationship between managerial equity stake and abnormal returns is nonlinear.

2.3 Control Variables:

We next discuss variables that were shown to be important drivers of wealth effects in the empirical private equity literature and which will serve as controls in our study.

2.3.1 Undervaluation

A number of studies have provided empirical and anecdotal evidence that firms going private suffer from stock market undervaluation, for example, Maupin, Bidwell and Ortegren (1984) for the US, Weir, Laing and Wright (2005) for the UK and Andres, Betzer and Weir (2007) for Europe. Undervaluation has a number of potential sources including financial invisibility. This occurs when quoted companies are small and do not receive the coverage, either in the financial press or from financial analysts, that larger quoted companies receive. This exacerbates the problem of getting accurate information to the market about the firm's performance. The lack of visibility increases the thinness of the market for the firm's shares and management perceive that the stock market does not provide an accurate fundamental valuation of the firm, Weir, Wright and Scholes (2008). Further, if there is no other evidence of other potential buyers, managers will welcome the private equity investors' share purchase and send a positive sign to the market. In addition, markets might overreact and temporarily depress a company's share price below a "fairly priced" level particularly if there is negative sentiment about the sector.

Undervaluation makes companies particularly attractive to private equity investors because they can bring their expertise to bear to improve the performance of the company by, for example, improving efficiency, divesting poorly performing parts of the business and setting higher performance targets. Private equity investor expertise will enable them to identify undervalued firms, which suggests that they have private information about the company and its true value, CMBOR (1999) and Weir, Wright and Scholes (2008). The greater the undervaluation, the greater the potential gains for shareholders.

The numerator of the control variable *undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the private equity investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the private equity investment. In order to exclude market movements we divide this figure by the equivalent ratio of the C-DAX, the broadest index representing the German stock market. The expected coefficient for *undervaluation* is negative.

2.3.2 Leverage

Jensen (1986) argues that buy-outs, financed by debt, will create an organisational form that prevents the consumption of perquisites and the undertaking of non-optimal investment. Management have a commitment to repay the increased coupon on the debt so that future cash flows cannot be used sub-optimally. Debt providers have an incentive to increase monitoring and if the interest on the debt is not paid, they can put the company into liquidation, with shareholders having little chance of recovering the value of their shareholding (Citron, Wright, Ball and Rippington, 2003).

There is evidence that MBOs result in increased debt, Kaplan (1989a), Opler (1993) and Desbrieres and Schatt (2002). The Centre for Management Buyout Research report that in 2006, debt accounted for 51.2% of all European MBO/MBI financing. The figure rises to 64.6% if other forms of debt, for example mezzanine finance, are included. The UK figures were 50.0% and 63.9% respectively. In addition to these findings on buyouts, empirical studies focussing on public to private transactions are also relevant. Weir, Wright and Scholes (2008) found that in the UK firms going private had lower debt ratios than firms remaining public.

As an important element in the buy-out process, private equity investment implies a substantial increase in leverage ratios with the increased debt bringing greater discipline to management, Wright and Robbie (1998). We proxy this by using the ratio of net debt to the book value of total assets. Net debt is the sum of long and short term debt less cash and marketable securities. The lower the ratio the more the company can cope with increased debt in the future and the more the management can be disciplined with the help of leverage. The expected coefficient of the variable *leverage* is negative.

2.3.3 Tax shield

Given that interest payments in Germany are tax deductible, it is reasonable to assume that private equity investors will restructure the financing side in order to increase the company's tax shield. Kaplan (1989a) and Lowenstein (1985) argue that the 'tax benefit hypothesis' is one of the most important motivations for private equity investors. High tax firms will reduce their liability as a result of the increased debt. Kaplan (1989a) found significant tax benefits after going private. Halpern, Kieschnick and Rotenberg (1999) found

that high tax firms were more likely to be involved in leveraged buyouts. However, in the UK, Weir, Laing and Wright (2005) found no relationship between tax and the decision to go private, a finding which supports Lehn and Poulsen (1989) and Kieschnick (1998) for the US.

The evidence relating to the tax benefit hypothesis is therefore mixed. Although the majority of our sample firms are not taken private, we propose that the tax benefit hypothesis holds and that private equity investors are likely to implement changes in the capital structure as part of their investment strategy. In the construction of the control variable *taxshield* we follow Lehn and Poulsen (1989). We use the firm's (net) tax payments standardized by the firm's market value of equity in the fiscal year prior to the buyout announcement. The expected coefficient is positive.

2.3.4 Risk

In line with the arguments above, private equity investors look for companies in which additional loans can be taken up. This, in turn, leads to higher levels of obligations towards debt holders who might take control if they do not receive their interest payments. In order to increase leverage, private equity target-companies should, therefore, have predictable and stable cash flows. The degree to which companies are exposed to volatile and cyclical markets is measured by the standard deviation of stock returns (over two years). The expected coefficient is negative.

3 DATA SOURCES AND DESCRIPTIVE STATISTICS

The data covers the period June 1998 to June 2007. We have constructed a unique database that includes all of the initial acquisitions by private equity investors of ownership stakes larger than 25% in exchange-listed German companies. This gives a sample of 48 private equity acquisitions. According to Deutsche Boerse AG 850 companies were listed on the three segments Prime Standard, General Standard and Entry Standard on 30th of June 2007. The initial sample was identified through a search of Reuters Newswires and the Merger Market database. In addition, data were matched with shareholding information of the German Financial Supervisory Authority (BaFin). We checked that there was no contamination such as other share price sensitive information announced around the announcement date. No such information was found. According to the German Securities

Trading Act (*Wertpapierhandelsgesetz*) shareholders have to report holdings to the BaFin whenever they exceed certain thresholds. Until 2007, the minimum threshold was 5%.[3]

In 19 out of 48 cases the target firm was taken private by the private equity investor. Examples for going private transactions are Friedrich Grohe AG, Friedrich Flender AG or Celanese AG. In all other cases the private equity investor remains a long-term active investor in the listed company. However, in some cases (for example, Knuerr AG and Grammer AG) the listed companies were sold to strategic investors or to institutional investors after 4 to 5 years. Table 1 reports summary statistics of the sample.

[Insert Table 1 about here]

The data listed in Table 1 are obtained from various sources. Financial data, such as total assets, leverage and tax shield are taken directly from each company's annual report in the fiscal year preceding the announcement of the transaction. Stock market data which is used to calculate the variables *risk* and *undervaluation* are obtained from Datastream. We further collected data on the ownership structure of the firms from Hoppenstedt Aktienführer,[4] which lists all investors with a stake of at least 5% of the shares outstanding. The ownership data is used in order to calculate the variables *management*, *stake1*, *stake2* and *freefloat*. The largest individual equity stake, *stake1* was, on average, 54.31% and the average size of the second largest shareholder, *stake2*, was 5.73%. An average freefloat of 32.81% confirms one of the stylized facts about German firms, namely that shareholdings are comparatively concentrated. Managerial average stock ownership which includes holdings of other family members was 13.02%. Further evidence of this is that 83% of our sample firms have one or more shareholders which hold more than 25% of the voting shares.

Table 1 also reveals that the market value of the median target firm is about € 70 million. The discrepancy between the mean and median values indicates that the sample is skewed. About 45% of the sample firms are traded at an equity value of more than € 100 million. The average tax paid, *taxshield,* prior to the private equity investor purchase is 2.55%. We report that the standard deviation of the targets' share price, *risk,* was 2.60%. The undervaluation

[3] In January 2007, the minimum threshold was lowered to 3%.
[4] The Hoppenstedt Aktienführer is a yearly publication that provides detailed information (e.g., ownership structure, board composition, balance sheet information) on German listed firms.

variable indicates that the stock prices of both, the median and average firm in our sample, have declined in the period before the announcement of the transaction.

[Insert Table 2 about here]

Table 2 provides further details about the ownership structures of German firms. It shows that the largest percentage of deals, 33.33%, undertaken by private equity investors involved buying equity from families or individuals. The average purchase of deals involving highly concentrated ownership was 79.13% for family/individual owned businesses. The second most common source of shares is other corporations, 25% of the deals, with the average purchase being 79.88%. We find that only 22.92% of deals involved companies that were widely held (i.e. no single investor owns an equity stake larger than 25%) and 77.08% being purchased from more closely held companies. These figures are consistent with Franks and Mayer (2001) who show that German firms have highly concentrated equity ownership.

4 EVENT STUDY ANALYSIS

4.1 EVENT STUDY METHODOLOGY

We expect that the announcement of the purchase of a stake in a publicly listed company by a private equity investor will lead to a positive share price reaction. We identify the wealth effects for the firms' current shareholders by using an event-time methodology. We follow Brown and Warner (1985) by applying the market model. For each firm, *I*, the abnormal return (ε_{it}) on event day *t* is calculated as the difference between the return on day *t* (R_{it}) and the expected return (without the announcement),

$$\varepsilon_{it} = R_{it} - \left(\hat{\alpha}_i + \hat{\beta}_i R_{mt}\right), \tag{1}$$

where R_{mt} is the return on the market portfolio on day *t*. The coefficients α_i and β_i are OLS estimates obtained from regressions of firm *i*'s daily returns on the market return over the estimation period from *t* = -280 till *t* = - 20 (relative to the announcement day (*t* = 0)). We use the CDAX, a broad, value-weighted German index, as a proxy for the market portfolio.

Daily abnormal announcement returns (AR) are then calculated for each day of the event period of 41 days (from *t* = -20 till *t* = +20):

$$\bar{\varepsilon}_t = \frac{1}{N}\sum_{i=1}^{N}\varepsilon_{it}\ , \tag{2}$$

where N is the total number of sample firms.

The average cumulative abnormal return (CAR) over the period from T_1 to event day T_2 is given by

$$CAR_{[T_1,T_2]} = \sum_{T_1}^{T_2}\bar{\varepsilon}_t\ . \tag{3}$$

We test the statistical significance of abnormal announcement returns and cumulative abnormal returns using both, a t-test (see Brown and Warner (1980), appendix A.3) and the standardized cross-sectional test suggested by Boehmer, Musumeci, and Poulsen (BMP) (1991). In contrast to "traditional" significance tests, the BMP test statistic is robust towards event-induced variance increases that bias tests for mean abnormal returns in short-term event studies. Harrington and Shrider (2007) demonstrate this effect through simulations and conclude that BMP's (1991) standardized cross-sectional test "is a good candidate for a robust, parametric test".

Specifically, the BMP test requires security residuals to be uncorrelated across firms (which should be noncritical in our application), but – unlike the traditional Brown-Warner (1980) method – does *not* require event-induced variance to be insignificant. To obtain the test statistic, the daily abnormal returns are standardized by the estimation-period standard deviation.

$$SR_{it} = \frac{AR_{it}}{S_{it}}, \qquad \text{where } S_{it} = \sqrt{\hat{\sigma}_i^2\left[1+\frac{1}{L}+\frac{\left(R_{mt}-\bar{R}_m\right)^2}{\sum_{t=-280}^{t=-21}\left(R_{mt}-\bar{R}_m\right)^2}\right]} \tag{4}$$

The term $\hat{\sigma}_i^2$ stands for the estimated variance of the abnormal return for firm i during the estimation period (length L), and $\bar{R}_m$ is the average market return. The test statistic is then found by dividing the average event-period standardized abnormal return by its contemporaneous cross-sectional standard error:

$$T_{Std} = \frac{\frac{1}{N}\sum_{i=1}^{N} SR_{it}}{\sqrt{\frac{1}{N(N-1)}\sum_{i=1}^{N}\left(SR_{it} - \frac{1}{N}\sum_{j=1}^{N} SR_{jt}\right)^2}}. \quad (5)$$

The test statistic for cumulative abnormal returns (CAR) is obtained accordingly.

4.2. EVENT STUDY RESULTS

Table 3 presents the results of the event study. Column 2 shows the average daily abnormal returns, columns 3 and 4 contain our significance tests, the t-statistic and the BMP test statistic, respectively. Cumulative abnormal returns over the period [-20 ; + 20, relative to the announcement day t = 0] are shown in column 5.

[Insert Table 3 about here]

As reported in Table 3, the announcement of a private equity investor to buy a stake in an exchange-listed company leads to significant and positive abnormal returns for shareholders. On the announcement day (t = 0) an average abnormal return of 5.90 % is earned. This figure is significant (at the 0.01-level) for both, the standard t-test and the BMP test. On the days immediately preceding the announcement, average abnormal returns of 1.36% (t = -2) and 0.125% (t = -1) are earned, again statistically significant at 1%. In most cases, we do not have information on the exact time of the day when the announcement reaches the market. As commonly applied in event-studies, the period from t = -1 till t = +1 should therefore be considered the announcement return. The three-day CAR [-1 ; +1] amounts to 8.83% and is again significant at the 1% level. Furthermore, the relationship of positive and negative abnormal returns around the announcement day confirms that these results are not due to outlier observations.

In addition, Table 3 only shows one significant abnormal return after the event period ranging from t = -2 till t = +2 (the BMP-statistic is significant on day +18). This means that no leakage of information about private equity investments influences share prices prior to the announcement day and can be interpreted as evidence for an information-efficient market. All

expected gains from the PE-investors' influence seem to be captured during the five-day period surrounding the announcement day.

This interpretation is further supported by Table 4, Panel A, which shows the cumulative abnormal returns as well as the associated significance tests for different event periods. The cumulative abnormal return over the whole event period from t = -20 till t = +20 is 14.95%, with a t-statistic of 6.03 and a BMP test statistic of 5.41. Both are significant at the 1% level. The whole period CAR figure is only slightly higher than the five-day announcement period return [-2 ; +2] of 11.77%, which also shows the highest significance values among the event periods included in Table 4.

Having shown that PE share purchases produce positive wealth effects for target shareholders, it is important to compare these wealth effects with those of non-PE share purchases. Over the sample period from June 1998 to June 2007 we identify all announcements of non PE purchases of at least a 25% stake in a market-listed German firm. These purchases were made by, for example, banks, insurance companies and industrial firms. This gives a control sample of 145 share purchases. Panel B, Table 4 shows that non PE share purchases generated announcement returns of 1.76% (statistically significant at the 1% level) on the event day and a cumulative abnormal return of 5.11% over the period [-20; +20] (significant at the 5% level).

Panel C compares the CARs of PE-backed and non PE-backed share purchases. We find that the cumulative abnormal returns of private equity investments are significantly higher for all event windows. These results indicate that market participants seem to attribute a higher potential to increase shareholder value to private equity investors, compared to other acquirers.

[Insert Table 4 about here]

Figure 1 shows the cumulative average abnormal returns (CAR) for PE and non-PE share purchases over the period [-20; +20]. We find CARs of around 3% until t = -5 and an increase to 5% around t = -2. There is a sharp rise to 12.32% on the day of the announcement with the figure reaching 16.03% on t = +3. The figure also shows that non-PE purchases have CARs

below PE purchases throughout the post purchase period. The differences are significant for each time window.

[Insert Figure 1 about here]

The event study results are therefore consistent with our general hypothesis that the announcement of the decision of private equity investors to buy an equity stake leads to significant abnormal returns. Announcement day abnormal returns are 5.90% and three day CARs are 8.83%. From these results, it seems clear that private equity investors generate positive wealth effects for the firms' shareholders. These wealth gains have been shown to be greater than those produced by non-PE share purchases. In the next section, we examine whether the different magnitudes of these abnormal returns are systematically related to certain characteristics of the target companies.

5. REGRESSION ANALYSIS

5.1. DETERMINANTS OF THE CUMULATIVE ABNORMAL RETURNS

In this section, we investigate the determinants of the CARs reported in the previous section. We focus on the CARs (-2;2) because this event window is the most significant one and captures most of the announcement effect of the private equity investment. In addition to the variables explained in section 2 we include controls *majority* and *size*. *Majority* is a binary variable taking the value "1" if the private equity investor bought the majority stake in the company and "0" if not. *Size* is defined as the natural logarithm of the firm's total assets in the year preceding the private equity investment. Table 6 reports estimates of the OLS regression of the following empirical model and three extensions:

$$CAR_{(-2,+2)i} = c_0 + c_1\, stake1_i - c_2\, stake2_i - c_3\, management_i - c_4\, undervaluation_i - c_5\, leverage_i + c_6\, taxshield_i - c_7\, risk_i + c_8\, majority_i - c_9\, size_i + e_i \quad (6)$$

where $CAR_{(-2,\ +2)i}$ is the 5-day[5] cumulated abnormal return for company *i* and e_i is the error term. The White Heteroscedasticity Test (without cross-terms) does not reject the hypothesis of homoscedasticity in the residuals (equal error variance).[6]

[5] The regression results are robust to variations of the event window size.
[6] Tests for heteroscedasticity are conducted using the White Heteroscedasticity Test (without cross-terms). The test statistics of all models lie above the 0.10-critical Chi-Square values.

Table 5 reports the correlations between the explanatory variables used in the regression analysis. It shows that there is no sign of multicollinearity between the explanatory variables in equation 6. However, given the correlation coefficient of -0.634 between Stake1 and Stake2, we also run separate regressions for each of them as a robustness check.

[Insert Table 5 about here]

We estimate three different model specifications. The first model contains all variables in equation 6. Model 2 includes year dummy variables (*yeardummies*) to account for year-specific effects. In model 3 we add the squared management variable ($management^2$) in order to test for a non-linear relationship between the CARs and the management stake. The explanatory power of the regressions as measured by the R^2 is in range of 0.49 to 0.60 and hence is in line with previous studies such as Renneboog, Simons and Wright (2007) and Andres, Betzer and Weir (2007). The F statistics in Table 6 show that all models are statistically significant.

[Insert Table 6 about here]

Table 6 shows that the variable that represents the voting rights of the largest shareholder (*stake1*) is negative as hypothesized and statistically significant at the 5% level. Consistent with hypothesis H2, we find that, the variable that represents the voting rights of the second largest shareholder, (s*take2*), is negative and highly significant in all regressions. The *stake2* result is consistent with Edwards and Weichenrieder (2004). Other large shareholders therefore have an incentive to monitor the largest shareholder because the largest shareholder does not necessarily act in the interest of all shareholders. Importantly this finding supports our hypothesis that the conflict of interest between large and small shareholders might be more severe than the conflict between management and shareholders in Germany.

Given the correlation between Stake1 and Stake2, we reran the regressions with each variable entered separately. The results remain the same with Stake1 still negative and significant and Stake2 negative and significant at 5%.

These findings are new in the going private / private equity literature because this is the first study that investigates a specific continental European market with its particular corporate governance system. The evidence supports the monitoring hypothesis in countries characterized by firms with large shareholders.

Second, we find empirical evidence that the shareholder wealth effect is determined by the degree of undervaluation before the private equity investment. As hypothesised we find a negative and significant relationship between the variable *undervaluation* and the CARs. This finding reveals that private equity investors identify poorly performing companies and enhance shareholder value after becoming an active investor. This result confirms previous findings by Weir, Laing and Wright (2005), Renneboog, Simons and Wright (2007) for the UK and Andres, Betzer and Weir (2007) for European LBO transactions.

Third, we find strong support for the financial restructuring hypothesis. The CARs are higher for firms with lower net debt to total assets ratios. As expected, private equity investors can substantially increase the leverage ratios of those firms and hence discipline management's actions. Furthermore, they can increase the tax shield with higher leverage ratios. This finding is further supported by our positive tax coefficient which confirms the 'tax benefit hypothesis'. Firms with higher tax payments before the private equity investment will benefit more from the financial restructuring process. Therefore, there seems to be a wealth transfer from the German state to shareholders. These findings are consistent with Kaplan's (1989a) and Halpern, Kieschnick and Rotenberg's (1999) findings for the US and partially with Renneboog, Simons and Wright's (2007) findings for the UK.

Fourth, the regression results show insignificant coefficients for the variables *risk, majority, size, management, management2, employees* and all *year dummies*. The insignificant *majority* variable indicates that the market does not differentiate between deals where private equity investors buy the majority stake (a stake larger than 50%) or just a significant (a stake larger than 5% but less than 50%) control stake. Furthermore, our findings in table 6 show that the wealth effects are not driven by the need to realign the incentives within the firm as both variables that proxy managerial stakes are insignificant. This finding stands in contrast to Renneboog, Simons and Wright's (2007) findings for the UK market but supports Andres, Betzer and Weir's (2007) findings for the European market. Finally, all time dummies in model specification two are insignificant.

One potential problem is that the period over which the undervaluation variable is calculated overlaps with the estimation window of the event study. This overlap could bias the results. Therefore, we estimated an additional regression using the CARs from a simple index adjustment model as dependent variable. In this alternative approach, the abnormal returns are obtained by subtracting the C-DAX returns from the event window returns. Thus, no estimation window is needed. The results from these specifications are not reported as they are qualitatively and quantitatively similar to the findings presented above.

5.2 Analysis Development

We develop the analysis by testing a number of additional hypotheses. The results are shown in table 7. First, we investigate the extent to which the reputation of the private equity investor has an influence on the wealth effects of private equity announcements. *Reputation* is defined as a binary variable taking the value "1" if the private equity investor belongs to the largest private equity investors in the world (measured as having capital invested larger than $5 billion) and "0" if not. Wright, Weir and Burrows (2007) find evidence that irrevocable commitments are more likely to be higher the higher the private equity investor's reputation. Kester and Luehrman (1995) show that reputation is an important factor in the choice of private equity investor. *Reputation* may therefore be linked to the idea of a fair price and so we expect that *reputation* will have a positive coefficient. However, we find that the variable is insignificant.

Second, we examine whether there are any significant differences in the abnormal returns if the target company is taken private (*delisting*) or not. *Delisting* is a binary variable taking the value "1" if the private equity investor takes the target firm private and "0" if not. Weir, Wright and Scholes (2008) show that 70% of going private transactions in the UK involves a private equity investor which indicates that they are active in the purchase of shares in quoted companies. They also find evidence consistent with the hypothesis that private equity investors are more likely to be involved in deals that have lower potential financial distress costs. Hence private equity investors are more likely to get involved with less risky share purchases and so we expect the coefficient to be negative. However, we find that taking a company private does not affect the wealth impact of the share purchase.

Third, we further investigate the free rider problem identified by Grossman and Hart (1980). We define ownership concentration in terms of free float which is the firm's share capital minus the sum of all shareholdings in excess of 5%.[7] A high free float illustrates a diffuse ownership and therefore offers the greatest opportunity for wealth gains for private equity investors. We therefore expect that shareholder wealth gains from the private equity investment will be positively related to levels of free float before the acquisition of the private equity investor. Model 6 shows a positive and significant relationship between wealth gains and the extent of free float.

Fourth, we offer an additional test of hypothesis 1 by investigating the wealth effects created by buying from different types of seller. We construct three dummy variables, *family*, *corporation* and *stock market* which are given the value "1" if the private equity investor bought the stake in the company from the respective shareholder and "0" if not. The reference group for these variables is buying the shareholding from a financial institution. Consistent with hypothesis 1, we expect the coefficients for *family* and *corporation* to be negative because of the active monitoring of the shareholder. In contrast, we expect the variable *stock market* to be positive because buying from the market implies that the purchase has been made from small shareholders. We find a positive, significant relationship between the purchase of shares on the open market and the wealth effect. This indicates that the purchasing share from a more diffuse group offers greater gains. The coefficients for *family* and *corporation* are insignificant and show that there is no difference in the wealth gains generated when buying from these blockholders.

[Insert Table 7 about here]

5.3 Robustness Checks

In the following, we address two potential problems of our sample. First, our sample contains 48 observations and is therefore rather small. Second, the distributional assumptions of our CARs could be incorrect due to event clustering and therefore lead to biased inferences.

[7] Until 2007, only ownership stakes above 5% had to be reported to the German Federal Financial Supervisory Authority (BaFin).

The econometric literature has dealt with these problems in the past. Many studies, for example Efron and Tibishirani (1993), Horowitz (2001) and MacKinnon (2002), have drawn statistical inferences from small samples from distributions that are calculated by simulations rather than applying asymptotic theory. These studies argue that small sample statistical inference can be based on so called 'bootstrap distributions'. The bootstrap procedure has a number of advantages. First, the procedure generates more information about your sample. Second, it does not make any distributional assumptions. Third, it can account for event-clustering.

The methodology of our robustness check follows closely MacKinnon (2002).[8] The bootstrap procedure generates many random samples – in our case 10,000 different bootstrap samples – out of our observed random sample of 48 observations. We select each sample randomly from the original sample with replacement. This procedure will generate information about our sample of private equity investments that we do not have because we artificially increase our observations. Furthermore, we define 24 different clusters in our sample where each cluster includes all events with overlapping event windows. For example, the creation of one bootstrap sample could start as follows: If we draw one cluster out of our 24 clusters and this respective cluster contains four events we draw four times with replacement out of this cluster in order to create our bootstrap sample. Subsequently, we continue to select the remaining 48 elements of this respective bootstrap sample.

Finally, we end up with 10,000 different bootstrap samples and hence, we get 10,000 different estimates of our regression parameters. Applying the so called bootstrap t procedure (see MacKinnon 2002) we get confidence intervals for our original regression coefficients. The regression coefficient has a significant influence on the CARs if the zero is not an element of the confidence interval. Table 8 reveals the results of our bootstrap simulations.

[Insert Table 8 about here]

Table 8 shows the regression coefficients from our first and our seventh model specifications and the confidence intervals for our sample estimates. The results of our robust regressions support the inference based on our OLS results. We find that the variables *stake1, stake2, undervaluation, leverage and taxshield* remain significant drivers of the shareholder

[8] For a detailed description of the bootstrap procedure see MacKinnon (2002).

wealth effects after the announcement of private equity investments. However, the variable *stock market* falls just short of being statistically significant.

6. CONCLUSION

This paper examines the wealth effects of private equity investor purchases of shares in public companies quoted on the German capital market. In addition, it sheds light on the factors that explain the impact on shareholder wealth by private equity investors. We find that private equity investors generate positive wealth effects for target shareholders of 5.90% around the event window, t-1 to t0. This figure is consistent with 5.95% over the same t-1 to t0 event window for continental European takeovers, Goergen and Renneboog (2004). Significant returns are also reported for t+1, 1.68%, and t+2, 1.59%. We find that the short term gains persist with CARs of 14.95% over the period t-20 to t+20.

We also find that the wealth effects of private equity investor involvement in Germany are greater the higher the target's tax liabilities, suggesting greater potential tax savings. Wealth effects are also negatively related to the extent of the target's undervaluation, the greater the undervaluation, the greater the wealth effect. Undervaluation makes companies particularly attractive to private equity investors because they can bring their expertise to bear to improve the performance of the company by, for example, improving efficiency, divesting poorly performing parts of the business and setting higher performance targets. Private equity investor expertise will enable them to identify undervalued firms, which suggests that they have private information about the company and its true worth.

Our results also support Barclay and Holderness (1989) and Zingales (1994) who report that large shareholders may use their voting power in order to generate private benefits of control. This was seen to be particularly important in our sample as 83% of the sample firms are controlled by a large shareholder. Furthermore, Edwards and Weichenrieder (2004) find empirical evidence for Germany that the equity holdings of the second largest shareholder increase the shareholder value of large German corporations. They interpret their finding as illustrating the presence of a supplementary monitoring effect on either the management or the largest shareholder, thereby reducing their private benefits of control. Consistent with the above, we find that wealth gains are lower the higher the shareholding of the second largest ownership block.

Table 1

Sample Characteristics and Summary Statistics for 48 Investments of Private Equity Investors in Germany during the Period from 1998 till 2007

Variable	Mean	Std. Deviation	Median
stake1	54.31%	29.02%	53.41%
stake2	5.73%	6.87%	2.30%
freefloat	32.81%	20.68%	35.33%
management	13.02%	23.94%	0.00%
market value of equity [thousands of Euros]	264,593	472,418	70,007
leverage	9.66%	34.65%	14.62%
taxshield	2.55%	9.64%	2.98%
risk	0.026	0.011	0.024
undervaluation	0.996	0.223	0.984

Descriptive data for a sample of 48 investments of private equity (PE) investors in Germany. Financial data, such as total assets, leverage and tax shield are taken directly from each company's annual report in the fiscal year preceding the announcement of the transaction. Stock market data which is used to calculate the variables market value of equity, risk and undervaluation are obtained from Datastream. We further collected data on the ownership structure of the firms from Hoppenstedt Aktienführer, which lists all investors with a stake of at least 5% of the shares outstanding. The ownership data is used in order to calculate the variables *management*, *stake1*, *stake2* and *freefloat*. *Stake1* is defined as the largest equity stake in the year preceding the PE investors' announcement. *Stake2* is defined as the second largest equity stake in the year preceding the PE investors' announcement. The *freefloat* is being determined by subtracting all shareholdings of investors with an interest of more than 5%. *Management* is the sum of all stakes of the firm's executive officers in the year preceding the PE investors' announcement. *Leverage* is computed as net debt/total assets. *Taxshield* is tax payments divided by the market value of equity (see Lehn/Poulsen 1988). *Risk* is measured as standard deviation of daily stock returns (over two years). *Undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the PE investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the PE investment.

Table 2

Sample Characteristics for 48 Investments of Private Equity Investors in Germany during the Period from 1998 till 2007

Ownership of the share bought by the PE investors	Number	Percentage	Mean Size of Share Purchase	Median Size of Share Purchase	Standard Deviation of Share Purchase
Family / Individual	16	33.33%	79.13%	89.51%	25.20%
Other Corporation	12	25.00%	79.88%	92.02%	23.66%
Widely held	11	22.92%	85.24%	100.00%	29.58%
Financial Institutions including Landesbanken	9	18.75%	66.92%	65.99%	21.94%
All	48	100%	73.37%	86.75%	30.09%

Table 3

Daily average abnormal returns and cumulative average abnormal returns for 48 investments of private equity investors in exchange-listed German companies

Day relative to the announcement	Daily average abnormal return (AR) in %	t-value	BMP- test statistic	Cumulative daily average abnormal return (CAR) in %	Positive: Negative
-20	0.11%	0.28	0.89	0.11%	24:24
-19	0.10%	0.25	0.17	0.21%	19:29
-18	-0.28%	-0.72	-0.35	-0.07%	24:24
-17	-0.09%	-0.23	-0.09	-0.16%	20:28
-16	0.66%	1.70	1.06	0.50%	26:22
-15	0.77%	1.99**	1.30	1.27%	22:26
-14	-0.32%	-0.82	0.45	0.95%	23:25
-13	0.52%	1.35	0.88	1.47%	20:28
-12	0.28%	0.72	0.39	1.75%	24:24
-11	-0.16%	-0.42	-0.01	1.59%	25:23
-10	0.15%	0.40	0.71	1.74%	22:26
-9	-0.08%	-0.20	-0.77	1.66%	23:25
-8	0.23%	0.59	0.29	1.89%	22:26
-7	0.69%	1.77	1.67	2.57%	25:23
-6	0.14%	0.37	-0.06	2.71%	19:29
-5	0.21%	0.54	1.10	2.92%	21:27
-4	0.31%	0.80	0.27	3.23%	24:24
-3	0.58%	1.51	1.26	3.82%	26:22
-2	1.36%	3.50***	2.59**	5.17%	26:22
-1	1.25%	3.23***	1.51	6.42%	28:20
0	5.90%	15.23***	4.45***	12.32%	33:15
1	1.68%	4.33***	2.12**	14.00%	27:21
2	1.59%	4.11***	1.89	15.59%	26:22
3	0.44%	1.14	1.45	16.03%	23:25
4	-0.20%	-0.51	0.11	15.83%	26:22
5	0.10%	0.27	0.56	15.93%	25:23
6	0.24%	0.63	0.74	16.18%	21:27
7	0.14%	0.36	0.09	16.32%	18:30
8	-0.01%	-0.04	-0.69	16.30%	20:28
9	-0.57%	-1.47	-1.64	15.73%	20:28
10	-0.45%	-1.16	-1.82	15.29%	17:31
11	0.41%	1.06	1.25	15.70%	24:24
12	-0.09%	-0.22	0.36	15.61%	23:25
13	0.36%	0.92	1.08	15.97%	19:29
14	0.18%	0.47	1.00	16.15%	22:26
15	-0.17%	-0.44	-1.02	15.98%	16:32
16	-0.19%	-0.48	-0.69	15.80%	19:29
17	-0.12%	-0.32	-0.12	15.67%	22:26
18	-0.53%	-1.38	-2.50**	15.14%	15:33
19	0.09%	0.24	0.08	15.23%	26:22
20	-0.28%	-0.73	-0.90	14.95%	19:29

**significant at the 0.05 level, ***significant at the 0.01 level (two-tailed test)

Column 1 lists a cut-out of the event window relative to the announcement day (t = 0), column 2 contains the daily average abnormal returns (ARs) for each event day. Columns 3 and 4 present the corresponding test statistics (t-Test and BMP-test). These statistics indicate whether the null hypothesis of zero abnormal return on a given day can be rejected or not. Cumulative daily average abnormal returns (CARs) are displayed in column 5, while column 6 shows the ratio of positive and negative abnormal returns.

Table 4

Average cumulative abnormal returns and test statistics for several event periods.

Panel A: Private Equity Investments

Event Window	CAR	t-test statistic	BMP-test statistic
[-1;1]	8.82%	13.16***	5.02***
[-2;+2]	11.77%	13.59***	5.76***
[-10;0]	10.73%	8.36***	5.09***
[-20;0]	12.32%	6.94***	5.21***
[-20;+20]	14.95%	6.03***	5.41***

Panel B: All Other Investments

Event Window	CAR	t-test statistic	BMP-test statistic
[-1;1]	1.76%	2.66***	2.11**
[-2;+2]	3.10%	3.62***	2.72***
[-10;0]	2.17%	1.71*	1.38
[-20;0]	1.88%	1.07	0.91
[-20;+20]	5.11%	2.08**	1.69*

Panel C: Differences in Means

Event Window	CAR PE	CAR all others	t-value difference in means
[-1;1]	8.82%	1.76%	1.72*
[-2;+2]	11.77%	3.10%	2.88***
[-10;0]	10.73%	2.17%	5.29***
[-20;0]	12.32%	1.88%	9.69***
[-20;+20]	14.95%	5.11%	13.20***

*significant at the 0.10 level, **significant at the 0.05 level, ***significant at the 0.01 level

Table 5

Correlation Matrix

	stake1	*stake2*	*Management*	*undervaluation*	*leverage*	*taxshield*	*risk*	*majority*	*size*
stake1	1.0000								
stake2	-0.6360	1.0000							
management	0.0443	-0.0465	1.0000						
undervaluation	0.0219	-0.0718	0.0727	1.0000					
leverage	-0.0575	0.0907	0.1325	0.0107	1.0000				
taxshield	0.0852	-0.1161	0.0321	0.1889	0.1008	1.0000			
risk	-0.2840	0.1653	0.0355	-0.1312	-0.2250	-0.0193	1.0000		
majority	0.2347	0.0240	0.0742	0.0025	-0.0618	-0.1284	-0.1714	1.0000	
size	0.2174	-0.2336	-0.1489	0.1266	-0.0714	-0.0519	-0.4970	-0.1606	1.0000

This table contains correlation coefficients of all variables included in our basic regression model. *Stake1* is defined as the largest equity stake in the year preceding the private equity (PE) investors' announcement. *Stake2* is defined as the second largest equity stake in the year preceding the PE investors' announcement. *Management* is the sum of all stakes of the firm's executive officers in the year preceding the PE investors' announcement. *Undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the PE investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the PE investment. *Leverage* is computed as net debt/total assets. *Taxshield* is tax payments divided by the market value of equity (see Lehn/Poulsen 1988). *Risk* is measured as standard deviation of daily stock returns (over two years). *Majority* is a binary variable taking the value "1" if the PE investor bought the majority stake in the company and "0" if not. *Size* is defined as the natural logarithm of the firm's total assets in the year preceding the PE investment. The *freefloat* is being determined by subtracting all shareholdings of investors with an interest of more than 5%.

Table 6

Estimated coefficients and t-statistics (in parentheses) of the CAR regression

explanatory variable	expected sign	model 1	model 2	model 3
constant		0.652 (2.85) ***	0.690 (2.21) **	0.618 (2.58) **
stake1	-	-0.002 (-2.33)**	-0.002 (-2.26)**	-0.002 (-2.02)**
stake2	-	-0.010 (-2.96)***	-0.011 (-3.06)***	-0.010 (-2.90)***
management	-	0.001 (0.94)	0.000 (0.54)	0.002 (0.77)
undervaluation	-	-0.273 (-3.43)***	-0.240 (-2.24)**	-0.259 (-3.06)***
leverage	-	-0.153 (-2.90)***	-0.175 (-3.04)***	-0.152 (-2.86)***
taxshield	+	0.576 (3.09) ***	0.476 (2.20) **	0.564 (2.98) ***
risk	-	-1.176 (-0.57)	-2.344 (-0.79)	-1.177 (-0.57)
majority	+	0.047 (0.85)	0.000 (0.01)	0.045 (0.82)
size	-	-0.011 (-0.80)	-0.018 (-1.11)	-0.010 (-0.72)
$management^2$	+			-0.000 (-0.50)
year dummies		no	yes	No
N		48	48	48
R^2		0.49	0.60	0.49
F-statistic (p-Value)		4.06 (0.00)	2.38 (0.02)	3.61 (0.00)

**significant at the 0.05 level, ***significant at the 0.01 level

OLS-regression of the CARs [-2;+2] on the variables *stake1, stake2, management, undervaluation, leverage, taxshield, risk, majority, size, management*^{2}*, employees, reputation, delisting, family, corporation* and *stock market* for 48 German private equity (PE) investments between June 1998 and June 2007. T-statistics are in parentheses. *Stake1* is defined as the largest equity stake in the year preceding the PE investors' announcement. *Stake2* is defined as the second largest equity stake in the year preceding the PE investors' announcement. *Management* is the sum of all stakes of the firm's executive officers in the year preceding the PE investors' announcement. *Undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the PE investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the PE investment. *Leverage* is computed as net debt/total assets. *Taxshield* is tax payments divided by the market value of equity (see Lehn/Poulsen 1988). *Risk* is measured as standard deviation of daily stock returns (over two years). *Majority* is a binary variable taking the value "1" if the PE investor bought the majority stake in the company and "0" if not. *Size* is defined as the natural logarithm of the firm's total assets in the year preceding the private equity investment. *Management*^{2} is the variable management to the power of 2.

Table 7

Estimated coefficients and t-statistics (in parentheses) of the CAR regression

explanatory variable	expected sign	model 4	model 5	model 6	model 7
constant		0.634 (2.56)**	0.671 (2.69)**	0.427 (1.85)*	0.493 (2.14)**
stake1	-	-0.002 (-2.30)**	-0.002 (-2.29)**		
stake2	-	-0.010 (-2.89)***	-0.010 (-2.88)***	-0.006 (-2.26)**	-0.007 (-2.47)**
management	-	0.001 (0.93)	0.001 (0.92)	0.001 (0.91)	-0.000 (-0.06)
undervaluation	-	-0.270 (-3.28)***	-0.275 (-3.39)***	-0.246 (-3.09)***	-0.223 (-2.71)***
leverage	-	-0.151 (-2.79)***	-0.153 (-2.86)***	-0.142 (-2.67)**	-0.124 (-2.31)**
taxshield	+	0.582 (3.04)***	0.571 (3.00)***	0.562 (3.02)***	0.467 (2.51)**
risk	-	-1.110 (-0.53)	-1.277 (-0.60)	-1.438 (-0.69)	-0.695 (-0.33)
majority	+	0.048 (0.86)	0.045 (0.79)	0.035 (0.65)	0.015 (0.29)
size	-	-0.010 (-0.65)	-0.012 (-0.81)	-0.009 (-0.68)	-0.012 (-0.92)
reputation	+	-0.009 (-0.20)			
delisting	-		0.009 (0.20)		
family	-				0.035 (0.62)
corporation	-				-0.040 (-0.66)
stock market	+				0.122 (1.90)*
freefloat	+			0.002 (2.20)**	
year dummies		no	no	no	no
N		48	48	48	48
R^2		0.49	0.49	0.49	0.53
F-statistic (p-Value)		3.57 (0.00)	3.57 (0.00)	4.02 (0.00)	3.71 (0.00)

*significant at the 0.10 level, **significant at the 0.05 level, ***significant at the 0.01 level

OLS-regression of the CARs [-2;+2] on the variables *stake1, stake2, management, undervaluation, leverage, taxshield, risk, majority, size, reputation, delisting, family, corporation* and *stock market* for 48 German private equity investments between June 1998 and June 2007. T-statistics are in parentheses. *Stake1* is defined as the largest equity stake in the year preceding the private equity (PE) investors' announcement. *Stake2* is defined as the second largest equity stake in the year preceding the PE investors' announcement. *Management* is the sum of all stakes of the firm's executive officers in the year preceding the PE investors' announcement. *Undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the private equity investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the private equity investment. *Leverage* is computed as net debt/total assets. *Taxshield* is tax payments divided by the market value of equity (see Lehn/Poulsen 1988). *Risk* is measured as standard deviation of daily stock returns (over two years). *Majority* is a binary variable taking the value "1" if the PE investor bought the majority stake in the company and "0" if not. *Size* is defined as the natural logarithm of the firm's total assets in the year preceding the PE investment. *Reputation* is a binary variable taking the value "1" if the PE investor belongs to the largest PE investors in the world (measured as having capital invested larger than 5 billion $) and "0" if not. Delisting is a binary variable taking the value "1" if the PE investor takes the target firm private and "0" if not. *Family, corporation and stock market* are a binary variable taking the value "1" if the private equity investor bought the stake in the company from the respective shareholder and "0" if not. The reference group for the variables f*amily, corporation* and *stock market* is the variable *financial institution. Freefloat* is defined as the firm's share capital minus the sum of all shareholdings in excess of 5%.

Table 8

Robustness check based on bootstrap procedure

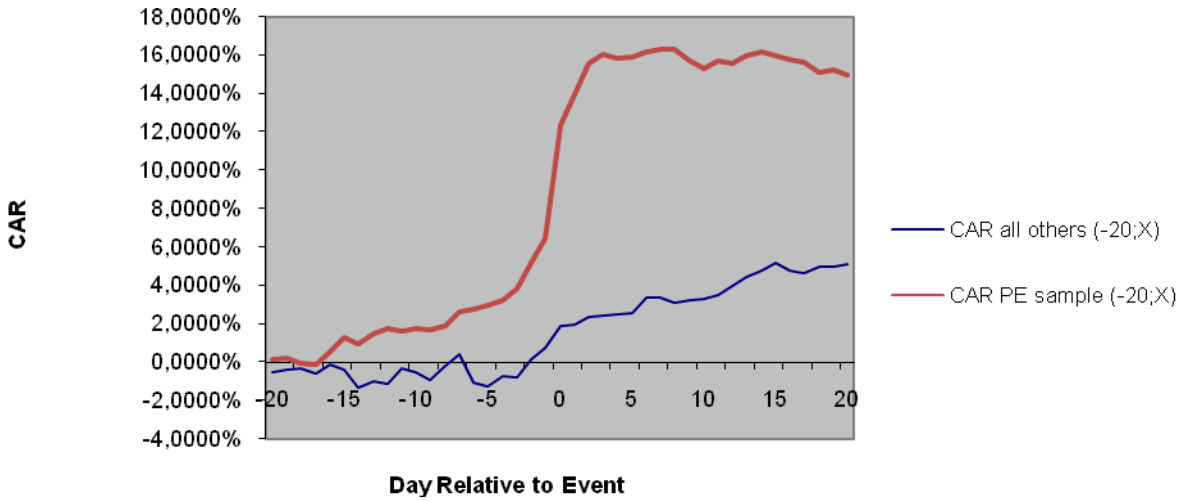
explanatory variable	expected sign	Model 1	Model 7
constant		0.652***	0.493
		[0.2463, 1.0575]	[-0.0089, 0.9943]
stake1		-0.002**	
	+	[-0.0035, 0.0004]	
stake2		-0.010***	-0.007**
	-	[-0.0162, -0.0036]	[-0.0117, -0.0016]
management		0.001	-0.000
	-	[-0.0002, 0.0016]	[-0.0012, 0.0011]
undervaluation		-0.273***	-0.223**
	-	[-0.4381, -0.1079]	[-0.3898, -0.0556]
leverage		-0.152**	-0.124
	-	[-0.2782, -0.0269]	[-0.2549, 0.0059]
taxshield		0.576**	0.467*
	+	[0.1658, 0.9856]	[0.0232, 0.9099]
risk		-1.176	-0.695
	-	[-5.7686, 3.4176]	[-6.0689, 4.6794]
majority		0.047	0.015
	+	[-0.0362, 0.1299]	[-0.0984, 0.1288]
size		-0.011	-0.012
	-	[-0.0314, 0.0094]	[-0.0355, 0.0106]
family			0.035
	-		[-0.0821, 0.1524]
corporation			-0.040
	-		[-0.1761, 0.0954]
stock market			0.112
	+		[0.0159, 0.2399]
Number of Observations		48	48
Number of Clusters		24	24
Number of Replications		10,000	10,000

*significant parameters are marked with an (*).

Robust OLS-regression for the empirical models 1 and 7 for 48 German private equity (PE) investments between June 1998 and June 2007. In parentheses are the confidence intervals at the 0.10 level for the estimated parameters based on 10,000 different bootstrap samples following MacKinnon (2002). *Stake1* is defined as the largest equity stake in the year preceding the PE investors' announcement. *Stake2* is defined as the second largest equity stake in the year preceding the PE investors' announcement. *Management* is the sum of all stakes of the firm's executive officers in the year preceding the PE investors' announcement. *Undervaluation* is defined as the ratio of the closing market price two months prior to the announcement of the PE investment divided by the average price, measured over 250 trading days counting backwards from two months prior to the announcement of the private equity investment. *Leverage* is computed as net debt/total assets. *Taxshield* is tax payments divided by the market value of equity (see Lehn/Poulsen 1988). *Risk* is measured as standard deviation of daily stock returns (over two years). *Majority* is a binary variable taking the value "1" if the private equity investor bought the majority stake in the company and "0" if not. *Size* is defined as the natural logarithm of the firm's total assets in the year preceding the private equity investment. *Family, Corporation and stock market* are a binary variable taking the value "1" if the PE investor bought the stake in the company from the respective shareholder and "0" if not.

Figure I

Average cumulative abnormal returns based on the Market Model for private equity and non-private equity investments



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