Essays in Empirical Corporate Finance and Corporate Governance

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to my mother

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Introduction

"[D]irectors of such [joint-stock] companies, however, being the managers rather of other people's money than of their own, it cannot well be expected, that they should watch over it with the same anxious vigilance with which the partners in a private copartnery frequently watch over their own."

Adam Smith (1776)

This fundamental insight of Adam Smith about the consequences of the separation of ownership and control is as relevant today as it was in 1776. It is central to our understanding of modern corporations and it permeates the literature on "corporate governance", a concept loosely defined by Shleifer and Vishny (1997) as "the ways in which suppliers of finance to corporations assure themselves of getting a return on their investment". Guided by the observation that ownership in large U.S. corporations is dispersed rather than concentrated in blocks of control (Berle and Means, 1932) and Jensen and Meckling's (1976) seminal principal-agent theory, much corporate governance research has put its focus on the conflict between managers and shareholders and the Anglo-American system of corporate governance.

The present thesis provides several contributions to this literature in the substantially different context of the German corporate governance system. Concentrated share ownership, a two-tiered board system, strong creditor influence and a limited market for corporate control have traditionally characterized the German capital market. As such, the German system of corporate governance differs in many aspects from the Anglo-American system and provides a promising testing ground for research on corporate governance.

As stated above, a large part of the literature on corporate governance focuses on conflicts of interest between managers and shareholders. These conflicts may be of less importance in countries such as Germany, where the majority of firms are dominated by a single large shareholder. Becht and Boehmer (2003), for example, document that more than 82% of Germany's listed firms have one shareholder with voting rights in excess of 25% and 65% of firms even have one shareholder holding the majority of votes. In firms with concentrated ownership managers are limited in their ability to act at their own discretion as large shareholders have both the incentive and the ability to curb managerial freedom. Monitoring by large shareholders can therefore alleviate the classical manager-shareholder conflict to the benefit of all shareholders. Yet, in the presence of large controlling shareholders conflicts of interest with small shareholders can emerge. Like managers, large shareholders have the ability to engage in self-dealing behaviors by, e.g., consumption of perks, transfer of resources through self-dealing transactions or choice of a befriended but costly supplier. These private benefits of control, however, often disadvantage small shareholders. Theoretical literature suggests that dividends may be a principal way of aligning conflicts of interest between different groups of shareholders. For example, the rent extraction hypothesis (Gugler and Yutoglu, 2003) states that a dividend increase signals a reduction of potential agency conflicts between small and large shareholders as it reduces the amount of cash that can be inappropriately utilized by large shareholders. The testing of predictions like this that relate to the concentration of voting power will be part of the discussion in chapter 1, which looks at a company's dividend policy from a corporate governance perspective.
A notable feature of the German corporate governance system is that its legal system allows for a combination of both strong control and dispersed ownership structures (Goergen et al., 2008). The Stock Corporation Act (§139 AktG) enables firms to issue up to 50% of their total book value of equity as non-voting preference shares, thus permitting shareholders to retain or purchase a controlling position in a company without having to own a proportional stake in its cash-flow rights. These dual-class share structures can thereby lead to a misalignment of interests by incentivizing large shareholders to generate private benefits of control at the expense of minority shareholders. Chapter 2 provides novel contributions to this literature. Rather than focusing on a firm's decision to issue more than one share class, the chapter explores

the drivers behind firms' decisions to abandon existing dual-class structures. We exploit a change in the index selection rules of Deutsche Boerse that discriminated against dual-class companies by adversely affecting their relative weight within selection indices. We suggest and empirically support the hypothesis that the change in rules resulted in a trade-off for large controlling shareholders between safeguarding their extant private benefits of control and the costs associated with a loss in index weight.

Aside from the concentration of control, the two-tier board structure is another distinctive feature of Germany's corporate governance system. As the name suggests, German corporations are governed by two separate boards: an executive board managing the firm and a supervisory board overseeing management. The supervisory board therefore fulfills the function of a corporate governance mechanism. Among other duties, members of the supervisory board appoint and dismiss executives, approve managements' decisions, and set their remuneration. Frequently, members of the board do not only serve on their own board, but are also simultaneously active in several other outside boards. The literature on board busyness (e.g. Fich and Shivdasani, 2006) suggests that such additional commitments may put too much strain on the board's resources and thereby adversely affect the compliance with its monitoring duties. Chapter 3 employs methods from social network analysis to explore aspects of board busyness and revisit the relationship between firm governance and the board's position in the network of directors. A detailed description of each chapter is given in the following.

CHAPTER 1.[1] Most existing theories of dividend policy imply that dividend announcements convey value-relevant information to market participants. However, in an efficient market, only the unexpected part of a dividend announcement should contain value-relevant information. The evaluation of the informational content conveyed by dividend announcements therefore crucially relies on the proper modeling of dividend expectations. We find that differences in modeling expectations have severe implications for the investigation of theories explaining the share price reaction to dividend announcements, including agency-based explanations. In this sense, one of the chapter's main contributions is methodological and lies in the approach we

[1]This chapter is based on joint work with Christian Andres, André Betzer, Christian Haesner and Erik Theissen (Andres et al., 2013a).

suggest to model dividend surprises.

Previous work predominantly uses a naive model that equates the change in dividends with the unexpected part of the dividend, thereby assuming that capital market participants' expectations of the dividend are based on the previous dividend. Instead, we model dividend surprises by relating the actual dividend announcement to the average analyst dividend forecast provided by I/B/E/S. Although the approximation of market expectations with analyst forecasts is a common approach in the earnings announcement literature, this methodology has rarely been employed in the dividend announcement literature. Based on a sample of 921 firm-year observations between 1996 and 2006, we document that the chosen measure of the dividend surprise is superior to the naive approach. When the cumulative abnormal return after a dividend announcement is regressed solely on the dividend change, we observe a positive and significant relation. Once we include the dividend surprise as an additional control, the coefficient on the dividend change becomes insignificant, whereas the coefficient on the dividend surprise is highly significant. Put differently, we document that the dividend change has no explanatory power for the abnormal return beyond the dividend surprise. This provides empirical evidence that share prices respond to the surprise in the dividend announcement, not to the dividend change per se.

We use these insights in an attempt to discriminate between competing theories that aim to explain the share price reaction to dividend announcements. Among the theories we test are the cash flow signaling (Bhattacharya, 1979; Miller and Rock, 1985) and the free cash flow hypothesis (Easterbrook, 1984; Jensen, 1986). The cash flow signaling theory posits that managers use dividends to signal expected cash flows to the market. For example, managers might use increases in dividends to signal better than expected future cash flows. The idea behind the free cash flow hypothesis is that increased dividend payments can serve to reduce the amount of cash under the management's control. Because managers might invest excess cash flows in projects with a negative net present value, increased dividends can signal lower agency costs. The driving forces behind the signaling and the free cash flow theory are informational asymmetries and conflicts of interest between managers and shareholders. However, it is not evident that these conflicts prevail in the German corporate governance system. Since large shareholders with typically sizable fractions of a company's voting shares dominate German firms, their abilities and incentives to effectively monitor

the management's actions are likely to alleviate this type of agency problems. This argument is reflected in the monitoring hypothesis and it suggests that there is less need to use dividends to signal reduced agency conflicts in the presence of large shareholders. Yet, in this situation conflicts of interest may emerge between large and small shareholders. If powerful shareholders abuse their position and pursue their own interests rather than those of minority shareholders, a dividend increase may be interpreted to signal that large shareholders commit not to expropriate minority shareholders. This is the rent extraction hypothesis first formulated by Gugler and Yurtoglu (2003). In addition, while informational asymmetries between managers and large shareholders should be less pronounced in Germany, minority shareholders might still have informational disadvantages compared to large shareholders. Dividends can hence also serve as a signaling device to mitigate this asymmetry. In addition to the above theories, we also explore the predictions of the dividend clientele hypothesis (Miller and Modigliani, 1961; Elton and Gruber, 1970), according to which stock price reactions to dividend announcements reflect the preferences of the firm's shareholders.
Our empirical findings concerning the distinction between the different theoretical explanations of share price reactions to dividend announcements can be summarized as follows. We document a non-linear relation between the cumulative abnormal returns and the voting power of the largest shareholder of the firm, which is consistent with both the monitoring and rent extraction hypotheses. These non-linearities suggest that monitoring by large blockholders reduces agency costs up to a certain point by aligning the incentives of management and shareholders. This increasing alignment of interests results in a weaker share price reaction to dividend news. At higher levels, voting power allows large shareholders to extract rents at the cost of minority shareholders. An increase in dividends reduces the resources they can potentially divert and can signal the large shareholders' unwillingness to engage in rent-extracting activities, thus resulting in a stronger share price reaction. Aside from these results, we also find evidence in favor of the cash flow signaling hypothesis and dividend clientele effects. However, we do not find support for the free cash flow hypothesis.
Our main analyses are based on separate estimates for good news announcements (positive surprises) and bad news announcements (negative surprises). To ensure that our results can be compared to those of previous studies, we also built subsamples of

dividend increases and decreases (conforming to the naive expectations model) and repeat the analysis. The findings support neither the dividend signaling hypothesis nor the monitoring or rent extraction hypothesis. We therefore conclude that the naive model may yield misleading results, and we recommend that, whenever data on analyst dividend forecast are available, the naive model should be abandoned in favor of a model that takes market expectations into account.

CHAPTER 2.[2] The second chapter is a contribution to the literature on dual-class share structures. Within the literature on dual-class shares, the consensus is that the decision to issue more than one share class is driven by the controlling shareholder's desire to maintain control while diversifying cash-flow risk (see e.g. DeAngelo and DeAngelo, 1985). However, little is known as to why firms decide to unify different share classes. The few studies investigating dual-class unifications (Maury and Pajuste, 2011; Dittmann and Ulbricht, 2007; Hauser and Lauterbach, 2004; Lauterbach and Pajuste, 2011) identify improved access to outside equity as an important motive and the existence of private benefits of control as a central deterrent.

Our study exploits a change in the index selection rules of Deutsche Boerse as a unique opportunity to contribute to this literature and investigate the drivers behind firms' decisions to abolish dual-class shares. As of June 2002, Deutsche Boerse altered the rules for weighting in its family of selection indices from a weighting scheme that considered only a firm's overall market capitalization to a scheme based on the market capitalization of the free-float portion of the more liquid share class. As a consequence of this change, firms included in any of its selection indices with more than one class of shares outstanding faced the danger of losing their current index position or dropping out of the index. We hypothesize that this situation led firms to reassess the benefits of retaining their dual-class shares against the possible costs of foregone index weight that resulted from having two share classes.

Some prior studies find evidence of significant shareholder wealth effects associated with unifications. For instance, Dittmann and Ulbricht (2007) analyse 89 German firms with dual-class shares between 1990 and 2001 of which 31 unify their stock. They document significantly positive stock price responses surrounding the announcement of the unification, and they attribute these to the market's appreciation of the resulting improved corporate governance of the firm and the enhanced liquidity of

[2]This chapter is based on joint work with André Betzer and Marc Goergen (Betzer et al., 2013).

the stock. We observe similar increases in firm value at the announcement of the change in Deutsche Boerse's rules. Given the evidence that shareholders of German firms prefer single-class stock over dual-class stock as evidenced by the wealth effects around actual unifications, we interpret this increase surrounding the reform as a sign that it led the market participants to increase their estimate of the likelihood of future conversions.

While giving up dual-class structures is associated with increases in a firm's value, retaining a dual-class structure allows large shareholders to maintain a controlling position in the firm without having to own the equivalent stake in cash-flow rights. The unification of voting and non-voting shares typically causes large shareholders to forfeit this advantage and experience a substantial loss of voting power. Therefore, self-interested large shareholders may favour the status quo of keeping a dual-class structure in order to safeguard their private benefits of control at the expense of minority shareholders. We hypothesize that the larger the loss of voting power suffered by a large shareholder in case of conversion, the lower is the likelihood of a dual-class unification. At the same time, retaining a dual-class structure is associated with the danger of losing large amounts of index weight. We therefore hypothesize that the higher the hypothetical penalty in terms of foregone index weight, the more likely a firm will abolish its dual-class share structure.

The chapter's main contribution is to study this trade-off faced by a large controlling shareholder between the benefits from a dual-class stock unification and the costs from losing control. Our findings support both hypotheses. While we document that firms with large shareholders who lose substantial amounts of control in case of a dual-class abolishment are less likely to unify share classes, firms forfeiting larger amounts of index weight under a dual-class structure are more likely to unify. Moreover, we find that the sensitivity towards loss of index weight decreases with increasing voting loss. This suggests that large shareholders with greater private benefits of control are less concerned about the costs associated with the reduction in the firm's index weight. Alternatively stated, forfeiting index weight may be the lesser of two evils if the alternative is losing control.

CHAPTER 3.[3] The third chapter contributes to the literature on busy boards. Since

[3]This chapter is based on joint work with Christian Andres and Mirco Lehmann (Andres et al., 2013b).

members of the supervisory board often do not only serve on one board, but are simultaneously active in several other boards, they are embedded in a network of social relations. However, maintaining a large network and adhering to its demands can take substantial temporal and cognitive resources and render intensely-connected directors exceedingly busy. As a result, board busyness can be detrimental to a board's duties as the management's monitor, which might ultimately lead to a deterioration in firm performance. Findings within the literature on this topic are ambiguous. Fich and Shivdasani (2006) provide supportive evidence and show that firms with busier boards exhibit significantly lower market-to-book ratios than firms with less busy boards. In contrast, Ferris et al. (2003) find no evidence of a relationship between the number of board appointments and firm performance.

A central aspect in studying the effects of board busyness is to classify boards as (not) busy. We argue that prior approaches that have largely been based on the number of board appointments ignore central aspects that characterize how busy a director actually is, because the concept of "busyness" in itself has more than one dimension. Rather than counting a director's board seats, a more adequate way of capturing busyness should incorporate a detailed characterization of the director's social network, including an analysis of individual ties as well as the overall architecture of the network. Put differently, we propose that an appropriate analysis of busyness should focus not only on a director's immediate connections to other directors within his social network, but also on the connections among the directors that he is connected to. Following this argument, we use methods from social network analysis to classify busy boards.

Our results show that firms with intensely connected supervisory boards are associated with lower firm performance. In addition, we find that firms with busy boards pay their executives significantly more. We interpret these results as indicative of poor monitoring in firms with directors who are more embedded in the social network. In both cases, we document that simple measures for busy directors used by other studies in the past fail to show any significant pattern. These findings indicate that both the quality and structural position of additional board seats seem to play a bigger role than simply the number of board appointments.

Chapter 1

The Information Content of Dividend Surprises: Evidence from Germany

1.1 Introduction

Dividend policy is one of the most intensely researched topics in corporate finance. And yet, we do not know exactly why firms pay dividends. Most existing theories imply that dividend announcements convey information and, consequently, affect share prices. A large number of empirical studies have been conducted in order to discriminate between the competing theories. The most common approach is to estimate the share price reaction to dividend announcements in an event study and then relate it to an appropriate set of explanatory variables.[1]

In the present study we adopt this approach to analyze the share price reaction to dividend announcements in Germany. In an attempt to discriminate between the major theoretical explanations of corporate dividend policy, we estimate panel models in which we relate the share price reaction after the dividend announcement to characteristics of the firm. We improve on the methodology of previous papers by using a random effects panel model instead of pooled OLS.[2]

[1] One strand of the literature analyzes the impact of the level of dividends on the market value of the firm after controlling for the effect of other accounting fundamentals (e.g. Rees, 1997; Akbar and Stark, 2003; Hand and Landsman, 2005; Rees and Valentincic, 2013) in a levels value relevance framework. This approach does not emphasise the timing of dividend announcements, merely whether dividends are partially correlated with market values and, hence, with the information set used to form market values. In contrast, we analyze how dividend announcements affect the market value of equity as measured by the change in share price after the time of the dividend announcement, potentially allowing for a tighter identification of the influence of dividends (and, hence, the information content of dividends) on market value/share price.

[2] An alternative to panel estimation is the Fama and MacBeth (1973) procedure, which is used by Amihud and Li (2006).

In efficient markets share prices will only react to surprises in dividend announcements. Therefore, an empirical analysis of the share price reaction to dividend announcements requires a model of expected dividends. We model dividend surprises by relating the actual dividend announcement to the average analyst dividend forecast provided by I/B/E/S. Although this is a standard procedure in the earnings announcement literature (e.g., O'Brien, 1988; Battalio and Mendenhall, 2005), a similar approach has rarely been used in the dividend announcement literature.[3] Rather, most previous papers use a naive model, where the change in the dividend is taken to be the dividend surprise.[4] We compare the performance of the naive model to that of our approach. This allows us to assess the accuracy of the naive model relative to that of an analysts' expectations-based approach.

In our analysis we use data from Germany. German data have several advantages. Since German firms pay dividends once a year,[5] changes in dividends potentially convey more information than changes in quarterly dividends (as are paid in, for example, the USA). The German corporate governance system is characterized by concentrated share ownership (Franks and Mayer, 2001; Becht and Boehmer, 2001;

[3]We are aware of only five papers that use analyst dividend forecasts in the context of share price reactions to dividend announcements. All five papers use data from only one analyst firm (Value Line). Fuller (2003) analyzes the relation between informed trading and dividend signaling. Woolridge (1983) and Dhillon et al. (2003) test the cash flow signaling hypothesis but do not consider the free cash flow hypothesis, nor do they analyze the relation between share price reaction and ownership structure. Leftwich and Zmijewski (1994) analyze the contemporaneous announcement of earnings and dividends. Bar-Yosef and Sarig (1992) compare Value Line forecast to an estimate of dividend surprises obtained from option prices. Ofer and Siegel (1987) and Lang and Litzenberger (1989) investigate changes in analysts' earnings forecasts following the announcement of dividend changes. They do not use data on analyst dividend forecasts, however.

[4]See, e.g., Aharony and Swary (1980), Bernheim and Wantz (1995), Yoon and Starks (1995), Amihud and Murgia (1997), Gerke et al. (1997) and Gurgul et al. (2003). Some papers use a dividend estimate obtained from a Lintner (1956) model (e.g., Watts, 1973 and Amihud and Li, 2006), derive dividend surprises from option prices (Bar-Yosef and Sarig, 1992) or use ad hoc specifications (e.g. Gugler and Yurtoglu, 2003, who look at firms that increase dividends even though earnings decrease).

[5]The payout decisions of German Stock Corporations (Aktiengesellschaften) are governed by § 58 of the Stock Corporation Act (Aktiengesetz, AktG). The executive and the supervisory board can decide to retain up to 50% of the profits. The decision on whether to retain or to pay out the remaining amount is taken by the shareholders' meeting by simple majority vote. In practice it is almost always the case that the shareholders' meeting votes in favor of the proposal made by the executive board. Repurchases are far less important in Germany than they are in the U.S. Until 1998 repurchases were essentially prohibited. In the period 1998-2008 the average repurchase ratio (repurchases as a percentage of total earnings) was 7.8% (see Andres et al., 2012). The corresponding figure for dividends (excluding special dividends) was 44.1%.

Andres, 2008) and weak minority shareholder protection (La Porta et al., 2000). Given these characteristics, conflicts between large and small shareholders may be relevant for the payout policy of German firms, and for the market reaction to dividend announcements. Therefore, the ownership structure and other specific features are taken into account in our empirical analysis.[6]

The two most popular theories explaining dividend policy are the cash flow signaling hypothesis (Bhattacharya, 1979; Miller and Rock, 1985) and the free cash flow hypothesis (Easterbrook, 1984; Jensen, 1986). The driving forces behind these hypotheses are informational asymmetries and conflicts of interest between managers and shareholders. Whereas these conflicts may be prevalent in countries with relatively dispersed ownership such as the U.S., they may be less important in countries with concentrated ownership such as Germany.

In firms with concentrated ownership managers are limited in their ability to act at their own discretion. Large shareholders have both the incentive and the ability to curb managerial freedom to dispose of free cash flows. Therefore, the monitoring function of large shareholders makes the classical manager-shareholder conflict less severe. However, conflicts of interest between large and small shareholders may arise instead (La Porta et al., 2000). In such a setting, a dividend increase may be interpreted as a signal by which large shareholders commit not to expropriate minority shareholders. This is the rent extraction hypothesis first formulated by Gugler and Yurtoglu (2003). In addition, informational asymmetries between management and shareholders should be less relevant when shareholders are large. Nonetheless, minority shareholders likely have informational disadvantages compared to large shareholders. In this context, dividends can serve as a signaling device to mitigate this asymmetry.

Taken together, the rationales behind both free cash flow and signaling theory persist, but we expect conflicts of interest and (or) informational asymmetries to (partly) shift from between managers and shareholders to among shareholders.

Our results can be summarized as follows. The results of the regressions aimed at discriminating among competing theoretical explanations of dividend policy support the cash flow signaling hypothesis and dividend clientele effects. We further find that the price reaction to dividend surprises is related to the ownership structure of the

[6] Some of the institutional features of the German market warrant a closer discussion, which we will return to when we describe our data.

firm in a non-linear way. Our results do not support the free cash flow hypothesis. This is in line with our argument that manager-shareholder conflicts are less important in a country with concentrated ownership.

We find that our measure of the dividend surprise - the difference between the actual dividend and the mean analysts' dividend forecast - is superior to the naive approach that implicitly assumes that the expected dividend equals the previous dividend. Out of more than 500 dividend increases in our sample, less than half actually constitute a positive surprise. The remaining dividend increases either constitute no-news events (that is, the dividend increase had been anticipated) or even negative surprises (analysts had forecasted a larger dividend increase). The results for unchanged dividends and dividend decreases are less pronounced but point in the same direction. When we regress the cumulative abnormal return after a dividend announcement on the dividend change and our measure of the dividend surprise, we find that the dividend surprise is highly significant while the dividend change is insignificant. Thus, and as one would expect in an efficient market, share prices react to the surprise in the dividend announcement, not to a dividend change per se. This result still holds when we control for the surprise in earnings announcements, which are often made together with dividend announcements. Interestingly, we find that dividend announcements are, if anything, more informative than earnings announcements. This result suggests that both variables should be used jointly whenever a firm announces earnings and dividends simultaneously.

The remainder of the chapter is organized as follows. The next section develops our hypotheses. Section 1.3 describes our sample selection procedure and presents descriptive statistics. Section 1.4 presents the event study results and Section 1.5 provides the results of our multivariate panel regressions. Section 1.6 concludes.

1.2 Hypotheses

It is a stylized fact that dividend announcements convey information to market participants. In an informationally efficient market, however, only the unexpected part of the dividend announcement is informative. Thus, an analysis of the share price reaction to dividend announcements requires a model for expected dividends. Many previous studies use a naive model that considers dividend changes as dividend surprises. This approach is based on the implicit assumption that market participants expect unchanged dividends. Although models of payout policy, such as Lintner (1956) or Fama and Babiak (1968), suggest that firms smooth their dividends, the very same models predict that earnings changes translate into dividend changes. If firms pay dividends each quarter, the expected dividend change is typically small. In this case, the previous dividend may be a reasonable proxy for the market's expectations of the next dividend. However, when firms pay dividends only once a year (as is the case in Germany and many other countries), this is much less likely to be the case. In our analysis we therefore use the average of analysts' forecasted dividends as provided by I/B/E/S as a proxy for the market expectations. We believe that the resulting estimate of the dividend surprise outperforms the naive model. This yields our first hypothesis:

H1: Share prices react to the dividend surprise, defined as the difference between the actual dividend announcement and the average analyst forecast as provided by I/B/E/S. The dividend change (defined as the actual dividend announcement minus the previous dividend) has no explanatory power for the share price reaction once we control for the dividend surprise.

We sort all dividend announcements into three categories based on our dividend surprise measure. If the difference between the actual dividend announcement and the mean analyst forecast is larger than +5% (smaller than -5%) the announcement is classified as good news (bad news). If the actual announcement is within ±5% of the analyst forecast, we classify the announcement as no news. This procedure follows Campbell et al. (1997).[7] In our implementation of the naive model, we classify dividend changes of more than +5% (more than -5%) as dividend increases (dividend decreases). Dividend changes of less than 5% are treated as unchanged dividends. Note that there may be cases in which an unchanged dividend or even a dividend increase is bad news. This will be the case whenever market participants expected

[7]Campbell et al. (1997) analyze the impact that earnings announcements have on the firm's stock price. They also employ three categories but they classify an announcement as good (bad) news if the deviation of the actual earnings from the expected earnings is larger than 2.5% (smaller than -2.5%). As a robustness test, we reclassify all observations based on the 2.5% threshold. All regression results are qualitatively similar.

an even higher dividend increase.
Dividend and earnings announcements are often made simultaneously. In our panel model we deal with this by including the earnings surprise (defined as the difference between the actual earnings figure and analysts' expectations obtained from I/B/E/S) as a control variable. This specification allows us to test whether the dividend surprise or the earnings surprise is more informative.
Our first hypothesis states that share prices react to the dividend surprise. However, the magnitude of the dividend surprise is not the only determinant of the share price reaction. The cash flow signaling hypothesis, the free cash flow hypothesis, the monitoring hypothesis and the rent extraction hypothesis all argue that dividends serve as signaling and / or monitoring devices and they all predict that the magnitude of the price reaction to a dividend announcement will depend on certain characteristics of the firm.
The cash flow signaling hypothesis states that managers (or large shareholders who effectively control managers) use dividends to signal their private information regarding the future cash flows of the firm (Bhattacharya, 1979; Miller and Rock, 1985). Signaling information to (small) investors via dividend announcements is of greater importance for smaller firms because smaller firms are usually not adequately covered by financial analysts, resulting in a larger degree of information asymmetries. Therefore, we hypothesize:

H2: The informational role of dividend announcements is more important in smaller firms, which are covered by fewer analysts. Hence, the magnitude of the share price reaction is decreasing in firm size and the number of analysts following the firm.

This hypothesis has been confirmed by, among others, Eddy and Seifert (1988), Yoon and Starks (1995) and Amihud and Li (2006) for the U.S. market. Using German data, Gugler and Yurtoglu (2003) do not find a statistically significant relationship between firm size and dividend announcement returns. We employ the number of analysts covering a firm as our proxy for the degree of informational asymmetries. Alternatively, we use firm size, measured by the logarithm of the market value of equity 14 days prior to the dividend announcement. Because these two variables are highly correlated, we do not include them simultaneously. It should be noted that,

in order to generate reliable consensus forecasts, we require firms to be covered by at least two analysts for inclusion in our final sample. This might bias our results against finding an effect as it excludes firms where asymmetries are supposedly most pronounced.
The free cash flow hypothesis is based on the presumption that managers will invest cash available to them even when there are no investment opportunities with positive net present value (Easterbrook, 1984; Jensen, 1986). Dividend payments decrease the level of free cash flow and can therefore serve to mitigate the overinvestment problem. Consequently, when firms with ample free cash flow and / or poor investment opportunities (as indicated by Tobin's Q) increase their dividend payout, this signals lower agency costs.[8]

H3a: Firms with higher free cash flows experience a larger price appreciation (drop) after a positive (negative) dividend surprise.

H3b: Firms with poor investment opportunities as measured by Tobin's Q experience a larger price appreciation (drop) after a positive (negative) dividend surprise.

Lang and Litzenberger (1989) were the first to test the free cash flow hypothesis using data from the U.S. market. Their results support the hypothesis. Gugler and Yurtoglu (2003) use data from Germany and confirm the results of Lang and Litzenberger (1989). The evidence is far from unanimous, however. Yoon and Starks (1995), using a larger U.S. sample than Lang and Litzenberger (1989), find no evidence to support the free cash flow hypothesis. They argue that the stronger price appreciation after dividend increases of firms with Q less than unity is due to the characteristics of these firms. They show that firms with Q less than unity are smaller, have a higher dividend change and exhibit a higher dividend yield. After controlling for these characteristics, they find no systematic relation between the price reaction to dividend announcements and Tobin's Q. We also include these control variables in our panel regressions. We further include the firm's leverage ratio as a control variable because debt also mitigates the overinvestment problem associated with free cash

[8] If managers privately knew that the firm has fewer profitable investment projects than previously expected, a dividend increase might be bad news. However, managers have no incentive to signal bad news. There is no empirical support for the hypothesis that dividend increases are bad news.

flow and can be regarded as a substitute for high payout levels.

The free cash flow hypothesis is based on the agency conflict between managers and shareholders. Blockholders have strong incentives to monitor managers. Therefore, the existence of a large shareholder may alleviate the classical agency problem. However, in firms with powerful blockholders, additional conflicts of interest may emerge between large and small shareholders as the former may have an incentive to expropriate the latter, for example by tunneling (Bebchuk, 1999). In line with this argument, several studies indicate a non-linear impact of block-ownership on firms' agency costs (Morck et al., 1988; McConnell and Servaes, 1990; De Miguel et al., 2004). These non-linearities imply that, to a certain point, monitoring by large blockholders reduces agency costs by aligning the incentives of managers and shareholders. This suggests that there will be less need to use dividends to signal reduced agency conflicts. However, higher levels of control open up the possibility for large shareholders to abuse their position by acting in their own interest rather than in the interest of all shareholders (Shleifer and Vishny, 1997). As dividends are distributed among shareholders in proportion to their cash flow rights, an increase in dividends reduces the resources that large shareholders can potentially divert. Consequently, a dividend increase signals a reduction of potential agency conflicts between small and large shareholders. This is the rent extraction hypothesis first formulated by Gugler and Yurtoglu (2003).

Combining the previous arguments yields the prediction of a non-linear relation between the largest shareholder's voting power and the share price reaction to dividend announcements. At low levels of voting power the monitoring effect dominates. An increase in voting power aligns the incentives of managers and shareholders. Consequently there is less need to use dividends to signal lower agency costs. At high levels of voting power the rent extraction effect kicks in. Potential conflicts of interest between small and large shareholders become important, and dividends can be used as a device to signal that large shareholders abstain from expropriating minority shareholders. We thus expect a hump-shaped or u-shaped relation between the voting power of the largest shareholder and the share price reaction to dividend announcements. Higher voting power results in a smaller price reaction, but at a decreasing rate. The relation becomes positive when the rent extraction effect becomes stronger than the monitoring effect.

H4: The relation between the voting power of the largest shareholder and the share price reaction to dividend announcements is non-linear and follows a hump-shape or u-shape.

Common measures of the ownership structure are the shares of the voting rights held by the largest and the second largest shareholder. However, the simplicity of these measures comes at a cost. A simple example illustrates the problems that may arise. Assume a decision has to be taken by simple majority vote. Assume that the largest shareholder owns 60 percent of the votes and the second-largest shareholder owns 10 percent. As the largest shareholder already holds a majority stake, his position cannot be contested and the voting rights of the second largest shareholder will effectively be irrelevant in every majority decision. The situation is different if the largest shareholder owns less than 50 percent of the votes. Consider a firm with three shareholders, two holding 45 percent each and a third holding 10 percent of the votes. Here, any shareholder is able to potentially form a winning coalition. This means that each shareholder holds the same power, even though the disparity in voting rights is substantial. It becomes apparent that the mere share of voting rights does not necessarily reflect the power that those votes actually possess. How much power a shareholder has to affect the firm's decisions does not only depend on his own voting stake, but depends crucially on the distribution of voting rights among all shareholders. Hence, methods to determine voting power and control contestability need to consider the entire ownership structure. Therefore, we employ the Shapley-Shubik (1954) index to identify a shareholder's voting power.[9] The index measures a shareholder's relative importance as her ability to change a voting coalition from a losing to a winning one, given the distribution of voting rights. Put simply, it attributes each shareholder a power index reflecting the probability that she is pivotal in determining the outcome of a cooperative game. We calculate Shapley-Shubik values using quotas of both 25 and 50 percent. We also use 25% because according to the German Stock Corporation Act (Aktiengesetz), a stake of 25% provides a blocking minority and allows holders of voting shares to veto specific important decisions such as the issuance of new shares, dismissal of directors,

[9]We thank an anonymous referee for suggesting a game theoretically founded measure.

or amendments to the articles of incorporation. During our sample period, only shareholdings of more than 5% had to be registered with the German Financial Supervisory Authority. Therefore, the information about firm ownership is necessarily incomplete and assumptions must be made about the undisclosed holdings. One way would be to consider the entirety of unknown shareholdings as powerless and to rescale the voting stakes of large shareholders to 100 percent. Instead of ignoring these stakes, we interpret unobserved voting rights in the sense of an oceanic game (Shapiro and Shapley, 1978), i.e. there is a small number of large shareholders and an "ocean" of shareholders with very small voting stakes.
Finally, the price reaction to dividend announcements may be related to the preferences of the shareholders of a firm. A firm that offers a high dividend yield is likely to have shareholders with a (potentially tax-induced) preference for dividend payouts. As these shareholders value dividends highly, the price reaction to dividend announcements should be stronger (dividend clientele effect; Miller and Modigliani, 1961; Elton and Gruber, 1970).

H5: Share prices react more strongly to dividend surprises in firms with higher dividend yields.

1.3 Data and Descriptive Statistics

The initial sample for our analysis consists of all 150 firms included in the DAX, MDAX, or SDAX[10] indices as of December 31, 2002. Our sample period covers the years 1996-2006. German firms pay and announce dividends on a yearly basis. Therefore, our sample potentially consists of 1,650 firm-year observations. Data on dividend announcements are obtained from Reuters newswires. We exclude 312 firm-year observations because we were unable to identify the exact dividend announcement date. Following Amihud and Li (2006) we exclude firms in the financial services sector (122 firm-year observations). In addition, firm-years in which a firm

[10] The DAX (largest firms), MDAX (mid caps) and SDAX (smaller caps) are calculated by Deutsche Boerse AG. They do not include "new economy" firms. We do not include these firms because a) most of them went public only in the hot issue market at the end of the 1990s, and b) many of these firms did not pay dividends. We note that the three indices alluded to above comprise about one third of the listed firms in Germany. Most firms that are not covered are very small and have insufficient analyst coverage to be included in our analysis.

had a "control agreement"[11] in place (7 firm-years), or years in which firms acted as either acquirer or target in an M&A transaction (11 firm-years) are also dropped from the sample. All accounting data items and share price data are obtained from the Thompson Financial Datastream database. 31 firm-year observations are excluded because of missing data items.

As already noted, we keep observations where dividend and earnings announcements are made on the same date. In order to control for the information conveyed by the earnings announcement, we include the earnings surprise as a control variable in our panel regressions. However, there are 65 cases in which other potentially value-relevant information (i.e. restructurings (30 observations), changes in the composition of the board (12 observations), stock repurchases and tax-free dividends (8 observations), capital structure changes (8 observations, and others (7 observations)) is released on the same day as the dividend announcement. We exclude these observations from the sample. This reduces the size of our sample to 1,102 firm-year observations.

One contribution of our study is the use of dividend forecasts provided by Institutional Brokers' Estimate System (I/B/E/S) as a proxy for the market's dividend expectations.[12] We use the arithmetic mean (the median is used in a robustness check) of the final forecasts made by the analysts following a firm prior to the announcement of the dividend payment.[13] We only include firm-years that are covered by at least two analysts. This requirement leads to the exclusion of another 181 firm-year observations and reduces our final sample to 921 observations.

Some of our sample firms (21 firms in 2002) have issued multiple share classes, usually common shares that carry a voting right along with non-voting preference shares.[14]

[11] Control agreements are defined as agreements between a company and its parent company and take the form of either Profit and Loss Agreements (Gewinnabfuehrungsvertrag) or Subordination of Management Agreements (Beherrschungsvertrag).

[12] To address the objection of Ljungqvist et al. (2009) that downloads from the I/B/E/S database may have been subject to errors before 2008, we check our data for consistency using a very recent download from the I/B/E/S database for a subsample and find no systematic bias in our data.

[13] In 93% of our observations, the consensus estimate refers to the last month before the dividend payment was announced. In 63 cases (6.8%), we use earlier forecast data (up to three months). Observations are excluded when no analyst forecasts were available for the three months preceding the dividend announcement.

[14] The only exception is Siemens AG, where preference shares are endowed with six times the voting rights of ordinary shares (from 1920 until 1998). Voting rights of Siemens AG are adjusted accordingly.

In these cases, we only include one class of shares in our sample.[15] A closer look at these firms reveals that dividends on common shares usually change along with dividends on preference shares, a finding that confirms the observation of Goergen et al. (2005) regarding German firms during the period from 1984 to 1993.
We include special dividends in our dividends per share measure. It has been pointed out in the literature (see, e.g., Goergen et al., 2005; Andres et al., 2009) that special dividends frequently reflect permanent changes in dividends rather than transitory increases. However, large one-off payments (Sonderausschuettungen) - which are associated with special anniversaries or the sale of subsidiaries - are excluded. This procedure is also in line with previous studies on the dividend policy of German firms, such as Behm and Zimmermann (1993), Goergen et al. (2005) and Andres et al. (2009).
Hypothesis 4 predicts that the ownership structure of a firm is a potential determinant of the share price reaction to a dividend surprise. We therefore collect data on ownership structures from the Hoppenstedt Aktienfuehrer.[16] All holdings of ordinary shares and preference shares in excess of 5% are recorded on an annual basis.[17] The use of annual ownership data is particularly important given the recent changes in the German system of corporate governance. Formerly characterized as an "insider system" (Franks and Mayer, 2001) with financial institutions at the center of a network of cross-holdings, the ownership structures of some of the largest German firms have changed as a result of a change in capital gains taxation in 2002. As reported in Dittmann et al. (2010), banks in particular have sold off their equity stakes in other corporations, either to other blockholders or to the public. With the help of annual ownership data, we are able to control for a potential effect of these changes in the institutional environment. From the ownership data collected, we calculate the voting power of the largest and second largest shareholder as their respective Shapley-Shubik values. In additional regressions (not tabulated), we examine whether the identity of

[15]The most common case is that the voting shares are privately held while the non-voting shares are listed. In these cases, the I/B/E/S database only contains forecasts for the dividend of the non-voting shares.
[16]This is a yearly publication that provides in-depth information about all listed German corporations.
[17]During our sample period, shareholdings of more than 5% must be registered with the German Financial Supervisory Authority (BaFin, see §21 of the German Securities Trading Act (Wertpapierhandelsgesetz)). Shareholdings of less than 5% - even when reported in Hoppenstedt - are excluded for reasons of data consistency.

the largest shareholder (provided his stake exceeds 25% of the voting rights) has an impact on announcement day returns.

Table 1.1 presents summary statistics for the final sample. In Panel A we report separate figures for firms that increased, decreased, and maintained their dividends. We consider a dividend change of less than 5% as an unchanged dividend since many of these small changes reflect rounding errors (due, for example, to the conversion from Deutsche Mark to Euro). The 5% threshold should be viewed in the context of the average magnitude of dividend changes in Germany. Andres et al. (2009) document an average dividend increase (cut) of 36% (30%) for a sample of 220 German firms for the period 1984-2005. Therefore, we consider the 5% threshold - though much larger than the 0.5% threshold employed by Amihud and Li (2006) for their U.S. sample - to be reasonable.

In 521 out of the 921 firm-year observations (56.5%), firms increase their dividends (18 of these cases (3.5%) are dividend initiations). Another 312 observations (33.9%) are associated with maintained dividends. We observe only 88 (9.6%) dividend cuts.[18] Among these, 33 cases (or 37.5% of the dividend cuts) are dividend omissions.

Panel A of Table 1.1 shows that firms that increase their dividends differ substantially from firms that maintain or decrease dividend payments. With an average leverage ratio[19] of 1.79, they are less heavily leveraged than firms that decrease (2.06) or maintain (2.14) their dividends. In addition, they exhibit higher Tobin's Q values[20] (1.82 compared to 1.32 for firms that cut dividends, and 1.41 for firms that maintain dividends) and a much lower average dividend yield[21] (1.88% as compared to 4.80% for decreased and 2.57% for maintained dividends), suggesting that firms that increase dividends tend to be growth stocks. On the other hand, firms that increase dividends are slightly larger than firms in the other two subgroups, both in terms of total assets

[18]Compared to Gugler and Yurtoglu (2003), we observe a slightly higher number of dividend increases and less dividend decreases. In their sample (from 1992 through 1998), 43.8% of the announcements are classified as dividend increases, 36.8% as unchanged dividends, and 19.4% as dividend cuts.

[19]Leverage is defined as the sum of total current liabilities and long-term debt divided by the book value of equity.

[20]Tobin's Q is defined as the market value of equity (including preference shares wherever appropriate) plus total assets minus book value of equity, divided by the book value of total assets.

[21]The dividend yield (DIV_Y) is defined as DIV(i,t-1)/P(i,t), where DIV (i,t-1) is the dividend per share of firm (i) in year t-1, and P(i,t) is the split adjusted share price 14 days before the dividend is announced in year t. This definition follows the procedure suggested in Amihud and Murgia (1997).

and in terms of sales. With respect to ownership structure, our sample confirms one of the stylized facts of the German corporate governance system, namely, the high degree of ownership concentration. On average, about 45% of the voting shares are held by the two largest shareholders.

The percentage of firm-year observations with increased, decreased, and maintained dividends over the sample period is documented in Panel C of Table 1.1. The distribution of dividend increases, dividend cuts and unchanged dividends in our sample mirrors the trend observed in other recent empirical studies (see, e.g., Julio and Ikenberry, 2004). With the exception of 1996 an 1997, the percentage of firms that increase dividends declines gradually, reaching a low of 42% in 2003, before taking a sharp turn upward in 2004. In line with a poor economic environment following the burst of the technology bubble, the proportion of dividend-cutting firms is significantly higher during the years 2001-2003. In sum, our 11-year sample period covers an economic boom period, followed by a recession, which is then followed by a second upswing.

The classification into dividend increases, decreases and maintained dividends conforms to the naive expectations model. However, we argue that using analyst forecasts to classify events into good news (positive surprise), bad news (negative surprise) and no news events is preferable because only the unexpected component of an announcement should trigger a share price reaction. Following Campbell et al. (1997) we define dividend announcements as *good news (bad news)* if the announcement is more than 5% above (below) the dividend expected by analysts. Announcements that lie within a 10% range around the expected dividend are classified as *no news*.[22] Our proxy for the market's dividend expectations is the average of (at least two) analyst forecasts in the month preceding the dividend announcement.[23]

Our sample consists of 281 good news events (as compared to 521 dividend increases), 266 bad news events (as compared to 88 dividend reductions) and 374 no news events (as compared to 312 cases with an unchanged dividend). These numbers already

[22] As mentioned above, we change the bandwidth of the *no news* category to 5% (i.e. dividend announcements are classified as *good news (bad news)* if the announcement is more than 2.5% above (below) the dividend expected by analysts) to test the robustness of the results. All coefficient estimates and significance levels are similar to the results reported in the study.

[23] As a robustness test, we also use the median of analyst forecasts and re-estimate all regressions using the median-based classification into *good news*, *bad news*, and *no news*. The results are not reported (but available on request) as they are qualitatively similar.

illustrate that the naive model results in a classification that is very different from that obtained when taking market expectations into account.

Descriptive statistics for the good news, bad news and no news events are provided in Panel B of Table 1.1. Even though the numbers are slightly different from those in Panel A, the qualitative results are similar. Good news events are associated with lower leverage ratios, higher values of Tobin's Q and lower dividend yields. Good news firms are also larger in terms of total assets and sales as compared to bad news and no news firms.

Our classification of dividend announcements into good news, bad news and no news events is based on the assumption that analysts' dividend forecasts are better predictors of actual dividends than the previous dividends. This is verified in Panel D of Table 1.1. No matter whether we consider absolute or relative deviations, or whether we consider the mean or the median deviation, we find that the mean analysts' forecast is a more accurate predictor of actual dividends than the previous dividend.[24]

These findings confirm the results of Brown et al. (2008). Using an international sample from 39 countries these authors have shown that I/B/E/S dividend forecasts are an accurate estimate of the actual dividend as evidenced by a low forecast error.

[24]We performed some additional analyses (results not shown). We regressed the actual dividend on the mean analyst expectation and a constant. If the analysts' mean estimate is an unbiased estimate of the true dividend we should find that the constant is zero and the slope is one. The actual estimates are -0.006 for the intercept (t-value -0.28) and 0.997 for the slope (t-value of a test against 1 is -0.07). An F-test of the joint hypothesis that the intercept is zero and the slope is one yields a p-value of 0.29. If we replace the mean analyst forecast by the previous dividend we obtain an intercept of 0.12 (t-value 3.55) and a slope of 0.87 (t-value of a test against 1 is -1.88). The p-value of the F-test is 0.00. Thus, while analysts' forecasts are an unbiased predictor of actual dividends, previous dividends are not.

Table 1.1: Summary Statistics

Panel A. Descriptive Statistics for Firms with Increased, Decreased and Maintained Dividends over the Entire Sample Period (1996-2006)
Naive Expectation Model (Dividend Changes)

	Increases (521 Observations)			Decreases (88 Observations)			No Change (312 Observations)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Dividend Yield (%)	1.88	1.67	1.36	4.80	4.09	3.73	2.57	2.44	1.86
Change in Dividend Yield (%)	0.57	0.33	0.67	-2.62	-1.95	2.50	0.01	0.00	0.04
Dividend Estimation Error (%)	0.16	0.08	0.41	-1.29	-0.86	1.42	-0.15	-0.07	0.38
Earnings Estimation Error (%)	0.13	0.00	2.54	-5.74	0.00	20.52	-0.56	0.00	4.28
Market Capitalization (Mio. Euro)	7197.91	1806.14	13100.63	3840.08	602.29	10578.83	5496.78	553.63	16414.32
Total Assets (Mio. Euro)	13634.58	1873.57	30499.10	11342.05	1354.76	33072.42	10739.01	1216.38	30134.27
Sales (Mio. Euro)	10384.13	1998.10	19477.11	8526.12	1860.30	20819.03	9717.28	1473.38	23478.73
Tobin's Q	1.82	1.37	1.40	1.32	1.07	1.13	1.41	1.20	0.91
Leverage	1.79	1.33	2.58	2.06	1.48	1.68	2.14	1.88	2.52
Analyst Coverage	17.33	17.00	10.41	15.61	12.00	10.84	15.25	13.00	10.89
Voting Rights of the Largest Shareholder (%)	39.07	36.07	26.93	38.32	30.33	25.32	43.30	37.08	29.08
Voting Rights of the 2. Largest Shareholder (%)	4.83	0.00	7.03	5.69	2.50	6.98	5.12	0.00	6.52

Panel B. Descriptive Statistics for Firms with Good News, Bad News and No News over the Entire Sample Period (1996-2006)
Market Expectation Model (Dividend Surprises)

	Good News (281 Observations)			Bad News (266 Observations)			No News (374 Observations)		
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.
Dividend Yield (%)	2.04	1.83	1.48	2.56	2.15	2.75	2.54	2.21	1.82
Change in Dividend Yield (%)	0.62	0.40	0.84	-0.55	0.00	1.81	0.11	0.11	0.88
Dividend Estimation Error (%)	0.41	0.28	0.39	-0.73	-0.36	0.96	0.00	0.00	0.08
Earnings Estimation Error (%)	0.27	0.00	3.05	-1.75	0.00	7.86	-0.59	0.00	8.78
Market Capitalization (Mio. Euro)	5813.50	1270.42	11391.25	4781.78	766.05	12984.94	7747.29	1221.49	16492.05
Total Assets (Mio. Euro)	10540.25	1286.30	25453.66	8836.06	1285.27	26692.68	16417.34	1754.56	35963.10
Sales (Mio. Euro)	9256.63	1530.68	19081.50	7529.96	1435.15	19120.12	12267.75	2103.84	23396.43
Tobin's Q	1.83	1.32	1.49	1.61	1.17	1.37	1.51	1.27	0.88
Leverage	1.79	1.24	2.82	1.93	1.54	1.57	2.05	1.65	2.08
Analyst Coverage	16.30	15.00	10.73	15.03	13.00	9.91	17.59	17.00	10.99
Voting Rights of the Largest Shareholder (%)	39.37	35.90	25.92	40.58	36.57	27.06	41.12	36.04	29.16
Voting Rights of the 2. Largest Shareholder (%)	5.22	0.00	7.34	5.07	0.00	6.83	4.80	0.00	6.50

Panel C. Percentage of Firm-Year Observations with Maintained, Increased and Decreased Dividends

Year	Number of Firms	Firms that Maintained Dividends (%)	Firms that Increased Dividends (%)	Firms that Decreased Dividends (%)
1996	67	39	52	9
1997	80	29	68	4
1998	78	26	67	8
1999	88	34	60	6
2000	87	32	64	3
2001	91	34	46	20
2002	89	38	43	19
2003	89	39	42	19
2004	85	33	60	7
2005	81	25	69	6
2006	86	19	78	3

Panel D. Accuracy of Analysts' Dividend Forecasts

	Absolute Error - Abs(Actual - Forecast)		Relative Error - Abs(Actual - Forecast)/Share Price	
	Mean	Median	Mean	Median
Naive Model	0.134	0.051	0.006	0.002
Mean Analyst Forecast	0.085	0.035	0.004	0.001

Notes: The table provides descriptive data for all sample firms. The sample consists of a total of 921 announcements for the 150 largest companies listed on the Frankfurt Stock Exchange (member firms of the DAX, MDAX and SDAX indices as of December 2002) for the 11-year period from 1996 to 2006. Dividend yield is calculated as DIV(i,y-1)/P(i,y) and market capitalization measures the market value of equity 14 days before the announcement. The change in dividend yield is defined as the change in dividends as a percent of price (P(i,y)) 14 days before the dividend announcement, (DIV(i,y)-DIV(i,y-1))/P(i,y), where DIV(i,y) is the total (adjusted) dividend per share for stock (i) announced for year (y) and DIV(i,y-1) is the total (adjusted) dividend per share for stock (i) announced for the preceding year (y-1). Tobin's Q is defined as the market value of the firm's equity plus total assets minus book value of equity, all divided by total assets. The firm's leverage is defined as the sum of total current liabilities and long-term debt divided by book value of equity. Analyst coverage denotes the number of analysts in the I/B/E/S database. The earnings estimation error is measured as (EPS(i,y)-ESTEPS(i,y))/P(i,y), where EPS(i,y) denotes (adjusted) earnings per share for stock (i) announced for year (y) and ESTEPS(i,y) is the last I/B/E/S consensus earnings estimates before the announcement. In addition to the voting rights of the largest shareholder, the voting rights of the second-largest shareholder are reported if they exceed 5% (they are set to zero if the second-largest shareholder holds less than 5%).

1.4 Event Study Results and Univariate Analysis

We measure the stock price reaction to the announcement of dividend payments using standard event-study methodology. Based on the market model (Brown and Warner, 1985), the abnormal return ϵ_{it} for firm i on day t is calculated as

$$\epsilon_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}), \tag{1.1}$$

where R_{it} is the return of firm i on day t, and R_{mt} is the return on the CDAX, our proxy for the market portfolio,[25] on day t. The coefficients $\hat{\alpha}_i$ and $\hat{\beta}_i$ are OLS estimates obtained from regressions of firm i's daily returns on the CDAX return over the estimation window running from t = -121 to t = - 2 (relative to the announcement day $t = 0$). We use two measures of abnormal returns: the average abnormal return on the announcement day, AAR_0, and the cumulative average abnormal return, $CAAR_{-1;1}$, measured over a three-day period centered on the event day. The statistical tests are based on the standardized cross-sectional t-statistic proposed by Boehmer et al. (1991) and the rank test of Corrado (1989).

Table 1.2 reports the event study results. In Panel A, all announcements are first classified according to the naive model into three groups: dividend increases, decreases and unchanged dividends. These groups are then subdivided into *good news*, *bad news*, and *no news* events, based on the dividend surprise (as defined above). We do not report results for two subgroups with ten observations or less.

The results in Panel A show that share prices increase after the announcement of a dividend increase. The average abnormal return on the announcement day, AAR_0, is significantly positive at 0.70%. The cumulative average abnormal return over a three-day window, $CAAR_{-1;1}$, is also positive and highly significant at 1.13%. When we subdivide the dividend increases into good news, bad news and no news events, it becomes obvious that an increase in dividends does not necessarily imply good news for market participants. Out of 521 dividend increases, only about 48% (248) are in fact positive surprises, i.e. positive deviations from the analysts' expectations. In cases in which market participants expected an even higher increase (cases in which the announcement represents bad news in spite of an increased dividend) we observe an announcement day return of -0.10% and a $CAAR_{-1;1}$ of 0.10% (both statistically

[25] The CDAX is a broad, value-weighted German index and comprises about 350 firms.

insignificant).

Dividend decreases trigger a significantly negative share price reaction on the event day. The AAR_0 amounts to -0.86%. The three-day $CAAR_{-1;1}$ is also negative at -0.30%, but is insignificant. In both cases the share price reactions are more pronounced when the dividend decrease represents bad news. In the other two cases (dividend reductions that are good news or no news) the number of observations is too small to report reliable results.

The average abnormal return for announcements of an unchanged dividend is positive and weakly significant at 0.22%. The three-day $CAAR_{-1;1}$ is positive and significant at 0.65%. A closer look at the three subcategories reveals that the positive announcement return for unchanged dividends is driven by a highly significant return of 2.24% for announcements in which a maintained dividend is a positive surprise for market participants. This result confirms hypothesis 1, which states that market expectations play an important role in share price reactions to dividend announcements.

Panel B of Table 1.2 shows the results that we obtain when we first sort by the dividend surprise and then subdivide into dividend increases, reductions and maintained dividends. Abnormal returns are highest for dividend announcements that constitute good news for market participants, with an average announcement day return of 0.95% and a three-day $CAAR_{-1;1}$ of 1.59% (both highly significant). Bad news announcements are associated with a significantly negative announcement day average abnormal return. The three-day cumulative average abnormal return, however, is slightly positive but insignificant. Surprisingly, we find that no news events are associated with significantly positive abnormal returns. These are slightly larger when the no news event is a dividend increase.

The results presented in Table 1.2 imply that sorting by dividend *changes* and dividend *surprises* yields different results. Admittedly, however, the results are somewhat less clear-cut than one might have hoped. In particular, the finding that no-news events are associated with positive abnormal returns is surprising. A possible explanation for this result is that the descriptive statistics presented thus far do not control for earnings announcements that are often made on the same day as dividend announcements. We return to this issue when we present the results of our panel estimation in the next section.

Table 1.2: Wealth Effects of Dividend Announcements

Panel A. Increases, Decreases and No Change

	#	AAR_0	T-Statistic	Corrado	$CAAR_{-1;1}$	T-Statistic	Corrado
Increases	521	0.70%	4.63***	4.19***	1.13%	5.24***	4.54***
Good News	248	0.99%	5.20***	4.53***	1.58%	5.74***	4.34***
Bad News	72	-0.10%	-0.53	-0.83	0.10%	0.32	0.12
No News	201	0.64%	2.45**	2.64***	0.93%	2.28**	3.12***
Decreases	88	-0.86%	-3.43***	-3.54***	-0.30%	-1.17	-0.43
Good News	7	-	-	-	-	-	-
Bad News	71	-0.95%	-3.52***	-3.65***	-0.53%	-1.69*	-0.93
No News	10	-	-	-	-	-	-
No Change	312	0.22%	1.68*	2.46**	0.65%	2.61**	3.13***
Good News	26	0.71%	2.62***	2.65***	2.24%	3.36***	3.53***
Bad News	123	-0.06%	-0.23	-0.09	0.37%	1.08	0.97
No News	163	0.36%	1.45	2.84***	0.61%	1.48	2.45**

Panel B. Increases, Decreases and No Change

	#	AAR_0	T-Statistic	Corrado	$CAAR_{-1;1}$	T-Statistic	Corrado
Good News	281	0.95%	5.67***	4.86***	1.59%	6.41***	4.87***
Increases	248	0.99%	5.20***	4.53***	1.58%	5.74***	4.34***
Decreases	7	-	-	-	-	-	-
No Change	26	0.71%	2.62***	2.65***	2.24%	3.36***	3.53***
Bad News	266	-0.31%	-1.50	-2.50**	0.06%	0.22	0.07
Increases	72	-0.10%	-0.53	-0.83	0.10%	0.32	0.12
Decreases	71	-0.95%	-3.52***	-3.65***	-0.53%	-1.69*	-0.93
No Change	123	-0.06%	-0.23	-0.09	0.37%	1.08	0.97
No News	374	0.47%	2.72***	3.34***	0.81%	2.84***	3.78***
Increases	201	0.64%	2.45**	2.64***	0.93%	2.28**	3.12***
Decreases	10	-	-	-	-	-	-
No Change	163	0.36%	1.45	2.84***	0.61%	1.48	2.45**

Notes: The table presents the (market model-adjusted) average abnormal returns (AAR_0) on the announcement date and the cumulative average abnormal returns ($CAAR_{-1;1}$) over the event window -1 to +1 relative to the announcement date. Panel A classifies the announcements into the three groups: dividend increases, dividend decreases and unchanged dividends, and then subdivides them into good news, bad news and no news events. In Panel B the announcements are first categorized into good news, bad news and no news events, and then subdivided into dividend increases, decreases and unchanged dividends. The test statistic proposed by Boehmer et al. (1991) and the non-parametric test statistic of Corrado (1989) are reported in columns 4 and 5 and in columns 7 and 8, respectively. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

1.5 Panel Analysis

The descriptive analysis in the previous section shows that market expectations are an important determinant of the share price reaction to dividend announcements. It is natural to ask whether the dividend *change* has explanatory power for the abnormal return once we control for the dividend *surprise*. In order to answer this question we estimate four panel models (Table 1.3). We use the random effects estimator, which is favored over the less efficient fixed effects estimator based on a Hausman test.[26]

The first model is the baseline specification. The dependent variable is the three-day $CAR_{-1;1}$. The explanatory variables are year and industry dummies (results not reported) and a measure of the dividend change, namely, the change in the dividend yield. It is defined as the current minus last year's dividend per share, standardized by the split-adjusted stock price 14 days before the dividend is announced. The coefficient on the change in the dividend yield is positive and significant. Thus, when we do not control for the dividend surprise we find that the cumulative abnormal returns are significantly related to the magnitude of the dividend change.

In model 2 we replace the change in the dividend yield with the dividend surprise, defined as dividend per share minus the estimated dividend per share (based on the last I/B/E/S consensus forecast prior to the announcement), both divided by the split-adjusted stock price 14 days before the dividend is announced. The dividend surprise yields a highly significant coefficient that has twice the magnitude of the coefficient on the change in dividend yield in model 1.

Model 3 includes both variables. The coefficient estimate for the dividend surprise is statistically significant at the 1% level, whereas the coefficient estimate for the dividend change is insignificant. We can thus conclude that dividend surprises, not dividend changes, drive the cumulative abnormal returns.[27]

As noted previously, dividends and earnings are often announced simultaneously. In order to disentangle the effects that dividend and earnings announcements have

[26] The main conclusions of our study do not change if the fixed effects estimator or the OLS estimator is used instead.

[27] As a robustness check, we include long-term volatility in our models to control for information asymmetry between managers and shareholders. In line with Amihud and Li (2006), long-term volatility is measured by the standard deviation of monthly returns in the 24 months prior to the month of the dividend announcement. Re-estimating our panel models including this measure, we obtain very similar results.

Table 1.3: Cumulative Abnormal Returns and Market Expectations

	$CAR_{-1;1}$			
	(1)	(2)	(3)	(4)
Change in Dividend Yield	0.514		0.185	0.18
	(3.03)***		(0.92)	(0.84)
Dividend Surprise		1.152	0.935	0.939
		(5.41)***	(3.00)***	(2.97)***
Earnings Surprise				0.002
				(0.12)
Intercept	-0.003	-0.011	-0.002	-0.012
	(-0.31)	(-0.15)	(-0.25)	(-0.71)
R-Squared	0.073	0.084	0.086	0.086
Number of Obs.	921	921	921	921

Notes: The table presents the results on the determinants of cumulative abnormal returns (random effects regressions). Cumulative abnormal returns ($CAR_{-1;1}$) are measured over the event window -1 to +1 relative to the announcement date. The change in dividend yield is defined as the change in dividends as a percentage of price (P(i,y)) 14 days before the dividend announcement, i.e., (DIV(i,y)-DIV(i,y-1))/P(i,y), where DIV(i,y) is the total (adjusted) dividend per share for stock (i) announced for year (y) and DIV(i,y-1) is the total (adjusted) dividend per share for stock (i) announced for the preceding year (y-1). The dividend surprise is calculated as (DIV(i,y)-ESTDIV(i,y))/P(i,y), where ESTDIV(i,y) is the estimated dividend per share based on the last I/B/E/S consensus estimates before the dividend announcement. The earnings surprise is measured as (EPS(i,y)-ESTEPS(i,y))/P(i,y), where EPS(i,y) covers diluted (adjusted) earnings per share for stock (i) announced for year (y) and ESTEPS(i,y) is the estimated earnings per share based on the last I/B/E/S consensus estimates before the announcement. All regressions include dummy variables for each year of the sample period and industry dummies (based on the classifications of Deutsche Boerse AG). The regressions comprise 921 firm-year observations. T-statistics from cluster-robust standard errors appear in parentheses. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

on share prices, we estimate model 4, which includes the earnings surprise as an additional independent variable. It is defined as the difference between the actual earnings per share and the I/B/E/S consensus forecast, standardized by the stock price 14 days before the dividend announcement. The variable is set to zero when no earnings announcement was made on the event date.[28] Neither the change in the dividend yield nor the earnings surprise has explanatory power for the abnormal returns. The dividend surprise, on the other hand, is positively and significantly related to the CARs. These results stand in contrast to those reported in Leftwich and Zmijewski (1994). Based on a sample of contemporaneous quarterly earnings and dividend announcements these authors conclude that earnings announcements provide information beyond that provided by dividend announcements. A possible reason for the different findings is the fact that U.S. firms announce both dividends and earnings each quarter. German firms, on the other hand, make dividend announcements only once a year, but often announce earnings on a quarterly basis (although there is no legal requirement to do so). Consequently, the relative information content of dividend announcements as compared to earnings announcements may be higher in Germany than in the U.S. We further note that the regressions shown in Table 1.3 do not control for other variables that may affect the CARs. They may thus suffer from omitted variables bias. Table 1.4 later in the chapter shows the results of regressions that include additional explanatory variables.

These results corroborate hypothesis 1. They allow two conclusions. First, they suggest that studies of dividend announcements should take market expectations into account and thus should consider dividend surprises rather than dividend changes. Second, the results imply that, in cases in which earnings announcements and dividend announcements are made on the same day, share prices react to the dividend announcement, not to the earnings announcement.[29]

In the next step we extend the set of independent variables in order to test hypotheses

[28] We re-estimate model 4 and include only those cases in which a dividend and an earnings announcement are made on the same day. The results are virtually identical, and are therefore omitted.

[29] We note that, at least in the first years of our sample period, many firms are still using German accounting standards rather than IAS/IFRS or US-GAAP. It would be interesting to explore whether the lack of a share price reaction to earnings announcement is due to the specific characteristics of German accounting standards. An investigation of this issue is, however, beyond the scope of this study.

2, 3, 4, and 5. We include the dividend surprise and the earnings surprise as control variables. The number of analysts following is used as a proxy for the degree of informational asymmetry. The cash flow signaling hypothesis (hypothesis 2) predicts a lower share price reaction if informational asymmetries are less pronounced. In order to test the free cash flow hypothesis (hypotheses 3a and 3b) we include three variables. The first is the ratio of free cash flow[30] to sales for the previous financial year.[31] The second variable is the natural logarithm of Tobin's Q. This variable is intended to identify firms without profitable investment opportunities. We expect a positive (negative) coefficient on the free cash flow variable (hypothesis 3a) and a negative (positive) coefficient on Tobin's Q (hypothesis 3b) for good news (bad news) announcements. We further include the leverage ratio as the free cash flow hypothesis suggests that dividends and debt serve as substitutes.[32]

Hypothesis 4 predicts that ownership structure matters. As explained in section 2 we expect a hump-shaped or u-shaped relationship between the voting power of the largest shareholder and the announcement returns. At low levels, increasing voting power reflects the shareholders increasing ability and willingness to monitor. At higher levels, voting power allows to extract rents at the cost of the remaining (minority) shareholders. In order to capture this potential non-linearity, we include the Shapley-Shubik value of the largest shareholder as well as its squared value.

We also include the Shapley-Shubik value of the second largest shareholder. We hypothesize that larger values thereof reflect the ability of the second largest shareholder to exert a controlling influence on the first shareholder. Consequently, a positive (negative) dividend surprise provides a weaker signal on reduced (increased) agency conflicts and hence weakens the market reaction.

Finally, to capture a possible clientele effect, we include the dividend yield as independent variable (hypothesis 5). We expect a positive (negative) coefficient on this variable for good news (bad news) announcements. Our regression models further

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[30]The free cash flow is defined as EBIT + depreciation - taxes + delta def. taxes - minority interest - interest - dividends + extra items.

[31]As a robustness test, we use the level of cash holdings and cash equivalents (over sales) instead of the FCF variable. The corresponding coefficient is insignificant in all model specifications (results not tabulated).

[32]As an additional robustness test, we include the standard deviation of the analysts' dividend forecasts as a further control variable (SD Forecasts) in all models. The variable is insignificant in most specifications. It is significant only in the model specification "bad news" (results not tabulated).

include year and industry dummies (results not reported). For some of the variables, we expect opposing signs for good news and bad news announcements. To provide an example, when share prices of larger firms react less strongly to dividend surprises, we expect a negative relation between firm size and the magnitude of the CARs for good news announcements, but a positive relation for bad news announcements. We therefore estimate separate models for good news announcements and bad news announcements. The no news announcements are excluded from the analysis. To ensure that our results can be compared to those of previous studies, we repeat the analysis using the subsamples of dividend increases and decreases instead of the good news and bad news subsamples.

Tables 1.4 and 1.5 present the regression results for all four specifications (dividend increases, decreases, good news, bad news).[33] The tables differ in the way we calculate the Shapley-Shubik index. In Table 1.4, we use a quota of 25%, whereas in Table 1.5, the quota is set to 50%. Considering the good news subsample first, we confirm our earlier result that the CARs are positively related to dividend surprises. This confirms hypothesis 1. However, with the additional explanatory variables included, the earnings surprise now also has explanatory power.

The negative coefficient on the number of analysts is consistent with cash flow signaling (hypothesis 2). Informational asymmetries are more pronounced in firms followed by fewer analysts.[34] Therefore, dividend announcements made by these firms convey more information.

The free-cash-flow-to-sales ratio, Tobin's Q and the leverage ratio are all not significantly different from zero.[35] Thus, we do not find support for the free cash flow hypothesis (hypotheses 3a and 3b). This is in line with the findings of Yoon and Starks (1995).

Our predictions with respect to the relationship between abnormal returns and the voting power of the largest shareholder find empirical support. Consistent with the

[33]The correlation coefficients between the explanatory variables used in the regression analysis show that there is no sign of multicollinearity in the various models (not reported in tabulated form).

[34]Using the market value of equity rather than the number of analysts yields qualitatively similar results (not reported).

[35]We also estimate a model that includes an interaction term between free cash flow and Tobin's Q. The coefficient estimate of the interaction term is insignificant. As stated above, an alternative measure of free cash flow based on balance sheet data (cash & equivalents over sales) also yields insignificant coefficient estimates.

monitoring effect the coefficient of the Shapley-Shubik value for the largest shareholder is negative. This implies that increases in the voting power of the largest shareholder are associated with a weaker price reaction to dividend news. The coefficient on the squared Shapley-Shubik value is positive. This is consistent with the rent extraction hypothesis. At high levels of voting power the largest shareholder has the power to expropriate minority shareholders. She can use dividend announcements to signal that she abstains from such rent-extracting activities. This signaling role for dividend announcements results in a stronger share price reaction which counterbalances the negative impact due to the monitoring effect. The Shapley-Shubik value for the second largest shareholder is never significant.
In additional regressions (not tabulated, but available upon request), we analyze the relationship between the identity of a dominant blockholder and announcement returns. In doing so, we create indicator variables that equal one if the largest ultimate shareholder at the 25%-level is a family or individual, a financial institution (bank or insurance company), the German government, or a foreign shareholder. Regression results for the subsamples of good news and dividend increases show insignificant coefficients for the blockholder variables, but are otherwise very similar to the results presented in Tables 1.4 and 1.5. For bad news and dividend decreases we document a negative and significant (at the 0.05- and 0.01-level, respectively) relationship between the existence of a government blockholder and the three-day announcement return.
The positive coefficient on the dividend yield is consistent with the existence of dividend clientele effects. Firms with higher dividend yields have shareholders who value dividends more highly. Consequently, the share price reacts more strongly to dividend news.
In column 2 we consider dividend increases instead of good news events. Despite the much larger number of observations, this specification yields lower explanatory power. Both the coefficients on the number of analysts and on the Shapley-Shubik values of the largest shareholder lose significance. Thus, a categorization based on the naive dividend expectations model may lead to different conclusions. While the results of model 1 - the "good news" model - support the cash flow signaling, monitoring and rent extraction hypothesis, the results of model 2 - the naive model - do not. Given our previous results, which clearly favored dividend surprises over dividend changes, we conclude that, whenever data on analyst dividend forecast are available, the naive

Table 1.4: Dividend Announcement Returns and Firm Characteristics (Shapley-Shubik Indices Calculated Using a Quota of 25%)

	$CAR_{-1;1}$							
	(1)		(2)		(3)		(4)	
	Good News		Increases		Bad News		Decreases	
△ in Dividend Yield			0.653	0.646			0.573	0.614
			(1.82)*	(1.81)*			(1.42)	(1.50)
Dividend Surprise	1.845	1.848			0.896	0.896		
	(2.49)**	(2.46)**			(2.13)**	(2.12)**		
Earnings Surprise	0.144	0.142	0.201	0.201	0.003	0.003	-0.007	-0.003
	(1.98)**	(1.88)*	(2.87)***	(2.82)***	(0.13)	(0.14)	(-0.27)	(-0.12)
Dividend Yield	0.310	0.334	0.395	0.396	0.171	0.173	0.005	0.067
	(1.78)*	(1.95)*	(2.24)**	(2.24)**	(1.38)	(1.40)	(0.03)	(0.40)
Analyst Coverage	-0.001	-0.001	-0.000	-0.000	0.000	0.000	-0.001	-0.001
	(-2.18)**	(-2.04)**	(-1.34)	(-1.28)	(0.69)	(0.69)	(-1.28)	(-1.05)
Ln(Tobin's Q)	0.010	0.010	0.002	0.002	0.002	0.002	0.007	0.005
	(1.51)	(1.51)	(0.44)	(0.46)	(0.25)	(0.28)	(0.52)	(0.32)
Leverage	-0.001	-0.001	-0.001	-0.001	0.000	0.000	0.004	0.005
	(-1.51)	(-1.54)	(-1.24)	(-0.39)	(0.01)	(0.03)	(0.98)	(1.12)
Free Cash Flow	0.009	0.009	-0.010	-0.010	0.004	0.004	0.164	0.183
/Sales (Lag)	(0.34)	(0.36)	(-0.41)	(-0.39)	(0.07)	(0.07)	(1.37)	(1.47)
Shapley Value for	-0.074	-0.073	-0.016	-0.017	0.018	0.018	-0.144	-0.134
Largest Shareholder	(-2.37)**	(-2.32)**	(-0.64)	(-0.67)	(0.47)	(0.48)	(-1.35)	(-1.27)
Shapley Value for	0.070	0.068	0.016	0.016	-0.011	-0.012	0.146	0.126
Largest Shareholder^2	(2.44)**	(2.36)**	(0.73)	(0.70)	(-0.31)	(-0.32)	(1.51)	(1.38)
Shapley Value for		0.015		0.009		0.002		0.060
2. Largest Shareholder		(1.03)		(0.78)		(0.11)		(1.44)
Intercept	0.028	0.027	0.012	0.012	-0.014	-0.014	-0.002	-0.012
	(1.18)	(1.13)	(0.78)	(0.78)	(-0.67)	(-0.67)	(-0.06)	(-0.31)
R-Squared	0.222	0.225	0.121	0.122	0.127	0.127	0.440	0.454
Number of Obs.	281	281	519	519	265	265	88	88

Notes: The table presents the results on the determinants of cumulative abnormal returns for good news events, dividend increases, bad news events and dividend decreases (all random effects regressions). Cumulative abnormal returns ($CAR_{-1;1}$) are measured over the event window -1 to +1 relative to the announcement date. The change in dividend yield is defined as the change in dividends as a percentage of price (P(i,y)) 14 days before the dividend announcement, i.e., (DIV(i,y)-DIV(i,y-1)/P(i,y), where DIV(i,y) is the total (adjusted) dividend per share for stock (i) announced for year (y) and DIV(i,y-1) is the total (adjusted) dividend per share for stock (i) announced for the preceding year (y-1). The dividend surprise is calculated as (DIV(i,y)-ESTDIV(i,y))/P(i,y), where ESTDIV(i,y) is the estimated dividend per share based on the last I/B/E/S consensus estimates before the dividend announcement. The earnings surprise is measured as (EPS(i,y)-ESTEPS(i,y))/P(i,y), where EPS(i,y) is diluted (adjusted) earnings per share for stock (i) announced for year (y) and ESTEPS(i,y) is the last I/B/E/S consensus earnings estimate before the announcement. Dividend yield is calculated as DIV(i,y-1)/P(i,y). Analyst coverage is the total number of analysts covering the respective firm in the last I/B/E/S file available before the announcement. Tobin's Q is defined as the market value of the firm's equity plus total assets minus book value of equity, all divided by total assets. The firm's leverage is defined as the sum of total current liabilities and long-term debt divided by book value of equity. Free cash flow is defined as EBIT + depreciation - taxes + delta def. taxes - minority interest - interest - dividends + extra items and divided by sales and lagged by one year. The measures of voting power for the largest and second largest shareholder are based on the Shabley-Shubik index (using a quote of 25%). All regressions include dummy variables for each year of the sample period and industry dummies (based on the classifications of Deutsche Boerse AG). T-statistics from cluster-robust standard errors appear in parentheses. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

Table 1.5: Dividend Announcement Returns and Firm Characteristics (Shapley-Shubik Indices Calculated Using a Quota of 50%)

	$CAR_{-1;1}$							
	(1)		(2)		(3)		(4)	
	Good News		Increases		Bad News		Decreases	
△ in Dividend Yield			0.653	0.655			0.510	0.522
			(1.79)*	(1.79)*			(1.21)	(1.30)
Dividend Surprise	1.875	1.897			0.895	0.863		
	(2.58)***	(2.74)***			(2.10)**	(2.02)**		
Earnings Surprise	0.150	0.149	0.203	0.203	0.006	0.010	-0.018	-0.014
	(2.01)**	(1.96)**	(2.88)***	(2.87)***	(0.22)	(0.38)	(-0.70)	(-0.49)
Dividend Yield	0.320	0.292	0.385	0.386	0.177	0.172	0.040	0.033
	(1.81)*	(1.63)	(2.19)**	(2.18)**	(1.43)	(1.40)	(0.27)	(0.23)
Analyst Coverage	-0.001	-0.001	-0.000	-0.000	0.000	0.000	-0.001	-0.001
	(-1.99)**	(-2.24)**	(-1.34)	(-1.21)	(0.65)	(0.47)	(-1.01)	(-1.22)
Ln(Tobin's Q)	0.008	0.009	0.002	0.001	0.002	0.002	0.004	0.007
	(1.20)	(1.43)	(0.34)	(0.33)	(0.21)	(0.21)	(0.30)	(0.49)
Leverage	-0.001	-0.001	-0.001	-0.001	0.000	0.000	0.003	0.003
	(-1.59)	(-1.50)	(-1.21)	(-1.22)	(0.08)	(0.12)	(0.70)	(0.70)
Free Cash Flow	0.011	0.018	-0.010	-0.009	0.006	0.008	0.136	0.149
/Sales (Lag)	(0.42)	(0.69)	(-0.35)	(-0.35)	(0.12)	(0.13)	(1.21)	(1.29)
Shapley Value for	-0.074	-0.062	-0.002	-0.003	0.048	0.062	-0.052	-0.046
Largest Shareholder	(-2.03)**	(-1.72)*	(-0.07)	(-0.10)	(1.02)	(1.24)	(-0.55)	(-0.48)
Shapley Value for	0.064	0.048	0.001	0.002	-0.039	-0.055	0.046	0.032
Largest Shareholder^2	(1.96)**	(1.47)	(0.03)	(0.08)	(-0.95)	(-1.23)	(0.62)	(0.42)
Shapley Value for		-0.077		0.006		-0.065		-0.104
2. Largest Shareholder		(-1.52)		(0.13)		(1.11)		(-0.93)
Intercept	0.028	0.026	0.010	0.010	-0.021	-0.020	-0.023	-0.016
	(1.16)	(1.12)	(0.63)	(0.60)	(-0.99)	(-0.90)	(-0.56)	(-0.38)
R-Squared	0.216	0.222	0.121	0.121	0.130	0.134	0.443	0.453
Number of Obs.	281	281	519	519	265	265	88	88

Notes: The table presents the results on the determinants of cumulative abnormal returns for good news events, dividend increases, bad news events and dividend decreases (all random effects regressions). Cumulative abnormal returns ($CAR_{-1;1}$) are measured over the event window -1 to +1 relative to the announcement date. The change in dividend yield is defined as the change in dividends as a percentage of price (P(i,y)) 14 days before the dividend announcement, i.e., (DIV(i,y)-DIV(i,y-1)/P(i,y), where DIV(i,y) is the total (adjusted) dividend per share for stock (i) announced for year (y) and DIV(i,y-1) is the total (adjusted) dividend per share for stock (i) announced for the preceding year (y-1). The dividend surprise is calculated as (DIV(i,y)-ESTDIV(i,y))/P(i,y), where ESTDIV(i,y) is the estimated dividend per share based on the last I/B/E/S consensus estimates before the dividend announcement. The earnings surprise is measured as (EPS(i,y)-ESTEPS(i,y))/P(i,y), where EPS(i,y) is diluted (adjusted) earnings per share for stock (i) announced for year (y) and ESTEPS(i,y) is the last I/B/E/S consensus earnings estimate before the announcement. Dividend yield is calculated as DIV(i,y-1)/P(i,y). Analyst coverage is the total number of analysts covering the respective firm in the last I/B/E/S file available before the announcement. Tobin's Q is defined as the market value of the firm's equity plus total assets minus book value of equity, all divided by total assets. The firm's leverage is defined as the sum of total current liabilities and long-term debt divided by book value of equity. Free cash flow is defined as EBIT + depreciation - taxes + delta def. taxes - minority interest - interest - dividends + extra items and divided by sales and lagged by one year. The measures of voting power for the largest and second largest shareholder are based on the Shabley-Shubik index (using a quote of 50%). All regressions include dummy variables for each year of the sample period and industry dummies (based on the classifications of Deutsche Boerse AG). T-statistics from cluster-robust standard errors appear in parentheses. Asterisks denote statistical significance at the 0.01 (***), 0.05 (**) and 0.10 (*) levels.

model should be abandoned in favor of a model that takes market expectations into account.

In the bad news sample, the dividend surprise is again positively related to the CARs, as expected. However, in contrast to the good news sample, the earnings surprise has no additional explanatory power. All other variables are insignificant. Thus, we find no support for any of the theories when we consider bad news events. This conclusion does not change when we consider dividend reductions instead. To put these results into perspective, we wish to note that many related papers do not even present results for dividend decreases (see, e.g., Bernheim and Wantz, 1995; Amihud and Li, 2006). Bernheim and Wantz (1995) argue that market reactions to dividend cuts are likely to be driven by fundamentally different processes compared to reactions to dividend increases. Independently, the results for dividend reductions should also be interpreted with caution due to the low number of observations.

To summarize, our analysis shows that share prices react to dividend surprises, not to dividend changes. With regard to the good news subsample, we document a number of further results. We find a negative relation between the number of analysts and the CARs after positive dividend surprises, consistent with the cash flow signaling hypothesis. In addition, we also find supporting evidence for a dividend clientele effect and we document a significant and non-linear relation between the price reaction to dividend surprises and the ownership structure of the firm. These results are consistent with both the monitoring and the rent extraction hypotheses. We do not find evidence in favor of the free cash flow hypothesis.

1.6 Conclusion

In this study we analyze dividend announcements made by German firms in the period from 1996 to 2006. We perform a standard event study and then use random effects panel models to analyze the determinants of the cumulative abnormal returns. The results show that share prices react to the surprise in the dividend announcement, not to a dividend change *per se*. Our results also suggest that, when dividend and earnings announcements are made on the same day, the dividend surprise has, if anything, higher explanatory power for the share price reaction than the earnings surprise.

We estimate panel regressions to discriminate between several popular hypotheses that aim to explain the price reaction to dividend announcements: the cash flow signaling hypothesis, the free cash flow hypothesis, the monitoring and rent extraction hypothesis and dividend clientele effects. When analyzing positive dividend surprises we find evidence in favor of the cash flow signaling hypothesis and dividend clientele effects. We further document a non-linear relation between the cumulative abnormal returns and the ownership structure of the firm which is consistent with the monitoring and rent extraction hypotheses. The free cash flow hypothesis receives no support. The results of the panel analysis are different when we consider dividend changes rather than dividend surprises. Most importantly, results of the naive model based on dividend changes do support neither the dividend signaling hypothesis nor the monitoring or rent extraction hypothesis. We therefore conclude that the naive model may yield misleading results. Our results thus suggest that future research on dividend announcements should make use of the analyst forecast data that are now readily available.

Chapter 2

Index Membership vs. Loss of Control: The Unification of Dual-Class Shares

2.1 Introduction

This study links the literature on dual-class stock unifications with that on index membership. The literature on why firms issue dual-class shares and why firms abolish them once they have been issued is as yet relatively sparse (Adams and Ferreira, 2008). Although the former decision seems to be driven by the controlling shareholder's desire to retain control while reducing cash-flow risk (see e.g. DeAngelo and DeAngelo, 1985), little is known as to why firms make the latter decision. The few studies that investigate dual-class unifications (Maury and Pajuste, 2011; Dittmann and Ulbricht, 2007; Hauser and Lauterbach, 2004; Lauterbach and Pajuste, 2011) suggest that improving access to external financing is an important motive whereas the existence of private benefits of control is a deterrent.

This study extends this literature by studying a major reform of how German firms are selected for membership of the various stock market indices. In August 2000, Deutsche Boerse announced new index weighting rules for its major stock indices. Under the old rules index membership was based on the firm's *aggregate* market capitalization. The changes caused by the reform, which became effective in June 2002, were twofold. First, only the most liquid or largest class now forms the basis for selection into an index. Second, only the free float of that class is taken into account when determining index membership.

As a consequence, firms with more than one class of shares outstanding included in a selection index faced the danger of losing their current index position or, worse even, dropping out of the index. For example, DAX index member SAP was set to

lose massively. At the announcement of the new rules in August 2000 and assuming the new rules had been effective immediately, SAP's weight in the DAX would have fallen by almost 40% from 9.51% to 5.64%. More generally, companies whose equity was split fairly equally between the two classes, i.e. the non-voting shares and the voting shares, and with little free float were adversely affected. Conversely, those with their equity in mainly one class and a large free float ranked among the winners.
Why should firms care about index membership and weight? As the mere gain or loss of membership does not provide any additional information on the firm's fundamental value, any such occurrence should therefore be valuation neutral. However, several studies document that index inclusions and deletions cause positive and negative abnormal returns, respectively.[1] As to index weight, Kaul et al. (2000) find that a change in the index weighting rules of the Toronto Stock Exchange (TSE), that redefined the weighting-relevant free float, caused valuation increases for those firms that experienced an increase in their index weight in the TSE 300 index. One important reason for these market reactions is changes in investor demand for the firm's stock, in particular index fund managers (see e.g. Shleifer, 1986; Barberis et al., 2005, and Claessens and Yafeh, 2013). Several other reasons, all of which have empirical support, have been advanced to explain these market reactions, including investor awareness (Merton, 1987), price pressure (Harris and Gurel, 1986), improved liquidity (Amihud and Mendelson, 1986) and information signals about the firm's prospects (Denis et al., 2003).

We hypothesize that the regulatory changes that became effective in 2002 forced the large shareholders of firms with dual-class shares to reassess the benefits from index membership by weighing them against the foregone control caused by the unification.[2] Anecdotal evidence suggests that some firms conducted this reassessment well before the implementation of the new rules. For example, SAP unified its stock in 2001, i.e. one year before the implementation of the rules, justifying the move by its endeavor

[1] Studies that examine the effect of index inclusions or deletions include Denis et al. (2003), Hrazdil and Scott (2009), Goetzmann and Garry (1986), Jain (1987), Lynch and Mendenhall (1997) and Chen et al. (2004). While there is a large body of literature on the US stock markets, there are only few empirical studies on the effects of index inclusion and deletion in the German market (see e.g. Gerke et al., 2001; Deininger et al., 2002).

[2] Large controlling shareholders dominate our sample firms. For 87.9% (71.4%) of the firm-year observations there is a shareholder holding at least 25% (50%) of the votes.

to keep its index weight.[3]

The study's main contribution is to study the trade-off faced by large controlling shareholders between the benefits from a dual-class stock unification and the costs from losing control. We estimate the probability of conversion - conditional on different levels of reduction in index weight - for various levels of the hypothetical voting loss the controlling shareholder would experience upon conversion. We find that the large shareholder is more likely to accept a reduction in index weight, and hence less likely to unify the dual-class shares, the higher his hypothetical voting loss from the conversion. This suggests that beyond a certain threshold of control the private benefits of control foregone by the large shareholder exceed his share of the benefits from unification. Similar to the wealth effects accruing to the holders of the non-voting stock that have been documented for German stock unifications before the reform (see e.g. Dittmann and Ulbricht, 2007), we observe such wealth effects at the announcement of the regulatory change. Finally and in line with anecdotal evidence, we find that the danger of dropping out of the index is an important reason for conversion. However, the opportunity to move up an index seems unrelated to unification decisions.

Our study is related to Dittmann and Ulbricht (2007), who study the timing and the announcement effects of German stock unifications for 1990 to 2001, a period during which the index rules remained the same. In contrast, we focus on an exogenous shock which forced the controlling shareholder to reconsider the benefits from maintaining dual-class shares in the light of the potential costs caused by a reduction in index weight. Our study also differs from Hauser and Lauterbach (2004) and Bigelli et al. (2011). Indeed, both studies are on two countries, i.e. Israel and Italy, that have higher private benefits of control as proxied by the price of a voting right. Voting shares trade at a premium of 27% in Israel and 37% in Italy, while for Germany this premium is only 10% (see Dyck and Zingales, 2004). Hauser and Lauterbach (2004) analyse 84 Israeli unifications. They find that the compensation paid to the large shareholder for the loss in voting rights depends on three factors. First, the

[3]During summer 2000, the CEO (the chairman of the management board), Hasso Plattner, denied that SAP was to convert its preference shares into ordinary shares: "We will keep the preference shares" ("Es wird weiter Vorzugsaktien geben"). A year later, Henning Kagermann (member of the management board of SAP) justified the decision to convert in the magazine Focus (June 7, 2001) as follows: "Thereby we avoid the risk of seeing SAP lose its position in the DAX index" ("Damit wird das Risiko einer Rueckgewichtung der SAP-Aktie im Dax-Index vermieden").

compensation increases with the large shareholder's percentage of votes. Second, it decreases if there is institutional ownership. Third, it is higher for family-controlled firms. In addition, the large shareholder is compensated for the loss of votes even if this loss does not reduce his percentage of the votes below a majority. Bigelli et al. (2011) study 47 dual-class unifications by 42 Italian firms between 1974 and 2008. While they observe that the market response to the unification is positive for non-voting shares, they find that the response of voting shares' prices is significantly negative only in situations where the controlling shareholder held non-voting shares prior to the announcement. For this subsample of firms they also show that the likelihood of receiving a compensation for the loss of their voting privileges is significantly lower, providing a possible explanation for the negative market responses. They suggest that owning non-voting shares during unifications allows controlling shareholders to benefit from the associated increases in share prices.

Finally, our study also differs from Lauterbach and Pajuste (2011), who study the impact of media pressure on the likelihood of stock unifications in seven Western European countries from 1996 to 2002. They find that the likelihood increases with media pressure and that seven years after the unification the decrease in the percentage of votes held by the controlling shareholder is greater for firms under intense media pressure. In our study, the pressure on the dual-class firms to convert is of a different type, consisting of a reduction in the firm's index weight.

The rest of the chapter is structured as follows. The next section reviews the literature on dual-class stock unifications. This is followed by a discussion of the institutional background before and after the regulatory change in Section 2.3. Section 2.4 describes the dataset and provides descriptive statistics. Section 2.5 explores the stock market's reaction to the regulatory change and to the actual unifications. Section 2.6 reviews the motives behind the decision to unify a firm's shares, develops several testable hypotheses and discusses the relevant econometric issues. Section 2.7 concludes.

2.2 Literature Review

Adams and Ferreira (2008) survey the empirical literature on disproportional ownership. They conclude that "few papers directly tackle the issue of the determinants of dual-class structures ... Consequently, we still know very little about this issue"

(Adams and Ferreira, 2008, p.62). Papers on the determinants of the decision to separate cash flow rights from voting rights include Lehn et al. (1990), Amoako-Adu and Smith (2001) and Gompers et al. (2010). Lehn et al. (1990) investigate the choice between dual-class recapitalizations and going private transactions as means to consolidate corporate control. Both transactions mainly differ in the allocation of cash flow rights to the controlling shareholder. They find that firms with better growth opportunities are more likely to undergo a dual-class recapitalization, compared to firms going private, as they want to maintain their access to the stock market. Amoako-Adu and Smith (2001) examine the determinants of dual-class stock structures for Canadian initial public offerings (IPOs). They find that a large family stake before the IPO increases the probability of a dual-class share structure after the IPO. Finally, Gompers et al. (2010) find that US firms with greater private benefits of control are more likely to have a dual-class structure.

There are even fewer papers that study the determinants of dual-class stock unifications. Studies on US firms, such as Ang and Megginson (1989) and Kunz (2002), do not find evidence of significant shareholder wealth effects from unifications. In contrast, the only two published studies on Germany (Maury and Pajuste, 2011, and Dittmann and Ulbricht, 2007) find significant wealth effects. Dittmann and Ulbricht (2007) analyse 89 German firms with dual-class shares between 1990 and 2001 of which 31 unify their stock. They document not only that dual-class stock unifications generate significantly positive shareholder wealth effects, but also that the percentage of voting shares held by the largest shareholder as well as the hypothetical loss of that shareholder's voting power after the conversion reduces the likelihood of unifying the shares. They also find that a lack of dividend payments in the recent past increases the likelihood of conversion, suggesting firms are more likely to unify their stock if they are financially constrained.

Maury and Pajuste (2011) explore the probability of stock unification in a cross-country study of seven Western European countries covering 493 non-financial dual-class stock firms from 1996 to 2002.[4] They confirm Dittmann and Ulbricht's (2007) results of both the fraction of voting shares of the largest shareholder and the wedge between his control and ownership rights reducing the likelihood of a stock unification. In contrast, their proxies for financing needs, such as the market-to-book ratio and

[4]Their regression results are based on a reduced sample of 382 firms.

proceeds from new equity issues, increase that likelihood.
Our study extends this literature in a major way by analysing the decision to unify dual-class shares in a situation, i.e. the 2002 change to the listing rules of Deutsche Boerse, where the status quo is associated with substantial costs in terms of reduced index weight, forcing the controlling shareholder to reassess the benefits from staying in control versus the costs of reduced index weight.

2.3 Institutional Background

This section describes the characteristics of German dual-class shares, more specifically non-voting shares, as well as the various selection indices. It also discusses the 2002 changes to the index selection rules in more detail. The German Stock Corporation Act (§139 AktG) allows firms to issue non-voting shares, also called preference shares[5] for up to 50% of their total book value of equity. In contrast to voting shares which confer one vote each, these shares do not confer any voting rights. However, they confer the right to a guaranteed dividend amount, which is normally a percentage of their face value. This guaranteed dividend amount must be paid out of profits before any dividend can be paid to the holders of the voting shares. If the remaining earnings are sufficient, the dividend amount accruing to the holders of the non-voting shares is then increased by the amount of the dividend paid to the voting shareholders. If the firm cannot afford the guaranteed dividend amount, the latter is carried over to the next year. If it has been carried over twice, then the non-voting shares confer voting rights until the firm has paid these arrears. Finally, non-voting shares are also senior to voting shares in case of liquidation and bankruptcy.
Deutsche Boerse distinguishes between two types of indices: all-share indices and selection indices. While the former include *all* the shares in a given market segment, the latter comprise only a *limited* number of shares. We focus on the latter. The selection indices are hierarchically structured: The DAX index tracks the largest and most actively traded firms at Frankfurt Stock Exchange (blue chip stocks), followed by the MDAX (50 mid cap stocks) and SDAX (50 small cap stocks) indices. The TecDAX index ranks below the DAX and provides coverage for the 30 largest and most

[5] Since 1998 the issuance of multiple-voting shares has been prohibited by German law (see KonTraG ("Gesetz zur Kontrolle und Transparenz im Unternehmensbereich"). Existing multiple-voting shares lost their validity on May 30, 2003, unless approved by the shareholders' meeting (§5 EGAktG).

Table 2.1: Selection Indices

Selection Index	No. of Members	Description
DAX	30	It tracks the 30 largest and most actively traded firms at the Frankfurt Stock Exchange (blue chip stocks) and covers roughly 80 percent of the tradable equity in Germany.
TecDAX	30	It ranks below the DAX and provides coverage for the 30 largest and most liquid technology sector ("new economy") stocks. It started in March 2003 and replaced the Nemax50 as the reference index for high tech firms.
MDAX	50	It ranks below the DAX and covers the 50 mid-cap stocks from mature ("old economy") sectors. It was downsized from 70 to 50 companies on March 24, 2003
SDAX	50	It ranks below the MDAX and comprises the next 50 stocks from the mature ("old economy") sectors. It was downsized from 100 to 50 companies on June 24, 2002.
Nemax50	50	It was the stock market index of the Neuer Markt and represented the 50 largest stocks from the technology ("new economy") sector. It was discontinued on December 31, 2004, as a result of the dissolution of the Neuer Markt.

Notes: This table provides an overview of the selection indices of Deutsche Boerse. The rank of firms within a given index is based on the market capitalization of the free float and stock turnover.

liquid technology stocks.[6] To be included in one of the selection indices, companies must fulfill certain criteria. Two of the criteria for inclusion are that the shares trade on the Prime Standard segment[7] of the Frankfurt Stock Exchange and that they are continuously traded on Xetra, an electronic trading platform. For all those firms that either are already included in a selection index or qualify for inclusion Deutsche Boerse publishes monthly so-called "equity index rankings". The key criteria for these rankings are order-book turnover at Frankfurt and market capitalization. The rankings form the basis at the quarterly meetings of the Working Committee for Equity Indices for the decision on whether a particular firm is to be included in or excluded from one of Deutsche Boerse's selection indices. Table 2.1 shows the list of selection indices and reviews the definition and composition of each selection index. In August 2000, Deutsche Boerse announced changes to the selection criteria for

[6]TecDAX started in March 2003 and replaced Nemax50 as the reference index for technology shares. Hence, we base ourselves on the latter for the pre-2003 period but the former for the remainder of the period of study.

[7]This criterion came into effect on January 1, 2003. Companies which are part of the Prime Standard segment have to fulfill the highest transparency requirements in the EU. They have to publish company reports on a quarterly basis in both German and English, follow international accounting standards (IFRS/IAS or US-GAAP), release a financial calendar, conduct at least one analyst conference per year and publish their ad-hoc disclosures in both German and English.

all its selection indices, which became effective in June 2002. Until then, the main criterion for the inclusion in a selection index was the firm's market capitalization which was computed by multiplying the number of *all* its issued shares, i.e. the sum of non-voting shares and voting shares for dual-class firms, multiplied by the price of the more liquid class.[8] Since the change, *only* the free float of the most highly capitalized or most liquid class of shares, i.e. *either* the non-voting stock *or* the voting stock, has formed the basis for the determination of the firm's market capitalization. There are two main ways of unifying dual-class shares. First, the non-voting shares may be converted into ordinary voting shares by amending the firm's articles of association. This change needs approval by the general shareholder meeting and requires a special resolution to be passed by the bearers of the non-voting shares in a separate meeting. Second, the company may repurchase the non-voting shares and then subsequently replace them by issuing new voting shares. In this case, the approval of the holders of the non-voting equity is not required, yet they must be willing to participate and sell their shares to the company.

2.4 Dataset and Descriptive Statistics

We start with all the 91 German companies with dual-class shares that are listed on Deutsche Boerse's CDAX segment[9] between January 2000 and December 2008. The period of study begins in 2000 to capture the run-up prior to the change in the rules. The official announcement of the regulatory change was made on August 8, 2000, but since it was published after the market's close, the effective event date is August 9.[10] Of the 91 firms, 30 convert their non-voting shares into voting shares at some point during the period of study. We exclude one firm that makes the decision to convert

[8]The liquidity of a stock is measured by its turnover on the exchange.

[9]The CDAX tracks all German companies listed on the Frankfurt Stock Exchange in the Prime and General Standard. It provides a performance measure of the overall German equity market.

[10]In 2000, speculations about new weighting rules arose after Stoxx Ltd. announced that henceforward weighting in its Euro Stoxx index would be based only on the free float proportion of the market capitalization of one class of shares. Though Deutsche Boerse officially denied intentions to adopt similar rules for its major stock indices (see Sueddeutsche Zeitung, July 5, 2000, p.29, and dpa-AFX, July 12, 2000), rumors intensified in mid-July as various newspaper articles speculated about a change in listing rules and evaluated potential index winners and losers. See Boersen-Zeitung, July 13, 2000, p.3; Financial Times Deutschland, July 17, 2000, p.28, and Financial Times Deutschland, July 17, 2000, p.1.

in 1999, another one that converts its non-voting shares immediately following its IPO and four firms with insufficient data. We arrive at a final sample of 85 firms, 25 of which abolish their dual-class shares during the period of study. Our sample size is comparable to that in Dittmann and Ulbricht (2007): they have 89 firms, for 1990-2001, of which 31 convert their non-voting shares. Nineteen of our sample firms, or 35% of the subsample of the 54 firms that have been listed in one of the selection indices of Deutsche Boerse, decide to convert, compared to only 6 firms or 19% of the remaining firms. The remainder of the analysis focuses on those 54 firms that are included in a selection index as these are the firms that are affected by the change in rules, generating 229 firm-year observations.[11]

The aforementioned changes in index weighting rules were introduced in June 2002. However, the intention to change the rules had already been the subject of speculation before that date while the changes were officially announced in August 2000. Well aware of the impending changes, many firms may have chosen to convert prior to the actual implementation of the new selection rules. Hence, we simulate the decision problem the firm and its controlling shareholder was facing by recalculating index weightings on a monthly basis prior to the implementation of the changes, but based on the new rules. In other words, instead of using actual historical data, we calculate the market capitalization of the free float of the larger or more liquid class of shares and use this information to determine the weighting of the firm in its current index under the new rules. These calculations illustrate the firm's situation had the new rules already been implemented. In contrast, the weightings used in the study subsequent to the change in rules are the actual weightings of Deutsche Boerse. In addition, we calculate the hypothetical index weight if the non-voting shares were converted into voting shares. The opportunity costs in terms of index weight of retaining the dual-class shares are then defined as the difference between the new hypothetical index weight and the actual weight. We refer to this difference as the index "Weight Penalty". In addition, we determine for each firm the quantile to which the firm belongs within its selection index. The quantile is based on the firm's rank or position within its index in terms of its index weighting. If the median monthly rank for a firm within a given year is in the 5% quantile, we consider it to be in danger of dropping out of its index during that year. If its median rank for a

[11] In a robustness check, we extend the main sample to include all dual-class CDAX companies.

year is in the 95% quantile, we consider that the firm has the chance to move up one index during that year.

Data on ownership and control as well as the numbers of voting and non-voting shares outstanding are collected from the Hoppenstedt annual stock guides.[12] We determine ultimate control following the procedure used by Da Silva et al. (2004) and Goergen et al. (2005). Their definition of a controlling shareholder is the largest shareholder with a stake of at least 25% of the voting rights. If there is no shareholder holding at least 25% of the votes, the company is considered to be widely held. This procedure accounts for control that is held indirectly via chains of control or pyramids of ownership. The ultimate controlling shareholder is situated at the first tier if it is a bank, insurance company, the German state, a foreign investor, or a family/individual. In all other cases, the ultimate controlling shareholder is said to be at a higher tier and this tier is reached once the tier above does not include any controlling shareholder or the controlling shareholder at that tier is a widely held bank or insurance company, the German state, a foreign investor, or a family/individual. In order to determine the control of intermediate companies that are not listed on a stock exchange, we consult Commerzbank's "Wer gehoert zu wem" handbooks. As in Dittmann and Ulbricht (2007), we calculate the hypothetical loss of the controlling shareholder's voting power if the non-voting shares were to be converted into voting shares. It is defined as the difference between the percentage of voting shares and the percentage of non-voting shares held by the controlling shareholder, multiplied by the proportion of non-voting shares. All remaining data are collected from Thomson Financial. Table 2.2 reports the definitions of all the variables used in this study.

Panel A of Table 2.3 reports the percentage of firm-year observations where the (ultimate) largest shareholder's stake exceeds the 25% voting threshold adopted by this study. For the sake of comparison, we also report the equivalent percentage for the higher threshold of 50%. Panel B reports the summary statistics for the voting rights, the cash flow rights, the hypothesized vote loss of the largest shareholder, the hypothesized weight penalty, total assets and the tangibility (defined as net property, plant & equipment divided by the firm's total assets).

Panel A suggests that control, as measured by the voting rights of the controlling

[12] For the few cases where the information on the numbers of preference and ordinary shares outstanding is not clear, we contact the firm's investor relations department.

Table 2.2: Definition of the Variables

Variable	Definition
Conversion	Dummy variable that is set to one for the year in which the firm decides to unify its shares, and zero otherwise. Observations for the years after the year of the conversion are excluded from the regression analysis.
Vote Loss	The difference between the percentage of voting shares and non-voting shares held by the controlling shareholder, multiplied by the proportion of non-voting shares.
Weight Penalty	The amount of index weight foregone by retaining the dual-class share structure. It is defined as the difference between the hypothetical index weight in percent if the non-voting shares were converted into voting shares and the actual weight in percent. This difference is calculated on a monthly basis. Weight penalty is measured as the median value of these differences over the 12 months in the preceding calendar year.
Danger	Dummy variable that is set to one if the median of the firm's quantile rank in its index in the year before the unification is in the 5% quantile, and zero otherwise. This dummy measures the potential for the firm to drop by one index.
Chance	Dummy variable that is set to one if the median of the firm's quantile rank in its index in the year before the unification takes is in the 95% quantile, and zero otherwise. This dummy measures the potential for the firm to move up one index.
Firm Size	Natural logarithm of total assets
Tangibility	Net property, plant & equipment divided by the firm's total assets in (t-1).
Financial Investor	Dummy variable that is set to one if the largest shareholder holding more than 25% of the votes is a financial institution (i.e. bank or insurance company).

Table 2.3: Descriptive Statistics

Panel A. Percentage and Number of Firm-Year Observations where the Largest Shareholder Holds at least 25% and 50% of the Votes, Respectively

Minimum Stake Held by Largest Shareholder	%	#
25%	88.2	202
50%	71.6	164

Panel B. Summary Statistics

Variable	Mean	Median	Std. Dev.
Voting Rights of Largest Shareholder [%]	64.7	65.6	28.6
Cash Flow Rights of Largest Shareholder [%]	40.5	41.8	20.5
Vote Loss [%]	22.3	23.2	16.1
Weight Penalty [%]	0.33	0.12	0.57
Financial Investor [%]	6.55		
Total Assets (Mio. Euro)	31300	1500	102000
Tangibility	0.33	0.28	0.21

Notes: The variables are defined as in Table 2.2. The table is based on the 229 firm-year observations for all the 54 dual-class firms that are part of a selection index. Panel A reports the percentage and number of firm-year observations where the largest shareholder holds at least 25% and 50% of the votes, respectively. Panel B reports descriptive statistics for the variables used in the regression analysis.

shareholder, is highly concentrated: for 87.9% of all the firm-year observations control exceeds 25% of the votes and for 71.4% control exceeds 50% of the votes. Existing studies also document a high concentration of control in listed German companies. For example, Becht and Boehmer (2003) find that more than 82% of firms have a large shareholder holding at least 25% of the votes for their sample of 372 companies in 1996. Likewise, for a sample of 171 companies in 1990 Franks and Mayer (2001) report that 85.4% of firms have a single large shareholder with more than 25% of the votes and 57.3% of firms have a majority shareholder.

Panel B suggests that, while the largest shareholder owns roughly 65% of the votes, he only owns 41% of the cash flow rights. On average, the hypothesized vote loss is 22% and the weight penalty amounts to 0.33%. Before we proceed with the discussion of the reasons that may lead firms to unify their shares, we explore the stock market reaction to the change in rules.

2.5 Event Study

This section explores whether there are wealth effects associated with the regulatory change. The reasons for doing this are twofold. First, we aim to assess whether the announcement of the new rules exerted pressure on dual-class firms to unify their shares. This would be the case if there is a positive market reaction surrounding *the announcement of the new rules*. Second, we aim to assess whether investors react positively to *the announcements of actual dual-class stock unifications*, attributing value to these unifications.

To this effect we run two distinct event studies. The two event studies are based on market model regressions. The estimation window for the parameters underlying the model is the 250 trading days ending 21 trading days prior to the announcement. The event windows used in this study include [-20, 20], [20, 0], [0, 20], [-1, 1] and [0, 0]. We use the CDAX, which comprises all German companies listed on the Prime and General Standard segments of the Frankfurt Stock Exchange, as a proxy for the market portfolio. Using the CDAX rather than one of the selection indices deals with the issue that the various selection indices may have been affected by the regulatory change and/or the actual conversions. The dates for the announcements of the actual conversions are gathered from the website of the German Association for Ad-Hoc Announcements ("Deutsche Gesellschaft für Ad-hoc-Publizität" (DGAP), www.dgap.de), company websites and newspaper articles.

For the event study on the regulatory changes[13] (Panel A of Table 2.4), we use the modified version of Boehmer et al.'s (1991) test statistic, as proposed by Kolari and Pynnoenen (2010), to assess the significance of the announcement returns. This test specifically adjusts for the clustering of the observations - the announcement date of the new rules is the same for all the firms - by accounting for cross-sectional correlation of the abnormal returns in the estimation window. For the event study on the actual conversions (Panel B of Table 2.4), we evaluate the significance of the announcement returns based on Boehmer et al.'s (1991) standardized cross-sectional t-statistic, which compared to the test by Patell (1976), also accounts for event-induced variance. In line with prior work we separately report the announcement returns for the sample firms' voting and non-voting shares.

Panel A of Table 2.4 presents the cumulative average abnormal returns (CAARs) for all the firms with dual-class stocks that were included in a selection index around the time of the announcement of the regulatory change, i.e. August 9, 2000. The CAARs in Panel A are those for the 30 dual-class firms with listed non-voting shares and the 15 dual-class firms with listed voting shares included in the index.[14][15] We start by analyzing the CAARs for the actually listed share category. There is no market reaction on the event day as evidenced by the insignificant AAR of 0.44%. However, when the event window is extended to include the 20 days preceding the announcement of the change to the rules, the CAAR increases to 4.15% and becomes significant at the 10% level. When the event window is further extended to cover the 20 days following the announcement day, the CAAR increases to 5.35% and is significant at the 5% level. Panel A also suggests that the positive announcement effect is mainly due to the non-voting shares. Indeed, the CAAR over the entire 41-day window amounts to 5.67% and is significant at the 5% level for the non-voting

[13] The announcement concerning the downsizing of the SDAX was made in August 2001, i.e. one year later than the regulatory changes. Hence, our event study is not contaminated by this downsizing.

[14] This is a snapshot of all dual-class firms included in a selection index in August 2000. As a result, the sample size differs from the one described on p.47 that covers the whole observation period.

[15] We lose three observations. We decided to exclude these firms due to possible confounding events. One firm was founded in 2000 and could therefore not be included. Another one changed its legal status in August 2000, at the same time as the announcement of the regulatory change. A third firm had a stock split in July 2000.

Table 2.4: Event Study Results

Panel A. Cumulative Average Abnormal Returns at the Announcement of the Regulatory Change in August 2000			
CAARs for the Actually Listed Share Category			
Event Window	CAAR	Positive : Negative	Adj. BMP T-Statistic
[-20, 20]	5.35%	29 : 16	1.997**
[-20, 0]	4.15%	29 : 16	1.671*
[0, 20]	1.63%	27 : 18	1.301
[-1, 1]	1.06%	26 : 19	1.188
[0, 0]	0.44%	25 : 20	0.931
CAARs for Non-Voting Shares			
Event Window	CAAR	Positive : Negative	Adj. BMP T-Statistic
[-20, 20]	5.67%	29 : 12	2.284**
[-20, 0]	4.50%	27 : 14	1.975**
[0, 20]	1.78%	23 : 18	1.346
[-1, 1]	0.87%	23 : 18	0.866
[0, 0]	0.62%	26 : 15	1.223
CAARs for Voting Shares			
Event Window	CAAR	Positive : Negative	Adj. BMP T-Statistic
[-20, 20]	3.74%	18 : 14	1.701*
[-20, 0]	3.37%	21 : 11	1.640*
[0, 20]	0.51%	16 : 16	0.686
[-1, 1]	1.28%	19 : 13	1.635
[0, 0]	0.14%	18 : 14	0.321

Panel B. Cumulative Average Abnormal Returns at the Announcement of a Stock Unification between 2000 and 2008			
CAARs for Non-Voting Shares			
Event Window	CAAR	Positive : Negative	BMP T-Statistic
[-20, 20]	7.35%	13 : 4	3.126***
[-20, 0]	8.61%	13 : 4	3.952***
[0, 20]	3.40%	10 : 7	1.514
[-1, 1]	5.29%	12 : 5	2.770***
[0, 0]	4.66%	12 : 5	2.127**
CAARs for Voting Shares			
Event Window	CAAR	Positive : Negative	BMP T-Statistic
[-20, 20]	0.47%	7 : 10	0.346
[-20, 0]	2.69%	9 : 8	0.757
[0, 20]	-1.18%	7 : 10	-0.543
[-1, 1]	1.88%	10 : 7	1.016
[0, 0]	1.04%	8 : 9	0.264

Notes: This table presents cumulative average abnormal returns (CAARs) around the announcement day for actual stock unifications as well as around the announcement day of the change in rules. CAARs are reported for four distinct event windows: [-20, 20], [-20, 0], [0, 20], [-1, 1] and [0, 0]. Panel A presents CAARs around the announcement of the regulatory change. The t-statistic is the modified version of Boehmer et al.'s test proposed by Kolari and Pynnoenen (2010) (Adj. BMP t-statistic). Note that not each stock class is traded. Hence, when we extend the analysis to both classes of dual-class firms, the number of observations for non-voting and voting shares is different. Panel B reports the CAARs for stock unifications between 2000 and 2008. The relevant test statistic is the one proposed by Boehmer et al. (1991) (BMP t-statistic). ***, ** and * denote statistical significance at the 1%, 5% and 10% level, respectively.

shares compared to 3.74% and significance at the 10% level only for the voting shares. Panel B of Table 2.4 reports the announcement returns around the actual conversion announcements. We find significantly positive announcement returns for the non-voting shares ranging from 4.7% on the announcement date to 8.6% over the [-20, 0] window. Previous work on Germany by Dittmann and Ulbricht (2007) also documents sizeable wealth effects generated by the conversion of non-voting shares. They justify the observed increases in shareholder value by the improved corporate governance and enhanced liquidity of the stock. We do not observe significant abnormal returns for the voting shares, whatever the event window. This suggests that the wealth effects of stock unifications accrue exclusively to the holders of the non-voting shares. These results are also in line with those of Dittmann and Ulbricht (2007) who do not find significant abnormal returns for the voting shares.
To conclude, two important findings emerge from this section. First, the market responds positively to the regulatory change announced by Deutsche Boerse. In the days surrounding the announcement of the change, we observe significantly positive market reactions for our sample firms. We interpret this as a sign that the market perceives that the regulatory change increases the likelihood of firms converting their shares and that in turn this puts firms under pressure to consider unification. Second and in line with previous work, we find significantly positive market reactions around actual stock unifications. Third and similar to Dittmann and Ulbricht (2007), we only find significant abnormal returns for the non-voting shares, but not for the voting shares.

2.6 Motives for the Unification of Dual-Class Shares

This section develops a set of hypotheses on the motives for the unification of dual-class shares. The new index weighting rules for the German selection indices, which were announced by Deutsche Boerse in August 2000 and became effective in June 2002, forced firms and their large shareholders alike to reassess the benefits from their dual-class structure by weighing them against the foregone index weight associated with having dual-class stock. This leads us to our first hypothesis.

H1(Weight Penalty): The higher the penalty in terms of foregone index weight, the more likely a firm will abolish its dual-class share structure.

As evidenced in Section 2.5 by the positive announcement effect, the unification of dual-class stock will likely increase firm value. This suggests that shareholders of German firms prefer single-class stock over dual-class stock. However, self-interested, large shareholders of dual-class firms may enforce the status quo at the expense of the minority shareholders in order to safeguard their private benefits of control. The theoretical literature (see e.g. Grossman and Hart, 1988) as well as the empirical literature (see e.g. Adams and Ferreira, 2008) suggest that the expropriation of minority shareholders is more likely for firms with a large shareholder that holds more voting rights than cash flow rights. The dual-class structure allows the large shareholder to retain a controlling position in the firm without having to own the equivalent stake in cash-flow rights. The unification of the voting and non-voting shares would then typically cause the large shareholder to experience a substantial loss of voting power. This discussion leads us to the following hypothesis.

H2(Voting Loss): The larger the loss of voting power suffered by the large shareholder the greater is the loss of private benefits of control and hence the lower is the likelihood of a dual-class unification.

As to the weight penalty, a special case arises when firms are in danger of dropping out of their index. In this case, a conversion might enable the firm to retain its index membership. Further, the heaviest-weighted firms within an index may move up one index by converting their shares.[16][17] This leads to the following two hypotheses.

H3a(Danger): Firms in danger of dropping from their index are likely to abolish their dual-class shares.
H3b(Chance): Firms with a chance to move up one index are likely to abolish their dual-class shares.

[16]Firms located at the upper end of the DAX index are not considered as potential move-up candidates in case they are already included in the Euro Stoxx 50.

[17]We classify firms as being in danger to drop out of (have the chance to move up) an index in 7.4% (2.6%) of the sample observations.

2.7 Empirical Analysis

To test our hypotheses that firms reassess the costs and benefits of having more than one class of shares, we run a series of pooled cross-sectional logistic regressions:

$$F(x\beta) = P(y = 1 \mid x) = \frac{exp(\beta_1 x_1 + \beta_2 x_2 + X\beta)}{1 + exp(\beta_1 x_1 + \beta_2 x_2 + X\beta)} \tag{2.1}$$

where y is a binary variable that takes the value 1 if the company unifies its share classes, and 0 otherwise. Our variables of interest are x_1, the "Voting Loss" and x_2, the "Weight Penalty". "Voting Loss" refers to the hypothetical loss of the controlling shareholder's voting power if the non-voting shares were converted into voting shares and "Weight Penalty" is the reduction in index weight that is associated with retaining a dual-class structure. The vector X contains the constant term and further explanatory variables.

We use five different variations or specifications of the above equation. Specification (1) is the base specification as above. In addition, specification (2) includes the interaction between "Voting Loss" and "Weight Penalty". Financial investors, i.e. banks and insurance companies, may have fewer incentives to extract private benefits of control and hence may increase the likelihood of unification (Maury and Pajuste, 2011). Therefore, specification (3) also includes the Financial Investor dummy variable (see below for further details). Specifications (4) and (5) include two further dummy variables, "Danger" and "Chance", that characterize a firm's relative position in its index. While "Danger" indicates cases where a firm is in danger of dropping from its current index due to its low relative rank, "Chance" indicates situations where a firm is at the high end of the index and thus has a chance to move up to the next highest index. Hypotheses 3a and 3b suggest that both situations may be a driving factor behind the decision to unify.

Moving onto the control variables, Maury and Pajuste (2011) argue that, because dual-class shares typically trade at a discount and thereby increase the cost of raising equity (Dyck and Zingales, 2004), a larger need for external capital is an important factor in explaining the decision of firms to abolish their dual-class structure. Firms with more tangible assets may be able to attract more external financing as tangible assets are easier to value, and hence ideal collateral reducing the expected costs of financial distress (Almeida and Campello, 2007). Therefore, we add the tangibility of

Table 2.5: Logit Estimates

Variable	(1)	(2)	(3)	(4)	(5)
Vote Loss	-0.005	-0.006	-0.006	-0.006	-0.006
	[-3.95***]	[-4.12***]	[-3.92***]	[-3.80***]	[-3.62***]
Weight Penalty	0.050	0.066	0.069	0.073	0.071
	[2.57***]	[2.99**]	[3.29***]	[3.47***]	[3.32***]
Firm Size	-0.025	-0.025	-0.026	-0.029	-0.030
	[-3.09***]	[-3.04***]	[-3.20***]	[-3.42***]	[-3.50***]
Tangibility	-0.201	-0.208	-0.228	-0.210	-0.207
	[-2.31**]	[-2.50**]	[-2.93***]	[-2.60***]	[-2.75***]
Financial Investor			0.057	0.039	0.040
			[1.95*]	[1.11]	[1.12]
Danger				0.100	0.102
				[2.96***]	[3.05***]
Chance					0.034
					[0.30]
Vote Loss * Weight Penalty		-0.006	-0.006	-0.006	-0.006
		[-1.70*]	[-1.75*]	[-1.65*]	[-1.58]
Pseudo R-Squared	0.1931	0.2009	0.2078	0.2435	0.2448

Notes: This table presents the results on the determinants of the probability to adopt a single-class share structure. We estimate the relationship for firms that are in a selection index. The sample comprises 229 firm-year observations with 54 dual-class firms of which 19 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. We report average marginal effects (AME). The interaction effect Vote Loss*Weight Penalty is defined as the change in the predicted probability of unification for a change in both the loss of voting rights and the foregone index weight. The definitions of the variables are provided in Table 2.1. Z-statistics are based on cluster-robust standard errors and appear in brackets below the slope estimates. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

assets to proxy for the fact that firms with a high tangibility are less dependent on the equity market. We also add firm size to all five specifications, measured as the natural logarithm of total assets. Table 2.5 presents the results.[18] The findings show that the reduction in index weight associated with retaining the dual-class structure is indeed a determinant of the firm's decision to convert its shares. "Weight Penalty" is positive and highly significant in all five specifications. This evidence is highly supportive of our main hypothesis, Hypothesis 1.[19]

[18] Companies not yet included in a selection index might have the "Chance" to move up to a selection index by converting their shares. To consider this possibility and to avoid sample selection issues, we repeat the analysis with all dual-class firms in Deutsche Boerse's CDAX segment. For CDAX-only firms, we set "Chance" to 1 in case the firm has the potential to move up and also fulfills all of Deutsche Boerse's requirements to be part of a selection index. We set "Weight Penalty" to zero for CDAX-only companies as they are of no relevance to index tracking funds. The main results do not change substantially (reported in the Appendix).

[19] It would be desirable to control for firm fixed effects in our framework. Unfortunately, this is not feasible due to several reasons. Simply including firm fixed effects in the estimation equation

Further, the loss of voting rights incurred by the ultimate controlling shareholder has a significantly negative impact on the likelihood to convert. The effect is significant at the 1% level in all five specifications, providing strong support for Hypothesis 2. This suggests that the large shareholder is less likely to agree to convert his firm's non-voting shares if he has more private benefits to lose.
Further, the effect of asset tangibility is significant, at the 5% level or better, suggesting that less equity dependence decreases the likelihood of the firm converting its non-voting stock. Hence, similar to prior studies (see Maury and Pajuste, 2011, and Dittmann and Ulbricht, 2007), we find that the large shareholder's desire to safeguard his private benefits of control and equity dependence in terms of financing are important explanatory variables of the decision to convert. In addition, we document that firms with large financial investors are more likely to unify their shares (significant at the 10% level in specification (3)). This finding is in line with that of Maury and Pajuste (2011).
We also find strong support for Hypothesis 3a. "Danger" is significant at the 1% level, indicating that a conversion is a measure of last resort to safeguard index membership for firms in danger of dropping out. On the contrary, we find no support for Hypothesis 3b that the chance to move up one index has a significant impact on the likelihood of conversion. These results are in line with anecdotal evidence, which suggests that a drop in the relative position within the index as well as the exclusion from the index are major concerns for companies whereas moving up one index is not a matter for consideration.
So far, our analysis has shown that the foregone gain in index weight has a positive

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would lead to inconsistent and biased unconditional maximum likelihood estimates of not only the fixed effects but also of the common parameters (so-called incidental parameter problem). For a fixed number of time periods (T), the estimators of the fixed effects will be inconsistent if the number of firms increases. Due to the fact that the estimators of the common parameters depend on the estimates of the fixed effects, the inconsistency directly translates to the estimates of the common parameters. Furthermore, e.g. Greene [2004] documents substantial biases in the parameter estimates if the number of time periods is small. For T=2, analytical evidence shows that the bias amounts to 100 percent. The size of the bias decreases by increasing the number of time periods, but still amounts to roughly 20 percent for T=8 in Greene's simulations. As pointed out by Dittmann and Ulbricht (2007), an extension of the periods of study would not solve the problem as firms will drop out of the sample after unification. Alternatively, conditioning out firm fixed effects by using a conditional logit approach would also cause severe problems as firms without variation in the dependent variable are excluded. This would lead to a significantly reduced number of observations.

impact on the likelihood of a conversion whereas the voting loss for the large shareholder has a negative impact on that likelihood. We now turn our attention to the trade-off the large shareholder faces between the main benefit from converting the non-voting shares, i.e. maintaining the firm's position within the index, and keeping control.
Our specifications (2) to (5) include the interaction between "Vote Loss" and "Weight Penalty":

$$F(x\beta) = P(y = 1 \mid x) = \frac{exp(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta)}{1 + exp(\beta_1 x_1 + \beta_2 x_2 + \beta_{12} x_1 x_2 + X\beta)} \tag{2.2}$$

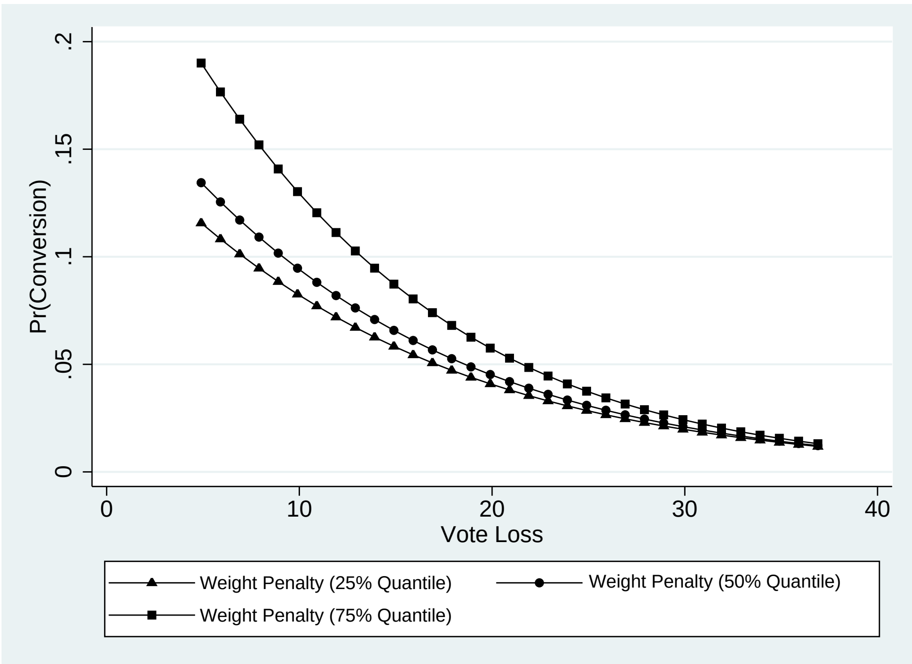
The inclusion of this interaction allows us to explore whether the effect of the weight penalty varies in line with the vote loss (and vice versa). Since the interaction effect in non-linear models cannot be easily evaluated on the basis of the sign, magnitude, or statistical significance of the coefficient on the interaction term, we take the cross-partial derivative of the expected probability of conversion (Norton et al., 2004):

$$\begin{aligned} \frac{\partial P(y = 1 \mid x)}{\partial x_1 \partial x_2} &= \beta_{12}(F(x\beta)(1 - F(x\beta))) \\ +(\beta_1 + \beta_{12} x_2)(\beta_2 + \beta_{12} x_1)&(F(x\beta)(1 - F(x\beta))(1 - 2F(x\beta))) \end{aligned} \tag{2.3}$$

The statistical significance is also based on the entire cross derivative. We then report the mean interaction effect and its significance. The interaction effect is negative and significant at the 10% level in three of the four specifications that include the term, i.e. specifications (2), (3) and (4). Taking into account the small sample size, a significance at the level of 10% seems to be relatively high. Additionally, McClelland and Judd (1993), among others, point out that interactions tend to be difficult to find in non-experimental data and that the power to detect these effects is usually lower than detecting main effects. This leads us to accept a significance level of 10%. We illustrate the trade-off between converting the non-voting shares to maintain or strengthen the index weight and keeping control by using a plot of predicted conditional probabilities of conversion for different levels of voting loss. We distinguish between high, intermediate and low levels of weight penalty (see Figure 2.1). High levels of weight penalty are defined as those in the 75% percentile, intermediate ones as those in the 50% percentile and low ones as those in the 25%

percentile. The difference between the probabilities of conversion for firms with a high weight penalty and those with a low weight penalty is positive, i.e., the marginal effect of the weight penalty is positive. However, this difference decreases as the vote loss increases, reflecting the negative interaction effect. Hence, the impact of the weight penalty on the probability of conversion becomes smaller as the loss of voting rights becomes greater. Figure 2.1 suggests that the larger the voting loss of the

Figure 2.1: Conditional Predicted Probabilities of Conversion Based on Different Hypothetical Weight Penalties



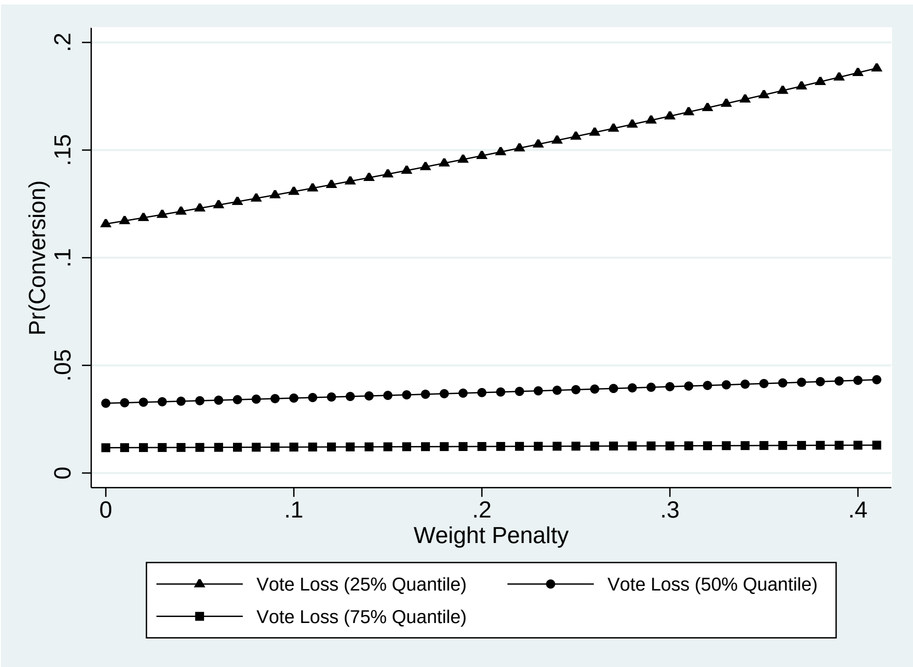
Notes: This figure depicts the decrease in the probability of conversion, based on different hypothetical weight penalties (75% quantile, 50% quantile and 25% quantile), brought about by different levels of vote loss (x-axis).

controlling shareholder the greater are his private benefits of control and the less he is concerned by the costs from the reduction in the firm's index weight. In contrast, controlling shareholders who experience only a small loss of voting power are more willing to convert rather than to forfeit index weight.

Another way of interpreting the difference between the curves is that it represents the large shareholder's sensitivity towards loss of index weight: Figure 2.1 then indicates that this sensitivity decreases with increasing voting loss. Put differently, if the large

shareholder loses a substantial fraction of the votes (bottom right corner of the graph), he does not care much about the index weight gain from conversion. Conversion is just too costly in terms of the private benefits that are foregone. Bearing in mind the difference in slopes between the three curves, for firms whose index weight penalty is more pronounced the probability of conversion decreases faster with increases in the percentage of voting loss by the large shareholder compared to firms with a comparatively small weight penalty. This pattern is in line with what one expects in the presence of a trade-off faced by the large shareholder between diluting control and tolerating a reduction in index weight.
Figure 2.2 complements Figure 2.1. Whereas Figure 2.1 depicts the probability

Figure 2.2: Conditional Predicted Probabilities of Conversion Based on Different Levels of Vote Loss



Notes: This figure depicts the decrease in the probability of conversion, based on different levels of vote loss (75% quantile, 50% quantile and 25% quantile), brought about by different levels of weight penalty (x-axis).

of conversion relative to different levels of vote loss (x-axis), Figure 2.2 shows the probability of conversion relative to different levels of weight penalty. The three curves in Figure 2.2 refer to the 25% quantile, the 50% quantile and the 75% quantile,

respectively.
The difference between the probabilities of conversion for firms with a low and high vote loss is negative, i.e., the marginal effect of vote loss is negative. Contrary to Figure 2.1 the curve representing the 75% quantile (of the vote loss) is now the lowest, rather than the highest, of all three curves. The difference between the curves further increases if we increase the weight penalty. This is the case because the probability of conversion increases faster for firms with a small vote loss as the weight penalty increases compared to firms with a high vote loss, i.e., each increase in the index weight penalty has less of an impact the higher the vote loss that accompanies the weight penalty.
In summary, we document that the index weight significantly affects the controlling shareholder's motivation to unify the non-voting and voting stock. However, this motivation also depends on the level of vote loss the controlling shareholder would experience if he agreed to a stock unification.

2.8 Conclusion

In summer 2000, Deutsche Boerse changed the rules on how firms are selected for membership of its selection indices. First, only the most liquid or largest share class now forms the basis for selection into an index. Second, only the free float of that class is taken into account when determining index membership. As a consequence of the new rules firms with dual-class stock faced the danger of losing large amounts of index weight. Within this context, this study examines the probability of dual-class stock unifications. There is evidence that firms were under pressure to unify their dual-class stock. Indeed, both the announcements of actual unifications as well as the announcement of the new rules generated significant abnormal returns.
We find that both the desire to safeguard or strengthen index weight and the danger of losing index membership have a significant impact on the probability of a dual-class stock unification. Similar to studies on dual-class stock unifications before the change in rules, we observe that firms are less likely to abolish their dual-class shares if they are less reliant on equity financing. We also find that the existence of private benefits of control makes it less likely for firms to unify their shares.
More generally, our findings suggest that the large shareholder faces a trade-off

between safeguarding the existing private benefits of control and the costs associated with an index weight loss when deciding on a conversion. The greater the private benefits, the less likely there will be a conversion. In other words, forfeiting index weight may be the lesser of two evils if the alternative is losing control.

Appendix to Chapter 2

Table 2.6: Logit Estimates for Dual-Class CDAX Companies

Variable	(1)	(2)	(3)	(4)	(5)
Vote Loss	-0.002	-0.002	-0.002	-0.002	-0.002
	[-2.11**]	[-2.53**]	[-2.36**]	[-2.30**]	[-2.27**]
Weight Penalty	0.056	0.070	0.071	0.072	0.071
	[2.85***]	[3.18***]	[3.49***]	[3.58***]	[3.52***]
Firm Size	-0.003	-0.005	-0.006	-0.009	-0.009
	[-0.71]	[-1.08]	[-1.42]	[-1.77*]	[-1.84*]
Tangibility	-0.070	-0.075	-0.096	-0.087	-0.086
	[-1.52]	[-1.75*]	[-2.17**]	[-2.00**]	[-2.01**]
Financial Investor			0.073	0.061	0.061
			[3.10***]	[2.21**]	[2.22**]
Danger				0.076	0.077
				[2.92***]	[2.99***]
Chance					0.021
					[0.34]
Vote Loss * Weight Penalty		-0.005	-0.005	-0.005	-0.005
		[-1.75*]	[-1.73*]	[-1.66*]	[-1.61]
Pseudo R-Squared	0.1174	0.1331	0.1567	0.1883	0.1892

Notes: This table presents the results on the determinants of the probability to adopt a single-class share structure. We estimate the relationship for firms that are included in the CDAX index. The sample comprises 496 firm-year observations with 85 dual-class firms of which 25 firms decide to unify over the period 2000-2008. Firms are excluded from the sample after unification. The regressors are lagged by one period. We report average marginal effects (AME). The interaction effect Vote Loss*Weight Penalty is defined as the change in the predicted probability of unification for a change in both the loss of voting rights and the foregone index weight. The definitions of the variables are provided in Table 2.1. Z-statistics are based on cluster-robust standard errors and appear in brackets below the slope estimates. ***, ** and * denotes statistical significance at the 1%, 5% and 10% level, respectively.

Chapter 3

Is Busy Really Busy? Board Governance Revisited

3.1 Introduction

A growing literature on board characteristics investigates the question of whether directors with multiple board appointments are too busy to perform their monitoring duties (Ferris et al., 2003; Fich and Shivdasani, 2006). The "busyness hypothesis" associates firms that have busy directors with weak corporate governance, the assumption being that directors who serve on a large number of boards may become overcommitted and unable to adequately comply with the requirements of their position as monitors of management. Fich and Shivdasani (2006) confirm this assertion and show that firms with busier boards exhibit significantly lower market-to-book ratios. In contrast, Ferris et al. (2003) find no evidence of a relationship between the number of board appointments and firm performance.

In this study, we revisit the association between board busyness and firm governance. We contend that prior approaches that have largely been based on the number of board seats ignore central aspects that characterize how busy a director actually is, because the concept of "busyness" in itself has more than one dimension. Specifically, we suggest that a crucial point in determining a director's busyness is how "embedded" (Granovetter, 1985, 1992) a particular director is within his social network, i.e., the "extent to which [a director's] economic action is embedded in structures of social relations" (Granovetter, 1985, p.481). We argue that rather than solely relying on counting a director's board seats or connections to other directors, a more adequate way of capturing busyness should incorporate a detailed characterization of the director's social network, including an analysis of individual ties as well as the overall architecture of the network. Put differently, we propose that an appropriate analysis of busyness should focus not only on the number of board seats and a director's immediate connections to other directors within his social network, but also on the connections among the directors that he is connected to. In particular, we suggest that because closed network structures facilitate the enforcement of social norms (Coleman, 1988), they can affect board busyness by exacerbating the social obligations that arise within a network.

Consider, for example, two of the directors in our sample, Mr. Schulte-Noelle, who held only four board appointments in 2006, and Michael Busch, director at Washtec AG (a producer of vehicle washing equipment), who served on seven boards in the same year. Based on the number of board appointments, Mr. Busch is busier. Mr. Schulte-Noelle, however, is chairman of Allianz AG and a director at Siemens AG, ThyssenKrupp AG, and E.ON AG, some of the most important German companies with connections to politics, media, and sports. Being among the best-connected of directors, and sitting at the heart of an "inner circle" of organizational elites (Useem, 1984), he is more likely than Mr. Busch to be overcommitted, not so much because of the (direct) duties associated with his directorships, but owing to the indirect obligations that stem from his central position in the network.

Our basic argument is that maintaining a large social network and adhering to its demands can take substantial temporal and cognitive resources and render intensely-connected directors exceedingly busy. As a result, a director with a demanding social network may be limited in his ability to act as an efficient monitor.

To explore the above hypothesis, we build on notions and methods derived from social capital theory and social network analysis that aid us in characterizing a director's social network with respect to his busyness. The variables that we use attempt to capture both how much time the network demands and the cognitive resources that it requires, but they may also be interpreted to proxy for the degree to which a director's network comes with time- and attention-consuming social obligations. For example, a director's formal ties to other directors often reflect informal ties (Hwang and Kim, 2009), e.g., joint memberships in golf clubs or a charitable organization. In addition, being a well-connected director is likely also associated with connections to important agents outside the boardroom, e.g., in politics, media, sports etc. Arguably, a director who has to spend considerable time catering to such social demands has

less time for his monitoring duties.
A caveat is in order at this point. Previous literature has documented that social networks can be beneficial to the partaking agents (e.g., Cohen et al., 2010; Horton et al., 2012). They may, for example, endow a director with privileged and timely access to information or more generally increase his social capital (Adler and Kwon, 2000). If these advantages enable a director to better fulfill his duties, intense social networks may benefit a firm's performance. However, it is not evident that similar advantages should accrue to directors through the network of board directorships, particularly in the context of a two-tier system such as Germany. Adams and Ferreira (2007, p.235) argue that a "dual board structure allows for the cleanest separation of the board's two roles", i.e., advising and monitoring. Therefore, it is unclear whether information that passes through the network of directors[1] is equally useful to directors whose primary role is to monitor management (as stipulated in article 111 of the German stock corporation act). We thus suggest that in a social network that simultaneously affects director busyness and endows them with informational advantages, the busyness effect should dominate.
To empirically investigate the impact of busyness on firm governance, we collect data on the social network of all members of the supervisory boards of all German publicly traded firms included in the DAX, MDAX, and SDAX indices (excluding financials) over four consecutive years (2003 to 2006). Each year, we map the connections among all of the sample firms' directors. Our dataset comprises roughly 1,600 directors and about 35,000 connections per year. We then calculate different measures to capture individual directors' busyness and aggregate them on the board-level. To this end, we exploit the fact that publicly traded firms in Germany are required to disclose all directorships held by members of their supervisory boards in other (for-profit) firms. This allows us to extend our mapping of connections among the sample's directors to connections outside the universe of sample firms. Finally, we explore in a multivariate panel framework whether firms with busy boards exhibit weaker firm governance.
Using fixed-effects panel regressions we find that firms with strongly connected supervisory boards tend to have significantly lower values of Tobin's Q. In addition, we document that the average remuneration of executives in firms with strongly

[1]For the ease of notation, the terms director and member of the supervisory board will be used interchangeably throughout the study. Members of the executive board will be referred to as management or executives.

connected directors is significantly higher. As such, we interpret our findings as evidence for weaker governance and poorer monitoring in firms with directors who play an important role in the social network. Simple measures for busy directors that were used by other researchers in the past fail to show any significant patterns. Lastly, we test whether our findings suffer from reverse causality. However, we find no evidence that directors' embeddedness in the network changes in response to past performance.

Our results contribute to the literature along several lines. First, our study informs the debate on the effects of multiple board appointments, supporting Shivdasani and Yermack (1999), Core et al. (1999), and Fich and Shivdasani (2006), who find busy directors to be associated with less effective monitoring. Our results stand somewhat in contrast to previous studies that ascribe positive value to multiple board appointments. For example, Mace (1986) argues that board seats can serve as a signal of director quality. Brown and Maloney (1999) similarly use the number of board appointments as a proxy for reputational capital. Perry and Peyer (2005) argue that "sender" firms can benefit from additional directorships since their directors can learn about different management styles or strategies that are used in other firms.

Importantly, our findings have implications for the discussion of limiting the number of directorships: They indicate that merely putting a limit on the number of board appointments that directors are allowed to hold is insufficient at preventing directors from being overcommitted.[2]

Second, previous papers in this area are limited to the U.S., where (inside) firm governance is based on the one-tier system. In this environment, corporate boards consist of inside directors who run the firm, and outside directors who are not part of the management team of the company they govern. The literature therefore focuses on outside directors under the premise that inside directors do not monitor management (Fich and Shivdasani, 2006). However, in the one-tier setting management might have a preference to appoint directors from the same social circle to the board (Barnea and Guedj, 2009; Mace, 1986). As a consequence, network measures do not only capture

[2]There is an ongoing debate about gender quotas on company boards. To the extent that the pool of qualified women available to fill posts is limited, the average female director may be embedded in a more intense social network than the average male director. All else equal, our results suggest then that a gender quota might adversely affect the board's ability to monitor by increasing the average board members' busyness.

how well connected an outside (i.e. monitoring) director is, but also how connected management is. This complicates the interpretation of a relationship between network variables and firm governance since members of the board might just be more "lenient" towards management because they reciprocate or position themselves for other board seats (Wade et al., 1990), and not because they are exceedingly busy. We use data from Germany, a country where governance structures are based on the two-tier system with an independent supervisory board. Most importantly, German law explicitly forbids executives from nominating candidates for the supervisory board.[3] This legal environment allows us to examine the effect of a director's position in the social network on firm governance independent from his interaction with executives. Third, we add to the growing literature that attempts to incorporate mathematical concepts of sociology (see Scott, 2000, for an overview) to assess the impact of network structures in finance. Horton et al. (2012) use methods of social network analysis to investigate whether the directors' social network provides valuable resources to the firm. They find that directors are rewarded for their connectedness and that the directors' connectedness is positively related to the firm's future performance. Barnea and Guedj (2009) generate measures that account for a director's importance in the social network and find that in firms with more connected directors, CEO remuneration is higher, and CEO turnover is less sensitive to firm performance.

The remainder of this chapter is organized as follows. The next section develops our central argument building on notions from social capital theory and social network analysis. Section 3.3 focuses on the construction of the dataset and our network measures and presents descriptive statistics. Section 3.4 contains the multivariate panel data analysis. Section 3.5 concludes.

3.2 Social Networks and Busy Boards

Directors are linked to each other both directly, e.g., through boards that they jointly sit on, and indirectly, e.g., through common acquaintances. We argue that analyzing these connections allows for a characterization of a director's busyness, because maintaining connections to other directors and adhering to the associated obligations draw

[3] According to paragraph 124(3) of the German Stock Corporation Act (AktG), executives are not allowed to nominate members of the supervisory board. Monitoring the executive board it is the main responsibility of members of the supervisory board.

on a director's limited temporal and cognitive resources that monitoring management requires.

Multiple board assignments are associated with a large number of direct obligations, most notably attending a variety of board meetings, reading corporate reports, etc., thus rendering directors busy. However, a multitude of board seats likewise mirror being intensely connected to the network of interlocking directorships. These intense connections reflect the direct obligations from sitting on a number of boards, but they similarly reflect the indirect connections and the resulting obligations, for example joint memberships in golf clubs or a charitable organization (Hwang and Kim, 2009). In addition, they are often associated with connections to important agents outside the boardroom, e.g., in politics, media, or sports. We suggest that a director has to spend considerable time catering to such social demands. However, as time is limited, too many of these connections may force directors to selectively allocate time among their activities (Ferriani et al., 2009), thereby possibly neglecting their monitoring duties.

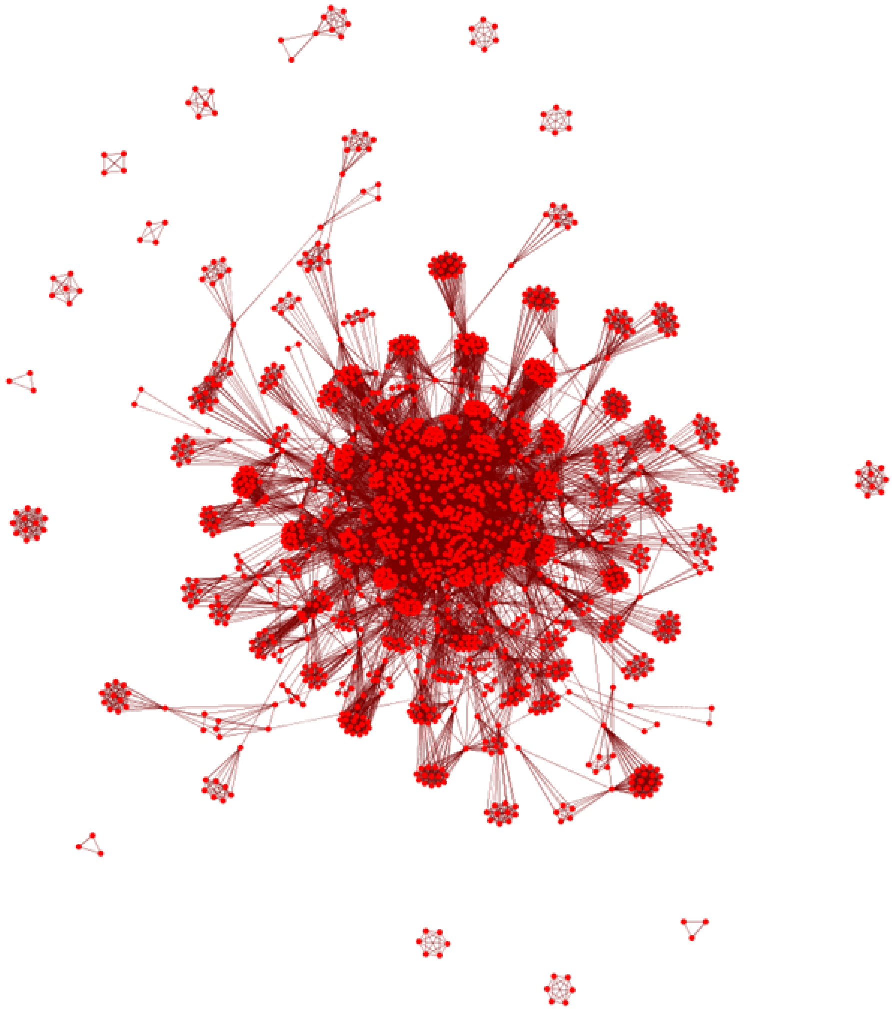
Further, intense network ties may expose directors to an abundance of information. Yet, as human cognitive capabilities are limited (Kahneman, 1973), an overexposure to information may lead to dysfunctionalities in information processing (for a general overview, see Eppler and Mengis, 2004), including the inability to identify relevant data (Schneider, 1987), shifts in attention to irrelevant issues, skipping a large amount of information, or a "greater tolerance of error" (Sparrow, 1999, p.144). Based on an analogous argument, a recent paper by Oldroyd and Morris (2012) theorizes that cognitive limitations restrict the value of network ties, because unmanaged, heavy amounts of information that come with intense network connections lead to information overload and thereby adversely affect an agent's performance. We hypothesize that a director's monitoring abilities are similarly affected if his network connections expose him to too much information. Moreover, we suggest that the intensity of contacts and information and the resulting busyness depend on both the amount and quality of network connections. For example, we argue that a director who is connected to a large number of further well-connected directors is busier than a director whose network connections have little further connections.

The network that we are basing our analysis on is characterized by a strong core-periphery structure with dense, cohesive subgroups (see Figure 3.1). In such environments, the quality of higher-order (triadic) relations among directors, i.e., the relations among the directors that a director is related to, are of particular importance. The literature on social capital (e.g., Coleman, 1988) has stressed the beneficial effects of network "closure", i.e., the existence of connections among a director's connections, because it enables the enforcement of social norms. For example, consider a triple of actors A, B, and C, where B and C have in common a connection to A. If B and C are not connected to each other, they have no means of imposing sanctions on A for deviating from any social norm. However, the formation of a link between B and C produces a so-called "closed" triad where all actors are connected to each other. In this situation, B and C can combine forces to collectively sanction A. Under the assumption that monitoring management constitutes a social norm, one might expect that directors devote more time to monitoring in the context of a relatively "closed" network. This might be reinforced by the fact that in a system with strongly embedded interactions, other directors will more likely receive knowledge of a director's failure to properly monitor (Raub and Weesie, 1990). Still, there are some arguments that closure may be a detriment to efficient monitoring. First, closed networks may restrict directors in their ability to freely allocate their resources among their monitoring duties. This is particularly likely to affect directors with a large number of connections in the network where additional restrictions should ceteris paribus have more intense effects.

Second, we suggest that a more important avenue by which closed networks can affect busyness is by exacerbating the social obligations that arise within the network. For example, take the case of directors B and C each hosting a societal event that director A is expected to attend. Given that A has attended B's event, also attending C's event may be more compulsive if B and C know each other than if they do not. Thus, by imposing more social obligations network closure may increase a director's busyness. We consider this effect to be detrimental for directors having a large number of connections. Additionally, members of the group "feel obligated to help others [...] [as] a societal norm prescribes socially responsible behaviour" (Cialdini and Trost, 1998, p.157). Applied to the supervisory board, members might feel obligated to take on tasks and to help each other if they are asked for advice. In this sense, network-related activities may turn into a time-consuming social liability.

Taken together, we suggest that being embedded in the social network of directors

Figure 3.1: Network of All Directors



Notes: This graphic shows connections between all directors of 133 German firms for the year 2003. The total number of directors is 1,654, the number of connections is 35,106.

limits a director's monitoring ability. On the one hand, maintaining intense network connections may overcommit directors by drawing on their time and cognitive resources. On the other hand, closed network structures restrict and limit a director in his ability to freely allocate his resources. The metrics that we employ attempt to grasp these different dimensions of being part of the network of directors.

3.3 Dataset and Network Measures

3.3.1 Sample Selection

The sample for this investigation is based on all companies that were part of the three largest German stock indices as of 31 December 2002. This results in 150 firms comprised of 30 DAX, 70 MDAX and 50 SDAX constituents.[4] We follow these firms over four years and arrive at a sample of 532 (non-financial) firm-year observations (including 133 firms).[5] Accounting data is obtained from Datastream and Hoppenstedt Aktienfuehrer[6], information on the composition of the supervisory board is manually collected from the annual reports of the firms in our dataset. Panel A of Table 3.1 presents descriptive statistics of several firm characteristics.

3.3.2 Measurement of Multiple Directorships

According to section 125 of the German Stock Corporation Act (AktG) publicly traded firms have to disclose all directorships that members of their supervisory board hold in other (for-profit) firms. We therefore count all directorships in public and non-public firms.[7] This information also allows us to detect all connections between directors in our sample that lie beyond the 133 firms. For example, though "FC Bayern Muenchen AG" is not a sample firm, four directors are connected through it in the sense that they all sit on its board.

As stated above, the German corporate board system is two-tiered. In this system, members of the supervisory board oversee the actions of the executive board, i.e. management. Among other duties, members of the supervisory board appoint and

[4]The DAX (largest firms), MDAX (mid caps), and SDAX (small caps) are the three major indexes of Deutsche Boerse for firms from the classic sectors. These companies, being part of the Prime Standard segment, must fulfill the highest transparency requirements in the EU, e.g. they have to publish their reports on a quarterly basis both in German and English, apply international accounting standards (IFRS/IAS or US-GAAP), release a financial calendar, conduct at least one analyst conference per year and also have to publish their ad-hoc disclosures in English in addition to the German version.

[5]The number of firm-year observations is reduced due to insolvencies, squeeze-outs and missing data.

[6]The Hoppenstedt Aktienfuehrer is a yearly publication that provides detailed information (e.g., ownership structure, balance sheet information) on German listed firms.

[7]If voluntarily reported, we exclude board appointments in non-profit organizations, trusts, and charitable organizations for reasons of data consistency.

dismiss executives, approve managements' decisions, and set their remuneration.[8] Depending on the number of staff, employees are allocated seats in the supervisory board by several codetermination laws. These codetermination laws apply to both public and private companies as soon as they reach a minimum of 500 employees. Simply put, firms with more than 500 but less than 2,000 staff have to allocate one-third, firms with more than 2,000 staff one-half of the supervisory board seats to employee representatives.[9] Employee representatives are often union members (and in the case of large firms often high rank union officials), but in general the staff can elect any employee to the supervisory board. In our sample, about 55% (25%) of the firms are subject to one-half (one-third) representation, 20% do not have employee representatives on their supervisory boards. The data in our main analysis is based on all members of the supervisory board. As a robustness test, we construct all network variables based on shareholder representatives only. Results are not tabulated as they are qualitatively and quantitatively similar.

Following Ferris et al. (2003) and the alternative methodology used by Fich and Shivdasani (2006) we construct three variables that classify boards as busy/not busy based on the number of board appointments held by members of the supervisory board. In line with these papers and consistent with prior work by Core et al. (1999) we consider directors busy if they hold three or more board appointments. Based on this definition, 52.44% (excluding employee representatives) and 33.07% (including employee representatives) of the directors are classified as busy. In Panel B of Table 3.1 we report data regarding the frequency of multiple board appointments for our sample.

The median board in our sample consists of 13 directors, seven of which are shareholder representatives and six are employee representatives. On average, directors hold 3.49 (excluding employee representatives) and 2.72 (including employee representatives) directorships. In line with Fich and Shivdasani (2006) we construct a dummy (0,1) variable that is set to one if 50% or more of the board's shareholder representatives are busy. According to this measure, about 47% of the firms are governed by "busy boards".

[8]See the German Stock Corporation Act (AktG) for a comprehensive description of the rights and duties of the supervisory board.

[9]See Gorton and Schmid (2004) for a more detailed description of the system of codetermination and the legal background.

Table 3.1: Data Description

Panel A.			
Variable	Mean	Median	Std. Dev.
Market Value of Equity (Mio. Euro)	5,382	759	11,490
Book Value of Assets (Mio. Euro)	35,602	1,317	25,167
Leverage	0.66	0.68	0.18
Tobin's Q	1.48	1.16	1.03
Age (Years since Incorporation)	79.54	78.5	56.05
Listing Age (in Years)	29.74	13	36.76
Return on Assets	3.82%	3.07%	7.04%
Executive Remuneration (1,000 Euro)	1,100.40	820.8	970
Without Options (1,000 Euro)	1,009.40	765.5	817

Panel B.			
Variable	Mean	Median	Std. Dev.
Board Size	13.58	13	6.06
Ordinary Board Members	7.78	7	2.51
Employee Representatives	5.8	6	4.71
Number of Directorships	3.49	3.17	1.7
Including Employee Representatives	2.72	2.4	1.29
Percentage of Busy Directors	52.44		
Including Employee Representatives	33.07		
Percentage of Busy Boards	46.78		
Including Employee Representatives	19.36		

Notes: This table contains descriptive statistics for 532 annual observations of 133 German firms for the period from 2003-2006. Leverage is defined as book value of total debt divided by book value of total assets. Tobin's Q is calculated as market value of equity at the end of the year plus book value of debt divided by the book value of assets at the end of the year. Executive remuneration is the average per-capita executive remuneration per year. Panel B provides data on 1,654 directors.

3.3.3 Social Network Measures

Any social network consists of several agents who are connected with each other through social relations such as direct contacts, group attachments, or meetings (Scott, 2000). The members of a network and their connections can be visualized as a structure of nodes and ties. In our analysis, nodes are the individual directors within the network, and ties are the relationships between these directors. Two directors are connected if they serve on the same supervisory board.
For each firm and each year in our sample, we collect data on all directors who serve on a firm's board.[10] This leads to a database with about 1,600 nodes and roughly 35,000 ties. We then build an annual social matrix, in which each director is represented by a column and a row. Whenever two directors i and j serve on the same board, the value of the intersection point, i.e. cell (i,j) is 1, otherwise it is 0. Since relationships are always bilateral (director i sits on the same board as director j, which implies that j must know i), this procedure results in a symmetric matrix, with the diagonal (the relation between i and i) being 0 by definition.
To capture how embedded a director is in the overall network, we use four different well-established measures. Our construction focuses on the overall architecture of a director's social network, i.e., we consider both pairwise (dyadic) relations to other directors as well as higher-order (triadic) relations.
The first measure, *Degree* centrality (C_D), is based on the number of direct links (or contacts) incident on a *node* (i.e. director) and is defined as follows:

$$C_D(n_i) = d_i(n_i) = \sum_{j=1}^{g} x_{ij} = \sum_{j=1}^{g} x_{ji} \tag{3.1}$$

where g is the total number of directors or *nodes* n_i. The variable is further normalized by dividing (3.1) by the number of possible connections of director n_i with the other *g-1 nodes* in the network. Theoretically, this measure should be closest to the variable "busy board" as it only captures the number of connections. *Degree* centrality describes how active an agent is in the network. Even though this measure is very intuitive and comparatively easy to implement, its explanatory power is limited to the first level of the network. This means that two directors who have the same number of

[10] Whenever a director leaves a board during a fiscal year, either due to end of tenure, dismissal, or death, we include both the old and the new director in the respective year's board.

direct connections will get assigned the same value $C_D(n_i)$, irrespective of how well connected their contacts are. The second measure, Eigenvalue centrality, addresses this issue.

Connectiveness or *Eigenvector* centrality (C_C), has been developed by Bonacich (1972, 1987) and uses weighted scores that measure the "quality" of connections when assessing the centrality of an agent. This means that the extent to which a director is connected to other well-connected directors is captured by the *Connectiveness* measure. Whenever a director gets connected to another well-connected agent, this will not only boost his own centrality, but also the centrality of other directors who are connected to him. Formally, the individual centrality of each director is computed as follows:

$$C_C(n_i) = \frac{\sum_{j=1}^{g} W_{ij} C_C(n_j)}{\lambda_{max}} \tag{3.2}$$

W_{ij} stands for the intersection of row i and column j in the social matrix discussed above. Bonacich (1972) shows that there exists a positive Eigenvalue λ for every Matrix W that results in a corresponding Eigenvector C_C that only consists of positive values or 0. This condition is met for the largest positive Eigenvalue. Like *Degree* centrality, *Eigenvector* centrality is normalized.

To proxy for the degree of triadic closure within a director's network, we calculate the local *Clustering Coefficient* (Watts and Strogatz, 1988). It measures how well-connected or dense an actor's neighbourhood is and is defined as the probability that two randomly selected contacts of director A are also connected to each other. In other words, it is the ratio of the number of pairwise relations between director A's contacts to the maximal possible number of relations between them. For example, director A is connected to director B, C, and D and thus has three potential pairs in his neighbourhood (BC, CD, BD). If only one pair is connected, e.g. (BC), the *Clustering Coefficient* of director A is 1/3. The *Clustering Coefficient* can range from zero (neither of A's contacts is connected) to one (all of A's contacts are connected). Therefore, a larger *Clustering Coefficient* implies a higher degree of triadic closure within a director's neighbourhood.

As a last measure we apply the *K-Core* decomposition, which allows identifying dense, cohesive subgroups in the network. The procedure was proposed by Seidman (1983) and is based on the minimum nodal degree within a subgraph. Put differently, a

K-Core is a sub-graph in which each node is connected to at least k other nodes. It can be identified by recursively removing or "peeling off" all nodes with degree smaller than k, until all remaining nodes in the subnetwork have at least a degree of k. This approach generates subgraphs of gradually increasing cohesion. Hence, the higher the *K-Core* score, the better connected are an actor's neighbours and thus the more restricted are his actions. We normalize this measure by dividing by its largest value. Our network measures are computed with the help of the UCINET software package v6.171. Our choice is based on Huisman and van Duijn (2005) who compare different software packages used for social network analysis. Table 3.2 lists the ten most central directors for *Degree* and *Eigenvector* centrality and each year of our sample period.[11] Figures in the table are computed relative to the size of the network to facilitate the comparability of data over different years.

As can be seen from Table 3.2, the *Degree* measure is comparatively stable over time. The number of directorships does not seem to change dramatically among the best connected directors. Taking a closer look at the *Degree*, it becomes apparent that the best connected directors are mostly chairmen of large DAX companies. *Connectiveness*, our second measure, puts an emphasis on the quality of connections. This approach can be illustrated with the example of Henning Schulte-Noelle (chairman of Allianz AG). In 2003, Mr. Schulte-Noelle is among the best connected directors with respect to *Degree* and *Connectiveness*. In 2004, he gave up several directorships and lost over 50 direct connections. As a result, Mr. Schulte-Noelle dropped out of the list with the highest *Degree*. Even though his *Connectiveness* also decreased, he is still among the best connected directors in the years 2004-2006 since he kept his positions at well-connected firms like E.ON AG and ThyssenKrupp AG.

In a last step, the data on individual directors is aggregated on a firm level. This allows us to draw conclusions concerning the extent to which members of the supervisory board - and thus the board as a whole - might be busy or overcommitted. Table 3.3 presents descriptive statistics (in percent) for our centrality measures.

[11] We do not tabulate *Clustering Coefficient* and *K-Core* because a large number of directors have the largest possible values in each variable and year due to the definition of the variables.

Table 3.2: Most Central Directors

Panel A. Top 10 *Degree* and *Connectiveness* for 2003 in Percent

No.	Name	C_D	Name	C_C
1	Schneider, Manfred	9.56	Cromme, Gerhard	26.32
2	Kohlhaussen, M	9.01	Schulte-Noelle, H.	23.89
3	Cromme, Gerhard	8.83	Baumann, Karl-H.	23.34
4	Baumann, Karl-H.	8.59	Schneider, Manfred	21.78
5	Hartmann, Ulich	8.29	Voss, Bernd W.	21.52
6	Schulte-Noelle, H.	7.99	Hartmann, Ulrich	21.05
7	Voss, Bernd W.	7.74	Breuer, Rolf-E.	20.19
8	Walter, Bernhard	7.74	Kohlhaussen, Martin	20.16
9	Breuer, Rolf E.	7.68	Diekmann, Michael	17.09
10	Schinzler, Hans-J.	7.56	Strube, Jürgen	16.82

Panel B. Top 10 *Degree* and *Connectiveness* for 2004 in Percent

No.	Name	C_D	Name	C_C
1	Cromme, Gerhard	8.91	Cromme, Gerhard	28.11
2	Schneider, Manfred	8.85	Schneider, Manfred	23.42
3	Hartmann, Ulrich	8.52	Hartmann, Ulrich	22.79
4	Walter, Bernhard	8.00	Kuhnt, Dietmar	21.47
5	Kuhnt, Dietmar	7.60	Baumann, Karl-H.	20.93
6	Baumann, Karl-H.	7.21	Kohlhaussen, Martin	20.10
7	Kohlhaussen, Martin	7.21	Schulte-Noelle, H.	19.37
8	Strube, Jürgen	6.49	Pierer, Heinrich von	19.18
9	Reich, Hans W.	6.42	Neuber, Friedel	19.04
10	Kley, Max Dietrich	6.36	Walter, Bernhard	18.23

Panel C. Top 10 *Degree* and *Connectiveness* for 2005 in Percent

No.	Name	C_D	Name	C_C
1	Schneider, Manfred	8.98	Cromme, Gerhard	26.56
2	Cromme, Gerhard	8.40	Pierer, Heinrich von	25.69
3	Pierer, Heinrich von	8.27	Schneider, Manfred	23.3
4	Hartmann, Ulrich	8.08	Hartmann, Ulrich	21.97
5	Walter, Bernhard	7.95	Kohlhaussen, Martin	20.78
6	Kohlhaussen, M.	7.18	Schulz, Ekkehard D.	19.78
7	Schulz, Ekkehard D.	6.93	Schulte-Noelle, H.	18.48
8	Reich, Hans W.	6.35	Baumann, Karl-H.	17.63
9	Kuhnt, Dietmar	6.16	Walter, Bernhard	17.43
10	Kley, Max Dietrich	6.09	Weber, Jürgen	17.19

Panel D. Top 10 *Degree* and *Connectiveness* for 2006 in Percent

No.	Name	C_D	Name	C_C
1	Schneider, Manfred	9.31	Cromme, Gerhard	26.27
2	Cromme, Gerhard	8.67	Schneider, Manfred	25.14
3	Hartmann, Ulrich	8.41	Schulz, Ekkehard D.	23.36
4	Schulz, Ekkehard D.	8.29	Hartmann, Ulrich	22.86
5	Pierer, Heinrich von	7.00	Kuhnt, Dietmar	20.03
6	Kuhnt, Dietmar	6.74	Weber, Jürgen	19.30
7	Kohlhaussen, Martin	6.62	Pierer, Heinrich von	18.67
8	Reich, Hans W.	6.42	Kohlhaussen, Martin	18.58
9	Grünberg, Hubertus	6.23	Schulte-Noelle, H.	16.52
10	Strube, Jürgen	5.97	Grünberg, Hubertus	15.97

This table contains a list of the ten most central directors in the network of German firms subdivided into *Degree* C_D and *Connectiveness* C_C centrality measures for the period from 2003-2006.

Table 3.3: Normalized Firm Centrality in Percent

Variable	Mean	Median	Lowest Decile	Highest Decile	Std. Dev.
Average Degree	1.259	1.034	0.321	2.647	0.876
Average Connectiveness	1.947	0.473	3.74×10^{-28}	6.851	2.911
Average Clustering Coefficient	84.533	86.059	67.556	100	11.34
Average K-Core	44.353	42.183	16.129	74.866	22.96
Average Degree (w/o empl.)	1.63	1.237	0.388	3.572	1.222
Average Connectiveness (w/o empl.)	3.235	0.927	0	11.178	4.57
Average Clustering Coefficient (w/o empl.)	73.872	76.508	46.883	100	19.261
Average K-Core (w/o empl.)	37.28	33.766	14.773	62.338	18.157

Notes: This table contains descriptive statistics of the network centrality measures *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* for a sample of 532 firm-year observations for the period from 2003-2006.

3.4 Multivariate Analysis

Our main hypothesis rests on the assumption that individuals who are overcommitted might shirk their responsibilities as directors. In the previous literature, the "busyness" of a director has been derived based on the number of directorships. We argue that this might be too simplistic a measure since it does not capture the "quality" of these other obligations and propose an alternative approach based on measures from social network research.

In this section, we examine the effect of overcommitted boards on firm performance (measured by Tobin's Q) and executive remuneration (measured by the sum of fix and variable compensation) in a multivariate panel regression framework.

3.4.1 Multiple Directorships and Firm Performance

In a first step, we apply the methodology used by Ferris et al. (2003) and Fich and Shivdasani (2006) to our dataset. More specifically, we estimate firm fixed-effects models using market-to-book value as the dependent variable.[12] These models assume that agency costs (which arise due to poor monitoring by overcommitted directors) are reflected by a lower market-to-book ratio. The market-to-book ratio is used as a proxy for Tobin's Q. It is calculated as market value of equity at the end of the year plus book value of debt divided by the book value of assets at the end of the

[12] Ferris et al. (2003) use a cross-section of 1995 data; Fich and Shivdasani (2006) analyze data from 1989-1995 using fixed-effects regressions.

year. As explanatory variables, we include the three alternative measures for "busy boards" used by Fich and Shivdasani (2006) and variables that control for corporate governance and financial characteristics. We control for firm size using the natural logarithm of total assets. According to the results of Yermack (1996) and Fich and Shivdasani (2006) board size has a negative and significant effect on firm performance. We therefore control for board size using the log of the number of directors. We also control for the fraction of employee representation on the board. In a study of German codetermination, Gorton and Schmid (2004) find that market valuation decreases with the number of employee representatives on the supervisory board. In addition, several studies have shown that ownership characteristics play an important role in the German system of corporate governance (Franks and Mayer, 2001; Andres, 2008). In the absence of an active takeover market, large blockholders often act as the main monitors of a firm. However, a very large blockholder might abuse his position and may have an incentive to expropriate minority shareholders. We therefore include both the voting rights of the largest blockholder ($> 5\%$) as well as its squared term as control variables. The regressions further contain controls for the (log) number of board meetings, firm age (natural logarithm of years since incorporation), risk (return volatility, measured as the standard deviation of daily share price returns for the previous 36 months) and capital structure (leverage, defined as book value of total debt divided by book value of total assets). Lastly, all models include year dummies. The results of the multivariate panel regressions are reported in Table 3.4. In models (1)-(3) all variables that measure the extent to which boards are busy are based on directors that represent the interests of shareholders (i.e. excluding employee representatives). Regressions (4)-(6) are based on all directors, including employee representatives. We do not find signs of a significant relationship between busy directors and firm performance in any model specification. The coefficients for busy board (a dummy that is set to one if 50% or more of the directors hold three or more directorships) and percentage of busy directors (both used by Fich and Shivdasani, 2006) are negative but insignificant. The variable average number of directorships (used by Ferris et al., 2003) shows positive, yet insignificant coefficients. These findings indicate that the number of board appointments that a directors holds does not seem to have an influence on firm performance in Germany. Compared to U.S. studies, the results are in line with Ferris et al. (2003) but stand partly in contrast to Fich and Shivdasani (2006).

3.4.2 Director Networks and Firm Governance

The preceding results do not support the hypothesis that busy boards are associated with poor firm performance. This view is based on the notion that too many board assignments might detract from the ability of directors to act as vigilant monitors of management; directors might become overcommitted and as a result they might not have the time and attention required for their monitoring duties. As discussed above, several research papers have tested the hypothesis that serving on multiple boards has a negative impact on corporate performance. In these studies, boards are classified as busy/not busy based on the number and percentage of directorships per director. We maintain, however, that these measures will be noisy if they fail to adequately capture the extent to which directors are truly busy and propose using alternative measures from social network analysis. The variables *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* (aggregated on a firm level) are employed in order to measure the extent to which a firm's directors are overcommitted.

We first examine the effect of directors' embeddedness in the social network on firm performance. Table 3.5 reports the results of fixed-effects regressions with market-to-book ratio as dependent variable. In model specifications (1) - (4) we use the network measures as substitutes for the busy board variables included in section 3.4.1. Model specifications (5) - (8) contain the busy dummy as an additional control variable. As network measures, we use the average *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* for every firm and year. All other control variables are equal to the regressions above. Concerning the influence of the number of directorships (captured by the variable *Busy Board*) on Tobin's Q, the specifications (5) - (8) in Table 3.5 confirm the preceding findings and show insignificant coefficients in all model specifications. In contrast, we find negative and significant coefficients (at the 0.05-level) on the variables *Degree* and *Connectiveness*. This indicates that having directors who are comparatively central in the network is associated with poor firm performance. Even though intense network connections could theoretically be beneficial for the firm (e.g. access to financial resources), they may overcommit directors by drawing on their time and cognitive resources. To further explore the impact of a director's higher order relations, we first use the local *Clustering Coefficient* which measures the degree

Table 3.4: Multiple Directorships and Firm Performance

	Excluding Employee Representatives			All Directors		
Variable	(1)	(2)	(3)	(4)	(5)	(6)
Busy Board	-0.045			-0.072		
	(-0.60)			(-0.75)		
Percentage of Busy Directors		-0.005			-0.012	
		(-0.02)			(-0.04)	
Average Number of Directorships			0.043			0.054
			(1.05)			(0.89)
Firm Size (Log of Total Assets)	-0.288	-0.232	-0.225	-0.230	-0.232	-0.226
	(-1.12)	(-1.24)	(-1.12)	(-1.14)	(-1.14)	(-1.12)
Board Size (Log of No. of Directors)	0.037	0.053	0.080	0.057	0.053	0.073
	(0.25)	(0.37)	(0.57)	(0.42)	(0.38)	(0.52)
Codetermination	0.852	0.822	0.798	0.813	0.822	0.855
	(1.74)*	(1.59)	(1.65)	(1.67)*	(1.64)	(1.63)
Leverage	-0.008	-0.009	-0.029	-0.036	-0.009	-0.026
	(-0.01)	(-0.02)	(-0.05)	(-0.06)	(-0.02)	(-0.05)
Largest Blockholder	0.005	0.005	0.004	0.005	0.005	0.004
	(0.82)	(0.82)	(0.69)	(0.78)	(0.81)	(0.69)
Largest Blockholder^2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.59)	(-0.58)	(-0.48)	(-0.54)	(-0.57)	(-0.49)
Board Meetings	0.025	0.025	0.030	0.026	0.025	0.029
	(1.33)	(1.33)	(1.44)	(1.36)	(1.32)	(1.41)
Return Volatility	0.000	0.000	0.000	0.000	0.000	0.000
	(1.51)	(1.48)	(1.52)	(1.48)	(1.48)	(1.50)
Firm Age	0.601	0.612	0.614	0.609	0.613	0.611
	(1.43)	(1.46)	(1.46)	(1.46)	(1.46)	(1.46)
R-Squared	0.142	0.142	0.147	0.142	0.141	0.146
F-Statistic	4.35	3.92	3.65	3.36	3.79	3.41
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: This table contains results of fixed-effects regressions of market-to-book value on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). Percentage of busy directors is the percentage of directors (per firm) who hold three or more directorships. In specifications (1)-(3) these variables are computed based on shareholder representatives only, the board variables in models (4)-(6) are based on all directors (including employee representatives). Codetermination is defined as the number of employee representatives divided by the number of supervisory board members. Leverage is defined as book value of total debt divided by book value of total assets. Large shareholders are shareholders who hold more than 5% of the voting equity. Return volatility is measured as the standard deviation of share price returns for the previous 36 months. Firm age is the natural logarithm of years since incorporation. All regressions include year dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

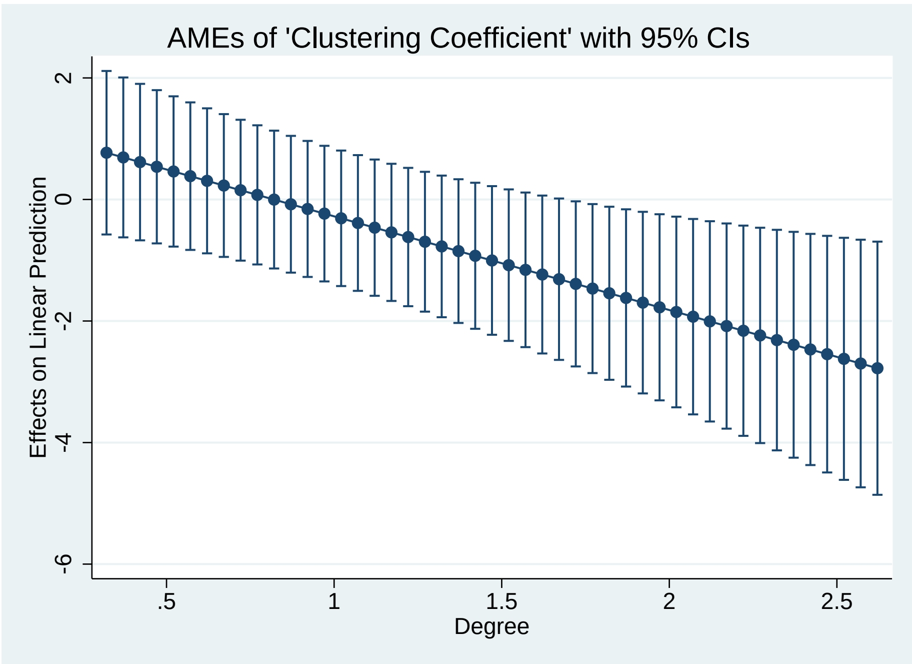
Table 3.5: Director Networks and Firm Performance

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Degree	-0.449		-0.704		-0.444		-0.686	
	(-2.21)**		(-2.57)**		(-2.27)**		(-2.66)***	
Connectiveness		-0.073				-0.073		
		(-2.07)**				(-2.10)**		
Clustering Coefficient			-0.771				-0.679	
			(-1.28)				(-1.16)	
Clustering Coefficient			-1.535				-1.542	
*Degree			(-2.74)***				(-2.77***)	
K-Core				-1.076				-1.078
				(-2.05)**				(-2.05)**
Busy Board					0.062	0.070	0.072	0.073
					(0.73)	(0.76)	(0.90)	(0.78)
Firm Size	-0.232	-0.222	-0.261	-0.250	-0.230	-0.220	-0.258	-0.247
(Log of Total Assets)	(-1.17)	(-1.10)	(-1.33)	(-1.25)	(-1.17)	(-1.10)	(-1.32)	(-1.25)
Board Size	0.367	0.125	0.602	0.430	0.367	0.128	0.588	0.434
(Log of No. of Directors)	(1.69)*	(0.84)	(2.06)**	(1.61)	(1.70)*	(0.86)	(2.08)**	(1.62)
Codetermination	0.721	0.768	0.529	0.640	0.717	0.763	0.529	0.633
	(1.83)*	(1.93)*	(1.26)	(1.27)	(1.82)*	(1.92)*	(1.27)	(1.26)
Leverage	-0.124	-0.101	-0.116	-0.033	-0.145	-0.125	-0.137	-0.058
	(-0.22)	(-0.18)	(-0.21)	(-0.06)	(-0.26)	(-0.22)	(-0.25)	(-0.11)
Largest Blockholder	0.006	0.005	0.007	0.006	0.006	0.005	0.007	0.006
	(0.96)	(0.84)	(1.06)	(0.97)	(0.95)	(0.82)	(1.05)	(0.96)
Largest Blockholder^2	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(-0.78)	(-0.66)	(-0.88)	(-0.72)	(-0.77)	(-0.65)	(-0.86)	(-0.71)
Board Meetings	0.027	0.025	0.030	0.027	0.028	0.026	0.031	0.028
	(1.42)	(1.32)	(1.55)	(1.40)	(1.45)	(1.35)	(1.59)	(1.43)
Return Volatility	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(1.53)	(1.36)	(1.67)*	(1.54)	(1.52)	(1.35)	(1.66)*	(1.53)
Firm Age	0.743	0.646	0.763	0.677	0.739	0.642	0.756	0.674
	(1.77)*	(1.54)	(1.86)*	(1.66)*	(1.76)*	(1.53)	(1.84)*	(1.65)
R-Squared	0.160	0.151	0.178	0.148	0.161	0.152	0.179	0.149
F-Statistic	4.44	4.28	3.89	3.47	4.15	3.99	3.68	3.28
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: This table contains results of fixed-effects regressions of market-to-book value on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* are measures for the embeddedness of a firm's directors in the social network. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). Codetermination is defined as the number of employee representatives divided by the number of supervisory board members. Leverage is defined as book value of total debt divided by book value of total assets. Large shareholders are shareholders who hold more than 5% of the voting equity. Return volatility is measured as the standard deviation of share price returns for the previous 36 months. Firm age is the natural logarithm of years since incorporation. All regressions include year dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

of closure within a director's neighbourhood. Since the *Clustering Coefficient* itself does not indicate to how many other directors a director is connected, we include an interaction term to allow the effect of the *Clustering Coefficient* to vary with a director's nodal *Degree*. Both interaction variables are centered at their respective mean (i.e. we subtract the variables' means from each of the variables' values). Our findings suggest that the degree of triadic closure does not significantly affect the performance of firms with an average nodal *Degree*. The interaction term, however, is negative and highly significant (at the 0.01-level), i.e. the marginal effect of closure significantly decreases if the number of connections a director holds increases. As stated before, we expect that a director's monitoring ability is adversely affected by a relatively closed network structure, particularly if he is already highly connected. To illustrate this effect, we plot the average marginal effect of the *Clustering Coefficient* for different levels of *Degree* (range: 10%-90% percentile of degree) in Figure 3.2. At low levels of a director's *Degree*, the marginal effect of closure is positive, yet not

Figure 3.2: Average Marginal Effect (AME) of 'Clustering Coefficient' on Tobin's Q with 95% Confidence Intervals (CIs)



significantly different from zero. At higher levels of *Degree*, the effect shrinks and becomes negative and significant (at the 0.05 (0.10)-level) if the normalized *Degree* amounts to roughly 1.7 (1.5). Accordingly, network closure seems to negatively affect firm performance if the boards' directors hold a large number of relations. These findings provide support to the idea that, by imposing too many time-consuming social obligations, closed network structures may be detrimental to efficient monitoring. In addition to these results, we find a negative and significant coefficient (at the 0.05-level) of the variable *K-Core*. This implies that directors whose relations are clustered in a cohesive subgroup are associated with lower firm performance. The results continue to hold if we include the busy dummy as additional control.

In order to investigate the effect on firm governance further, we examine the relationship between network embeddedness and the level of executive compensation. Prior academic research suggests that weak monitoring and poor governance are positively related to executive compensation. The underlying theory is based on the notion that in firms with weak corporate governance structures and insufficient monitoring, executives successfully influence their compensation committees. Core et al. (1999), for example, find that CEO compensation is higher when the board is large, and when the CEO holds the position of chairman of the board. Yermack (1997) presents related evidence by showing that the CEO's success in receiving stock options at favourable times depends significantly on his influence on the board. Cyert, Kang and Kumar (2002) show, both theoretically and empirically, that top-management compensation is influenced by the board's structure. In line with Core et al. (1999), they find CEO compensation to be higher when the CEO is also chairman of the board. Lastly, Sapp (2008) shows that measures for weaker boards are related positively to the level of CEO compensation.

According to Shleifer and Vishny (1986), the presence of a large shareholder leads to closer monitoring of the managements' performance. Bertrand and Mullainathan (2001) find that in firms that lack a large external blockholder, CEO compensation is less dependent on managerial effort. They find that in better governed firms, CEOs are less likely to be rewarded for luck. Hartzell and Starks (2003) examine the relationship between ownership concentration and executive compensation and find higher pay-performance sensitivities and lower executive compensation the more concentrated institutional ownership is. Related to the literature on busy boards, Shivdasani (1993) finds evidence of a positive relation between CEO compensation and the number of directorships that each director holds.

All in all, these papers provide strong support for the view that executive compensation is an important component of corporate governance and show that poor governance is associated with comparatively high levels of executive pay. Following the hypothesis that overcommitted directors spend less time and effort monitoring management, we investigate the relationship between the directors' embeddedness in the network and the level of executive compensation. As dependent variable, we compute the average per-capita executive compensation for each firm and year.[13] As before, the variables *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* (aggregated on a firm level) are employed in order to measure the directors' busyness. One of the stylized facts of compensation research is the positive relationship between firm size and executive pay. It is well documented in the empirical literature that large firms pay their executives more (see e.g. Murphy, 1985; Ryan and Wiggins, 2001). We therefore include firm size (logarithm of total assets) as a control variable. With regard to board characteristics, we include the size of the executive board (measured as the log of the number of executives) and the fraction of employee representatives as controls. Among the explanatory variables, we also include the fraction of voting rights of the largest blockholder as well as its squared term. Even though most firms use some form of equity-based compensation as part of their executive compensation packages, pay-performance sensitivities are generally found to be low (e.g. Jensen and Murphy, 1990). Nevertheless, we control for past operating performance (return on assets) and stock price performance (we use the CDAX performance index to adjust stock returns over the past 12 months). Leverage (as book value of total debt divided by book value of total assets) and firm age (natural logarithm of years since incorporation) are also included as control variables. Lastly, we include dummy variables to control for year fixed effects.

The results of fixed-effects panel regressions with executive compensation as dependent variable are presented in Table 3.6. In model specifications (1) - (4), the busy board

[13] Until recently, German companies were not required to disclose executive remuneration on an individual basis. However, disclosure of the aggregate executive remuneration is mandated by the German Commercial Code. We combine the information on aggregate compensation with information on the number of executives to compute the average per-capita remuneration for all sample firms. From 2007 onwards, publicly listed firms are required by law to disclose executive compensation on an individual basis (if the shareholders' meeting does not grant an exemption from the disclosure requirement).

Table 3.6: Director Networks and Executive Compensation

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Degree	230.1		151.6		236.8		161.5	
	(1.79)*		(1.11)		(1.84)*		(1.16)	
Connectiveness		59.31				59.93		
		(1.71)*				(1.76)*		
Clustering Coefficient			-705.0				-637.9	
			(-1.31)				(-1.17)	
Clustering Coefficient			-200.3				-214.4	
*Degree			(-0.37)				(-0.39)	
K-Core				66.58				75.93
				(0.16)				(0.19)
Busy Board					83.44	77.87	68.98	75.59
					(1.38)	(1.33)	(1.13)	(1.24)
Firm Size	376.0	361.6	363.7	373.9	379.0	364.2	366.7	376.8
(Log of Total Assets)	(2.32)**	(2.21)**	(2.35)**	(2.37)**	(2.29)**	(2.19)**	(2.33)**	(2.35)**
Executive Board Size	-216.0	-218.0	-211.0	-225.8	-222.2	-224.0	-215.7	-231.8
(Log of No. of Executives)	(-2.18)**	(-2.22)**	(-2.09)**	(-2.22)**	(-2.27)**	(-2.30)**	(-2.15)**	(-2.30)**
Codetermination	516.7	590.3	526.1	594.7	517.1	592.8	524.4	596.3
	(1.09)	(1.03)	(0.96)	(1.16)	(1.10)	(1.04)	(0.97)	(1.18)
Leverage	240.5	256.5	229.0	181.2	219.9	236.4	213.1	161.3
	(0.70)	(0.77)	(0.67)	(0.53)	(0.64)	(0.71)	(0.62)	(0.47)
Largest Blockholder	2.318	2.292	2.072	2.321	2.230	2.210	2.025	2.243
	(0.37)	(0.37)	(0.33)	(0.36)	(0.35)	(0.35)	(0.32)	(0.35)
Largest Blockholder^2	-0.024	-0.022	-0.020	-0.027	-0.023	-0.021	-0.020	-0.027
	(-0.34)	(-0.32)	(-0.29)	(-0.39)	(-0.33)	(-0.30)	(-0.29)	(-0.38)
Stock Price	68.52	68.19	66.46	66.75	67.23	66.97	65.79	65.49
Performance	(2.08)**	(2.07)**	(1.99)**	(2.00)**	(2.05)**	(2.04)**	(1.98)**	(1.97)*
Return on Assets	954.9	928.8	919.0	939.2	951.0	924.5	916.8	936.2
	(2.07)**	(2.01)**	(1.99)**	(1.99)**	(2.05)**	(1.99)**	(1.97)*	(1.98)**
Firm Age	-298.2	-241.9	-283.8	-218.4	-305.3	-246.5	-290.3	-223.6
	(-1.35)	(-1.44)	(-1.30)	(-1.01)	(-1.38)	(-1.16)	(-1.33)	(-1.04)
R-Squared	0.207	0.206	0.210	0.197	0.210	0.208	0.213	0.199
F-Statistic	5.88	5.97	5.19	5.36	5.57	5.65	4.91	5.03
(P-Value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: This table contains results of fixed-effects regressions of the logarithm of average per-capita executive remuneration on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* are measures for the embeddedness of a firm's directors in the social network. Busy board is an indicator variable that is set to one if 50% (or more) of a firm's directors hold three (or more directorships). Codetermination is defined as the number of employee representatives divided by the number of supervisory board members. Leverage is defined as book value of total debt divided by book value of total assets. Large shareholders are shareholders who hold more than 5% of the voting equity. Stock price performance is defined as the raw stock price return minus the return of the CDAX index. Firm age is the natural logarithm of years since incorporation. All regressions include year dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

variable is substituted by our network measures, whereas model specifications (5) - (8) contain the busy dummy as an additional control.[14] As hypothesized, we find a positive and significant relationship between the network measures and the level of executive compensation. While we find no evidence for a relation between the *Clustering Coefficient* and *K-Core*, the coefficients on *Degree* and *Connectiveness* are all positive and significant (at the 0.10-level). This finding implies that firms in which members of the supervisory board are better connected in the network of German directors pay their executives more. Since the regressions also control for size and performance, these results can be interpreted as supporting evidence of the hypothesis that directors who are well connected are associated with poor monitoring. Concerning the other control variables, the coefficients on *Busy Board* are positive, but insignificant in all model specifications. In line with the literature, we find a significantly positive relationship between firm size and executive compensation. In addition, remuneration seems to be positively influenced by the stock price performance of the past 12 months.

In sum, the results of the regression analysis provide evidence that high levels of director embeddedness are associated with low firm performance and high levels of executive compensation. The results further indicate that social network measures yield explanatory power beyond simple measures of director busyness. We interpret our findings as evidence for weaker governance and poorer monitoring in firms with directors who are intensely-connected in the social network.

3.4.3 Robustness Tests

The findings presented above potentially suffer from the problem of endogeneity: As a result of bad performance, firms might seek to appoint well connected directors - who have built experience and reputation - to their boards in order to improve corporate performance. This reversed causality would imply that performance is not worse due to better connected boards: It could be the case that only bad firms seek the advice of better connected directors and therefore boost their boards' network embeddedness

[14]We also run all regressions with executive compensation as dependent variable using the three measures for busy boards that are derived from the number of directorships per director (not reported). The coefficients on these measures are negative, but insignificant in all regressions. We suggest that this supports our idea that these measures are inadequate proxy variables to capture the extent to which directors are truly overcommitted.

Table 3.7: Effect of Past Performance on Network Embeddedness

Dependent Variable	Change in Degree	Change in Connectiveness	Change in Clustering Coefficient	Change in K-Core
Variable	(1)	(2)	(3)	(4)
Abnormal Stock Return	0.023	0.241	0.012	0.013
(Current Year)	(0.51)	(1.17)	(0.74)	(0.06)
Abnormal Stock Return	0.004	-0.002	-0.003	-0.194
(Previous Year)	(0.18)	(-0.04)	(-0.34)	(-1.49)
Change in Tobin's Q	-0.038	-0.298	0.002	0.058
	(-0.96)	(-1.58)	(0.16)	(0.34)
Change in Size	-0.00	-0.00	0.00	-0.00
	(-1.66)*	(-0.15)	(0.99)	(-0.76)
Industry Dummies	yes	yes	yes	yes
Year Dummies	yes	yes	yes	yes
R-Squared	0.021	0.032	0.031	0.137

This table contains results of ordinary least square regressions of changes in network embeddedness on several firm characteristics for a sample of 133 German firms for the period from 2003 till 2006. *Degree*, *Connectiveness*, *Clustering Coefficient* and *K-Core* are measures for the embeddedness of a firm's directors in the social network. The abnormal stock return is computed as raw stock return during the current year minus the return of the CDAX-index. The change in size is measures by the log of total assets. All regressions include year and industry dummies. T-Statistics (in parentheses) are based on White-Heteroskedasticity consistent standard errors clustered at the firm level. The total number of observations is 399. Asterisks denote statistical significance at the 0.01(***), 0.05(**) and 0.10(*)-level.

through the appointment of well connected directors. We test the causality of our results by estimating regression models of the relation between past performance and changes in network embeddedness. Similar to the methodology used in Yermack (1996) we take the total annual change in the network measure (from t=-1 to t=0) as the dependent variable. As explanatory variables, we include the abnormal stock price performance (raw stock price return minus the return of the CDAX index) during the same year (t=-1 to t=0) and in the previous year (t=-2 to t=-1). If companies indeed appointed well connected directors as a result of poor performance, either the performance in the year of the board change or in the previous year (and hence the coefficients of these two variables) should show some level of significance. As additional control variables, we include the change in Tobin's Q and the change in firm size (log of total assets).

Table 3.7 contains the results of these OLS-regressions. The models do not provide any evidence that firms change the embeddedness of their boards in response to poor performance. In other words, we do not find evidence of a reversed causality as well connected directors do not seem to be appointed as a response to bad performance.

There is weak evidence that the measure *Degree* tends to decrease in response to (positive) changes in firm size.

3.5 Conclusion

Following a number of corporate scandals, governance structures have recently become a subject of public debate in many countries. Shareholder activists and organizations that defend the interests of minority shareholders often criticize firms for appointing directors who hold several directorships in other firms. This view is based on the argument that serving on too many boards will place a heavy burden on directors. As a result, directors might become overcommitted and shirk their responsibility as monitors of management. Corporate governance policy advocates have therefore called for limits on the number of directorships that a director should hold.

The debate has also spurred empirical research that investigates whether busy directors are indeed associated with poor governance. So far, empirical evidence is scarce and limited to the U.S. Most importantly, previous papers only look at the number of directorships in order to classify directors as (not) busy. In this manner, the metric used fails to grasp the quality and structural position of additional board seats. We propose an alternative approach based on measures from the social network literature. We examine a sample of 133 German firms over four years, leading to a network of about 1,600 directors and 35,000 connections. Aggregated on a firm level, we use this data to investigate the relationship between firm governance and the directors' embeddedness in the network. Our results show that well connected boards are associated with lower performance (as measured by Tobin's Q). In addition, firms with better connected directors (in terms of *Degree* and *Connectedness*) pay their executives significantly more. We interpret these findings as evidence for poor monitoring in firms that have well connected directors.

We by no means claim that we have found the "perfect" measure of director busyness. There might be cases in which supervisors with weak or (almost) no connections to the corporate elite are busier than other directors due to hobbies, volunteer activities, etc. However, our results indicate that network measures contribute to the complex and hard to measure issue of busyness and help explain dimensions of busyness that go beyond the simple number count of board appointments.

These findings have direct policy implications. They suggest that calls for a limit of directorships are ill-advised (as long as a limitation does not take into account the quality of these obligations). Our results also imply that it might not be optimal for shareholders to base their decision to vote for a particular director solely on his/her reputation, since the most reputable directors will most likely be those who are already present on several boards and therefore have to balance the interests of many parties. Having a large number of intensely connected directors on the board can thus be counterproductive as it might lead to an overcommitted board.

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