

Corporate Governance and the Market Value of Shareholder Voting Rights*

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Abstract

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This study investigates the relation between voting-right values and corporate governance in European companies. Shareholder voting values are negatively related to the degree of minority-investor protection provided by the legal system in the following decreasing order: French civil law, German civil law, Scandinavian civil law, and common law. Further, voting-right values increase with the existence of CEO-chairman dual mandates and staggered boards, but decrease with voting-right caps and active poison-pill securities. Finally, cumulative voting and binding say-on-pay provisions are found to strengthen the decision power of minority shareholders and, thus, increase voting values at general meetings.

1 Introduction

Agency issues arise in modern corporations because ownership and control are separated (see, e.g., Coase, 1937; Jensen and Meckling, 1976). The resulting information asymmetries between company insiders, the agents, and outsiders, the owners, paired with conflicting interests lead to agency costs and a misallocation of funds (see, e.g., Grossmann and Hart, 1986).¹ These inefficiencies arise from monitoring expenses for shareholders, bonding costs for the managers, e.g., when managers guarantee to limit the scope of their activity, and so-called residual losses occurring from managers' actions that are detrimental to the maximization of shareholder welfare (Jensen and Meckling, 1976). Corporate governance can be defined as a system of mechanisms that reduce agency costs by providing incentives for the agents to act in the best interest of the principal, e.g., through monitoring from the supervisory board as well as the shareholders themselves, via performance-dependent compensation, or product-market competition (see, e.g., Shleifer and Vishny, 1997; Gompers, Ishii, and Metrick, 2003). This theory of the modern firm has sparked the interest of many researchers who try to quantify the correlations between various governance mechanisms and firm valuation. Typically, the measurement of governance effects focuses either on the level and returns of share prices or on accounting performance (see, e.g., Yermack, 1996; Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009; Ammann, Oesch, and Schmid, 2011). In this study, we examine a novel perspective and measure the relationship between corporate governance and voting-right values.

This study contributes to the literature on corporate governance as well as the research on the measurement of voting-right values and private benefits. First, the study provides a comprehensive valuation of voting rights in companies from ten of the major European economies. Second, the voting values are related to the firms' governance mechanisms in two different settings. In a first analysis, the relationship between the levels of voting values and the firms' governance effectiveness is examined based on several major channels; i.e., the supervisory board, management compensation, shareholder monitoring, the market of corporate control, and the minority-investor protection of the legal system. The second investigation focuses on shareholder meetings and tests whether certain voting procedures, such as cumulative voting during the election of directors or say-on-pay votes, have a measurable impact on the voting power of small shareholders.

To the best of our knowledge, no study has so far extensively researched the empirical relations between corporate governance and voting values. The reasons for the lack of the respective research are associated with the problematic measurement of voting-right values. Classical approaches are either not suitable to test for level effects or limited in their empirical relevance (see, e.g., Kalay, Karakas, and Pant, 2014).² We circumvent

¹While the owners focus on maximizing the returns on their investments, rational managers aim at maximizing their compensation at lowest possible effort.

²The two more longstanding valuation approaches are the dual-class approach (see, e.g., Lease, McConnell, and

the valuation problems by extracting voting-right values from equity options as proposed by Kalay, Karakas, and Pant (2014) and Kind and Poltera (2013). The intuition for using options as valuation subjects is that the share price must carry a voting premium if it is valuable for an investor to hold the voting rights at a specific point in time. If such voting values accrue to shareholders, similar as in the case of dividend payments, not only share prices should react, but also the prices of options written on it. Compared to the other methods, the most important advantage of the option-based approaches, besides the broader coverage of firms, lies in the fact that the extracted estimates reflect voting values over a limited period of time, namely the options' maturity. Therefore, the approach allows one to associate voting-right values with specific control-related events. In contrast, the analysis of share prices and returns leads to a measurement of voting-right values over an infinite time horizon equal to the present value of all expected future voting and control-related events.

The empirical results provide several interesting insights. In a first comprehensive analysis, we measure 17,582 voting yields in monthly intervals for 442 companies in ten of the major European economies between 2002 and 2012. The valuation reveals an average voting yield of 0.45%, which significantly increases during general-meeting months (1.62% on average). For one, the weak legal protection of minority-investor interests in French and German civil-law countries has a significantly positive effect on voting yields when compared with voting values obtained in common-law countries. Further, the value of votes are positively correlated with the existence of the CEO-chairman duality and staggered boards, but negatively with voting-right caps and poison-pill provisions adopted from outsider-dominated boards. These findings indicate that the value of voting rights of small shareholders are high in those firms where control can be acquired frictionlessly and agency costs are high, i.e., when the monitoring threats for company insiders regarding private consumption are low and no takeover-defense mechanisms are active. In a second valuation setting, we focus on voting yields measured in the forefront of shareholder meetings. The results provide evidence that the controlling power of small investors increases when board directors are elected in a cumulative voting procedure. Additionally, the legal possibility to vote on management compensation seems to be perceived positively by shareholders given that the say-on-pay votes are binding and existing compensation packages are not performance sensitive.

The remainder of this study is organized as follows. Section 2 discusses the relationship between corporate voting rights and the effectiveness of governance mechanisms. Section 3 continues with the presentation of the methodological setup and the empirical measurement of voting-right values in European firms. In addition, it also provides cross-sectional analyses of the voting values by means of a broad set of governance variables. In a second analysis, Section 4 focuses on the valuation of voting values around shareholder meetings to test the shareholders' perception of governance practices directly related to voting at general meetings. Finally, Section 5 discusses the most important findings of the study and concludes.

2 Corporate Governance and Voting-Right Values

2.1 Advantages of Using Voting-Right Values to Measure Governance Effects

Studying the empirical correlations of corporate governance standards and practices of European firms with voting-right values offers several advantages over traditional approaches. First, the governance-voting relationship is for a large part unexplored in empirical literature and, thus, can provide new insights about the virtue of governance standards as well as investors' perceptions of certain practices.

Mikkelsen, 1983; Zingales, 1994; Nenova, 2003) - which compares prices of two shares with different voting power issued by the same company (small sample sizes, significant liquidity differences between share classes) - and the block-trade approach (see, e.g. Bradley, 1980; Barclay and Holderness, 1989; Dyck and Zingales, 2004), which measures controlling premiums paid for large block transfers of shares (very small and non-representative samples).

Second, the traditional tests of corporate-governance effects based on stock returns or accounting data are subject to various measurement problems. Although there is evidence that governance matters for share returns at least during certain time periods (see, e.g., Yermack, 1996; Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009; Ammann, Oesch, and Schmid, 2011), the price measure is likely not able to capture all effects. If investors anticipate that managers consume company assets at the cost of outside shareholders, share prices should incorporate these losses while stock returns should remain unaffected (Gompers, Ishii, and Metrick, 2010). Further, reported accounting numbers are infrequently updated and are subject to earning management at the discretion of managers and directors (see, e.g., Ball and Brown, 1968; Cheng and Warfield, 2005). Therefore, the inferred governance impact on firm valuation of such studies are distorted measures of the true correlation. In contrast, voting values isolated from option and stock prices (i) are obtained from liquid financial assets whose values are frequently updated and (ii) reflect the marginal investor’s willingness to pay for a voting right over a short time span for which the assumption of perfect market foresight is reasonable.³

Third, European companies provide an ideal setting for empirical tests of the relationships between governance and voting values. For one, the trading volume of exchange-listed individual equity options is second only to the one of US-firms and makes out roughly one third of the global volume over the sample period.⁴ Further, governance structures differ significantly across the sample countries (cf. Subsection 3.3.2) which leads to a heterogeneous distribution of mechanisms and practices ideal for comprehensive cross-sectional analyses.

2.2 Governance Mechanisms

In the empirical analyses of this study, we focus on four governance channels on the firm level, i.e., the supervisory board, management compensation, shareholder monitoring, and the market of corporate control, while also accounting for external mechanisms in the form of minority-investor protection and leverage. For each of these channels, researchers have comprehensively studied their economic effectiveness in reducing agency costs and the circumstances under which the mechanisms are compromised.

First of all, it is the legal duty of corporate boards to supervise and monitor executive managers in the German two-tier system as well as in the one-tier system of the other sample countries. A board’s monitoring efficiency is supposedly high when board members have no relations with the management, i.e., typically when the majority of the directors are independent firm outsiders (see, e.g., Rosenstein and Wyatt, 1990; Faleye, Hoitash, and Hoitash, 2011) and when the positions of CEO and chairman are separated (see, e.g., Dahya, Lonie, and Power, 1996). Although there can be strategical and know-how advantages of inside directors (see, e.g., Coles, Daniel, and Naveen, 2008), corporate checks and balances and the corresponding supervision task of a board are compromised with the CEO-chairman duality (Jensen, 1993) or the managers’ power to affect board composition, information flow, and decision processes is high in insider-dominated boards (see, e.g., Westphal and Zajac, 1995; Dunn, 2004). Furthermore, managers are less likely to be replaced from their position if they can exercise control over the board, even when their company is underperforming (see, e.g., Weisbach, 1988; Huson, Parrino, and Starks, 2001).

A second internal tool for boards and shareholders to align the managers’ goals with the principals’ interests is the composition of management compensation packages (see, e.g., Holmström, 1979; Grossman and Hart, 1983). As previously mentioned, the agency theory postulates conflicting interests between shareholders and managers. While the former are interested in maximizing the return on their investments, the latter are better off by optimizing their personal consumption at minimal effort (Jensen and Meckling, 1976; Grossman and Hart, 1983). If a compensation package manages to reward well-performing executives by incorporating the

³In this study, the calculated voting values cover a period of one to two months.

⁴See exchange-volume statistics provided by FIA: <https://fimaf.fia.org/categories/exchange-volume>.

shareholder value into their utility, managers are provided with natural incentives to increase their efforts and act in accordance with the shareholders' objective (see, e.g., Holmström, 1979; Bryan, Hwang, and Lilien, 2000).

The shareholders themselves are responsible for a third internal monitoring channel (see, e.g., Short, 1994; Francis and Smith, 1995; Shleifer and Vishny, 1997). Since their wealth is closely linked to the performance of the company, large shareholders are provided with intrinsic incentives to control their agents, e.g., through direct negotiations with the management, shareholder proposals, proxy contests, or - as ultimate measure - via lawsuits. Brav, Jiang, Partnoy, and Thomas (2008), among others, show that the involvement of activist hedge funds improves the operating performance of target firms solely through the challenge of the management. In contrast to the large shareholders, the existence of high collective-action costs in the form of free-rider problems and the relatively small monetary gains usually prevent such actions from minority shareholders (see, e.g., Strickland, Wiles, and Zenner, 1996).

The fourth channel, Market Value of Corporate Control, measures the threat of a hostile takeover for the incumbent managers and directors (see, e.g., Jensen, 1986; Gibbs, 1993). Since low market valuation inspires takeover interest, managers have less discretion over the use of free cash flows if they are easily replaced from their positions (see, e.g., Brav, Jiang, Partnoy, and Thomas, 2008). Company executives and board directors can bypass this threat through the introduction of various takeover defenses, most prominently in the form of poison pills. In fact, companies with outstanding takeover defenses are less innovative (Atanassov, 2013), less productive (Bertrand and Mullainathan, 2003) and generally valued at a discount on the market (Jarrell and Poulsen, 1987; Malatesta and Walkling, 1988; Karpoff and Malatesta, 1989). All of this indicates high agency costs and the existence of large private benefits for company insiders in firms with antitakeover mechanisms (Coates, 2001).

Besides the discussed governance channels, there are further external control mechanisms that can exercise agency pressure on managers, most prominently the legal system, leverage and product-market competition. First of all, consumption of private benefits is easier in firms located in countries with weak legal protection of the interest of outside shareholders (see, e.g., La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998, 2000). Second, debt restricts the possibility for managers to malinvest surplus cash flows according to the Free Cash Flow Theory of Jensen (1986). The threat of bankruptcy is directly related to a manager's job security, thus he/she needs to make sure to afford the retirement of debt and corresponding interest payments. Additionally, debt can add further pressure on managements through lender monitoring (see, e.g., Diamond, 1984). Finally, managers operating in a highly competitive industry have significantly less leeway to deviate from "optimal" behavior (see, e.g., Schmidt, 1997; Giroud and Mueller, 2011). If they do not take the appropriate steps to maximize firm value, the replacement threat of bankruptcy is more imminent compared to less competitive industries.⁵

2.3 Empirical Testing and Research Hypotheses

In this study, we distinguish between two test settings. In the first analysis, the empirical relationship between governance mechanisms and the level of voting-right values is examined. For this, voting values are calculated for firm months where liquid exchange-traded options are available and then related to governance structures in cross-sectional regressions. The second setting focuses on voting-right values during annual shareholder meetings. Thereby, we analyze the meeting-related voting values with respect to governance practices that should directly affect the shareholders' controlling power, i.e., say-on-pay votes and cumulative voting.

⁵In the empirical analysis, competition effects are not explicitly investigated but controlled for with country-industry fixed effects.

2.3.1 The Relationship Between Voting-Right Values and Governance Mechanisms

First of all, the level of marginal voting-right values is arguably high when the rights of minority shareholders are poorly protected because both the likelihood of future control contests as well as expected takeover premiums are positively related to the amount and accessibility of private benefits (see, e.g., Zingales, 1994; Rydqvist, 1996; Nenova, 2003; Dyck and Zingales, 2004). Large investors are willing to pay more for control in companies when their expected personal profits from an acquisition are higher. As a direct consequence, also small investors are willing to pay a premium for voting rights since takeovers present a valuable opportunity for them to earn large control premiums when selling their aggregated voting power (see, e.g., Zingales, 1994; Nenova, 2003; Dojode, 2004). Several testable hypotheses arise from this theoretical connection of outside-investor protection and voting-right values.

First, a major determinant of the degree to which minority investors are protected from the expropriation of company insiders is the legal system in which the firms are operating (see, e.g., La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998, 2000). To examine the legal-system effect, the sample countries are classified according to the Legal Origins Theory by La Porta, Lopez-de Silanes, Shleifer, and Vishny (1997) and La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998). Based on this theory, the study covers nine civil-law countries and, with the United Kingdom, one common-law country. Within the group of countries with civil-law codes, the Legal Origins Theory differentiates between French civil-law countries (Belgium, France, Italy, Netherlands, Spain), German civil-law countries (Germany, Switzerland), and Scandinavian civil-law countries (Finland, Sweden). Since all the civil-law codes originate from the Roman Law, the biggest legal differences exist between the United Kingdom and civil-law countries. Outside shareholders are systematically better protected from the expropriation of company insiders in the common law than in the civil law (see, e.g., La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998, 2000). Within the different forms of civil laws, the French code provides the least effective protection of small shareholders. The level of outside-investor protection of the German and Scandinavian code is similar and lies between the common law and the French civil law. Therefore, the French civil code should positively affect corporate voting-right values whereas the legal-system effect should be negative for common-law countries in reference to German and Scandinavian civil-law countries.

Second, private consumption within a firm at the expense of company outsiders is relatively easy - and agency costs accordingly high - if governance is not effective, i.e., when (i) the board is under the control of executives, (ii) compensation is not linked to the managers' effort, (iii) there is no controlling shareholder with incentives to invest in monitoring activities, and (iv) managers and directors are protected from hostile takeovers. A poor governance structure is positively associated with agency costs since private benefits can be consumed without credible threats of a negative backlash. In addition, ineffective standards do not only proxy for the accessibility of private benefits but are very likely endogenously established by company insiders to protect a considerable amount of personal profits. As argued before, both the accessibility and the value of private benefits are expected to be positively correlated with marginal voting-right premiums. In the same line, also a high leverage prevents insiders from consuming private benefits (Jensen, 1986) and, thus, should have a negative effect on voting values.

The empirical analysis is complicated due to the fact that most of the addressed mechanisms are linked with voting-right values in more ways than just with respect to private benefits. First, antitakeover mechanisms do not only indicate a sizable amount of private benefits (Coates, 2001) but they also secure the access for incumbent managers and controlling shareholders (see, e.g., DeAngelo and DeAngelo, 1985). The lower probability of future takeover events resulting from defensive measures theoretically has the opposite, negative effect on marginal voting-right values.

Second, the existence of dominant majority shareholders has an ultimate effect on voting values as their

decision power renders marginal voting rights useless. However, also a completely dispersed ownership structure could have adverse impacts on the voting power of shares. The high costs of collective action and accompanying free-rider problems as well as the lack of active blockholders fighting for control in controversial votes, lowers the decision power of marginal voting rights (Kind and Poltera, 2013). As a result, the highest voting values should be expected for an intermediate ownership concentration which simultaneously is also the most suitable ownership structure for an effectively working shareholder-monitoring mechanism. Furthermore, just the existence of a large shareholder signals a sizable pool of private benefits, as the particular investor used to be willing to acquire a controlling stake in the company at an earlier point in time.

In addition, also board effectiveness and leverage are associated with further theoretical connections with the decision power of voting rights. While a management-dependent board likely signals high agency costs and, thus, the existence of private consumption by company insiders (Westphal and Zajac, 1995; Dunn, 2004), even an outsider-dominated board can have a positive impact on the decision power of voting rights. Outside directors are expected to be more inclined to listen to the shareholders' concerns and implement the decisions of meeting votes due to reputational pressure (Fama and Jensen, 1983; Ertimur, Ferri, and Stubben, 2010). Leverage and voting-right values are positively connected as the controlled pool of assets per equity unit increases with the amount of outstanding debt (see, e.g., Harris and Raviv, 1988; Zingales, 1994).

Table 1 summarizes the research hypotheses and shows the expected correlations of the discussed governance channels with private benefits and voting-right values.

Table 1: Expected Correlations Between Voting Values and Governance Mechanisms

This table provides an overview of expected correlations between governance characteristics and voting values. The first column specifies the effectiveness of the covered governance channels. In columns two and three, the expected effects on the accessibility of private benefits for company insiders and on existing amount of private benefits are outlined, followed by the expected sign of a secondary effect of the mechanism with voting values. Finally, the last column combines all single effects and, if possible, establishes the expected correlation between voting-right values and the respective governance channel.

| Governance Characteristics | Accessibility of Private Benefits | Amount of Private Benefits | Secondary Effect | Expected Correlation |
|---|-----------------------------------|----------------------------|------------------|----------------------|
| Minority-Investor Protection (Legal System) | - | | | - |
| Dual Mandate | + | + | | + |
| Board Independence | - | - | + | ? |
| Performance-Sensitive Manager Compensation | - | | | - |
| Existence of Large Shareholders | - | + | + ⁶ | ? |
| Takeover Defenses | + | + | - | ? |
| Leverage | - | | + | ? |

2.3.2 Hypotheses for the Shareholder-Meeting Analysis

In the second empirical analysis of the present study, the focus lies on shareholder meetings and the relationship of voting-right values with specific governance practices related to shareholder voting. During an annual meeting, shareholders have the opportunity to vote on a wide range of company matters, such as the election of board directors, changes in the company by-laws, decisions on the distribution of earnings, or the discharge of executives and directors. In general, it is plausible to expect that voting values are high in the forefront of meetings with high-importance agendas where shareholders vote on resolutions with an economically significant impact on the companies' prospect (see, e.g., Kalay, Karakas, and Pant, 2014). Only when the shareholders' expected returns

⁶We exclude firms with majority investors in the first analysis; therefore the sign of the expected secondary effect is positive.

on investment are affected by a particular vote, they are provided with the necessary incentives to invest in voting rights. Further reasons for an increased voting value related to general meetings arise if shareholders appreciate participating and expressing their sentiment in specific votes or simply enjoy the consumption during the assembly.

One particular agenda item that could spark the interest of shareholders are the currently politically popular votes on management-compensation practices. After all, management compensation - a topic that is comprehensively covered in the media all over the world and has been the cause for public controversies for decades by now - is arguably a predestined agenda item that can provide an intrinsic benefit of voting against the management for shareholders. In addition, say-on-pay votes can provide an instrumental value for shareholders when their implementation leads to more efficient compensation contracts (Bebchuk, 2007; Ferri and Maber, 2013). There is evidence that even the introduction of mandatory but advisory say-on-pay votes is associated with positive effects on shareholder value. Cai and Walkling (2011) for the US and Ferri and Maber (2013) for the UK, for example, show that the stock prices of companies with high abnormal CEO compensation and/or performance-insensitive compensation packages increase significantly upon the implementation of say-on-pay bills. However, the fraction of votes against the proposed compensation plans are generally low - in British firms on average 14.0% (2003) and 10.9% in 2004 (Ferri and Maber, 2013) and for US-firms 9.6% during the proxy season 2011 (Ertimur, Ferri, and Oesch, 2013) - and almost never rejected by the majority; in both the US and the UK the rejection rate of all votes amounts to approximately 2% (Ertimur, Ferri, and Oesch, 2013; Ferri and Maber, 2013). In the empirical analysis, we evaluate the impact of mandatory advisory and binding say-on-pay votes on the value of voting rights. The fact that the countries covered by this study follow their own specific set of regulations offers an ideal setting to test for the shareholders' perception of voting on compensation practices. Based on existing evidence, we expect that say-on-pay votes are not universally generating conflicts between shareholders and directors. Voting values should only react for meetings of firms where compensation practices are not efficient and shareholders can expect a reduction of agency costs through the reformation of compensation practices. In such instances, they are provided with the necessary monetary incentives to actively engage in a campaign. In addition, binding votes should trigger stronger effects than advisory votes since the board's willingness to implement the shareholders' decisions is required in the latter case. However, reputational concerns of board directors could also force them to act according to the shareholders' preferences upon advisory votes (Bebchuk, 2007).⁷

Supposedly, general meetings are particularly important for small shareholders as the participation in the votes present one of the few possibilities for them to express their preferences besides the ultimate measure of voting with their feet; their low controlling power likely prevents them from directly negotiating with the management or the board. Thereby, the cumulative voting of board directors is one of the most popular measures to strengthen the voting power of minority investors (see, e.g., Gordon, 1994; Black and Kraakman, 1996; Bodenhorn, 2014). In contrast to straight voting - where a shareholder has as many votes as defined by his/her stockholdings and each director seat is voted separately - the cumulative voting procedure multiplies the votes per shareholder with the number of director positions. The voters are then free to place as many of their votes on their preferred candidates. With this procedure, small shareholders are given the possibility to elect directors even against the will of the voting majority (Bhagat and Brickley, 1984). Especially actively involved institutional investors are thereby provided with a leverage when they seek changes in the composition of the board (Gordon, 1994). On the one hand, there is evidence that the approval of management-sponsored resolutions with the intent of removing cumulative voting is received negatively by the stock market (Bhagat and Brickley, 1984). On the other hand, Xi and Chen (2014) find no positive effect of the legally mandatory introduction of cumulative voting in Chinese firms with large blockholders. The authors note, however, that the

⁷Bebchuk (2007) argues that the re-election probability for directors is less dependent on managers when the shareholders' decision power is high.

weak political and private implementation enforcement in China is arguably an important determinant of their findings. In summary, the empirical question whether cumulative voting is a value-enhancing internal governance mechanisms for shareholders or not remains inconclusive (Gordon, 1994) - even until today. Arguably, the value of a voting right is positively correlated with its explicit voting power. Therefore, voting values present the best measure to test if small shareholders perceive the cumulative voting procedure as beneficial. If so, voting rights should be more valuable in firms which adopted the procedure.

3 Corporate Voting-Right Values in Europe

3.1 Extraction of Voting-Right Values

The measurement of voting values in this study is based on the direct optimization method by Kind and Poltera (2013). It uses prices of single-stock options to implicitly extract estimates of corporate voting-right values. The application of an option-based approach has several advantages over other classical valuation models. Most importantly, this method allows one to associate the measured voting values to the period over which the options are traded and, thus, also to control events in this time period. Especially in the second part of the study, the option-implied approach is particularly suitable to isolate the effect of shareholder meetings on voting-right values.

In their effect on the share price, and therefore also on prices of options written on the respective stock, voting values are equivalent to cash dividends. If a stock carries a positive voting-right value which at some future point in time accrues to investors, both the expected drift and the value of the stock should be reduced accordingly:

$$E_t^Q [S(t + \Delta t)] = S(t) \cdot \exp\{r \cdot \Delta t\} - PV(D_C) - v, \quad (1)$$

where $S(t)$ describes the stock price at time t , r the risk-free interest rate and Δt the time step over which expectations are build. $PV(D_C)$ stands for the present value of expected cash dividends paid in the period $t + h$ and v the present value of expected voting values in the same time window. Consequently, these changes in the expected stock price S directly affect the value of call and put options written on the stock. For the purpose of measuring voting values, an option price can be defined as a function of three sets of variables:

$$P = f(\Theta, \Sigma, v). \quad (2)$$

Θ includes all pricing-relevant parameters known at the time the option is traded, i.e., the option type, the price of the underlying stock, the option's maturity, the strike, the risk-free interest rate, and known dividend payments. Σ includes all parameters governing the future volatility of the underlying stock returns and v captures the voting values that affect the expected value of the stock until the option's maturity. Both, Σ and v contain unknown variables that have to be extracted from option prices via a suitable option pricing model. The voting yields, v^* , are obtained by simultaneously solving for the volatility and voting parameters when minimizing the squared distance of model-generated prices, \hat{P} , from observed option prices, P , for a given number N of options:

$$v^* = \arg \min_{\Sigma, v} \sum_{i=1}^N (\hat{P}_i(\Theta, \Sigma, v) - P_i)^2. \quad (3)$$

For this empirical analysis, voting values are defined as continuous voting yields. To price the options and calculate \hat{P} , we follow Geske and Johnson (1984) and use a modified version of the Binomial Black & Scholes model with Richardson extrapolation which is based on the binomial pricing routine by Cox, Ross, and

Rubinstein (1979). The appendix provides a discussion of the applied numerical option pricing procedure, the implementation of voting yields, and other method-related issues.

3.2 Empirical Setup

For the voting-yield measurement, we split the sample period into monthly intervals over which both voting values and volatilities are assumed to be constant. Thereby, the third Friday of every month outlines the end of one monthly interval and simultaneously the start of the subsequent one. The reason for this choice lies in the fact that exchange-traded option contracts mature on the third Friday of the final trading month. All suitable option quotes⁸ observed in the first five trading days of an interval which simultaneously mature on the next third Friday are used as inputs for the optimization algorithm to extract the voting yield according to Equation (3). Thereby, each optimization yields the voting value of the respective trading month if at least four valid option quotes are available within the five-day valuation window to implicitly back out the two unknown parameters, i.e., one that describes the one-month expected volatility of the underlying stock and the monthly voting yield. With that simple procedure, the valuation exclusively uses options with almost identical maturities and, thus, minimizes the term-structure effect on the volatility surface that would bias the constant volatility assumption across multiple option contracts (see, e.g., Rubinstein, 1985; Cont and da Fonseca, 2002). Furthermore, the inclusion of options traded within a five-day span increases the coverage of companies for which the market of exchange-traded stock options is less liquid.

3.3 Definition of Empirical Sample

3.3.1 Option Sample

The empirical valuation of voting values is based on European companies between 2002 and 2012. The only limiting factor to the inclusion of firms is the existence of liquid exchange-traded equity options written on their stock. The option sample stems from the complete Ivy DB Europe database from OptionMetrics which combines quotes of the most important European derivative markets, e.g., Eurex, Euronext, or ICE Futures Europe. Information on stock prices and dividend payments is obtained via Thomson-Reuters' Datastream.

To minimize the influence of valuation biases, option contracts are filtered with the following two criteria common in the option-pricing literature (see, for example, Rubinstein, 1985; Dumas, Fleming, and Whaley, 1998; Peña, Rubio, and Serna, 1999; Cont and da Fonseca, 2002). First, only end-of-day option quotes with positive trading volume are valid. Thereby, pricing errors stemming from stale prices and synchronization biases when matching option quotes with prices of the underlying stock are reduced. Additionally, this filter makes sure that only actual market quotes are applied in the optimization and not model-generated end-of-day quotes.⁹ Second, the analysis is limited to at-the-money options with a moneyness¹⁰ between 0.95 and 1.05 to prevent volatility-smile or smirk effects from distorting the measurement of implied volatilities and voting values.

After applying the above criteria and considering the restrictions of the empirical setup described in Subsection 3.2, the final sample covers 443 firms in ten countries.¹¹ Table 2 presents the final sample and shows the distribution of the companies as well as the option quotes across countries. It shows that the majority of

⁸Subsection 3.3 clarifies the criteria with which option contracts are filtered.

⁹Option exchanges estimate closing prices for illiquid contracts to settle margin accounts after each trading day.

¹⁰Moneyness describes the ratio of the present value of an option's strike and the price of the corresponding share price.

¹¹We excluded firms from Austria, Ireland, Luxembourg, and Norway because of the low trading activity in the option market and the small number of voting-yield observations.

exchange-traded options on European stocks is traded on Eurex, where options on French, German, Italian, Dutch, and Swiss firms are quoted. Especially the liquidity of the single option contracts is significantly higher, but also the coverage of firms tends to be better compared to the other exchanges.

Table 2: Empirical Option Sample

This table summarizes this study’s empirical sample. The first column defines the origin country of the respective firms. Columns two and three present the number of unique firms in the sample and the total number of analyzed general meetings. In column three, the total number of option contracts used during the complete valuation process is shown followed by the average number of options applied per optimization step in column four. Finally, column five reflects the classification of each country according to the origin of its legal system.

| Country | Firms | Monthly Voting Yields | Option Quotes | Options per Voting Yield | Legal System |
|----------------|-------|-----------------------|---------------|--------------------------|--------------------|
| Belgium | 18 | 723 | 7,017 | 9.71 | French Civil |
| Finland | 9 | 225 | 2,204 | 9.80 | Scandinavian Civil |
| France | 54 | 3,103 | 38,238 | 12.32 | French Civil |
| Germany | 74 | 4,524 | 66,400 | 14.68 | German Civil |
| Italy | 39 | 1,126 | 12,680 | 11.26 | French Civil |
| Netherlands | 56 | 2,870 | 57,592 | 20.07 | French Civil |
| Spain | 30 | 282 | 2,711 | 9.61 | French Civil |
| Sweden | 34 | 860 | 8,381 | 9.75 | Scandinavian Civil |
| Switzerland | 57 | 2,523 | 29,114 | 11.54 | German Civil |
| United Kingdom | 71 | 1,346 | 13,389 | 9.95 | Common Law |
| Total Sample | 442 | 17,582 | 237,726 | 13.52 | |

3.3.2 Corporate-Governance Characteristics of European Firms

In the empirical analyses of this study, we employ several variables that describe the governance structures of the sample firms. For this, we use the ESG-Ratings database of Governance Metrics International (GMI) for a first set of dummy variables (as defined by GMI):

- *Dual Mandate*: Indicates whether the chairman of the supervisory board is also an executive manager of the company.
- *Independent Board*: Indicates whether the majority of the supervisory board is independent of the company’s management.
- *Performance Link*: Indicates whether the CEO’s equity-based compensation reflects the company’s share-price movement over the last five years.
- *Poison Pills*: Indicates whether the company have active shareholder-rights plans in their charter or by-laws.
- *Voting-Right Caps*: Indicates whether voting power is limited for company outsiders, no matter how many shares an investor owns.
- *Staggered Board*: Indicates whether the election cycle of board directors is staggered (classified).
- *Entrenched Board*: Indicates whether the fraction of long-tenured, aging directors suggests a problem with board entrenchment.

In addition, we collect information on the equity structure and ownership concentration of the sample firms manually by consulting by-laws and annual reports. From this data, five further variables are created. *Majority*

Table 3: Summary Statistics of Corporate-Governance Characteristics

This table gives an overview of the corporate-governance characteristics of the sample firms. For all dummy variables, the percentages reflect the fraction of firm for which the respective attribute is applicable. Channel 1 aggregates statistics of the board composition, including the variables *Dual Mandate*, *Independent Board*, *Entrenched Board*, and *Busy Outsiders*. In Channel 2, the variable *Performance Link* describes the performance sensitivity of management compensation. Channel 3 includes details on the shareholder structure and consists of the variables *Majority Shareholder* and *Widely Held*. Channel 4 summarizes characteristics related to the market of corporate control, i.e., *Poison Pills*, *Dual-Class Structure*, *Staggered Board*, and *Voting-Right Caps*. Finally, Panel E reflects balance-sheets characteristics in the form of *Leverage* (defined as $Leverage = Debt/Equity$) and the *Total Assets* (natural logarithm of total assets).

| | Belgium | Finland | France | Germany | Italy | Netherlands | Spain | Sweden | Switzerland | UK | Total |
|--------------------------------------|---------|---------|--------|---------|---------|-------------|---------|--------|-------------|--------|--------|
| Panel A: Board Characteristics | | | | | | | | | | | |
| Dual Mandate | 5.18% | 5.99% | 47.83% | 0.00% | 9.53% | 0.40% | 47.87% | 0.00% | 11.29% | 3.46% | 13.59% |
| Independent Board | 76.39% | 100.00% | 61.15% | 34.23% | 68.93% | 94.96% | 40.84% | 62.28% | 85.36% | 92.62% | 67.57% |
| Panel B: Management Compensation | | | | | | | | | | | |
| Performance Link | 70.57% | 84.33% | 77.65% | 83.61% | 76.47% | 77.25% | 73.17% | 86.81% | 77.69% | 78.03% | 78.93% |
| Panel C: Shareholder Monitoring | | | | | | | | | | | |
| Majority Shareholder | 22.22% | 22.22% | 18.52% | 16.22% | 51.28% | 17.86% | 33.33% | 14.71% | 17.54% | 21.13% | 22.17% |
| Widely Held | 22.22% | 33.33% | 40.74% | 33.78% | 20.51% | 32.14% | 16.67% | 11.76% | 49.12% | 40.85% | 33.03% |
| Panel D: Market of Corporate Control | | | | | | | | | | | |
| Poison Pills | 4.39% | 0.00% | 0.14% | 0.84% | 5.95% | 0.00% | 0.00% | 0.35% | 0.21% | 2.42% | 1.04% |
| Staggered Board | 97.68% | 0.00% | 81.57% | 9.73% | 5.87% | 81.11% | 21.35% | 0.00% | 67.54% | 83.18% | 49.41% |
| Voting-Right Caps | 0.00% | 0.00% | 20.04% | 1.40% | 8.46% | 0.97% | 40.93% | 2.34% | 45.54% | 0.36% | 12.31% |
| Entrenched Board | 3.63% | 0.00% | 4.41% | 0.02% | 9.62% | 0.00% | 6.69% | 0.00% | 1.42% | 0.00% | 1.94% |
| Dual-Class Structure | 0.00% | 25.33% | 3.40% | 8.08% | 10.05% | 15.24% | 2.54% | 72.44% | 13.24% | 8.78% | 12.31% |
| Panel E: Balance Sheet | | | | | | | | | | | |
| Leverage | 61.95% | 49.75% | 73.19% | 69.47% | 169.11% | 69.67% | 193.34% | 64.21% | 54.04% | 59.61% | 67.69% |
| Total Assets | 22.70 | 23.36 | 23.91 | 22.83 | 23.79 | 21.90 | 23.74 | 22.51 | 22.19 | 23.59 | 23.01 |

Shareholder is a dummy that equals one if a single shareholder holds the majority of voting power during the time of voting-yield observation. In contrast, *Widely Held* signals a dispersed ownership structure where no single shareholder or shareholder group holds a significant stake in the company. Thereby, we follow Faccio and Lang (2002) and apply a control threshold of 10%. *Dual Class* indicates if a firm issued more than one class of shares that differ with respect to voting power.¹² Finally, information on the companies' balance sheets is obtained via Thomson-Reuters' Datastream to construct the variables Leverage, and Total Assets. *Leverage* is defined as the ratio of debt and equity, calculated by using book values of total assets and outstanding debt. *Total Assets* refers to the natural logarithm of the total asset value.

Table 3 summarizes these governance variables and shows the observation frequency of each characteristic across the sample countries. Thereby, each of the introduced variable is allocated to one of the governance mechanism discussed in the previous subsection, i.e., Supervisory Board, Management Compensation, Shareholder Monitoring, Market of Corporate Control, and Balance Sheet. The table shows that governance practices are highly heterogeneous across the sample countries. For example, while the chairman of the board in almost half of French and Spanish firms also holds an executive position, German law prohibits the existence of this dual mandate (see §105-1 of the German Stock Corporation Act). However, members of the supervisory board in German companies most frequently have inside relations with company executives. The most independent boards are present in Finland, the Netherlands, Switzerland and the United Kingdom, where in more than 85% of observations the company outsiders account for the majority of directors. In fact, all of the observed Finnish companies have an outsider-dominated board, thereby following the recommendations of the Finnish Corporate Governance Code.¹³ Further, the sample also reflects international differences regarding ownership structures. In contrast to other empirical findings, the ownership concentration in British firms is in this sample not more dispersed than in some of the other European countries (see, e.g., Faccio and Lang, 2002). While still many companies have no shareholders with more than 10% of voting rights in the UK (40.85%), the fraction is higher in Switzerland and almost identical in France with 49.12% and 40.74%, respectively. On the other end of the spectrum, the highest concentration of voting power is observed in Italian and Spanish firms. There are also substantial international differences regarding antitakeover provisions. While many Scandinavian firms count on a dual-class share structure, British and the other continental European companies rely on protection of staggered boards or in the case of France, Spain, and Switzerland on voting-right caps. Finally, we observe a significantly higher leverage for the average Spanish and Italian firm. This sample characteristic can be explained by this study's sample-selection criteria, i.e., the existence of liquid stock-option quotes. The trading activity of options written on Spanish and Italian shares focuses on a small number of large firms. Most prominently, these firms are banks and other financials which naturally have a high debt-equity ratio.

To descriptively compare the distribution of governance effectiveness across Europe, we construct a governance score based on the presented variables (cf. Gompers, Ishii, and Metrick, 2003; Ammann, Oesch, and Schmid, 2011). For each voting-yield observation, the central governance channels, i.e., Board of Directors, Management Compensation, Shareholder Monitoring, and the Market of Corporate Control, are either classified as effective or ineffective. For each effectively working channel one point is awarded to the respective firm. As a consequence, the CGE-score of a company is equal to four if a firm meets the requirements of all channels and zero if it fails in every category. The criteria for each channel are as follows:

- Supervisory Board: The board is defined as effective monitoring body if the CEO is not the chairman and the majority of directors is classified as company outsiders.

¹²Some of the companies in the sample divide their equity capital in registered and bearer shares while both types have the same face value and voting power. Such an equity structure is not classified as dual class.

¹³Finnish Corporate Governance Code, Recommendation 14: The majority of the directors shall be independent of the company. In addition, at least two of the directors representing this majority shall be independent of significant shareholders of the company.

- Management Compensation: Compensation practices are classified as suitable to provide incentives for managers if a link between compensation levels and firm performance exists.
- Shareholder Monitoring: The monitoring pressure from shareholders is assumed to be present if the ownership structure is not dispersed, i.e., if there is at least one shareholder that discloses holdings of more than 10% of voting rights.
- Market of Corporate Control: Company insiders are defined as not protected from the threat of hostile takeovers if a company has no outstanding poison pills, knows no voting-right caps, and the board is neither classified (staggered) nor entrenched.¹⁴

Table 4: Governance Effectiveness of European Firms

This table summarizes the effectiveness score of the governance index based on the five channels presented in Table 3. While Panel A shows the number of firm-month observations per score, Panel B discloses the relative frequency of observations.

| | CGE-0 | CGE-1 | CGE-2 | CGE-3 | CGE-4 |
|---------------------------------------|-------|--------|--------|--------|--------|
| Panel A: Number of Observations | | | | | |
| Belgium | 22 | 128 | 323 | 250 | 0 |
| Finland | 8 | 28 | 63 | 83 | 43 |
| France | 88 | 1,004 | 1,421 | 550 | 40 |
| Germany | 136 | 551 | 1,477 | 1,953 | 407 |
| Italy | 25 | 137 | 284 | 438 | 242 |
| Netherlands | 227 | 957 | 769 | 882 | 35 |
| Spain | 15 | 95 | 89 | 60 | 23 |
| Sweden | 4 | 29 | 366 | 336 | 125 |
| Switzerland | 248 | 445 | 1,081 | 596 | 153 |
| UK | 52 | 369 | 565 | 290 | 70 |
| Total | 825 | 3743 | 6,438 | 5,438 | 1,138 |
| Panel B: Relative Frequency of Scores | | | | | |
| Belgium | 3.04% | 17.70% | 44.67% | 34.58% | 0.00% |
| Finland | 3.56% | 12.44% | 28.00% | 36.89% | 19.11% |
| France | 2.84% | 32.36% | 45.79% | 17.72% | 1.29% |
| Germany | 3.01% | 12.18% | 32.65% | 43.17% | 9.00% |
| Italy | 2.22% | 12.17% | 25.22% | 38.90% | 21.49% |
| Netherlands | 7.91% | 33.34% | 26.79% | 30.73% | 1.22% |
| Spain | 5.32% | 33.69% | 31.56% | 21.28% | 8.16% |
| Sweden | 0.47% | 3.37% | 42.56% | 39.07% | 14.53% |
| Switzerland | 9.83% | 17.64% | 42.85% | 23.62% | 6.06% |
| UK | 3.86% | 27.41% | 41.98% | 21.55% | 5.20% |
| Total | 4.69% | 21.29% | 36.62% | 30.93% | 6.47% |

Table 4 displays the distribution of the total CGE-scores across the sample countries. It shows that the scores are similarly distributed in the different countries and that the frequency of observations peaks at a score of two or three points. Switzerland and the Netherlands are the countries where zero scores are most common with a relative frequency of 9.83% and 7.91%, respectively. On the other end of the spectrum, 21.49% of the Italian firm-month observations satisfy the criteria for all channels, whereas the perfect score is very rarely observed for Belgian, French and Dutch firms. These findings are unexpected as Italy is typically known for one of the developed countries with the poorest governance standards (see, e.g., Shleifer and Vishny, 1997). A possible explanation might lie in the fact that the option-trading activity in Italian stocks focuses on a few large companies, as indicated by the the highest average firm size in the whole sample (see Table 3). Those large companies arguably adapted voluntarily to international governance standards to reduce capital costs. Maybe,

¹⁴The dual-class characteristic is not part of this definition because of its endogenous association with voting values. Therefore, we exclude those firms from the empirical tests (see Subsection 3.5).

Italian companies have per se a poor reputation on international capital markets because of the lax national standards and the reaction from large firms is therefore all the more extreme.

3.4 Empirical Voting Values

Table 5 summarizes the results of the empirical voting-yield valuation on the country level for all observations (Panel A), across the different legal systems (Panel B), and separately for general-meeting months (Panel C). The annualized average voting yield amounts to 0.45% of the stock price for the complete sample of 442 companies and 17,582 monthly observations between 2002 and 2012. This value is very similar to the 0.37% obtained in the empirical study of Kind and Poltera (2013) which covers French, German, Dutch and Swiss firms between 2003 and 2010.¹⁵ In eight out of the ten countries, the voting yields are significantly positive. The exceptions are Finnish and British firms for which we measure the lowest voting yields of 0.06% and -0.02%. On the contrary, the highest values are observed for French and Spanish firms (0.86% and 0.83% on average).

A look at the yield aggregation over the legal systems in Panel B reveals that the highest voting values are observed for firms in countries with French civil law (0.63%) followed by German (0.39%) and Scandinavian civil-law countries (0.27%). The lowest yields are obtained for firms incorporated in the only common-law country in the sample with an average of -0.02%. The two-sample *t*-tests reported in Table 6 confirm that voting values in civil-law countries are significantly more valuable than in the sample country with common-law origin. Within the groups of the different civil-law codes, the French code is associated with significantly higher values than the German code, for which in turn we observe higher yields in comparison with the Scandinavian code. These findings are in line with the literature on minority-investor protection and the Legal Origins Theory (see, e.g., La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998, 2000). The French civil code provides the poorest protection for outside shareholders from the expropriation of company insiders. In contrast, the common-law code contains more effective regulations that strengthen the rights of small investors. The outlook of accessing private benefits with a less credible threat from the legal system increases both the probability of a future takeover (see, e.g., Rydqvist, 1996; Zingales, 1994, 1995) and the observed control premiums paid in such control contests (see, e.g., Dyck and Zingales, 2004). As a direct consequence, marginal voting rights are worth more for small shareholders when they are poorly protected from company insiders (see, e.g., Zingales, 1994; Nenova, 2003; Doidge, 2004).

Finally, Panel C of Table 5 focuses on voting yields measured during months with general meetings. The average yield for the 1,287 meeting months equals 1.62% and is substantially higher than the average voting value of non-meeting months according to the *t*-tests reported in Panel B of Table 6. In fact, these results confirm the meeting effect found by Kind and Poltera (2013) for six out of the ten sample countries, i.e., Belgium with the biggest effect of 3.09%, France, Germany, the Netherlands, Sweden and Switzerland. In these countries, the explicit possibility to exercise the voting rights during shareholder meetings seems to be valuable even for small shareholders. For Finnish firms, a significant increase of voting values in meeting months is observable too, despite that the yields are not statistically different from zero due to the high volatility of the voting measures and the small number of meeting observations. In contrast, the meeting values of Italian, Spanish and British firms are statistically similar to the yields obtained for non-meeting months. As a direct comparison, Kalay, Karakas, and Pant (2014) find no correlation between ordinary general meetings and voting values for US-firms with their option-based approach. A rationale for the lack of the meeting effect might be the better

¹⁵A country-level comparison between this study and the results of Kind and Poltera (2013) shows that the values are very similar for the different samples and periods: 0.86% and 0.89% for French companies, 0.33% and 0.19% for German companies, 0.54% and 0.48% for Dutch companies, as well as 0.48% and 0.34% for Swiss companies.

Table 5: Descriptive Results of Empirical Voting Values

This table provides descriptive statistics of the monthly voting yields extracted from option quotes written on the stock of European companies between 2002 and 2012. Panel A shows descriptive results for the full sample and for each country subsample. In Panel B, only the months with general meetings are analyzed. Finally, Panel C presents the statistics of the full set of voting yields according to the legal-system classification. For each sample, the mean voting value, the t -statistics as well as the three quartiles are presented. The last two columns add the number of voting-yield observations and the number of covered firms. The two-tailed t -tests are based on the null hypothesis that the mean voting values are equal to zero. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

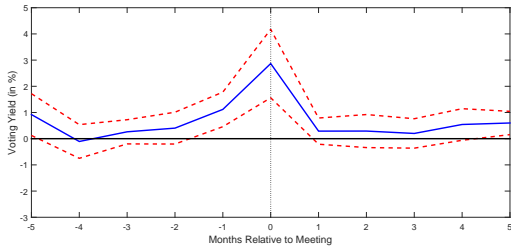
| Country | Mean | t -Stats | 25%Perc. | Median | 75%Perc. | Voting Yields | Firms |
|--|----------|------------|----------|--------|----------|---------------|-------|
| Panel A: Voting Yields by Country - Full Sample | | | | | | | |
| Belgium | 0.51%*** | 4.53 | -0.90% | 0.22% | 1.89% | 723 | 18 |
| Finland | 0.06% | 0.25 | -1.59% | 0.09% | 1.74% | 225 | 9 |
| France | 0.86%*** | 17.47 | -0.49% | 0.62% | 2.18% | 3,103 | 54 |
| Germany | 0.33%*** | 15.56 | -0.27% | 0.10% | 0.96% | 4,524 | 74 |
| Italy | 0.21%*** | 3.06 | -0.58% | 0.22% | 1.10% | 1,126 | 39 |
| Netherlands | 0.54%*** | 10.48 | -0.73% | 0.38% | 1.83% | 2,870 | 56 |
| Spain | 0.83%*** | 3.20 | -1.93% | 0.86% | 3.87% | 282 | 30 |
| Sweden | 0.33%** | 2.58 | -1.81% | 0.27% | 2.49% | 860 | 34 |
| Switzerland | 0.48%*** | 11.17 | -0.45% | 0.16% | 1.29% | 2,523 | 57 |
| United Kingdom | -0.02% | -0.26 | -1.06% | -0.02% | 1.02% | 1,346 | 71 |
| Complete Sample | 0.45%*** | 24.52 | -0.51% | 0.22% | 1.42% | 17,582 | 442 |
| Panel B: Voting Yields by Legal System - Full Sample | | | | | | | |
| Common Law | -0.02% | -0.26 | -1.06% | -0.02% | 1.02% | 1,346 | 71 |
| French Civil | 0.63%*** | 20.07 | -0.65% | 0.43% | 1.86% | 8,104 | 197 |
| German Civil | 0.39%*** | 18.66 | -0.32% | 0.12% | 0.93% | 7,047 | 131 |
| Scandinavian Civil | 0.27%** | 2.45 | -1.71% | 0.21% | 2.30% | 1,085 | 43 |
| Panel C: Voting Values by Country - General-Meeting Months | | | | | | | |
| Belgium | 3.49%*** | 4.10 | 0.37% | 3.67% | 7.57% | 29 | 14 |
| Finland | 2.47% | 1.51 | -2.04% | 3.14% | 6.46% | 10 | 3 |
| France | 2.65%*** | 12.64 | 0.74% | 2.63% | 4.72% | 253 | 49 |
| Germany | 1.22%*** | 12.34 | 0.36% | 1.19% | 2.06% | 351 | 351 |
| Italy | 0.05% | 0.21 | -0.44% | 0.22% | 1.00% | 86 | 86 |
| Netherlands | 1.99%*** | 10.14 | 0.49% | 2.12% | 3.47% | 189 | 189 |
| Spain | 0.25% | 0.41 | -3.39% | 0.86% | 3.63% | 17 | 12 |
| Sweden | 2.63%*** | 5.65 | 0.35% | 2.89% | 4.71% | 60 | 24 |
| Switzerland | 1.77%*** | 8.09 | -0.05% | 1.56% | 3.79% | 192 | 37 |
| United Kingdom | -0.21% | -0.92 | -1.05% | -0.19% | 0.95% | 100 | 28 |
| Complete Sample | 1.62%*** | 19.86 | 0.04% | 1.55% | 3.41% | 1,287 | 303 |

minority-investor protection that reduces the value of marginal voting rights in the US whose legal system is also based on the common law (see, e.g., La Porta, Lopez-de Silanes, Shleifer, and Vishny, 1998; Doidge, 2004).

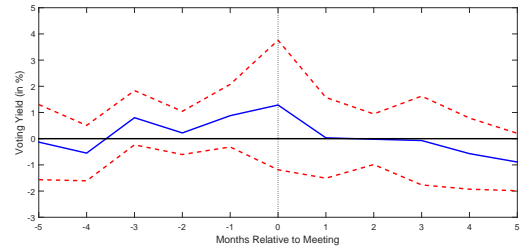
To further illustrate the general-meeting effect, we average the voting yields over their observation month relative to a shareholder meeting. Figure 1 shows the results of this aggregation and plots the average monthly voting yield for a ten-month interval around general meetings for each sample country. The subfigures of Belgium, Finland, France, Germany, the Netherlands, Sweden and Switzerland are able to reflect the meeting effect by showing a spike in average voting values in month 0 - the month including the shareholder meeting. Again, the same increase cannot be observed for Italy, Spain and the United Kingdom.

Figure 1: Voting Yields Surrounding Shareholder Meetings

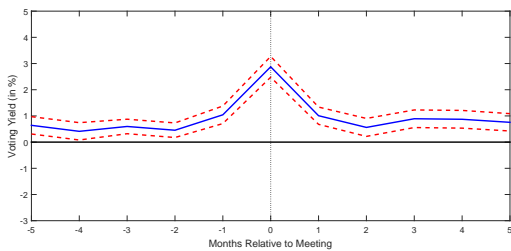
This figure illustrates the average voting yield (solid lines) for eleven months surrounding the meeting as well as upper and lower 95%-confidence bounds (dashed lines). The figure is divided in ten subfigures and visualizes the results for each of the sample countries. The dotted lines indicate meeting months and the number in parentheses shows the average number of monthly yield observations.



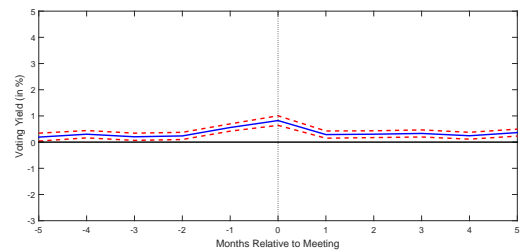
(a) Belgium (59 Yields)



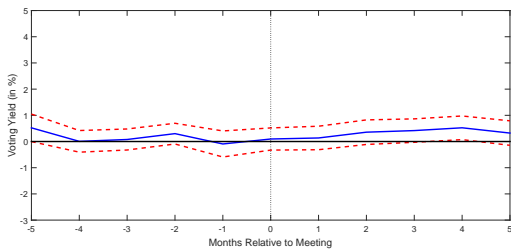
(b) Finland (18 Yields)



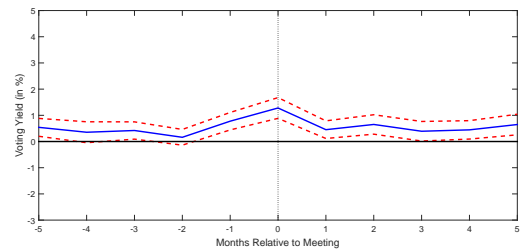
(c) France (249 Yields)



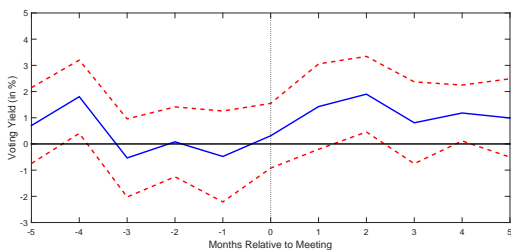
(d) Germany (390 Yields)



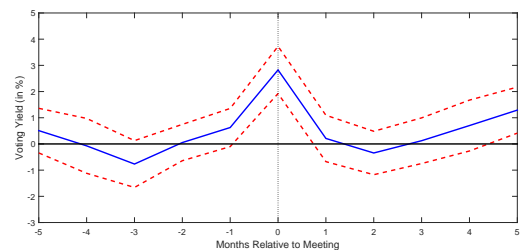
(e) Italy (86 Yields)



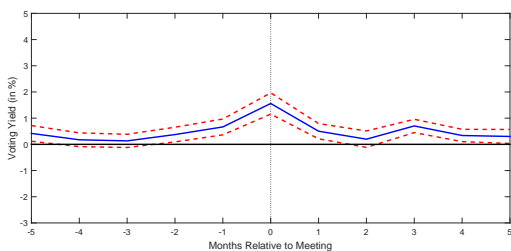
(f) Netherlands (229 Yields)



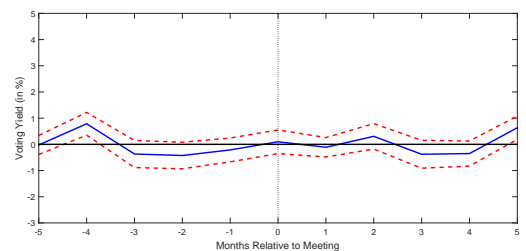
(g) Spain (23 Yields)



(h) Sweden (68 Yields)



(i) Switzerland (213 Yields)



(j) United Kingdom (107 Yields)

Table 6: Two-Sample t -Tests

This table tests for statistical voting-yield differences between two subsamples. Panel A compares voting yields of meeting months with those of non-meeting months across all countries and the full sample. In Panel B, the differences of voting values between legal systems are analyzed. For each statistics, the difference in means (Δ Mean) and the t -value is presented. The two-tailed t -tests are based on the null hypothesis that the mean voting values of the subsamples are identical. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| | Δ Mean | t -Stats |
|--|---------------|------------|
| Panel A: Legal-System Effect | | |
| Civil Law vs. Common Law | 0.52%*** | 7.34 |
| French Civil vs. Scandinavian Civil | 0.36%*** | 3.75 |
| German Civil vs. Scandinavian Civil | 0.12%* | 1.67 |
| French Civil vs. German Civil | 0.24%*** | 6.19 |
| Panel B: Meeting Months vs. Non-Meeting Months | | |
| Belgium | 3.09%*** | 5.48 |
| Finland | 2.52%** | 2.39 |
| France | 1.95%*** | 11.05 |
| Germany | 0.96%*** | 12.31 |
| Italy | -0.17% | 0.67 |
| Netherlands | 1.55%*** | 7.46 |
| Spain | -0.62% | 0.57 |
| Sweden | 2.48%*** | 5.01 |
| Switzerland | 1.39%*** | 8.63 |
| United Kingdom | -0.21% | 0.83 |
| Complete Sample | 1.26%*** | 17.62 |

3.5 Cross-Sectional Analyses

3.5.1 Regression Specification and Control Variables

First of all, majority-owned firms and companies with a dual-class share structure are excluded from the empirical analysis. Both characteristics signal a concentrated and persistent ownership structure that has an ultimate effect on voting values (see, e.g., DeAngelo and DeAngelo, 1985; Renneboog and Szilagyi, 2011). The voting power of small investors becomes negligible if a dominant shareholder is able to decide each votes on his/her own.

Second, several control variables are applied in each of the following regression settings, i.e., *Shareholder Meeting*, *Firm Size*, *Leverage*, *Widely Held* and indicators for the legal systems, to account for their supposed correlations with voting-right values. Shareholder Meeting represents a dummy that equals one if a voting yield is observed during months where the respective firm held a general meeting. Firm Size corresponds to the logarithmic value of total assets. Further, the legal-system indicator variable signals if a firm is incorporated in a common law, French civil, German civil, or Scandinavian civil-law country. The remaining variables are defined as outlined in Subsection 3.3.2. In addition to the control variables, the regression models account for the time, industry and country dependence of voting-right values by including fixed-effects regressors (FE) where mentioned.

Table 7 shows the correlation of the controls with voting yields in univariate and multivariate regressions. First of all, Models (1), (5), and (6) confirm the results of the previous subsection. Voting yields are significantly and substantially higher during months with general meetings by a robust average magnitude of approximately 1.2 percentage points. In addition, firms incorporated in French and German civil-law countries are associated with high voting values relative to companies in common-law countries. There is, however, no statistical difference between voting-yield levels of common-law and Scandinavian civil-law firms.

Table 7: Correlations of Regression Controls and Voting Yields

This table shows the univariate and multivariate relations between voting yields and the control variables. Thereby, Shareholder Meeting equals one for yields observed in months with a general meeting. Firm Size corresponds to the natural logarithm of total asset value and leverage measures the debt-equity ratio. Further, Widely Held signals an ownership structure where no shareholder holds more than 10% of voting rights. Finally, indicate the legal system with common law as reference category. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (in %) | | | | | |
|------------------------|---------------------|----------------------|----------------------|----------------------|--------------------|---------------------|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) |
| Shareholder Meeting | 1.251*** (13.75) | | | | | 1.210*** (12.89) |
| Firm Size | | -0.042*** (-3.83) | | | | -0.004 (-0.50) |
| Leverage | | | -0.020*** (-3.14) | | | -0.007 (-0.98) |
| Widely Held | | | | -0.126*** (-3.23) | | -0.072* (-1.82) |
| French Civil Law | | | | | 0.643*** (8.36) | 0.669*** (8.48) |
| German Civil Law | | | | | 0.351*** (4.83) | 0.404*** (5.41) |
| Scandinavian Civil Law | | | | | 0.086 (0.47) | 0.182 (0.98) |
| Constant | Yes | Yes | Yes | Yes | Yes | No |
| Time FE | No | No | No | No | No | Yes |
| Industry FE | No | No | No | No | No | Yes |
| Country FE | No | No | No | No | No | Yes |
| Observations | 13,517 | 13,482 | 13,442 | 13,517 | 13,517 | 13,442 |
| R^2 | 0.02 | 0.01 | 0.01 | 0.00 | 0.01 | 0.10 |
| Adjusted R^2 | 0.02 | 0.01 | 0.00 | 0.00 | 0.01 | 0.10 |

Models (2) and (3) examine the relationships of voting yields with firm size and leverage, respectively. For both variables, the regression results render a significantly negative coefficient. The negative effect of firm size on control values is well-documented in the empirical literature (see, e.g., Zingales, 1995; Barclay and Holderness, 1989) and suggests that the high costs of obtaining the effective control in a large company act as a natural antitakeover measure. As a consequence, the observed voting premiums are smaller in such companies. In the same line, the leverage coefficient supposedly reflects the fact that a large amount of outstanding debt lowers the attractiveness of owning corporate control since the access to private benefits is limited (Albuquerque and Schroth, 2010). Both, the size and leverage effect, however, vanish as soon as the regression accounts for industry fixed effects in Model (6).

Finally, the regression provides further evidence that a low ownership concentration adversely affects voting values, as indicated by the negative coefficient for Widely held (Models (4) and (6)). The decision power of small shareholders is arguably low when no large investors exist who are willing to invest in voting rights to achieve a controlling majority. Additionally, the coordination among minor shareholders is likely too expensive for collective action compared to the relatively small monetary benefits they can expect from an active involvement.

3.5.2 Empirical Voting-Right Values and Corporate-Governance Mechanisms

In the first set of governance-related cross-sectional regressions, the voting yields are analyzed with respect to board composition. Table 7 presents the coefficients for the two independent variables Dual Mandate and Board Independence obtained in five different regression specifications. Thereby, the first variable indicates the existence of a CEO-chairman duality while the second denotes outsider-dominated boards.

Table 8: Voting Yields and Board Characteristics

This table presents the statistical correlations between voting yields and board composition. Dual Mandate is a dummy that signals a CEO-chairman duality and Independent Board indicates that the majority of directors are company outsiders. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (in %) | | | | |
|--------------------|---------------------|--------------------|-------------------|--------------------|--------------------|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) |
| Dual Mandate | 0.103** (2.48) | | 0.097** (1.99) | | 0.103** (2.10) |
| Independent Board | | 0.358*** (5.29) | | 0.286*** (4.02) | 0.289*** (4.06) |
| Constant | Yes | Yes | No | No | No |
| Control Variables | No | No | Yes | Yes | Yes |
| Legal-System FE | No | No | Yes | Yes | Yes |
| Time FE | No | No | Yes | Yes | Yes |
| Industry FE | No | No | Yes | Yes | Yes |
| Country FE | No | No | Yes | Yes | Yes |
| Observations | 11,967 | 11,967 | 11,917 | 11,917 | 11,917 |
| R^2 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 |
| Adjusted R^2 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 |

The results show that both characteristics are positively correlated with voting yields in univariate regressions (Models (1) and (2)) as well as in multivariate analyses (Models (3), (4), (5)). The significant dual-mandate coefficients reveal that voting values are on average 10 basis points higher when the CEO also holds the chairman position. Since the CEO-chairman duality eliminates the monitoring power of boards (Jensen, 1993), the finding provides evidence that such a board composition enables private consumption of company insiders and is not suitable to protect the interest of outside shareholders. Because the governance of private benefits is arguably not in the board's interest, owning a controlling stake is more attractive for large outside investors. As a consequence, the likelihood of future control contests and expected voting premiums increase (Zingales, 1994; Rydqvist, 1996; Dyck and Zingales, 2004), which in turn positively affects the value of marginal voting rights. In contrast, the coefficients for outsider-dominated boards suggest that also a supposedly effective board is associated with a positive effect on voting yields, despite that it may lower the attractivity of control for potential acquirers. This observation indicates that management-independent directors increase the decision power of voting rights since they are supposedly more willing to implement shareholder-approved resolutions. As argued by Fama and Jensen (1983) and Ertimur, Ferri, and Stubben (2010), outside directors are provided with reputational incentives to act in the interest of shareholders in order to increase their re-election probability.

A second set of regressions examines the relationships of voting yields with compensation policy as well as shareholder-monitoring effectiveness. The results of the first two models outlined in Table 9 indicate that voting yields and the performance sensitivity of CEO compensation are statistically unrelated. The fact that a CEO is not paid according to the quality of efforts does not seem to affect the attractiveness of controlling the respective company. It could be that weak compensation incentives are a signal for managerial power and, accordingly, for the consumption of a considerable amount of private benefits in the form of rent extraction

(see, e.g., Bebchuk, Fried, and Walker, 2002). However, the sizable benefits might be out of reach for outside investors when managers have the power to exclude shareholders from accessing these rents. In summary, the regression outputs suggest that the first positive effect (high private benefits) and the latter negative effect (blocked access) cancel out.

Table 9: Effect of Executive Compensation and Shareholder Monitoring on Voting Yields

This table provides results of the regression of voting yields on compensation policy in the first two models and shareholder monitoring in the latter two. Performance Link is a dummy that indicates a performance sensitive manager-compensation policy. Shareholder Monitoring signals an intermediate ownership concentration and the existence of large but not dominant blockholders. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (in %) | | | |
|------------------------|---------------------|-----------------|--------------------|--------------------|
| | Model (1) | Model (2) | Model (3) | Model (4) |
| Performance Link | -0.055 (-1.22) | 0.041 (0.87) | | |
| Shareholder Monitoring | | | 0.127*** (3.24) | 1.729*** (4.13) |
| Constant | Yes | No | Yes | No |
| Control Variables | No | Yes | No | Yes |
| Legal-System FE | No | Yes | No | Yes |
| Time FE | No | Yes | No | Yes |
| Industry FE | No | Yes | No | Yes |
| Country FE | No | Yes | No | Yes |
| Observations | 13,517 | 13,442 | 13,517 | 13,442 |
| R^2 | 0.00 | 0.09 | 0.00 | 0.10 |
| Adjusted R^2 | 0.00 | 0.09 | 0.00 | 0.09 |

Both, the univariate regression in Model (3) and the complete Model (4) show that the existence of large blockholders positively affects voting yields. According to this, the expected negative impact of shareholder-monitored private benefits is dominated by the ownership-structure effect. Thereby, the results confirm the findings of the empirical studies following the same valuation approach¹⁶ and provide further evidence that voting values are highest in firms with an intermediate ownership concentration. Such a distribution of voting rights seems ideal for the controlling power of marginal voting rights as they might become decisive when large blockholders try to achieve a controlling majority in controversial votes.

The purpose of the third regression setting is to investigate the correlations between voting yields and takeover-defense mechanisms. For the tests, we employ four regressors, i.e., Voting-Right Caps, Staggered Board, Entrenched Board, and Poison Pills. The first is a variable that indicates the existence of a voting-power limit for outside shareholders. Staggered Board signals a classified election cycle of board members, while Entrenched Board stands for boards where directors have longstanding tenures and are difficult to replace. Finally, Poison Pills is a dummy which equals one when a company has active poison-pill provisions in its charter or by-laws.

Ex ante, the direction of the theoretical relationship between voting yields and antitakeover mechanisms is unclear. On the one hand, takeover defenses are a proxy for the existence of large private benefits since the decision of their adoption is endogenously related to the value of enabled private consumption (Coates, 2001). On the other hand, the direct consequence of such defenses is a reduction of the probability of future takeover contests (DeAngelo and DeAngelo, 1985; Gompers, Ishii, and Metrick, 2010). Therefore, it is not surprising that the regression models displayed in Table 10 show mixed results. For all four variables, we run a univariate regression (Models (1) to (4)), as well as single and combined multivariate regressions (Models (5) to (9)). First

¹⁶See Kind and Poltera (2013) and the empirical results of the studies in Chapters 2 and 3 of this dissertation.

Table 10: Voting Yields and the Market of Corporate Control

This table shows the statistical relationship of voting yields and takeover defenses. Thereby, Poison Pills is a dummy that equals one if a company's charter includes poison-pill provisions. Further, Staggered Board indicates a classified election cycle of board members and Entrenched Board denotes boards where directors have longstanding tenures and are difficult to replace. Finally, Voting-Right Caps is a dummy that signals the existence of a voting-power limit for outside shareholders. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (in %) | | | | | | | | |
|--------------------|---------------------|--------------------|-----------------|-------------------|---------------------|--------------------|-------------------|-------------------|---------------------|
| | Model (1) | Model (2) | Model (3) | Model (4) | Model (5) | Model (6) | Model (7) | Model (8) | Model (9) |
| Voting-Right Caps | 0.059 (0.97) | | | | -0.144** (-1.99) | | | | -0.143** (-1.97) |
| Staggered Board | | 0.192*** (4.80) | | | | 0.147*** (3.19) | | | 0.145*** (3.04) |
| Entrenched Board | | | 0.228 (1.03) | | | | -0.232 (-1.04) | | -0.221 (-0.99) |
| Poison Pills | | | | -0.325 (-0.98) | | | | -0.255 (-0.86) | -0.278 (-0.94) |
| Constant | Yes | Yes | Yes | Yes | No | No | No | No | No |
| Legal-System FE | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Time FE | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Industry FE | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Country FE | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Observations | 11,967 | 11,967 | 11,967 | 11,967 | 11,917 | 11,917 | 11,917 | 11,917 | 11,917 |
| R^2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Adjusted R^2 | 0.00 | 0.00 | 0.00 | 0.00 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |

of all, the existence of voting-right caps does not display a statistical correlation with voting yields in the simple Model (1). However, the coefficients become significantly negative as soon as the regression corrects for fixed effects in Models (5) and (9). The limitation of voting power for outside shareholders supposedly poses a serious obstacle for investors to gain control in a firm and, thus, the likelihood of a control fight is substantially reduced. In this case, the effect of the defense mechanism exceeds the possible signal for valuable private benefits. Second, the coefficients for the staggered-board characteristics are robust and positive at high confidence levels across all regression models (Models (2), (6), and (7)). In contrast to voting-right caps, the results suggest that a classified board might not deter possible raiders significantly but enable private consumption through the lack of board monitoring. In fact, the defensive virtue of staggered boards is considered weak in comparison with other mechanisms as their existence does not interfere with the acquisition of control blocks (Bebuck and Cohen, 2005). An additional reason for increased voting premiums might be given by the fact that the shares of firms with staggered director-election cycles trade at a discount on the market (Bebuck and Cohen, 2005). Given that they do not impede control contests, staggered boards even increase the likelihood of takeover contests through the relatively small acquisitions costs. Furthermore, the results suggest that poison-pill provisions and entrenched boards are not statistically associated with the level of voting yields. Despite that both mechanisms signal a weak disciplining factor of the market of corporate control for managers and directors (Jensen, 1986; Gibbs, 1993), the supposedly facilitated private consumption does not affect voting values. For one, poison pills are an effective deterrent of hostile takeovers and, thus, decrease the ability of gaining controlling power for company outsiders (see, e.g., Ryngaert, 1988). For another, entrenched directors might be able to secure the access to private benefits through their job security, which in turn decreases the possibility of extracting private benefits for company outsiders.

With respect to poison-pill securities, Brickley, Coles, and Terry (1994) show that their adoption has a particularly high negative effect on shareholder value in firms with insider-dominated boards. Arguably, the existence of outside directors is in the interest of shareholders and their disciplining monitoring pressure is suitable to reduce agency costs - even if the threat from the market of corporate control is neutralized. To test this board-composition effect, we divide the sample into firms with insider-dominated and outsider-dominated boards and repeat the above regressions for the poison-pill dummy.

Table 11: Poison-Pill Securities and Board Independence

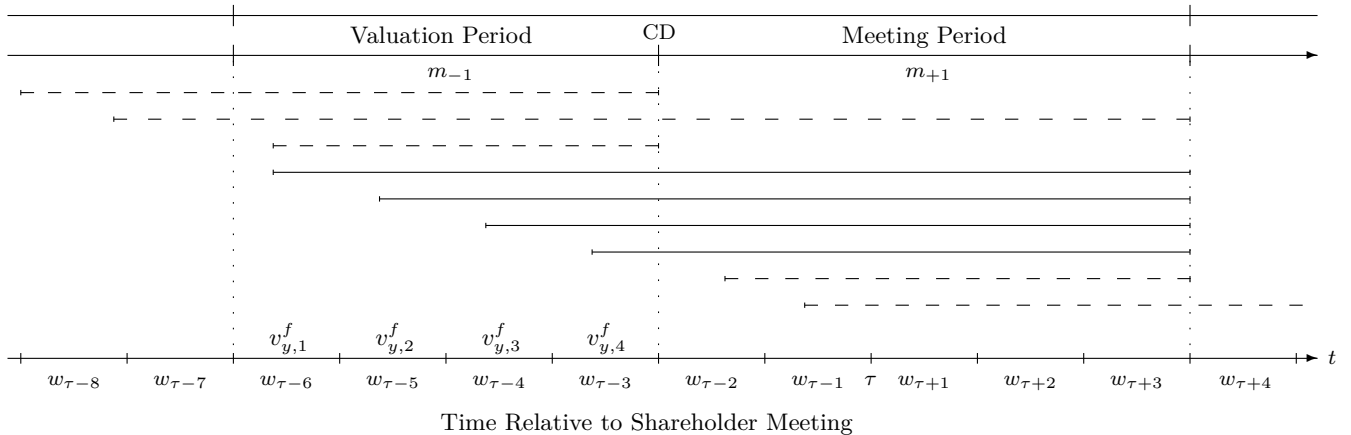
This table displays the output of voting-yield regressions with respect to the existence of poison-pill provisions. Thereby, the full sample is divided in subsamples of firms with outsider-dominated boards (Models (1) and (3)) and insider-dominated boards (Models (2) and (4)). The dummy Poison Pill signals active poison pills in a company's charter or by-law. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (in %) | | | |
|--------------------|----------------------------|---------------------------|----------------------------|---------------------------|
| | Model (1) Outside Board | Model (2) Inside Board | Model (3) Outside Board | Model (4) Inside Board |
| Poison Pills | -2.233*** (-3.92) | 0.361 (1.00) | -1.688*** (-3.12) | 0.328 (0.89) |
| Constant | Yes | Yes | No | No |
| Legal-System FE | No | No | No | No |
| Time FE | No | No | Yes | Yes |
| Industry FE | No | No | Yes | Yes |
| Country FE | No | No | Yes | Yes |
| Observations | 7,335 | 4,632 | 7,290 | 4,627 |
| R^2 | 0.00 | 0.00 | 0.10 | 0.14 |
| Adjusted R^2 | 0.00 | 0.00 | 0.10 | 0.13 |

The results presented in Table 11 suggest that board independence is indeed a significant driver of the poison-pill effect. The negative and large coefficients obtained for the sample of firms with independent boards

Figure 2: Valuation Setting and Selection of Option Contracts

This figure illustrates the valuation setting and shows the selection of option contracts used for the computation of voting-right values around firm f 's shareholder meeting in year y . The cum-voting date (CD) separates the valuation period from the meeting period and lies two weeks prior to the shareholder meeting (held on day τ) in this example. The valuation period lasts four weeks from week $w_{\tau-6}$ to week $w_{\tau-2}$. For each week, a voting value is computed based on all valid option contracts observed within the respective week that mature on the third Friday directly after the shareholder meeting. The contractual maturities of eligible option contracts are drawn with solid horizontal lines. All other options, i.e. those that are not traded over the meeting date or don't mature directly on the third Friday after the meeting, are excluded from the optimization process. The maturities of deleted option contracts are drawn with dashed lines. m defines the option trading month (third Friday of a month to third Friday of the next one) relative to the cum-voting date.



provide evidence that (i) poison-pill securities drastically reduce the possibility for outside investors to obtain control and (ii) the reduced takeover threat does not increase private consumption of company insiders when outside directors pose a credible monitoring threat. In contrast, the existence of both, inside boards and poison pills, supposedly is a strong signal for large and unmonitored private benefits. This in turn increases the attractivity for external investors and counteracts the negative takeover-defense effect (Models (2) and (4)).

4 Voting-Right Values at Shareholder Meetings

4.1 Valuation Procedure

To increase the coverage of shareholder meetings compared to the monthly-voting yield valuation (as described Subsection 3.2) and to address the legal aspects of shareholder voting, we adjust the measurement procedure for meeting-related voting-right values. The voting mechanics at shareholder meetings of European companies are at their core identical to the US-setting (cf. Kahan and Rock, 2008; Kalay, Karakas, and Pant, 2014). In both, the European and the US-case, companies close their shareholder book prior to a general meeting on the record date. Between the record date and the meeting date, an investor who newly purchases shares is not able to register as shareholder and, therefore, is not allowed to participate or vote at the upcoming meeting. This legal issue has direct consequences for the valuation of voting-right values via option prices. If the goal is to capture the value of voting at a specific event, the valuation must be based on option contracts that satisfy the following two criteria: (i) the options' lifetimes must include the control event, and (ii) the observation of option quotes needs to be at a point in time where the purchase of the underlying stock entitles to participate, otherwise the share price does not carry a voting premium related to the event of interest.

Figure 2 shows the valuation setting in detail with an exemplarily chosen two-week period between the cum-

voting date and the meeting date.¹⁷ Thereby, the cum date separates the valuation period from the meeting period. For each of the four trading weeks just before the cum-voting date (during the valuation period), a weekly voting yield is backed out of the option contracts traded during the respective week which mature directly after the meeting (on the first third Friday of the month after the meeting). In the figure, the contractual maturities of eligible options are drawn with solid horizontal lines. With this minimal time horizon over which voting values are calculated, the meeting effect can be isolated optimally. The influence on voting values of control matters unrelated to the particular meeting, such as merger activities or proxy contests, is arguably minimal as their occurrence is relatively unlikely during this short period of time. All other options, whose maturity is depicted with dashed horizontal lines - which either are not traded within the valuation period and/or mature before the meeting or after the first third Friday of the meeting period - are excluded from the analysis.

In the end, the annualized voting yield of company f 's shareholder meeting in year y , \overline{vy}_y^f , is calculated as the arithmetic average of the four weekly voting-yield observations, $vy_{y,j}^f$, during the valuation period:

$$\overline{vy}_y^f = \frac{1}{4} \sum_{j=1}^4 vy_{y,j}^f. \quad (4)$$

The duration of the period with closed shareholder registers varies from country to country and firm to firm, but is much shorter in Europe than in the US.¹⁸ In contrast to the US, however, historical record dates of European firms are neither recorded in a central database nor widely available in company filings for the full sample period. Thus, for each country, the meeting period starts on a specific day relative to the general meeting depending on the financial market regulations in a way that makes sure that no option contracts are used in the optimization process which are traded after the cum-voting date.

Table 12: Vote-Registration Laws

This table shows for each country covered in the empirical analysis of voting values around shareholder meetings the earliest possible record date according to financial-market regulations. The third column provides the legal source.

| Country | Earliest Record Date | Source |
|-------------|-------------------------------------|---|
| Belgium | 14 calendar days prior to meeting | Belgian Companies Code - Art 536 §2, s 1, ch 2 |
| Finland | Eight working days prior to meeting | Finnish LLC Act - Art 2, s 2, ch 4 |
| France | Three working days prior to meeting | French Commercial Code - Art R225-85, s 3, ch 5 |
| Germany | 21 calendar days prior to meeting | German Stock Corporation Act - §123-2 |
| Italy | No binding law in effect | Italian Civil Code - Tit 5, Book 5 |
| Netherlands | 28 days prior to meeting | Dutch Civil Code - Art 119 §2, Book 2 |
| Spain | Five working days prior to meeting | Spanish Corporate Enterprises Act - Art 179 §3 |
| Sweden | One week prior to meeting | Swedish Companies Act - S 16, ch 7 |
| Switzerland | No binding law in effect | Swiss Code of Obligations |
| UK | Two working days prior to meeting | UK Companies Act (c.46) - Art 327, ch 3, pt 13 |

Table 12 provides an overview of regulations regarding vote-registration laws of the countries covered in this empirical analysis. For each meeting observation, the record date is set on the last trading day of the week just before the earliest possible record date. For the two countries with no binding law in effect (Italy and Switzerland), a sensible date based on empirical observations including a safety margin is chosen.¹⁹

¹⁷The cum-voting date is the last day on which the purchase of a share is timely enough so that the transaction can be both settled at the exchange and registered in the shareholder book. We choose a full trading week, i.e., five days, between cum-voting date and record date to make sure that the shareholder registration is possible on the cum date.

¹⁸According to the empirical sample analyzed in Chapter 3 of this dissertation, US-firms close their shareholder book 43 calendar days before the meeting on average.

¹⁹In Italy, companies typically close their shareholder register one or two working days prior to the meeting. This

4.2 Shareholder-Meeting Sample

The shareholder-meeting analysis is based on the same sample of European companies between 2002 and 2012 and equivalent contract filters as described in Subsection 3.3. The only difference arises from the adjusted valuation procedure outlined in Subsection 4.1. Table 13 summarizes the meeting sample and shows that the number of covered general meetings increases to 1,952 and 394 firms compared to the 1,287 meetings in 303 firms captured by the previous analysis. Especially in countries with less trading activity in the option market, i.e., Belgium, Finland, Spain and Sweden, the number of observed meetings increases multiple times.

Table 13: Option Sample of Meeting Analysis

This table summarizes the shareholder-meeting sample based on the valuation setting described in Subsection 4.1. The first column defines the origin country of the sample firms. Columns two and three present the number of unique firms in the sample and the total number of covered shareholder meetings. In column three, the total number of option contracts used during the complete valuation process is shown followed by the average number of used options per general meeting.

| Country | Firms | Shareholder Meetings | Option Quotes | Options per Meeting |
|----------------|-------|----------------------|---------------|---------------------|
| Belgium | 17 | 90 | 3,412 | 37.91 |
| Finland | 8 | 36 | 1,086 | 30.17 |
| France | 52 | 350 | 15,739 | 44.97 |
| Germany | 75 | 450 | 38,366 | 85.26 |
| Italy | 38 | 136 | 5,985 | 44.01 |
| Netherlands | 57 | 324 | 38,154 | 117.76 |
| Spain | 25 | 51 | 1,062 | 20.82 |
| Sweden | 34 | 122 | 5,176 | 42.43 |
| Switzerland | 48 | 249 | 16,014 | 64.31 |
| United Kingdom | 40 | 144 | 5,255 | 36.49 |
| Total Sample | 394 | 1,952 | 130,249 | 66.73 |

For the cross-sectional analysis of meeting-dependent voting values, we add further variables related to shareholder voting compared to the first empirical study of this paper (see Subsection 3.3.2). Specifically, we incorporate information on cumulative voting as well as on practices and regulations regarding say-on-pay votes. The first variable, *Cumulative Voting*, stems from the ESG-Ratings database by Governance Metrics International and indicates whether the company applies a cumulative voting procedure during the election of board directors.

Regarding say-on-pay votes, we differentiate between advisory and binding resolutions. Both variables, *Advisory SoP Votes* and *Binding SoP Votes*, refer to state-imposed legislations regarding shareholder votes on management compensation during general meetings. Thereby, the financial-market regulations differ remarkably across the sample countries, even within the European Union. In 2002 and effective for the meeting season 2003, the United Kingdom was the first country to adopt a law that requires public companies to hold advisory votes on executive remuneration at the annual shareholder meeting (Ferri and Maber, 2013). A similar bill - proposed by the European Commission - mandating non-binding votes on executive director compensation has been introduced in Italy and Belgium in 2012 (Correa and Ugur, 2013; Belcredi, Bozzi, Ciavarella, and Novembre, 2014). The Italian regulation additionally includes a provision that demands binding votes from shareholders of financial companies (banks and insurances). The regulatory framework in Germany represents a special case (Vesper-Graeske, 2013). With the introduction of a new remuneration bill in 2009,²⁰ the supervisory board has the competence to include advisory votes on executive-director compensation at the annual meeting. Typically,

results in a chosen record date of one week prior to the shareholder meeting. In Switzerland, stock companies close their shareholder register around one week ahead of a meeting. Therefore, we apply a 14-day period with closed shareholder registers.

²⁰Gesetz zur Angemessenheit der Vorstandsvergütung

voluntarily implemented votes are subject to a self-selection bias as the inclusion decision is highly endogenous. Firms with poor compensation standards which may anticipate a rejection of their plans from shareholders are unlikely to offer such votes. Therefore, a sample consisting of such voluntary votes is clearly not independent from compensation and other firm characteristics. However, the German bill enables shareholders of corporations to demand for the say-on-pay votes if the supervisory board refuses to implement them. Due to this amendment, we classify the general meetings of German companies starting from 2010 as meetings with non-binding say-on-pay votes. In fact, 27 of the 30 DAX-companies held the say-on-pay votes during their annual meeting in the first year after the passage of the remuneration bill (2010). In 2011, all of them let their shareholders vote on compensation practices. All other voluntary votes in Germany as well as in firms of other countries are not considered as true say-on-pay votes because of the mentioned endogeneity issues.

The most strict regulations apply for Swedish and Dutch companies (Correa and Ugur, 2013). In Sweden, shareholders of public firms have a binding say on compensation practices since 2006. The law in the Netherlands demands a binding vote during general meetings since 2004 whenever a company significantly alters its compensation policy. In order to capture all meetings with a compensation vote, we consulted the minutes of each general meeting for the Dutch sample companies since 2004. All remaining countries, i.e., Finland, France, Spain and Switzerland, did not have legal requirements on say-on-pay votes during the sample period.²¹ Many of these countries are, however, on the verge of passing (Finland, France, Germany, Italy) or have already passed (UK, Switzerland) new laws that require mandatory votes on CEO and/or director compensation for current or upcoming meeting seasons.

Table 14 summarizes the frequency and distribution of the newly incorporated variables along further characteristics employed in the upcoming empirical analysis for the shareholder-meeting sample. Thereby, the second and third column reflect the previously discussed country-dependent regulations regarding advisory and binding votes on management compensation practices. Interestingly, only firms of countries with French civil-law code apply the cumulative voting procedure during director elections. The procedure seems to be especially popular in Spanish firms (87.50% of country-specific observations). The definitions of the remaining characteristics listed in Table 14, *Performance Link* (of manager compensation), *Staggered Board*, and *Board Independence*, stay the same as in the first empirical study of this paper (as outlined in Subsection 3.3.2).

4.3 Empirical Voting Values Around Shareholder Meetings

The re-valuation of voting yields with focus on general meetings and the consideration of the institutional characteristics of shareholder voting provides some interesting results. Table 15 shows that the average meeting value is equal to 1.13%, significantly different from zero at high confidence levels but overall smaller than the mean meeting value of 1.62% obtained for the monthly valuation setting (see Subsection 3.4). In most cases, however, the results are similar to those of the previous analysis. For example, general meetings of Belgian companies are still associated with the highest value across all countries with a yield of 2.92% (3.49% before), although the number of covered meetings increased from 29 to 90 in this setting. Further, voting-right values of Spanish and British firms remain statistically close to zero. In contrast, we now find a statistically positive average voting yield for shareholder meetings of Finnish firms for the larger sample, although the value decreased from 2.47% to 1.57% (cf. Panel C of Table 5). The biggest difference in values compared to the first analysis is obtained for Italian firms. The broader coverage of firms leads to an increase of the average voting value from 0.05% to 0.54% and an accordingly significant meeting effect (cf. Panel C of Table 5).

²¹Some of the mentioned countries have laws regarding the compensation of board directors in place. This empirical study focuses solely on executive compensation.

Table 14: Summary Statistics of Voting Practices and Board Characteristics

This table presents summary statistics of the governance variables used in the regression analysis of the voting values surrounding general meeting. The percentages show the fraction of meetings for which the respective characteristics apply. The second and third columns show the distribution of advisory and binding say-on-pay votes (SoP Votes) across countries. The fourth column outlines the fraction of firms whose compensation policy is performance dependent. The last three columns describe board characteristics, i.e., the frequency of cumulative voting procedures during director elections, staggered (classified) boards, and board independence as defined in Section 3.3.2.

| Country | Advisory SoP Votes | Binding SoP Votes | Performance Link | Cumulative Voting | Staggered Board | Board Independence |
|-----------------|-----------------------|----------------------|---------------------|----------------------|--------------------|-----------------------|
| Belgium | 14.44% | 0.00% | 73.08% | 0.00% | 97.44% | 64.44% |
| Finland | 0.00% | 0.00% | 84.38% | 0.00% | 0.00% | 77.78% |
| France | 0.00% | 0.00% | 79.14% | 20.25% | 80.67% | 32.29% |
| Germany | 36.89% | 0.00% | 86.91% | 0.00% | 16.79% | 29.78% |
| Italy | 11.03% | 2.21% | 86.92% | 7.69% | 13.08% | 58.09% |
| Netherlands | 0.00% | 13.89% | 75.36% | 3.86% | 80.68% | 59.57% |
| Spain | 0.00% | 0.00% | 87.50% | 87.50% | 35.42% | 17.65% |
| Sweden | 0.00% | 100.00% | 88.33% | 0.00% | 0.00% | 54.10% |
| Switzerland | 0.00% | 0.00% | 70.97% | 0.00% | 66.82% | 67.07% |
| United Kingdom | 90.97% | 0.00% | 88.29% | 0.00% | 83.78% | 72.92% |
| Complete Sample | 16.65% | 8.71% | 81.42% | 7.53% | 50.54% | 48.77% |

Table 15: Empirical Voting Values at Shareholder Meetings

This table provides descriptive statistics of the voting yields extracted from option quotes written on the stock of European surrounding their shareholder meetings. For each country, the mean voting value, the t -statistics as well as the three quartiles are presented. The last two columns add the number of general-meetings observations and the number of covered firms. The two-tailed t -tests are based on the null hypothesis that the mean voting values are equal to zero. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Country | Mean | t -Stats | 25%Perc. | Median | 75%Perc. | Meetings | Firms |
|-----------------|----------|------------|----------|--------|----------|----------|-------|
| Belgium | 2.92%*** | 8.78 | 0.94% | 3.01% | 5.19% | 90 | 17 |
| Finland | 1.57%*** | 2.80 | -0.04% | 1.08% | 3.58% | 36 | 8 |
| France | 2.00%*** | 13.98 | 0.46% | 2.16% | 3.56% | 350 | 52 |
| Germany | 0.72%*** | 7.57 | -0.03% | 0.73% | 1.40% | 450 | 75 |
| Italy | 0.54%*** | 3.51 | -0.10% | 0.48% | 1.01% | 136 | 38 |
| Netherlands | 1.21%*** | 7.79 | 0.17% | 1.02% | 2.21% | 324 | 57 |
| Spain | 0.66% | 1.11 | -1.79% | 0.70% | 3.39% | 51 | 25 |
| Sweden | 1.95%*** | 6.69 | 0.42% | 2.10% | 3.88% | 122 | 34 |
| Switzerland | 0.60%*** | 3.95 | -0.24% | 0.75% | 1.78% | 249 | 48 |
| United Kingdom | -0.16% | -0.94 | -1.11% | -0.09% | 0.88% | 144 | 40 |
| Complete Sample | 1.13%*** | 18.72 | -0.06% | 0.92% | 2.36% | 1,952 | 394 |

4.4 Cross-Sectional Analyses of Voting Values at Shareholder Meetings

4.4.1 Voting-Right Values at General Meetings and Say-on-Pay Votes

In a first regression analysis of the meeting-related voting yields, the impact of advisory and binding say-on-pay votes is examined. Table 16 presents the outputs of four different regression models. While the first model includes all meeting observations, the latter three base the analysis on subsamples of firms that either do provide their executives with monetary incentives (Model (2)) or not (Models (3) and (4)). Furthermore, Model (4) includes interaction terms of both binding and advisory compensation votes with the CGE-Score described in Subsection 3. A CGE-Score of zero proxies for high agency costs and poor governance effectiveness with respect to the four channels board independence, monetary incentives, shareholder monitoring and the threat of hostile takeovers from the market of corporate control. In contrast, a score of three implies that all of the channels

besides monetary incentives are supposedly effective monitoring mechanisms.²²

Table 16: Effects of Say-on-Pay Votes on Voting-Right Values

This table shows the correlations between voting yields measured around shareholder meetings and say-on-pay votes. The regressions include dummies that signal advisory and binding say-on-pay votes as well as interaction terms with the CGE-score in Model (4). The first model tests the full sample, the second focuses on meetings of firms where the CEO's compensation is performance dependent and the final two include companies performance-insensitive compensation standards. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (\overline{vy} , in %) | | | |
|--|--|----------------------------------|-------------------------------------|-------------------------------------|
| | Model (1) Full Sample | Model (2) Performance Link | Model (3) No Performance Link | Model (4) No Performance Link |
| Advisory Say-on-Pay Vote | 0.323 (1.33) | 0.147 (0.52) | 0.872 (1.20) | |
| Binding Say-on-Pay Vote | -0.597 (-1.11) | -0.819 (-1.34) | 1.547*** (2.76) | |
| Advisory Say-on-Pay Vote*CGE Score = 0 | | | | 0.908 (0.61) |
| Advisory Say-on-Pay Vote*CGE Score = 1 | | | | 0.671 (0.81) |
| Advisory Say-on-Pay Vote*CGE Score = 2 | | | | 1.062 (1.11) |
| Advisory Say-on-Pay Vote*CGE Score = 3 | | | | 0.597 (0.80) |
| Binding Say-on-Pay Vote*CGE Score = 1 | | | | 2.215*** (2.84) |
| Binding Say-on-Pay Vote*CGE Score = 2 | | | | 1.266* (1.69) |
| Binding Say-on-Pay Vote*CGE Score = 3 | | | | -1.379 (-0.65) |
| Control Variables | Included | Included | Included | Included |
| Legal-System FE | Yes | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes | Yes |
| Observations | 1,191 | 852 | 227 | 227 |
| R^2 | 0.33 | 0.35 | 0.46 | 0.47 |
| Adjusted R^2 | 0.31 | 0.33 | 0.37 | 0.37 |

The regression outputs reveal that the mandatory requirement of say-on-pay votes is per se not significantly correlated with the value of voting at general meetings. In the full sample (Model (1)) and the sample of firms with performance-sensitive compensation practices (Model (2)), the coefficients of both advisory and binding say-on-pay votes are statistically not different from zero. There seems to be no added voting value for shareholders from say-on-pay votes if a company already provides monetary incentives for their executive managers. In fact, the results are in line with the observation that most board-proposed compensation plans are approved by the shareholder assembly with a clear majority (see, e.g., Ertimur, Ferri, and Oesch, 2013; Ferri and Maber, 2013). This must, however, not necessarily mean that say-on-pay votes are economically

²²There are no observations of the full CGE-score since the regression models focus on meetings of firms with performance-insensitive compensation policies. Unfortunately, there are also not sufficient observations of firms with a zero score that are legally required to hold a binding vote on compensation practices to test for statistical correlations.

unimportant for firms with effective remuneration policy. Already their existence might force companies to adjust their compensation standards voluntarily because of the threat of increased media and public scrutiny when these votes are controversial (Cai and Walkling, 2011; Ertimur, Ferri, and Oesch, 2013).

In contrast to the first two models, binding say-on-pay votes are linked with a significant increase of voting yields for the subsample of firms with supposedly poor compensation policy. Arguably, there are two sources for the high voting values. First, it could be intrinsically valuable for shareholders to show their dissent with current practices and, thus, they are willing to increase their voting power prior to the meeting. Second, the votes can provide an instrumental value when shareholders expect benefits from improved compensation contracts and the simultaneous reduction of agency costs upon the rejection of poor remuneration standards (Bebchuk, 2007; Ferri and Maber, 2013). In this case, the necessary monetary incentives are given for shareholders to engage in a voting battle with managers and directors. The interaction terms of binding say-on-pay votes and the CGE-score further support this argumentation. The strongest reaction of voting values is measured for binding votes in firms with relatively poor governance standards (CGE-score of one), decreases for firms with a CGE-score of two and even becomes insignificant in companies with independent boards, large blockholders and no outstanding antitakeover measures (CGE-score of three). This finding suggests that different governance channels cannot be viewed as independent mechanisms but more likely as a system of mechanisms that serve the same purpose, i.e., the reduction of agency costs (Rediker and Seth, 1995; Weir, Laing, and McKnight, 2002). Rediker and Seth (1995), for example, document significant substitution effects between outside-director and shareholder monitoring as well as between compensation incentives and board monitoring. In the same line, the expectations of improved governance efficiency via binding say-on-pay votes is supposedly particularly high when other monitoring channels are neutralized. On the contrary, the votes do not provide incentives for an active involvement of shareholders if other channels are capable of exercising monitoring pressure on the company's management.

In Models (3) and (4) also the positive coefficients for advisory say-on-pay votes increase for the subsample of firms with performance-insensitive compensation but remain statistically insignificant. Supposedly, binding votes offer more power to shareholders than advisory votes. This at first sight trivial conclusion supports evidence that advisory votes do not seem to be able to exercise significant pressure on boards to act according to the shareholders' voice - at least not on those boards who persist on offering performance-insensitive compensation contracts to their executives. It could be that managers in such firms are able to exert power on directors who then in turn are compelled to ignore the interests of shareholders.

4.4.2 Voting-Right Values at General Meetings and Director-Election Procedures

The second analysis of meeting values focuses on the decision power of marginal voting rights during the election of directors. Through the adoption of cumulative voting, companies can voluntarily increase the controlling power of small shareholders (see, e.g., Gordon, 1994; Black and Kraakman, 1996). To test if the cumulative voting procedure empirically affects the value of voting at shareholder meetings, we run three regressions for different samples. The first one includes all meeting observations of the full sample. In Models (2) and (3), the sample is separated into companies with outsider-dominated (independent) and insider-dominated (dependent) boards. Additionally, we include a dummy for staggered boards in each of the models to test for the influence of the restricted director-election process.

The regression outputs summarized in Table 17 reveal that the possibility for shareholders to elect directors cumulatively is positively associated with voting values (cf. Model (1) and (3)) if the majority of directors is not independent from company executives (cf. Model (2)). First of all, voting yields are on average more than 70

Table 17: Voting-Right Values and Director-Election Procedures

This table shows the statistical relationship between voting yields measured around shareholder meetings and the existence of either a cumulative voting-procedure during the election of directors or a classified board of directors. The first model tests the full sample, while the second focuses on meetings of firms with an independent supervisory board where the majority of board directors are firm outsiders and the roles of CEO and chairman are separated. The last model tests for the correlation of director voting and management-dependent boards. The t -statistics are based on robust standard errors and shown in parentheses. The significance levels of the t -statistics are as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

| Dependent Variable | Voting Yield (\overline{vy} , in %) | | |
|--------------------|--|-----------------------------------|---------------------------------|
| | Model (1) Full Sample | Model (2) Independent Board | Model (3) Dependent Board |
| Cumulative Voting | 0.748** (2.20) | 0.454 (0.79) | 0.801* (1.74) |
| Staggered Board | -0.042 (-0.20) | 0.147 (0.62) | -0.100 (-0.28) |
| Control Variables | Included | Included | Included |
| Legal-System FE | Yes | Yes | Yes |
| Time FE | Yes | Yes | Yes |
| Industry FE | Yes | Yes | Yes |
| Country FE | Yes | Yes | Yes |
| Observations | 1,079 | 648 | 431 |
| R^2 | 0.35 | 0.33 | 0.42 |
| Adjusted R^2 | 0.31 | 0.29 | 0.37 |

basis points higher for firms with cumulative voting (Model (1)). Second, Model (3) shows that the correlation is even higher for companies with insider-dominated boards. In contrast, the coefficient of the cumulative-voting dummy is not significant at satisfying confidence levels for the subsample of firms with independent boards (Model (2)). The shareholders' positive reception suggests that the cumulative voting procedure is suitable to strengthen the decision power of marginal voting rights, as suggested by Bhagat and Brickley (1984) and Gordon (1994). For this effect to be reflected in increased voting premiums, however, the economic importance of the election is required. Only when its composition does not allow a board to work efficiently, i.e., when boards are insider dominated (Rosenstein and Wyatt, 1990; Faleye, Hoitash, and Hoitash, 2011), shareholders are willing to actively invest in the election process. It is important to note that the empirical relevance of this finding must be viewed in the context of this empirical analysis. The sample exclusively includes cumulative-voting observations for companies originating in French civil-law countries. It could be that these companies voluntarily try to compensate for the poor legal minority-investor protection in the French civil code by strengthening the decision power of marginal voting rights. The adoption of cumulative voting might not be associated with the same effects for companies in other legal systems. Finally, the dummy for staggered boards is small and insignificant in all models, supposing that a classified election cycle of directors has no adverse effects on the value of voting at general meetings - in contrast to the effect on the levels of non-meeting voting yields (cf. Table 10).

5 Conclusion

This study examines the relationship between marginal voting-right values and corporate governance. Thereby, annualized voting yields extracted from liquid equity options serve as basis for the empirical analysis. In a first valuation setting, the average monthly-constant voting yield of 442 European companies amounts to 0.45% in terms of the share price during the period from 2002 to 2012. The voting rights are particularly valuable in months with shareholder meetings and in countries where the interests of minority investors are poorly protected

by the legal system (French and German civil law). Further, the existence of a CEO-chairman dual mandate and a classified election cycle of board directors exhibit positive correlations with voting yields. In contrast, active poison-pill securities adopted from outsider-dominated boards and voting-right limits for outside shareholders adversely affect voting-right values. In combination, the results indicate that the market value of voting rights is high in firms with high expected agency costs, i.e., low monitoring threats for company insiders regarding the consumption of private benefits, of which control can be acquired without frictions in the form of takeover defenses.

In the second empirical analysis, voting yields are extracted from options traded prior to 1,952 shareholder meetings in 394 companies. The value to vote at a general meeting is significantly higher when shareholders have the legal possibility to vote on management compensation practices when (i) the say-on-pay votes are binding and (ii) existing compensation contracts are not performance sensitive. The observed effect is particularly strong when other governance channels supposedly fail to operate efficiently. Finally, the analysis provides evidence that the cumulative election procedure of board directors strengthens the decision power of the marginal shareholder as it is associated with increased voting yields.

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Appendix

A Implementation Issues

A.1 Loss Function

The metric for measuring the distance between model and observed option prices, i.e., the loss function L , is not uncontroversial in the option-pricing literature (see, e.g., Christoffersen and Jacobs, 2004; Bams, Lehnert, and Wolff, 2009). The three prevalent metrics used in empirical option-pricing studies are (i) the (dollar) mean squared error (MSE), (ii) the mean squared relative error (MSRE), and (iii) the implied volatility mean squared error (IVMSE). Christoffersen and Jacobs (2004) examine the results obtained by using each of these functions and conclude that the mean squared error (MSE) is “[...] a good general-purpose loss function in option valuation applications.” (p. 316) Bams, Lehnert, and Wolff (2009) draw similar conclusions. For this reason, we use the MSE as baseline target function in our optimization problem:

$$L = \frac{1}{W} \sum_{w=1}^W \left[\hat{P}_w(\Theta_\kappa, \Theta_u, v) - P_w \right]^2, \quad (5)$$

where W is the number of options used in the optimization, $\hat{P}_w(\Theta_\kappa, \Theta_u, v)$ the model price, and P_w the empirically-observed price of option w .

A.2 Numerical Optimization

The optimization is computationally challenging because it requires the minimization of the loss function over several parameters. To increase the likelihood of finding the global minimum of the loss function within the parameter space, we adopt the robust simplex algorithm by Nelder and Mead (1965).

Since each computation of the loss-function involves the construction of W binomial trees (one for each option), it is crucial to implement an efficient option pricing routine. To obtain smooth convergence, the canonical binomial-tree routine is enhanced by replacing the time value of the option in the second last nodes in the tree with the Black & Scholes option value for the remaining maturity (Binomial Black & Scholes Model). Furthermore, we compute option prices by applying the Richardson extrapolation, as first described by Geske and Johnson (1984). The binomial tree model with the just described enhancements is called Binomial Black & Scholes Model with Richardson extrapolation (BBSR) and is known to outperform other binomial-tree methods.²³

B Option-Pricing Algorithm

As valuation model, we employ a modified version of the Binomial Black & Scholes Model with Richardson extrapolation as proposed in Geske and Johnson (1984), which is based on the binomial pricing model by Cox, Ross, and Rubinstein (1979) [CRR]. Depending on either defining the voting values as yields or discrete values, the pricing algorithm has to be adjusted accordingly. In the case of a continuous voting yield, vy , the adjustment corresponds to the one for continuous dividend yields. When voting yields are positive, the risk-neutral branching probabilities of the binomial CRR-model, $p(u)$ and $p(d)$, have to be adjusted to account for the reduction in the expected stock-price drift:

$$\begin{aligned} p(u) &= \frac{\exp\{(r - vy) \cdot \Delta t\} - d}{u - d} \\ p(d) &= 1 - p(u), \end{aligned} \quad (6)$$

²³By testing several option pricing methods, Broadie and Detemple (1996) point out that the BBSR-model “[...] is significantly better than the other binomial-type methods” (p. 1231) in terms of the trade-off between computational speed and valuation accuracy.

where Δt is the length of one time step in the binomial tree, and u and d are the one-step stock returns in the up and down movement that define the geometry of the binomial tree.

In the second case, where voting values are assumed to accrue to investors as discrete values at a specific date, we follow the method of Schroder (1988) that adjusts the binomial pricing model correctly for discrete cash outflows such as dividends. The method changes the set up of the stock price tree by starting from a hypothetical initial stock price that equals the observed stock price reduced by the present value of the sum of all cash outflows during the option's lifetime. Thereby, the binomial tree retains its computationally efficient recombination characteristics. By then adding back the present value of dividends or voting values that are not yet paid out to the share price in each node, the method creates a discrete price jump at the chronologically nearest node to the ex-dividend or ex-voting date in the tree. As a result, the modified tree is able to simulate the correct influence a discrete dividend or voting value has on the exercise behavior of stock-option investors.

By applying this binomial-tree modification for cash dividends and discrete voting values, the model implicitly assumes perfect forecasting on the investors' part. Since this study focuses on options with a maturity of maximally two months, this assumption seems reasonably justified. Within this time horizon, it is unlikely that an unexpected dividend is announced and, in addition, the stock goes ex-dividend as well. The same holds for the announcement and realization of a fixed and surprising voting event such as a special meeting.