Corporate Governance and Equity Risk*

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January 15, 2017

Abstract

This paper studies the influence of corporate governance on equity risk. By using a Regression Discontinuity Design applied to shareholder proposals which fail or pass by a small margin, we obtain causal estimates of the influence of corporate-governance provisions on three forward-looking measures of equity risk extracted from option prices: (i) total volatility, (ii) idiosyncratic volatility, and (iii) equity beta. An improvement of the G-Index by one point increases expected stock-return volatility by 5%, on average. As equity beta is found to remain unaffected by changes in corporate governance, the effect is fully attributable to higher idiosyncratic volatility. The rise in volatility after governance improvements is found to be particularly large for items included in the E-Index.

Keywords: Corporate Governance, Regression Discontinuity Design, Implied Volatility, M&A Delay Provisions

JEL codes: G30, G34, G32

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We would like to thank Ralf Elsas, Marcel Fischer, Joachim Grammig, Patrick Hauf, Jens Carsten Jackwerth, Marco Poltera, Stefan Ruenzi, Christian Schlag, Erik Theissen, Torsten Twardawski, Christophe Volonte, Nadja Younes, Iana Zborshchyk, seminar participants at University of Konstanz and DGF PhD workshop for valuable comments.

The Causal Effects of Corporate Governance on Equity Risk

This paper studies the influence of corporate governance on equity risk. By using a Regression Discontinuity Design applied to shareholder proposals which fail or pass by a small margin, we obtain causal estimates of the influence of corporate-governance provisions on three forward-looking measures of equity risk extracted from option prices: (i) total volatility, (ii) idiosyncratic volatility, and (iii) equity beta. An improvement of the G-Index by one point increases expected stock-return volatility by 5%, on average. As equity beta is found to remain unaffected by changes in corporate governance, the effect is fully attributable to higher idiosyncratic volatility. The rise in volatility after governance improvements is found to be particularly large for items included in the E-Index.

1 Introduction

In the last decades, scholars in the field of corporate governance have gained significant insights on the relation between governance provisions and a multitude of firm-performance measures, such as stock returns (most prominently, Gompers, Ishii, and Metrick, 2003; Bebchuk, Cohen, and Ferrell, 2009; Cuñat, Gine, and Guadalupe, 2012), Tobin's Q (see, e.g., Harold Demsetz, 1985; Yermack, 1996; Morck, Shleifer, and Vishny, 1988; Gompers, Ishii, and Metrick, 2003; Fich and Shivdasani, 2006; Coles, Daniel, and Naveen, 2008, , among others), accounting profitability (e.g., Gompers, Ishii, and Metrick, 2003; Joh, 2003), cost of debt (Klock, Mansi, Maxwell, et al., 2005), cash holdings (Harford, Mansi, and Maxwell, 2012), executive compensation (Core, Holthausen, and Larcker, 1999), and corporate innovation (Chemmanur and Tian, 2013).

In this paper, we study the influence of firm-specific governance characteristics on different established measures of equity risk, namely total stock-return volatility, idiosyncratic volatility, and equity beta. The relevance of this research question is intrinsically related to the central role played by equity risk for investment decisions, cost-of-capital calculations, and even managerial incentives via executive stock options.

To measure the causal effect of corporate governance on equity risk, we follow Cuñat, Gine, and Guadalupe (2012) and Capuano (2008) and employ a Regression Discontinuity Design (RDD) applied to votes on governance-related shareholder proposals. As the outcomes of close votes, i.e., proposals that fail or pass by a small margin (e.g., 49% or 51%), can hardly be anticipated and are uncorrelated with firm characteristics, they are akin to independent random events. Thus, close votes on shareholder proposals serve as plausible exogenous shocks to selected corporate-governance characteristics. They allow us to overcome the well-known endogeneity obstacles in empirical analysis and improve - in terms of methodology - over studies that simply regress equity risk on selected governance provisions (see, e.g., Ferreira and Laux, 2007; Parigi, Pelizzon, Thadden, et al., 2014). In particular, unlike cross-sectional regressions, the research design adopted in this paper does not suffer from estimation biases arising from reverse causality or the omission of unobserved firm characteristics that drive both corporate governance and equity risk.

Instead of relying on realized volatilities and betas, we extract forward-looking measures of equity risk from option prices. This procedure has three decisive advantages. First, implied risk measures are less noisy than their historical counterparts. The former reflect aggregate market expectations of future stock returns, whereas the latter represent single realizations of the same quantities. In fact, the high predictive power of option implied volatilities and betas compared to other sophisticated forecast methods is confirmed by several studies (see, e.g., Busch, Christensen, and Nielsen, 2011; Chang, Christoffersen, Jacobs, and Vainberg, 2011). Second, implied measures of equity risk can be easily computed in high frequency and in close proximity to annual meetings, which makes them less affected by confounding events and news unrelated to changes in corporate governance. Third, the comparison of an implied risk measure just before and just after the vote on governance-related issues is particularly interesting because - by construction - both refer to the same future period, i.e., until the options' expiration date. This allows us to isolate the influence of corporate-governance changes on equity risk from other effects.

The main empirical analysis is carried out on a sample of 501 governance-related shareholder proposals that fail or pass by a maximum margin of five percentage points in publicly traded U.S. companies in the period 1997-2013. The paper contributes to the extant literature along the following lines. First, it presents evidence of a causal link between governance provisions and stock-return volatility. The average governance provision included in the Governance Index of Gompers, Ishii, and Metrick (2003) (G-Index) is found to increase stock-return volatility by 5%, i.e., for the median firm, from 30% to 31.5%. This effect is smaller than the 20% increase reported by Ferreira and Laux (2007) based on cross-sectional regressions.[1] Second, we show that the increase in volatility is fully attributable to higher idiosyncratic volatility and not to equity betas which remain fairly constant. In this respect, we are unable to confirm the positive relation between corporate governance and equity betas obtained by Parigi, Pelizzon, Thadden, et al. (2014) in cross-sectional regressions. Finally, we contribute to the debate on the importance of different governance provisions (see, e.g., Bebchuk, Cohen, and Ferrell, 2009) and confirm that items included in the E-Index of Bebchuk, Cohen, and Ferrell (2009) trigger significantly and particularly large increases in stock-return volatility of ca. 7%. Conversely, governance

[1] The difference between the results of this paper and those of Ferreira and Laux (2007) is not attributable to the different time period. In fact, our results do not change when running the analysis either on the period 1997-2001 (included in Ferreira and Laux, 2007) or 2002-2013. The results are reported in the appendix.

provisions outside the E-Index (including the subset comprised in the G-Index) do not lead to significant changes in equity risk.

The use of RDD already limits concerns regarding systematic differences in firm characteristics. Furthermore, the main findings are robust to several changes in the specification of the baseline model. In particular, results are statistically and economically stable when considering (i) polynomials of order zero, one, and two, (ii) different time frames around the annual meeting, (iii) realized betas instead of option implied betas.

The remainder of the paper is organized as follows. Section 2 describes the Regression Discontinuity Design as well as the methods employed to obtain implied equity-risk measures from option prices. Section 3 introduces the sample and presents the data used in the empirical analysis. The results of the baseline model and appropriate extensions are shown and discussed in Section 4. Section (5) concludes.

2 Methodology

2.1 Regression Discontinuity Design and Shareholder Proposals

In this section, we describe the methodology used to estimate the effect of corporate-governance provisions on several measures of equity risk. Following Cuñat, Gine, and Guadalupe (2012), we use close votes on governance-related shareholder proposals as exogenous shocks to a firm's corporate governance. The focus on the outcome of shareholder proposals is appealing for several reasons.

First, shareholder proposals are likely to provide a variety of important shareholders' concerns about the management of a company. In fact, both the requirements for sponsoring a resolution and their costs are fairly small. According to §8b of Section 240.14a, Title 17 of the Code of Federal Regulation (CFR), a shareholder is eligible to file a proposal if she is registered in the shareholder's book and has been holding shares in excess of $2,000 or 1% of the voting shares for at least one year. Further, under Rule 14a-8, the company (and not the proposal sponsor) bears the cost of preparing and distributing the resolution in the proxy statement.

Second, unlike management proposals, which are strategically placed in (and withdrawn from) meetings, resolutions filed by shareholders are not subject to a selection bias induced by the agenda setter. In fact, a boards of directors will likely exclude those proposals for which they expect a rejection in the shareholder assembly (see, e.g., Cuñat, Gine, and Guadalupe, 2012). This argument is reflected by the very high approval rates of management proposals (Maug and Rydqvist, 2009)[2] and leads to a

[2] In their US-sample of 13,405 management-sponsored proposals between 1994 and 2003, Maug and Rydqvist (2009) report an average of 82.8% favorable votes and a success rate of 98.5%.

selection bias, i.e., a variation in the cross section of voting outcomes based on self-censored data.

Third, and most importantly, the discontinuity in the relation between the votes in favor of shareholder proposals (the so called “forcing variable”) and their subsequent implementation probability at the threshold level of success induces an exogenous shock in firm governance that is as good as random (Cuñat, Gine, and Guadalupe, 2012) and can thus be used to measure the impact of governance provisions on selected firm characteristics.

The Regression Discontinuity Design (RDD) used in this paper exploits these interesting characteristics of shareholder proposals. It allows us to observe changes in corporate governance triggered by close votes and to deal with market expectations prior to annual meetings. The discontinuity arises from the fact that the success of a proposal is a binary function that depends on the percentage of votes in favor, $v \in [0, 1]$, a continuous variable, and the cutoff point, $\bar{v} = 50\%$. In a nutshell, the approach compares changes of selected risk measures following governance-related shareholder proposals that pass in close votes to changes in the same risk measures following the same governance-related proposals that, however, fail in close votes. Despite the possible lagged implementation of approved shareholder proposals, an immediate market reaction is expected. For example, the passage of resolutions on the abolishment of antitakeover provisions are a strong signal for weaker future takeover protection. As they will likely induce potential acquirers to start a screening activity and, possibly, embark in negotiations, they will fuel takeover rumors and lead to an immediate rise in stock-return volatility.

In formal terms, we define a given equity-risk measure, M, as a function of the votes in favor of a shareholder proposal, v: $M(v)$. Given the binary nature of votes, the above function can be expressed as

$$M(v) = M_1 \text{ if } v > \bar{v}, \text{ (proposal passes)}$$
$$M(v) = M_0 \text{ if } v \leq \bar{v}. \text{ (proposal fails)}$$

For the sake of simplicity, but without loss of generality, we assume $M_1 > M_0$. The purpose of our study is to estimate the difference in equity risk between the two states, i.e., $\tau = M_1 - M_0$, which represents the increase in equity risk attributable to governance provisions. Unfortunately, τ is not directly observable by the reaction of equity risk to the passage of successful proposals because market participants will, to some extent, anticipate voting outcomes and adjust their risk expectations $E[M|v]$, accordingly. The actual reaction following a vote is correctly expressed as

$$\Delta M(v) = M(v) - E[M(v)],$$

where $E[M|v]$ captures the expected level of equity risk conditional on the expected votes in favor of a proposal. Reasonably, $E[M|v]$ assumes values between M_0 and M_1 and is a continuous and strictly increasing function of the number of votes in favor, v. For example, a shareholder proposal that is considered to have no chance of passing leads to $E[M|v] = M_0$ and should trigger no market reaction when it actually fails. The same holds for a proposal that is successful but was already expected to pass by a large majority. On the contrary, a proposal with a 50% chance of being successful implies $M_0 < E[M|\bar{v}] < M_1$ and should thus lead to a positive (negative) change in equity risk if the vote passes (fails). Figure 1 illustrates the relation between votes, market expectations, and observed reactions around the day of the vote.

[INSERT FIGURE 1 ABOUT HERE]

Since $E[M|v]$ is continuous, one can assume that $E[M|\bar{v} - \epsilon] \approx E[M|\bar{v} + \epsilon]$ for small $\epsilon > 0$, which implies similar market expectations for proposals that fail or pass by a very small margin. By using this equality one can show that the effect of corporate governance on equity risk, τ, can be recovered from the difference between observed changes in equity risk after shareholder votes that pass by a small margin, $\Delta M(\bar{v} + \epsilon)$, and those that fail by a small margin, $\Delta M(\bar{v} - \epsilon)$:

$$
\begin{aligned}
\tau &= M(\bar{v} + \epsilon) - M(\bar{v} - \epsilon) \\
&\approx \big(M(\bar{v} + \epsilon) - E[M|\bar{v} + \epsilon]\big) - \big(M(\bar{v} - \epsilon) - E[M|\bar{v} - \epsilon]\big) \\
&= \Delta M(\bar{v} + \epsilon) - \Delta M(\bar{v} - \epsilon), \qquad (1)
\end{aligned}
$$

According to Lee and Lemieux (2010), three requirements need to be satisfied in order to use voting outcomes as quasi-random experiments in RDD: (i) Continuity of explanatory variables, (ii) no precise manipulation of votes, and (iii) a sharp cutoff point.

Since we investigate changes in implied volatility of the same company during the days before and after the vote, explanatory variables, such as size or leverage, do not change depending on whether a shareholder proposal fails or passes.

Second, due to both practical considerations and empirical evidence, we exclude that precise manipulation of votes represents an issue for our study. In order to systematically influence votes and act as the pivotal investor, one would need to accurately anticipate the voting behavior of all other shareholders, which seems a very hard task, especially given a large number of private investors. Further, as suggested by Lee (2008), the absence of large jumps around the cutoff point of 50% in the density function of voting results (see Figure 2) is a strong indicator of the difficulties to precisely control voting outcomes.

Third, while shareholder proposals are generally not binding (see Appendix A.1 for a detailed discussion on this issue), Ertimur, Ferri, and Stubben (2010) show that the probability of implementation has a sharp increase at the 50% threshold.

2.2 Quantification of Market Reactions

In this section we describe a suitable methodology to measure the causal effect of corporate governance on equity risk, τ, based on a limited number of votes on governance-related shareholder proposals. Ideally, one would like to estimate τ by using a very high number of votes that pass (e.g., $v \in [50\%, 50.1\%]$) and fail (e.g., $v \in [49.9\%, 50\%]$) by a very small margin. Unfortunately, as the number of available votes in limited, it is advisable and more promising to extract information from proposals farther away from the cutoff point.
The following regression represents a parsimonious and simple way to estimate τ:

$$\Delta M_j(v_j) = \alpha + \tau D_j + \varepsilon_j, \tag{2}$$

where $\Delta M_j(v_j)$, the dependent variable, is the observed change of a given equity-risk measure following proposal j, D_j is a binary variable assuming a value of one if the proposal passed and zero if it failed, and ε_j is the error term, with $E(\varepsilon_j) = 0$. α can be either positive or negative, depending on the average change in equity risk following votes on shareholder proposals in our sample. Unfortunately, this regression approach ignores the dependency between the observed change in equity risk and the votes in favor of a proposal, which potentially leads to an underestimation of the true effect (see Lee and Lemieux, 2010). To address this issue, we follow Lee and Lemieux (2010) and modify Equation (2) to include polynomial functions of the fraction of votes in favor of a given proposal, v:[3]

$$\Delta M_j(v_j) = \alpha + D_j * \tau + D_j \sum_{i=1}^{d} \beta_{li}(v - \bar{v})^i + (1 - D_j) \sum_{i=1}^{d} \beta_{ri}(v - \bar{v})^i + \varepsilon_j, \tag{3}$$

where β_l and β_r indicate the parameters of the polynomials left and right of the cutoff $\bar{v}$, respectively. The binary variable D_j $(1 - D_j)$ make sure that failed (passed) proposals are included in the estimation of the polynomial to the left (right) of the cutoff. As by construction all polynomials are equal to zero at the cutoff point, the discontinuity effect at the cutoff is captured by τ.

Importantly, this enhanced regression method allows us to exploit the information embedded in proposals that are farther away from the cutoff point. Furthermore, it offers an unbiased measure of the causal effect of corporate governance on equity risk at the cutoff point, i.e., the so-called local average treatment effect (LATE).

However, the use of polynomials has also two disadvantages. First, the number of parameters in the regression increases with the order of the polynomial, which can decreases the significance of the

[3] Lee and Lemieux (2010) provides a discussion on parametric and non-parametric RDD models to account for the dependency of the measured effect on the forcing variable.

results. Second, according to Lee and Lemieux (2010), high-order polynomials tend to overestimate the true effect .

For these reasons, Lee and Lemieux (2010) recommend the use of polynomials of degree zero (comparison of means) for all windows within ± 5 percentage points around the 50% voting threshold. Based on all the considerations above, we use as baseline models of our empirical analysis polynomials of order one for $\pm 5 p.p.$ windows and polynomials of degree zero (i.e., no polynomials as in Equation 2) for the $\pm 3 p.p.$ windows. As a robustness check, we also report results obtained using polynomials of degree two.

2.3 Measures of Equity Risk

In the empirical analysis, we focus on risk measures extracted from option prices. This has three reasons. First, risk measures backed out from option prices (e.g., implied volatilities) are less noisy than their historical counterparts (e.g., the standard deviation of equity returns) because the former reflect aggregate market expectations of future stock returns, whereas the latter represent single realizations of the same quantities. Second, implied measures of equity risk can be easily computed in high frequency and in close proximity to annual meetings, which makes them less affected by confounding events and news unrelated to changes in corporate governance. Third, the comparison of an implied risk measure just before and just after the vote on governance-related issues is particularly interesting because - by construction - both refer to the same future period, i.e., the time until options' maturity. This allows us to isolate the influence of corporate-governance changes on equity risk from other effects.

To draw a comprehensive picture on the impact of corporate governance on both the systematic and the unsystematic part of equity risk, we consider three measures of equity risk: (i) total volatility, σ_{tot}, (ii) idiosyncratic volatility, σ_{idio}, and (iii) equity beta, β. Accordingly, relative changes in equity risk are indicated by $\Delta M \in \{\Delta\sigma_{tot}, \Delta\sigma_{idio}, \Delta\beta\}$

Total Volatility

Total volatility of a firm is computed as the average implied volatility extracted from a set of suitable stock options. To account for the well-documented empirical phenomena of volatility smirks in single-stock options and an increasing term-structure of volatility (see, e.g., Das and Sundaram, 1999; Toft and Prucyk, 1997), we only consider at-the-money options with standardized maturities.

More specifically, in the baseline setting, we compute for each governance proposal the relative change in total volatility as the difference of average implied volatility obtained from all at-the-money call options traded in a four-day period just before and just after a vote. We exclude the day of the vote, for two reasons. First, we are interested in studying permanent changes in equity risk and not transitory ones on the day of the vote. Second, it is unclear at what time of the day the results of the shareholder proposal becomes known to the market, as this varies substantially across companies. For example, some companies disclose the outcomes of shareholder votes on the same day through newswire and real-time broadcast while others do not rely on such services.

Thus, in the case of total volatility, the dependent variable used in regressions (2) and (3) is computed as

$$\Delta\sigma_{tot,j} = \frac{\sum_{i=1}^{T}\sigma_{j,i} - \sum_{i=-T}^{-1}\sigma_{j,i}}{\sum_{i=-T}^{-1}\sigma_{j,i}} \tag{4}$$

where $\sigma_{j,i}$ indicates the (annualized) implied volatility of the at-the-money option written on firm j's shares i days after the vote. T describes the number of days around the vote. In the baseline setting we choose $T = 4$.

Idiosyncratic Volatility

In addition to changes in total implied volatility, we investigate whether corporate governance has an effect on firm-specific volatility. We obtain a measure of idiosyncratic volatility by adjusting the observed change in implied volatility for changes in implied market volatility.

$$\Delta\sigma_{idio,j} = \left(\frac{\sum_{i=1}^{T}\sigma_{j,i} - \sum_{i=-T}^{-1}\sigma_{j,i}}{\sum_{i=-T}^{-1}\sigma_{j,i}}\right) \Big/ \left(\frac{\sum_{i=1}^{T}\sigma_{M,i}}{\sum_{i=-T}^{-1}\sigma_{M,i}}\right), \tag{5}$$

where $\sigma_{M,i}$ indicates the implied volatility obtained from index options traded on day i.
This approach avoids assumptions regarding the equity β, i.e., a measure influencing the relation between firm volatility and market volatility which could possibly change depending on the outcome of the vote. The approach assumes an elasticity of total volatility to market volatility of one:[4]

2.4 Systematic Risk

To measure changes in companies' systematic risk, we follow the methodology of Chang, Christoffersen, Jacobs, and Vainberg (2011) which is based on previous work by Carr and Madan (2001) and Bakshi, Kapadia, and Madan (2003). Their method allows us to obtain a (one-factor model) beta estimate as a function of the option implied variance and skewness of the stock-return distribution. For each of the four days before and after an annual meeting, we extract implied variance and skewness from prices of index options and stock options. A detailed description of the methodology can be found in the appendix. Finally, the percentage change in beta is computed from daily option-implied betas as

$$\Delta\beta_j = \frac{\sum_{i=1}^{T}\beta_{j,i} - \sum_{i=-T}^{-1}\beta_{j,i}}{\sum_{i=-T}^{-1}\beta_{j,i}}, \tag{6}$$

[4] A discussion of this issue and an alternative method to compute option-implied idiosyncratic volatilities can be found in Appendix A.2.

where $\beta_{j,i}$ is the option-implied beta of company j on day i.
As single-stock options suffer from low liquidity, for robustness we also use realized betas obtained from standard market-model regressions based on stock and index returns in the six months prior and after the vote, excluding a five-day window around the vote.

3 Data and Sample

3.1 Data on Shareholder Proposals

We use annual meetings between 1997 and 2013 covering shareholder proposals of approximately 2,000 US companies including all S&P 1500 firms. The data includes the date of the meeting, company details, a description of the proposal, its status (e.g., "voted on", "omitted", or "withdrawn"), votes in favor, and details on the sponsor. To increase the sample size, in several instances, we hand-collected missing data from 10-Q company filings as listed in the SEC's EDGAR database. Out of the 15,768 shareholder proposals listed in the database between 1997 and 2013, 8,651 include information on the percentage of votes in favor. Figure 2 shows the frequency of proposals in relation to the votes in favor. In compliance with the no-manipulation assumption of RDD, there is no discontinuity around the cutoff point of 50%.

[INSERT TABLE 1 ABOUT HERE]

[INSERT FIGURE 2 ABOUT HERE]

In the empirical analysis, we only consider governance proposals that comply with the following four criteria. First, as we are interested in the impact of corporate governance on equity risk, we only consider those that address governance-related issues, according to the classification provided by RiskMetrics. Additionally, we manually screen the content of all the proposal and categorize them into coherent subgroups, depending on whether they address any of the 6 governance provisions included in the E-Index, any of the 24 provisions of the G-Index, or none of these.

Second, we only consider close-vote shareholder proposals; more specifically, only resolutions that pass or fail by a margin of 5 percentage points or less. By applying this restriction, we follow the related literature (see, e.g., Cuñat, Gine, and Guadalupe, 2012; Flammer, 2015; Cheng, Hong, and Shue, 2013)[5]

[5]Cuñat, Gine, and Guadalupe (2012) argue (and show) that market participants are able to accurately anticipate the outcome of ballots when the votes in favor of a proposal are more than 5 p.p. away from the cutoff point.

and make sure to use only proposals that reveal some new information to financial markets and can thus be seen as exogenous shocks to the governance structure of a corporation.

Third, we require for each proposal a complete set of essential data on the proposal, i.e., (i) the exact meeting date, (ii) the percentage of votes in favor of the proposal, and (iii) a description of the proposal.

Fourth, in the baseline setting, we exclude all events with two or more governance related close-vote shareholder proposals with opposite outcomes. If all close-vote proposals influence a governance index in the same direction, we count them as one event but adjust the observed change in the equity-risk measure by dividing it by the number of proposals.

[INSERT TABLE 2 ABOUT HERE]

3.2 Market Data

For the computation of option-implied volatilities, we obtain data from OptionMetrics IV DB and use in the baseline setting all available standardized at-the-money call options with maturities of 30 days.[6] To calculate the idiosyncratic component of the implied volatility, we use - as the reference for implied market volatility - the Chicago Board Options Exchange Volatility Index (VIX). This index is based on implied volatilities of the S&P 500 with a 30-day horizon. Daily VIX-data is available from the CBOE website from 1990 onwards.

For the computation of option-implied betas, the volatility smirk is extracted from non-standardized single-stock options as provided by OptionMetrics IV DB. In line with Chang, Christoffersen, Jacobs, and Vainberg (2011), we use implied volatilities of all available in-the-money options with closest maturity below and above 60 days. Each option in the database is associated with an implied volatility that is extracted using a binomial-tree for American options. Whenever we have less than two options with implied volatilities, the corresponding proposal is excluded. As a proxy for the risk-free interest rate used to estimate beta, we use the three-month treasury bill rates as provided by the Federal Reserve of St. Louise. All stock-prices are obtained from CRSP.

[6] We use short-term options because they are more liquid than their long-term counterparts. While the implementation of successful proposals is unlikely realized within 30 days, expected changes in volatility will occur immediately due to rumors and anticipations.

4 Results

4.1 G-Index Provisions and Equity Risk

We start the analysis by investigating the influence of governance provisions included in the G-Index on equity risk. Figure 3 depicts the RDD regression with polynomials of degree one. It represents the empirical counterpart of Figure 1 and shows the presence of a discontinuity of the (changes in) stock-return volatility at the 50% voting threshold.

[INSERT FIGURE 3 ABOUT HERE]

Table 3 presents a broader set of regression results. They show that a positive shock in a firm's G-Index leads to higher (expected) values of both total volatility and idiosyncratic volatility. Based on shareholder proposals that lie in a 5-percentage-point window around the threshold and regression polynomials of degree one, total volatility is found to increase by +5.57% (t-value: 2.44) and idiosyncratic volatility by +4.88% (t-value: 2.08). Thus, both effects are significant at the 5%-level.

[INSERT TABLE 3 ABOUT HERE]

Table 3 also reports the results obtained by a conservative comparison of the mean implied volatilities in a three-percentage-point window to the left and the right of the 50% threshold. With this specification, total volatility is found to increase by 4.57% (t-value: 3.11). With a reaction of +2.43%, the effect of G-Index provisions on idiosyncratic volatility is also positive but does not reach statistical significance (t-value: 1.65). The smaller effects obtained in regressions (2) and (4) compared to regressions (1) and (3) are likely due to the well-known underestimation of the true causal effect when neglecting the functional relation between the voting outcome and market expectations Lee and Lemieux (see, e.g., 2010). In fact, although not statistically significant, the negative coefficients β_f and β_p (combined with the negative α) indicate that proposals with votes farther away from the threshold trigger smaller changes in equity risk, which is sensible as the effect is partially anticipated by market participants. While the explanatory power of the regressions is rather low ($R^2 = 0.031$ in regression (1)) it is similar to the study conducted by Cuñat, Gine, and Guadalupe (2012) on stock returns and using the same specification ($R^2 = 0.024$). All regressions deliver a negative and significant value for α. This complies with the idea that generally uncertainty builds up before annual meetings and declines afterward.

Regressions (5) and (6) evidence that the acceptance of governance-related proposals does not exert a significant impact on implied betas. Thus, the results suggest that G-Index provisions lead to higher equity risk, which is, however, attributable to an increase in idiosyncratic risk and not to higher systematic risk. Thus, given that only systematic risk is compensated, better corporate-governance provisions are not expected to increase the cost of equity capital.

4.2 What Matters in Corporate Governance?

Economist have dedicated considerable resources on learning about the economic importance of different corporate-governance provisions. Most prominently, Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, and Ferrell (2009) have developed two indexes that aim at capturing the the most important features of a firm's governance.

In this section, we contribute to this debate by assessing the relative importance of different types of corporate-governance items on the basis of their influence on equity risk. To this purpose, we consider different sets of shareholder proposals, depending on whether they address issues included in the G-Index of Gompers, Ishii, and Metrick (2003) or the smaller Entrenchment Index (E-Index).

Table 4 reports the sign, size, and significance of the effect of eight different sets of corporate governance measures on total volatility (Models (1) and (2)) and idiosyncratic volatility (Models (3) and (4)). Provisions related to corporate governance are found to increase total volatility by 3.78% (t-value: 2.07) on average. This effect increases to 5.57% (t-value: 2.44) and 8.10% (t-value: 3.20) when we focus on provisions included in the G-Index and E-Index, respectively. Based on these results, we support the view that the governance items included in the Entrenchment Index proposed by Bebchuk, Cohen, and Ferrell (2009) are important for a company even from an equity-risk perspective. Interestingly, governance items not included in the E-Index - even those included in the G-Index - do not seem to have a significant impact on equity risk. Conservative regressions based on polynomials of degree zero (Model (2) in Table 4) draw a very similar picture, although the coefficients are - as expected - generally smaller.

The regressions carried out on idiosyncratic volatility (Models (3) and (4)) confirm that the described increase in stock-return volatility stems from its idiosyncratic part. Unreported regressions on equity beta indicate no significant effects. Only the provisions included in the E-Index lead to a significant increase in firm-specific volatility by 6.29% (t-value: 2.01) or 4.08% (t-value: 2.10), depending on the regression specification used. The fact that in Model (3) also G-Index provisions trigger higher volatilities is likely due to the fact that all E-Index provisions are also included in the G-Index. In fact, no set of governance provisions outside the E-Index is found to have a significant effect on idiosyncratic volatility.

[INSERT TABLE 4 ABOUT HERE]

4.3 Robustness

In this section we address potential concerns on the validity of our findings. Previous findings of Cuñat, Gine, and Guadalupe (2012) show that close shareholder proposals are followed by jumps in stock prices. To exclude the possibility that different sizes of these jumps drive our results, we control for the absolute change in stock prices on the voting day. The correspondent coefficient is non-significant in all of our settings.

Table 5 provides additional regression results obtained with alternative model specifications. In Panel I, we change both the window sizes around the threshold (3 p.p. or 5 p.p) and degree of the polynomials (0, 1, and 2). All observed effects for total and idiosyncratic volatility are positive, and most of them significant. The observed effects lie between 2.4% and 6%, except the very large effects obtained with a polynomial of degree two. We explain this by the potential overestimation of higher-degree polynomials and small window sizes, as explained in Section (2.2). We observe the smallest effects when using the large window of 5 percentage points and a polynomial of degree zero. This supports the hypothesis that the effect diminishes for proposals further away from the cutoff point because market participants are able to anticipate their outcome. The effect on systematic risk is never significant.

Panel II shows the estimated effects using different time windows for the estimation of the option implied risk measures around the annual meeting. All results for total and idiosyncratic volatility are between 2.5% and 6%. The lower effects for the 3-day window might be explained by the fact that market participants can make better estimates of the voting outcome (and incorporate this information into prices) as the meeting approaches. This does not contradict the finding of Cuñat, Gine, and Guadalupe (2012) who observe no clear spike in stock-returns in the days prior to a close vote on a shareholder proposal because the better anticipation holds for both failed and passed proposals. Again, effect on systematic risk is never significant.

[INSERT TABLE 5 ABOUT HERE]

5 Conclusion

In this paper we use a Regression Discontinuity Design applied to shareholder proposals to measure the causal effect of corporate governance on three measures of equity risk: (i) total volatility, (ii) idiosyncratic volatility, and (iii) equity beta. Close votes on shareholder proposals serve as plausible exogenous shocks to selected corporate-governance characteristics.

When a governance-related shareholder proposal passes by a small margin, the changes of both total and idiosyncratic implied volatility are found to be significantly larger than those observed for similar proposals that, however, fail by a small margin. The average increase in total volatility attributable to a one-point improvement in the G-Index of Gompers, Ishii, and Metrick (2003) amounts to ca. 5.6%; The same effect on idiosyncratic volatility is ca. 4.9%. Governance provisions included in the Entrenchment Index of Bebchuk, Cohen, and Ferrell (2009) have a particularly high effect on both total volatility (+8.11%) and idiosyncratic volatility (+6.3%). However, we do not find evidence that changes in corporate governance have a significant effect on a firm's systematic risk as measured by CAPM's beta. The results are consistent with the idea that stronger shareholder rights increase the likelihood of being acquired.

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A Appendix

A.1 Non-Binding Votes and Majority Thresholds

As mentioned in Section (2.1), shareholder proposals on corporate-governance issues are generally not binding.[7] An exception to this rule could be a shareholder vote that amends the corporate certificate or bylaws to redeem a Poison Pill. While such a section in the certificate is more powerful than a bylaw (the certificate takes precedence over bylaws if they conflict), changes in the certificate are problematic for shareholders because only the board can initiate amendments and shareholders have to approve. This is different for bylaws, where the required majority might differ from 50%. In general, shareholders can amend bylaws alone and they are the only way for shareholders to initiate binding rules for corporate policy. The legal validity of a Poison Pill bylaw is questionable and has generated much scholarly debate. While the question whether such a bylaw is valid is answered in some states (e.g. Georgia and Oklahoma), it is not for Delaware where the majority of S&P 500 companies is incorporated. The central element of this debate are D.G.C.L. § 141(a), § 157 and § 109(b). § 141(a) could oppose Poison Pill bylaws because it states *"The business and affairs (...) shall be managed by or under the direction of the board of directors, except as may be otherwise provided in this chapter or in its certificate of incorporation."* The paragraph does not include bylaws as a limiting factor for the Board of Directors. § 109(b) includes *"The bylaws may contain any provision, not inconsistent with law or with the certificate of incorporation, relating to the business of the corporation, the conduct of its affairs, and its right or power or the rights or powers of its stockholders, directors, officers or employees.*, which favors the validity of Poison Pill bylaws. Paragraph 157 may actually cover Poison Pills, as it provides *Subject to any provision in the certificate of incorporation, every corporation may create and issue (...) rights or options entitling the holders thereof to purchase from the corporation any shares of its capital stock of any class or classes."*. Although the paragraph does not include *bylaws* as a limiting factor, neither is the Board of Directors named as the authority to create and issue stock rights. *Corporation* could also include other stakeholders. The ruling Supreme Court in Oklahoma (the relevant law is very close to Delaware law in this section) made this point in 1999 to uphold a Poison Pill bylaw. The debate also includes other sections of D.G.C.L.. A detailed discussion on the topic can be found in e.g. McDonnell (2008) and Coffee Jr (1996).

Due to the legal issues of Poison Pill bylaws and the non-binding nature of other proposals we use 50% as the relevant threshold for all shareholder proposals. It is unquestioned that passing a simple majority of 50% is always an advisory signal from shareholders to management. This is backed by empirical findings of Ertimur, Ferri, and Stubben (2010) who study the responses to governance-related shareholder proposals, including implementation frequencies by boards of directors. The probability of implementation is found to have a clear cutoff point at the simple-majority threshold (50%), which offers a rationale for the use of Regression Discontinuity Design.

[7] Besides electing directors, Delaware General Corporation Law (D.G.C.L.) includes the right to vote for shareholders only on certificate amendments (§ 242), mergers (§ 251), sales of substantially all corporate assets (§ 271), and dissolutions (§ 275).

A.2 Idiosyncratic Risk Component

Another approach, explained by e.g. Dennis, Mayhew, and Stivers (2006), uses the *Capital Asset Pricing Model* and Equation (7) to determine the idiosyncratic part of volatility.

$$\sigma_{j,t}^2 = \beta_j^2 \sigma_{M,t}^2 + \sigma_{idio,j,t}^2 \tag{7}$$

β_j describes the beta from the CAPM, $\sigma_{IV,j,t}$ the implied volatility for stock j at time t, $\sigma_{IV,M,t}$ the implied volatility for the market at time t and $\sigma_{IV,idio,j,t}$ the idiosyncratic part of implied volatility of stock j at time t. While this approach is valid to determine absolute idiosyncratic volatility, it is characterized by important peculiarities in our setting. The first one, explained by e.g. Diavatopoulos, Doran, and Peterson (2008), is the possibility of negative idiosyncratic volatility. Using historic data for β_j and VIX data for market return, the idiosyncratic component becomes negative. The standard procedure is to set the implied volatility to zero instead of negative numbers. Given the comparable low number of shareholder proposals within our sample, this is not an option in our case. The second problem is a theoretical and can be seen from a different representation of the (theoretical) β:

$$\beta_j = \frac{\text{Cov}(R_i, R_m)}{\text{Var}(R_m)} = \frac{\sigma_j * \sigma_m * \rho_{j,m}}{\sigma_m^2}$$

The value for β_j is estimated based on historic data, assuming the standard deviation does not change from the estimation period to the event window. While this makes sense in most applications, our situation differs. The purpose of our research is to show that there *is* a structural change in implied volatility and thereby potentially the β_j from the estimation window to the time after passing of the governance proposal. This is not only a problem itself, in addition this only holds for passed proposals, while there is no equivalent structural change for a non-implemented proposal. Therefore the comparability of passed and failed proposals must be questioned. Additionally, the approach is sensitive to estimates of β, which varies with different estimation procedures. Nevertheless, we apply the method described by Dennis, Mayhew, and Stivers (2006) with the assumption of a stable beta equal to one (stable betas are supported by our findings described in Section 2.4). This leads to a pure additive approach which has nearly identical results for small changes in implied market volatility presented in Chapter 4.

A.3 Option-Implied Betas

We estimate option implied betas as a proxy for a companies' exposure to systematic risk. The methodology relies on the papers by Chang, Christoffersen, Jacobs, and Vainberg (2011), Carr and Madan (2001), and Bakshi, Kapadia, and Madan (2003).
We use second and third order moments of returns R, variance and skewness, to calculate the option implied betas. These moments are defined as

$$\text{VAR} := E[(R - E[R])^2] \tag{8}$$

$$\text{SKEW} := \frac{E[(R - E[R])^3]}{\text{VAR}^{3/2}}, \tag{9}$$

which can be rewritten as

$$\text{VAR} = E[R^2] - E[R]^2 \tag{10}$$

$$\text{SKEW} = \frac{E[R]^3 - 3E[R]E[R^2] + 2E[R]^3}{\text{VAR}^{3/2}}.^8 \tag{11}$$

We assume that the log return of Stock i follows a one-factor model depending on market return R_m of the form

$$R_i = \alpha_i + \beta_i R_m + \epsilon_i, \tag{12}$$

where the idiosyncratic term ϵ_i is independent of market returns and has a mean of zero. Using Equations (10) and (11), Beta can be isolated depending on the skewness and variance of stock and market returns:

$$\beta_i = \left[\left(\frac{\text{SKEW}_i}{\text{SKEW}_m}\right)\left(\frac{\text{VAR}_i}{\text{VAR}_m}\right)^{3/2} - \left(\frac{\text{SKEW}_{\epsilon,i}}{\text{SKEW}_m}\right)\left(\frac{\text{VAR}_{\epsilon,i}}{\text{VAR}_m}\right)^{3/2} \right]^{1/3}. \tag{13}$$

Adopting the assumption of $\text{SKEW}_{\epsilon,i} = 0$ from Chang et al., one can derive an expression for beta depending only on moments of the market and the Stock i:[9]

$$\beta_i = \left(\frac{\text{SKEW}_i}{\text{SKEW}_m}\right)^{1/3}\left(\frac{\text{VAR}_i}{\text{VAR}_m}\right)^{1/2}. \tag{14}$$

We follow Chang et al. and define discounted expected payoff functions of squared and cubed returns to estimate variance and skewness using option data:

$$\text{Quad} = e^{-rt}E[R^2] \tag{15}$$

$$\text{Cubic} = e^{-rt}E[R^3]. \tag{16}$$

These payoff functions can be estimated with prices of traded options. Using Equations (10) and (11), We follow Chang et al. and use that variance and skewness can be written as:

$$\text{SKEW} = \frac{e^{rt}\text{Cubic} - 3E[R]e^{rt}\text{Quad} + 2E[R]^3}{\text{VAR}^{3/2}} \tag{17}$$

$$\text{VAR} = e^{rt}\text{Quad} - E[R]^2. \tag{18}$$

Bakshi, Kapadia, and Madan (2003) derive the prices of the payoff functions Quad and Cubic using European call and put options depending on the strike price K, volatility σ, risk-free rate r and time to maturity t. Quad can be estimated using

$$\text{Quad} = \int_0^S \frac{2(1 + \ln\left[\frac{S}{K}\right])}{K^2} P(t, K, \sigma, r)dK + \int_S^\infty \frac{2(1 - \ln\left[\frac{K}{S}\right])}{K^2} C(t, K, \sigma, r)dK, \tag{19}$$

while Cubic can be estimated using

$$\text{Cubic} = \int_0^S \frac{-6\ln\left(\frac{S}{K}\right) - 3\ln\left(\frac{S}{K}\right)^2}{K^2} P(t, K, \sigma, r)dK + \int_S^\infty \frac{6\ln\left(\frac{K}{S}\right) - 3\ln\left(\frac{K}{S}\right)^2}{K^2} C(t, K, \sigma, r)dK. \tag{20}$$

[9]For intermediate steps, see Chang et al. Chapter 3.3.

The last missing component to estimate the skewness and variance, $E[R]$, can be approximated by

$$E[R] = e^{rt} - 1 - \frac{e^{rt}}{2}\text{Quad} - \frac{e^{rt}}{6}\text{Cubic}.$$

We use trapezoidal numerical integration for the estimation of the integrals in Equations (19) and (20). Call and put prices are calculated using the Black-Scholes model. As explained and empirically verified in Chang et al., the use of Black-Scholes does not assume that options are actually priced according to this model; the model only provides a translation (or mapping) between volatilities and option prices. While the risk-free interest rate and stock prices can be readily observed and the strike, K, is the integration parameter, volatility is not traded and depends on the moneyness of the option. We use the same approach as Chang et al. to estimate the volatility smile of stock and index options based on implied volatilities of traded options with different strike prices. We use implied volatilities of traded put and call options of different moneyness and apply an interpolation-extrapolation technique to gain data for all moneyness levels between 1% and 300%.[10] We extrapolating the implied volatility of the highest observed moneyness to all levels above it. The same procedure is done for all levels of moneyness between 1% and the lowest level of moneyness using the implied volatility corresponding to the respective option. For all intermediate values, cubic splines are used to interpolate the volatility smiles in between. Since options are only traded at specific maturities, we linearly interpolate the implied volatilities next to the 60-day maturity for each traded strike price. In rare cases where only the implied volatilities of the shorter/longer time to maturity can be observed, we approximate the 60-day maturity by adjusting it by a factor estimated by the differences at other levels of moneyness. We chose the 60-day maturity because liquidity is largest for short-term options, which can be problematic especially for single-stock options.

[10] Optionmetrics includes call and put options for each combination of time to maturity and strike price, which gives us the freedom to choose between call and put options. In line with Chang, Christoffersen, Jacobs, and Vainberg (2011), we use out of the money options because they have higher liquidity.

Figure 1: Market Reaction to Shareholder Proposals

This figure shows prior expectations and observed reactions of a given risk measure M around votes on governance-related shareholder proposals. The black dotted line indicates the expected level of the risk measure before the vote. The solid gray line illustrates the market reaction to the vote. It is zero when the outcome was expected by a vast majority of market participants and this information is already included in the prices. Around the threshold, the reaction for a very close approved proposal is half of the total effect because it is already partially included in the prices and vice versa for proposals denied by a small margin.

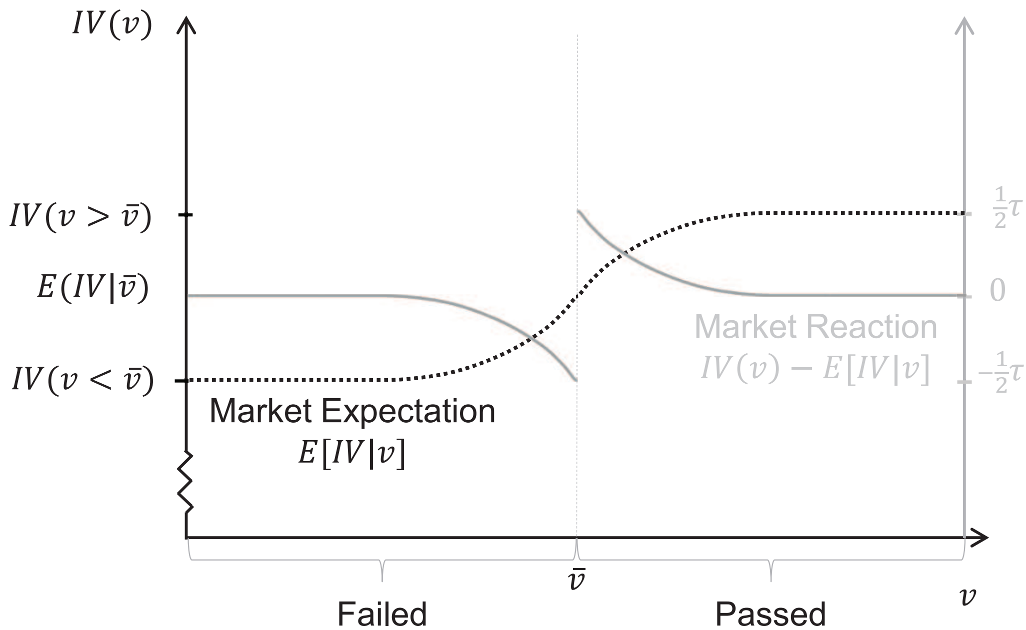

Figure 2: Distribution of votes in favor of Shareholder Proposals

This figure shows the density of votes between 40% and 60% in favor of shareholder proposals (N = 1,367) in our initial data set.

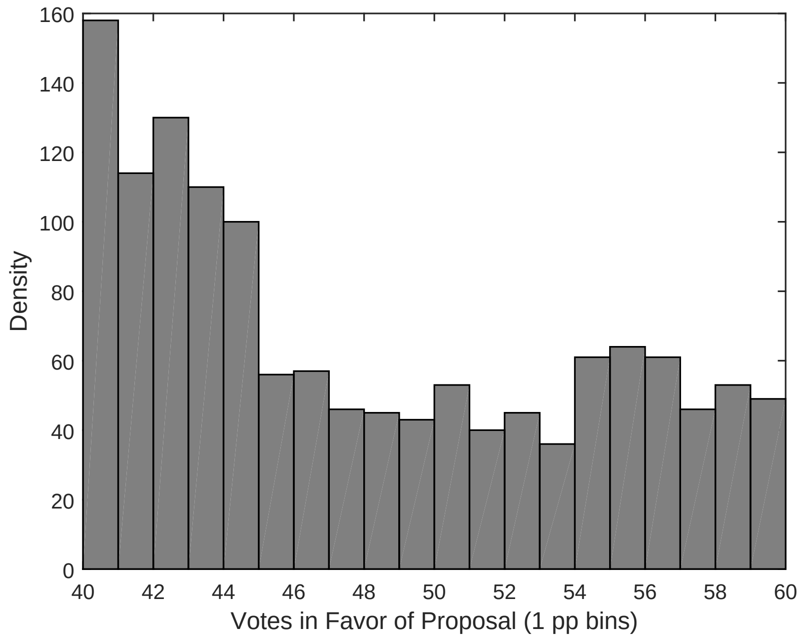

Figure 3: Empirical Effect of Shareholder Proposals on Implied Volatility

The dashed line in this figure shows average relative changes in implied total volatility around the voting date depended on the outcome of the vote. The proposals in this sample affect the G-Index score by Gompers, Ishii, and Metrick (2003) and are grouped in ten bins with 1.00 percentage points each. The left (failed proposals) and right (passed proposals) solid lines show an estimated polynomial of order one on both sides of the threshold. They are based on all proposals (not the grouped points of the dashed line) using Equation (3). We estimate effect for passing of a shareholder proposal as the difference between the solid left and right line at the threshold.

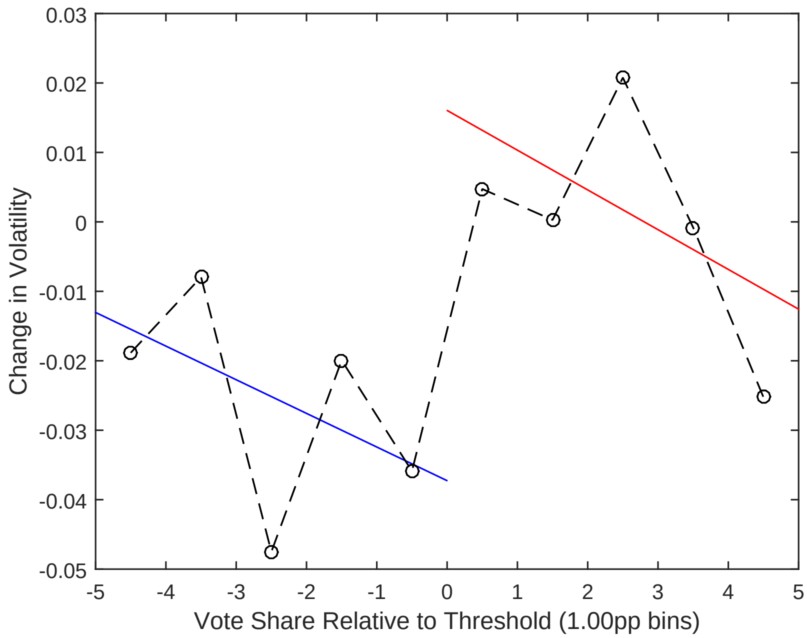

Table 1: Descriptions of Shareholder Proposals

This Table provides an overview of the contested shareholder proposals, i.e., proposals that pass or fail by a margin of less than five percentage points, in our sample. All the proposals are filed by shareholders of S&P1500 companies in the period 1997-2013. Category "E-Index" describes proposals affecting the Entrenchment Index by Bebchuk, Cohen, and Ferrell (2009), which is a subset of the provisions in the Governance index by Gompers. G-Index describes all proposals affecting the Governance Index by Gompers, Ishii, and Metrick (2003), but not included in the E-Index. All proposals have complete data including implied volatility from OptionMetrics.

Description	Category	Proposals
Repeal classified board	E-Index	82
Repeal poison pill	E-Index	48
Golden parachute	E-Index	16
Eliminate supermajority provision	E-Index	16
Total	E-Index	162
Call special meeting	G-Index	41
Right to act by written consent	G-Index	34
Adopt cumulative voting	G-Index	15
Adopt confidential voting	G-Index	4
Total	G-Index	256
Majority vote to elect directors	Other	81
Advisory vote on compensation	Other	71
Expense stock options	Other	28
Separate CEO/Chairman	Other	19
Majority vote shareholder committee	Other	4
Link pay to performance	Other	3
Other	Other	39
Total	All	501

Table 2: Descriptive Statistics

This table gives an overview of descriptive statistics for the 501 firm-year observations in our final sample. All accounting variables are from Compustat: Total Assets (at), Market Value (mkvalt_f), EBITDA (ebitda), Capital Expenditures (capex), Tobin's Q (defined as Market Value of Assets (at+mkvalt_f-ceq) devided by the sum of Total Assets (at) and Balance Sheet deferred taxes and Investment Tax Credit (txditc). Ownership data is obtained from Thomson Reuters financial. Ownership by top five institutional shareholders is the sum of shares held by top five institutional shareholders divided by total shares outstanding in percent. All values are in 1996 US Dollars. The number of observations may change due to missing data.

	N	Mean	Std. Dev.	10th Per.	90th Per.
Total Assets ($millions)	457	60,235	208,232	1,674	81,921
Market Value ($millions)	425	25,928	42,473	1,173	79,344
EBITDA ($millions)	422	4,047	7,547	178.1	8,175
Capital Expenditures ($millions)	417	1,357	2,761	18.6	2,487
Tobins Q	342	1.80	1.35	0.99	2.95
Return on Equity(in %)	395	3.50	13.5	-0.60	10.7
Ownership by top five shareholders (in %)	421	24.5	8.1	16.1	34.0
Institutional shareholders that own at least 5%	423	1.57	1.32	0	3

Table 3: The Impact of G-Index Provisions on Equity Risk

This table shows the impact of governance provisions that improve the G-Index by Gompers, Ishii, and Metrick (2003) on three measures of equity risk extracted from option prices: total volatility, idiosyncratic volatility, and systematic risk as measured by equity beta. The observed effect τ represents the difference between changes in risk measures in dependence of the success or failure of shareholder proposals. It is computed based on a regression discontinuity design (RDD). Implied risk measures are extracted from 30-day options traded in a four-day period just before and after votes on governance proposals. *Pol. Degree* describes the degree of the polynomial used in the RDD regressions. *Window size* indicates the voting interval around the majority threshold used for for the regressions. t-values are displayed in parenthesis. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Dependent variable: Percentage Change in Risk Measure						
	Total Volatility		Idiosyncratic Volatility		Systemic Risk	
	(1)	(2)	(3)	(4)	(5)	(6)
τ	5.57**	4.57***	4.88**	2.43	0.80	-5.39
	(2.44)	(3.11)	(2.08)	(1.65)	(1.05)	(-0.45)
α	-3.75**	-3.27***	-4.08***	-2.94***	18.98	10.75
	(-2.50)	(-3.29)	(-2.66)	(-2.95)	(1.25)	(1.05)
β_f	-53	-	-68	-	573	-
	(-0.92)		(-1.15)		(1.06)	
β_p	-61	-	-94	-	-876**	-
	(-0.98)		(-1.48)		(-2.30)	
Poly. Degree	1	0	1	0	1	0
Window size (in p.p.)	± 5	± 3	± 5	± 3	± 5	± 3
R-squared	0.031	0.053	0.017	0.016	0.043	0.002
Observations	256	174	256	174	157	104

Table 4: The Impact of Provisions in Different Governance Indexes on Equity Risk

This table presents the differences in changes in implied volatility from the four days before and after a vote on a governance proposal using American style call options with 30 day maturity. The observed effect τ represents the difference between changes in volatility following failed and passed shareholder proposals. All proposals affect the Corporate Governance of the company in favor of stronger shareholder rights. Subscript *All* indicates all Governance proposals, $G-Index$ indicates proposals included in the G-Index by Gompers, Ishii, and Metrick (2003), $E-Index$ the proposals included in the Entrenchment Index by Bebchuk, Cohen, and Ferrell (2009). *Polynomial Degree* describes the degree of the polynomial used to estimate the effect. *Window size* of ±5 includes all proposals with votes in favor within 5 points around the majority threshold. t-values are displayed in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	Total Volatility		Idiosyncratic Volatility	
	(1)	(2)	(3)	(4)
τ_{All}	3.78**	2.00*	2.12	0.47
	(2.07)	(1.82)	(1.23)	(0.44)
$\tau_{G\text{-}Index}$	5.57**	4.57***	4.88**	2.43
	(2.44)	(3.11)	(2.08)	(1.65)
$\tau_{E\text{-}Index}$	8.10***	5.48***	6.29**	4.08**
	(3.20)	(3.41)	(2.01)	(2.10)
$\tau_{All\text{ - }G\text{-}Index}$	1.81	-0.81	-0.96	-1.67
	(0.62)	(-0.50)	(-0.37)	(-1.06)
$\tau_{All\text{ - }E\text{-}Index}$	1.42	0.35	0.31	-1.27
	(0.58)	(0.24)	(0.15)	(-0.99)
$\tau_{G\text{-}Index\text{ - }E\text{-}Index}$	0.52	3.13	3.49	-0.30
	(0.12)	(1.11)	(0.99)	(-0.13)
Poly. Degree	1	0	1	0
Window size (in p.p.)	± 5	± 3	± 5	± 3

Table 5: Robustness Tests

This table shows the impact of governance provisions that improve the G-Index by Gompers, Ishii, and Metrick (2003) on equity risk measures based on a regression discontinuity design (RDD) applied to votes on shareholder proposals. The observed effect τ represents the difference between changes in risk measures depending on the success or failure of shareholder proposals. *Polynomial Degree* describes the degree of the polynomial used to estimate the effect. *Days around vote* specifies the number of days around the annual meeting used to extract option implied risk measures. t-values are displayed in parentheses. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	Total Volatility		Idiosyncr. Volatility		Systematic Risk	
	(1)	(2)	(3)	(4)	(5)	(6)
Panel I: Degrees of Polynomial						
$\tau_{deg=0}$	2.95**	4.57***	1.15	2.43	-7.23	-5.39
	(2.48)	(3.11)	(0.94)	(1.65)	(-0.71)	(-0.45)
$\tau_{deg=1}$	5.57**	3.03	4.88**	5.83**	0.80	-16.3
	(2.44)	(1.04)	(2.08)	(2.01)	(0.04)	(-0.70)
$\tau_{deg=2}$	4.76	12.66***	8.28**	12.53***	-32.97	-42.6
	(1.39)	(2.86)	(2.38)	(2.81)	(-1.16)	(-1.20)
Window size (in p.p.)	± 5	± 3	± 5	± 3	± 5	± 3
Days around vote	4	4	4	4	4	4
Option Type	Call	Call	Call	Call	Call/Put	Call/Put
Panel II: Days Around Vote						
$\tau_{dav=3}$	5.05**	2.61	4.26*	5.07*	0.66	-10.6
	(2.25)	(0.91)	(1.80)	(1.76)	(0.04)	(-0.46)
$\tau_{dav=4}$	5.57**	3.03	4.88**	5.83**	0.80	-16.3
	(2.44)	(1.04)	(2.08)	(2.01)	(0.04)	(-0.70)
$\tau_{dav=5}$	5.15**	2.52	4.45*	5.07*	13.06	3.00
	(2.23)	(0.87)	(1.85)	(1.72)	(0.73)	(0.23)
Poly. Degree	1	1	1	1	1	1
Window size (in p.p.)	± 5	± 3	± 5	± 3	± 5	± 3
Option Type	Call	Call	Call	Call	Call/Put	Call/Put