ABSTRACT

Title of dissertation: ESSAYS ON EXECUTIVE COMPENSATION, CAPITAL STRUCTURE AND CORPORATE GOVERNANCE

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This dissertation consists of three essays on the relation between executive compensation, capital structure and corporate governance.

In the first essay, I examine the relation between CEO option compensation and firm capital structure. The empirical challenge in studying this relation is that these are both choices of the firm that are made simultaneously. Therefore, it is difficult to conclude from the existing literature the causation of this relation. Using the Internal Revenue Code (IRC) 162(m) tax law as an exogenous shock to the compensation structure in a natural experiment setting, I can identify now firm leverage changes as a result of the CEO option compensation changes. The evidence provides strong support for the debt agency theory. The results indicate that firms decrease leverage when CEOs are paid with more option grants and as those options become a higher percentage of the

firm's future cash flows. The findings are robust to addition of corporate governance and convertible debt dimensions to estimation.

The second essay studies the effect of internal board monitoring on the firm's debt maturity structure. I use the Sarbanes – Oxley Act of 2002 (SOX) and the Securities and Exchange Commission (SEC) regulations as exogenous shocks to board structure in a natural experiment setting. Supporting the agency theory, the findings indicate that firms have debt with longer maturity as board independence increases and internal board monitoring becomes powerful. The results are even stronger for complex and larger firms such as conglomerates. I find the relation between internal monitoring and debt maturity becomes less clear during times of financial instability.

The third essay investigates the impact of externally mandated versus organically determined corporate governance modifications on firm performance. SOX and SEC regulations are employed as a natural experiment in order to examine the imposed rules and elucidate the identification issues. The findings suggest that companies which voluntarily determine the necessary corporate governance modifications based on firm specific characteristics and needs perform better than the case where they are all forced to alter their board structure.

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by

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This dissertation is dedicated to my father, Orhan, my mother, Ufuk, and my sister, Işıl.

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Chapter 1

The Effect of the CEO's Option Compensation on the Firm's Capital Structure: A Natural Experiment

1.1 Introduction

Numerous studies have examined the relation between CEO option compensation structure and the firm's capital-structure choice. Some papers define leverage as the dependent variable and examine its relation to the CEO's option compensation, explicitly assuming that pay structure variation causes differences in observed firm leverage. Others describe option compensation as the dependent variable and investigate how it varies with the firm's leverage decision. The empirical challenge is that these are both choices of the firm that are arguably made simultaneously. Therefore, it is difficult to conclude causation of this relation from the existing literature. In this paper, I use an exogenous shock that only influences the CEO's compensation and examine how changes in the CEO's option compensation resulting from that shock affect the firm's capital structure. By doing that, I can identify whether changes in compensation structure cause changes in firm leverage ratios.

The specific exogenous shock used in the natural experiment is Section 162(m) of the Internal Revenue Code (IRC 162(m)). The Revenue Reconciliation Act of 1993 added Section 162(m) to restrict the corporate tax deduction for executive compensation to $1 million but with an exception for performance-based compensation:

"…In the case of any publicly held corporation, no deduction shall be allowed under this chapter for applicable employee remuneration with respect to any covered employee to the extent that the amount of such remuneration for the taxable year with respect to such employee exceeds $ 1,000,000…"

Consequently, beginning on January 1, 1994, companies have largely adjusted their compensation packages so that pay over $1 million qualifies under the performance based exception. That change primarily occurs in the form of increased option compensation. Importantly, IRC 162(m) should have no direct influence on the firm's capital structure. This tax deduction limitation and linkage to performance based compensation should not alter the tax benefits, financial distress costs, information asymmetry, or market timing motivations of a firm when determining its optimal capital structure. As a result of that, I can use IRC 162(m) as a valid instrument for the exogenous shock in my natural experiment. Moreover, IRC 162(m) is not a binding constraint for all companies. Only firms paying CEOs a cash salary of $1 million or more are affected. This binding constraint enables me to compare these treated firms (those paying at least $1 million in salary) to the untreated companies in the after exogenous shock period, not just contrasting the before exogenous shock period to the after shock period.

With respect to the studies that investigate the relation between the CEO's option compensation and the firm's capital structure, there is a substantial disagreement over the nature of this relation. The research suggests a positive, negative or even no relation between option compensation and leverage. John and John (1993), Bryan, Hwang and Lilien (2000), Ortiz-Molina (2007), Hassan and Hosino (2008), Andrikopoulos (2009)

and Sepe (2010) claim either empirically or theoretically that there is a negative relation between CEO's option compensation and the firm's leverage decision. Their results rely on the agency cost of debt. Stock options mitigate the agency problem between shareholders and managers by incentivizing the CEO to act in the best interest of the shareholders and tying their wealth together. In order to increase the benefit gained from the option compensation, the CEO can increase stock-price volatility by investing in riskier projects and the potential debtholders may need to bear the costs and risks of these risky investments which results in wealth shifting from debtholders to shareholders and the CEO. Thus, debtholders may require higher interest rates to compensate the risk of those investments which potentially creates the agency cost of debt. To keep the cost of funding at minimum, the CEO may decide to raise less debt that result in a negative relation between CEO's option compensation and leverage.

On the other hand, Lewellen, Loderer and Martin (1987), Berger, Ofek and Yermack (1997), MacMinn and Page Jr. (2006), Coles, Daniel and Naveen (2006) and Tchistyi, Yermack and Yun (2009) argue in their empirical or theory paper this relation should be a positive one which is supported by the managerial agency theory. When the CEO is paid with more options, this compensation package may create incentives for the CEO to use more debt-funding strategies. If there is an information asymmetry and equityholders are not well informed, then the shares of the firm may be underpriced. In such a case, the CEO doesn't want to raise equity. Also, if debtholders are passive or uninformed, they don't ask for higher interest or any kind of a compensation for the wealth shifted away from them. Therefore, the CEO can easily raise more debt in order to increase the stock-price volatility and she can benefit more from their stock-option

compensation as the shares become riskier. But highly volatile stocks may destroy the firm value and harm the shareholders. On the whole, this theory suggests a positive relation between CEO's option compensation and the firm's leverage.

The theory and empirical papers of the existing literature can not come to an agreement about the causality and the nature of the relation between managerial option compensation and the firm's capital structure. I overcome this identification challenge by conducting a natural experiment in my paper with the setting of 162(m) tax law as the exogenous shock to the CEO compensation structure. I use a difference-in-difference analysis and compare the treated firms, affected by the IRC 162(m) law, with the untreated firms in terms of the change in the CEO compensation and its impact on the firms' leverage decisions. In the analysis, I conduct this comparison both before and after the exogenous shock. I consider my main variables of option compensation to be the value of and the number of options. While the CEO's option value normalized by the total CEO compensation captures the wealth impact, the CEO's number of options normalized by the shares outstanding provides insight into what percentage of the firm's future cash flows is granted to the CEO as opposed to the shareholders. Moreover, to check the robustness of my findings, I also use an instrumental variable (IV) regression model, where I estimate the CEO option compensation measures via several instruments in the first stage and regress the firm's leverage on my instrumented option pay measures along with controls in the second stage.

The main finding of this study is that the firm decrease leverage as its CEO is compensated more and more through options and as those options become a higher percentage of the firm's future cash flows. Furthermore, the CEO chooses less debt

financing as she receives more valuable options. My findings are consistent with the agency theory of debt stating a negative relation between CEO's option compensation and the firm's leverage.

A strong corporate-governance mechanism disciplines the CEO by reducing the discretion the CEO has over her compensation. This mechanism can prevent the destruction of the firm's value and the excessive wealth transfer from shareholders to the CEO through more and more incentives such as options. In addition, implementing a convertible-debt issuance system mitigates the concerns of debtholders about bearing too much risk and receiving low returns compared to the CEO and shareholders. Because of these potentially mitigating effects, I control for corporate governance and convertible-debt issuances in my analyses as a robustness check.

I examine new debt issuance and investigate the change in leverage due to new debt issuance through the influence of the change in the CEO's option compensation, rather than the level of leverage as in the original model. In addition to that, I introduce the vested CEO options in my analyses to capture the motivating effect of this type of option pay on the CEO's decisions as they become exercisable to buy stocks. I also control for the CEO ownership of firm shares because it may have a similar impact on leverage. Further, I examine CEO salaries of $900,000 and $800,000 as alternative cut-off points different from $1 million in order to test the validity of the IRC 162(m) as an exogenous shock and observe how my original findings are affected. Placebo tests are also conducted in which I run the same models but with data in a shifted time range in order to observe whether there are any other factors affecting either the CEO's option compensation or the firm's capital structure different from the exogenous shock I rely on.

Additionally, I examine the unlevered firm risk before and after the shock. I try to detect if the IRC 162(m) law causes increased "real" risk taking by the CEO who is compensated with more options. Finally, I construct several robustness tests in which I redefine the treatment variable as the size of the firm in order to control for the effect of firm size on the investigated relation in my models. After implementing all these tests in my analyses, I observe that the original results for the relation between the CEO's option compensation and the firm's leverage decision stay robust.

In this paper, I contribute to the literature by suggesting a solution to the long debated identification and causality problems in linking executive compensation with capital structure. Via the introduction of a natural experiment to the analysis, I argue that increased option compensation leads to less use of debt, all else equal. As a result, my analysis can offer clear and unambiguous findings and presents a baseline for future studies to be built upon. Due to the clear identification which I use in the natural experiment, my findings can suggest without a doubt the option compensation as a strong determinant of the firm leverage. Thus, this study can help the CEO compensation committee and the board to make better and efficient decisions about the CEO compensation regarding the impact on the firm leverage.

The remainder of the paper proceeds as follows. Section 2 reviews the literature on the relation between the CEO's options and the firm's capital structure and provides two different theories to explain this relation. Section 3 describes the data selection and the variables. Section 4 discusses the implications IRC 162(m) law and the initial findings. Section 5 explains the empirical method used to examine the relation and provides the main results. In Section 6, I present my conclusion.

1.2 Literature Review and Related Theories

The capital structure literature has documented several factors that have high explanatory power for leverage. Tangibility, operating profitability, firm size, growth, firm volatility, top executive tenure, industry concentration, and industry debt level can be counted among the most commonly used factors in the studies. In addition to these well-known factors, a fairly new concept has been discussed in the last two decades: the structure of the CEO's compensation. The attention focuses primarily on the CEO's option compensation. This literature examines the relation between the CEO's option compensation and the firm's leverage choices in a broader aspect, and the results are mixed. In some studies, researchers state that the firm's leverage decreases with option compensation or the leverage has a negative impact on the granting of options to CEOs, but others claim the opposite relation. In this study, without taking a side, I present these different views regarding the relation between the executive option compensation and the firm's capital structure. Then, I use the natural experiment setting via an exogenous shock and let the data speak to those theories.

Considering the previous studies on capital structure decisions by Titman and Wessels (1988), Berger, Ofek and Yermack (1997), Leary and Roberts (2005), Mackay and Phillips (2005), Faulkender and Petersen (2006), Billett, King and Mauer (2007), Hassan and Hosino (2008), Ma and Martin (2010), Rauh and Sufi (2010), Rampini and Viswanathan (2011), Faulkender and Petersen (2011), and Faulkender, Flannery, Henkins and Smith (2011), there are several frequently used determinants of leverage. The findings of these studies suggest that high-leverage companies are relatively larger, have higher tangibility, lower growth, and less volatile earnings. Further, the results indicate

that firms managed by CEOs with long tenure and that have low operating profitability have higher leverage. Moreover, close examination of the relation between the firm's leverage and the industry's characteristics shows that companies operating in more concentrated industries and in industries with higher debt averages prefer higher leverage as their capital structure choice.

The CEO's option compensation and its interaction with the firm's leverage have been attracting the interest of researchers in the last several decades. The studies suggesting a decreasing impact of CEO option compensation on the firm leverage rely on the debt agency theory. Jensen and Meckling (1976) suggest that stock options tie the wealth of the CEO and the equity holders together and mitigate agency problems between them. When potential debtholders are informed about this compensation structure of the CEO, they hesitate to grant funds and ask higher interest because they know that the CEO wants to increase stock-price volatility by investing in more risky projects. In that case, debtholders bear the costs and risks of those investments while the CEO and shareholders get the majority of the returns; and the wealth is shifted away from the debtholders to the shareholders. Consequently, debtholders demand higher interest for debt; and to keep the cost of debt at minimum, the CEO compensated by more options decides on less debt which decreases the firm's leverage.

The decreasing effect of CEO option compensation on firm leverage is examined by several studies. John and John (1993) investigate the interaction between top-management compensation and the design of external claims issued by firms. They analyze in detail the optimal management compensation for when the external claims are equity and risky debt and equity and convertible debt. The article claims equity-based

compensation ties CEO wealth changes to shareholder wealth changes, and that creates trust for potential shareholders. This trust incentivizes the CEO to raise more equity that decreases the firm's leverage. Further, Andrikopoulos (2009) examines the significance of compensation and alternative sources of income on investment timing, endogenous default, yield spreads, and capital structure. Andrikopoulos (2009) claims the higher the CEO's compensation is, the more the CEO will be aligned with shareholders. The yield spread will be higher because the CEO will have a stronger tendency to abide by an equity maximizing policy. So, the increased risk of debt contracts can lead to an increased yield spread affecting the cost of debt and lowering the optimal leverage ratio. Furthermore, Bryan, Hwang and Lilien (2000) find that the number of new stock options decreases with the firm's leverage. Hassan and Hosino (2008) analyze the economic justifications of options in Japanese companies by using a framework of three different theories: agency theory, a retention and sorting model, and the financial and ownership structure of a firm. Their findings suggest a negative relation between leverage and the use of stock options. Moreover, Sepe (2010) specifically examines the Dodd-Frank Act of 2010 and shows low leverage reduces overinvestment through a smaller debt cushion, but high equity-based compensation is very effective in inducing the CEO to perform better. Thus, Sepe (2010) proposes that firm leverage should decline as equity-based CEO compensation increases. In general, all of these papers provide evidence of a negative relation between the CEO's option compensation and the firm's leverage.

Managerial agency theory provides a counter argument. Executives compensated with options are willing to increase stock-price volatility. Agrawal and Mandelker (1987) examine the relation between common stock and option holdings of managers and the

choice of investment and financing decisions by firms. They find that firms undertaking variance increasing decisions have management compensation contracts with larger stock and option components. Moreover, DeFusco, Johnson and Zorn (1990) focus on the effect of CEOs' option compensation on risk taking and claim that for firms announcing changes in executive option plans, there is a significant increase in stock variance. As stated in these studies, CEOs engage in more risk-taking decisions as they are paid with more options. If debtholders are uninformed and don't ask for higher interest for the wealth shifted away from them, CEOs can easily raise more debt in order to boost stock-price volatility because they can extract more benefits from their stock-option compensation as the shares become riskier. On the other hand, very high volatility in stock prices might affect the shareholders in a negative way by destroying the value of the firm. This theory suggests that as the CEO receives more options, the firm issues excessive amounts of debt that increases the firms' leverage.

There are also a considerable amount of studies that suggest the positive relation. Lewellen, Loderer and Martin (1987) conduct an empirical analysis on executive incentive issues and argue a positive impact of the firm's leverage on stock options. Tchistyi, Yermack and Yun (2009) investigate the relation between CEOs' equity incentives and their use of performance-sensitive debt contracts. They argue that performance pricing contracts give CEOs a tool to gain private benefits by increasing firm risk. Tchistyi, Yermack and Yun (2009) find that CEOs with high pay sensitivity to stock volatility (vega) decide on more risky performance pricing schedules, while managers with high pay sensitivity to stock price (delta) choose less risky ones. Moreover, Coles, Daniel and Naveen (2006) study the relation between the managerial

compensation structure, such as option compensation, and investment and debt policy. The paper provides empirical evidence that higher CEO wealth sensitivity to stock volatility is connected with more R&D investments and higher leverage. Further, Ortiz-Molina (2007) analyzes the effect of the firm's capital structure on executive-compensation policies. The article documents that pay-performance sensitivity declines in straight debt, but the sensitivity increases in convertible debt. Ortiz-Molina (2007) argues that as leverage increases, the sensitivity to the firm's performance for the CEO's wealth in options falls more rapidly than it does for her wealth in stocks. Also, MacMinn and Page Jr. (2006) conduct a theoretical analysis on the CEO option compensation and leverage. Relying on the pecking-order theory, they show that a CEO prefers debt to equity funding to maximize the firm's value when she is compensated with stock options.

There are also some papers that do not favor either type of relation. Yermack (1995) analyzes stock options by using the Black-Scholes valuation approach. The article claims that there is no significant relation between option compensation and leverage decisions. Similarly, Mehran (1995) examines the executive compensation structure of randomly-selected manufacturing firms. Even though the paper suggests that firm performance is positively related to the percentage of equity held by CEOs and to the percentage of their equity-based compensation, it doesn't find evidence for a significant relation between the equity-based compensation and the leverage choice.

1.3 Data Selection and Variable Construction

My data sample comes from the Compustat and Execucomp databases for the years of 1992–1997. I exclude financial firms and utilities and winsorize the variables with

extreme values at 1% and 99% in order to mitigate the effect of outliers. While the data related to the firm's capital structure and controls come from Compustat, the data necessary for the explanatory variables and the option compensation come from the Execucomp database. The missing values crucial for the calculation of option compensation measures are hand collected from the EDGAR system through the SEC-Def 14a filings where available. My sample consists of 1,329 observations with 410 firms.[1]

In my analyses, the CEO's option compensation is represented in two different ways. I define "Option Ratio" as the Black-Scholes value of the option grants in a certain year for the CEO of a specific firm divided by the CEO's total compensation for that year. This measure represents the percentage of total compensation derived from option pay. The second major explanatory variable represents the number of the CEO's option shares as the "Option Grant Ratio" that is basically the number of options granted to the CEO in thousands divided by the number of the firm's shares outstanding in the millions. This measure explains what percentage of the firm's future cash flows have been granted to the CEO as opposed to the shareholders. By using multiple measures of CEO option compensation, I seek to establish the robustness of the relation between the CEO option compensation and leverage in terms of both the quantity and the value.

I evaluate the firm's capital structure with two different measures of leverage. Leverage is the book leverage of the firm that is calculated by dividing the sum of the debt in current liabilities and the long-term debt by the book value of total assets. The

[1] Data back to 1992 cover only S&P 500 firms. Out of 500 companies, there are around 30 financial and utility firms; from the remaining 470 companies, I lose about additional 60 firms due to the missing values on tenure, growth variables and CEO compensation data.

literature uses this measure frequently (recently by Ma and Martin, 2010). This measure allows me to focus on only the debt itself that is possibly influenced by the structure of the CEO's compensation. The other proxy for capital structure (recently by Faulkender and Petersen, 2011), Net Leverage, is calculated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and the long-term debt and then dividing the new sum by the book value of total assets.[2] This measure includes the cash component as "negative debt." The effect of the cash is the following: Firms can keep the same amount of debt but increase cash to reduce the equity volatility. This alternative proxy captures this different aspect of firm leverage that serves as a test for the robustness of my findings.

As discussed in the capital-structure and executive-compensation literature by Titman and Wessels (1988), Berger, Ofek and Yermack (1997), Opler, Pinkowitz, Stulz, and Williamson (1999), Guay and Harford (2000), Leary and Roberts (2005), Mackay and Phillips (2005), Faulkender and Petersen (2006), Billett, King and Mauer (2007), Hassan and Hosino (2008), Ma and Martin (2010), Rauh and Sufi (2010), Rampini and Viswanathan (2011), Faulkender, Flannery, Henkins and Smith (2011), I use certain control variables in this study. One of them is operating profitability that is the net cash flow from operating activities over total assets. Growth opportunity is constructed as capital expenditures over total assets. Size represents a natural logarithm of sales. Tangibility is controlled by two variables. One of them is defined as the total of property, plant, and equipment over the total assets, and the other variable represents leasing.

[2] I construct the same leverage measures by also using the market value of total assets even though these leverage variables with the market value of assets potentially have a mechanical effect on options because both options and market leverage are functions of stock price returns. My results stay robust.

Leasing is formulated as the sum of property, plant, equipment, and ten times the rental expenses over the sum of total assets and ten times the rental expenses. Cash flow volatility is controlled as the quarterly standard deviation of the percentage of change in operating income for the last three years. This percentage is an important measure of volatility because the firm's debt level does not directly affect it. Tenure, the natural logarithm of the years served as CEO, is also controlled for because it is a strong representative of the CEO's characteristics. The last control variable focuses on the industry. Specifically, this variable is the natural logarithm of the debt average of the industries in which the firms operate. Fama-French 12 industries are used for the industry classifications.

Table 1.1 presents the summary statistics for all of the variables used in the models. Both, Leverage and Net Leverage show similar patterns in their distributions. Net Leverage is slightly more volatile compared to Leverage because it is the measure with the cash taken from the leverage. On the other hand, the statistics for the option compensation proxies are quite interesting. Considering the mean and median, the Option Ratio and especially Option Grant Ratio variables display right-skewed features. Along with high variance, this positive skewness shows that between the years 1992 and 1997, there are some firms compensating their CEOs with very high option compensation while the majority does not. The statistics for the firm characteristics are similar to the ones documented in previous studies. On the other hand, the measure of volatility is quite different. Cash flow volatility has a very right-skewed distribution with an extremely high standard deviation that shows my sample consists of a large spectrum of firms with varying volatilities that mainly have a high level of risk. According the statistics for

industry characteristics, the distribution of the industry debt average is consistent with the literature. Considering the CEO characteristics measure, the statistics show that CEOs have tenure of approximately 6.5 years on average while the median value is 7 years, as similarly documented in the literature.

Table 1.1: Descriptive Statistics of Variables

This table provides descriptive statistics for the mean, standard deviation, 75th, 50th, and 25th percentiles of all types of variables used in the regression model. There are 410 firms with 1,329 firm-year observations. Net Leverage is calculated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is constructed by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to CEO in thousands divided by the number of shares outstanding in millions. Operating Profitability is the net cash flow from operating activities over total assets. Growth represents capital expenditures over total assets. Lease is constructed as the sum of property, plant, equipment total, and 10 times the rental expenses over the sum of total assets and 10 times the rental expenses. Tangibility is property, plant, and equipment total over total assets. Size is defined as the natural logarithm of sales. Cash Flow Volatility is the quarterly standard deviation of the percentage change in operating income for the last three years. Industry Debt Mean represents the natural logarithm of the debt average of industries. Tenure is the natural logarithm of the years served as CEO.

Variables	Mean	Stdev	P75	P50	P25
Net Leverage	0.196	0.194	0.319	0.193	0.073
Leverage	0.243	0.161	0.335	0.227	0.129
Option Ratio	0.289	0.302	0.449	0.227	0.000
Option Grant Ratio	1.674	5.046	1.167	0.389	0.000
Operating Profitability	0.083	0.119	0.105	0.040	0.013
Growth	0.062	0.046	0.083	0.055	0.032
Lease	0.425	0.239	0.610	0.422	0.260
Tangibility	0.326	0.244	0.508	0.290	0.121
Size	8.360	1.349	9.263	8.502	7.630
Cash Flow Volatility	1.058	7.482	0.591	0.279	0.117
Industry Debt Mean	8.302	1.047	9.269	8.031	7.516
Tenure	1.843	0.943	2.565	1.946	1.099

I provide a broader view of the relation between the CEO's option compensation and the firm's capital structure before I move to the next step and focus on the main model in this study. Figure 1.1 shows the yearly average values of all the independent and dependent variables in my analyses. Before the exogenous shock (the pre-period), Option Ratio has steady values around 0.26 and the yearly average Option Grant Ratio shows a slight increase. In the pre-period, Net Leverage and Leverage follow an incremental pattern on average, from 0.20 to 0.22 and from 0.25 to 0.27, respectively. At the time of the IRC 162(m) in 1994 and in the following years up to 1997, Option Ratio begins to increase after a drop in 1994 from 0.21 to about 0.37. Likewise, Option Grant Ratio increases drastically in the post-period from 0.10 to 0.27. The annual mean values of Net Leverage start to drop from approximately 0.22 to 0.17 after the exogenous shock. Similarly, Leverage starts to decrease gradually to 0.24 in the post-period. This reversed relation between option and leverage measures around the time of the exogenous shock clearly shows the impact of the CEO's option compensation changes after 1993 on the firm's capital structure.

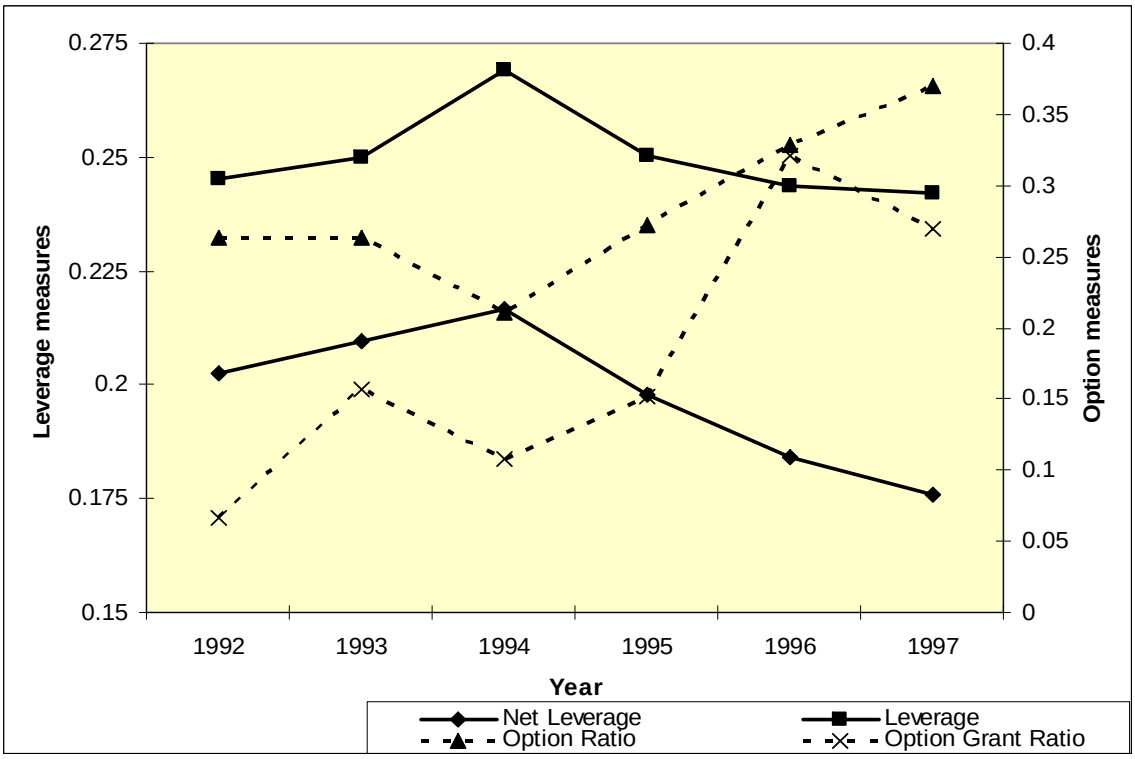

Figure 1.1: Distribution of All Leverage and Option Measures

This figure displays the distribution of Leverage, Net Leverage, Option Ratio, and Option Grant Ratio mean values by years for the firms paying CEO salaries equal to or greater than $1 million. Net Leverage is calculated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is constructed by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in ten thousands divided by the number of shares outstanding in millions.

1.4 The IRC 162(m) Law and Initial Findings

1.4.1 IRC 162(M)

In this study, I employ IRC 162(m) law as the exogenous shock to the CEO compensation in a natural experiment setting. The Revenue Reconciliation Act with the

Section 162(m) was enacted in 1993; and it limits the corporate tax deduction for executive compensation to $1 million with an exception for performance based compensation. Therefore, for the taxable years beginning on or after January 1, 1994, some firms have altered the structure of their compensation packages so that any excess over $1 million qualifies under the performance based exception. Stock-option plans were preferred more as opposed to other compensation forms for compliance as performance based (by Perry and Zenner, 2001). As an exogenous shock, IRC 162(m) clearly provides suitable conditions for the identification of the changes in the CEO's option pay, because IRC 162(m) only influences the CEO's option compensation but not the firm's capital structure. Due to the CEO's altered compensation structure, causality occurs from the option compensation towards the firm's capital structure.

After the IRC 162(m) Statement, the CEO's compensation structure changed drastically. Rose and Wolfram (2002) investigate the changes in CEO total compensation and cash salary caused by IRC 162(m) and they find that in general, the affected firms choose to pay CEO salaries around $ 1 million. Reintenga, Buchheit, Yen and Baker (2002) examine the impact of IRC 162(m) on performance based pay and earnings management and they conclude the law affects the CEO's performance based payment drastically which incentivizes the CEO to smooth reported earnings. As documented by Perry and Zenner (2001), CEOs started to be compensated with more performance based compensation after the IRC 162(m). They state that companies prefer option compensation significantly more over other types of performance based payments, such as bonuses. One of the possible explanations for this choice may be the fact that bonus plans can destroy firm value by providing incentives to manipulate earnings ineffectively.

Murphy and Jensen (2011) discuss that CEOs may withhold effort, shifting the earnings and cash flow unproductively from one period to another to justify the bonus payments. Furthermore, via regulations of the Securities and Exchange Commission (SEC), Murphy (2011) justifies the choice of options over the bonuses as the CEO's incentive compensation. In the early 1990s, the SEC decided that shares acquired by exercising options could be sold right after they are exercised. This change eliminated the six-month holding requirement. The SEC also required the disclosure of only the numbers of options granted and not their value. On the other hand, companies needed to report the value of bonuses they pay their CEO. All these new regulations made option compensation more attractive for firms compared to bonus payments. Consequently, CEOs were compensated with more and valuable options after the IRC 162(m) law as performance based compensation.

1.4.2 Univariate Analyses

The time interval for the univariate analyses is from 1992 until 1997. Thus, the interval covers the two-year pre-period before the announcement of IRC 162(m), 1992–1993 and the four-year post period, 1994–1997.

I conduct two univariate analyses in order to investigate the relation between options and the firm's capital structure decision. In the first univariate analysis, I compare the leverage measures and the option measures in the pre- and post-periods to observe any significant differences in their values. Further, I repeat the same analysis only for years 1993 and 1997 to discern any differences on a larger scale. Then, I replicate the same tests for two sample groups: firms paying CEO salaries equal to or greater than $1

million and the firms paying less than $1 million. I compare the results for these unaffected and affected firms and show the significance of those findings under the under the binding condition of the exogenous shock.

Table 1.2 provides the results of my first univariate analysis. Focusing on a comparison of the pre- and post-periods in Panel A, I find a statistically significant increase both for Option Ratio and Option Grant Ratio values in treated firms. While considering the untreated firms in Panel B that are not affected by IRC 162(m), the increase is insignificant for Option Grant Ratio and Option Ratio. This is a strong sign for the influence of IRC 162(m) on the CEO's option compensation. On the contrary, both Leverage and Net Leverage values for treated firms either remain unchanged or decrease after the exogenous shock despite the broader trend of increasing leverage of untreated firms. The decrease for these measures is small and statistically insignificant. One of the possible reasons for this small decrease contrary to the expectation of a greater decline might be the fact that firms' leverage values on average continued to increase in 1994, which is the first year in the post-period of my natural experiment. Because the mean values of the pre- and post-periods are compared in this test, that increase affects the difference. For the untreated firms in Panel B, both leverage measures increase significantly. Even though the decline in leverage measures for the treated firms is small, it shows that the main trend of leverage increase is broken and even slightly reversed for treated firms in the post-period.

Table 1.2: T-Test Mean Comparison for Leverage Measures, Option Ratio and Grants

This table presents results of the t-test mean comparison for Option Ratio, Option Grant Ratio, Leverage, and Net Leverage in the two main columns regarding to two different samples of CEO salaries greater and less than $1 million, respectively. In Column I, the mean values of each of these variables for the pre-period (1992-1993) are compared to their mean values for the post-period (1994-1997). The mean difference and related p-values are provided. In Column II, the same analysis is repeated for each variable individually considering the years 1993 and 1997 only.

Panel A: Sample of CEO salary ≥ $1 million (Treated)					Panel B: Sample of CEO salary < $1 million (Untreated)				
	I		II			I		II	
	Pre-Period	Post-Period	Year 1993	Year 1997		Pre-Period	Post-Period	Year 1993	Year 1997
Option Ratio	0.261	0.306	0.263	0.370	Option Ratio	0.263	0.306	0.324	0.329
dif	0.045		0.107		dif	0.043		0.005	
p-val	0.084		0.019		p-val	0.110		0.842	
Option Grant Ratio	1.138	2.170	1.562	2.399	Option Grant Ratio	1.520	1.662	1.347	1.566
dif	1.032		0.837		dif	0.142		0.219	
p-val	0.039		0.085		p-val	0.289		0.519	
Net Leverage	0.201	0.194	0.200	0.185	Net Leverage	0.179	0.215	0.182	0.222
dif	-0.007		-0.015		dif	0.036		0.040	
p-val	0.788		0.344		p-val	0.001		0.022	
Leverage	0.252	0.245	0.250	0.242	Leverage	0.230	0.253	0.232	0.262
dif	-0.006		-0.008		dif	0.023		0.030	
p-val	0.565		0.384		p-val	0.010		0.025	

Column II shows the findings for the same tests when considering the years 1993 and 1997 only. The mean value increases of Option Ratio and Option Grant Ratio for treated firms are statistically significant, which is important evidence for the impact of the exogenous shock on the CEO's option compensation. That is also documented by Perry and Zenner (2001). Focusing on the firms that pay CEO salary of less than $1 million in Panel B, there is slight and insignificant increase in the Option Ratio and the Option Grant Ratio value, which indicates the IRC 162(m) law influences the option compensation only in firms with the binding condition. Interestingly, the decrease in Net Leverage and Leverage is also greater in this case although neither of them is statistically significant. On the other hand, there is a big and statistically significant increase for both leverage measures in untreated firms in Panel B which means firms that are not subjected to IRC 162(m) raise their leverage in this period and create a trend of leverage increase. All these results give a general idea about how the exogenous shock changes the option compensation which affects the firm's leverage decision.

For the second analysis, I contrast the highest and lowest quartiles of Option Ratio and Option Grant Ratio individually in terms of the associated Leverage and Net Leverage quartile averages for the pre-period. I repeat the same analysis for the post-period and examine whether there is a significant difference between the pre- and post-periods' quartile differences. If the option compensation influences the firm's capital structure, then the effect should be mainly reflected in quartile differences of the post-period. If there is a relation between the CEO's option compensation and the firm's capital structure changes then it can be uncovered through this analysis. I include both data sets with CEO salaries equal to or greater than $1 million as the binding condition of

the IRC 162(m) and less than $1 million, so that I can compare my results and show their significance for the treated firms. All these tests provide a general insight into the relation between the option compensation and the firm's leverage choice.

Table 1.3 shows the findings of my second univariate analysis. Considering the quartile averages of Leverage and Net Leverage for Option Ratio in the pre-period, there is a difference between the mean values even though the difference is not statistically significant. Specifically, in Panel A for treated firms, the mean of leverage measures are higher for the lowest Option Ratio quartile (Q1) and lower for the highest quartile (Q4), which suggests a reverse, weak relation between the CEO's option compensation and capital structure. Moving on to the post-period results, the proposed relation becomes strong and statistically significant. The mean leverage difference is larger for the post-period which shows the clear influence of option compensation on leverage in post-period and the negative relation between them. Furthermore, for untreated firms, the relation is exactly the opposite. Particularly, the mean leverage values are lower for the lowest Option Ratio quartile and higher for the highest quartile that indicates a positive relation between the CEO's option compensation and the firm's capital structure choice. For the post-period results, that relation stays the same. These findings strongly suggest the influence of the CEO's option compensation on the firm's leverage after the IRC 162(m) law. Another important point to focus on is the mean leverage changes of the same quartiles before and after the exogenous shock. For treated firms in the post-period, the value for the lowest quartile drops from 0.219 to 0.209 for Net Leverage and from 0.275 to 0.257 for Leverage. The value change for the highest quartile is even greater. This finding shows that both Leverage values decrease after the exogenous shock and the

change is even bigger for high Option Ratio values. This decrease might be due to the impact of the CEO's option compensation on the firm's capital structure decisions which I investigate further in detail in the next section of this paper.

Table 1.3: T-Test Leverage Mean Comparison for Option Ratio and Grants

This table reports results of the t-test mean comparison for Option Ratio and Option Grant Ratio in two panels considering both data sets with CEO salaries equal to or greater than $1 million and less than $1 million. In Panel A, the highest and the lowest quartiles of Option Ratio are compared in terms of the associated quartile mean leverage values, namely, Net Leverage and Leverage seperately. The analysis is conducted for both the pre-period (1992-1993) and the post-period (1994-1997) considering the two different data sets. The mean difference and related p-values are provided. In Panel B, the t-tests are performed for Option Grant Ratio with the same logic.

	Pre-Period Treated	Post-Period Treated	Pre-Period Untreated	Post-Period Untreated
PANEL A: T-Test for Option Ratio				
Net Leverage-Q1	0.219	0.209	0.171	0.205
Net Leverage-Q4	0.206	0.168	0.185	0.218
dif	0.013	0.041	-0.014	-0.013
p-val	0.420	0.088	0.497	0.279
Leverage-Q1	0.275	0.257	0.221	0.242
Leverage-Q4	0.257	0.222	0.230	0.262
dif	0.018	0.035	-0.009	-0.020
p-val	0.379	0.084	0.578	0.137
PANEL B: T-Test for Option Grant Ratio				
Net Leverage-Q1	0.242	0.225	0.165	0.227
Net Leverage-Q4	0.223	0.183	0.171	0.230
dif	0.019	0.042	-0.006	-0.003
p-val	0.389	0.092	0.602	0.442
Leverage-Q1	0.267	0.263	0.221	0.263
Leverage-Q4	0.252	0.232	0.224	0.276
dif	0.015	0.031	-0.003	-0.013
p-val	0.402	0.100	0.431	0.582

Panel B reports the results of the same analysis for Option Grant Ratio. The findings for Option Grant Ratio have the similar pattern as for Option Ratio in both treated and untreated firms. In both periods, there are big quartile differences of mean leverage measures that are even greater and statistically significant in the post-period. Also, all leverage values of quartiles seem to decline in the post-period compared to the pre-period due to the possible influence of increased option compensation on the firm's leverage decisions.

1.5 The Empirical Method and Main Results

1.5.1 The Model

The time period for the natural experiment is from 1992 until 1997. The interval covers the two-year period before the announcement of IRC 162(m), 1992–1993 and compares it to the two two-year periods after the statement, 1994–1995 and 1996-1997. The main reason for the two-year pre-period is the availability of company data. I also restrict the experiment with two two-year post-periods because the power of the experiment deteriorates over time after the exogenous shock due to other potential factors that affect the relation between the CEO's option compensation and leverage.

The natural experiment to disclose any possible impact of the CEO's option compensation on the firm's capital structure is done via a difference-in-difference analysis. In the analysis, I use dummy variables for the post-period and the treated observations along with the interactions from these variables with the option measure so that I can examine all the possible effects from option measure variations on the capital structure. The treated firms are the IRC 162(m) binding firms that compensate their

CEOs with salaries equal to or greater than $1 million; and the post-period data cover all observations after 1994 and beyond. The model is specified as follows:

$$Y_{i,t} = \alpha + \beta * post_{i,t} + \gamma * treated_{i,t} + \delta * post_{i,t} * treated_{i,t} + \theta * X_{i,t} + \varepsilon * post_{i,t} * X_{i,t} + \lambda * treated_{i,t} * X_{i,t} + \varphi * post_{i,t} * treated_{i,t} * X_{i,t} + \sum_{l=1}^{8} \rho_l * Controls_{i,t,l} + \mu_{i,t} \quad (1.1)$$

where Y is the leverage measure; X is the option measure; the firm-year observation is i = 1, … , N; the entire period is t = 1992, … , 1997; the number of control variables is l = 1, … , 8; and α, β, γ, δ, θ, ε, λ, φ, ρ, μ are the coefficients of the constant term, post-period, treated firms, post-period treated firms, option measures, post-period option measures, treated firms' option measures, post-period treated firms' option measures, controls, error term, respectively.

To validate the robustness of the results, I also estimate an instrumented regression (IV) model. I introduce an IV approach in order to focus only on the treated firms' option compensation in the post-period and its influence on leverage decisions. Thus, the IV approach excludes the effect from the untreated firms' option compensation and the pre-period that might crowd out the real impact of the treated firms' option compensation. In this analysis, the treated firms are also the IRC 162(m) binding firms and the post-period data start with 1994. This model consists of two stages where the option measure is estimated with instrumental variables in the first stage. In addition to the necessary controls, dummy variables for the post-period and treated observations are included along with their interactions that become the instruments for the option compensation in the first stage of the model. These aspects are represented by Post,

Treated and Post*Treated as valid instruments because the change in the option payment is primarily caused by the IRC 162(m) (Post) and observable for the firms paying CEO salary of $1 million or above (Treated). The Post*Treated is the only factor identifying the treated firms' option compensation in the post-period whose impact on the leverage decisions is examined in the second stage of the model.

$$X_{i,t} = \alpha + \beta * post_{i,t} + \gamma_k * treated_{i,t} + \delta_k * post_{i,t} * treated_{i,t} + \sum_{l=1}^{8} \rho_l * Controls_{i,t,l} + \varepsilon_{i,t} \quad (1.2)$$

where X is the option compensation; the firm-year observation is i= 1, … , N; the entire period is t = 1992, … , 1997; and the number of control variables is l= 1, … , 8.

At the second stage, the leverage measure is regressed on the instrumented option measure with the controls, year and fixed effects. Even though this approach provides a clear interpretation of the option compensation's influence compared to a regular difference-in-difference analysis, the regression omits the effects of the other possible option compensation variations in the model.

$$Y_{i,t} = \theta + \delta * \hat{X}_{i,t} + \sum_{l=1}^{8} \rho_l * Controls_{i,t,l} + \varphi_{i,t} \quad (1.3)$$

where Y is the leverage measure; $\hat{X}$ is the instrumented option compensation from the first-stage regression; the firm-year observation is i= 1, … , N; the entire period is t = 1992, … , 1997; and the number of control variables is l= 1, … , 8.

The fixed effect approach is used in the analyses because it controls for the potential omitted variables that differ between firms but are constant over time, which is

a necessity for difference-in-difference analysis. Moreover, I want to examine the change in a firm's response before and after the exogenous shock. So, I need to focus on the difference between the average post-period values and the average pre-period values for that firm after removing changes explained by other factors. That requires using the firm specific intercept which is estimated via the fixed effect. Finally, for precision, I conduct the Hausman test and decide to use the fixed effect approach.

To strengthen the robustness of my findings, I focus on different CEO salary groups to show how the results change by different salary cut-offs. If the choice of IRC 162(m) as a natural experiment is correct and my model is valid, then in general the influence of the CEO's option compensation on the firm's capital structure decision should be less significant or even insignificant for alternative salary cut-offs, such as above $900,000 or above $800,000. The results are presented in Table 9 in Appendix A. Moreover, I examine corporate governance and convertible debt issuance within the context of option compensation and leverage relation. These variables offer useful tools to mitigate both managerial agency and debt agency problems, each of which supports opposite findings about the CEO's compensation and the firm's leverage relation in the literature. In addition to that, I use placebo tests in which I run the same models but with data in a shifted time range. The purpose is to examine and prove the validity of the exogenous shock and its effect. Further, I investigate the unlevered firm's volatility before and after the shock aside of the financial risk in order to find out whether the IRC 162(m) results in increased "real" risk taking by the managers who are receiving more stock options. Finally, I conduct robustness tests to control for the impact of firm size on the investigated relation in my models.

1.5.2 Multivariate Analysis (Difference-in-Difference Regression Model)

The main analysis on the relation between the CEO's option compensation and the firm's capital structure is a difference-in-difference analysis. There are two main dummy variables in this model. Post is a dummy that equals one for values in the post-period (1994–1997) and zero otherwise. Treated is a dummy that equals one for CEO salaries equal to or greater than $1 million and zero otherwise. Option Ratio*post, Option Ratio*treated, Option Ratio*post*treated, Option Grant Ratio*post, Option Grant Ratio*treated, Option Grant Ratio*post*treated, and post*treated are the interaction variables of Option Ratio, Option Grant Ratio, Treated, and Post. Consequently, this model enables me to observe and control for any possible effects from option measures of treated, untreated, pre- and post-periods of firm data. The major focus should be on the estimated coefficients for Option Ratio*post*treated and Option Grant Ratio*post*treated because they are the main variables that explain the possible impact of the CEO's option compensation, which is influenced by IRC 162(m), on the firm's leverage choice. Year and fixed effects along with controls such as tenure, operating profitability, growth, leasing, tangibility, firm size, cash flow volatility, and average industry debt are also added in the model. This test contains firm data from all CEO salary groups because the dummy Treated controls the data set for CEO salaries equal to or greater than $1 million. This analysis also eliminates any potential effects specific to each industry because the difference is calculated via the regressions. Also, the time interval is six years which is a very short time period for the industries to change and cause an effect on the variables in my model.

Considering the baseline regression estimates for controls in Table 1.4, I get mixed results. Consistent with the literature, my findings indicate that longer tenured CEO's decide to raise less debt as well as the firms with high operating profitability, high growth rates, high leased properties and equipment, low tangibility, and operating in industries with low debt average. Interestingly, contrary to the literature, the outcomes of this baseline regression analysis suggest that firms with higher cash flow volatility choose to issue more debt as a method of funding, and this needs further investigation.

The third and fourth columns of Table 1.4 have the results from the CEO's option-compensation ratio impact on the firm's leverage decision. Option Ratio*post*treated represents the Option Ratio for the treated firms after the exogenous shock that are influenced by the IRC 162(m) and expected to affect the firm's leverage. Thus, they are the firms believed to show the true impact of the CEO's option compensation on the firm's leverage. Considering Option Ratio*post*treated, the variable has a strong and statistically significant, negative influence. This result suggests that CEOs of the treated firms decide to raise less debt as they are compensated more with valuable options after the exogenous shock from the enactment of IRC 162(m). In particular, the firm's net leverage deteriorates by 2.55% (= 0.085 * 0.302) with one standard deviation increase (about 30%) in the option ratio. In other words, if the dollar value of the CEO's options increases 30% of the total compensation keeping the total compensation constant, or similarly, if the CEO is paid 30% over her current options' dollar value with options keeping the total compensation constant, then the CEO will raise less debt that will lead to a decline of 2.6 % in the firm's net leverage. Considering

firm's leverage, the decrease is around 2.64% (= 0.088 * 0.302) for an option ratio increase of one standard deviation.

Table 1.4: Difference in Difference Analysis of Leverage on Option Measures

This table reports difference-in-difference analysis estimates for Option Ratio, Option Grant Ratio, and their interactions with treatment variables along with CEO tenure, operating profitability growth, leasing, tangibility, size, operating income volatility, average industry debt as control variables, and also year dummies and fixed effects. It also provides the baseline regression results in the first two columns. The analysis is conducted using two different option measures for two different leverage measures individually. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to CEO in thousands divided by the number of shares outstanding in millions. Post is a dummy that equals one for values in the post-period (1994-1997) and zero otherwise. Treated is a dummy that equals one for CEO salaries equal to or geater than $1 million and zero otherwise. Option ratio*post, Option ratio*treated, Option ratio*post*treated, Option grant ratio*post, Option grant ratio*treated, Option grant ratio*post*treated, and Post*treated are the interaction variables of Option Ratio, Option Grant Ratio, Treated and Post. The *** indicates statistical significance at the 1% level.

	Treated ≥ $1 Million					
	Net Leverage	Leverage	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio			0.002	0.002		
			0.002	*0.002*		
Option grant ratio*post			-0.001	-0.001		
			0.001	*0.001*		
Option grant ratio*treated			0.003	0.004**		
			0.002	*0.002*		
Option grant ratio *post*treated			-0.007***	-0.007***		
			0.002	*0.002*		
Option ratio					-0.041***	-0.044***
					0.013	*0.013*
Option ratio*post					0.054**	0.052**
					0.021	*0.021*
Option ratio*treated					0.058	0.066
					0.057	*0.056*
Option ratio*post*treated					-0.085*	-0.088*
					0.051	*0.051*

Table 1.4 (cont.): Difference in Difference Analysis of Leverage on Option Measures

	Treated ≥ $1 Million					
	Net Leverage	Leverage	Net Leverage	Leverage	Net Leverage	Leverage
Treated			-0.020	-0.020	-0.030	-0.032
			0.018	*0.018*	*0.025*	*0.024*
Post			-0.016	-0.027	-0.035*	-0.043**
			0.019	*0.018*	*0.020*	*0.019*
Post*treated			0.017	0.016	0.035	0.034*
			0.017	*0.017*	*0.021*	*0.020*
Tenure	-0.003	-0.003	0.001	0.001	-0.001	-0.001
	0.005	*0.004*	*0.005*	*0.005*	*0.005*	*0.005*
Operating profitability	-0.795***	-0.232***	-0.847***	-0.186***	-0.825***	-0.146*
	0.078	*0.060*	*0.098*	*0.079*	*0.097*	*0.088*
Growth	-0.102	-0.206	0.004	-0.058	-0.037	-0.078
	0.187	*0.183*	*0.180*	*0.177*	*0.194*	*0.193*
Lease	-0.305***	-0.228**	-0.092	-0.066	-0.098	-0.081
	0.106	*0.096*	*0.215*	*0.216*	*0.206*	*0.205*
Tangibility	0.363***	0.323***	0.125	0.099	0.148	0.151
	0.090	*0.082*	*0.221*	*0.219*	*0.218*	*0.212*
Size	-0.001	-0.001	-0.017	-0.021	-0.022	-0.026
	0.007	*0.006*	*0.018*	*0.018*	*0.019*	*0.018*
Cash flow volatility	0.128***	0.128***	0.127***	0.129***	0.126***	0.128***
	0.021	*0.021*	*0.020*	*0.020*	*0.022*	*0.021*
Industry debt mean	0.024**	0.012	-0.010	-0.027	-0.017	-0.033*
	0.011	*0.010*	*0.018*	*0.018*	*0.018*	*0.018*
Constant	0.107	0.193*	0.494*	0.674*	0.603**	0.756***
	0.121	*0.112*	*0.293*	*0.405*	*0.232*	*0.215*
Adj. R-sq.	0.23	0.04	0.26	0.08	0.23	0.07
No of Obs.	1329	1329	1329	1329	1329	1329
No of Firms	410	410	410	410	410	410

For all firms from 1992 to 1997, Option Ratio, the CEO's option compensation has a statistically significant but a small negative effect on the firm's capital structure. This is a rather general finding and contains the effect of various parameters because data for these variables also contain untreated firms as well as the entire time interval. Moving on to the

other findings, if all firms after 1994 are taken together, Option Ratio*post, the potential option compensation effect becomes slightly weaker but a positive impact. One possible explanation can be the fact that the untreated firms are also included in this group and the influence of option-compensation on leverage for these untreated firms might be strongly positive so that it dominates the effect in general. Similarly, if the treated companies paying CEO salaries equal to or greater than $1 million are taken into the consideration for the entire time period; then the option compensation impact, Option Ratio*treated, is positive and statistically not significant. This result shows that the exogenous shock from IRC 162(m) influences the option compensation so that the positive effect before the announcement overcomes the negative impact on the firm's leverage in the post-period.

In Columns five and six, the real and significant impact of options on leverage is evident in Option Grant Ratio*post*treated. The option compensation influence is negative and statistically very significant, which suggests as CEO's of treated firms are paid more and more with options after IRC 162(m), they choose to decrease the leverage and net leverage of the firm. Particularly, Leverage and Net Leverage, decrease about 3.53% (= 0.007 * 5.046) for one standard deviation increase in the option grant ratio. Specifically, if the amount of options granted to the CEO (in millions) is increased by 0.5% keeping the total firm shares outstanding (in millions) constant or if the CEO is offered more options in the amount of 0.5% of her current existing options without issuing new company shares, then the CEO chooses less debt that reduces the firm leverage by 3.53%. This negative relation persists for all firms after the exogenous shock, Option Grant Ratio*post, but loses its statistical and economical significance because of the joint impact of untreated firms in that sample. For Option Grant Ratio, the relation

between the CEO's option compensation and the firm's capital structure is positive and very weak both statistically and economically when considering all firms from 1992 to 1997. Moreover, the effect of Option Grant Ratio*treated becomes a positive impact for the entire time period considering only the firms paying CEO salaries equal to or greater than $1 million[3].

After the difference-in-difference analysis with Option Ratio and Option Grant Ratio[4], the conclusion is that after IRC 162(m) CEOs are compensated with more and valuable options that lead them to make leverage decreasing decisions, consistent with the debt agency theory.[5]

[3] In untabulated difference-in-difference analyses, I additionally control for both the total CEO compensation and the increase in total CEO compensation via including them as control variables separately. Using the natural logarithm of total compensation and a dummy variable representing whether there is an increase in total pay, respectively as control variables, I obtain significant results showing the robustness of the negative effect of the CEO's option compensation on the firm's capital structure.

[4] I conduct the same difference-in-difference analysis with other independent and dependent variables in order to catch different aspects of the researched relation and to test its robustness. I construct an independent variable as the new debt issuance over total assets. Differently from Leverage and Net Leverage, this variable represents the change in leverage due to new debt issuance through the influence of the CEO's option compensation rather than the level of leverage. I use a dependent variable calculated as the vested CEO options over the number of shares outstanding to capture the motivating effect of vested options on CEOs' decisions. I repeat the dif-in-dif analysis by adding these new variables; and in each of the cases, I observe that the negative impact of the CEO's option compensation on the firm's capital structure stays robust.

[5] I repeat the difference-in-difference analysis including the CEO ownership aspect as a control. As the CEO owns more shares of the firm, it may have a similar effect on the leverage such the option pay. Therefore, I control the CEO ownership calculated as the percentage of common shares outstanding owned by the CEO. I obtain a significant and decreasing impact of the CEO option pay on the firm leverage as in my original findings.

1.5.3 Robustness

1.5.3.1 Instrumented Variable Regression Model

As a robustness test, I follow another approach and use an instrumented regression analysis. In the first stage, Option Ratio and Option Grant Ratio are estimated with treatment dummies as valid instruments: Post, Treated, Post*treated, and related controls. In the second stage, Leverage and Net Leverage are regressed individually on the instrumented Option Ratio* and Option Grant Ratio* along with controls, year and fixed effects. Similar to the previous analysis, this test has firm data from all of the CEO salary groups because in the first-stage regression the dummy Treated controls for the data set for CEO salaries equal to or greater than $1 million. This analysis concentrates on the effect of option compensation for the post-period on the treated firms' capital structure and doesn't include the interaction variables in the previous difference-in-difference model. The option measures are estimated via treatment dummies[6]. In the second stage, only the effect from the treated option measures of the post-period are represented and directly linked to the leverage measures that exclude the other interactions of the treatment and period dummies with option compensation proxies such as; Option Ratio*post, Option Grant Ratio*treated, etc. Therefore, it isolates any other potential impacts from those variables on the firm's leverage decision, and it provides a simpler and clearer interpretation of the option compensation influence on the firm's leverage decision compared to a regular difference-in-difference analysis.

[6] Following Stock and Yogo (2002), I test the weakness of my instruments for Option Ratio and Option Grant Ratio in the IV regression model. I compare the Cragg-Donald F-statistics of the first stage regression to the critical values in Table 1 by Stock and Yogo (2002) and find that Post, Treated and Post*treated are strong instruments enough to explain the option measures in the IV regression model.

Table 1.5 shows the results of the instrumented regression analysis. Columns I and II provide the outcomes of the first- and second-stage analyses that focus on the Option Ratio, Leverage, and Net Leverage relation. In the first stage, most importantly, Post*treated is very significantly and positively related to Option Ratio suggesting that treated firms' option ratios increase after the IRC 162(m) announcement. This first-stage finding is crucial for two reasons. First, the finding provides evidence for the validity of the natural experiment by indicating that IRC 162(m) inflates the CEO's option compensation. Second, this strong result is going to be the instrumented Option Ratio* whose impact on leverage will be examined in the second-stage regression. In the first-stage results, I have statistically significant and negative coefficients for Post when all firms after 1994 are taken together. According to the estimates for Post, the IRC 162(m) influences all firms in such a way that their CEOs are not paid more with valuable options. This finding suggests that the untreated firms that are expected to pay less valuable options in the first place have an overweighting effect in the sample. Furthermore, option ratios decline in treated firms when both pre- and post-periods are considered. The data set for this variable, Treated, includes the companies from the pre-period where firms don't pay too many options with high values to their CEOs. This might explain the dominating negative relation.

The outcomes for Post*treated for Option Grant Ratio in Columns III and IV provide a weak positive relation which shows the treated firms compensate their CEOs with more options in the post-period. Moreover, Post estimates for Option Grant Ratio demonstrate that all companies after 1994 compensate their CEOs with more options. Similar to the first-stage Option Ratio findings, firms with CEO salaries equal to or

greater than $1 million pay fewer options to their CEOs when both pre- and post-periods are taken into consideration.

Table 1.5: Instrumented Regression Analysis of Leverage on Option Measures

This table reports instrumented regression analysis estimates for option ratio*, option grant ratio* as instrumented independent variables along with CEO tenure, operating profitability, growth, leasing, tangibility, size, cash flow volatility, average industry debt as control variables and year effects. The analysis is conducted using two different option measures for two different leverage measures individually. In the first stage, Option Ratio and Option Grant Ratio are estimated through treatment dummies and related controls as a difference-in-difference analysis. In the second stage, the leverage measures are regressed on the IVed Option ratio* and Option grant ratio*. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in thousands divided by the number of shares outstanding in millions. Post is a dummy that equals one for values in the post-period (1994-1997) and zero otherwise. Treated is a dummy that equals one for CEO salaries equal to or geater than $1 million and zero otherwise. Post*treated is the interaction variable of Treated and Post. Year dummies are included in the model. The *** indicates statistical significance at the 1% level.

	Treated ≥ $1 Million First Stage Results			
	Option Ratio (I)	Option Ratio (II)	Option Grant Ratio (III)	Option Grant Ratio (IV)
Post	-0.135***	-0.135***	0.464	0.464
	0.044	*0.044*	*0.713*	*0.713*
Treated	-0.063	-0.063	-0.106	-0.106
	0.076	*0.076*	*0.590*	*0.590*
Post*treated	0.179***	0.179***	0.688	0.688
	0.073	*0.073*	*0.604*	*0.604*
Controls	Yes	Yes	Yes	Yes
	Treated ≥ $1 Million Second Stage Results			
	Net Leverage (I)	Leverage (II)	Net Leverage (III)	Leverage (IV)
Option ratio*	-0.100**	-0.050*		
	0.051	*0.037*		
Option grant ratio*			-0.038*	-0.037*
			0.023	*0.023*

Table 1.5 (cont.): Instrumented Regression Analysis of Leverage on Option Measures

	Treated ≥ $1 Million			
	Net Leverage	Leverage	Net Leverage	Leverage
Tenure	-0.009	-0.002	-0.002	-0.002
	0.007	*0.005*	*0.010*	*0.009*
Operating profitability	-0.072***	-0.055***	-0.110***	-0.046***
	0.018	*0.013*	*0.014*	*0.014*
Growth	-0.034	-0.001	-0.036	-0.210
	0.135	*0.100*	*0.301*	*0.288*
Lease	-0.153	-0.138	-0.500**	-0.408**
	0.123	*0.091*	*0.207*	*0.193*
Tangibility	0.175	0.040	0.049*	0.042*
	0.138	*0.103*	*0.025*	*0.024*
Size	-0.001	-0.011	-0.036	-0.025
	0.013	*0.010*	*0.040*	*0.036*
Cash flow volatility	0.050	0.049*	-0.040	0.031
	0.034	*0.026*	*0.102*	*0.097*
Industry debt mean	-0.011	-0.004	0.023	-0.001
	0.011	*0.008*	*0.035*	*0.033*
Constant	0.353**	0.461***	0.423	0.514
	0.175	*0.130*	*0.357*	*0.333*
Adj. R-sq.	0.04	0.03	0.11	0.05
No of Obs.	1329	1329	1329	1329
No of Firms	410	410	410	410

For the second-stage findings, both Option Ratio and Option Grant Ratio have negative and statistically powerful estimates. This instrumented regression analysis helps to show that the negative impact of the CEO's option compensation on the firm's capital structure still persists under different settings such as the case where the focus is on the treated companies in the post-period, but the possible influences of variations in the option-dummy interaction variables are isolated.

The negative estimates for Option Ratio* and Option Grant Ratio* indicate that CEOs choose less debt as they are paid more and valuable options after the IRC 162(m).

In particular, the firm net leverage decrease around 3% (= 0.100 * 0.302) for one standard deviation increase (about 30%) in Option Ratio. In other words, if the dollar value of the CEO's options increases 30% of the total compensation keeping the total pay constant, or similarly, if the CEO is paid 30% over her current options' dollar value with options keeping the total compensation constant, then the CEO will raise less debt that will lead to a decline of 3% in the firm's net leverage. Considering the firm leverage the decrease is around 1.51% (= 0.050 * 0.302) as the option ratio increases one standard deviation. For the option grant ratio one standard deviation increase reduces both Net Leverage and Leverage, for 19.18% (= 0.038 * 5.046) and 18.67% (= 0.037 * 5.046), respectively. Specifically, if the amount of options granted to the CEO (in millions) is increased by 0.5% keeping the total firm shares outstanding (in millions) constant or if the CEO is offered more options in the amount of 0.5% of her current existing options without issuing new company shares, then the CEO chooses less debt that reduces the firm net leverage and leverage by 19.2% and 18.7%, respectively.

After the instrumented regression analysis with the findings from Option Ratio and Option Grant Ratio, there is strong evidence that after the exogenous shock of IRC 162(m), CEOs are paid with more and valuable options, which motivate them to make leverage decreasing decisions as proposed by the debt agency theory.[7]

[7] I conduct the same instrumented regression analysis with another independent and dependent variables: the new debt issuance over total assets and the vested CEO options over the number of shares outstanding, respectively. The negative impact of the CEO's option compensation on the firm's capital structure persists in each case.

1.5.3.2 Robustness Checks

In the literature, some papers suggest that compensating the CEO with stock options ties the interests of shareholders and CEOs together and thus increases the cost of debt, because the wealth is shifted away from the debtholders and they worry that they will bear the risk of CEO's investments without receiving enough benefits from them. This problem is called the debt agency issue. As suggested by Haugen and Senbet (1981), issuing convertible debts can mitigate this problem because the issuance gives the debtholders the chance to trade the debt into stock in times of need such as when they think projects are too risky. In order to control for any possible effect of debt agency on the CEO's option compensation and the firm's capital structure relation, I rerun my models by using the "Convertible debt dummy" variable. I form two subsamples with Convertible debt dummy. In the first, Convertible debt dummy equals one and comprises firms that face less debt agency problems because they issue convertible debt. In the second subsample, Convertible debt dummy equals zero and the companies do not issue convertible debt. The results are presented in Table 1.6. The negative impact of option compensation on leverage that is supported by my previous findings persists in this robustness test.[8]

[8] As an additional robustness test, I construct three subsamples (none, medium, high) based on the ratio of the dollar amount of convertible debt over total assets, in order to observe the effect of varying convertible debt levels. I obtain robust results.

Table 1.6: Difference in Difference Analysis with Managerial and Debt Agency Controls

This table reports a replication of the difference-in-difference analysis for option ratio, option grant ratio with additional control variables such as, the GIM index dummy, compensation committee dummy, and convertible debt dummy. The analysis is conducted in the exact same way as before. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated via dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in thousands divided by the number of shares outstanding in millions. Post is a dummy that equals one for values in the post-period (1994-1997) and zero otherwise. Treated is a dummy that equals one for CEO salaries equal or geater than $1 million and zero otherwise. Option ratio*post*treated and Option grant ratio*post*treated are the interaction variables of Option Ratio, Option Grant Ratio, Treated, and Post. GIM index dummy is a dummy that equals one if the firm has a GIM index value less than eight. Compensation committee dummy is a dummy variable that equals one if the CEO is a member of compensation committee. Convertible debt dummy is a dummy that equals one for the firms issuing convertible debt. The *** indicates statistical significance at 1% level.

PANEL A: Test for Option Ratio with GIM index dummy

	GIM index dummy = 1		GIM index dummy = 0	
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio*post*treated	-0.016	-0.014	-0.017	-0.017
	0.074	*0.071*	*0.067*	*0.062*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.34	0.38	0.44	0.16
No of Obs.	144	144	482	482

PANEL B: Test for Option Grant Ratio with GIM index dummy

	GIM index dummy = 1		GIM index dummy = 0	
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio*post*treated	0.140***	0.119***	0.006	0.004
	0.019	*0.018*	*0.008*	*0.008*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.40	0.44	0.44	0.16
No of Obs.	144	144	482	482

Table 1.6 (cont.):Difference in Difference Analysis with Managerial and Debt Agency Contr

PANEL C: Test for Option Ratio with Compensation committee dummy				
	Pay committee dummy = 0		Pay committee dummy = 1	
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio*post*treated	-0.076	-0.070	-0.593***	-0.603***
	0.056	*0.054*	*0.177*	*0.176*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.25	0.07	0.39	0.39
No of Obs.	985	985	107	107
PANEL D: Test for Option Grant Ratio with Compensation committee dummy				
	Pay committee dummy = 0		Pay committee dummy = 1	
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio*post*treated	-0.007***	-0.008***	-0.092***	-0.090***
	0.002	*0.002*	*0.030*	*0.034*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.27	0.09	0.38	0.34
No of Obs.	985	985	107	107
PANEL E: Test for Option Ratio with Convertible debt dummy				
	Convertible debt dummy=1		Convertible debt dummy=0	
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio*post*treated	-0.202**	-0.177**	-0.048	-0.052
	0.089	*0.082*	*0.053*	*0.053*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.49	0.4	0.25	0.07
No of Obs.	177	177	915	915
PANEL F: Test for Option Grant Ratio with Convertible debt dummy				
	Convertible debt dummy=1		Convertible debt dummy=0	
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio*post*treated	-0.012*	-0.012**	-0.004	-0.004
	0.007	*0.006*	*0.003*	*0.003*
Firm Controls	Yes	Yes	Yes	Yes
Year Effects	Yes	Yes	Yes	Yes
Adj. R-sq.	0.51	0.34	0.29	0.10
No of Obs.	177	177	915	915

The managerial agency theory states that CEOs engage riskier investment projects as they are paid more stock options that can potentially destroy the firm's value and lead to an excessive wealth transfer from stockholders to CEOs. A typical solution for this problem is strong corporate governance. As proposed by Gompers, Ishii and Metrick (2003), the Statement of the Financial Economists Roundtable (2003), Jiraporn and Gleason (2007), Faulkender, Kadyrzhanova, Prabhala and Senbet (2011), the reduction in the high level of discretion CEOs have on their own compensation by implementing a board with independent directors helps to mitigate this agency problem. To control any potential impact of managerial agency on the relation between the CEO's option compensation and the firm's leverage decisions, I replicate my main analysis with four subsamples formed in the following way: "GIM index dummy" (as a corporate governance dummy) is a dummy that equals one if the firm has a GIM index value less than eight and zero otherwise. The "Compensation committee dummy" is a dummy variable that equals one if the CEO is a member of the compensation committee and zero otherwise. The samples where GIM index dummy is one or Compensation committee dummy is zero should have firms with stronger corporate governance compared to firms in the other samples because the firms with low GIM index values have strong corporate governance with weak CEO influence; and companies that have the CEO on the compensation committee experience weak corporate governance. The results are presented in Table 1.6. As supported by my previous findings, the negative effect of the CEO's option compensation on the firm's capital structure stays robust and statistically

significant [9] although the difference-in-difference analysis for Option Grant Ratio has some mixed results only for GIM index dummy subsamples.

The correct choice of the exogenous shock for a solid identification is essential in this study. In order to examine the robustness of the natural experiment with IRC 162(m), I conduct placebo tests in which I keep the main structure of my model the same but only shift the time range of the study. By doing this, I can observe whether there are other firm related endogenous or independent exogenous shocks influencing the relation between the option compensation and leverage. If I have significant results from the placebo tests, it means there are other trends than the IRC 162(m) law that affect the CEO's option compensation. In the first test, I move the time frame of the difference-in-difference analysis one year earlier and define a dummy variable, Post1, that equals one for values in the shifted post-period (1993–1996) and zero otherwise. In the second test, I shift the time range of the model three years later and use a dummy variable, Post3, that equals one for values in the shifted post-period (1997–2003) and zero otherwise. The findings are given in Table 1.7. These analyses provide statistically insignificant results that support the validity of the use of IRC 162(m) in the natural experiment as the only exogenous shock affecting the relation between the CEO's stock options and the firm's capital structure.[10]

[9] As another robustness test, I construct three subsamples (low, medium, high) based on the GIM index values of firms in order to control the effect when the quality of corporate governance varies among firms and through time. My results stay similar and robust as in previous analyses.

[10] I conduct an additional placebo test with a time shift of four years in order to be away from the effect of IRC 162(m) and I obtain similar robust results.

Table 1.7: The Placebo Tests for the Difference in Difference Analysis

This table presents the placebo test estimates for the difference-in-difference (dif-in-dif) analysis. In the first placebo test, the time frame of the dif-in-dif analysis is shifted one year earlier and the estimates are given in columns I - IV. In the second placebo test, the time frame is shifted three year later and the estimates are shown in columns V - VIII. The analyses comprise control variables and year fixed effects. The tests are conducted using two different option measures for two different leverage measures individually. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to CEO in thousands divided by the number of shares outstanding in millions. Post1 is a dummy that equals one for values in the shifted post-period (1993-1996) and zero otherwise. Post3 is a dummy that equals to one for values in shifted post period (1997-2003) and zero otherwise. Treated is a dummy that equals one for CEO salaries equal or geater than $1 million and zero otherwise. Option ratio*post1, Option ratio*treated, Option ratio*post1*treated, Option grant ratio*post1, Option grant ratio*treated, Option grant ratio*post1*treated, Post*treated, Option ratio*post3, Option ratio*post3*treated, Option grant ratio*post3 and Option grant ratio*post3*treated are the interaction variables of Option ratio Option grant ratio Treated, Post1 and Post3. The *** indicates statistical significance at the 1% level.

PANEL A: The First Placebo Test

			Treated ≥ $1 Million	
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio	-0.018	-0.028		
	0.021	*0.022*		
Option ratio*treated	0.009	-0.002		
	0.070	*0.066*		
Option ratio*post1	0.010	0.016		
	0.017	*0.016*		
Option ratio*post1*treated	0.020	0.029		
	0.068	*0.063*		
Treated	-0.028	-0.021	-0.021	-0.013
	0.029	*0.027*	*0.021*	*0.019*
Post1	-0.017	-0.026	-0.016	-0.025
	0.020	*0.019*	*0.020*	*0.019*
Post1*treated	0.019	0.012	0.024	0.015
	0.028	*0.025*	*0.023*	*0.020*

Table 1.7 (cont.): The Placebo Tests for the Difference in Difference Analysis

			Treated ≥ $1 Million	
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio			0.005	0.005
			0.004	*0.004*
Option grant ratio*treated			-0.007	-0.010
			0.009	*0.008*
Option grant ratio*post1			-0.001	-0.001
			0.002	*0.002*
Option grant ratio*post1*treated			0.005	0.008
			0.009	*0.008*
Constant	0.463*	0.671***	0.416*	0.638***
	0.249	*0.231*	*0.233*	*0.216*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.24	0.06	0.27	0.07
No of Obs.	906	906	918	918
No of Firms	342	342	343	343

PANEL B: The Second Placebo Test

			Treated ≥ $1 Million	
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio	-0.023	-0.019		
	0.016	*0.014*		
Option ratio*treated	0.022	0.021		
	0.036	*0.035*		
Option ratio*post3	0.021	0.010		
	0.017	*0.016*		
Option ratio*post3*treated	-0.033	-0.023		
	0.037	*0.036*		
Treated	0.003	0.001	0.011	0.008
	0.017	*0.017*	*0.014*	*0.013*
Post3	0.024	0.036**	0.035**	0.042***
	0.016	*0.015*	*0.016*	*0.014*
Post3*treated	-0.014	-0.018	-0.024*	-0.025*
	0.018	*0.017*	*0.014*	*0.013*

Table 1.7 (cont.): The Placebo Tests for the Difference in Difference Analysis

	Treated ≥ $1 Million			
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio			0.003	0.003
			0.003	*0.003*
Option grant ratio*treated			-0.002	-0.002
			0.002	*0.002*
Option grant ratio*post3			-0.002	-0.001
			0.003	*0.002*
Option grant ratio*post3*treated			0.002	0.001
			0.003	*0.002*
Constant	0.040	0.048	-0.008	0.026
	0.150	*0.146*	*0.150*	*0.144*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.24	0.04	0.24	0.04
No of Obs.	8,116	8,116	8,185	8,185
No of Firms	1,849	1,849	1,856	1,856

Although I control for the firm size at a level throughout my analyses in this paper, there still might be an impact of size on the option compensation and firm leverage relation because size is somewhat correlated (approximately, 0.20) to the treatment effect. In order to eliminate this concern, I use two robustness tests. In the first test, I replace the treatment variable with an indicator for the firm size above the top 25th percentile so that I can exactly mimic the original treatment variable. I define a dummy variable, TreatedQ, that equals one for the firms with sizes in the top 25th percentile and zero otherwise. In the second robustness test, I substitute the treatment variable with an indicator for the firm size above median and I use a dummy variable, TreatedM, that equals one for the firms with sizes above the median and zero otherwise. The findings are shown in Table 1.8. I obtain statistically insignificant findings in both cases that indicate firm size is not

the main factor impacting the relation between the CEO's option compensation and the firm's leverage. This provides evidence for the robustness of my previous results.

Table 1.8: The Size-Robustness Tests for the Difference in Difference Analysis

This table presents the size-robustness test estimates for the difference-in-difference (dif-in-dif) analysis. In this robustness test, the treatment variable is replaced by an indicator for the firm size. The analysis comprises control variables and year fixed effects. The test is conducted using two different option measures for two different leverage measures individually. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to CEO in thousands divided by the number of shares outstanding in millions. Post is a dummy that equals one for values in the post-period (1994-1997) and zero otherwise. TreatedQ is a dummy that equals one for the firms with the size in the top 25th percentile and zero otherwise. Because the treated firms are 25 percent of the whole sample, the cutoff point for firm size is the top 25th percentile in order to exactly mimic the effect of the original treatment variable. For the second test, TreatedM is a dummy which equals to one for the firms greater than median firm size and zero otherwise. Option ratio*post, Option ratio*treatedQ, Option ratio*post*treatedQ, Option grant ratio*post, Option grant ratio*treatedQ, Option grant ratio*post*treatedQ, Post*treatedQ, Option ratio*treatedM, Option ratio*post*treatedM, Option grant ratio*treatedM, Option grant ratio*post*treatedM, Post*treatedM are the interaction variables. The *** indicates statistical significance at the 1% level.

PANEL A: The First Size-Robustness Test

	TreatedQ > 75th percentile of firm size			
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio	-0.039***	-0.040***		
	0.015	*0.015*		
Option ratio*post	0.027	0.029		
	0.023	*0.022*		
Option ratio*treatedQ	0.041	0.033		
	0.040	*0.037*		
Option ratio*post*treatedQ	0.013	0.011		
	0.045	*0.043*		
TreatedQ	0.032	0.037	0.036**	0.034**
	0.024	*0.023*	*0.017*	*0.016*
Post	-0.009	-0.019		
	0.019	*0.018*		
Post*treatedQ	-0.036	-0.035	-0.025*	-0.023*
	0.023	*0.022*	*0.014*	*0.014*

Table 1.8 (cont.): The First Size-Robustness Test for Difference in Difference Analysis

	TreatedQ > 75th percentile of firm size			
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio			0.003	0.002
			0.002	*0.002*
Option grant ratio*post			-0.004*	-0.003
			0.002	*0.002*
Option grant ratio*treatedQ			-0.005	-0.005
			0.003	*0.003*
Option grant ratio*post*treatedQ			0.006	0.005
			0.003	*0.003*
Constant	0.586***	0.745***	0.577**	0.745***
	0.223	*0.212*	*0.224*	*0.217*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.24	0.08	0.26	0.07
No of Obs.	1329	1329	1329	1329
No of Firms	410	410	410	410

PANEL B: The Second Size-Robustness Test

	TreatedM > median firm size			
	Net Leverage	Leverage	Net Leverage	Leverage
Option ratio	-0.032	-0.031		
	0.020	*0.020*		
Option ratio*post	0.013	0.016		
	0.032	*0.032*		
Option ratio*treatedM	-0.004	-0.013		
	0.026	*0.025*		
Option ratio*post*treatedM	0.040	0.037		
	0.037	*0.036*		
TreatedM	0.035*	0.035*	0.042**	0.043**
	0.019	*0.018*	*0.019*	*0.018*
Post	-0.009	-0.019	0.002	-0.009
	0.022	*0.021*	*0.019*	*0.018*
Post*treatedM	-0.028*	-0.026*	-0.031*	-0.030**
	0.016	*0.015*	*0.016*	*0.015*

Table 1.8 (cont.): The Second Size-Robustness Test for Difference in Difference Analysis

	TreatedM > median firm size			
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio			0.003	0.002
			0.002	*0.002*
Option grant ratio*post			-0.003	-0.003
			0.002	*0.002*
Option grant ratio*treatedM			0.000	0.001
			0.005	*0.005*
Option grant ratio*post*treatedM			-0.001	-0.001
			0.005	*0.004*
Constant	0.683***	0.826***	0.511**	0.691***
	0.235	*0.227*	*0.227*	*0.215*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.24	0.07	0.26	0.07
No of Obs.	1329	1329	1329	1329
No of Firms	410	410	410	410

In my paper, I focus on the capital structure implied by financial risk. In order to investigate the relation between the exogenous shock and the "real" risk taking by CEOs paid more stock options, I conduct another robustness test. I examine the unlevered firm volatility before and after the shock for the treated firms. In untabulated analyses, the statistically significant findings suggest an increased firm volatility for treated firms while the firm risk stays about the same after the exogenous shock for untreated firms. This result provides robustness for the original findings in the paper and supports the idea that the IRC 162(m) law results in increased risk taking by managers as they are compensated with more options.[11]

[11] I investigate the potential impact of the increase in the CEO option pay on the firm investment policy. After examining the dividend, cash holding, capital expenditures and R&D policies of the firms in relation to the CEO option pay changes, I find that only the R&D policy is affected significantly which is calculated as the ratio of R&D expenditures over total assets. As suggested by Bryan, Hwang and Lilien (2000), increasing the option compensation incentivizes the CEO to take more risky projects which are represented

1.6 Conclusion

This paper examines the relation between the CEO's option compensation and the firm's capital structure. Specifically, the main interest is to uncover any possible impact of the CEO's increased option compensation on the firm's leverage choices. Controlling for the other channels of potential effects on the firm's leverage decisions, I use an exogenous shock, the IRC 162(m) law, in the natural experiment setting to clearly identify the CEO's option compensation. Relying on this natural experiment during the period of 1992 to 1997, I find that when CEOs are compensated with more and valuable options, they decide to engage in less debt financing suggested by the debt agency theory.

This paper contributes to the CEO compensation and capital structure literature by providing insight into the impact from the CEO's option compensation on the firm's leverage decision. This study investigates the interaction between the proposed relation and the corporate governance. Controlling for any possible effects by the firm's corporate governance mechanism on the option compensation and leverage relation provides robust findings. Further, this study presents a thorough research by including two different empirical models. These models comprise a difference-in-difference analysis and an instrumented regression analysis. Maybe most importantly, this research is built on a natural experiment based on the IRC 162(m) law. To the best of my knowledge, there is no study on the relation between the CEO's option compensation and the firm's capital structure that is conducted in a natural experiment setting. Thus, my paper does not only present a solid, reliable identification of variables and a strong, precise causality but also

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via the increase in R&D expenditures. Likewise, I obtain a strong and significantly positive impact from the CEO's option compensation on the firm R&D policy in my analysis.

provides a baseline for further studies by using natural experiments while investigating the option compensation and leverage relation. Lastly, this study with the clear identification and consistent findings can provide assistance to the compensation committee and the board in firms to make better decisions about the CEO compensation regarding its impact on the firm's leverage.

Appendix A

A.1 Distribution of Leverage and Option Measures

I plan to show whether there is a trend for the leverage and option pay measures. Therefore, I investigate the distribution of the mean values of the net leverage, leverage, option ratio and option grant ratio over the years from 1992 until 1997 for untreated firms only. I present the findings in Figure 1.2. I also compare the distribution of those measures for the untreated firms and treated companies in Figure 1.3 and Figure 1.4. For the treated firms after 162(m) Statement, I show the deviation from the trend in option pays in Figure 1.4.

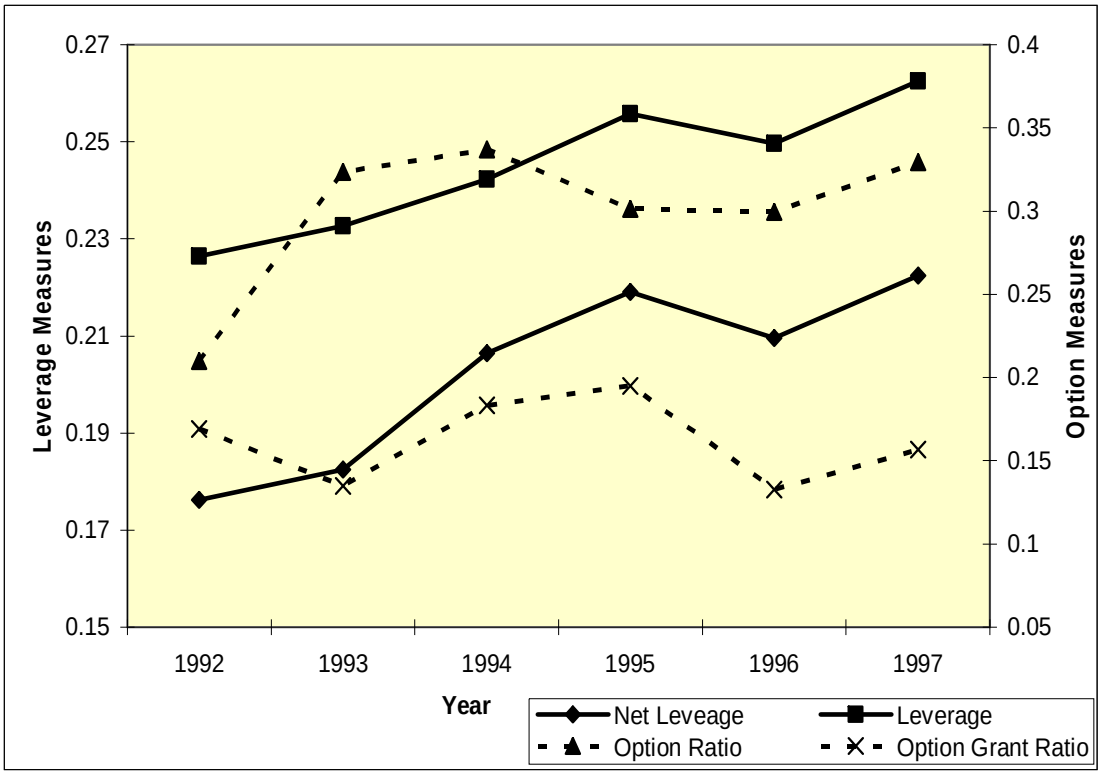

Figure 1.2: Distribution of All Leverage and Option Measures for Untreated Firms

This figure displays the distibution of Leverage, Net Leverage, Option Ratio, and Option Grant Ratio mean values by years for the firms paying CEO salaries less than $1 million, i.e. the untreated firms. Net Leverage is calculated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is constructed by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in ten thousands divided by the number of shares outstanding in millions.

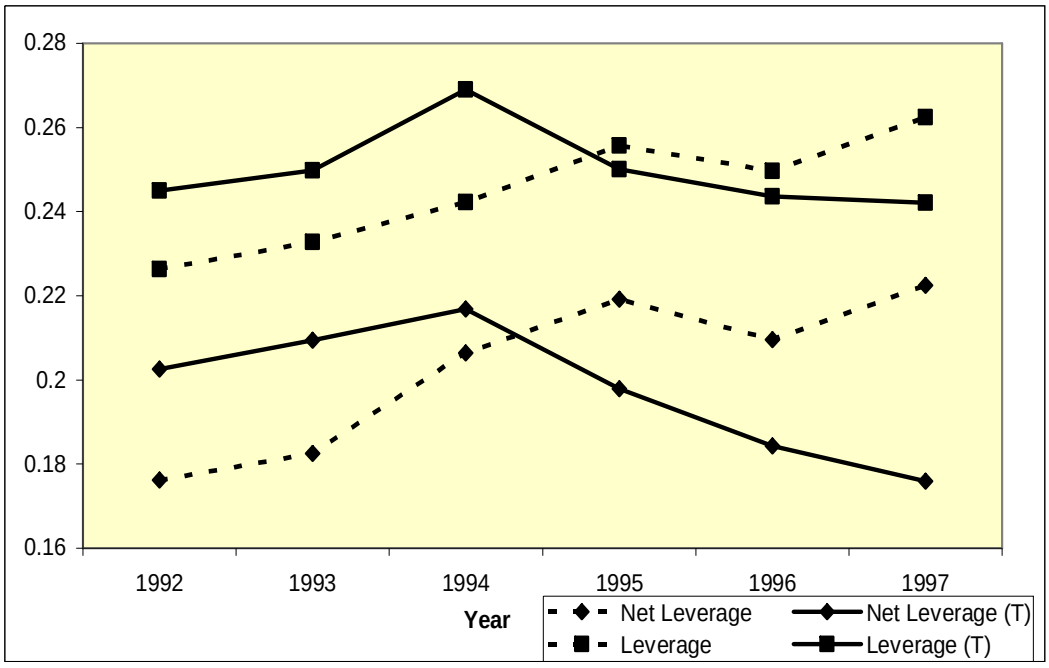

Figure 1.3: Distribution of All Leverages Measures for Treated and Untreated Firms

This figure displays the distibution of Leverage and Net Leverage mean values by years for the firms paying CEO salaries less than $1 million, i.e. the untreated firms, and for the companies paying CEO salaries equal to or greater than $1 million, i.e. the treated firms. Net Leverage is calculated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is constructed by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. For the treated firms, these variables are labeled as Net Leverage (T) and Leverage (T), respectively.

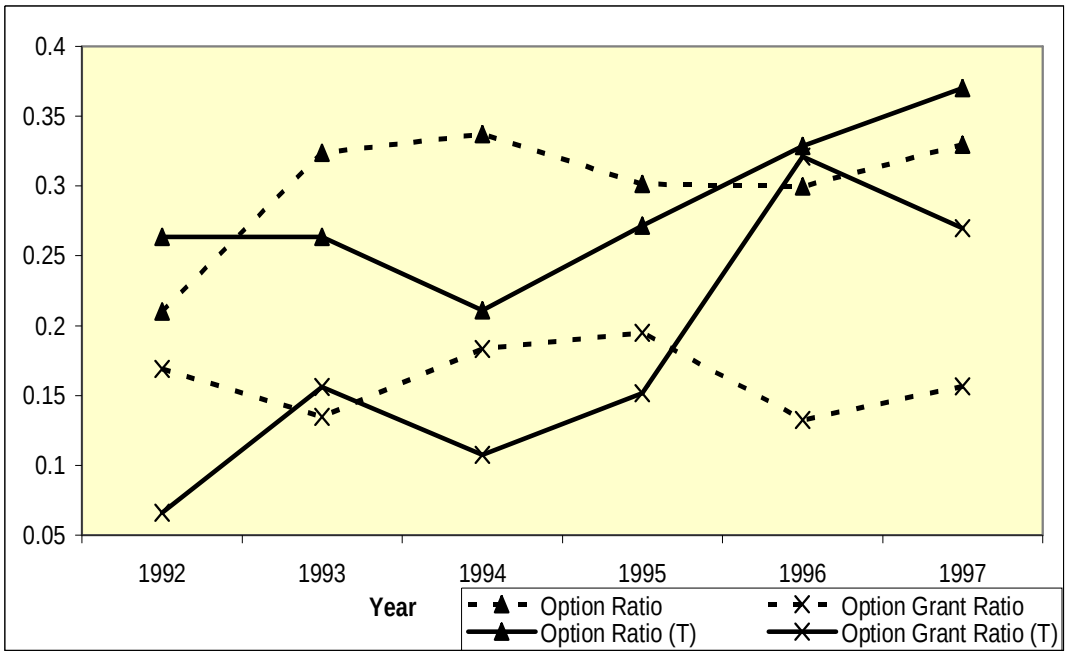

Figure 1.4: Distribution of All Option Measures for Treated and Untreated Firms

This figure displays the distibution of Option Ratio and Option Grant Ratio mean values by years for the firms paying CEO salaries less than $1 million, i.e. the untreated firms, and for the companies paying CEO salaries equal to or greater than $1 million, i.e. the treated firms. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in ten thousands divided by the number of shares outstanding in millions. For the treated firms, these variables are labeled as Option Ratio (T) and Option Grant Ratio (T), respectively.

A.2 Difference-in-Difference Analysis with different CEO Salary Groups

Table 1.9: Difference in Difference Analysis of Leverage on Option Measures

This table reports difference-in-difference analyses estimates for option ratio, option grant ratio and their interactions with treatment variables along with CEO tenure, operating profitability, growth, leasing, tangibility, size, cash flow volatility, average industry debt as control variables, and also year dummies and fixed effects. The analyses are conducted using two different option measures for two different leverage measures individually. Net Leverage is formulated by subtracting the cash holdings of the firm from the sum of the debt in current liabilities and long-term debt and dividing that by the book value of total assets. Leverage is calculated by dividing the sum of the debt in current liabilities and long-term debt by the book value of total assets. Option Ratio is the ratio of the Black-Scholes value of the option grants for the CEO over the CEO's total compensation for that year. Option Grant Ratio is defined as the amount of options granted to the CEO in thousands divided by the number of shares outstanding in millions. Post is a dummy that equals one for values in post period (1994-1997) and zero otherwise. In Panel A, Treated is a dummy that equals one for CEO salaries equal to or geater than $0.9 million and zero otherwise; while in Panel B, Treated is a dummy that equals one for CEO salaries equal to or geater than $0.8 million and zero otherwise. Option ratio*post, Option ratio*treated, Option ratio*post*treated, Option grant ratio*post, Option grant ratio*treated, Option grant ratio*post*treated, and Post*treated are the interaction variables of Option Ratio, Option Grant Ratio, Treated and Post. The *** indicates statistical significance at the 1% level.

PANEL A: Treated ≥ $0.9 Million				
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio	0.002	0.001		
	0.002	*0.002*		
Option grant ratio*post	-0.001	-0.001		
	0.001	*0.001*		
Option grant ratio*treated	0.003	0.003		
	0.003	*0.003*		
Option grant ratio*post*treated	-0.005***	-0.005**		
	0.002	*0.002*		
Option ratio			-0.043***	-0.042***
			0.013	*0.013*
Option ratio*post			0.059**	0.054*
			0.030	*0.030*
Option ratio*treated			0.056	0.042
			0.047	*0.047*
Option ratio*post*treated			-0.077	-0.062
			0.050	*0.051*

Table 1.9 (cont.): Difference in Difference Analysis of Leverage on Option Measures

	Treated ≥ $0.9 Million			
	Net Leverage	Leverage	Net Leverage	Leverage
Treated	-0.003	0.000	-0.017	-0.010
	0.015	*0.015*	*0.021*	*0.022*
Post	-0.007	-0.014	-0.028	-0.033*
	0.019	*0.018*	*0.019*	*0.020*
Post*treated	0.002	-0.001	0.022	0.014
	0.015	*0.014*	*0.019*	*0.020*
Constant	0.494***	0.682***	0.610***	0.768***
	0.226	*0.216*	*0.218*	*0.225*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.26	0.07	0.23	0.06
No of Obs.	1329	1329	1329	1329
No of Firms	410	410	410	410

PANEL B: Treated ≥ $0.8 Million				
	Net Leverage	Leverage	Net Leverage	Leverage
Option grant ratio	0.001	0.000		
	0.002	*0.002*		
Option grant ratio*treated	0.004	0.005**		
	0.002	*0.002*		
Option grant ratio*post*treated	-0.006***	-0.006***		
	0.001	*0.001*		
Option ratio			-0.043***	-0.045***
			0.015	*0.015*
Option ratio*treated			0.056	0.049
			0.036	*0.036*
Option ratio*post*treated			-0.013	-0.007
			0.029	*0.029*
Treated	0.022	0.018	0.003	0.001
	0.012	*0.012*	*0.018*	*0.017*
Post*treated	-0.019	-0.029	-0.022	-0.032
	0.021	*0.020*	*0.022*	*0.021*

Table 1.9 (cont.): Difference in Difference Analysis of Leverage on Option Measures

	Treated ≥ $0.8 Million			
	Net Leverage	Leverage	Net Leverage	Leverage
Constant	0.536**	0.713***	0.629***	0.779***
	0.223	*0.214*	*0.222*	*0.215*
Controls	Yes	Yes	Yes	Yes
Adj. R-sq.	0.27	0.07	0.24	0.06
No of Obs.	1329	1329	1329	1329
No of Firms	410	410	410	410

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Chapter 2

Does Internal Board Monitoring Affect The Debt Maturity? - A Natural Experiment

2.1 Introduction

In this paper, I consider the internal monitoring feature of strong corporate governance as a substitute for the external monitor via short term debt. Fama (1980) discusses that as the number of outside members increase in the board of directors, the board becomes more independent and acts more effectively as monitors because the outsiders want to protect reputation capital and they are not associated with the internal incentives and company politics. A board with independent outside members establishes strong corporate governance which can mitigate the agency problem between firms and lenders by establishing a monitoring mechanism of managers. In the presence of a powerful board with efficient control of the firm, lenders don't necessarily have to restrict themselves to the short term debt as monitoring the management is done by that strong independent board. Consequently, lenders may become more willing to issue longer term debt as firms have more independent and stronger board[12]. This is the hypothesis I test in this paper.

[12] As an alternative channel to the creditor driven force in explaining the shift towards long term debt, one can also focus on the firm-centric force as well: As internal board monitoring becomes stronger via the increase in the number of independent directors, the CEO is conditioned to take a longer-term view in her strategy and therefore, she makes long term investments. If so, due to "duration matching" of investment to financing, the CEO decides on more long term debt.

The determinants of the debt maturity structure have been long researched in literature. As suggested by Morris (1975), Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Ozkan (2000), Scherr and Hulburt (2001); leverage, growth options, asset maturity, profitability and tangibility are counted among the main factors explaining the maturity decisions of firm debt. Other studies by Arslan and Karan (2006), Jiraporn and Kitsabunnarat (2007) focus on the corporate governance in terms of large shareholder ownership and the shareholder rights and try to rationalize the debt maturity structure using these aspects. Yet, the other features of corporate governance remain unexamined. In this study, I try to investigate further the internal monitoring feature of strong corporate governance.

One of the main challenges in examining the effect of board independence on debt maturity is to identify exogenous changes in board. In this study, I construct a natural experiment and use the Sarbanes – Oxley Act of 2002 (SOX hereafter) and the following corporate governance rules by the Securities and Exchange Commission (SEC hereafter) in 2003, as the exogenous shock. SOX consists of eleven sections about corporate board responsibilities and requires the SEC to implement rules operationalizing the law. In 2003, important corporate governance rules of the NYSE and the NASDAQ are enacted under Section 303A and 5605A, respectively. One of the regulations for the listed companies is the requirement of the majority independence of the board of directors. Following that rule, firms modified their boards and we observed a significant increase in board independence at NYSE and NASDAQ firms. As the exogenous shock, the SOX regulations only impact the independence of the board but not the maturity of firm's debt, and thus, it proves to be a valid instrument for the natural experiment. Due to

the improvements in board independence via the SOX rules, the causality occurs from the corporate governance towards the debt maturity structure, and it allows me to research how changes in board independence resulting from that shock cause changes in debt maturity.

In the natural experiment, I use the difference-in-difference analysis where I compare the firms, affected by the SOX regulations after the exogenous shock, to the companies before the shock. I document the impact of the changes in board independence on the debt maturity structure. I'm also interested in investigating this relation under different economic conditions separately, in particular, the crisis periods.

During the financial instability, the risk of payments and the default risk of firms can be high, and thus, lenders may be more hesitant to supply debt. They can act differently in providing debt with certain type of maturities and be more conservative in bad times compared to years with financial stability. In order to research the board independence and debt maturity relation in such different economic conditions, I use the same difference-in-difference analysis setting but I restrict my sample to consist of years of financial instability only.

The main finding of this study suggests firms have debt with longer maturity as board independence increases and internal board monitoring becomes stronger. I find the relation between internal monitoring and debt maturity becomes less clear during times of financial instability.

To show the robustness of my results, I conduct placebo tests in which I keep the main structure of my model the same but only shift the time range of the study. By doing this, I can observe whether there are other firm related endogenous or independent

exogenous shocks influencing the relation between the board independence and debt maturity. Aside of that analysis, I also focus on distinctive aspects of organizational structure and debt issuance. Conglomerate firms are often seen as large companies which have a complex organizational structure. Therefore, compared to the simple single segment firms, conglomerates may benefit more from an efficient internal control over the management of multiple segments together. I need to control the possible influence of the firm's organizational structure on the relation between the board independence and debt maturity. Moreover, in further analysis, I concentrate only on the maturity structure of the new debt issuance rather than the one of the total outstanding debt while researching the impact of the board independence. Lastly, I investigate the CEO duality issue in the firms and show how the board independence and debt maturity relation is affected depending on whether the CEO is the chair of the board or not. The CEO duality may affect independence of the board because CEO as the chair of board may influence the decisions. On the other hand, the SOX amendments provide necessary conditions to mitigate any potential effect by the CEO even if there is CEO duality issue in the firm. After implementing all these robustness tests in my analyses, I observe that the original results for the relation between the board independence and the maturity structure of the firm's debt stay unchanged.

In this study, I contribute to the debt maturity literature by introducing board independence as a new measure for effective internal board monitoring and research its impact on debt maturity. I suggest the board independence as a significant determinant of the long term debt via solidly identifying this factor and investigating its effect with an exogenous shock in a natural experiment setting. I also provide more insight into this

relation by considering different aspects of debt issuance, organizational structure and as well as the times with financial crises. Therefore, this paper presents clear findings and offers a baseline for future studies on the debt maturity.

The remainder of the paper is organized as follows. Section 2 reviews the relevant literature. Section 3 develops the hypotheses and presents the empirical method used to examine the board independence and debt maturity relation. Section 4 describes the data selection and the variables. In Section 5, I discuss the empirical findings and the robustness of these results. Section 6 concludes the study.

2.2 Literature Review

In the finance literature, the determinants of the debt maturity have always been an interesting topic for the researchers. Morris (1975) develops a hypothesis regarding the factors influencing average maturity of the corporate debt such as capital structure, asset maturity, size and growth. Morris (1975) finds that firms match their maturity of the assets to the debt maturity and decide on shorter term debt if they have growth options and highly variable income. When large firms increase the amount of debt, they go for longer maturities. Myers (1977) also investigates the factors affecting the maturity decision of debt. He expands on Morris (1975) matching maturity idea and shows that lack of matching the maturities can lead underinvestment. Myers (1977) suggests firms with high growth opportunities should issue short term debt because the shorter maturity reduces the worries and the hesitation by the debtholders about the payments from risky investments due to the growth options. Thus, the short term debt can mitigate this underinvestment problem. Also, Barnea, Haugen and Senbet (1980) consider the debt

maturity structure while suggesting a solution for the agency issue of debt associated with informational asymmetry and risk incentives. They recognize that short term debt and long term debt with call option reduce the incentive for risky asset substitution and discourage managers from engaging in suboptimal risky contracts which transfer wealth from bondholders to stockholders. Further, Titman and Wessels (1988) use balance sheet measures for debt maturity and verify that smaller firms have a greater proportion of the debt with shorter maturity due to the relatively high costs of long term debt. In addition to that, Mitchell (1991) focuses on the information asymmetry dimension and finds that firms facing a high degree of information asymmetry choose debt with shorter maturity to reduce adverse selection cost.

While analyzing the factors in relation with the debt maturity decision, researchers also focus on the bond ratings. Barclay and Smith (1995) examine firm quality along with size and growth opportunities and find that the term to maturity of debt increases with size and credit quality and decreases with growth opportunity. In addition, Stohs and Mauer (1996) introduce the signaling and the maturity matching hypotheses in their study and obtain similar results suggesting that firms with poor growth opportunities and larger firms issue debt with longer maturity. In their study, Guedes and Opler (1996) examine the determinants of the maturity of new public debt issues. Contrary to previous work, Guedes and Opler (1996) claim a quadratic relation between credit ratings and the debt maturity choice and argue that large firms with high credit ratings either choose short term or long term debt, while firms with speculative grade credit ratings borrow in the middle of the maturity spectrum. Moreover, Ozkan (2000) considers the relation between the debt maturity structure and size, growth opportunities, asset maturity and

signaling. Focusing on the UK firms over the period 1983-1996, Ozkan (2000) finds consistent results with previous studies but rejects that firms use the maturity structure to signal information to the market. Further, Scherr and Hulburt (2001) examine small firms and conclude that the probability of default, capital structure and asset maturity are economically and statistically important for small firms deciding on their debt maturity structure.

The potential impact of corporate governance has also been investigated in the debt maturity literature. Arslan and Karan (2006) consider the Turkish firms as companies operating in an emerging market and examine the effect of large shareholders and a concentrated ownership structure under the corporate governance concept. Arslan and Karan (2006) find that companies with large shareholders via high ownership concentration choose debt with longer maturity. Their findings also support the previous studies investigating the relation between debt maturity and asset maturity, size and growth options. Moreover, Jiraporn and Kitsabunnarat (2007) focus on corporate governance in terms of shareholder rights. Using the GIM index as the measure for the strength of the shareholder rights, Jiraporn and Kitsabunnarat (2007) suggest an inverse relation between that and debt maturity. In particular, the managers of firms with weak shareholder rights avoid debt with shorter maturity to minimize the external monitor.

As stated in agency theory, managers can extract benefits from lenders' money when the monitoring mechanism is weak. In such a case, Petersen and Rajan (1995) state that banks and lenders in the bond market prefer to issue short term debt because the short term maturity requires contact between the firm and the lender during continuous renewals and allows creditors more flexibility to effectively monitor managers with

minimum effort. Stulz (1990 and 2000) also shows that shorter maturity of debt makes it more difficult for managers to defraud creditors since it provides creditors the opportunity to vary terms of financing before the managers make wealth shifting decisions. So, short term debt can be a powerful tool to monitor management and deter moral hazard by enabling lenders to detect borrowers' opportunistic behavior and punish it via superior liquidation and renegotiation of the debt.

In this paper, I investigate the relation between debt maturity and strong corporate governance in terms of an effective monitoring. Monitoring the manager is one of the duties of the board of directors, and one way to describe the effectiveness of monitoring is to examine the independence of the board from the internal corporate politics and influences. Fama (1980) suggests that as the ratio of outside versus inside directors increases, the board becomes more independent because outside members are expected to be less associated with the internal dynamics and the conflict of interests within the firm. An independent board can monitor the CEO more effectively, and so, the lenders may not need to supervise the managers strictly via the debt with shorter maturity, for instance.

2.3 Hypotheses and the Empirical Method

In this study, I examine the impact of strong corporate governance on debt maturity through an independent and efficient board of directors. As stated by the agency theory, managers tend to benefit from outstanding debt via investing in wealth increasing risky projects in the absence of a powerful monitoring mechanism. Therefore, the lenders prefer to provide debt with a shorter maturity and interact with the firm frequently via the renewal of the contract which enables them to supervise the manager's actions. On the

other hand, this external control can be shifted towards the firm as an internal monitoring mechanism with the help of a neutral, independent board. In that case, the lenders don't feel a strong necessity of monitoring the managers and consider offering debt with longer maturity. In addition to that, the CEO may also be encouraged to take a longer term view in her strategy and therefore make long term investments. Due to "duration matching" of investment to financing, the CEO focuses on more long-term debt. Because of these reasons, I empirically estimate the relation between the board independence and the maturity of firm's debt under the null hypothesis of no relation and allow the data to inform me which hypothesis dominates.

H0: The board independence has no effect on the maturity of the firm's debt.

$H1_a$: With a strong governance provided by a high board independence, the firm has debt with longer maturity.

$H1_b$: With a strong governance provided by a high board independence, the firm has debt with shorter maturity.

As mentioned earlier, the literature on the debt maturity focuses on various factors as the determinants of the maturity in order to explain the maturity structure of the firm's debt. Aside of the most common factors such as, asset maturity, leverage, profitability, tangibility, growth options, cash holdings, volatility and industry concentration; only a few researchers consider the potential effect of the corporate governance on the debt maturity via the shareholder rights and the ownership structure. But interestingly, the monitoring feature of the board has been out of the scope of the studies. In this paper, I differ from the previous studies by introducing the board independence as a measure of

the strong corporate governance. I investigate the influence of board independence on the firm's debt maturity structure through a valid natural experiment while supporting all my work with the agency theory in the literature. That's why; the central theme of my study is to answer the following question:

How do the changes in the board independence affect the maturity structure of the firm's debt?

In order to answer the main research question in my paper, I need to use a natural experiment setting with a valid instrument as the exogenous shock. Thus, in my study, I employ the Sarbanes – Oxley Act of 2002 (SOX) which was enacted in 2002 and it is a United States federal law that set new or enhanced standards for all U.S. public company boards, management and public accounting firms. The act contains 11 sections, ranging from additional corporate board responsibilities to criminal penalties, and requires the SEC to implement rulings on requirements to comply with the law. Following that amendment, corporate governance rules were enacted for the NYSE and NASDAQ under Section 303A and 5605A, respectively. According to that regulation, companies listed on the NYSE and NASDAQ must comply with certain standards regarding corporate governance such as the majority independence of the board of directors. Consequently, those companies started to adjust their corporate boards following these rules for stronger governance. As an exogenous shock, the SOX amendments clearly fulfill the requirements for the identification of improved corporate governance because these rules only influence the board characteristics such as majority independence but not the maturity structure of the firm's debt. Due to the changes in the corporate governance,

causality occurs from the corporate board structure towards the firm's debt maturity decision.

My natural experiment has the time interval from 1996 until 2009 which compares a seven year – period before the SOX regulations, 1996-2002, to the seven year – period after these rules, 2003-2009. The pre-period time includes a three year dot-com crisis, 2000-2002, sub-period. In order to have a comparable after period time interval, I need to consider a similar structure after the SOX rules. That's why; I decide to have a seven year post-period which contains a three years long sub-prime mortgage crisis time, 2007-2009.

Before focusing on the natural experiment and the multivariate analyses, I conduct several univariate tests in order to take a broader view of the board independence and the maturity structure of the firm's debt. I compare the mean values of the dependent variable, debt maturity, and the independent variable, board independence, each before and after the exogenous shock and show the significance of those findings. Additionally, I examine the validity of the exogenous shock. I regress the debt maturity variables on the board independence along with controls and run this regression analysis for each year. I display the coefficient estimates for the board independence every year. I expect to see clustered estimates before and after the shock at different levels. Also, a sudden change in the cluster right after the exogenous shock verifies that there is not any ongoing trend, but the SOX regulations are the only factor influencing the relation between the board independence and the debt maturity.

The main model in this paper is a difference-in-difference analysis. In this multivariate test, I use dummy variables for the period after the SOX amendments along

with the interactions from these variables with the board independence measure. So, I can examine all the possible effects from board independence variations on the debt maturity structure. The post-period data cover all observations after 2003 and beyond.[13] The model is specified as follows:

$$Y_{i,t} = \alpha + \beta * post_{i,t} + \theta * X_{i,t} + \gamma * post_{i,t} * X_{i,t} + \sum_{l=1}^{10} \delta_l * Controls_{i,t,l} + \mu_{i,t} \quad (2.1)$$

where Y is the debt maturity measure; X is the board independence measure; the firm-year observation is i= 1, … , N; the entire period is t = 1996, … , 2009; the number of control variables is l = 1, … , 10; and α, β, θ, γ, δ, μ are the coefficients of the constant term, post-period, board independence measures, post-period board independence measures, controls, error term, respectively.

The firm leverage is one of the control variables in my model. In literature by Barclay, Marx, and Smith (2003) and Johnson (2003), it has been discussed that the decisions for the leverage and the maturity of the debt are made simultaneously in the firm. Gatchev, Pulvino, and Tarhan (2012) suggest a system-of-equations approach via the simultaneous equations where they use the lagged dependent variables to incorporate the intertemporal dependencies within variables and prevent the potential omitted variables bias. Taking these arguments into account, I build a simultaneous equations model. In the first step of the equations, I predict the leverage via the lagged debt maturity measure and the common factors mentioned in the capital structure literature. In the second step, I use a difference-in-difference analysis and I regress the debt maturity

[13] The NYSE and NASDAQ listed firms which already have majority in independent directors before the new regulations are excluded from the sample because the exogenous shock via the SOX amendments may not necessarily impact those companies.

measures on post dummy, the interaction with board independence, as well as, board independence, asset maturity, lagged controls and the predicted leverage from the first step.

$$Z_{i,t} = \sigma + \tau * Y_{i,t-1} + \sum_{l=1}^{8} \varphi_l * Controls_{i,t,l} + \varepsilon_{i,t} \tag{2.2}$$

where Z is the leverage measure; Y is the debt maturity measure; the firm-year observation is i= 1, … , N; the entire period is t = 1996, … , 2009; the number of control variables is l = 1, … , 8; and σ, τ, φ, ε are the coefficients of the constant term, debt maturity measures, controls and the error term, respectively.

$$Y_{i,t} = \alpha + \beta * post_{i,t} + \theta * X_{i,t} + \varepsilon * post_{i,t} * X_{i,t} + \sum_{l=1}^{8} \rho_l * Controls_{i,t-1,l} + \pi * W_{i,t} + \omega * \hat{Z}_{i,t} + \mu_{i,t} \tag{2.3}$$

where Y is the debt maturity measure; X is the board independence measure; W is the asset maturity as a control variable; $\hat{Z}$ is the predicted leverage measure as a control variable; the firm-year observation is i= 1, … , N; the entire period is t = 1996, … , 2009; the number of control variables is l = 1, … , 8; and α, β, θ, ε, ρ, π, ω, μ are the coefficients of the constant term, post-period, board independence measures, post-period board independence measures, controls, the asset maturity, the predicted leverage measure and the error term, respectively.

In order to examine the potential effects of crisis period on the independence and debt maturity relation, I use the same difference-in-difference model but with different time intervals. I compare the dot-com crisis period before the SOX regulations, 2000-2002, to the mortgage crisis period after the amendments, 2007-2009. I use a dummy

variable representing the crisis period after the SOX rules, along with the interaction from these variables with the board independence measure.

$$Y_{i,t} = \alpha + \beta * postcrisis_{i,t} + \theta * X_{i,t} + \gamma * postcrisis_{i,t} * X_{i,t} + \sum_{l=1}^{10} \delta_l * Controls_{i,t,l} + \mu_{i,t} \quad (2.4)$$

where Y is the debt maturity measure; X is the board independence measure; the firm-year observation is i= 1, … , N; the crisis period is t = 2000, 2001, 2002, 2007, 2008 2009; the number of control variables is l = 1, … , 10; and α, β, θ, γ, δ, μ are the coefficients of the constant term, post-period crisis time, board independence measures, post-period crisis time board independence measures, controls, error term, respectively.

To check the robustness of the results, I focus only on the new debt issuance by the firms. While the lenders decide on a new debt, they consider the current board power in terms of monitoring the manager and agree on the maturity structure accordingly. Therefore, concentrating on the new debt issuance every year may provide a better understanding of the monitoring effect via the board independence on the maturity structure of the new debt.

Moreover, following the debt maturity literature, I control for the bond ratings and the executive ownership level in the firms since these measures reflects the strength and the credibility of the company and the board of directors, respectively. Further, the organizational structure of the firm may impact the need and the nature of the debt maturity too. Conglomerate firms are often considered as complex and big companies which require more effort and resources to run compared to single segment firms. Thus, for conglomerates it can be more difficult and complicated to decide on the maturity

decision of the debt; and also an efficient internal monitoring over the management of the entire segments of the company can be more useful compared to the case of a simple single segment firm. As I want to examine the monitoring power of the board via the independence only, I need to control for all these factors. I also focus on other aspects which may influence the board independence and the debt maturity relation. The CEO duality is a factor needed to be controlled because having the CEO as the chair of the board can contradict with the strength and effectiveness of the board in terms of monitoring the CEO herself. Thus, I need to control this factor in my analyses as well.

The correct choice of the exogenous shock for a solid identification is essential in this study. In order to examine the robustness of the natural experiment with the SOX regulations, I run placebo tests where I keep the main structure of my model the same but only shift the time range of the study +/- two years. So, I can test the existence of other possible firm related endogenous or independent exogenous shocks influencing the relation between the board independence and debt maturity.

2.4 Data Selection and Variable Construction

I collect my data sample using the Compustat and Risk Metrics databases for the years of 1996-2009. I exclude financial firms and utilities. I restrict my sample to have positive values for the total assets and the capital expenditures. Moreover, in my sample, I require the total assets have a greater value than the capital expenditures and property, plant and equipment measure. Further, I drop the data where the total liabilities are greater than the total assets and also where the sum of long and short term debt is greater than the total assets. I also winsorize the variables with extreme values at 1% and 99% in order to

mitigate the effect of outliers. While the data related to the board independence come from the Risk Metrics, the data necessary for the debt maturity measures and the controls come from the Compustat database. My sample consists of 8,715 observations with 1,300 firms.

In my analyses, I define "Board Independence" as the percentage of the outside members in the board of directors. Fama (1980) suggests that as the ratio of outside versus inside directors increases, the board becomes more independent. The outside members in the board are expected not to be associated with the internal dynamics, the conflict of interests or the power struggle within the firm. So, they stay neutral and independent from the firm's internal politics and can act more effectively as monitors.

I evaluate the maturity structure of the firm's debt via three different variables. One of them is the "Short Term Ratio". It concentrates on the shorter term debt which is the portion of the firm's debt maturing less than one year. Short Term Ratio is calculated by dividing debt in current liabilities over the sum of the debt in current liabilities and long term debt which is the total debt of the firm. The second measure for the debt maturity structure is the "Long Term Ratio" suggested by Barclay and Smith (1995), which focuses on the long term horizon of the firm's debt. It is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt.[14] Lastly, I use "Weighted Average Maturity" which is calculated via multiplying the fraction of each type of debt with its maturity in years. Compared to the previous debt maturity measures which provide a more general focus on debt maturity, the "Weighted

[14] Following Jiraporn and Kitsabunnarat (2007), I construct another Long Term Ratio which represents the percentage of long term debt maturing in more than 5 years. Using this additional dependent variable for a longer term horizon provides robust results.

Average Maturity" which is also suggested by Morris (1975), Stohs and Mauer (1996) and Scherr and Hulburt (2001), offers more insight about the maturity length of debt. It concentrates on each maturity type of the firm's debt separately and amplifies its strength according to the length of the maturity. By using several measures for the maturity structure of the firm's debt, I seek to capture the different features of the maturity and establish the robustness of the board independence and the debt maturity relation.

Following the debt maturity literature by Morris (1975), Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Ozkan (2000), Scherr and Hulburt (2001), Johnson (2003), Barclay, Marx, and Smith (2003), Arslan and Karan (2006), Faulkender and Petersen (2006), Jiraporn and Kitsabunnarat (2007), and Erhemjamts, Raman, Shahrur (2010), I use several control variables. Growth option is controlled via two variables. MB represents market to book ratio and it is calculated by dividing common shares outstanding multiplied by the closing price of one share over the common equity. Growth is the second variable and defined as capital expenditures over total assets. Size is the natural logarithm of total assets.[15] Tangibility is measured by dividing property, plant, and equipment total over total assets. Profitability is defined as the earnings before interest and taxes over total assets. Cash is controlled via dividing the cash and short term investments over the total assets. Volatility is calculated via the daily stock price volatility of the previous year. Asset Maturity is also controlled. It is defined as the ratio of the fixed assets over the annual depreciation expense.[16] I compute the

[15] I also use the natural logarithm of the net sales as Size. My findings stay robust.

[16] Alternatively, I also compute the Asset Maturity measure as suggested by Stohs and Mauer (1996) and Johnson (2003). It is (gross property, plant, and equipment / total assets) x (gross property, plant, and

Leverage as the sum of debt in current liabilities and long term debt over the total assets.[17] Lastly, I also control the possible effects of the industries on the board independence and the debt maturity relation. I use the industry concentration, the HHI, which is computed via the Text-based Network Industry Classification method as suggested by Hoberg and Phillips (2010).

Table 2.1 provides the summary statistics for all of the variables used in the models. In my sample, approximately 34% of the firm's debt has the maturity less than one year. The right skewness of the Short Term Ratio suggests that some firms issue large amount of debt when they decide on the short term maturity. On the other hand, Long Term Ratio has a slight left skewness and claims on average 53% of the firm's debt in the sample matures in longer than 2 years. Weighted Average Maturity and Board Independence have means close to the median values. The average maturity of the firm's debt is about 3 years and 3 months while the average board independence is approximately 65%. Taking the statistics for the remaining firm characteristics into account, they all show a right skewed pattern, except the profitability measure. That shows my sample consists of companies some of which have high grow options, tangibility, volatility with longer asset maturity and larger size while some firms have very low, in some cases even negative, profitability. The statistics for the industry concentration, HHI, claim an average of 0.218, a value between 0.150 and 0.250, which states that the firms in my sample operate in moderately concentrated industries.

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equipment / depreciation expense) + (current assets / total assets) x (current assets / cost of goods sold). I obtain robust results.

[17] I also use the Leverage measure as the ratio of total liabilities over the total assets. I obtain similar results.

Table 2.1: Descriptive Statistics of Variables

This table provides descriptive statistics for the mean, standard deviation, 75th, 50th, and 25th percentiles of all types of variables used in the regression model. There are 1,300 firms with 8,715 firm-year observations. Short Term Ratio is calculated by dividing debt in current liabilities over the sum of the debt in current liabilities and long term debt which is the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. MB represents market to book ratio and it is calculated by dividing common shares outstanding times closing price of one share over the common equity. Growth is defined as capital expenditures over total assets. Tangibility is measured by dividing property, plant, and equipment total over total assets. Profitability is defined as the earnings before interest and taxes over total assets. Cash is the ratio of the cash and short term investments over the total assets. Volatility is calculated via the daily stock price volatility of the previous year. Size is the natural logarithm of total assets. Asset Maturity is defined as the ratio of the fixed assets over the annual depreciation expense. Leverage is the sum of debt in current liabilities and long term debt over the total assets. Industry concentration, HHI, is computed via the Text-based Network Industry Classification method as suggested by Hoberg and Phillips (2010).

Variables	Mean	Stdev	P75	P50	P25
Short Term Ratio	0.343	0.365	0.612	0.178	0.035
Long Term Ratio	0.529	0.380	0.892	0.617	0.083
Weighted Average Maturity	3.212	1.607	4.614	3.198	1.712
Board Independence	0.655	0.182	0.800	0.667	0.545
Leverage	0.203	0.210	0.342	0.148	0.001
Profitability	-0.015	0.277	0.113	0.057	-0.031
Asset Maturity	0.152	0.168	0.174	0.108	0.064
MB	3.636	5.921	3.636	1.975	1.134
Size	5.270	2.336	6.825	5.158	3.576
Growth	0.058	0.068	0.071	0.035	0.016
Tangibility	0.255	0.237	0.379	0.173	0.067
Cash	0.212	0.234	0.324	0.115	0.031
Volatility	0.170	0.243	0.204	0.137	0.092
HHI	0.218	0.230	0.281	0.126	0.064

I examine the big picture about the relation between the board independence and the maturity structure of the firm's debt in Figure 2.1. It shows the yearly average values of the two main variables in my models, Board Independence and Short Term Ratio. Before the exogenous shock via the SOX regulations, the pre-period, both of the measures follow a similar slightly incremental pattern. Between the years 1996 and 2002, Board Independence increases about 2%, from 46% to 48%. Right after exogenous shock in 2003,Board Independence jumps 17% to 65% and keep rising towards 78% until 2009.

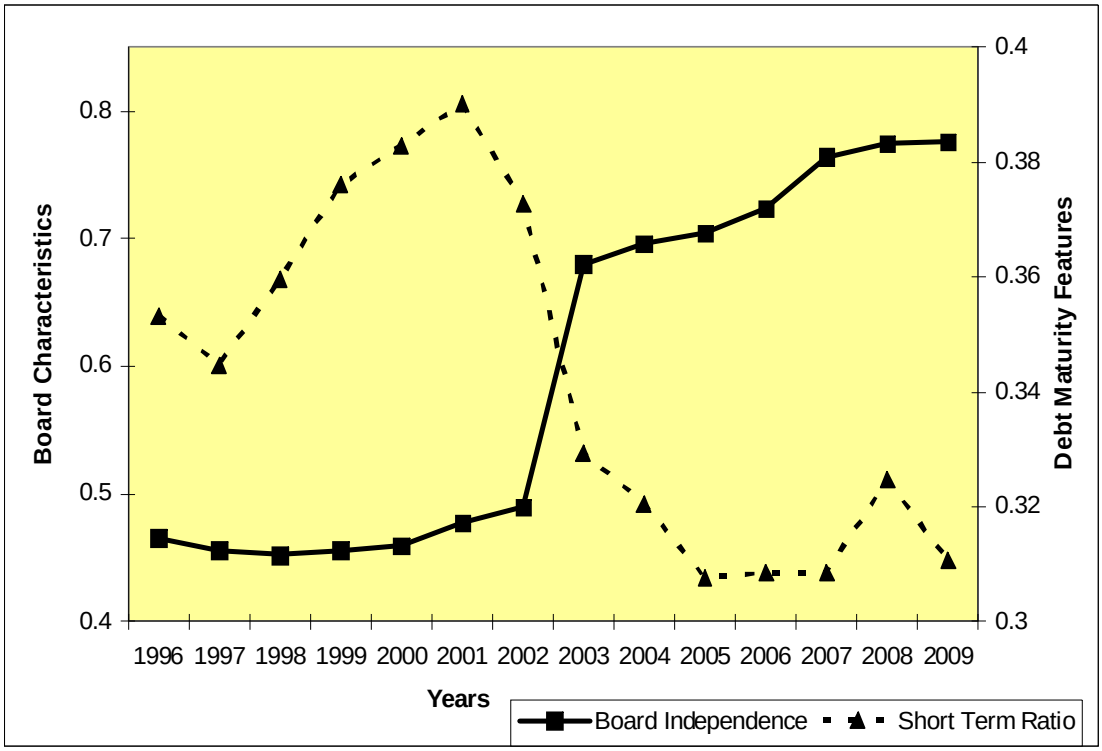

Figure 2.1: Distribution of Board Independence and Short Term Debt Measures

This figure displays the mean distibution of Board Independence and Short Term Ratio by years. Board Independence is the percentage of the outside members in the board of directors. Short Term Ratio is calculated by dividing debt in current liabilities over the sum of the debt in current liabilities and long term debt which is the total debt of the firm.

That sharp increase is a clear sign of the exogenous shock hitting the companies, mainly the amendment of SOX rules. Although Short Term Ratio is increasing in general from 35% to 38% before the shock, it starts to decline rapidly from 38% to 31% after the exogenous shock until 2009 which indicates a decrease in the amount of short term debt in firms on average after the SOX legislations. This reversed relation between these two variables around the exogenous shock clearly exhibits the impact of the corporate governance changes via the board independence after 2002 on the debt maturity decisions in the firms. Further, Figure 2.2 compares the behavior of Board Independence, Long Term Ratio and Weighted Average Maturity on yearly average basis. The variables representing the debt maturity follow a very similar distribution. In the pre-period, the annual mean values of Long Term Ratio and Weighted Average Maturity decrease from 51% to 47% and from 3.15 to 3.00, respectively. With the exogenous shock after 2002, both measures increase quickly. While Long Term Ratio reaches to 56%, Weighted Average Maturity becomes almost 3.4 years which denotes a rise in long term debt after the exogenous shock. The change in patterns in Board Independence, Long Term Ratio and Weighted Average Maturity provides evidence of the effect from board independence changes on the firm's debt maturity structure.

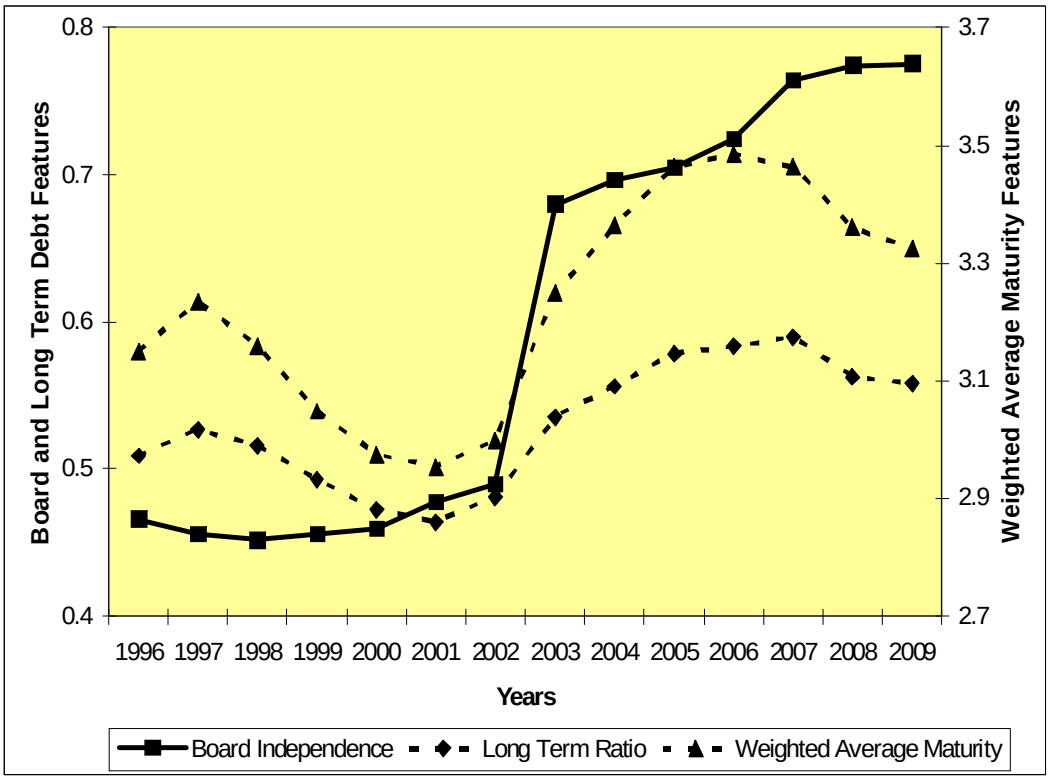

Figure 2.2: Distribution of Board Independence, Long Term Debt and Weighted Average Maturity

This figure displays the mean distibution of Board Independence, Long Term Ratio and Weighted Average Maturity values by years. Board Independence is the percentage of the outside members in the board of directors. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years.

2.5 Results

2.5.1 Univariate Analyses

As a part of the univariate analyses, I compare the behavior of each of my proxies for the board independence and the debt maturity structure before and after the exogenous shock. I use a mean comparison test of two groups, i.e. pre- and post-period. Table 2.2 provides the results of my first univariate analysis. Focusing on a comparison of the pre- and post-

periods, I find a statistically significant increase of 27% for Board Independence. The exogenous shock clearly impacts the outsider percentage in the board of directors positively which manifests the validity of the SOX rules as an instrument in the natural experiment. I also obtain statistical significance in the results for the debt maturity measures. Short Term Ratio declines about 5% on average after the exogenous shock while the Long Term Ratio increases approximately 7%. Moreover, Weighted Average Maturity also increases approximately from 3 to 3.4 years, an increase of 4 months in maturity. The findings on the debt maturity structure states an obvious increase in the amount of long term debt of the firm after the exogenous shock.

Table 2: Mean Comparision for Board Independence and Debt Maturity Measures

This table presents results of the *t* -test mean comparison for Board Independence, Short Term Ratio, Long Term Ratio and Weighted Average Maturity. In Column and Column II, the mean values of each of these variables are given for the pre-period (1996-2002) and the post-period (2003-2009), respectively. The mean difference and related *p* -values are provided.

	I		II
	Pre-Period		Post-Period
Board Independence	0.467		0.733
dif		0.266	
p-val		*0.000*	
Short Term Ratio	0.367		0.315
dif		-0.052	
p-val		*0.000*	
Long Term Ratio	0.497		0.566
dif		0.069	
p-val		*0.000*	
Weighted Average Maturity	3.083		3.365
dif		0.282	
p-val		*0.000*	

I further investigate the validity of the SOX regulations in terms of the effect of the board independence on the maturity of the firm's debt. I regress the debt maturity variables individually on the board independence along with controls and run this regression analysis for each year in my sample. I display the coefficient estimates for the board independence every year. If the SOX amendments are the only reasons influencing the board independence in its impact on the debt maturity, in other words, if the exogenous shock is a valid instrument in my natural experiment, then it can be revealed through this analysis and I should see clustered estimates before and after the shock at different levels. Such a finding would validate nonexistence of an ongoing trend but the direct impact of the SOX rules as an exogenous shock.

Figure 2.3 presents the yearly coefficient estimates for Board Independence in the regression analysis for Short Term Ratio. Considering the period before the exogenous shock, the estimates are gathered between -0.05 and 0.05, more or less around zero, which indicates that Board Independence has almost no effect on the debt maturity structure. When the board independence increases after the SOX regulations, the yearly estimates become largely negative and they are grouped between -0.10 and -0.15 which states the negative impact of Board Independence on the short term debt after the exogenous shock. Considering the estimates all together, there is no evidence of an existing trend passing on through the exogenous shock. Contrary, there is a sudden change in the cluster of the estimates after the SOX and the SEC rules, which manifests the validity of the exogenous shock in the impact of the board independence on the maturity of the firm's debt.

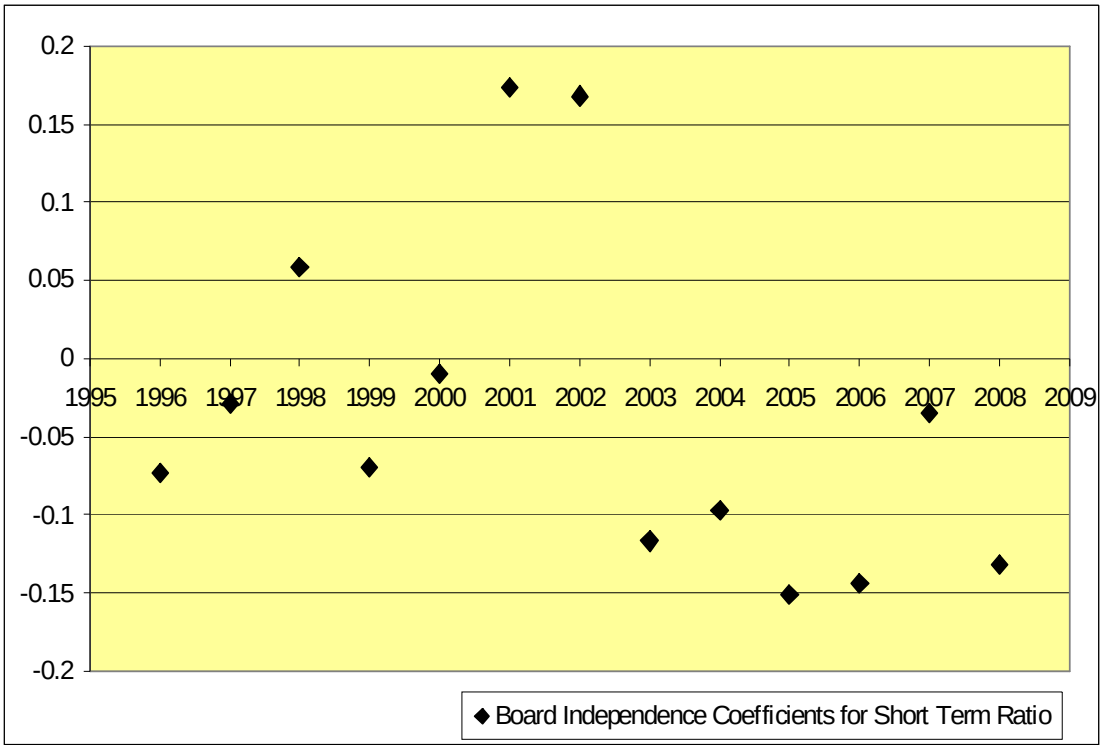

Figure 2.3: Yearly Board Independence Coefficient Estimates for Short Term Ratio

This figure displays the distibution of the yearly coefficient estimates for Board Independence in the regression analysis for Short Term Ratio. Board Independence is the percentage of the outside members in the board of directors. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. The control variables are included in the regression analysis for Short Term Ratio.

The Board Independence coefficient estimates for Long Term Ratio are given in Figure 2.4. Before the exogenous shock, the estimates show up mainly between the values of 0 and 0.05 claiming there is slightly a positive impact of board independence on the long term debt. After the SOX amendments, the estimates become more positive and are usually gathered between 0.1 and 0.2. That finding shows the positive impact of the exogenous shock on the board independence in its relation to the debt maturity. This considerable change also validates the choice of the exogenous shock as a correct instrument in the natural experiment.

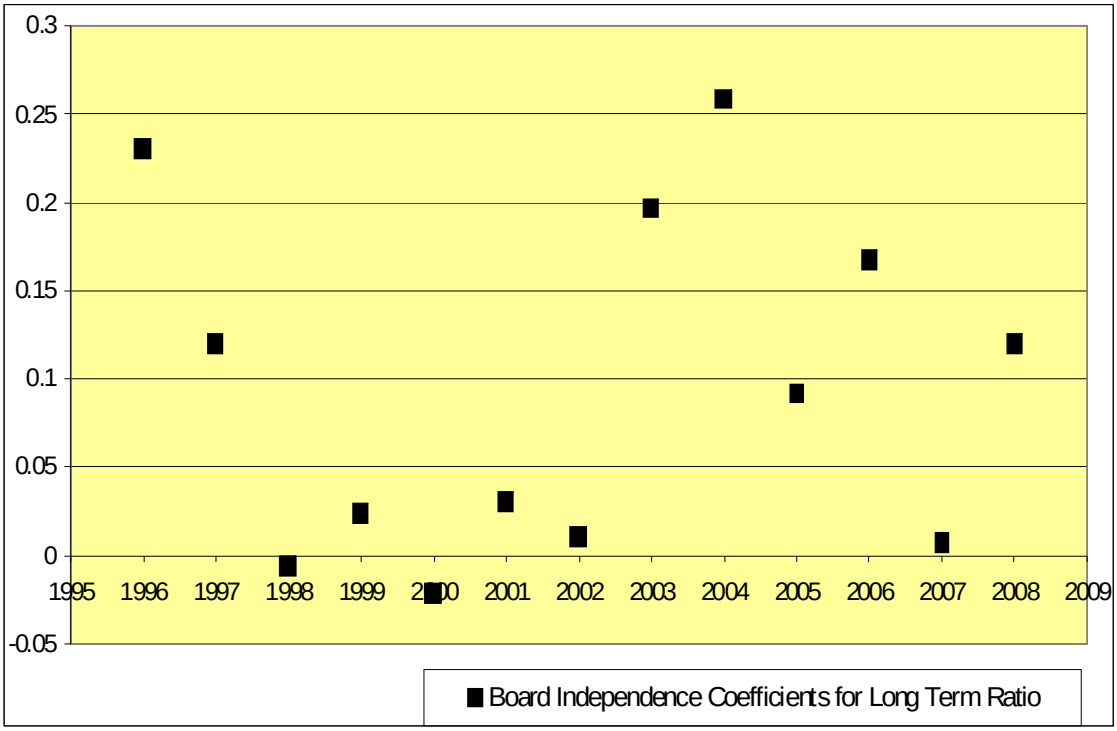

Figure 2.4: Yearly Board Independence Coefficient Estimates for Long Term Ratio

This figure displays the distibution of the yearly coefficient estimates for Board Independence in the regression analysis for Long Term Ratio. Board Independence is the percentage of the outside members in the board of directors. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. The control variables are included in the regression analysis for Long Term Ratio.

Figure 2.5 displays the yearly coefficient estimates of Board Independence for Weighted Average Maturity. Before the SOX regulations, the estimates are generally between -0.6 and 0, and they become strongly positive after the exogenous shock, ranging between 0.2 and 0.6. This significant change in estimates denotes the stronger positive effect of the board independence on the long term debt after the exogenous shock is applied in my natural experiment. Along with the lack of any existing trend throughout the years, this large change provides the evidence of the shock as a valid instrument.

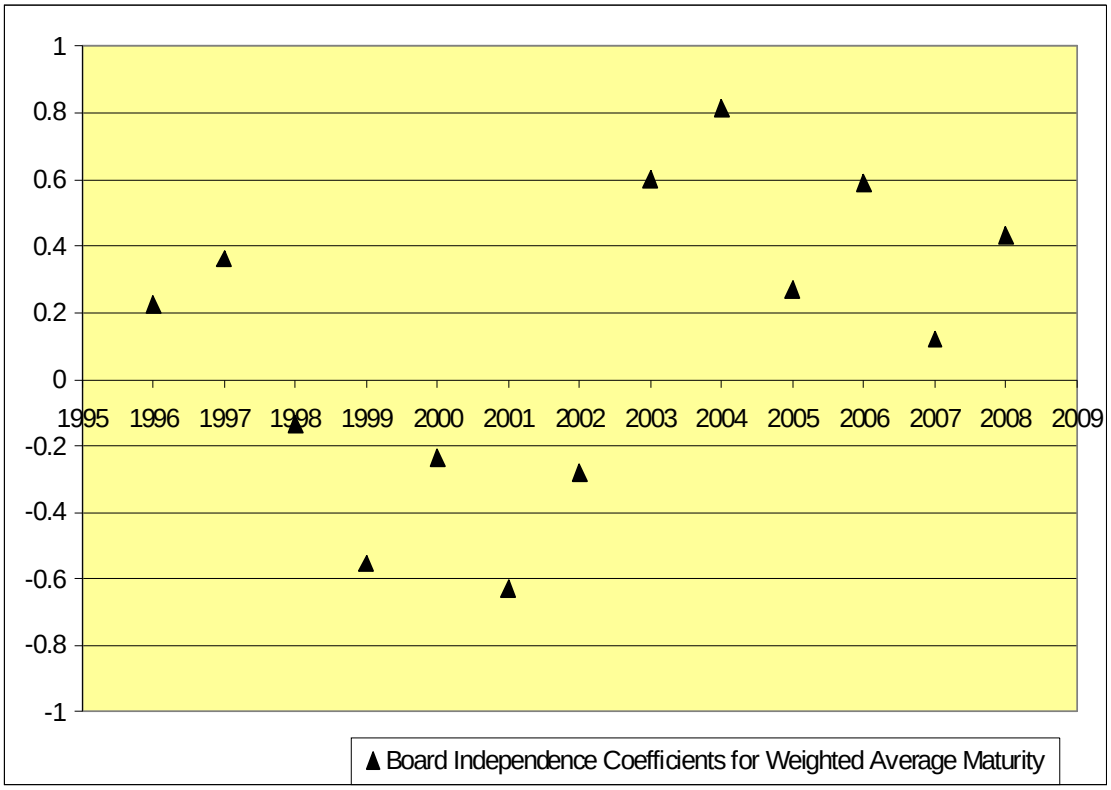

Figure 2.5: Yearly Board Independence Coefficient Estimates for Weighted Average Maturity

This figure displays the distibution of the yearly coefficient estimates for Board Independence in the regression analysis for Weighted Average Maturity. Board Independence is the percentage of the outside members in the board of directors. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. The control variables are included in the regression analysis for Weighted Average Maturity.

2.5.2 Multivariate Analysis (Difference-in-Difference Regression Model)

The difference-in difference analysis is the main model to examine the relationship between the strong corporate governance via the board independence and the maturity structure of the firm's debt. A dummy variable, Post, is used that equals to one for the values after the SOX regulations (2003-2009) and zero otherwise. Board Independence*Post, is the interaction variables of Board Independence and Post. This

analysis enables me to study any potential impacts from the board independence in the post-period. The major focus should be on the estimated coefficient for Board Independence*Post since it explains the influence of the increased number of outsiders in firms' board of directors after the SOX and the SEC rules, on the maturity decisions on the firm's debt. In my model, I also control the possible effects from leverage, profitability, asset maturity, growth, tangibility, size, book-to-market, volatility, cash and the industry concentration[18]. Further, I also estimate the debt maturity simultaneously with the control variable, leverage, where I use the predicted leverage values which I obtain from the first step regression because in the debt maturity literature, it's been argued by Barclay, Marx, and Smith (2003) and Johnson (2003) that leverage and debt maturity are endogenously determined.

Table 2.3 displays the baseline regression estimates. As suggested in literature by Morris (1975), Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Ozkan (2000), Scherr and Hulburt (2001), Johnson (2003), Barclay, Marx, and Smith (2003), Arslan and Karan (2006), Faulkender and Petersen (2006) and Jiraporn and Kitsabunnarat (2007); my results denote that larger, more profitable and less risky firms operating in less concentrated industries and have high cash and high tangibility tend to issue longer term debt. Moreover, I also find that companies match the maturities of their assets and the debt together and issue higher amount of debt if they agree on the longer term structure. Consistent with Stohs and Mauer (1996), my results for MB and growth opportunities suggest either insignificant or a positive effect, stating that firms with higher growth options are more likely to issue longer term debt.

[18] In all my analyses, I include year fixed effects in order to capture the changes in term structure of interest rates and the possible effects by macro economic factors.

Table 2.3: Baseline Regression Model for the Debt Maturity Measures

This table reports baseline regression estimates for Leverage, Leverage-(p), Profitability, Asset Maturity, Market-to-Book (MB), Size, Growth, Tangibility, Cash, Volatility, and Industry Concentration (HHI) via the fixed effects. The regressions with Leverage-(p) consist of lagged variables. The analysis is conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Leverage is the sum of debt in current liabilities and long term debt over the total assets. Leverage-(p) represents the predicted leverage values obtained from the first step regression. Profitability is defined as the earnings before interest and taxes over total assets. Asset Maturity is defined as the ratio of the fixed assets over the annual depreciation expense divided by hundred. MB is calculated by dividing common shares outstanding times closing price of one share over the common equity. Size is the natural logarithm of total assets. Growth is defined as capital expenditures over total assets. Tangibility is measured by dividing property, plant, and equipment total over total assets. Cash is the ratio of the cash and short term investments over the total assets. Volatility is calculated via the daily stock price volatility of the previous year adjusted by hundred. HHI is computed via the Text-based Network Industry Classification method as suggested by Hoberg and Phillips (2010). The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Leverage	-0.399***		0.490***		2.068***	
	0.016		*0.018*		*0.067*	
Leverage-(p)		-0.621***		0.625***		3.558***
		0.047		*0.054*		*0.202*
Profitability	-0.131***	-0.066***	0.115***	0.061***	0.474***	0.303***
	0.014	*0.019*	*0.015*	*0.021*	*0.059*	*0.081*
Asset Maturity	-0.118***	-0.090***	0.142***	0.107***	0.751***	0.484***
	0.018	*0.022*	*0.020*	*0.025*	*0.077*	*0.096*
MB	0.008	-0.001**	0.006	0.002***	0.004**	0.010***
	0.043	*0.001*	*0.048*	*0.001*	*0.002*	*0.002*
Size	-0.039***	-0.002	0.056***	0.011**	0.227***	0.002
	0.003	*0.004*	*0.004*	*0.005*	*0.014*	*0.018*
Growth	-0.128***	-0.038	0.274***	0.081	1.110***	0.194
	0.038	*0.043*	*0.042*	*0.050*	*0.162*	*0.190*
Tangibility	-0.177***	-0.045	0.117***	0.028	0.524***	0.066
	0.026	*0.031*	*0.029*	*0.035*	*0.109*	*0.135*
Cash	-0.070***	0.030	0.130***	0.041	0.812***	0.347***
	0.019	*0.023*	*0.021*	*0.026*	*0.080*	*0.100*
Volatility	0.019***	-0.006	-0.014*	0.006	-0.063**	0.030
	0.006	*0.007*	*0.007*	*0.007*	*0.028*	*0.029*
HHI	0.025**	-0.006	-0.032**	-0.015	-0.149***	-0.037
	0.012	*0.014*	*0.014*	*0.016*	*0.052*	*0.060*

Table 2.3 (cont.): Baseline Regression Model for the Debt Maturity Measures

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Constant	0.706***	0.479***	0.044*	0.325***	1.128***	2.358***
	0.022	*0.027*	*0.024*	*0.031*	*0.092*	*0.118*
Adj. R-sq.	0.05	0.02	0.06	0.02	0.08	0.03
No of Obs.	27,091	19,962	27,091	19,962	27,091	19,962
No of Firms	6,535	4,875	6,535	4,875	6,535	4,875

The results from the board independence impact on the debt maturity structure are given in Table 2.4. Board Independence*Post represents the Board Independence for the firms after the exogenous shock that are influenced by the SOX and the SEC regulations and expected to affect the maturity structure of the firm's debt. That's why; they are the only companies which can show the true impact of the changed independence of the board of directors on the debt maturity. In first, third and fifth columns, Board Independence*Post has both statistically and economically significant and strong estimates. It is negatively related to the short term debt ratio and positively related to both the long term debt ratio and the weighted average debt maturity. Consequently, this finding suggests that firms have more long term and less short term debt as the independence of the board increases after the exogenous shock from the SOX amendments. Particularly, the amount of debt which matures less than one year, declines by 2.7% (=0.156 * 0.172) with one standard deviation increase (about 17%) in the board independence after the exogenous shock. Similarly, the Long Term Ratio rises by 2% (=0.113 * 0.172) with one standard deviation increase in the board independence which

states that the amount of debt maturing over 2 years increases 2% as there are 17% more outside members in the board of directors after the SOX amendments.

Table 2.4: Difference-in-Difference Analysis of Board Independence on the Debt Maturity Measures

This table reports difference-in-difference analysis estimates for Board Independence along with Leverage, Leverage-(p), Profitability, Asset Maturity, Market-to-Book (MB), Size, Growth, Tangibility, Cash, Volatility, and Industry Concentration (HHI) as control variables. The regressions with Leverage-(p) include lagged control variables. The analysis is conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. Post is a dummy that equals one for values in the post-period (2003-2009) and zero otherwise. Board Independence*Post is the intercation variable of Post and Board Independence. In Columns II, IV and VI, the analysis is repeated with Leverage-(p), which represents the predicted leverage values obtained from the first step regression. The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Board Independence	0.037	-0.002	0.017	0.043	-0.133	0.010
	0.048	*0.053*	*0.056*	*0.063*	*0.230*	*0.253*
Post	0.106***	0.063	-0.076*	-0.040	-0.306*	-0.051
	0.034	*0.040*	*0.040*	*0.043*	*0.162*	*0.172*
Board Independence*Post	-0.156***	-0.118**	0.113*	0.102	0.526**	0.434
	0.054	*0.059*	*0.064*	*0.071*	*0.260*	*0.283*
Leverage	-0.439***		0.602***		2.373***	
	0.037		*0.044*		*0.178*	
Leverage-(p)		-0.901***		1.117***		7.196***
		0.132		*0.155*		*0.602*
Profitability	-0.126**	0.084	0.116*	-0.061	0.606**	-0.309
	0.055	*0.059*	*0.065*	*0.071*	*0.264*	*0.284*
Asset Maturity	-0.183***	-0.123**	0.217***	0.181***	0.959***	0.590**
	0.048	*0.048*	*0.056*	*0.058*	*0.228*	*0.232*
MB	-0.015	-0.086	0.084	0.031	0.835	0.395
	0.108	*0.111*	*0.127*	*0.134*	*0.520*	*0.536*
Size	-0.023**	0.018*	0.036***	-0.022*	0.199***	-0.215***
	0.011	*0.011*	*0.013*	*0.013*	*0.051*	*0.051*
Growth	-0.184*	-0.124	0.213*	0.274**	0.727	0.565
	0.105	*0.106*	*0.123*	*0.128*	*0.503*	*0.513*
Tangibility	-0.067	0.152**	0.079	-0.213***	0.067	-1.193***
	0.066	*0.068*	*0.078*	*0.082*	*0.316*	*0.327*

Table 2.4 (cont.): Difference-in-Difference Analysis of Board Independence on the Debt Maturity Measures

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Cash	-0.037	0.068	0.062	-0.056	0.515**	0.109
	0.048	*0.049*	*0.056*	*0.058*	*0.229*	*0.234*
Volatility	0.063	-0.082	-0.075	0.186**	-1.210***	0.808**
	0.070	*0.075*	*0.083*	*0.090*	*0.338*	*0.360*
HHI	0.033	0.025	-0.021	-0.057*	-0.170	-0.312**
	0.027	*0.028*	*0.032*	*0.034*	*0.130*	*0.137*
Constant	0.501***	0.356***	0.201*	0.455***	1.775***	3.179***
	0.089	*0.087*	*0.105*	*0.104*	*0.428*	*0.416*
Adj. R-sq.	0.05	0.03	0.06	0.03	0.06	0.05
No of Obs.	8,715	8,004	8,715	8,004	8,715	8,004
No of Firms	1,300	1,227	1,300	1,227	1,300	1,227

According to the Weighted Average Maturity measure, the jump is about 9.1% (=0.526 * 0.172) for a board independence increase of one standard deviation which indicates a rise of about one month (=9.1% * 1 year) in average maturity of the firm's debt. Considering the second, fourth and the sixth columns, I have very similar results when I repeat the analysis via simultaneously estimating the leverage, Leverage-(p), and the debt maturity measures[19].

Moving on to the other estimates, for all companies from 1996 to 2009, Board Independence has a weakly positive and rather insignificant relation with Short Term Ratio. Similarly, the estimate of Board Independence for Long Term Ratio and Weighted Average Maturity is either weakly negative or insignificant. It suggests that there is no

[19] In untabulated difference-in-difference analyses, I focus on small cap firms only due to the possible concern that the SOX regulations may not be as effective as in large companies due to relatively high cost, effort, etc. Compared to my original findings, I obtain similar and significant results confirming the positive impact of board independence on long term debt.

impact of the independence of the board on the debt maturity considering all years together. The reason is mainly the following: In addition to the post-period, the variable Board Independence also includes the period before the exogenous shock where the board monitoring is weak due to the considerably low ratio of outsiders in the board of directors, and the pre-period effect weakens the relation between the board independence and debt maturity. Focusing on the post period only via the variable Post, I find relatively strong and statistically significant estimates for the debt maturity. In particular, more short term debt and less long term debt are issued after the SOX regulations. The finding states that, if not only Board Independence but all features of the companies are taken into consideration in the post-period time via the variable Post, then those other potential firm characteristics overcome the impact of the Board Independence, which leads to opposite results than the original findings via Board Independence*Post.

Following the difference-in-difference analysis with Board Independence, I can conclude that after the SOX regulations, firms have majority in outside members in their board of directors which is a change leading to stronger corporate governance with powerful monitoring ability; and this improvement enables the lenders to provide debt with longer maturity, consistent with the agency theory. This result rejects the null hypothesis of no relation and supports the $H1_a$ hypothesis of a positive relation between the high board independence and the debt with longer maturity[20].

[20] Considering the other provisions by SOX and SEC aside of the board independence, I also control for the existence of nominating committee, full independence of nominating, auditing and compensation committees in the main difference-indifference analysis. I also repeat the main analysis by substituting the board independence with these variables. Loss of significance in the results shows that other provisions are not effective on debt maturity as the board independence since it provides a stronger corporate governance via a broader coverage of independence for the entire board and not only for the key committees. Slightly increased standard errors in the findings also confirm the other provisions are in fact noisy measures in relation to debt maturity.

2.5.3 The Case of Crisis Periods

The capital structure and financing decisions are generally different during the crisis times. Due to the high volatility and uncertainty, periods of financial instability have complex dynamics. Several factors such as, the increased risk of default, financial distress, loss of strong credibility can result in a low supply of money in financial markets. Lenders become more cautious in monitoring the managers and may trust less the effectiveness of the inside monitoring even by a strong and independent board of directors. Consequently, they may become sensitive and reluctant to provide debt, specifically with a long term maturity due to its less supervisory feature. Because of these reasons, the pure impact of the board independence on the debt maturity structure may not be examined clearly under the crisis conditions. So, I decide to investigate the board independence and debt maturity relation specifically for the times of financial instability.

The sample for this analysis consists of years with financial instability only: 2000-2002 and 2007-2009. The dummy variable, PostCrisis stands for the sub-prime mortgage crisis period after the SOX regulations, 2007-2009. Similar to the previous model, I have the interaction variable: Board Independence*PostCrisis. I apply my main model of difference-in-difference analysis and compare the dot-com crisis period before the exogenous shock, 2000-2002, to the mortgage crisis time after the shock, 2007-2009, so that I can investigate the relation between the board independence and the debt maturity during the time of financial instability.

Table 2.5 displays the estimates from the difference-in-difference analysis with crisis periods only. Contrary to my original findings, I have weak results.

Table 2.5: Difference-in-Difference Test of Board Independence on Debt Maturity for Crisis Time

This table reports difference-in-difference analysis estimates during the crisis time periods before and after the SOX regulations for Board Independence along with Leverage, Leverage-(p), Profitability, Asset Maturity, Market-to-Book (MB), Size, Growth, Tangibility, Cash, Volatility, and Industry Concentration (HHI) as control variables. The regressions with Leverage-(p) include lagged control variables. The analysis is conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. PostCrisis is a dummy that equals one for values in the sub-prime mortgage crisis time in the post-period (2007-2009) and zero otherwise. Board Independence*PostCrisis is the intercation variable of PostCrisis and Board Independence. In Columns II, IV and VI, the analysis is repeated with the control variable Leverage-(p), which represents the predicted leverage values obtained from the first step regression. The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Board Independence	-0.021	-0.058	0.051	0.132	0.120	0.432
	0.091	*0.092*	*0.106*	*0.111*	*0.419*	*0.433*
PostCrisis	0.094	0.019	-0.073	0.304***	-0.245	0.011
	0.076	*0.040*	*0.089*	*0.049*	*0.352*	*0.193*
Board Independence*PostCrisis	-0.057	-0.081	0.123	0.156	0.345	0.300
	0.113	*0.117*	*0.132*	*0.141*	*0.521*	*0.551*
Leverage	-0.422***		0.612***		2.387***	
	0.067		*0.078*		*0.308*	
Leverage-(p)		-0.952***		1.066***		7.499***
		0.256		*0.298*		*1.108*
Profitability	-0.104	0.323***	0.094	-0.171	0.765*	-1.200**
	0.093	*0.117*	*0.108*	*0.140*	*0.427*	*0.548*
Asset Maturity	-0.117	-0.123	0.146	0.140	0.629	0.796**
	0.090	*0.086*	*0.105*	*0.103*	*0.415*	*0.399*
MB	0.035	-0.003	-0.146	0.001	0.194	0.017*
	0.212	*0.002*	*0.248*	*0.002*	*0.978*	*0.009*
Size	-0.050**	-0.015	0.039*	0.010	0.279***	-0.022
	0.020	*0.019*	*0.023*	*0.023*	*0.092*	*0.090*
Growth	-0.426**	-0.302	0.385*	0.346	1.567*	0.155
	0.190	*0.198*	*0.222*	*0.238*	*0.874*	*0.930*
Tangibility	0.001	0.178	-0.116	-0.421***	-1.335**	-2.228***
	0.123	*0.123*	*0.144*	*0.148*	*0.567*	*0.572*

Table 2.5 (cont.): Difference-in-Difference Test of Board Independence on Debt Maturity for Crisis Time

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Cash	-0.010	0.002	-0.050	-0.03	0.339	0.298
	0.099	*0.090*	*0.115*	*0.107*	*0.455*	*0.419*
Volatility	0.001	0.002	-0.001	-0.001	-0.012**	-0.006
	0.001	*0.001*	*0.001*	*(\0.002*	*0.005*	*0.006*
HHI	0.041	-0.008	-0.038	-0.072	-0.249	-0.001
	0.056	*0.057*	*0.065*	*0.068*	*0.256*	*0.267*
Constant	0.698***	0.663***	0.205	0.215	1.398*	1.964**
	0.163	*0.176*	*0.190*	*0.211*	*0.751*	*0.824*
Adj. R-sq.	0.06	0.04	0.08	0.04	0.10	0.07
No of Obs.	2,238	2,067	2,238	2,067	2,238	2,067
No of Firms	1,009	933	1,009	933	1,009	933

Board Independence*PostCrisis represents the Board Independence for the firms throughout the mortgage crisis years after the exogenous shock. Board Independence seems to have a weakly negative relation with short term and a weakly positive relation with the long term debt ratio and weighted average maturity measures. They are rather insignificant and there is no strong evidence for an effect of the board independence on the debt maturity during the financially instable times. One of the possible explanations for that might be the fact that lenders may be more conservative during the times of financial troubles because the risk of payments and the default risk. So, no matter how strongly a company is monitored, they may be hesitant to supply debt with certain type of maturities. Thus, it is not clear the possible impact of improved corporate governance via increased board independence on debt maturity structure during these troubled times. Focusing on Board Independence and PostCrisis estimates, I obtain weak and insignificant results as well.

Considering all these findings for the crisis periods, it can be stated that there is not sufficient evidence to claim a relation between the board independence and the debt maturity decision in the firm for the years with financial crisis due to the complex and different dynamics of those troubled periods.

2.5.4 Robustness

In my analyses, I focus on the firm's total debt outstanding. Some may argue that the new debt issuance should be related to the board independence as the lenders consider the current monitoring efficiency of the board when they decide on the maturity of the new debt. In order to test the robustness of the original findings, I concentrate on the new debt issuance only and repeat the main difference-in-difference analysis. The results are presented in Table 2.6. The positive impact of the increased board independence on the debt with longer maturity that is supported by my previous findings persists in this robustness test. Companies have less new debt with shorter maturity and more new debt with longer maturity as the board's monitoring power increases via the board independence.

In order to provide vigorous findings in my study I need to control other potential channels which may affect the decision on the debt maturity structure. The organizational structure and the CEO influence are two important factors needed to have a further examination.[21] First, I consider the potential impact of different organizational structures.

[21] Following the literature by Barclay and Smith (1995), Guedes and Opler (1996), Scherr and Hulburt (2001), Arslan and Karan (2006), I also focus other potential factors. I include the corporate bond ratings and the executive ownership as control variables in the main model separately, so that I can control the strength and the credibility of the company and the board of directors provided by these measures. My original results stay robust.

Table 2.6: Difference-in-Difference Test of Board Independence on Maturity via New Debt Issuance

This table reports difference-in-difference analysis estimates for Board Independence along with Leverage, Leverage-(p), Profitability, Asset Maturity, Market-to-Book (MB), Size, Growth, Tangibility, Cash, Volatility, and Industry Concentration (HHI) as control variables. The analysis is conducted for three different debt maturity measures and using the new debt issuance data only. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. Post is a dummy that equals one for values in the post-period (2003-2009) and zero otherwise. Board Independence*Post is the intercation variable of Board Independence, Post and Treated. In Columns II, IV and VI, the analysis is repeated with the control variable Leverage-(p), which represents the predicted leverage values obtained from the first step regression. The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Short Term Ratio	Long Term Ratio	Long Term Ratio	Weighted Average Maturity	Weighted Average Maturity
Board Independence	-0.012*	0.005	-0.208**	-0.074	-1.181***	-0.825**
	0.007	*0.005*	*0.090*	*0.087*	*0.439*	*0.413*
Post	0.006	-0.028***	-0.301***	-0.227***	-1.441***	-1.219***
	0.006	*0.006*	*0.058*	*0.054*	*0.281*	*0.259*
Board Independence*Post	-0.014*	-0.012*	0.171*	0.058	1.023**	0.750*
	0.008	*0.007*	*0.099*	*0.094*	*0.480*	*0.447*
Leverage	0.021***		-0.028		-0.003	
	0.007		*0.037*		*0.182*	
Leverage-(p)		0.293***		0.359**		1.803**
		0.025		*0.163*		*0.779*
Constant	-0.018	0.024***	0.368***	0.246***	1.710***	1.284***
	0.015	*0.005*	*0.062*	*0.057*	*0.302*	*0.270*
Controls	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.10	0.13	0.09	0.08	0.10	0.09
No of Obs.	7,177	6,484	7,177	6,484	7,177	6,484
No of Firms	1,206	1,185	1,206	1,185	1,206	1,185

The firm structure and the business dynamics are often different between the multi-segment, i.e. conglomerate, firms and the single segment companies. Conglomerate firms are usually big, complex entities which necessitate greater effort and resources to manage and monitor because they operate in several industries with different characteristics. Therefore, compared to the single segment firms, conglomerates may benefit more from an efficient internal control over the management of multiple segments together.

Moreover, transparency of the business transactions and the auditing become more difficult and also vital to achieve for complex and diverse conglomerate firms compared to single segment firms. As the exogenous shock, the SOX bring several requirements for the companies which may have greater influence for the conglomerates. It compels enhanced financial disclosure via disclosing off balance sheet transactions in the sections 401-409. Through sections 701-705, the SOX also ask for the companies to provide studies and reporting by the SEC and the audit firms. Specifically in section 404, it requires the assessment of the internal control. This assessment rule via external auditing certainly creates extra costs for the firms which may not be easy to handle by small, single segment firms compared to big conglomerates. In addition to that, the section 303A of the SEC regulations ask firms to provide continuous education to the directors in the board for expertise which can be another extra heavy cost item for the single segment firms. Further, the Title 2 of SOX discusses the independence of board which can clearly provide an efficient internal control over the management of multiple segments of a conglomerate. That feature can be more beneficial for a complex multi segment firm than for a single segment company. Because of these reasons, I need to investigate the effect of firm's organizational structure on my findings in this natural experiment.

The CEO duality may affect the independence and the neutrality of the board because the CEO as the chair of the board may influence the decisions and also contradict with the power and effectiveness of the board in terms of monitoring the CEO herself. On the other hand, the SOX amendments provide necessary conditions to mitigate any potential effect by the CEO even if there is the CEO duality issue in the firm. In addition to the rules in sections 401-409 and 701-705 covering the enhanced financial disclosure,

the assessment of the internal control, studies and reporting by the SEC; the SOX bring criminal penalties for the influenced administration in the firm and also for the fraud in financial statements by the CEO via the sections 802 and 906. These regulations certainly discourage the CEO to engage any fraud or empower herself as the chair of the board and impact the board's decisions for her own benefits. Due to these reasons, I also examine any possible effects of the CEO duality on my previous results.

I apply two methods to explore any potential influence by the organizational structure. First, I introduce the dummy variable SingleSegment which equals to one if the company has one segment and zero otherwise. I conduct the main difference-in-difference model including this new control variable. The results are presented in Table 2.7. The positive relation between the board independence and the long term debt persists in these findings which show the robustness of my original results. Second, I build two sub-samples with single segment firms and conglomerate firms. Then, I run the difference-in-difference analysis with two different samples. The outcomes are presented in Table 2.8. Comparing the findings for both types of companies, I obtain stronger results for multi-segment firms supporting the idea that for conglomerates, the board independence is more effective in terms of monitoring via the SOX regulations, and it has a significantly positive effect on the debt with longer maturity which provides evidence for the robustness of the original findings.

To test any potential influence by CEO duality, I construct the dummy variable ChairCEO. It equals to one if the CEO is the chair of the board of the directors and zero otherwise. I conduct the main difference-in-difference model with this control variable. The results are presented in Table 2.7. Similar to my original findings, I obtain significant

and negative relation between board independence and short term debt while a positive relation with long term debt. Further, I build two sub-samples considering CEO duality.

Table 2.7: Difference-in-Difference Analysis with Conglomerate Firm and CEO Duality Controls

This table reports the estimates from the replication of the difference-in-difference analysis including the additional controls: SingleSegment and ChairCEO. The analysis is conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. Post is a dummy that equals one for values in the post-period (2003-2009) and zero otherwise. Board Independence*Post is the intercation variable of Board Independence and Post. SingleSegment is a dummy variable that equals one if the firm has one segment and zero otherwise. ChairCEO is a dummy that is one if the CEO is also the chair of the board and zero otherwise. Columns I, II, III display the results with SingleSegment and columns IV, V, VI show the findings with ChairCEO. The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Long Term Ratio	Weighted Average Maturity	Short Term Ratio	Long Term Ratio	Weighted Average Maturity
Board Independence	0.0349	0.019	-0.120	0.037	0.018	-0.129
	0.048	*0.056*	*0.230*	*0.048*	*0.056*	*0.230*
Post	0.105***	-0.075*	-0.301*	0.106***	-0.076*	-0.308*
	0.034	*0.040*	*0.162*	*0.034*	*0.040*	*0.162*
Board Independence*Post	-0.155***	0.112*	0.521**	-0.156***	0.113*	0.526**
	0.054	*0.064*	*0.260*	*0.054*	*0.064*	*0.260*
SingleSegment	-0.028**	0.024*	0.153***			
	0.012	*0.014*	*0.058*			
ChairCEO				0.003	-0.017*	-0.092**
				0.008	*0.010*	*0.039*
Constant	0.525***	0.180*	1.646***	0.499***	0.211**	1.830***
	0.090	*0.106*	*0.431*	*0.089*	*0.105*	*0.429*
Controls	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.05	0.06	0.07	0.05	0.06	0.07
No of Obs.	8,715	8,715	8,715	8,715	8,715	8,715
No of Firms	1,300	1,300	1,300	1,300	1,300	1,300

Table 2.8: Difference-in-Difference Analysis with CEO Duality and Segment Sub-Samples

This table reports the estimates from the replication of the difference-in-difference analysis using the sub-samples for CEO duality and conglomerate firms. Panel A displays the findings with the sub-samples for the CEO duality: CEO is Chair and CEO is not Chair; and Panel B presents the outcomes with the sub-samples for the firm segment types: Conglomerate and Single Segment Firms. The analyses are conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. Post is a dummy that equals one for values in the post-period (2003-2009) and zero otherwise. Board Independence*Post is the intercation variable of Board Independence and Post. The *** indicates statistical significance at the 1% level.

PANEL A: The Analysis with CEO Duality Sub-Samples						
	CEO is Chair			CEO is NOT Chair		
	Short Term Ratio	Long Term Ratio	Weighted Average Maturity	Short Term Ratio	Long Term Ratio	Weighted Average Maturity
Board Independence*Post	-0.138**	0.183**	0.830***	-0.086	-0.085	-0.394
	0.066	*0.079*	*0.317*	*0.121*	*0.142*	*0.585*
Firm Controls	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.04	0.05	0.06	0.08	0.09	0.08
No of Obs.	5,933	5,933	5,933	2,784	2,784	2,784
No of Firms	869	869	869	431	431	431
PANEL B: The Analysis with Segment Sub-Samples						
	Conglomerate			Single Segment		
	Short Term Ratio	Long Term Ratio	Weighted Average Maturity	Short Term Ratio	Long Term Ratio	Weighted Average Maturity
Board Independence*Post	-0.175**	0.077	0.561**	-0.083	0.160	0.824*
	0.068	*0.080*	*0.224*	*0.103*	*0.123*	*0.498*
Firm Controls	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.04	0.06	0.07	0.07	0.07	0.08
No of Obs.	4,859	4,859	4,859	3,856	3,856	3,856
No of Firms	769	769	769	531	531	531

While one sample consists of companies with the CEO as the chair of the board, the other sample has firms without the CEO duality. After I conduct the difference-in-difference test with these subsamples and compare the results, I observe the significant and positive effect from the board independence on the long term debt for the firms with CEO duality. The findings are presented in Table 2.8. This result shows the restricting effects of the SOX rules on the CEO as the chair which leads to a more effective board monitoring and a relation with the debt maturity.

I conduct placebo tests in which I shift the time range of the study +/- two years while keeping the main structure of my model the same. By doing this, I can examine the existence of other potential firm related endogenous or independent exogenous shocks influencing the board independence and debt maturity relation. If I have any significant results from the placebo tests, it means there are other trends or shocks than the SOX regulations that affect the increase in board independence. In the first test, I move the time frame of the difference-in-difference analysis two years back and define a dummy variable, Post1, that equals one for values in the shifted post-period (2001–2006) and zero otherwise. In the second test, I shift the time range of the model two years forward and use a dummy variable, Post2, that equals one for values in the shifted post-period (2005–2009) and zero otherwise. The findings are given in Table 2.9. These analyses provide statistically insignificant results that support the validity of the use of the SOX rules in the natural experiment as the only exogenous shock affecting the relation between the board independence and debt maturity.[22]

[22] I also conduct additional placebo tests with a time shift of +/- one year and I obtain insignificant results which suggest that not any other trends but the SOX rules are the only exogenous shock affecting the increase in board independence in this study.

Table 2.9: The Placebo Tests for the Difference-in-Difference Analysis

This table presents the placebo test estimates for the difference-in-difference (dif-in-dif) analysis. In the first placebo test, the time frame of the dif-in-dif analysis is shifted two years back and the estimates are given in columns I - III. In the second placebo test, the time frame is shifted two years forward and the estimates are shown in columns IV - VI. The analyses comprise control variables and year fixed effects. The analyses are conducted for three different debt maturity measures. Short Term Ratio is calculated by dividing debt in current liabilities over the total debt of the firm. Long Term Ratio is constructed by dividing the sum of all the long term debt maturing in more than two years over the total debt. Weighted Average Maturity is calculated via multiplying the fraction of each type of debt with its maturity in years. Board Independence is the percentage of the outside members in the board of directors. Post1 is a dummy that equals one for values in the shifted post-period (2001-2005) and zero otherwise. Post2 is a dummy that equals to one for values in shifted post period (2005-2009) and zero otherwise. Board Independence*Post1, Board Independence*Post2 are the intercation variables of Board Independence, Post1 and Post2. The *** indicates statistical significance at the 1% level.

	I	II	III	IV	V	VI
	Short Term Ratio	Long Term Ratio	Weighted Average Maturity	Short Term Ratio	Long Term Ratio	Weighted Average Maturity
Board Independence	-0.080	0.051	-0.092	-0.054	0.128**	0.406**
	0.079	*0.065*	*0.261*	*0.044*	*0.051*	*0.205*
Post1	0.020	0.007	-0.126			
	0.039	*0.038*	*0.155*			
Board Independence*Post1	-0.040	0.046	0.449			
	0.086	*0.071*	*0.287*			
Post2				0.079**	0.026	0.110
				0.035	*0.041*	*0.165*
Board Independence*Post2				-0.051	-0.018	-0.109
				0.049	*0.057*	*0.229*
Constant	0.257*	0.266*	2.236***	0.606***	0.133	1.396***
	0.148	*0.147*	*0.593*	*0.113*	*0.133*	*0.532*
Firm Controls	YES	YES	YES	YES	YES	YES
Year Dummies	YES	YES	YES	YES	YES	YES
Fixed Effects	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.04	0.05	0.05	0.04	0.06	0.07
No of Obs.	8,004	8,004	8,004	6,530	6,530	6,530
No of Firms	1,208	1,208	1,208	1,170	1,170	1,170

2.6 Conclusion

Throughout this study, I investigate the relation between strong corporate governance in terms of monitoring and the maturity structure of the firm's debt. In particular, I measure the effective board monitoring via the independence of the board of directors and try to reveal any impact of the increased board independence on the debt maturity choice. I control for other possible channels of influences on the debt maturity and also estimate the firm leverage simultaneously. I construct a natural experiment for the period of 1996 to 2009 using the SOX regulations as an exogenous shock and find that companies have more debt with longer maturity as they have stronger internal monitoring via more independent board of directors. This result rejects the null hypothesis of no relation and supports the $H1_a$ hypothesis of a positive relation between the board independence and the long term debt.

This paper contributes to the debt maturity literature by further investigating the effect of strong corporate governance on the debt maturity structure. To the best of my knowledge, the monitoring characteristic of the board via the board independence has not been researched as one of the determinants of the debt maturity decision. Furthermore, I conduct my study via a natural experiment to make it sure that the variables in the researched relation are clearly identified without any issues. In order to find out any potential influence by other factors, I also examine specific conditions of board and organization characteristics, such as CEO duality and segment type of firms; and I provide robustness of the original findings. As an additional contribution, I explicitly focus on the era of financial instability and research how the relation between the board independence and the debt maturity is affected. Taking everything into account, I can say

that my paper not only solidifies the reliability of the variable identifications via a natural experiment but also provides an unexplored effect of the internal board monitoring via the board independence on the firm's debt maturity structure.

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Chapter 3

Changes in Corporate Governance: Externally Dictated vs Organically Determined

3.1 Introduction

Several major corporate scandals in the United States during the early 2000s brought attention to the corporate governance mechanisms of US companies. Not long after these scandals, the U.S. Congress passed the Sarbanes - Oxley Act of 2002 (SOX hereafter) and the Securities and Exchange Commission (SEC hereafter) announced certain corporate governance regulations in order to restore public confidence in the governance of public corporations. While significant research has been conducted on the corporate governance and firm performance relationship, there are only a few studies investigating SOX's impact on companies' governance structure. Among these papers, consensus has not emerged on the influence of governance structure changes on firm performance nor whether SOX and SEC legislations have been necessary and successful in improving the performance of companies.

Previous literature concentrates on different characteristics of the corporate governance mechanism in order to explain any potential influence on the firm performance and provides mixed results. Schellenger et al. (1989), Daily and Dalton (1993), Brown and Caylor (2006), Dey (2008), Lin and Jen (2011) investigate board independence and the independence of key governance committees, such as audit,

nominating and compensation committees. In their empirical studies, they find a positive relation between governance and performance suggesting that increasing the number of outside members reduces the agency cost and improves the firm performance. Bhagat and Bolton (2008) focus on GIM and BCF indices that measure the corporate governance in firms and find that board independence has a negative impact on firm performance. Hermalin and Weisbach (1991), Daily and Johnson (1997), Klein (1998), Bhagat and Black (1999, 2002) and Adjaoud et al. (2007) are also interested in the governance and performance relation. They do not find significant evidence supporting any kind of an influence. There are a few papers in the literature particularly concentrating on SOX. Switzer (2007) examines the effects of SOX compliance on Canadian small-cap companies and proposes that SOX has performance improving influence on those firms. Moreover, Holmstrom and Kaplan (2003) discusses the SOX and SEC changes in their paper stating that SEC regulations are beneficial for companies while SOX might have performance reducing impacts for small firms due to the additional variable cost of complying with it. They also believe that in general, SOX can have somewhat negative effects in the short term, declining over time. Chhaochharia and Grinstein (2007) also investigate the SOX effects and consider the small size firms, claiming a positive influence for less compliant companies with a negative impact for small firms. Furthermore, Romano (2004) specifically focuses on the SOX and challenges that SOX provisions are ill-conceived. She proposes they should be optional rather than mandatory for all companies.

This study departs from the previous literature by focusing on the efficiency of the government imposed mandatory changes versus the organic changes done voluntarily.

By doing that, we try to clarify the ambiguity in existing literature which is about whether improvements in the corporate governance should be dictated by external forces such as government, regulators and the exchanges or decided internally by the firm in order to increase the firm performance. To test these opposite hypotheses and mitigate the related identification issues, we concentrate on regulatory reforms mandated by SOX and embraced by SEC. We conduct analyses to provide significant empirical evidences favoring one of the main stream ideas. One fair concern might be the difficulty of separating two types of firms after SOX and SEC regulations: The ones that still voluntarily deciding on changes after these imposed rules; and the others that are forced to modify their governance structures. First of all, the vast majority of the firms are obliged to change their corporate governance mechanisms; thus, the analysis is still plausible to the largest extend. Secondly, any negative or insignificant results on performance after SOX and SEC announcements would certainly show the overcoming influence of externally dictated governance modifications over the voluntarily decided changes. As another interesting part of this work, we research the effects of changes during the recession periods to provide an additional insight via the case where the firms try to survive in a severe business environment and appreciate the functionality of a strong board. Finally, we also employ a specific aspect of firm characteristics and evaluate the impact of the modifications for the small cap companies only.

We confirm that when companies decide on changes in board and key governance committee structure internally relying on the firm dynamics and needs, it enhances firm performance. On the other hand, when these modifications are dictated uniformly to all companies, it destroys the performance. The positive relation is supported by the agency

theory. Fama (1980) suggests that as the ratio of outside versus inside directors or members increases, the board and the committees become more independent. This reduces the agency cost because outside directors act more effectively as monitors due to their desire to protect reputation capital and also lack of association with the internal incentives and company politics. The latter result of this study is also backed up by Romano (2004) claiming that making the governance changes mandatory for all firms disregarding the firm specific dynamics can not be performance improving; such regulations should be optional for companies. Moreover, we find that during crisis periods, these results are partly strong in terms of board structure changes. Focusing on small-cap companies, we can not find significant difference between the firm performance outcomes in pre- and post-periods implying that there is not a significant relationship between governance changes and performance.

This paper makes important contributions to the literature. Firstly, it provides insight about the validity and true influence of imposing rules that alter firm governance structure on the performance measures, results not covered in such content in previous research. Secondly, we use the SOX and SEC regulations as a valid instrument for imposed rules and compare the performance measures in before and after periods. Focusing on this event enables distinction between imposed and organically generated governance. Besides, we introduce additional explanatory measures in the analyses to cover most aspects of these legislations. Finally, we investigate the influence of changes on performance during recession periods which has not been researched before.

The rest of the paper is organized as follows. Section 2 reviews the existing literature on the corporate governance and firm performance relationship as well as the

effects of SOX and SEC rules along with two different opinions on mandated rules. Section 3 describes the empirical methodology. Section 4 explains the data, the variables and provides explanatory statistics. In section 5, we discuss the empirical findings and robustness of these results. Section 6 concludes the paper.

3.2 Literature Review

The relationship between the corporate governance and the firm performance has been an interesting topic for most of the researchers for decades. Tremendous amount of studies have been conducted to clarify this relationship; yet the results are mixed. According to agency theory by Fama (1980), the independence of the board of directors can be increased by raising the ratio of external to internal directors making the board more effective in reducing the agency cost via better monitoring. Independent boards have a superior ability of limit the opportunism of board members and also the directors are more involved in strategic decision making which decreases the agency cost and improves the firm performance while protecting the reputational capital of the directors. Schellenger et al. (1989), Daily and Dalton (1993) conduct analyses on the board composition and its effects on the accounting performance measures. They provide significant evidence for a positive relationship. Brown and Caylor (2006) also explore key governance committee characteristics, such as independence of audit, nominating and compensation committees. Based on a dataset by Institutional Shareholder Services, they create a broad measure of corporate governance, Gov-Score; a composite measure of 51 factors. Among their findings, they claim board, nominating and compensation committee independence is positively related to firm performance. Furthermore, Dey

(2008) investigates any potential relationship between corporate governance and the level of agency conflicts in companies. She uses principal component analysis on 22 individual governance variables and forms 7 factors representing different dimensions of governance for a firm. She discusses when the agency conflict in a company is high, the key committee and board independence is significantly associated with firm performance and have positive impact on it. In their paper, Lin and Jen (2011) focus on board structure. Their results show that outside independent directors have a positive impact on firm performance.

There are few studies in literature proposing a negative influence of corporate governance on firm performance. Among them, Bhagat and Bolton (2008) examines the relationship between corporate governance and performance, by taking into account the inter-relationships among corporate governance, corporate performance, corporate capital structure, and corporate ownership structure. Considering seven different governance measures in their study, Bhagat and Bolton (2008) measure the governance via GIM and BCF indices and show that board independence is negatively correlated with operating performance.

Contrary to the above stated literature, there are a considerable amount of research suggesting no relationship between corporate governance structure measures and the firm performance. Hermalin and Weisbach (1991) and Daily and Johnson (1997) study the board independence and suggest that there isn't a significant relationship between the board composition and company performance. Bhagat and Black (1999, 2002) focus on any possible impact of board independence on the firm performance for large U.S. companies. They claim that although low profitability firms increase the

number of outside directors in their boards, this strategy doesn't work to help companies perform better. Besides, Klein (1998) tries to demonstrate a linkage between the board structure and firm performance via also including the key governance committee structure in the study. Focusing on years 1992 and 1993, she suggests that there is not any significant effect of board, audit, nominating and compensation committee independence on the firm performance. Adjaoud et al. (2007) employ a score to define board quality for 219 Canadian firms considering different board characteristics. Their results show that there is no relationship between board independence and the company performance using traditional accounting measures.

Considering the previous literature on firm performance by Klein (1998), Bhagat and Black (1999), Brown and Caylor (2006), Adjaoud et al. (2007), Bhagat and Bolton (2008), Dey (2008); there are commonly used factors affecting the company performance. Their findings suggest that firms performing better usually have higher liquidity, higher growth, more free cash flow and more tangible assets. Larger firms are also associated with high company performance, as well as highly volatile companies. Moreover, levering the firm too much is linked to performance destruction. Finally, companies spending more on research and development are believed to perform better. In our research, we control the influence of all these factors in order to reveal the true impact of board and key committee structure changes on the firm performance.

Aside of the literature on the corporate governance structure modification and firm performance relationship, there is very few research conducted focusing on differentiation of the type of the governance change. More specifically, as stated by Finegold et al. (2007), previous studies show less attention on the governance mechanism

modifications which are dictated externally on companies. Furthermore, these papers also fail to agree on a common result about the effect of the mandated adjustments on the firm performance. Switzer (2007) examines the impact of SOX compliance on companies via contrasting performance of Canadian small-cap firms that are subject to SOX provisions with those that are not. He focuses the internal and external governance mechanisms of firms and their simultaneous interactions with performance. He states that SOX has beneficial effects on those small cap Canadian firms in terms of incremental increase in market valuation. In addition to that, Chhaochharia and Grinstein (2007) also investigate 2002 governance rules and use a four factor model on abnormal returns for 2001 and 2002 period. They discuss companies which are less compliant with the provisions earn a positive return compared to the other firms. Considering the firm size, they claim less compliant small firms face with negative abnormal returns verifying the negative effect of SOX on the small companies.

Providing less optimistic opinions than other studies on the same topic, Holmstrom and Kaplan (2003) examines the corporate governance changes and its current status for U.S. companies. They suggest SEC imposed modifications should have explicitly positive impact on firms overall whereas the influence of SOX is expected to be somewhat negative in the short run even though SOX helps to restore the confidence in the U.S. corporate governance system till certain extend. They also believe that SOX affects the smaller companies in a more negative way since the additional costs of complying with it are fixed rather than variable. Besides, Romano (2004) provides an assessment of the corporate governance mandates of SOX in her study. She claims that SOX was enacted as an emergency legislation due to the huge stock market fall and its

provisions are not a focus of any careful attention disregarding the facts proven in the scholarly literature. Showing evidences from the literature she proposes that SOX provisions should not be mandatory but rather optional.

As it is stated above, there is a lack of unification on the governance mechanism changes on firm performance; particularly when they are dictated externally. In this paper, we differ from previous literature by comparing the impacts of both internally and externally altered governance structures on the company performance via considering before and after periods of SOX and SEC regulations. By doing that, we employ a valid instrument representing the mandated modifications in order to test the impacts of both types of changes on the firm performance and clarify the ambiguity in this literature. we try to find answers to the following main question throughout the study.

> *"How do the externally imposed adjustments in corporate governance structure of companies affect the firm performance compared to the organically decided changes?"*

3.3 The Empirical Method

Various high-profile US corporate scandals in early 2000s have led to enactment of SOX and several regulations by US stock exchanges. These new mandatory rules are considered as the most important corporate governance legislation since 1930s. SOX institutes several new requirements for public company boards among which the most significant ones are the followings: The key committees must exist within each firm; such as audit committee, nominating committee and compensation committee. Besides, the board should consist of independent directors. In particular, the members of the audit

committee must be independent directors and at least one member of the committee must be considered a financial expert. In addition to these regulations imposed by SOX; in 2003, the SEC approved several governance related reforms suggested by the three major US stock exchanges; NYSE, NASDAQ and AMEX. Among them, the most prominent ones are again related with the board independence. Both, nominating and compensation committees must consist of independent directors.

Considering the purpose of this study, SOX and SEC regulations clearly provide suitable conditions for a natural experiment. Before these legislations, companies apply necessary changes in their boards organically based on their own needs in order to improve the efficiency and performance of the firm. Starting from 2003, firms forced to reshape their corporate governance structure according to the mandatory rules by SOX and SEC. This enables us to investigate and compare the effect on firm performance by organic changes done by firms themselves versus the changes imposed by external forces, separately, which mitigates any potential endogeneity concerns related to identification issues. The time interval for our analysis is from 1996 till 2009. It covers a 7-year period before the regulations by SOX and SEC become effective, namely 1996-2002, and compares it to a 7-year period after the enactment, 2003-2009. One of the main reasons for the 7-year pre period is the availability of corporate governance data. Moreover, both 7-year pre and post periods include one financial crisis each, dot-com recession of 2000 and mortgage crisis of 2007, so that we can conduct a joint analysis with the financial crisis when the advice of a governing board is the most valuable. Furthermore, this enables us to construct two time frames with similar features for the natural experiment.

As the univariate analyses, we conduct three explanatory tests in which we examine whether using the regulations by SOX and SEC is a valid instrument for the natural experiment. We expect to receive results which demonstrate significant differences between before and after enactment periods so that these new rules can be employed as representatives of external forces requiring firms to change their board structure. In the first analysis, we compare both dependent and independent variables, namely, performance and board measures individually for pre and post periods to observe any significant differences in their values. It has been argued by Graham et al. (2011) that firms need and value the functions of a good board and strong corporate governance at most during a crisis time; thus, as a second test we focus on the crisis periods only and apply to same comparison between dot-com crisis as a recession period before the new legislations and mortgage crisis as a recession period after the new rules. In addition to these analyses, in the third univariate test, we concentrate on the possible impact of the firm size. In literature by Holmstrom and Kaplan (2003), Chhaochharia and Grinstein (2007) it has been discussed that small cap firms bear higher costs relative to their size to adjust the board structure requirements of SOX. As a consequence, applying the provisions of SOX and SEC can be performance destructive for small size companies. In order to examine this hypothesis, we use the same comparison between pre- and post-periods of new regulations but for small cap firms only. All these tests provide a general insight about the impact of an externally imposed change in board structure on the firm performance.

The next major step in the study is to perform a series of analyses[23] in order to reveal the efficiency of externally imposed mandatory modifications on board structure versus the organic changes decided and applied by the firm itself and how they affect the firm performance. The first multivariate test is a cross sectional regression model. The industry adjusted firm performance average after SOX and SEC legislation period is regressed on the both post period and pre period average board structure measures along with controls, so that we can observe the individual impacts of board structure changes initiated by external versus internal sources on the firm performance in a joint model. We also intend to capture which type of channels altering the board characteristics majorly picks up the real effects on the firm performance via this model.

$$Y_i = \alpha + \beta * X_i + \gamma * Z_i + \sum_{l=1}^{8} \rho_l * Control_{i,l} + \mu_i \qquad (3.1)$$

where Y is the industry adjusted average performance measure for 2003-2009; X is the average board structure measure for 1996-2002; Z is the average board structure measure for 2003-2009; firm observation, i= 1, …, N; number of control variables, l = 1, …, 8; and α, β, γ, ρ, μ are the coefficients of the constant term, board structure measures for, board structure measures in post-period, controls and error term, respectively.

The second multivariate model in this paper is the difference in difference analysis. We conduct this analysis where a dummy variable for post enactment period is

[23] As a preliminary analysis which is not included in this paper, a time series regression model is developed in which the firm performance variables are regressed on the board structure variables along with controls, year dummies and fixed effects. This model is applied separately for 1996-2002 and 2003-2009; and the results of these tests are compared in order to provide evidence for how externally forced versus organic board modifications impact the firm performance. The same model is repeated for 2000-2002 and 2007-2009 periods to focus on only the crises occurred in pre and post SOX periods. All these models provide results in the same direction and significance as the findings of the other models discussed in the paper.

included along with the intersection with the board structure measure; so that we can examine all the possible effects of governance measure variations on the industry adjusted firm performance. The post-period data start with 2003 and the model is built in the following way:

$$Y_{i,t} = \alpha + \beta * post_{i,t} + \gamma * X_{i,t} + \delta * post_{i,t} * X_{i,t} + \sum_{l=1}^{8} \rho_l * Control_{i,t,l} + \mu_{i,t} \qquad (3.2)$$

where Y is the industry adjusted performance measure; X is the board structure measure; firm observation, i= 1, … , N; entire period, t = 1996, … , 2009; number of control variables, l = 1, … 8; and α, β, γ, δ, ρ, μ are the coefficients of the constant term, post-period, board structure measures, post-period board structure measures, controls and error term, respectively.

As the third multivariate model, we adopt the same structure of the previous model but only focused on two crisis periods, namely dot-com recession (2000 – 2002) and mortgage crisis of (2007 – 2009), as representatives of financial recession before and after SOX – SEC regulations, respectively, so that we can investigate the efficiency of board structure modifications by external versus internal sources when the need of a strong corporate governance is higher than usual. The dummy variable post-crisis represents the years for the mortgage crisis.

$$Y_{i,t} = \alpha + \beta * post-crisis_{i,t} + \gamma * X_{i,t} + \delta * post-crisis_{i,t} * X_{i,t} + \sum_{l=1}^{8} \rho_l * Control_{i,t,l} + \mu_{i,t} \qquad (3.3)$$

where Y is the industry adjusted performance measure; X is the board structure measure; firm observation, i= 1, …, N; crisis periods, t = 2000, 2001, 2002, 2007, 2008, 20009; number of control variables, l = 1, …, 8; and α, β, γ, δ, ρ, μ are the coefficients of the constant term, post-period crisis, board structure measures, board structure measures in post-period crisis, controls and error term, respectively.

Taking the above stated analyses, it must be straight forward that the last two regression models are longitudinal while the first one is a cross sectional regression model. More specifically, the difference in difference analyses use fixed effects regression as the technique. Due to the nature of these tests, variation within each firm across the time period is the focus for this type of model. Because the correlation both between firm effects and explanatory variables and also between time effects and independent variables is important for this analysis, employing the fixed effects is the correct decision. Moreover, firm fixed effects approach controls the potential omitted variables differing between firms while constant over time which is a necessity for difference in difference analysis. For precision, we also conduct hausman test for these first two models which significantly suggests the use of fixed effects. The first model employs OLS regression with the standard variance estimator for the standard errors due to its cross sectional structure.

To strengthen the robustness of our findings, we include additional board and governance characteristics discussed in the literature by Lipton and Lorsch (1992), Jensen (1993), Brown and Caylor (2006), Switzer (2007) and Dey (2008). These governance features are the ones affected by the rules of other agencies which try to enhance the corporate governance and improve firm performance. Thus, considering these

supplementary board characteristics provides a different insight while we present evidence for the robustness of the results via these new measures. Moreover, we are also interested the possible impact of industries on our findings and their robustness against this factor. For that purpose, we adjust our firm performance measures according to the industries in which those firms operate using the 48 Fama-French industries.

3.4 Data Selection and Variable Construction

We take our data sample from Compustat and Risk Metrics databases for the years 1996-2009. We exclude the financial firms and the utilities and restrict the sample to have data for all the variables for a given year and firm. We winsorize the variables with extreme values at 1% and 99%. While the data related to the firm performance and controls are collected from Compustat, data necessary for the board structure and corporate governance variables are obtained from Risk Metrics database. Our sample consists of 10,942 observations with 1,813 firms.

Following the previous literature by Klein (1998), Vafeas and Theodorou (1998), Bhagat and Black (1999), Brown and Caylor (2006), Bhagat and Bolton (2008), in this study, we consider several board structure and corporate governance characteristics which can be summoned in two groups. There are board of directors characteristics which are affected by SOX legislations and the ones influenced by new SEC rules. Among the SOX enforced changes, the board independence is represented as the percentage of outside directors to the total number of directors in the board, namely “Board Independence”. The existence of the nominating committee is characterized by the dummy variable “Nominating-existence” which equals one if there is any member in the

nominating committee and zero otherwise. “Audit-full-independence” evaluates whether that committee entirely consists of outside directors, and it is a dummy variable equals one if so and zero otherwise. Among the SEC mandated changes, “Nominating-full-independence” shows if all the members of this committee are outside directors, and it is a dummy variable equals one if so and zero otherwise. Similarly, “Compensation-full-independence” is a dummy equals one if compensation committee is fully independent and zero otherwise. By using these several types of measures, we seek to embrace all the different aspects of the board structure modifications either enforced by SOX and SEC or done organically by firm itself which we believe affect the firm performance.

We evaluate the firm performance via three different measures. These measures are widely used in literature while investigating corporate governance and firm performance relationship by Vafeas and Theodorou (1998), Klein (1998), Bhagat and Black (1999), Brown and Caylor (2006), Bohren and Odegaard (2005), Core et al. (2006), Garcia and Anson (2007), Bhagat and Bolton (2008), Dey (2008), Wang (2010), Lin and Jen (2011). The first performance measure is “Return on Assets (ROA)” constructed as operating income before depreciation over total assets. As an alternative performance measure “Net Profit Margin (NPM)”, is calculated by the ratio of net income to net sales. In order to capture a different feature of firm performance such as equity based representation, we use “Return on Equity (ROE)” which is constructed as a ratio of net income to common equity of the firm. Following Brown and Caylor (2006), all these performance measures are adjusted by their industry mean values to provide robustness against industry effects.

As stated in literature by Klein (1998), Bhagat and Black (1999), Brown and Caylor (2006), Adjaoud et al. (2007), Bhagat and Bolton (2008) and Dey (2008); we employ certain control variables in this study. One of them is the liquidity which is cash over total assets. Free cash flow is defined as the natural logarithm of the difference between cash flow from operations and capital expenditures. Firm growth opportunity is also controlled and constructed as natural logarithm of common shares outstanding multiplied by shares' closing price over total assets. It is also proxied alternatively as the ratio of R&D expenses to net sales. Moreover, tangibility is defined as property, plant, equipment total over total assets. Size is measured as the natural logarithm of total assets. Volatility is controlled as the monthly standard deviation of the closing prices of shares. Furthermore, leverage is proxied as a control via the sum of debt in current liabilities and long term debt over total assets.

In Table 3.1, summary statistics are presented. Firm performance measures, ROA, ROE and NPM, show similar patterns in their distributions, even though ROE and NPM has higher volatility compared to ROA. Moreover, NPM displays a negative skewness stating that the majority of firm has relatively low net profit margins. Considering the explanatory variables, on average 68% of the firm's board are outside directors. Furthermore, 74% of the firms have the nominating committee. Focusing on the committee independence, about 82% of all firms' audit and compensation committees have completely outside directors. Interestingly, only 53% of the firms have the nominating committee with fully independent members. In general, the statistics for the firm characteristics are similar to the ones documented in previous studies. On the other hand, volatility has a right skewed distribution with a high standard deviation which

states that the sample consists of a large spectrum of firms with varying volatilities mainly of the ones with a higher risk level. Both of the growth measures, MB and Growth, have a high positive skewness claiming that the sample contains firms with very high market values as well as high R&D expenses which signals highly growth firms.

Table 3.1: Descriptive Statistics of Variables

This table provides descriptive statistics, i.e. mean, standard deviation, 75th, 50th and 25th percentiles, of all variables used in regression models. There are 1,813 firms with 10,942 firm year observations. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean adjusted versions of these performance measures are used. Board Independence is the percentage of outside directors to the total number of directors in the board. Nominating-existence is a dummy which equals one if there is any member in the nominating committee and zero otherwise. Nominating-full-independence, Audit-full-independence, Compensation-full-independence are dummy variables equal one if that specific committee entirely consists of outside directors and zero otherwise. Liquidity is cash over total assets. Free cash flow is defined as the natural logarithm of the difference between cash flow from operations operations and capital expenditures. Size is the natural logarithm of total assets. MB is natural logarithm of common shares outstanding multiplied by shares' closing price over total assets. Growth is the ratio of R&D expenses to net sales. Tangibility is property, plant, equipment total over total assets. Volatility is calculated as the monthly standard deviation of the closing prices of shares. Leverage is proxied via the sum of debt in current liabilities and long term debt over total assets.

Variables	Mean	Stdev	P75	P50	P25
ROA	0.094	0.099	0.145	0.093	0.049
ROE	0.092	0.319	0.187	0.119	0.046
NPM	0.031	0.207	0.100	0.054	0.018
Board Independence	0.678	0.174	0.818	0.714	0.571
Nominating-existence	0.742	0.438	1.000	1.000	0.000
Nominating-full-independence	0.533	0.499	1.000	1.000	0.000
Audit-full-independence	0.820	0.385	1.000	1.000	1.000
Compensation-full-independence	0.833	0.373	1.000	1.000	1.000
Size	7.449	1.614	8.448	7.308	6.321
MB	1.578	1.856	1.875	1.080	0.626
Leverage	0.212	0.180	0.326	0.195	0.046
Liquidity	0.099	0.113	0.139	0.057	0.019
Tangibility	0.262	0.216	0.370	0.201	0.097
Volatility	5.391	5.275	6.383	3.763	2.246
Growth	0.047	0.101	0.045	0.000	0.000
Free Cash Flow	4.715	1.729	5.834	4.678	3.606

In order to provide a broader picture of how externally forced regulations compared to internal needs alter the firm board structure and affect firm efficiency and performance, we focus on these factors more in detail in this section. Figure 3.1 shows the yearly average values of firm performance and board independence variables. Before SOX and SEC legislations from 1996 until 2002, board independence average climbs up from 59% to 65% which means even before the externally imposed rules companies changes their board structure organically as much as they need and decide on the level of board independence resulting in a better firm performance. In this pre-period, industry adjusted ROA and NPM values show the similar incremental pattern while ROE has a slight increase. Starting with the year 2002, all firms have to adjust their board structure even if it may not be for the best interest for some firms due to SOX and SEC rules. Consequently, the average number of board independence continues to increase but with a steeper trend from 65% to 79%. It is remarkable to observe how the average firm performance measures suffer and drop until 2009 as all the firms forced to increase the level of their board independence. All the performance values begin to decrease as it is recognizable mostly in ROA and NPM measures. Even the positive impact on firm performance by organic modifications which is observed before and supposedly after SOX and SEC rules is suppressed by the severe negative effect of forced changes in the post period. These preliminary facts clearly show the negative influence of new mandatory regulations in board independence on firm performance.

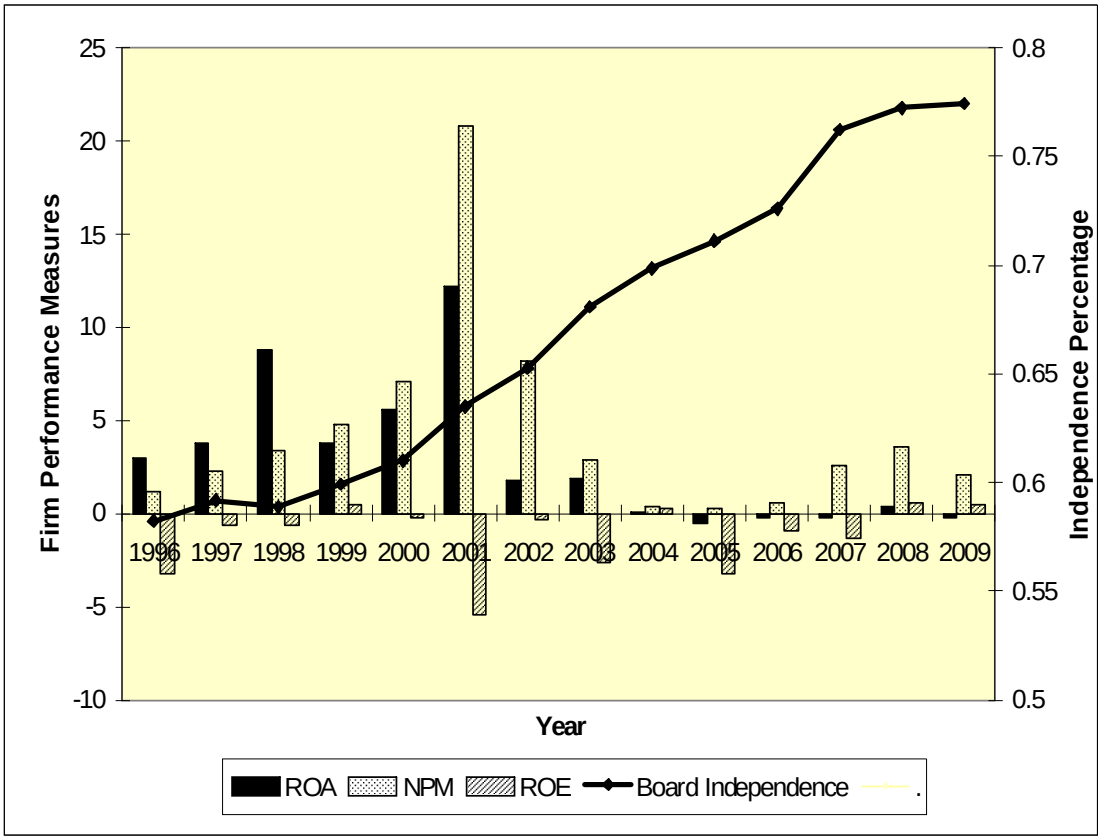

Figure 3.1: Distribution of Firm Performance and Board Structure Measures

This figure shows distibution of board independence and industry adjusted ROA, ROE and NPM values of firms by years. Board Independence is defined as the percentage of outside directors to the total number of directors in the board. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. The values of industry adjusted ROA, ROE and NPM are multiplied by thousand, hundred and hundred, respectively, for display purposes.

The statistical distribution of nominating committee existence by years is displayed in Figure 3.2. The average number of firms having nominating committee increases from 55% to 70% until 2002. After SOX and SEC rules, it rapidly jumps up to almost 100% in my sample which indicates that SOX and SEC regulations altered the firm corporate governance in terms of existence of the nominating committee.

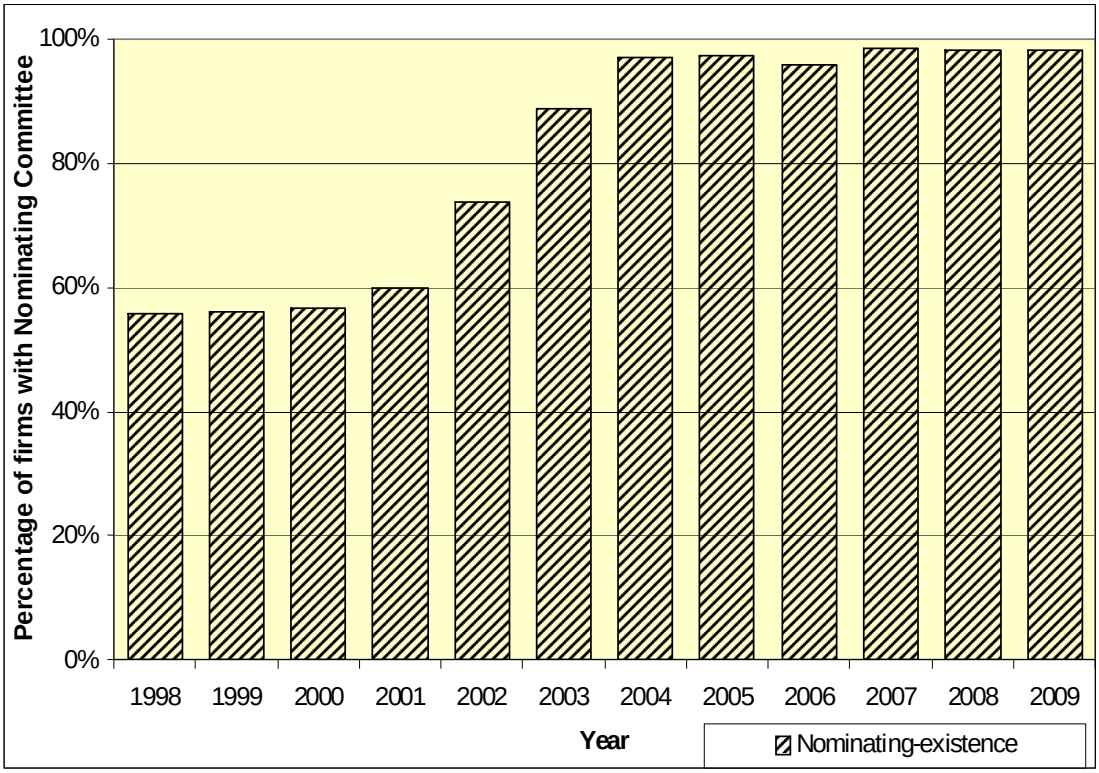

Figure 3.2: Distribution of Nominating Committee Existence

This figure displays distibution of nominating committee existence for firms by years. Nominating-existence is a dummy equals one if there is any member in the nominating committee and zero otherwise.

Figure 3.3 displays the full independence of key governance committees in companies by years. The average number of firms having fully independent audit committee rises from 55% to 70% until 2002 while that increase is from 20% to 40% for the nominating committee. The average number of companies with the compensation committee having all outside members fluctuates around 70% in pre period. After SOX and SEC legislations, firms modify their key committees making them fully independent. As a consequence, the average number of companies with fully independent committees reaches around 90-95% level for all committees.

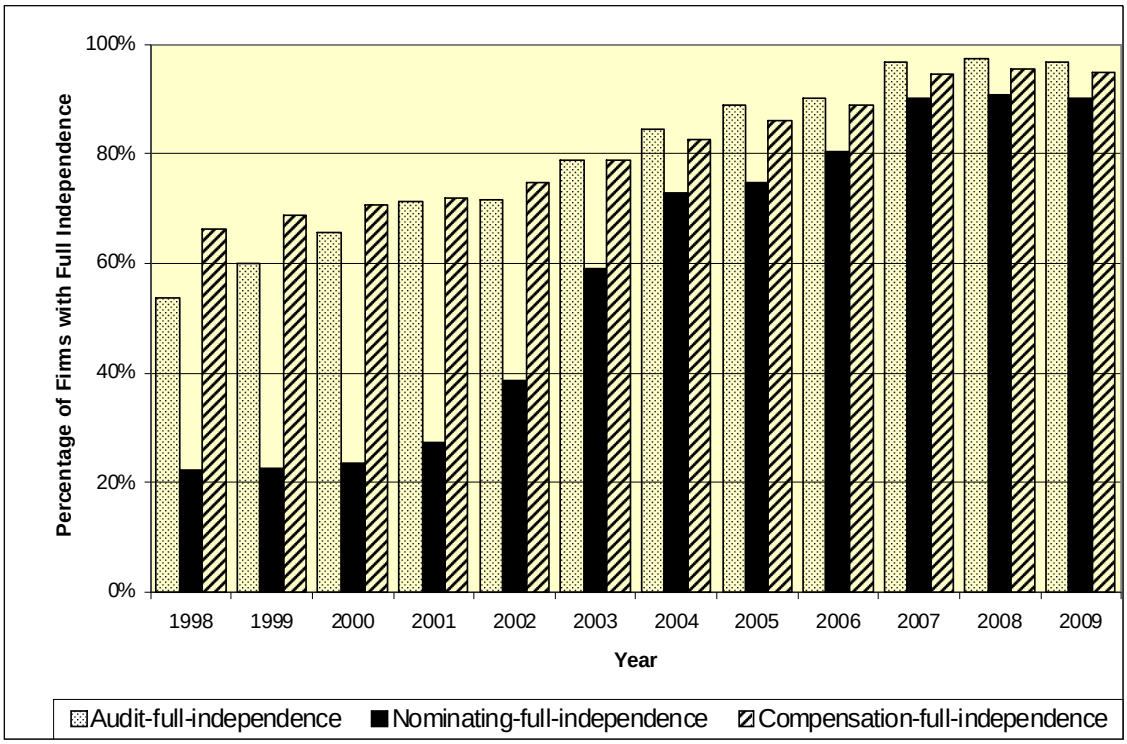

Figure 3.3: Distribution of Key Committee Measures

This figure displays distibution of Audit-full-independence, Nominating-full-independence and Compensation-full-independence values for firms by years. Audit-full-independence, Nominating-full-independence and Compensation-full-independence are dummy variables which equal one if that specific committee entirely consists of outside directors and zero otherwise.

3.4 Results

3.4.1 Univariate Analyses

In this section, we conduct univariate analyses in order to provide a broader view of the effect of external versus internal forces altering the firm's board structure on the firm performance. In the first of these tests, we compare firm board structure measures from pre-period (1996-2002) to post SOX and SEC regulations period (2003-2009) to examine whether these new mandatory rules affect firm's board of directors. Similarly, we perform the same evaluation for the firm performance variables. In addition to these

analyses, we repeat same tests for the crisis periods only, namely, 2000-2002 and 2007-2009. So, we contrast the dot-com crisis period to the mortgage crisis period through which we examine the impact of SOX on the variables in this study. In all these analyses, we use two group mean comparison T-test technique.

Table 3.2 provides the results of first univariate analysis. Focusing on the pre- and post-period comparison, we find statistically significant increase in all board structure measures. In particular, the average board independence rises to 74% after SOX and SEC regulations while more than 95% of firms have nominating committee in that post-period. In pre-period, the average full independence values for nominating, audit and compensation committees are about 21%, 72% and 77%, respectively. After the SOX and SEC legislations, 80% of the companies on average have only outside directors in the nominating committee while the average value is around 90% in terms of audit and compensation committees. These results broadly suggest that mandated SOX and SEC rules are valid instruments to represent external forces altering the firm board structure. In Panel B, the findings for firm performance measures are given. Interestingly, both ROA and NPM of companies decease significantly after SOX and SEC rules which are the laws for all companies to improve their corporate governance and thus increase the firm performance. There is an increase for ROE but it is statistically not significant. The big decline in firm performance average in post period provides a clue that the imposed rules which change the board structure may have a destructive influence on the performance.

Table 3.2: T-Test Mean Comparison for Board Structure and Firm Performance Measures

This table presents results of t-test mean comparison for the board structure and firm performance measures in two main columns regarding to two different samples, all periods and crisis periods only, respectively. In Column I, the mean values of each of these variables for pre period (1996-2002) are compared to their mean values for post period (2003-2009). The mean difference and related p-values are provided. In Column II, the same analysis is repeated for each variable individually considering the crisis periods, (2000-2002) and (2007-2009) only.

Panel A: Board Structure Measures				
	I		II	
	Pre-Period	Post-Period	Pre-Period Crisis	Post-Period Crisis
Board Independence	0.611	0.735	0.632	0.770
dif	0.124		0.138	
p-val	0.000		0.000	
Nominating-existence	0.477	0.964	0.662	0.983
dif	0.487		0.321	
p-val	0.000		0.000	
Nominating-full-independence	0.211	0.804	0.294	0.903
dif	0.593		0.609	
p-val	0.000		0.000	
Audit-full-independence	0.716	0.908	0.694	0.969
dif	0.192		0.275	
p-val	0.000		0.000	
Compensation-full-independence	0.766	0.891	0.723	0.950
dif	0.125		0.227	
p-val	0.000		0.000	
Panel B: Firm Performance Measures				
	I		II	
	Pre-Period	Post-Period	Pre-Period Crisis	Post-Period Crisis
ROA (adj)	0.006	0.000	0.007	0.000
dif	-0.006		-0.007	
p-val	0.000		0.004	
ROE (adj)	-0.015	-0.009	-0.021	0.000
dif	0.006		0.021	
p-val	0.330		0.023	
NPM (adj)	0.075	0.018	0.124	0.028
dif	-0.057		-0.096	
p-val	0.000		0.000	

Column II shows the findings of the same analysis considering the crisis periods only. For firm board characteristics, I obtain similar results with greater mean value differences when the dot-com crisis is compared to the mortgage recession. Considering the firm performance measures, all of them show bigger difference and statistical significance. While ROA and NPM decline during the crisis in post period, ROE increases. Even though there is not a unity among the performance measures, the majority of them claims companies perform poorly during the mortgage crisis period when the rules by SOX and SEC are dictated to them forcing all companies to modify their board structure.

Before we move on to the more advanced models in our study, we want to investigate further the possible impact of firm size on the findings. As proposed in literature, the externally imposed rules forcing the firms to modify their board structure is a costly process. Thus, small companies influenced by these mandated rules face higher costs damaging their firm performance. In order to examine this hypothesis, we repeat the previous univariate analyses for small size firms only. Following the literature, we constraint our sample to have companies whose market capitalization is less than $1 billion dollars.

Table 3.3 presents the findings related to small size firms only. In Column I, the average of firm board structure and key committee independence measures are given. Not surprisingly, the average number of firms with nominating committee and the number of outside directors in board, audit, nominating and compensation committees increase after the SOX and SEC legislations for small companies. These results indicate that small firms are also affected by the SOX and SEC regulations. In terms of firm performance,

small firms perform slightly poorer in post-period compared to pre-period; but it is statistically insignificant except for NPM. That's why; it is difficult to claim that the mandatory changes in board structure destroy the firm performance necessarily more for small firms. Because of that reason, we don't pursue this weak hypothesis in our multivariate analyses.

Column II provides findings for small companies in crisis periods only. The changes in board and committee independence are similar to the previous cases and statistically significant stating that SOX influences the small firms during the mortgage crisis too. Sure enough, the average values for firm performance decline for small firms in crisis time, but the difference between the dot-com crisis before SOX and the mortgage recession after SOX is neither sufficient nor statistically significant in majority of measures. Therefore, it's hard to accept the claim that especially small firms perform worse than the other companies after SOX and SEC rules. So, this idea is not investigated further via the multivariate tests.

Table 3.3: T-Test Mean Comparison for Board Structure and Firm Performance Measures (Small Firms)

This table presents results of t-test mean comparison for the board structure and firm performance measures of small companies only, in two main columns regarding to two different samples, all periods and crisis periods only, respectively. The size constraint for two samples is that firms having market capitalization less than $1 billion. In Column I, the mean values of each of these variables for pre period (1996-2002) are compared to their mean values for post period (2003-2009). The mean difference and related p-values are provided. In Column II, the same analysis is repeated for each variable individually considering the crisis periods, (2000-2002) and (2007-2009) only.

Panel A: Board Structure Measures for Small Market Cap Companies				
	I		II	
	Pre-Period	Post-Period	Pre-Period Crisis	Post-Period Crisis
Board Independence	0.591	0.717	0.621	0.747
dif	0.126		0.126	
p-val	0.000		0.000	
Nominating-existence	0.429	0.943	0.579	0.975
dif	0.514		0.396	
p-val	0.000		0.000	
Nominating-full-independence	0.173	0.777	0.244	0.880
dif	0.604		0.636	
p-val	0.000		0.000	
Audit-full-independence	0.727	0.914	0.704	0.964
dif	0.187		0.260	
p-val	0.000		0.000	
Compensation-full-independence	0.752	0.881	0.721	0.934
dif	0.129		0.213	
p-val	0.000		0.000	
Panel B: Firm Performance Measures for Small Market Cap Companies				
	I		II	
	Pre-Period	Post-Period	Pre-Period Crisis	Post-Period Crisis
ROA (adj)	-0.021	-0.028	-0.023	-0.027
dif	-0.007		-0.004	
p-val	0.169		0.276	
ROE (adj)	-0.064	-0.080	-0.071	-0.077
dif	-0.016		-0.006	
p-val	0.112		0.747	
NPM (adj)	0.031	-0.025	0.076	-0.024
dif	-0.056		-0.100	
p-val	0.000		0.000	

3.4.2 Multivariate Analyses

One of the major analyses in this paper is a difference in difference analysis. The dummy variable representing the period after SOX and SEC regulations is Post. The intersection of explanatory variables with Post are Board Independence*post, Nominating-existence*post, Audit-full-independence*post, Nominating-full-independence*post, Compensation-full-independence*post. This test enables us to observe any possible impact of externally imposed as well as internally decided board and key committee modifications in pre- and post-periods. The primary focus should be concentrated on these intersection variables in the study because they are the major variables clarifying the effect of mandated vs. organic changes on firm performance. Year and fixed effects along with controls such as liquidity, growth, firm size, tangibility, free cash flow, leverage, R&D ratio and volatility are included in the model. The performance measures are adjusted by the industry averages in which the companies operate in order to mitigate and control any possible industry effects on the findings.

Considering the baseline regression estimates in Table 3.4, we obtain mostly similar results documented in literature by Klein (1998), Bhagat and Black (1999), Brown and Caylor (2006), Adjaoud et al. (2007), Bhagat and Bolton (2008) and Dey (2008). Our findings suggest that companies with high tangibility, high volatility, high market-to-book ratio and high free cash flow seem to perform better while interestingly high leverage appears to have a destructive effect on firm performance. Contrary to literature, we find that highly liquid firms have poor firm performance, so do the large companies. Moreover, high R&D ratio seems also to be performance destructive for the companies in our sample, contradicting with previous literature.

Table 3.4: Difference in Difference Analysis of Board and Nominating Committee Structure on Performance Measures

This table reports the difference in difference analysis estimates for board independence, nominating committee existence and their interactions with post-period dummy along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables and also year and fixed effects. It also provides the baseline regression results in columns I-III. The analysis is conducted using two different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Board Independence is the percentage of outside directors to the total number of directors in the board. Nominating-existence is a dummy equals one if there is any member in that committee and zero otherwise. Post is a dummy which equals one for values in post SOX period (2003-2009) and zero otherwise. Board Independence*post and Nominating-existence*post are the interaction variables of Board Independence, Nominating-existence and Post. The *** indicates statistical significance at 1% level.

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Board Independence				0.071**	0.006	0.065***			
				0.033	*0.006*	*0.020*			
Board Independence *post				0.047	-0.014**	0.004			
				0.040	*0.007*	*0.024*			
Nominating-existence							0.018*	0.001	0.022***
							0.010	*0.002*	*0.006*
Nominating-existence*post							-0.020	-0.008*	-0.032**
							0.025	*0.004*	*0.015*
Post				-0.071**	-0.009*	-0.134***	-0.018	-0.012***	-0.102***
				0.029	*0.005*	*0.018*	*0.024*	*0.004*	*0.015*
MB	0.075***		0.046***	0.078***		0.052***	0.076***		0.051***
	0.008		*0.005*	*0.008*		*0.005*	*0.008*		*0.005*
Size	0.001	-0.036***	-0.022***	0.015	-0.026***	0.046***	0.015	-0.026***	0.045***
	0.008	*0.001*	*0.005*	*0.010*	*0.002*	*0.006*	*0.010*	*0.002*	*0.006*
Volatility	0.003***	0.002***	0.001	0.002***	0.002***	-0.001**	0.002***	0.002***	-0.001**
	0.001	*0.000*	*0.001*	*0.001*	*0.000*	*0.000*	*0.001*	*0.001*	*0.000*
Leverage	-0.103***	-0.061***	0.029	-0.123***	-0.073***	-0.043**	-0.125***	-0.073***	-0.044**
	0.036	*0.006*	*0.022*	*0.036*	*0.006*	*0.022*	*0.036*	*0.006*	*0.022*

Table 3.4 (cont.): Difference in Difference Analysis of Board and Nominating Committee Structure on Performance Measures

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Tangibility	-0.017	0.026**	0.109***	-0.060	-0.001	-0.054	-0.062	0.001	-0.053
	0.062	*0.011*	*0.039*	*0.064*	*0.011*	*0.038*	*0.063*	*0.011*	*0.038*
Liquidity	0.041	-0.020**	0.023	0.054	-0.009	0.093***	0.059	-0.009	0.095***
	0.045	*0.008*	*0.028*	*0.045*	*0.008*	*0.027*	*0.045*	*0.008*	*0.027*
Growth	-0.689***	-0.258***	-0.957***	-0.686***	-0.259***	-0.964***	-0.695***	-0.260***	-0.972***
	0.105	*0.019*	*0.066*	*0.105*	*0.019*	*0.063*	*0.105*	*0.019*	*0.063*
Free Cash flow	0.017***	0.014***	0.005*	0.017***	0.014***	0.006***	0.017***	0.014***	0.006***
	0.004	*0.001*	*0.002*	*0.004*	*0.001*	*0.002*	*0.004*	*0.001*	*0.002*
Constant	-0.042	0.236***	0.209***	-0.164**	0.174***	-0.227***	-0.130*	0.177***	-0.192***
	0.065	*0.011*	*0.040*	*0.071*	*0.012*	*0.043*	*0.070*	*0.012*	*0.042*
Adj. R-sq.	0.03	0.16	0.05	0.04	0.18	0.13	0.03	0.18	0.12
No of Obs.	10,987	10,992	10,987	10,937	10,942	10,937	10,937	10,942	10,937
No of Firms	1,819	1,820	1,819	1,812	1,813	1,812	1,812	1,813	1,812

Columns IV-VI show the results from board independence impact on firm performance. Board Independence*post represents the board independence of the companies after SOX and SEC regulations; and thus they are the firms believed to reveal the true impact of mandated board changes on firm performance. The findings for ROE and NPM are both statistically and economically insignificant. In terms of ROA, the changes necessitated by SOX and SEC have even a statistically negative effect on firm performance. In particular, the return of firm's assets declines by 0.24% (= 0.014 * 0.174) with one standard deviation increase in board independence which is 17.4% more outside directors in the board. Focusing on the "Board Independence" estimates, the increase in the number of outside directors affects the firm performance positively when all years before and after SOX and SEC legislations included. This finding implies that making the board of directors more independent helps to improve the firm performance considering the externally imposed and organic changes all together for all time periods.

These results are strong and statistically significant especially for ROE and NPM measures. These findings all together state that although there might be companies voluntarily modifying their boards after SOX, the negative impact by the externally forced changes is so strong that the relationship over all loses its positive significance and even becomes significantly negative in terms of ROA because those mandated changes may not be efficient and suitable for some companies.

In terms of the existence of nominating committee after SOX and SEC rules in columns VII-IX, firms perform poorly when they are dictated to have a nominating committee. Especially, ROA and NPM values suffer severely according to statistically significant and negative Nominating-existence*post estimates. On the other hand, there is a significantly positive influence on firm performance, ROE and NPM, by "Nominating-existence" taking all the years from 1996 to 2009 into account. All these findings propose that even though to found a nominating committee in firms may improve firm's efficiency and functionality, the timing and the plan for this decision may not be right when it is dictated externally on them rather than leaving this choice to the companies that agree internally that they need such a change.

Table 3.5 provides the estimates for the key governance committee variables. For post-period only, the results for full independence of nominating committee are negative and significant for NPM. This finding suggests the negative influence of mandated SOX and SEC regulations on the firm performance. Considering all years combined, the results show a mainly positive impact on firm performance by the change in full independence of nominating committee. It is especially strong and statistically significant for NPM. Shifting the focus to the findings for full independence of the other key committees, it

seems externally forcing that all firms should have independent audit and compensation committee, serves to the desired purpose and improves the firm performance because Audit-full-independence*post and Compensation full-independence*post have positive coefficients only for NPM. If either audit or compensation committee consists of entirely outside members, it has a negative and statistically significant influence on the firm performance considering all times combined. This finding parts away from the previous outcomes in this study. Therefore, it is investigated further also via different models in this paper.

Taking all the results of this difference in difference analysis into account, it is evident to propose when governance structure of companies are altered via imposing externally decided regulations, it has a destructive effect on firm performance, rather than the case where these changes are made by the firms voluntarily relying on their needs. This phenomenon is particularly significant for the existence of a nominating committee and board independence, as well as the full independence of the nominating committee.

As another multivariate analysis, we follow the previous model of difference-in-difference analysis with a small difference in timing. Instead of focusing on the entire period before or after SOX, we concentrate on only the crisis times, namely dot-com crisis and mortgage recession. The time interval for this analysis is between 2000 and 2002 as well as between 2007 and 2009. Post-Crisis is the dummy variable representing the mortgage crisis period after SOX and SEC legislations. The interactions of explanatory variables with Post-Crisis are the followings: Board Independence*post-crisis, Nominating-existence*post-crisis, Nominating-full-independence*post-crisis, Audit-full-independence*post-crisis and Compensation-full-independence*post-crisis.

Table 3.5: Difference-in-Difference Analysis of Key Committee Structure on Performance Measures

This table reports the difference in difference analysis estimates for key committee full independence and their interactions with post-period dummy along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables and also year and fixed effects. The analysis is conducted using three different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Nominating-full-independence, Audit-full-independence and Compensation-full-independence are dummy variables equal one if that specific committee entirely consists of outside directors and zero otherwise. Post is a dummy which equals one for values in post SOX period (2003-2009) and zero otherwise. Nominating-full-independence*post, Audit-full-independence*post and Compensation-full-independence*post are the interaction variables of Nominating-full-independence, Audit-full-independence and Compensation-full-independence and Post. The *** indicates statistical significance at 1%.

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Nominating-full-independence	-0.005	0.003	0.016**						
	0.012	*0.002*	*0.007*						
Nominating-full-independence*post	0.018	-0.003	-0.016*						
	0.015	*0.003*	*0.009*						
Audit-full-independence				-0.005	-0.004**	-0.015**			
				0.011	*0.002*	*0.006*			
Audit-full-independence*post				0.018	0.004	0.026**			
				0.017	*0.003*	*0.010*			
Compensation-full-independence							-0.017	-0.003	-0.027***
							0.012	*0.002*	*0.007*
Compensation-full-independence*post							0.025	0.003	0.024**
							0.017	*0.003*	*0.010*
Post	-0.042***	-0.018***	-0.120***	-0.045***	-0.022***	-0.146***	-0.050***	-0.021***	-0.144***
	0.012	*0.002*	*0.007*	*0.016*	*0.003*	*0.010*	*0.016*	*0.003*	*0.010*
MB	0.076***		0.050***	0.076***		0.050***	0.076***		0.050***
	0.008		*0.005*	*0.008*		*0.005*	*0.008*		*0.005*
Size	0.018*	-0.026***	0.047***	0.017*	-0.026***	0.048***	0.017*	-0.026***	0.048***
	0.010	*0.002*	*0.006*	*0.010*	*0.002*	*0.006*	*0.010*	*0.002*	*0.006*
Volatility	0.002***	0.002***	-0.001**	0.002***	0.002***	-0.001**	0.002***	0.002***	-0.001**
	0.001	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*	*0.001*	*0.000*	*0.000*
Leverage	-0.124***	-0.074***	-0.044**	-0.121***	-0.074***	-0.046**	-0.122***	-0.074***	-0.047**
	0.036	*0.006*	*0.022*	*0.036*	*0.006*	*0.022*	*0.036*	*0.006*	*0.022*

Table 3.5 (cont.): Difference in Difference Analysis of Key Committee Structure on Performance Measures

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Tangibility	-0.060	0.001	-0.053	-0.056	0.001	-0.052	-0.052	0.002	-0.047
	0.064	*0.011*	*0.038*	*0.063*	*0.011*	*0.038*	*0.063*	*0.011*	*0.038*
Liquidity	0.060	-0.009	0.096***	0.057	-0.009	0.094***	0.057	-0.009	0.094***
	0.045	*0.008*	*0.027*	*0.045*	*0.008*	*0.027*	*0.045*	*0.008*	*0.027*
Growth	-0.690***	-0.260***	-0.970***	-0.692***	-0.260***	-0.969***	-0.693***	-0.260***	-0.971***
	0.105	*0.019*	*0.063*	*0.105*	*0.019*	*0.063*	*0.105*	*0.019*	*0.063*
Free Cash flow	0.017***	0.014***	0.007***	0.018***	0.014***	0.007***	0.018***	0.014***	0.007***
	0.004	*0.001*	*0.002*	*0.004*	*0.001*	*0.002*	*0.004*	*0.001*	*0.002*
Constant	-0.139**	0.178***	-0.198***	-0.134*	0.179***	-0.189***	-0.122*	0.178***	-0.179***
	0.070	*0.012*	*0.042*	*0.071*	*0.012*	*0.042*	*0.071*	*0.012*	*0.042*
Adj. R-sq.	0.03	0.18	0.12	0.03	0.18	0.12	0.03	0.18	0.12
No of Obs.	10,987	10,992	10,987	10,937	10,942	10,937	10,937	10,942	10,937
No of Firms	1,819	1,820	1,819	1,812	1,813	1,812	1,812	1,813	1,812

This model with these interaction variables allows us to examine any specific effect of mandated as well as organic board and key committee modifications particularly for crisis times when it is believed that the functionality of corporate governance is valued most. Year and firm fixed effects along with controls such as liquidity, growth, firm size, tangibility, free cash flow, leverage, R&D ratio and volatility are included in the model. Similar to previous analysis, the performance measures are adjusted by the industry averages to control any possible industry effects on results.

The findings of the analysis for crisis periods are shown in Table 3.6. Considering the estimates for the board independence, for both crisis periods together, it is clear that it has a positive influence on firm performance, especially a statistically significant one in terms of NPM. Excluding the pre-period dot-com crisis time when the firms modify their board willingly if they need it, and concentrating on the mortgage crisis period after SOX and SEC regulations, the positive effect of board independence diminishes and even become negative in terms of ROA, but neither of these results or statistically significant

except for ROE. Interestingly, mandated regulations seem to have a positive impact on firm ROE during the mortgage crisis. Taking these findings into account, it's hard to claim that externally imposed board changes have a totally different impact than organic modifications on the firm performance during crisis times.

Table 3.6: Difference in Difference Analysis of Board and Nominating Committee Structure on Performance Measures During Crisis Periods

This table reports the difference in difference analysis estimates for board independence, nominating committee existence and their interactions with post-period crisis dummy along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables and also year and fixed effects. The analysis is conducted using two different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Board Independence is the percentage of outside directors to the total number of directors in the board. Nominating-existence is a dummy equals one if there is any member in that committee and zero otherwise. Post-crisis is a dummy which equals one for values in mortgage crisis (2007-2009) and zero otherwise. Board Independence*post-crisis and Nominating-existence*post-crisis are the interaction variables of Board Independence, Nominating-existence and Post-crisis. The *** indicates statistical significance at 1% level.

	I	II	III	IV	V	VI
	ROE	ROA	NPM	ROE	ROA	NPM
Board Independence	0.082	0.014	0.071*			
	0.058	*0.010*	*0.038*			
Board Independence*post-crisis	0.144*	-0.017	0.064			
	0.087	*0.015*	*0.056*			
Nominating-existence				-0.041**	-0.017***	-0.068***
				0.020	*0.004*	*0.013*
Nominating-existence*post-crisis				-0.051	0.002	-0.073
				0.078	*0.014*	*0.050*
Post-crisis	-0.150**	-0.014	-0.197***	0.035	-0.023*	-0.048
	0.068	*0.012*	*0.044*	*0.077*	*0.014*	*(0.050*
MB	0.080***		0.087***	0.078***		0.083***
	0.012		*0.008*	*0.012*		*0.008*
Size	0.020	-0.019***	0.046***	0.022	-0.018***	0.051***
	0.018	*0.003*	*0.012*	*0.018*	*0.003*	*0.012*
Volatility	0.004***	0.002***	-0.001	0.004***	0.002***	-0.001
	0.001	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*
Leverage	-0.017	-0.064***	0.004	-0.020	-0.064***	0.000
	0.063	*0.011*	*0.041*	*0.063*	*0.011*	*0.041*
Tangibility	0.000	0.061***	0.064	0.012	0.071***	0.092
	0.115	*0.020*	*0.075*	*0.115*	*0.020*	*0.074*

Table 3.6 (cont.): Difference in Difference Analysis of Board and Nominating Committee Structure on Performance Measures During Crisis Periods

	I	II	III	IV	V	VI
	ROE	ROA	NPM	ROE	ROA	NPM
Liquidity	-0.002	-0.009	0.048	0.005	-0.009	0.052
	0.081	*0.014*	*0.053*	*0.081*	*0.014*	*0.052*
Growth	-0.540***	-0.356***	-1.103***	-0.523***	-0.346***	-1.073***
	0.188	*0.033*	*0.122*	*0.188*	*0.033*	*0.122*
Free Cash Flow	0.018***	0.012***	-0.003	0.019***	0.012***	-0.001
	0.007	*0.001*	*0.004*	*0.007*	*0.001*	*0.004*
Constant	-0.247*	0.122***	-0.181**	-0.187	0.127***	-0.133
	0.137	*0.023*	*0.089*	*0.133*	*0.023*	*0.086*
Adj. R-sq.	0.03	0.16	0.16	0.03	0.17	0.16
No of Obs.	5,211	5,213	5,211	5,211	5,213	5,211
No of Firms	1,574	1,574	1,574	1,574	1,574	1,574

In columns IV-VI, the estimates for crisis periods are not clear for the existence of a nominating committee. There is a negative and significant influence on the firm performance when both crisis times are considered. The negative impact of Nominating-existence*post-crisis seems to deteriorate and become insignificant for the after SOX crisis time which suggests that mandating the firms to have a nominating committee during crisis time helps to stop the negative effect on the performance.

Table 3.7 presents the results of the difference-in-difference analysis for the total independence of the key committees. Considering both crisis periods together, there is a positive relationship between Audit-full-independence and firm performance measures which is statistically significant for ROA. Contrary to that, the influence of having a nominating committee with outside members only is significantly negative. Moreover, there isn't any noteworthy relation when the full independence of the compensation committee is concerned. Shifting the focus to the mortgage crisis period after SOX and

SEC regulations, the positive impact of having a fully independent audit committee is gone and it becomes insignificant which suggests that externally mandating all companies to have their audit committee fully independent may damage the firm performance. On the other hand, the negative effect of Nominating-full-independence completely flips to a positive influence during the mortgage recession where it is statistically significant for ROA. This result implies that imposing firms to have a nominating committee with all outside members increase the firm performance. In terms of full independence of the compensation committee, we can not obtain any evident and significant results for the post-period crisis.

Relying on all of the results of this difference in difference analysis focusing on the crisis periods only, we can say that there is no clear evidence fully supporting one idea over the other. The main reason for that might be the fact that during the times of financial instability, there can be primarily other factors and market conditions which affect the firm performance; and the impact of those variables may overcome the influence of corporate governance on firm performance. Considering the findings, in terms of total independence of the audit committee, it can be proposed that it destroys the firm performance during financially troubled times when the governance structure of companies are modified via dictating externally decided regulations rather than the changes made by the firms internally based on their needs. Contrary to that, considering the existence and full independence of nominating committee which is brought to the attention by SEC legislations only, mandating these changes on companies improves the firm performance during times of financial instability compared to the case where these decisions are left to the firms to take voluntarily.

Table 3.7: Difference in Difference Analysis of Key Committee Structure on Performance Measures During the Crisis Periods

This table reports the difference in difference analysis estimates for key committee full independence and their interactions with post-period crisis dummy along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables and also year and fixed effects. The analysis is conducted using three different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Nominating-full-independence, Audit-full-independence, Compensation-full-independence are dummy variables equal one if that committee entirely consists of outside directors and zero otherwise. Post-crisis is a dummy which equals one for values in mortgage crisis (2007-2009) and zero otherwise. Nominating-full-independence*post-crisis, Audit-full-independence*post-crisis and Compensation-full independence*post-crisis are the interaction variables of Nominating-full-independence, Audit-full-independence and Compensation-full-independence and Post-crisis. The *** indicates statistical significance at 1% level.

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Nominating-full-independence	-0.037**	-0.006*	-0.019						
	0.019	*0.003*	*0.012*						
Nominating-full-independence*post-crisis	0.051	0.010*	0.026						
	0.032	*0.006*	*0.021*						
Audit-full-independence				0.007	0.007**	0.014			
				0.019	*0.003*	*0.012*			
Audit-full-independence*post-crisis				0.050	-0.007	0.028			
				0.047	*0.008*	*0.030*			
Compensation-full-independence							-0.019	0.004	0.003
							0.020	*0.004*	*0.013*
Compensation-full-independence*post-crisis							0.009	0.002	-0.030
							0.042	*0.007*	*0.027*

Table 3.7 (cont.): Difference in Difference Analysis of Key Committee Structure on Performance Measures During the Crisis Periods

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Post-crisis	-0.051*	-0.031***	-0.150***	-0.074	-0.021**	-0.168***	-0.028	-0.028***	-0.109***
	0.029	*0.005*	*0.019*	*0.046*	*0.008*	*0.030*	*0.041*	*0.007*	*0.026*
MB	0.079***		0.086***	0.080***		0.087***	0.080***		0.087***
	0.012		*0.008*	*0.012*		*0.008*	*0.012*		*0.008*
Size	0.021	-0.019***	0.047***	0.020	-0.019***	0.048***	0.019	-0.019***	0.047***
	0.018	*0.003*	*0.012*	*0.018*	*0.003*	*0.012*	*0.018*	*0.003*	*0.012*
Volatility	0.004***	0.002***	-0.001	0.004***	0.002***	-0.001	0.004***	0.002***	-0.0001
	0.001	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*
Leverage	-0.018	-0.063***	0.003	-0.019	-0.064***	-0.001	-0.020	-0.064***	-0.001
	0.063	*0.011*	*0.041*	*0.063*	*0.011*	*0.041*	*0.063*	*0.011*	*0.041*
Tangibility	0.008	0.066***	0.071	-0.004	0.065***	0.076	-0.003	0.062***	0.070
	0.114	*0.020*	*0.075*	*0.114*	*0.020*	*0.074*	*0.114*	*0.020*	*0.074*
Liquidity	0.007	-0.009	0.054	0.004	-0.008	0.051	0.004	-0.009	0.053
	0.081	*0.014*	*0.053*	*0.081*	*0.014*	*0.052*	*0.081*	*0.014*	*0.052*
Growth	-0.529***	-0.353***	-1.097***	-0.542***	-0.355***	-1.105***	-0.538***	-0.356***	-1.102***
	0.188	*0.033*	*0.122*	*0.188*	*0.033*	*0.122*	*0.188*	*0.033*	*0.122*
Free Cash flow	0.018***	0.012***	-0.002	0.018***	0.012***	-0.003	0.018***	0.012***	-0.003
	0.007	*0.001*	*0.004*	*0.007*	*0.001*	*0.004*	*0.007*	*0.001*	*0.004*
Constant	-0.194	0.126***	-0.139	-0.198	0.124***	-0.155*	-0.170	0.125***	-0.140
	0.133	*0.023*	*0.087*	*0.133*	*0.023*	*0.087*	*0.133*	*0.023*	*0.087*
Adj. R-sq.	0.03	0.18	0.12	0.03	0.18	0.12	0.03	0.18	0.12
No of Obs.	10,987	10,992	10,987	10,937	10,942	10,937	10,937	10,942	10,937
No of Firms	1,819	1,820	1,819	1,812	1,813	1,812	1,812	1,813	1,812

Relying on all of the results of this difference in difference analysis focusing on the crisis periods only, we can say that there is no clear evidence fully supporting one idea over the other. The main reason for that might be the fact that during the times of financial instability, there can be primarily other factors and market conditions which affect the firm performance; and the impact of those variables may overcome the influence of corporate governance on firm performance. Considering the findings, in terms of total independence of the audit committee, it can be proposed that it destroys the firm performance during financially troubled times when the governance structure of companies are modified via dictating externally decided regulations rather than the

changes made by the firms internally based on their needs. Contrary to that, considering the existence and full independence of nominating committee which is brought to the attention by SEC legislations only, mandating these changes on companies improves the firm performance during times of financial instability compared to the case where these decisions are left to the firms to take voluntarily.

The final major analysis in this study is a cross sectional regression model. We regress the industry adjusted firm performance averages after SOX and SEC regulation period on post-period as well as pre-period average board and key committee structure measures. While Board Independence-A, Nominating-existence-A, Nominating-full-independence-A, Audit-full-independence-A and Compensation-full-independence-A represent the explanatory variables in the post-period after SOX and SEC legislation; Board Independence-B, Nominating-existence-B, Nominating-full-independence-B, Audit-full-independence-B and Compensation-full-independence-B stand for the independent variables defined in the pre-period. This joint model gives us a better chance to examine the individual effects of externally dictated as well as organically decided board and key committee structure changes on the firm performance. Moreover, we can investigate whether mandated or voluntary modifications in governance characteristics pick up the real impact on firm performance via this analysis. Control variables such as, liquidity, MB, firm size, tangibility, free cash flow, leverage, growth and volatility are included in the model. The performance measures are adjusted by the industry averages in order to mitigate and control any possible industry effects on the outcomes.

Table 3.8 shows the results of the cross sectional regression analysis for board independence and existence of nominating committee. Before SOX and SEC rules, the

changes in board independence, Board Independence-B, which are decided voluntarily by companies based on the need, seem to have strongly positive and statistically significant influence on firm performance, specifically in terms of ROE and NPM. Contrary to that, in post-period, it damages the performance when all companies are forced to increase the number of outside directors in the board as the estimates for Board Independence-A are greatly negative and statistically significant particularly for ROE and NPM. These findings evidently shows that dictating companies to modify their board structure beyond their needs shifts the ultimate goal of improving the firm efficiency and functionality, and destroys the performance while leaving this decision to companies to be taken voluntarily helps the firm performance strengthen.

In columns IV-VI, focusing on the existence of a nominating committee in companies, it seems that voluntary decisions by firms in pre-period, Nominating-existence-B, don't have any significant impact on the post-period firm performance. Interestingly, once all the firms are forced by SOX to assemble this key committee, Nominating-existence-A, that has a destructive impact on the firm performance in terms of ROA and NPM while the influence is suggested to be positive by ROE.

Table 3.9 shows the cross sectional regression estimates for the total independence of key governance committees. The findings propose that before the SOX and SEC regulations, there is a clear positive and significant influence on the firm performance implying that as companies decide organically on having their audit, nominating and compensation committees consists of outside members only, the performance increases in the post-period; except for the relation between Compensation-full-independence-B and ROA.

Table 3.8: Cross Sectional Regression Analysis of Board and Nominating Committee Structure on Performance Measures

This table reports the cross sectional regression analysis estimates for board independence and nominating committee existence along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables. The industry adjusted firm performance average after SOX and SEC legislation period is regressed on the both post-period and pre-period average board structure measures along with controls. The analysis is conducted using two different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Board Independence is the percentage of outside directors to the total number of directors in the board. Nominating-existence is a dummy equals one if there is any member in that committee and zero otherwise. Board Independence-A, Nominating-existence-A and Board Independence-B, Nominating-existence-B represent the post-period and the pre-period averages of those board and committee characteristics, respectively. The *** indicates statistical significance at 1% level.

	I	II	III	IV	V	VI
	ROE	ROA	NPM	ROE	ROA	NPM
Board Independence-A	-0.075*	-0.014	-0.037**			
	0.044	*0.010*	*0.017*			
Board Independence-B	0.121***	0.001	0.054***			
	0.029	*0.006*	*0.011*			
Nominating-existence-A				0.064**	-0.012*	-0.021*
				0.029	*0.006*	*0.011*
Nominating-existence-B				0.017	0.001	-0.004
				0.011	*0.003*	*0.004*
MB	0.113***		0.048***	0.112***		0.047***
	0.007		*0.003*	*0.007*		*0.003*
Size	0.016**	-0.049***	-0.009***	0.017**	-0.049***	-0.009***
	0.007	*0.001*	*0.003*	*0.007*	*0.001*	*0.003*
Volatility	0.003**	0.004***	0.002***	0.003**	0.004***	0.002***
	0.001	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*
Leverage	0.136***	-0.014**	-0.027**	0.128***	-0.014**	-0.025**
	0.027	*0.006*	*0.011*	*0.027*	*0.006*	*0.011*
Tangibility	0.019	0.043***	0.005	0.017	0.044***	0.005
	0.020	*0.004*	*0.008*	*0.020*	*0.004*	*0.008*
Liquidity	0.066	0.039***	-0.094***	0.065	0.039***	-0.099***
	0.053	*0.011*	*0.020*	*0.053*	*0.011*	*0.020*
Growth	-0.527***	-0.090***	0.042*	-0.508***	-0.090***	0.050**
	0.059	*0.012*	*0.023*	*0.059*	*0.012*	*0.023*

Table 3.8 (cont.): Cross Sectional Regression Analysis of Board and Nominating Committee Structure on Performance Measures

	I	II	III	IV	V	VI
	ROE	ROA	NPM	ROE	ROA	NPM
Free Cash Flow	0.017***	0.052***	0.027***	0.015**	0.052***	0.027***
	0.007	*0.001*	*0.003*	*0.007*	*0.001*	*0.003*
Constant	-0.262***	0.110***	-0.051***	-0.310***	0.112***	-0.026*
	0.036	*0.007*	*0.014*	*0.039*	*(0.008*	*0.015*
Adj. R-sq.	0.13	0.40	0.24	0.13	0.40	0.24
No of Obs.	4,314	4,314	4,314	4,314	4,314	4,314

Considering the post-period changes in all key governance committees mandated by SOX and SEC, they have a negative and statistically significant impact on firm performance. Forcing all firms to have fully independent audit, compensation and nominating committees evidently destroys the firm performance in post-period which implies that dictating rules regardless to the firm's specific characteristics and needs can be damaging for the overall firm performance.

Taking all the results of this cross sectional regression model into the consideration, it is unmistakable when external forces such as laws and regulations dictate companies to modify their board and key committee structures, it damages the firm functionality and performance whereas voluntarily agreed decisions based on company needs and specific characteristics improve the performance. In particular, changes in board independence as well as all key committee full independence show significant evidence for this phenomenon.

Table 3.9: Cross Sectional Regression Analysis of Key Committee Structure on Performance Measures

This table reports the cross sectional regression analysis estimates for key committee full independence along with MB, size, volatility, leverage, tangibility, liquidity, growth and free cash flow as control variables. The industry adjusted firm performance average after SOX and SEC legislation period is regressed on the both post-period and pre-period average key committee structure measures along with controls. The analysis is conducted using three different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Nominating-full-independence, Audit-full-independence and Compensation-full-independence are dummy variables equal one if that specific committee entirely consists of outside directors and zero otherwise. Nominating-full-independence-A, Audit-full-independence-A, Compensation-full-independence-A and Nominating-full-independence-B, Audit-full-independence-B, Compensation-full-independence-B represent the post-period and the pre-period averages of those key committee characteristics, respectively. The *** indicates statistical significance at 1% level.

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Nominating-full-independence-A	-0.009	-0.007**	-0.009						
	0.014	*0.003*	*0.006*						
Nominating-full-independence-B	0.078***	-0.001	0.012***						
	0.012	*0.003*	*0.005*						
Audit-full-independence-A				-0.002	-0.009*	-0.017**			
				0.020	*0.004*	*0.008*			
Audit-full-independence-B				0.054***	0.005*	0.010**			
				0.012	*0.003*	*0.005*			
Compensation-full-independence-A							-0.073***	0.002	0.001
							0.019	*0.004*	*0.008*
Compensation-full-independence-B							0.047***	-0.008***	0.003
							0.013	*0.003*	*0.005*
MB	0.112***		0.047***	0.113***		0.047***	0.114***		0.048***
	0.007		*0.003*	*0.007*		*0.003*	*0.007*		*0.003*
Size	0.014*	-0.049***	-0.009***	0.017**	-0.049***	-0.009***	0.018**	-0.049***	-0.008***
	0.007	*0.001*	*0.028*	*0.007*	*0.001*	*0.028*	*0.007*	*0.001*	*0.028*
Volatility	0.003**	0.004***	0.002***	0.003**	0.004***	0.002***	0.003**	0.004***	0.002***
	0.001	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*	*0.001*	*0.000*	*0.001*

Table 3.9 (cont.): Cross Sectional Regression Analysis of Key Committee Structure on Performance Measures

	I	II	III	IV	V	VI	VII	VIII	IX
	ROE	ROA	NPM	ROE	ROA	NPM	ROE	ROA	NPM
Leverage	0.131***	-0.015**	-0.028***	0.137***	-0.015**	-0.028***	0.136***	-0.015***	-0.027**
	0.027	*0.006*	*0.011*	*0.027*	*0.006*	*0.011*	*0.027*	*0.006*	*0.011*
Tangibility	0.018	0.043***	0.004	0.025	0.044***	0.005	0.020	0.043***	0.005
	0.020	*0.004*	*0.008*	*0.020*	*0.004*	*0.008*	*0.020*	*0.004*	*0.008*
Liquidity	0.067	0.039***	-0.096***	0.074	0.042***	-0.093***	0.072	0.039***	-0.098***
	0.052	*0.011*	*0.020*	*0.053*	*0.011*	*0.021*	*0.053*	*0.011*	*0.021*
Growth	-0.519***	-0.088***	0.050**	-0.516***	-0.092***	0.047**	-0.520***	-0.089***	0.049**
	0.059	*0.012*	*0.023*	*0.059*	*0.012*	*0.023*	*0.059*	*0.012*	*0.023*
Free Cash Flow	0.017***	0.052***	0.027***	0.016**	0.052***	0.027***	0.016**	0.052***	0.027***
	0.007	*0.001*	*0.003*	*0.007*	*0.001*	*0.003*	*0.007*	*0.001*	*0.003*
Constant	-0.240***	0.106***	-0.041***	-0.293***	0.105***	-0.040***	-0.227***	0.105***	-0.049***
	0.030	*0.006*	*0.012*	*0.034*	*0.007*	*0.013*	*0.032*	*0.006*	*0.013*
Adj. R-sq.	0.14	0.40	0.24	0.13	0.40	0.24	0.13	0.40	0.24
No of Obs.	4,314	4,314	4,314	4,314	4,314	4,314	4,314	4,314	4,314

3.4.3 Robustness

In addition to governance structure measures discussed so far in this paper, there are other board characteristics which are believed by some agencies and literature to have influence on firm performance. Lipton and Lorsch (1992) and Jensen (1993) focus on the relationship between board size and firm performance. They claim that the downsides of a larger board such as the poor communication and decision making outweigh the benefits obtained from increased monitoring in larger boards. Therefore, they suggest limiting board size improves the firm performance. Moreover, Switzer (2007) and Dey (2008) investigate any positive impact of board size on the firm performance. In their empirical studies, they couldn't find significant evidence supporting such a positive relationship. Furthermore, Brown and Caylor (2006) conduct an intensive research on the effect of several governance characteristics on the firm performance suggesting that

companies with smaller boards perform significantly better. They also examine whether there is a relationship between the mandatory retirement age for directors to exit and the firm performance. Interestingly, they find having more directors below age 70 in board increases the firm performance.

Even though the aspects about the board structure mentioned above are not included in SOX and SEC regulations, they are very close in concept and also discussed among agencies, financial press, shareholder activist, business roundtable.[24] It is highly likely that a great majority of firms follow the literature and discussions and decide to apply these changes in their boards if there is a need for that. Consequently, they may have similar impact as mandated modifications on firm performance. Following the literature, we define "Board Size" as the natural logarithm of the total numbers of directors in the board. Further, we construct "Board Age" which is calculated by the percentage of the board members below age 70. As robustness check, we rerun our major multivariate models using these additional board characteristics which also provide a different insight in our research. The results are presented in Table 3.10. Considering "Board Size", we obtain results from the both difference in difference analyses supporting our previous findings: as firms decrease the number of directors in their boards in post-period since they feel obligated, it has a destructive effect on firm performance, while it improves the performance when companies decide on this change voluntarily according to their needs in pre-period. The cross sectional regression model

[24] In addition to the board and key committee structure measures discussed in this paper, we construct supplementary governance committee measures to test the robustness of our findings. We defined Nominating-independence, Audit-independence and Compensation-Independence as the percentage of the outside members in those committees. After repeating the difference-in-difference analysis and the cross sectional regression model with these new measures, we obtain estimates similar to our original findings and thus, we provide robustness of our results.

provides mixed outcomes. According to both the cross sectional model and the difference-in-difference analysis for crisis periods, findings for Board Age show support to our original results. Companies which decide voluntarily to have more directors younger than 70 perform better than the firms which reduce the number of older members in board just to follow the trends without evaluating the company essentials and characteristics.

Table 3.10: Robustness Tests for Additional Board Characteristics

This table reports the estimates for the difference-in-difference analyses and the cross sectional regression model in three panels using new board characteristics along with the controls. The analyses are conducted using two different governance measures for three different performance measures individually. ROA is constructed as operating income before depreciation over total assets. ROE is the ratio of net income to common equity of the firm. NPM is the ratio of net income to net sales. In analyses, industry mean values of these performance measures are substracted from the performance variables to obtain the adjusted versions. Board Size is the natural logarithm of the total number of directors in board. Board Age is the percentage of the directors below age 70. Board Size*post, Board Age*post and Board Size*post-crisis, Board Age*post-crisis are the interaction variables of Board Size, Board Age, Post and Post-crisis. Board Size-A, Board Age-A and Board Size-B, Board Age-B represent the post-period and the pre-period averages of those measures, respectively. The *** indicates statistical significance at 1% level.

Panel A: Difference-in-Difference Analysis						
	ROE	ROA	NPM	ROE	ROA	NPM
Board Size	-0.033	-0.017***	-0.062***			
	0.023	*0.004*	*0.014*			
Board Size*post	0.083***	0.019***	0.14***			
	0.024	*0.004*	*0.015*			
Board Age				-0.071	-0.004	-0.041
				0.045	*0.008*	*0.027*
Board Age*post				0.060	0.001	0.001
				0.049	*0.009*	*0.029*
Controls	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.04	0.18	0.13	0.03	0.18	0.12
No of Obs.	10,937	10,942	10,937	10,937	10,942	10,937
No of Firms	1,812	1,813	1,812	1,812	1,813	1,812

Panel B: Difference-in-Difference Analysis (Crisis Periods Only)						
	ROE	ROA	NPM	ROE	ROA	NPM
Board Size	-0.015	-0.027***	-0.113***			
	0.041	*0.007*	*0.026*			
Board Size*post-crisis	0.194***	0.037***	0.266***			
	0.043	*0.008*	*0.028*			
Board Age				-0.045	0.026*	0.053
				0.075	*0.013*	*0.048*
Board Age*post-crisis				0.031	-0.026*	-0.148***
				0.083	*0.015*	*0.054*
Controls	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.03	0.17	0.18	0.03	0.16	0.16
No of Obs.	5,211	5,213	5,211	5,211	5,213	5,211
No of Firms	1,574	1,574	1,574	1,574	1,574	1,574

Table 3.10 (cont.): Robustness Tests for Additional Board Characteristics

Panel C: Cross Sectional Regression Model						
	ROE	ROA	NPM	ROE	ROA	NPM
Board Size-A	0.070**	-0.010*	-0.053***			
	0.028	*0.006*	*0.011*			
Board Size-B	0.036*	-0.008*	0.004			
	0.021	*0.005*	*0.008*			
Board Age-A				-0.084**	-0.015*	-0.019
				0.036	*0.008*	*0.014*
Board Age-B				0.108***	0.003	-0.051***
				0.038	*0.008*	*0.015*
Controls	YES	YES	YES	YES	YES	YES
Adj. R-sq.	0.14	0.40	0.25	0.13	0.40	0.24
No of Obs.	4,314	4,314	4,314	4,314	4,314	4,314

3.5 Conclusion

This paper examines the influence from SOX and SEC regulations on firm performance. In particular, we investigate the individual impacts of externally dictated as well as organically decided board and key committee modifications on the performance while comparing and questioning the results of these changes. Controlling the other channels of potential effects on firm performance, we use SOX and SEC regulations as representatives for external forces imposing changes on companies. In this natural experiment setting with SOX and SEC rules as the exogenous shock, we conduct difference-in-difference and cross sectional analyses for the period of 1996 to 2009. The evidence supports significantly the agency theory along with the idea of the optional adjustment. The findings indicate when firms are forced externally to alter their governance structure, it damages the firm performance while it improves the performance when companies decide on these changes voluntarily based on their own needs and the time they think is right.

This study contributes in corporate governance and firm performance joint literature by providing insight about the real impact from mandated regulations altering firm governance structure on the performance measures. The paper also examines the influence of voluntarily taken decisions on board and key committee modifications and compares these to the mandated ones in terms of firm performance using a natural experiment. Departing from the previous literature, we construct a cross sectional model where we use the SOX and SEC legislations as a valid instrument for imposed rules and contrast the performance measures in pre- and post-periods. Moreover, we explore the behavior of these externally versus voluntarily determined changes during the times of financial instability; and we investigate how important specifically the corporate governance on the firm performance is. Taking these facts into account, this study pioneers in literature with new, yet important aspects of corporate governance changes. It presents reliable findings via various models and thus clarifies the conflicting opinions discussed in literature.

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