DOES INTERNAL BOARD MONITORING AFFECT THE DEBT MATURITY? - A NATURAL EXPERIMENT

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ABSTRACT

The managerial agency issue between manager and investors can be controlled by debtholders via short term debt as it provides an external control on managers via frequent renegotiation of the debt contract. Alternatively, increased board independence can mitigate the managerial agency problem by establishing a stronger and effective internal monitoring mechanism of managers. So, strong corporate governance can substitute the maturity structure of debt, or vice versa, in terms of managerial control. In this paper, we investigate the effect of internal board monitoring on firms' debt maturity structure. We exogenously identify internal monitoring via board independence and estimate its real impact on maturity using Sarbanes – Oxley Act of 2002 and the Securities and Exchange Commission regulations as exogenous shocks to board structure in a natural experiment setting. Supporting the managerial agency theory, our findings indicate that firms have debt with longer maturity as board independence increases and internal monitoring becomes stronger. Our original results stay unchanged after implementing placebo tests and controlling for the CEO ownership, bond ratings and CEO duality. We 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. Our findings stay robust focusing only on the new debt issuance while the results are even stronger for conglomerate firms. We find the relation between internal monitoring and debt maturity becomes less clear during times of financial instability.

JEL Classification: G32, G38, C33

Keywords: Governance, Board Duality, Debt Maturity, Agency Issue, Natural Experiment, Identification.

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1. Introduction

In this paper, we consider the internal monitoring feature of strong corporate governance as a substitute for external monitoring via short term debt. Fama (1980) discusses that as the number of outside members increases on the board of directors, it can mitigate the managerial agency problem between manager and investors by establishing a monitoring mechanism of managers. Alternatively, the managerial agency issue can also be controlled by debtholders via maturity of debt. 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. Therefore, the maturity structure of debt can substitute strong corporate governance, or vice versa, in terms of managerial control. As substitutes for each other, when one increases, the other can decrease. Particularly, in the presence of a powerful board with efficient control of the firm, lenders don't necessarily have to restrict themselves to 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 boards[1]. Using a natural experiment in this paper, we empirically document precisely this relation.

The determinants of the debt maturity structure have been long researched in the literature. As suggested by Morris (1975), Barclay and Smith (1995), Stohs and Mauer (1996), Guedes and Opler (1996), Ozkan (2000), and 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), and Jiraporn and Kitsabunnarat (2007) focus on corporate governance in terms of large shareholder ownership and shareholder rights to rationalize debt

[1] 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.

maturity structure. Yet, other features of corporate governance remain unexamined. In this study, we try to further investigate 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 the independence of boards. In this study, we examine 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. The 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 were enacted under Section 303A and 5605A, respectively. One of the regulations for the listed companies is the requirement of majority independence of the board of directors.

"… Independent Director means a person other than an Executive Officer or employee of the Company or any other individual having a relationship which, in the opinion of the Company's board of directors, would interfere with the exercise of independent judgment in carrying out the responsibilities of a director. … A majority of the board of directors must be comprised of Independent 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 setting for the natural experiment. Due to improvements in board independence via the SOX rules, causality occurs from corporate governance towards the debt maturity structure, and it allows us to research how changes in board independence resulting from that shock cause changes in debt maturity.

In the natural experiment, we use the difference-in-difference analysis where we compare firms, affected by SOX regulations after the exogenous shock, to the companies before the shock. We document the impact of changes in board independence on the debt

maturity structure. We are also interested in investigating this relation under different economic conditions separately, in particular, the crisis periods.

During 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 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, we use the same difference-in-difference analysis setting but we restrict my sample to consist of years of financial instability only.

The firm leverage is one of the control variables in our model. As the literature suggests, decisions for leverage and the maturity of debt are made simultaneously in the firm. In order to incorporate the intertemporal dependencies within variables and prevent the potential omitted variables bias, we used the simultaneous equations model where we predict the leverage in the first stage via lagged debt maturity measure, and we use the predicted leverage as one of the controls in the difference-in-difference analysis in the second stage.

The main finding of this study suggests firms have debt with longer maturity as board independence increases and internal board monitoring becomes stronger which mitigates debt agency, as well as, managerial agency problem since improved governance serves as a disciplining mechanism on the CEO which benefits all the stakeholders due to new composition of the board; and also increased long term debt resolves the free cash flow problem via forcing out cash out of the firm which would have been wasted. We find the relation between internal monitoring and debt maturity becomes less clear during times of financial instability.

To show the robustness of our results, we conduct placebo tests in which we keep the main structure of our model the same but only shift the time range of the study. By doing this, we can observe whether there are other firm related endogenous or independent exogenous shocks influencing the relation between the board independence

and debt maturity[2]. Moreover, we need to investigate if our results are driven by the need for internal control via increased board independence. That's why; we also focus on cases with and without the need for an improved control mechanism; such as, straight vs. convertible debt, firms with high vs. low GIM Index, companies with and without CEO Duality issues. In addition to that, we control for the bond ratings and the executive ownership in our regression models. Aside of that analysis, we 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 efficient internal control over the management of multiple segments together. We need to control for the possible influence of the firm's organizational structure on the relation between board independence and debt maturity. Moreover, in further analysis, we concentrate on the maturity structure of the new debt issuance only rather all of the total outstanding debt. Lastly, we 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 CEOs who serve as the chair of board may influence the board's 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 our analyses, we observe the original results for the relation between the board independence and the maturity structure of the firm's debt stay unchanged.

Before proceeding, we will briefly address possible concerns about the model and alternative explanations to our findings. Due to the nature of long term debt ratio, one may claim that the increase in that ratio in the post period of SOX regulations can be caused only by reduction in short term debt in that period but not necessarily by increase in long term debt level in companies. After a thorough research, we detect the long term

[2] Introduction and the rapid growth of Credit Default Swaps (CDS) market started in late 1990s might be argued as having a potential influence on the debt and debt maturity decisions of firms. Nevertheless, it was not an instant shock but more a growing trend over the time. Due to this nature, the year fixed effects used in our models would control for any possible effects by increasing trend of the CDS market over the time. Additionally, the placebo tests should show if the CDS market had any impact on the firm's debt maturity in earlier or later years in our study; yet, we can't find any significant evidence for such an effect.

debt holdings on average rise drastically after the SOX amendments in post period and show steep upward trend in those years. Thus, it is safe to claim that the rise in long term debt ratio is also certainly due to the increase in debt levels with longer maturity in firms.

Another possible explanation for our findings might be the type of debt issued by companies. It can be argued that firms may choose to issue more convertible debt rather than straight debt. As convertible debt allows the creditors to switch the stocks any given time, they may feel comfortable to hold the debt and agree with debt having longer maturity. So, steep increase in convertible debt holdings might be the driving factor for the rise in long term debt. Our results do not appear to be driven by the type of debt because both the straight and convertible debt holdings show the similar distribution patterns throughout the year before and after the exogenous shock.

An alternative explanation to our findings might be coming from the yield structure and the cost of debt. One can suggest that the reduction in short term debt ratio might be due the change in loan yields that firms can borrow with, as well as, the change in cost of debt for firms. We investigate this possibility and show that is not the case because yields for both long and short term loans are lower on average in post period after SOX regulations. Particularly, the yield for short term borrowings deceases about 50% in post period compared to the period before 2003 while the reduction in yield is about 30% for long term borrowings. Moreover, the cost of debt for companies increases about 70% for short term debt in post period while it decreases about 30% for debt with longer maturity. In such conditions, short term debt level in firms is expected to rise due to cheaper borrowings and expected higher demand by creditors in post period. Yet, our findings suggest a decrease in short term debt ratio in post period as board independence increases and internal monitoring becomes stronger. Consequently, our results do not appear to be driven by the change in cost of debt.

One of the possible concerns about our model and findings might be the tension between the managerial agency and debt agency issues. The tension is that if managerial agency is resolved by improved internal control via increased board independence, that could lead to managerial and shareholder alignment, hence acting against the debtholders, and debt agency is aggravated. Consequently, rise in board independence

may not be effective to influence the debt maturity. This is not the case in this paper. The claim of the paper is more in line with the idea of Board Duality. Improved governance with more independent directors serves all the stakeholders, with the attendant firm value maximization, rather than equity value maximization (ex post). Thus, the new board governance serves as a mechanism which mitigates not only managerial agency but also debt agency issue. Focusing on the board composition before and after the SOX amendments, we find that on average in post period, 30% of independent directors is associated with stakeholders while only 10% of independent board members can be called as shareholder-friendly. On average after the shock, 17% of the entire board has more of a stakeholder-friendly view while only 13% of all board members may choose to favor shareholders only. Consequently, it is correct to suggest that improved internal control by independent directors can serve as a disciplining mechanism against managerial opportunism and a substitute for external control via short term debt by debtholders at the same time; which validates the story behind our results.

Another potential group of concerns may include the influence by blockholders, asset maturity and increased cash holdings on the debt maturity decision of firms. The existence of large blockholders in the firm may act as a control mechanism on the CEO, similar to the case of an independent board in strong corporate governance. Consequently, it may influence the decision on the maturity structure of the firm's debt. After controlling for the large blockholders in our study, we obtain similar results to the original findings showing the robustness of our main results. According to the matching maturity theory, firms with shorter asset maturity should have more short term and less long term debt. As it suggests, the maturity structure of firm's assets has an impact of the firm's debt maturity choice. Aside of controlling for asset maturity in our analyses, we run our model for subsamples of long and short term asset maturity separately, we find that firms have more long term debt as board independence increases significantly only for the sample of short term asset maturity. It implies that asset maturity can not be the deriving factor in our original findings as the matching maturity theory should hold otherwise. Lastly, cash holdings may impact the firm's debt and debt maturity choice because firm can see the cash as collateral and can borrow more debt, both long and short

term. After investigating this, we find that firms with high cash levels have increased debt only for longer term but not for short term while board independence becomes stronger. Also examining further, we constructed “net debt maturity” measures via adjusting maturity ratios by the percentage of cash and short term investments on total assets. Having discounted the possible effect of cash, our results are in line with our main findings showing the robustness of our original results against any effect by cash holdings.

In this study, we contribute to the debt maturity literature by introducing board independence as a measure for effective internal board monitoring and research its impact on debt maturity. We suggest the board independence as a significant determinant of the long term debt via exogenously identifying this factor and investigating its effect with an exogenous shock in a natural experiment setting. We 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. Overall, we provide results which can be a joint solution for debt agency and managerial agency issues. 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, we discuss the empirical findings and the robustness of these results. Section 6 concludes the study.

2. Literature Review

In the finance literature, the determinants of debt maturity have always been an interesting topic for researchers. Morris (1975) develops hypotheses regarding the factors influencing average maturity of 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 the Morris (1975) matching maturity idea and shows that lack of matching the maturities can lead to 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, short term debt can mitigate this underinvestment problem. Also, Barnea, Haugen and Senbet (1980) consider debt maturity structure while suggesting a solution for the agency issue of debt associated with information 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 their 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 costs.

While analyzing the factors that relate 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 time to maturity of debt increases with size and credit quality and decreases with growth opportunities. 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 Turkish firms as companies operating in an emerging market and examine the effect of large shareholders and concentrated ownership structure. 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 managerial agency theory, managers can extract benefits from investors' money when the monitoring mechanism is weak due to lack of strong corporate governance. 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. After each time debt reaches maturity, the CEO needs to convince the bondholders to reinvest their money. That necessity acts as a disciplining mechanism on the CEO against opportunistic behavior such as shirking, wealth shifting, risk shifting, free cash flow, etc. So, short term debt provides an external control on managers via frequent renegotiation of the debt

contract. Consequently, when the corporate governance is not strong, short term debt can be used by debtholders as an alternative in terms of managerial control.

In this paper, we 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. As a substitute to short term debt, an independent board can monitor the CEO more effectively, and so, debtholders may not need to supervise the managers strictly via the debt with shorter maturity, for instance.

3. Hypotheses and the Empirical Method

In this study, we examine the impact of strong corporate governance on debt maturity through an independent and efficient board of directors. As stated by the managerial agency theory, managers tend to engage in opportunistic behavior; such as, benefitting from outstanding debt via shifting the wealth away from the debtholders 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 replaced with an internal monitoring mechanism with the help of a neutral, independent board. In that case, this independent board controls for the managerial wealth shifting and the debtholders may not find it necessary to monitor the managers externally and they consider offering debt with longer maturity. As an alternative explanation, 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.

Contrary to the arguments proposing a positive relation between strong corporate governance and long term debt, as governance gets stronger, the manager may be aligned

with shareholders. This situation may create the debt agency issue. Therefore, potential debtholders may reluctant to provide debt with longer maturity. The response to this argument may be given via the idea of "Board Duality". Due to new composition of the board, when governance becomes powerful, both shareholders and debtholders can take advantage from it because the idea is that it is a board which serves all the stakeholders, with the attendant firm value maximization, rather than equity value maximization (ex post). Consequently, debtholders may benefit from strong corporate governance and decide to provide longer term debt.

We 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 strong governance provided by the high board independence, firm has debt with longer maturity.

$H1_b$: With strong governance provided by the high board independence, 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, we differ from the previous studies by introducing the board independence as a measure of the strong corporate governance. We investigate the influence of board independence on the firm's debt maturity structure through a valid

natural experiment while supporting all our work with the agency theory in the literature. That's why; the central theme of our 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 our paper, we need to use a natural experiment setting with a valid instrument as the exogenous shock. Thus, in our study, we 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.

Our 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, we need to consider a similar structure after the SOX rules. That's why; we 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, we conduct several univariate tests in order to take a broader view of the board independence and the maturity structure of the firm's debt. We 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, we examine the validity of the exogenous shock. We regress the debt maturity variables on the board independence along with controls and run this regression analysis for each year. We display the coefficient estimates for the board independence every year. We 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, we use dummy variables for the period after the SOX amendments along with the interactions from these variables with the board independence measure. So, we 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.[3] 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.

[3] 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.

The firm leverage is one of the control variables in our 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, we build a simultaneous equations model. In the first step of the equations, we predict the leverage via the lagged debt maturity measure and the common factors mentioned in the capital structure literature. In the second step, we use a difference-in-difference analysis and we regress the debt maturity 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, we use the same difference-in-difference model but with different time intervals. We compare the dot-com crisis period before the SOX regulations, 2000-2002, to the mortgage crisis period after the amendments, 2007-2009. We 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, we 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.

In order to examine whether our findings are driven by the need for internal control via board independence, we also look at cases with and without the need for an improved control mechanism; such as, straight vs. convertible debt, firms with high vs. low GIM Index, and companies with and without CEO Duality issues. Moreover, following the debt maturity literature, we 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 we want to examine the monitoring power of the board via the independence only, we need to control for all these factors. We 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, we need to control this factor in our 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, we run placebo tests where we keep the main structure of our model the same but only shift the time range of the study +/- two years. So, we can test the existence of other possible firm related endogenous or independent exogenous shocks influencing the relation between the board independence and debt maturity.

4. Data Selection and Variable Construction

We collect our data sample using the Compustat and Risk Metrics databases for the years of 1996-2009. We exclude financial firms and utilities. We restrict our sample to have positive values for the total assets and the capital expenditures. Moreover, in our sample, we require the total assets have a greater value than the capital expenditures and property, plant and equipment measure. Further, we 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. We also winsorize variables with extreme values at 1% and 99% in order to mitigate the effect of outliers. While the data related to board independence come from the Risk Metrics, the data necessary for the debt maturity measures and the controls come from the Compustat database. Our sample consists of 8,715 observations with 1,300 firms.

In our analyses, we 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.

We 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.[4] Lastly, we 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 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, we 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), we use several control variables. Growth option is controlled via two variables. MB represents market to book ratio and it is calculated by

[4] Following Jiraporn and Kitsabunnarat (2007), we 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.

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.[5] 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.[6] We compute the Leverage as the sum of debt in current liabilities and long term debt over the total assets.[7] Lastly, we also control the possible effects of the industries on the board independence and the debt maturity relation. We 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 1 provides the summary statistics for all of the variables used in the models. In our 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 our 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

[5] We also use the natural logarithm of the net sales as Size. Our findings stay robust.
[6] Alternatively, we 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 equipment / depreciation expense) + (current assets / total assets) x (current assets / cost of goods sold). We obtain robust results.
[7] We also use the Leverage measure as the ratio of total liabilities over the total assets. We obtain similar results.

concentration, HHI, claim an average of 0.218, a value between 0.150 and 0.250, which states that the firms in our sample operate in moderately concentrated industries.

We examine the big picture about the relation between the board independence and the maturity structure of the firm's debt in Figure 1. It shows the yearly average values of the two main variables in our 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. 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 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.

5. Results

5.1 Univariate Analyses

As a part of the univariate analyses, we compare the behavior of each of our proxies for

the board independence and the debt maturity structure before and after the exogenous shock. We use a mean comparison test of two groups, i.e. pre- and post-period. Table 2 provides the results of our first univariate analysis. Focusing on a comparison of the pre- and post-periods, we 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. We 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.

We 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. We regress the debt maturity variables individually on the board independence along with controls and run this regression analysis for each year in our sample. We 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 our natural experiment, then it can be revealed through this analysis and we 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 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.

The Board Independence coefficient estimates for Long Term Ratio are given in Figure 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 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 our 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.

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 our model, we also control the possible effects from leverage, profitability, asset maturity, growth, tangibility, size, book-to-market, volatility, cash and the industry concentration[8]. Further, we also estimate the debt maturity simultaneously with the control variable, leverage, where we use the predicted leverage values which we 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 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); our 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, we 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), our 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.

The results from the board independence impact on the debt maturity structure are given in Table 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

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

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 2.8% (=0.156 * 0.182) with one standard deviation increase (about 18%) in the board independence after the exogenous shock. Similarly, the Long Term Ratio rises by 2.1% (=0.113 * 0.182) 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 18% more outside members in the board of directors after the SOX amendments. According to the Weighted Average Maturity measure, the jump is about 9.1% (=0.526 * 0.182) for a board independence increase of one standard deviation which indicates a rise of about one month (=9.6% * 1 year) in average maturity of the firm's debt. Considering the second, fourth and the sixth columns, we have very similar results when we repeat the analysis via simultaneously estimating the leverage, Leverage-(p), and the debt maturity measures[9].

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 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, we 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

[9] In untabulated difference-in-difference analyses, we 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 our original findings, we obtain similar and significant results confirming the positive impact of board independence on long term debt.

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, we 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 managerial agency theory[10]. 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[11].

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, we decide to investigate the board independence and debt maturity relation specifically for the times of financial instability.

[10] As an alternative explanation, the fact that some debtholders may serve as outsider directors in the board may impact their decision on the maturity of debt and they may provide longer term debt because they monitor the CEO directly. After determining those potential debtholder-directors in the board via Risk Metrics database, we control them in our regression models. Original results slightly improve and mainly stay robust.

[11] Considering the other provisions by SOX and SEC aside of the board independence, we also control for the existence of nominating committee, full independence of nominating, auditing and compensation committees in the main difference-indifference analysis. We 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.

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, we have the interaction variable: Board Independence*PostCrisis. We apply our 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 we can investigate the relation between the board independence and the debt maturity during the time of financial instability.

Table 5 displays the estimates from the difference-in-difference analysis with crisis periods only. Contrary to our original findings, we have weak results. 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, we 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.

5.4 Robustness

In our analyses, we 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, we concentrate on the new debt issuance only and repeat the main difference-in-difference analysis. The results are presented in Table 6. The positive impact of the increased board independence on the debt with longer maturity that is supported by our previous findings persists in this robustness test. Companies have less new debt with shorter maturity and more new debt with longer maturity as board's monitoring power increases via board independence.

In order to provide vigorous findings in our study we 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.[12] First, we consider the potential impact of different organizational structures. 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 firms which may not be easy to handle by small,

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

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, we need to investigate the effect of firm's organizational structure on our 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, we also examine any possible effects of the CEO duality on our previous results.

We apply two methods to explore any potential influence by the organizational structure. First, we introduce the dummy variable SingleSegment which equals to one if the company has one segment and zero otherwise. We conduct the main difference-in-difference model including this new control variable. The results are presented in Table 7. The positive relation between the board independence and the long term debt persists in these findings which show the robustness of our original results. Second, we build two sub-samples with single segment firms and conglomerate firms. Then, we run the difference-in-difference analysis with two different samples. The outcomes are presented in Table 8. Comparing the findings for both types of companies, we 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, we construct the dummy variable ChairCEO. It equals to one if the CEO is the chair of the board of the directors and zero otherwise. We conduct the main difference-in-difference model with this control variable. The results are presented in Table 7. Similar to our original findings, we obtain significant and negative relation between board independence and short term debt while a positive relation with long term debt. Further, we build two sub-samples considering CEO duality. 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 we conduct the difference-in-difference test with these subsamples and compare the results, we 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 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.

We have to investigate if our results are driven by the need for internal control via increased board independence as we suggest throughout this paper. That's why; we also focus on cases with and without the need for an improved control mechanism. When the CEO is the chair of board of directors, she may influence the board decisions. For such firms, the necessity of a disciplining mechanism on the CEO is certainly higher than for the companies without a CEO Duality issue. Table 8 presents findings of our main model on subsamples of firms with and without CEO Duality issues. It indicates that the results only for the subsample of CEO Duality are significant and similar to our original findings; which shows that actually it is the need for internal control via increased board independence which drives our main results. Furthermore, firms issuing convertible debt provide their debtholders conversion privileges which may alleviate the necessity of controlling the CEO by bondholders while the debtholders of firms with straight debt still need a strong internal control. Similarly, there are companies where the CEO has certain powers over the board of directors. Those firms can be represented by a high GIM Index,

and for those ones, the need for a strong control mechanism on the CEO is far more essential compared to companies with a low GIM Index where the board is more powerful. In untabulated analyses, we test our model via subsamples of firms with straight vs. convertible debt, as well as, firms with a high vs. low GIM Index. We find significant and similar results to our original findings only for the cases of straight debt and low GIM index, which shows if there is a need for internal control via increased board independence, then that can drive our findings on debt maturity.[13]

We conduct placebo tests in which we shift the time range of the study +/- two years while keeping the main structure of our model the same. By doing this, we can examine the existence of other potential firm related endogenous or independent exogenous shocks influencing the board independence and debt maturity relation. If we have any significant results from placebo tests, it means there are other trends or shocks than SOX regulations that affect the increase in board independence. In the first test, we 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, we 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 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.[14]

6. Conclusion

Throughout this study, we investigate the relation between strong corporate governance in terms of monitoring and the maturity structure of the firm's debt. In particular, we measure effective board monitoring via independence of the board of directors and try to

[13] Our main sample contains all kind of firms with straight and convertible debt, a high and a low GIM Index, and CEOs with and without Duality issues. Even though this may cause our results being underestimated, our original findings are still strongly significant.

[14] We also conduct additional placebo tests with a time shift of +/- one year and we 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.

reveal any impact of increased board independence on debt maturity choice. We control for other possible channels of influences on debt maturity and also estimate the firm leverage simultaneously. We construct a natural experiment for the period of 1996 to 2009 using 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 which mitigates both debt agency and managerial agency issues because better governance acts as a control mechanism on the CEO which benefits all the stakeholders; and also increased long term debt resolves the free cash flow problem. This result rejects null hypothesis of no relation and supports $H1_a$ hypothesis of a positive relation between board independence and 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 our knowledge, the monitoring characteristic of board via board independence has not been researched as one of the determinants of the debt maturity decision. Furthermore, we conduct our study via a natural experiment to make it sure that variables in the researched relation are clearly identified without any endogeneity issues. In order to find out any potential influence by other factors, we also examine specific conditions of board and organization characteristics, such as CEO duality and segment type of firms; and we provide robustness of the original findings. As an additional contribution, we explicitly focus on the era of financial instability and research how the relation between board independence and debt maturity is affected. Overall, we provide findings which can be a joint solution for debt agency and managerial agency problems. Taking everything into account, we can say that our paper not only solidifies the reliability of variable identifications via a natural experiment but also provides an unexplored effect of the internal board monitoring via board independence on the firm's debt maturity structure.

Tables and Figures

Table 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

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*	

Table 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 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

Table 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 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

Table 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	-0.053	0.051	0.161	0.120	0.447
	0.091	*0.090*	*0.106*	*0.109*	*0.419*	*0.431*
PostCrisis	0.094	0.105	-0.073	-0.131	-0.245	-0.174
	0.076	*0.079*	*0.089*	*0.095*	*0.352*	*0.377*
Board Independence*PostCrisis	-0.057	-0.075	0.123	0.126	0.345	0.083
	0.113	*0.117*	*0.132*	*0.140*	*0.521*	*0.556*
Leverage	-0.422***		0.612***		2.387***	
	0.067		*0.078*		*0.308*	
Leverage-(p)		-0.859***		0.803***		4.950***
		0.233		*0.270*		*1.027*
Profitability	-0.104	0.339***	0.094	-0.173	0.765*	-1.071*
	0.093	*0.115*	*0.108*	*0.139*	*0.427*	*0.548*
Asset Maturity	-0.117	-0.151*	0.146	0.183*	0.629	1.214***
	0.090	*0.083*	*0.105*	*0.099*	*0.415*	*0.394*
MB	0.035	-0.003	-0.146	-0.001	0.194	0.013
	0.212	*0.002*	*0.248*	*0.002*	*0.978*	*0.009*
Size	-0.050**	-0.012	0.039*	0.016	0.279***	-0.025
	0.020	*0.019*	*0.023*	*0.023*	*0.092*	*0.089*
Growth	-0.426**	-0.302	0.385*	0.321	1.567*	0.034
	0.190	*0.198*	*0.222*	*0.238*	*0.874*	*0.941*
Tangibility	0.001	0.159	-0.116	-0.376***	-1.335**	-1.870***
	0.123	*0.122*	*0.144*	*0.146*	*0.567*	*0.575*

Table 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	-0.001	-0.050	-0.026	0.339	0.260
	0.099	*0.089*	*0.115*	*0.107*	*0.455*	*0.422*
Volatility	0.001	0.002	-0.001	-0.001	-0.012**	-0.005
	0.001	*0.001*	*0.001*	*(\0.002*	*0.005*	*0.006*
HHI	0.041	-0.005	-0.038	-0.061	-0.249	0.050
	0.056	*0.057*	*0.065*	*0.068*	*0.256*	*0.269*
Constant	0.698***	0.509***	0.205	0.347*	1.398*	2.803***
	0.163	*0.150*	*0.190*	*0.181*	*0.751*	*0.715*
Adj. R-sq.	0.06	0.04	0.08	0.03	0.10	0.05
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

Table 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. 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 outside members in the board. 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. 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**	-0.188*	-1.376**	-1.466***
	0.007	*0.005*	*0.090*	*0.111*	*0.566*	*0.527*
Post	0.006	-0.028***	-0.301***	-0.164***	-1.142***	-0.962***
	0.006	*0.006*	*0.058*	*0.059*	*0.308*	*0.282*
Board Independence*Post	-0.014*	-0.012*	0.171*	0.153	1.238**	1.316**
	0.008	*0.007*	*0.099*	*0.116*	*0.596*	*0.551*
Leverage	0.021***		-0.028		-0.140	
	0.007		*0.037*		*0.171*	
Leverage-(p)		0.293***		0.268**		1.248*
		0.025		*0.159*		*0.746*
Constant	-0.018	0.024***	0.368***	0.197***	1.320***	1.084***
	0.015	*0.005*	*0.062*	*0.063*	*0.330*	*0.297*
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

Table 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 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

Table 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

Figure 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.

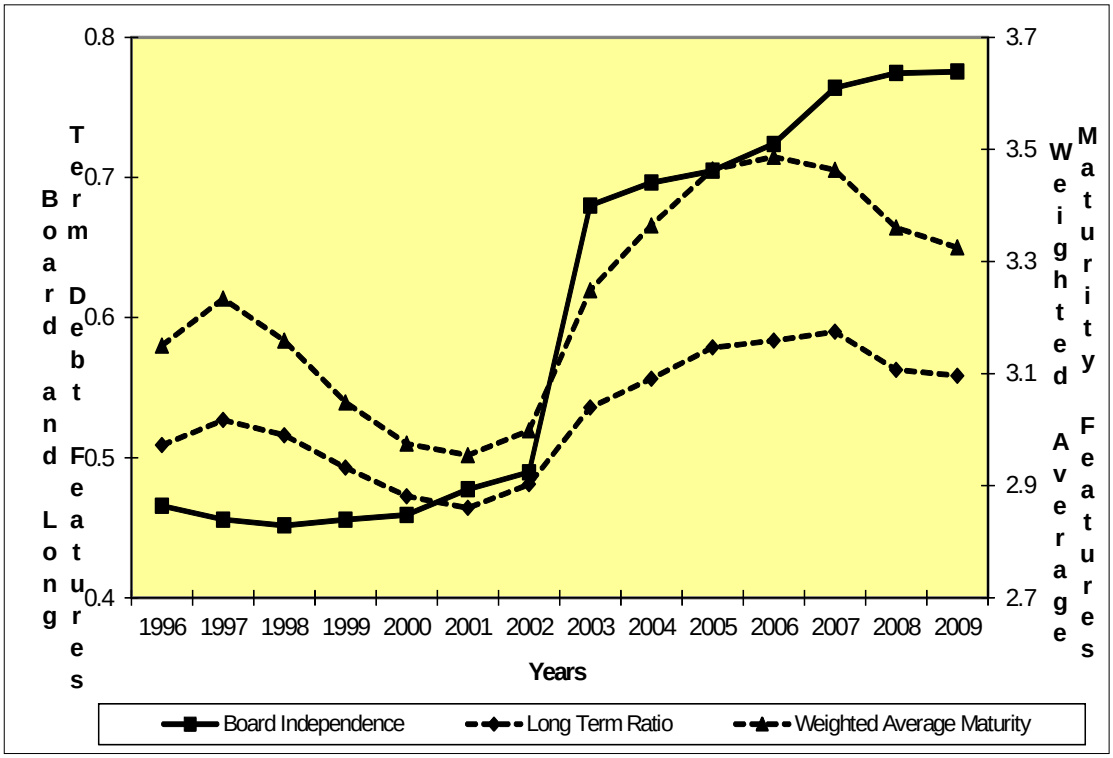

Figure 2: Distribution of Board Independence, Long Term Debt and Weighted Average Maturity

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.

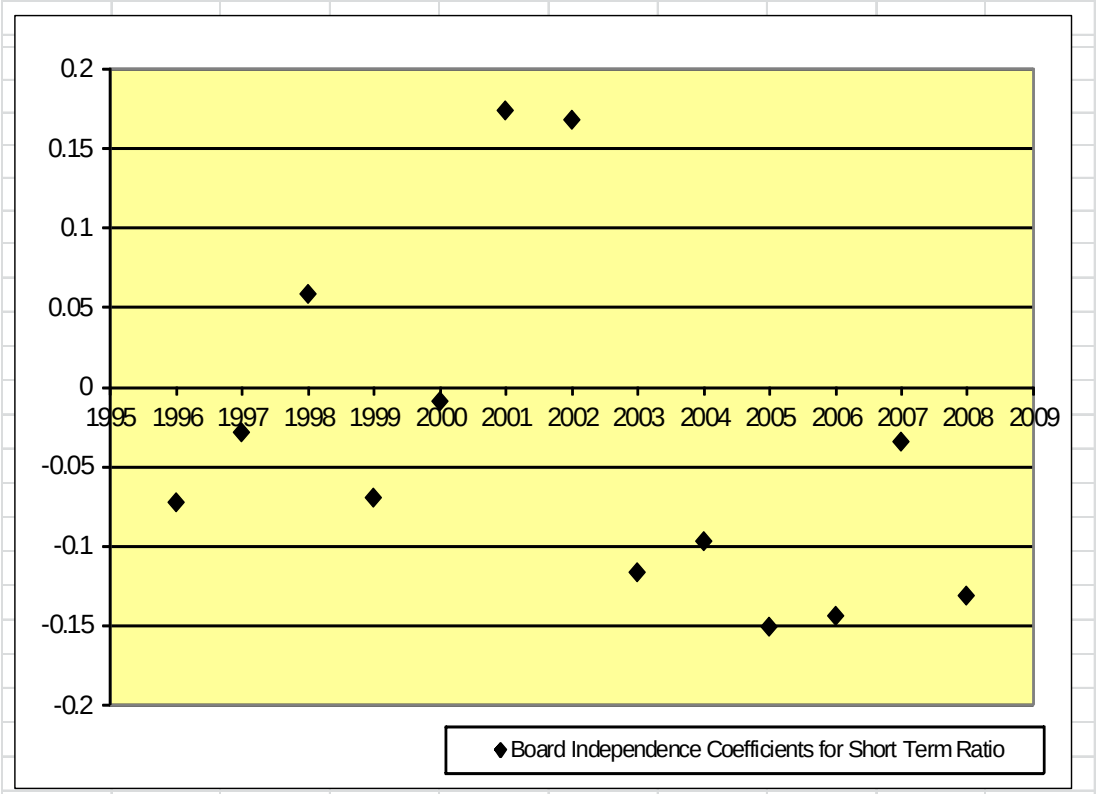

Figure 3: Yearly Board Independence Coefficient Estimates for Short Term Ratio

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.

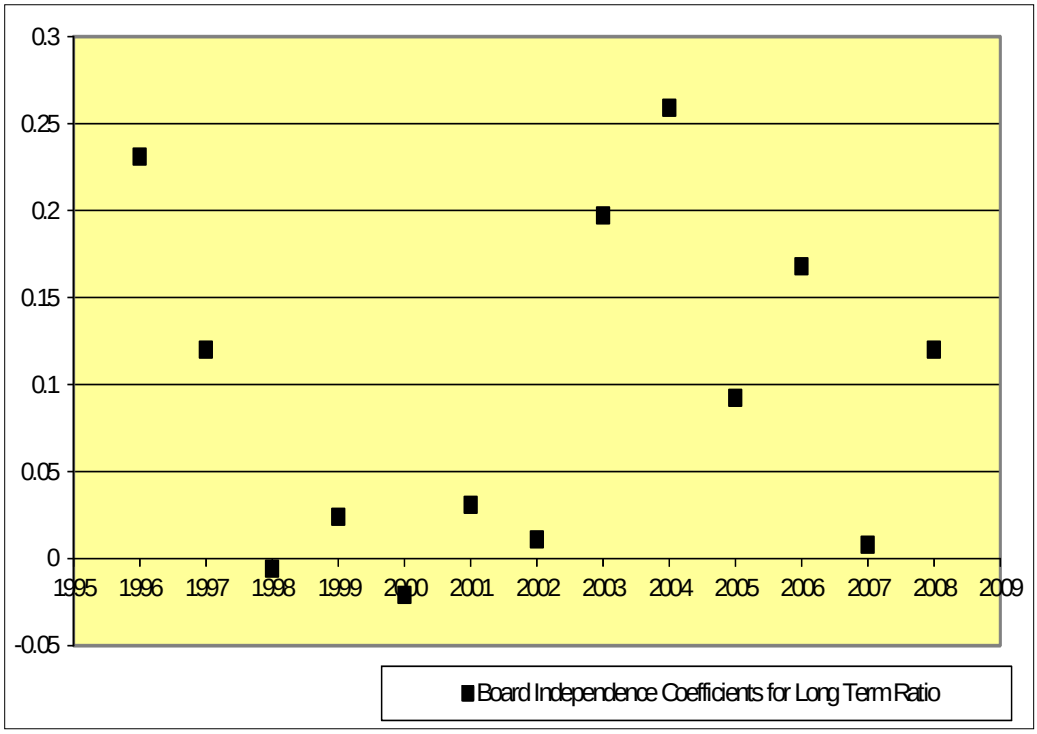

Figure 4: Yearly Board Independence Coefficient Estimates for Long Term Ratio

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.

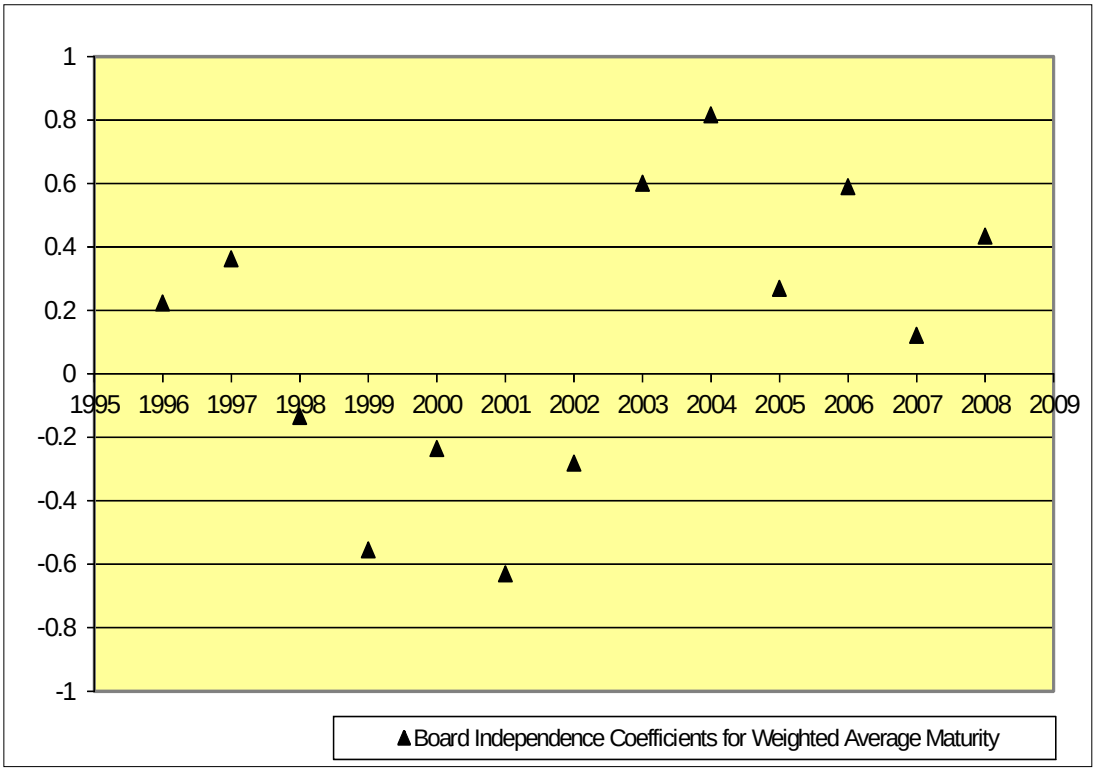

Figure 5: Yearly Board Independence Coefficient Estimates for Weighted Average Maturity

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.

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