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#### Article

## Corporate board vigilance and insolvency risk: A mediated moderation model of debt maturity and fixed collaterals

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#### **Empirical Paper**

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## Corporate board vigilance and insolvency risk: a mediated moderation model of debt maturity and fixed collaterals

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**Abstract:** Studies indicate that a consistent rise in insolvency risk should be addressed at the strategic level. Vigilant boards can use leverage maturity structure as a tool to control insolvency risk. However, according to the information asymmetry theory, leverage acquisition is subject to the presence of fixed assets which can be used as collateral. The current study focuses on the relationship between board vigilance and insolvency risk, mediated by debt maturity and moderated by fixed collaterals in Pakistan based non-financial firms. A data set of 284 firms is constructed between the years 2013 and 2017. Hierarchical multiple regression analysis is used to test the proposed hypothesis using ordinary least squares (OLS) and panel corrected standard errors (PCSE) regression estimators. The results indicate that debt maturity mediates the relationship between board vigilance and insolvency risk. New information is generated about the fixed collaterals, and these negatively moderate the relationship between leverage maturity and emerging market z-score indicating inefficiency in the usage of fixed assets as collaterals. These results are robust to both regression techniques confirming that the non-productive fixed collaterals overshadow the positives of tangible assets in asset structure.

**Keywords:** board vigilance, insolvency risk, debt maturity, fixed collaterals **JEL Classification:** G30, G32

#### **1** Introduction

Poor corporate governance remains a crucial issue in third world countries; it hampers the going concern nature of businesses and also damages the future prospects of the enterprise. In emerging economies, resource acquisition and utilization are unmanaged or mismanaged in the corporate sector, and thus, the need for a vigilant board becomes relevant. Board vigilance refers to the availability of a high percentage of independent directors in the composition of corporate boards and not the idea that the holding of a dual position of CEO and board chairman ought to be avoided. [Park et al., 2018]. This monitoring hypothesis

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places responsibility on the corporate boards of companies to monitor the role of managers so that they may make decisions to prevent undesirable outcomes. Insolvency avoidance is one of the critical results which need to be controlled through proper financial management. Inability on the part of an enterprise to honor its loan obligations leads to insolvency; this can be avoided by managing leverage decisions [Hussain et al., 2020a, b]. Conservative managers prefer long-term financing options since they postpone the rollover risk. Aggressive choices in leverage acquisition on the part of managers may put the firm on an insolvency track, but sometimes they also result in profit-oriented results. However, choosing between long-term and short-term loans involves a scenario-based decision. More risk-bearing firms tend to decrease their reliance on short maturity debt and less risky firms do not observe any such restriction. Loan acquisition is also subject to the availability of appropriate collaterals. A high percentage of fixed assets in the asset structure can serve as potential collateral that managers can use to acquire leverage on reasonable terms as validated by the information asymmetry theory [Anderson, 1990]. The current study of Pakistani non-financial firms is based on a mediated moderation framework. We analyze the mediating role of debt maturity based on the relationship existing between board vigilance and insolvency risk. Further, we analyze how tangible assets can moderate the mediating role of debt maturity.

Research on the mediating role of leverage maturity is rare, but there are a few papers that consider the mediating role of capital structure. Capital structure indicates the percentage of leverage in the overall financing structure of a company and debt maturity refers to the contribution of short-term and long-term debt to the debt structure. The existing body of literature on the subject suggests that the debt component of capital structures is more risky as compared to the equity component. Researches prove that the shortterm component is even more perilous in the debt structure as it involves rollover risk [Morris and Shin, 2016]. It means that the choice of debt maturity has its repercussions on firm risk levels. Short-term loans generate more current obligations while long-term loans postpone the current requirements to a future period. Hussain et al. [2020a] emphasized that the mediating role of debt maturity, apart from the capital structure, was tested as a weak mediator in their study.

Further, a different aspect underlying the usage of debt maturity and asset maturity in a single study is supported by the maturity matching principle. The maturity matching principal leads the debate on fixed assets and debt maturity association. Debt with long maturity can act as a tool for avoiding insolvency and fixed assets with longer maturity can help raise debt [Daskalakis and Psillaki, 2008]. Fixed assets are also crucial in loan repayment as they serve as a source of regular income that is used for debt servicing, and also they can be disposed to generate funds at the time of loan repayment. However, the unmatched maturity between the loan and assets can create troubles for the firm. Secondly, non-productive assets also increase the firm's financial burdens instead of creating avenues for loan redemptions. Assets are considered to be productive only if they generate revenue or it is estimated that they have the potential to generate revenue in the future [Sriram, 2008]. In the case of external leverage, firms can also face difficulties if the resale value of fixed assets fluctuates; this concept is principally discussed at the time of redeployment of assets [Campello, 2007]. This study contributes to the current literature in many ways. It assesses the mediating role of debt maturity in an emerging economy and also the moderating role of fixed collaterals in a single study. Previous literature has suggested that fixed collaterals positively moderate the relation between leverage and insolvency risk by referring to a reduction in insolvency because of the moderating role [Lee et al., 2011]. We will corroborate the mediated moderating role of debt maturity and potential fixed collaterals in a board vigilance and insolvency risk relationship framework, as presented in Figure 1.

Many literatures discuss the role of financial constraints in the financial sector of Pakistan. The nonfinancial sector, a consumer of external financial leverage, is less focused in the context of insolvency risk. Moreover, according to the World Bank [2016] indicators, the selection of Pakistani firms is an excellent choice for this purpose owing to multiple reasons. First of all, Pakistan has the lowest credit to GDP ratio (15.4%) based on credit extended to local private firms. The ratio is very high in other countries such as Sri Lanka (40.7%), Bangladesh (43.9%), and India (52.2%) when compared by using the same criteria.



Figure 1. A conceptual model of the current study.

Pakistani firms also face the highest interest rates in the sub-continent, and the average is 8.32%. Further, non-performing loans (NPLs) are very high and they account for 11.3% of the total advances. This ratio of Europe, the United States, and India is found to be 5.4%, 1.5%, and 7.6%, respectively. These figures clearly exhibit constrained access to loans by Pakistani firms and it becomes more severe when the country faces financial troubles, which is a regular feature of Pakistan's economy. Thus, Pakistan offers a perfect case to study because of the operation of these financial constraints.

#### 2 Literature review and hypothesis development

#### 2.1 Board vigilance and insolvency risk

Board vigilance has two sub-constructs, namely board independence and CEO non-duality. There is an abundance of literature focusing on the relationship these two share with insolvency risk. However, most researches have used CEO duality instead of non-duality; yet, this doesn't create any difficulty when interpreting the past literature. Three primary theoretical justifications explain the relationship between board independence and insolvency risk. According to the reputation hypothesis, the managers are advised by the autonomous boards to invest in less risky projects which reduce the chances of failure and save a firm reputation [Pathan, 2009]. The monitoring hypothesis also supports the argument that firms with more non-executive members onboard control the high risk-taking behavior of managers through continuous monitoring. Finally, the agency theory also advises in limiting the conflict between agents and principals by safeguarding the interests of shareholders [Brick and Chidambaran, 2008]. Undue risktaking can put firms under distress and hence more independent boards prevent managers from indulging in actions which cause the firm to undergo considerable risk-taking. Karkowska and Acedański [2019] obtained data from 239 firms from 40 different countries to ascertain the role of board independence and risk and found a negative association between them. Chong et al. [2018] investigated the data of 290 public firms listed in Malaysia from 2010 to 2014 and they reported an inverse relationship between board independence and insolvency risk as well. Mathew et al. [2016] and Akbar et al. [2017] have also supported a negative association between risk and board independence among UK based firms. Berger et al. [2016] studied this relationship in US commercial banks and also confirmed the existence of a negative association between board independence and chances of firm failure. Rossi [2016] analyzed the impact of a number of independent members in a firm's board on profitability and risk based on data of 82 Italian firms. His reports of positive impact on profitability and adverse effects of risk were also consistent with the results of other studies.

Most of the past literature points toward the availability of a positive linkage between CEO duality and insolvency risk, which enables us to interpret that there should be a negative association between CEO non-duality and risk. Dong et al. [2017] reported a positive impact of CEO duality on risk and also captured a negative effect on firm efficiency in their analysis. Carmona et al. [2016] also discovered similar evidence by studying the link between CEO duality and risk disclosure. Daily and Dalton [1994] made a comparison between failed businesses and businesses in operation. These findings revealed that a higher percentage of businesses fail because the same individual holds the position of both CEO and chairman. There is also empirical evidence that establishes a negative association between CEO duality and insolvency risk; theoretically, this is justified through the stewardship theory, which postulates that a goal-oriented and enthusiastic person can bring more good results. Such a person is spared by procedural delays and unnecessary objections in making better decisions for organizational well-being. Recently, Felício et al. [2018] reported a negative association between CEO duality and firm risk. Armeanu et al. [2017] also supported these results as they found a negative relationship between CEO duality and failure risk, but their results were insignificant. Similarly, Boussaada and Labaronne [2015] analyzed the insignificant role of the duality while regressed on credit risk. Based on the literature discussed in this section, we propose the following hypothesis:

*H*<sub>1</sub>=*Vigilant boards reduce corporate insolvency risk.* 

 $H_{Ia}$  = Independent boards reduce the corporate insolvency risk.

 $H_{tb}$  = CEO non-duality reduces the corporate insolvency risk.

#### 2.2 Board vigilance and debt maturity

There is a plethora of researchers who have established the relationship between board vigilance and financial leverage [Kieschnick and Moussawi, 2018; Aktas et al., 2019]. However, evidence on debt maturity in comparison to overall debt is scarce and needs to be studied more frequently. There is proven diversity among the results generated over the years related to debt usage. However, there are specific characteristics of boards which result in particular outcomes. A more independent board has consistently been ascertained to be capable of taking unbiased decisions on various problems as well as on deciding the debt maturity. The agency theory pushes the firm to opt for the non-duality of the CEO to avoid aggressive adventures of individuals who are vested with overly vested power. On the other hand, stewardship theory and resource dependency theory favor CEO duality. In this scenario, a determined CEO can work with complete freedom and without any interruption. Moreover, he can deploy organizational resources with ease to get results. However, the literature related to this theory disagrees with the concept of separation of duties at the top strategic level. Past research suggests that conservative boards accumulate more long-term debt in the corporate debt structure as it is less risky as compared to the short-term debt. However, more vigilant and informationally efficient boards have shown progress while using short-term debt. A corporate board is considered more useful if it has good negotiating power and better market relations that enable the firm to re-acquire short-term debt regularly and at reasonable terms [Harford et al., 2008].

The literature on one hand portrays the short-term debt as risky, but on the other hand considers it is a tool to discipline the managers. Superior skills are needed to handle the short-term debt to get excellent results because it enhances the chances of bankruptcy generally. Long-term debt, on the other hand, delays the probability of financial default but cannot be as rewarding as short-term debts. Recently, Tosun and Senbet [2020] confirmed the positive effects of an internal board monitoring mechanism. They observed a positive relationship between board independence and long-term debt and this evidence is found to be consistent in firms with CEO duality and with other robustness tests. Sheikh and Wang [2012] also made the same proposition regarding independent directors. Alves et al. [2015] stated that boards with more independence prefer short term leverage on retained profits, long-term debt over short-term debt, and equity financing over long-term debt. Huang et al. [2016] have stated that overconfident CEOs prefer more short-term debt. Shyu and Lee [2009] took data of 611 Taiwanese listed firms from 2002 to 2006 and

observed a negative association between CEO duality and short-term debt by employing GMM regression. So, the resultant hypothesis can be constructed as:

 $H_2$ = Vigilant boards attract more long -term debt in leverage structure.

 $H_{2a}$  = Independent boards attract more long-term debt in leverage structure.

 $H_{2b}$  = CEO non-duality attract more long-term debt in leverage structure.

#### 2.3 Debt maturity and insolvency risk

The available literature supports the notion that debt with longer maturities is less risky when compared to short-term debt. Cathcart et al. [2020] observed the impact of leverage on the default risk of large, medium-sized, and small enterprises. They observed a significant effect of leverage on default risk but it was more severe in SMEs due to their exposure to short-term financing. The difference between defaulted and survived firms lies in the maturity of their consumed debt. Della Seta et al. [2020] also opposed the view that short-term debt can be a value enhancer. They suggested that the rollover risk and other operational losses enhance the default risk due to the presence of high financial friction and fair debt pricing. Wang et al. [2020] confirmed the rollover risk hypothesis in US-based firms. They explained that an increase in short-term debt causes an increase in the cost of debt and credit risk eventually. However, this phenomenon was not severe in high growth firms. The asset substitution hypothesis is in contradiction to the associated rollover risk. Its proponents claim that short-term debt is closely monitored and negotiated. However, the majority of the recent researches are in agreement with the hypothesis concerning rollover effects. Chen and Duchin [2019] believed that unpaid high levels of debt with shorter maturities increase asset risk leading to distress as such firms invest more in financial securities.

Short-term debt puts the firms on run risk and long-term debt generates risk-shifting tendencies for the firms [Cheng and Milbradt, 2012]. He and Xiong [2012] supported the association of rollover risk and short-term debt, and the hypothesis that the probability of default intensifies since it causes conflict between shareholders and debtholders. Wang and Chiu [2019] confirmed the claims that short-term debt increases the chances of default. They analyzed the data of five Pacific Basin nations during 2002–2016. They also evidenced that it is highly undesirable for firms under financial difficulty to accumulate liquid reserves to cope with this situation. Adachi-Sato and Vithessonthi [2019] showed that an increase in debt maturity reduces the volatility in firm performance in the future.

 $H_3$ = Debt with long term maturity reduces corporate insolvency risk.

#### 2.4 Mediating role of debt maturity

Past studies prove the importance of governance in corporations, especially in today's dynamic business environment [Wan and Ong, 2005; Kula and Tatoglu, 2006]. The research on the board's decision-making in performing their duties is still insufficient [Hasnah and Hasnah, 2009] especially in the context of risk avoidance. Past literature has mainly focused on the study of a direct influence of board attributes, structure, and composition, on corporate performance, financial leverage, and risk [Rohana et al., 2009; Noriza, 2010]. Research on board processes and decision making is necessary since the literature focusing only on board characteristics is insufficient to ensure adequate quality. The board process refers to the tactics adopted by board members to perform their duties and the reflection of company decisions [Macus, 2008]. The Board of directors has a monitoring role to play in governing the financial affairs of the company. So, they are supposed to observe intensely the decision making and performance, keeping in mind all relevant risk tolerance approaches [Jensen and Meckling, 1976]. There is recent evidence on the mediating role of financial leverage [Detthamronga et al., 2017; Ramli et al., 2018; Naseem et al., 2020], but there is

not enough empirical evidence that supports the mediating role of debt maturity except financial leverage [Hussain et al., 2020b]. By focusing on the mediating role of debt maturity on growth and insolvency risk relationship, some studies have established the relationship between board independence and debt maturity [Sheikh and Wang, 2012; Alves et al., 2015] and between CEO duality and debt maturity [Ataullah et al., 2018; Tosun and Senbet, 2020]. There is also plenty of evidence that supports the relationship between debt maturity and insolvency risk [Javadi and Mollagholamali, 2018; Brancati and Macchiavelli, 2020]. Therefore, the current study proposes the following hypothesis to evaluate the mediating role of debt maturity on the relationship between board vigilance and insolvency risk.

 $H_4$ = Relationship between board vigilance and corporate insolvency risk is mediated by debt maturity.

- $H_{4a}$  = Relationship between board independence and corporate insolvency risk is mediated by debt maturity.
- $H_{ab}$  = Relationship between CEO non-duality and corporate insolvency risk is mediated by debt maturity.

#### 2.5 Moderating role of fixed collaterals

There are several theoretical explanations for the moderating role of fixed assets that can act as potential collaterals in pursuit of financial leverage. Resource dependency theory explains that business assets are possible resources which can be used to perform business operations and generate profitability. Fixed assets do not act only as operational wheels but also can be used as a source of bringing liquidity to the business through loan acquisition [Lowe et al., 1994]. This scenario establishes a positive link between the presence of fixed assets and financial leverage [Alipour et al., 2015]. Plenty of research proves a negative impact of fixed collaterals on insolvency risk [Barton et al., 1989]. Daskalakis and Psillaki [2008] reported that firms that invest more in fixed assets feel less distressed. Recently, Alfaro et al. [2019] determined the importance of total assets in defining the association between financial leverage and financial fragility in emerging markets. They further insisted that large firms are more fragile and equally crucial for economic growth. Lee et al. [2011] studied the relationship between leverage and financial distress in the restaurant industry in the USA. This study found out the positive moderating role of the capital intensity measured through fixed assets to total assets ratio on the relationship between financial leverage and distress. So, the positive association between financial leverage and financial difficulty may be moderated by the volume of tangible assets possessed by firms, other things remaining constant. Joshi [2018] reported that firms with better risk management systems issue more debt and acquire more tangible assets. Increased debt causes more risk, but it is neutralized through better risk management practices. Firms having a higher debt component as compared with equity also exhibit better cash flows with stability in sales and profits. Recently, Xuezhou et al. [2020] analyzed the interaction of asset tangibility in Pakistan-based non-financial firms that are directly or indirectly associated with agriculture. They reported that tangible assets negatively moderate the relationship between leverage maturity and insolvency risk.

 $H_{\rm s}$ = Fixed collaterals moderate the relationship between debt maturity and corporate insolvency risk.

#### **3 Methods**

#### 3.1 Sample, data, and sources

A total of 369 non-financial firms were listed in the Pakistan Stock Exchange (PSX) at the end of the year 2017, which was the last year of the study period presently adopted. The detailed study sample comprising of 284 listed and non-financial firms of Pakistan is presented in Appendix A. These firms are divided into 14 different sectors and a fair representation of firms is given to each sector. The highest number of

firms are from the textile sector i.e., 101 firms out of 136 firms. The distribution of firms in other sectors is comparatively small but within sectors, even the smallest contribution of firms is 50% of what belongs to other services activities, as can be seen in the percentage column of Appendix A. Further, the firms are included under sectors "Cement Sector and Motor Vehicles, Trailers & Autoparts" in the final sample as represented by 100% in the percentage column. The data for this study was extracted from multiple sources and made part of the sample based on several criteria. The five-year financial data (2013–2017) is obtained from the financial statement analysis (FSA) published by the State Bank of Pakistan (SBP) for the years 2012–2017. The data regarding board vigilance was manually extracted from the audited financial statements of individual firms in annual frequency available at the official website of the Pakistan Stock Exchange (PSX) and also the respective websites of the different firms. The criteria for exclusion of firms was as follows: (a) those firms with missing values were dropped, (b) firms not in operation during the study period were excluded, and (c) and firms with no return on assets (ROA) data for five years before the study period were also excluded because it was needed to calculate the volatility of the profits.

#### 3.2 Study variables

#### 3.2.1 Independent variable

This study aims at analyzing the mediated and moderated role of debt maturity and fixed collaterals on the relationship between board vigilance and insolvency risk. Consequently, board independence and CEO non-duality are our independent variables which are collectively termed as board vigilance. Board independence refers to the combined percentage of independent and/or non-executive directors present on the corporate board. The CEO non-duality is measured as a binary number and assumes the value "1" if there is no dual responsibility of CEO and chairman of the board of directors held by the same individual and "0" otherwise.

#### 3.2.2 Dependent variable

The dependent variable insolvency risk is measured through the emerging market z-score presented by [Altman, 2005] which is represented in the form of following equation (1):

$$IR (emerging market z - score) = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4 + 3.25$$
(1)

In equation (1) *IR* shows insolvency risk for which we used emerging market z-score as a proxy. This model uses ratios ranging from  $X_1$  to  $X_4$ . The first ratio is shown as  $X_1$ , which is the ratio between working capital and total assets. The second ratio is  $X_2$ , which is the ratio between retained earnings and total assets, and  $X_3$  is a ratio between operating income and total assets. Finally,  $X_4$  is a ratio between the book value of equity and total liabilities. A z-score value of less than 3.75 shows high insolvency risk and a value between 3.75 and 5.85 is a gray zone. Firms with emerging market z-score of above 5.85 are considered safe since they have low insolvency risk. This measure is a modification of the traditional z-score but it is more appropriate for emerging markets since it has better precision compared with other models in emerging markets and is also widely used in emerging economies. The only difference between this amended model and the traditional model is that it uses the book value of assets in place of the market value of assets owing to less trade liquidity in these markets.

#### 3.2.3 Mediator variable

The current study is based on the proposition that debt maturity is more crucial when compared to capital structure; also, the measure used to compute maturity is multidimensional as it is capable of interpreting the role of both short-term and long term-debt maturity [Xuezhou et al., 2020]. The mediator variable debt maturity is measured as a ratio of long-term liabilities to total liabilities [Orman and Bülent, 2015].

#### 3.2.4 Moderator variable

The study proposes that the availability of fixed collaterals is highly advantageous since it enables managers to make better borrowing decisions. So, they have been introduced as an interacting factor in this analysis. We used a proxy for fixed collaterals that represent a ratio between a firm's fixed assets and total assets [Mota and Moreira, 2017].

#### 3.2.5 Control variable

Several control variables are also used in this study that includes firm size, taxes, growth, profitability, risk, and liquidity. The variable firm size is measured as a logarithmic value of total assets [Patel et al., 2018]. Past researchers claim that "firm size does matter" and this conclusion has led us to control its effect in studying our propositions in this paper. We used taxes as it affects the leverage structure since debt is a tool for tax saving in high tax-paying firms [Hussain et al., 2020a]. Growth-oriented firms usually take an aggressive position that translates into more risk and vice versa. A rate of change in firm assets is considered as a measure for firm growth [Handoo and Sharma, 2014]. Profitable firms have a low tendency of being insolvent and can also obtain more loans on account of the higher ability in paying regular debt-related costs. So, return on assets can reliably be used as a proxy for profitability [Saeed and Sameer, 2017]. Risky firms tend to use less debt as they are already facing difficulties. We measured risk as volatility of return on assets [Palich et al., 2000]. Finally, the firms that have a better liquidity position can quickly meet short term obligations and also bear less financial distress [Goel et al., 2015]. The detail of the study variables, their measurement techniques, and econometric notations are reported in Appendix B.

#### 3.3 Econometric model

The primary purpose of this study is to capture the mediated moderation effect of potential fixed collaterals with debt maturity as mediators. We followed the footsteps of Cheng et al. [2019] and used the hierarchical multiple regression approach to detect the mediated and moderated role of debt maturity and fixed collaterals. This approach involves multiple regressions conducted stepwise on eight different models to prove our hypothesis. The following equations (2) and (3) will explain the final regressions in this eight-step process that incorporate all the study variables, but deal with the two independent variables separately.

$$IR_{i,t} = \alpha + \beta_1 (NDU_{i,t}) + \beta_2 (DMR_{i,t}) + \beta_3 (FC_{i,t}) + \beta_4 (DMR^*FC_{i,t}) + \beta_5 (SIZE_{i,t}) + \beta_6 (TAX_{i,t}) + \beta_7 (FG_{i,t}) + \beta_8 (ROA_{i,t}) + \beta_9 (\sigma ROA_{i,t}) + \beta_{10} (LIQ_{i,t}) + \beta_{11} (DummyYE_{i,t}) + \beta_t$$
(2)

$$IR_{i,t} = \alpha + \beta_1(BI_{i,t}) + \beta_2(DMR_{i,t}) + \beta_3(FC_{i,t}) + \beta_4(DMR^*FC_{i,t}) + \beta_5(SIZE_{i,t}) + \beta_6(TAX_{i,t}) + \beta_7(FG_{i,t}) + \beta_8(ROA_{i,t}) + \beta_9(\sigma ROA_{i,t}) + \beta_{10}(LIQ_{i,t}) + \beta_{11}(DummyYE_{i,t}) + \beta_t$$
(3)

The notation *IR* represents insolvency risk measured through the emerging market z-score. We used *NDU* in equation (2) that stands for our first independent variable non-duality of the CEO. In equation (3) we used the second independent variable known as board independence and represented by *BI*. The debt maturity ratio is shown as *DMR* and fixed collaterals stand as *FC*. The interaction term between debt maturity ratio and fixed collaterals is represented by *DMR\*FC*. This study used six control variables namely size, taxes, firm growth, profitability, risk, and liquidity posed by *SIZE*, *TAX*, *FG*, *ROA*, *oROA*, and *LIQ*, respectively. We also controlled the time and industry effects in our regression models using year and industry dummies represented by *DummyYE* and *DummyIE*, respectively. The notation  $\alpha$  is intercept or constant term and  $\beta_i^{12}$  represents our regression coefficients.

#### **4** Empirical results

This section reports the study results and starts with the data description, which is essential to understand the nature of data. This section also indicates the main regression results using ordinary least squares (OLS) regression with robust standard errors and cross-checks also made by applying alternate regression techniques.

#### 4.1 Descriptive analysis

The study sample comprises 1420 observations for each variable, making it a balanced pool of panel data as reported in Table 1. This table reports the mean values of each variable with their standard deviations. Further, it also reports the correlations among study variables with their reported level of significance.

The mean value for insolvency risk is 9.96, which shows that on average, the sampled firms are in a safe zone revealing the low level of insolvency risk and shows a variation of 76.86 from this mean value. The mean value for board independence is 2.64 and its standard deviation is 0.24. CEO non-duality is a binary number and is not explained in descriptive terms. The data regarding debt maturity reveals that there is 27% long-term debt in the debt structure of selected firms and it can vary up to 21% across firms. However, it is found that the proportion of fixed assets that can be used as collaterals for loan acquisition is 55% of the total assets and it can vary up to 22%. This shows the disparity between the debt maturity and asset maturity structure of Pakistani firms. The reported correlation between debt maturity and fixed collaterals also shows a significant negative association between these two variables. This evidence is against the maturity matching principle according to which loan repayment period should match the asset maturity period. Instead, it depicts that firms in Pakistan are extensively using debt with short term maturity. Moreover, the correlations among all study variables are smaller which means there is no problem of multicollinearity among the data series used.

#### 4.2 Main results

Table 2 presents the OLS regression results with robust standard errors by including CEO non-duality as the independent variable. We employed hierarchical regression which includes a set of variables under eight different models. The first two models consider debt maturity as the dependent variable and the next six models assume insolvency risk as a dependent.

Among control variables, size and taxes have an insignificant impact in all of the eight models, but they have positive coefficients for debt maturity as dependent variables and negative coefficients for insolvency risk as dependent variables. The firm growth has a significant positive impact on debt maturity, but its impact is negative and insignificant for all the remaining models which consider insolvency risk as a dependent. However, size, taxes, and growth have a negative but insignificant impact in the final model that has incorporated all the independent variables having coefficient values of -1.10897, -0.53800, and -0.28125, respectively. The remaining control variables have a significant impact on insolvency risk. Profitability reduces insolvency risk, as it has a positive impact ( $\beta = 0.30508^{**}$ ). The liquidity also reduces insolvency risk ( $\beta = 1.13018^{***}$ ), and risk impact insolvency risk adversely ( $\beta = -0.43472^{**}$ ).

CEO non-duality has a significant negative impact on the debt maturity ratio ( $\beta = -0.02763^*$ ), but it consistently had a positive but insignificant impact on insolvency risk ( $\beta = 3.77374$ ). Debt maturity has a significant positive impact on insolvency risk which means that firms with more long-term financing reduce insolvency risk to listed firms in Pakistan. The significant impact of non-duality on debt maturity and significant impact of debt maturity. Further, it confirms the presence of full mediation between CEO non-duality and insolvency risk using hierarchical regression.

The interaction term *DMR\*FC* is introduced to capture the moderating effects of fixed collaterals on the relationship between debt maturity ratio and insolvency risk. The OLS regression results with robust standard errors prove a negative moderating effect of fixed collaterals ( $\beta = -140.6002^{***}$ ). As suggested by

	1	2	3	4	5	6	7	8	6	10	11
1) Insolvency Risk (IR)	4										
2) Board Independence (BI)	0.0017	1									
<ol><li>Non-duality (NDU)</li></ol>	0.0262	0.1321*	1								
4) Debt Maturity (DMR)	0.0390	0.0163	-0.0642*	1							
5) Fixed Collaterals (FC)	-0.0832*	$-0.1496^{*}$	-0.1127*	-0.4745*	1						
6) Size (SIZE)	-0.0092	0.2247*	0.1168*	0.0590*	0.0021	1					
7) Taxes (TAX)	0.0035	-0.0509	0.0046	0.0112	-0.0224	0.0354	1				
8) Growth (FG)	-0.0030	0.0475	0.0420	0.0948*	0.0361	0.0174	0.0086	1			
9) Profitability (ROA)	0.0897*	0.0622*	0.0800*	-0.0265	-0.1993*	0.2091*	0.0434	0.443	1		
10) Volatility of returns (gROA))	-0.0598*	0.0200	0.0524*	$-0.1519^{*}$	-0.0369	-0.2670*	0.0046	0.0018	0.0305	1	
11) Liquidity (LIQ)	0.1498*	0.0111	0.0115	-0.0407	-0.1809*	-0.1223*	0.0040	-0.0090	0.0349	0.0543*	1
×	9.96	2.64	I	0.27	0.55	15.29	16.41	0.09	4.04	7.66	2.12
α	76.86	0.24	I	0.21	0.22	1.76	0.43	0.48	16.23	10.44	10.08
Z	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420	1420
<b>Note:</b> * <i>p</i> < 0.05 (two tailed).											

Table 1. Mean, Standard Deviation and Correlations

	Debt M	aturity			Insolvency	Risk		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variables								
Size	0.00160	0.00224	-0.93308	-1.02897	-1.09899	-0.96605	-0.97568	-1.10897
(SIZE)	(0.003)	(0.003)	(1.374)	(1.380)	(1.376)	(1.381)	(1.375)	(1.370)
Тахез	0.00772	0.00769	-0.16607	-0.16175	-0.40188	-0.18751	-0.54600	-0.53800
(TAX)	(0.011)	(0.011)	(4.654)	(4.655)	(4.643)	(4.655)	(4.635)	(4.617)
Growth	0.04132***	0.04205***	-0.34973	-0.46025	-1.77269	-0.16476	-1.53567	-0.28125
(FG)	(0.010)	(0.010)	(4.157)	(4.160)	(4.173)	(4.168)	(4.166)	(4.166)
Profitability	-0.00013	-0.00011	0.36536***	0.36229***	0.36585***	0.33794**	0.30989**	0.30508**
(ROA)	(0000)	(0000)	(0.131)	(0.131)	(0.131)	(0.133)	(0.132)	(0.132)
Volatility of returns	-0.00289***	-0.00280***	$-0.53881^{***}$	$-0.55181^{***}$	-0.46419**	-0.55673***	-0.44523**	-0.43472**
(aroa)	(0.001)	(0.001)	(0.201)	(0.202)	(0.204)	(0.202)	(0.203)	(0.203)
Liquidity	-0.00035	-0.00035	1.14943***	1.14839***	1.15940***	1.10864***	1.06987***	$1.13018^{***}$
(TIO)	(0.001)	(0.001)	(0.202)	(0.202)	(0.202)	(0.205)	(0.205)	(0.205)
Independent Variable								
Non-duality		-0.02763*		4.14921	5.01171	3.58257	3.98121	3.77374
(NDN)		(0.014)		(5.797)	(5.789)	(5.818)	(5.794)	(5.771)
Mediator								
Debt Maturity					31.20601***		42.07174***	134.6859***
(DMR)					(10.604)		(11.469)	(29.084)
Fixed Collateral						-11.74894	-27.59376**	0.16597
(FC)						(10.398)	(11.217)	(13.751)
Moderator	-							
DM*FC								-140.6002***
								(40.604)
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.24	0.24	0.06	0.06	0.06	0.06	0.07	0.08
Adjusted R <sup>2</sup>	0.23	0.23	0.04	0.04	0.05	0.04	0.05	0.06
F stat	19.29***	18.67***	3.75***	3.61***	3.84***	3.52***	3.93***	4.26***
*** × / 0 01: ** × / 0 0E: * ×	× 0 10	-						

Table 2. Results of hierarchical OLS regression with non-duality as IV

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\*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.10. Note: The values in parenthesis show standard errors.

previous literature, the regression results provide new evidence that in an emerging economy a business with more fixed assets which can be used as collaterals should have low insolvency risk. This new evidence suggests that potential fixed collaterals increase insolvency risk in the listed firms of Pakistan. It confirms the results generated by Xuezhou et al. [2020], which suggest that Pakistan firms do not use tangible assets to their advantage and they accumulate non-productive assets that have more maintenance and associated fixed costs. This scenario makes fixed collaterals a risk enhancing factor when compared to the other countries where they caused a reduction in insolvency risk [Lee et al., 2011].

Table 3 reports board independence as an independent variable while other things remain the same. The impact of size, taxes, profitability, and liquidity on debt maturity is insignificant, but it is negatively correlated to profitability and liquidity. Growth is a significant positive predictor of debt maturity whereas risk is a substantial negative predictor of debt maturity in the listed firms in Pakistan. Size, taxes, and growth proved to have an insignificant negative impact on insolvency risk. Results for profitability, risk, and liquidity were significant and only volatility of returns had a negative influence on insolvency risk among these three. Board size, our second independent variable, turns out to be the significant positive  $(\beta = 0.07101^{***})$  influencer of the debt maturity as reported under model 2.

Further, debt maturity had a significant favorable influence on emerging market z-score ( $\beta$  = 135.3171\*\*\*) showing a reduction in insolvency risk. Further, it also completes the indirect impact of board independence on insolvency risk via debt maturity and once again confirms the mediating role of debt maturity in this relationship. Fixed collaterals once again negatively moderated the impact of leverage maturity structure on insolvency risk ( $\beta$  = -140.8334\*\*\*). This evidence once again confirms that non-productive fixed assets with high associated costs increase insolvency risk in Pakistan firms.

#### 4.3 Robustness check with PCSE regression

We also employed panel corrected standard errors (PCSE) regression as an alternative, to make our analysis more rigorous and robust. The PCSE regression calculates superior standard error estimates efficiently and hence generates correct standard errors of coefficients [Reed and Webb, 2010]. It creates robust standard errors that not only controls for heteroscedasticity, but also for serial correlations [Bailey and Katz, 2011]. According to Marques et al. [2016], the PCSE estimator is also highly suitable when the number of cross-sections is greater than the time intervals i.e., (N > T).

Table 4 reports the hierarchical PCSE regression results by considering CEO non-duality as the independent variable. The firm size, taxes, and firm growth had a positive, but insignificant impact on the debt maturity ratio. The profitability, volatility of returns, and liquidity showed a negative effect on the debt maturity ratio, but coefficient values for the volatility of returns were significant. For insolvency risk, the firm size and volatility of returns showed significant negative coefficients, but profitability and liquidity displayed significant positive beta coefficients. The influence of taxes and firm growth on insolvency risk was insignificant at a 5% level of confidence.

The CEO non-duality had a significant negative impact on the debt maturity ratio, having a beta value of -0.02763 and a *p*-value of less than 0.01. The effect of debt maturity ratio on insolvency risk is also significant but positive ( $\beta = 134.6859^{***}$ ) confirming the indirect path coefficients through debt maturity. Interestingly, the direct impact of CEO non-duality on insolvency risk also tested to be positive and significant ( $\beta = 3.77374^{**}$ ), hence proving the partial mediating role of debt maturity ratio using PCSE estimates. The moderating role of fixed collaterals between leverage maturity and insolvency risk once again turned out to be significantly negative proving our previous observation of association of non-productive assets with high costs ( $\beta = -140.6002^{***}$ ).

Table 5 is also based on PCSE regression estimates, but it uses board independence as an independent variable. Similar results as compared to Table 4 are evident for the control variable in this case also i.e., the significant negative role of the volatility of returns in defining debt maturity ratio at a 1% level of significance. Similarly significant negative impact of size and volatility of returns on insolvency risk are observed, but there is significant positive impact of profitability and liquidity on insolvency risk and insignificant negative impact of taxes and growth on insolvency risk in this case also. The board's independence had a significant

						2		
	nen	r maturity			IIISOLV	ency kisk		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variables								
Size	0.00160	-0.00022	-0.93308	-0.94319	-0.93628	-0.87341	-0.77118	-0.91159
(SIZE)	(0.003)	(0.003)	(1.373)	(1.393)	(1.390)	(1.394)	(1.388)	(1.383)
Taxes	0.00772	0.00958	-0.16607	-0.15579	-0.45210	-0.20001	-0.66659	-0.65639
(TAX)	(0.011)	(0.011)	(4.654)	(4.662)	(4.651)	(4.662)	(4.642)	(4.624)
Growth	0.04132***	0.03958***	-0.34973	-0.35935	-1.58314	-0.04862	-1.32004	-0.07162
(FG)	(0.010)	(0.010)	(4.157)	4.164	(4.174)	(4.172)	(4.167)	(4.166)
Profitability	-0.00013	-0.00013	0.36536***	0.36533***	0.36963***	0.33940**	0.31087**	0.30597**
(ROA)	(0000)	(0000)	(0.131)	(0.131)	(0.131)	(0.133)	(0.132)	(0.132)
Volatility of returns	-0.00289***	-0.00302***	$-0.53881^{***}$	-0.53956***	-0.44588**	-0.54528***	-0.42396**	$-0.41421^{**}$
(oroa)	(0.001)	(0.001)	(0.201)	(0.202)	(0.204)	(0.202)	(0.204)	(0.203)
Liquidity	-0.00035	-0.00038	1.14943***	1.14930***	$1.16113^{***}$	1.10768***	$1.06866^{***}$	1.12913***
(LIQ)	(0.001)	(0.001)	(0.202)	(0.202)	(0.202)	(0.205)	(0.205)	(0.205)
Independent Variable							-	
Board Independence		0.07101***		0.39269	-1.80295	-0.28789	-4.21389	-4.14236
(BI)		(0.022)		(9.045)	(9.052)	(9.061)	(9.084)	(9.048)
Mediator								
Debt Maturity					30.91784***		42.55229***	135.3171***
(DMR)					(10.630)		(11.548)	(29.115)
Fixed Collateral						-12.32151	-28.694**	-0.84991
(FC)						(10.381)	(11.249)	(13.784)
Moderator								
DM*FC								-140.8334***
								(40.606)
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.24	0.25	0.06	0.06	0.06	0.06	0.07	0.08
Adjusted R <sup>2</sup>	0.23	0.23	0.04	0.04	0.05	0.04	0.05	0.06
F stat	19.29***	19.01***	3.75***	3.59***	3.81***	3.51***	3.92***	4.25***
*** <i>p</i> < 0.01; ** <i>p</i> < 0.05; * <i>p</i> <	0.10.							
Note: The values in parenth	esis show standard e	rrors.						

Table 3. Results of hierarchical OLS regression with board independence as IV

	Debt	Maturity			Insolv	ency Risk		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variables								
Size	0.00160	0.00224	-0.93308***	$-1.02897^{***}$	-1.09899***	-0.96605***	-0.97559***	$-1.10897^{***}$
(SIZE)	(0.003)	(0.003)	(0.321)	(0.340)	(0.343)	(0.332)	(0.325)	(0.303)
Taxes	0.00772	0.00769	-0.16607	-0.16175	-0.40188	-0.18751	-0.54600	-0.53800
(TAX)	(0.005)	(0.005)	(0.193)	(0.182)	(0.367)	(0.185)	(0.421)	(0.434)
Growth	0.04132	0.04205*	-0.34973	-0.46025	-1.77269*	-0.16476	-1.53567*	-0.28125
(FG)	(0.023)	(0.024)	(0.500)	(0.488)	(0.999)	(0.576)	(0.860)	(0.651)
Profitability	-0.00013	-0.00011	0.36536***	0.36229***	0.36585***	0.33794***	0.30989***	0.30508***
(ROA)	(0000)	(0000)	(0.097)	(0.096)	(0.098)	(0.089)	(0.079)	(0.082)
Volatility of returns	-0.00289***	-0.00280***	$-0.53881^{***}$	$-0.55181^{***}$	-0.46419***	-0.55673***	-0.44523***	-0.43472***
(gROA)	(0000)	(0000)	(0.342)	(0.096)	(0.093)	(0.087)	(0.072)	(0.0750
Liquidity	-0.00035	-0.00035	1.14943***	1.14839***	$1.15940^{***}$	1.10864***	1.06987***	$1.13018^{***}$
(LIQ)	(0.001)	(0.001)	(0.035)	(0.034)	(0.041)	(0.034)	(0.024)	(0.041)
Independent Variable								
Non-duality		-0.02763***		4.14921***	5.01171***	3.58257**	3.98121***	3.77374**
(NDN)		(9000)		(1.497)	(1.747)	(1.508)	(1.641)	(1.465)
Mediator								
Debt Maturity					31.20601***		42.07174***	134.6859***
(DMR)					(0.960)		(8.680)	(21.667)
Fixed Collateral						$-11.74894^{***}$	-27.59376***	0.16597
(FC)						(4.09)	(4.556)	(2.589)
Moderator								
DM*FC								-140.6002***
								(21.716)
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.24	0.24	0.06	0.06	0.06	0.06	0.07	0.08
Prob>chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
*** <i>p</i> < 0.01; ** <i>p</i> < 0.05; * <i>p</i> ·	< 0.10.							
Note: The values in parent!	hesis show standard	errors.						

Table 4. Results of hierarchical PCSE regression with non-duality as IV

	Debt Mi	aturity			Insolven	cy Risk		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
Control Variables								
Size	0.00160	-0.00022	-0.93308***	-0.94319**	-0.93628**	-0.87341**	-0.77118**	$-0.91159^{***}$
(SIZE)	(0.003)	(0.003)	(0.321)	(0.391)	(0.374)	(0.384)	(0.340)	(0.321)
Taxes	0.00772	0.00958	-0.16607	-0.15579	-0.45210	-0.20001	-0.66659	-0.65639
(TAX)	(0.005)	(0.006)	(0.193)	(0.204)	(0.370)	(0.225)	(0.463)	(0.451)
Growth	0.04132*	0.03958*	-0.34973	-0.35935	$-1.58314^{*}$	-0.04862	$-1.32004^{*}$	-0.07162
(FG)	(0.023)	(0.022)	(0.500)	(0.502)	(0.922)	(0.600)	(0.767)	(0.663)
Profitability	-0.00013	-0.00013	0.36536***	0.36533***	0.36963***	0.33940***	0.31087***	0.30597***
(ROA)	(0000)	(0000)	(0.097)	(0.097)	(0.099)	(0.089)	(0.079)	(0.082)
Volatility of returns	-0.00289***	-0.00302***	$-0.53881^{***}$	-0.53956***	-0.44588***	-0.54528***	-0.42396***	$-0.41421^{***}$
(oroa)	(0000)	(0000)	(0.096)	(0.099)	(0.097)	(0.089)	(0.075)	(0.079)
Liquidity	-0.00035	-0.00038	1.14943***	1.14930***	$1.16113^{***}$	1.10768***	1.06866***	1.12913***
(LIQ)	(0.001)	(0.001)	(0.035)	(0.035)	(0.043)	(0.033)	(0.022)	(0.041)
Independent Variable								
Board Independence		0.07101***		0.39269	-1.80295	-0.28779	-4.21389	-4.14236
(BI)		(0.021)		(4.675)	(4.723)	(4.805)	(4.967)	(4.648)
Mediator								
Debt Maturity					30.91784***		42.55229***	135.3171***
(DMR)					(6.871)		(8.859)	(21.898)
Fixed Collateral						$-12.32152^{***}$	-28.69400***	-0.84991
(FC)						(4.235)	(5.015)	(2.689)
Moderator								
DM*FC								-140.8334***
								(21.898)
Year Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R <sup>2</sup>	0.24	0.25	0.06	0.06	0.06	0.06	0.07	0.08
Prob>chi <sup>2</sup>	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
**** / 0 01. *** / 0 0E. **	10							

Table 5. Results of hierarchical PCSE regression with board independence as IV

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\*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.10. Note: The values in parenthesis show standard errors.

		Indirect	Path	Direct Path		
	Paths	Path A	Path B	Path C	- Mediation	Moderation
	OLS regression					
1	NDU-DMR*FC-IR	-0.02763*	134.6859***	3.77374	Full Mediation	Negative Moderation
		(0.014)	(29.084)	(5.771)		
2	BI-DMR*FC-IR	0.07101***	135.3171***	-4.14236	Full Mediation	Negative Moderation
		(0.022)	(29.115)	(9.048)		
	PCSE regression					
3	NDU-DMR*FC-IR	0.02763***	134.6859***	3.77374**	Partial Mediation	Negative Moderation
		(0.006)	(21.667)	(1.465)		
4	BI-DMR*FC-IR	0.07101***	135.3171***	-4.14236	Full Mediation	Negative Moderation
		(0.021)	(21.898)	(4.648)		

Table 6. Summarized Results

\*\*\*p < 0.01; \*\*p < 0.05; \*p < 0.10.

Note: The values in parenthesis show standard errors.

positive impact on the debt maturity ratio confirming the predictions OLS regression and ( $\beta = 0.07101^{***}$ ). The debt maturity also had a significant positive impact on insolvency risk ( $\beta = 135.3171^{***}$ ). The direct impact of board independence on insolvency risk is insignificant, referring to the full mediation in this case. The results for the interacting effect of fixed collaterals consistently proved to be significantly negative ( $\beta = -140.8334^{***}$ ) in this scenario also.

The board's independence had a significant positive impact on the debt maturity ratio, confirming the predictions of OLS regression and ( $\beta = 0.07101^{***}$ ). The debt maturity also had a significant positive impact on insolvency risk ( $\beta = 135.3171^{***}$ ). The direct effect of board independence on insolvency risk is insignificant, referring to the full mediation in this case. The results for the interacting effect of fixed collaterals consistently proved to be significantly negative ( $\beta = -140.8334^{***}$ ) in this scenario also.

Table 6 presents the summarized mediated moderation results using both OLS with robust standard errors and PCSE estimators. It is easy to compare the results in this table to arrive at the inference that the fixed collaterals have negatively moderated the mediating role of the debt maturity ratio in all of the four independent regression scenarios. Full mediation is detected by the debt maturity ratio on the relationship between board vigilance and insolvency risk even if it is negatively moderated by fixed collaterals as reported in the OLS regression results. However, partial mediation is detected for CEO non-duality and insolvency risk relationships, but the results are unchanged as far as the moderating role of fixed collaterals is concerned. There is no difference in results when we assess the intervention of debt maturity ratio on board independence and insolvency risk relationship; further, the negative moderating effect of fixed collaterals confirm the previous results.

#### 5 Conclusion, implications, and limitations

This study analyzed the interactive role of monitoring hypothesis and information asymmetry in a sample of non-financial firms. In the corporate sector, vigilant boards are assumed to exercise control over insolvency risk. Debt maturity is one of the underlying reasons that contribute to the degree of insolvency risk. Debt maturity involves making a strategic choice between short-term and long-term leverage. Current research has proved the positive mediating role of debt maturity, one which supports the notion that long-term debt reduces the insolvency risk in listed non-financial firms in Pakistan. Moreover, loan acquisition normally is subject to the availability of collateral, as posited by the information asymmetry theory. However, in this study, the moderating role of fixed collaterals hampered the expected outcome as it enhanced the insolvency risk of the selected firms. This evidence can have multiple justifications which are also evidenced by the study of Xuezhou et al. [2020]. The firms can have higher costs associated with fixed assets that outweigh

the fruits attached to them. Therefore, over-acquisition of non-productive fixed collaterals can enhance insolvency risk instead of moderating the adverse effects of leverage on risk.

This study analyzes various factors and provides results which would be highly useful for managers and policymakers alike. Managers in high-risk firms should enhance the usage of long-term debt in their debt maturity structure to mitigate insolvency risk. They should also acquire productive fixed assets which generate revenue instead of creating financial burdens and which can also be used during loan negotiations as collaterals. Highly informed managers with better market relations can use tangible collaterals wisely to acquire loans at low cost at favorable conditions including desirable loan covenants. At policy levels, the concerned regulators should draft policies in such a way that access to loans is easy and cheaper, especially for long-term loans. The government should ease the policies and conditions associated with procurement of debt so that the loans can be availed easily at low cost by the corporate sector; this is expected to promote economic growth in the country. This study uses fixed collaterals as moderators in all sectors alike, which is a limitation to this study. The asset base of each sector of the firm varies according to its needs; thus, instead of applying the same scale to all firms, each sector should be analyzed separately in future studies. Moreover, future research should incorporate other governance variables to obtain more diverse opinions in this framework.

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## Appendix A

	Sector	Total Firms	Selected Firms	Percentage
1	Textile	136	101	74.26%
2	Sugar	30	23	76.67%
3	Food Sector	16	11	68.75%
4	Chemical & Pharmaceuticals	43	34	79.07%
5	Manufacturing	31	25	80.65%
6	Mineral Products	09	05	55.56%
7	Cement Sector	17	17	100%
8	Motor Vehicles, Trailers & Autoparts	18	18	100%
9	Fuel & Energy Sector	22	14	63.64%
10	Information & Communication	11	10	90.91%
11	Coke & Refined Petroleum Products	10	09	90%
12	Paper, Paperboard & Products	09	07	77.78%
13	Electrical machinery & Apparatus	07	05	71.43%
14	Other Services Activities	10	05	50%
	Total	369	284	76.96%

Note: Sectorial distribution of firms based on Financial Statement Analysis (FSA 2012-17) published by SBP.

### Appendix B

	Variable	Notation	Measurement	Unit
1	Insolvency risk	IR	Measured through emergent market Z-score proposed by Altman (2005).	Ratio
2	Non-duality	NDU	A binary variable that assumes value '0' in case of CEO duality and '1' otherwise.	Binary
3	Board Independence	BI	Ratio of independent & non-executive directors to total directors.	Ratio
4	Debt Maturity	DMR	Ratio of long term debt to total debt.	Ratio
5	Fixed Collaterals	FC	Ratio of fixed assets to total assets.	Ratio
6	Size	SIZE	Natural log of value of total assets in each financial year.	Number
7	Taxes	TAX	Natural log of value of total taxes in each financial year.	Number
8	Firm Growth	FG	Rate of growth in firm's total assets.	Ratio
9	Profitability	ROA	Net profit (loss) scaled by total assets.	Ratio
10	Volatility of returns	σROA	Standard deviation of return on assets for last five years.	Ratio
11	Liquidity	LIQ	Ratio of current assets to current liabilities.	Ratio