Determinants of Bankruptcy: Evidence From Financially Distressed Firms

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This study examines whether and how external monitoring, managerial ability, and investment decisions impact a financially distressed firm's probability of future bankruptcy. We find that a financially distressed firm with higher institutional ownership or higher managerial ability is less likely to file for bankruptcy. Additionally, a financially distressed firm's non-capital expenditure investment is negatively associated with its probability of bankruptcy. This study provides empirical evidence that external monitoring, competence of management, and non-capital expenditure investment should be considered when predicting bankruptcy among financially distressed firms. Our results are of particular interest to managers, lenders, financial institutions, and credit rating agencies.

Keywords: determinants of bankruptcy, external monitoring, managerial ability, non-capital expenditure

INTRODUCTION

Corporate bankruptcy results in significant costs to multiple stakeholders, such as shareholders, creditors, employees, investors, suppliers, customers, and the community (Eckbo, et al., 2016; Cooper and Uzun, 2019). For example, in the early 2000s, shareholders lost $460 billion during the financial scandals involving WorldCom, Qwest, Global Crossing, Tyco, and Enron (Cotton, 2002; Lucci, 2003). Concordantly, a series of academic research attempts to explore characteristics that predict firm bankruptcy. Our study extends this line of research and investigates determinants of bankruptcy for financially distressed firms from three perspectives: external monitoring, managerial ability, and investment decisions.

The demand for an appropriate bankruptcy prediction model, serving as an early warning signal of corporate failure, increasingly attracts the attention of practitioners, regulators, and researchers, especially after the implementation of the Sarbanes-Oxley (SOX) Act (Chan, et al., 2016). Early academic research focuses on the impacts of companies' accounting and market variables (Altman, 1968; Ohlson, 1980; Zmijewski, 1984; Begley, et al., 1996; Shumway, 2001; Hillegeist, et al., 2004). Several recent studies examine the predictive power of corporate governance factors, such as board size and independence (Fich and Slezak, 2008; Darrat, et al., 2016; Goktan, et al., 2018), compensation committee (Chan, et al., 2016), and nomination committee (Appiah and Chizema, 2016). However, certain factors that play an essential

role in firm performance are excluded in the bankruptcy prediction model, leading to concerns with potential omitted variables (Chancharat and Chancharat, 2013).

One example is a firm's external monitoring, such as the level of institutional ownership. Institutional investors have the incentives and resources to monitor managers to act in shareholders' best interests (Shleifer and Vishny, 1986; Cornett, et al., 2007). Several prior studies find evidence that large institutional shareholdings constrain managers' earnings management behavior (Chung, et al., 2002), leading to better firm performances (McConnell and Servaes, 1990; Cornett, et al., 2007). Therefore, it is expected that institutional investors may interfere with firms' corporate governance and influence their bankruptcy decisions. Another factor is managerial ability. Management makes day-to-day decisions which ultimately leads their firm toward its goals (Cooper and Uzun, 2019). A manager's knowledge, competence, and capability determine whether they could make adequate decisions impacting the chances of firm survival. Lastly, a firm's investment decisions may contribute to predicting firm bankruptcy. Overinvestment in long-term capital expenditures may benefit the company in the long run but limit a firm's ability to generate cash flows in the short term. Non-capital investment, on the other hand, may improve a firm's innovation and productivity, which are essential for a firm's survival. In summary, examining whether these three factors, institutional ownership, managerial ability, and investment decisions, significantly impact the probability of bankruptcy is theoretically and economically meaningful to regulators, practitioners, and researchers.

We use the financially distressed firms in the U.S. during 2000-2016 as our sample for two reasons. First, previous academic findings for healthy firms may not hold for distressed firms (Parker, et al., 2002; Fich and Slezak, 2008; Darrat, et al., 2016). For example, while managers are expected to seek long-term benefits for healthy firms, they may have more incentives to engage in opportunistic behavior to maximize their personal wealth when a firm is financially distressed (Myers, 1977; Richardson and Waegelein, 2002; Fich and Slezak, 2008). Likewise, investment in capital expenditures may benefit healthy firms with cash flows in the long run, but it may create liquidity problems for distressed firms. Second, including both healthy and distressed firms in a sample may generate endogeneity problems. For example, Darrat, et al. (2016) argue that firms that go bankrupt are generally smaller, mechanically resulting in a higher percentage of institutional ownership. Therefore, using only the distressed firms is a more appropriate setting to examine whether and how institutional ownership, managerial ability, and investment decisions contribute to predicting bankruptcy.

Our results indicate that larger institutional ownership is associated with a lower probability of future bankruptcy for financially distressed firms, suggesting that institutional investors provide efficient external monitoring and additional resources for a firm to survive. Additionally, we find a negative relationship between managerial ability and bankruptcy filings, consistent with the notion that capable managers make adequate decisions and lead to higher firm values. Lastly, capital expenditures are found to have no impact in predicting bankruptcy while non-capital expenditures lower the probability of bankruptcy for financially distressed firms. Investment in non-capital expenditures during financial distress periods may increase productivity or create new product lines, which help with a firm's survival. Our results are consistent to a series of robustness tests with an alternative measurement of financial distress and different sample periods.

This paper has the following contributions. First, our results contribute to the improvement of the bankruptcy prediction model. While factors of external monitoring, managerial ability, and research and development investment decisions are found to be essential in determining firms' performance, they have not been included in the bankruptcy prediction models of financially distressed firms in prior studies. This study shows how these three factors affect the probability of bankruptcy for financially distressed firms. Second, this study contributes to literature related to financially distressed firms, whose operating strategies may be different from healthy firms (Parker, et al., 2002). Prior research finds that corporate governance, such as CEO turnover, blockholder, insider ownership, and board characteristics, are significantly related to bankruptcy of distressed firms (Parker, et al., 2002; Fich and Slezak, 2008). Our results extend these studies and document that external institutional shareholders, managerial ability, and investment decisions play an essential role in a financially distressed firm's operations. Third, this study provides practical implications. Our analysis contributes to enhancing the bankruptcy prediction model, which is important to

related parties, such as regulators, investors, lenders, financial institutions, and credit rating agencies, who attempt to identify the probability of bankruptcy for financially distressed firms.

The remainder of this paper is organized as follows. Section 2 develops the hypotheses. Section 3 outlines the sample selection and regression models. Section 4 and Section 5 reports the empirical results and robustness tests. Section 6 concludes.

HYPOTHESES DEVELOPMENT

Determinants of Bankruptcy

According to the Bankruptcy Reform Act 1978 and 2005, firms in the United States may file under Chapter 7 for liquidation bankruptcy or Chapter 11 for reorganization bankruptcy (Thorburn, et al., 2013). Given the severe negative consequences of bankruptcy for the shareholders, employees, and society, there is a series of academic research exploring the determinants of bankruptcy. For example, a firm's efficiency, productivity, liquidity, financing frictions, and credit constraints are found to significantly impact the probability of bankruptcy (Ericson and Pakes, 1995; Olley and Pakes, 1992; Dwyer, 1998; Cooley and Quadrini, 2001; Fariñas and Ruano, 2005; Ni, et al., 2014; Osotimehin and Pappadà, 2017; Aleksanyan and Huiban, 2016). Several recent studies demonstrate other determinants of bankruptcy. For example, Buehler, et al. (2010) provide evidence that bankruptcy is significantly related to geographic areas. Bryan, et al. (2014) find a positive association between fraud and bankruptcy filing. Zorn, et al. (2017) state that the likelihood of bankruptcy is significantly increased for downsizing firms. Cooper and Uzun (2019) report that bankruptcy is less likely to occur for firms with a more substantial corporate social responsibility. Lastly, Biddle, et al. (2020) find evidence that accounting conservatism is negatively related to bankruptcy risk.

Prior literature also demonstrates that including corporate governance characteristics increases the prediction power of the bankruptcy prediction model (Fich and Slezak, 2008). Specifically, Parker, et al. (2002) find that CEO turnover is positively, while blockholder and insider ownership are negatively, related to bankruptcy. Fich and Slezak (2008) report evidence that distressed firms are more likely to avoid bankruptcy if their boards are smaller and more independent. Contrary to Fich and Slezak (2008), Darrat, et al. (2016) demonstrate that larger boards inversely impact the likelihood of bankruptcy only for complex firms. Furthermore, the authors find empirical evidence that board diversification, management stability, and CEO power are significantly associated with bankruptcy. Goktan, et al. (2018) also find that smaller and less independent boards are positively associated with bankruptcy. Moreover, Chan, et al. (2016) and Appiah and Chizema (2016) find a significant relationship between bankruptcy and characteristics of firms' compensation and nomination committees.

To sum up, existing research shows evidence that both endogenous and exogenous factors affect firms' bankruptcy decisions. In this study, we focus on institutional ownership, managerial ability, and investment decisions and explore whether these factors help firms survive during the financial distress period.

Institutional Ownership

Institutional shareholders are generally considered as an external monitoring mechanism that provides a "safety net" for firm performance (Badrinath, et al., 1989). Shleifer and Vishny (1986) claim that large institutional shareholders have more incentives than the board of directors to monitor managers' behaviors. Consistently, prior research provides evidence that institutional investors constrain managers' opportunistic behaviors and make them focus on firms' benefits (McConnell and Servaes, 1990; Nesbitt, 1994; Smith, 1996; Del Guercio and Hawkins, 1999; Chung, et al., 2002). Moreover, given their holding size and analytical skills, large institutional investors are believed to have the professional resources and ability to be influential in certain decisions and strategies of firms (Cornett, et al., 2007).

Kane and Velury (2004) argue that institutional shareholders may provide monitoring functions in two ways. First, institutional shareholders may directly vote during the management decision process through the voting rights derived from their holdings of a large amount of common stocks. Second, institutional

shareholders may indirectly affect firm decisions by buying and selling their holdings, which impacts the firms' cost of capital.

Consistently, prior literature provides empirical evidence that institutional shareholders, who provide extra monitoring functions, help reduce the agency costs, which in turn improves firm value. For example, McConnell and Servaes (1990), Nesbitt (1994), and Del Guercio and Hawkins (1999) report a positive relationship between institutional ownership and firm performance. Kane and Velury (2004) find that institutional ownership is associated with higher audit quality. Ramalingegowda and Yu (2012) document evidence that higher institutional ownership leads to more conservative financial reporting. Moreover, Aghion, et al. (2013) provides evidence that innovation is positively impacted by institutional ownership.

Contrarily, several prior studies find no evidence that institutional ownership is significantly associated with firm performance (Agrawal and Knoeber, 1996; Karpoff, et al., 1996; Duggal and Millar, 1999; Faccio and Lasfer, 2000). Likewise, Wahal (1996), Smith (1996), and Opler and Sokobin (1997) document that institutional ownership improves firm performance only in limited cases.

Regarding the relationship between institutional ownership and bankruptcy, Darrat, et al. (2016) report a positive impact of institutional ownership on bankruptcy risks, inconsistent with the authors' expectations. The authors argue that the possible reason may be the potential endogeneity problems. That is, the authors use all public firms as their sample, which includes both bankruptcy firms and healthy firms. It is possible that the bankruptcy firms are generally smaller, resulting in a higher percentage of shares held by institutional shareholders.

In our study, we use financially distressed firms as our sample to diminish the potential endogeneity problem. Suppose the institutional shareholders utilize their influencing power to guide the firms with decisions that benefit the firms. In that case, we expect that firms may be less likely to go bankruptcy during the financial distress period. On the other hand, it is possible that institutional shareholders have no significant influence on firms' financial distress problems. Then we may not find a significant relationship between bankruptcy and institutional ownership. We state our hypothesis in null form as follows:

H1: *There is no association between bankruptcy and institutional ownership for financially distressed firms.*

Managerial Ability

Management plays a crucial role in companies' bankruptcy decisions, and a majority of the bankruptcy filings are initiated by the managers (Hotchkiss, et al., 2008). Given the information asymmetry, creditors or other outside users may not be aware of the firm's actual financial situation. Therefore, managers may choose to continue to operate the companies in line with their own interests. For example, managers may undertake high-risk projects, which may harm the firm's value in the long run to avoid their penalty of filing bankruptcy (Aghion, et al., 1992; White, 1994).

It is expected that managers with different skills and capabilities may influence the likelihood of bankruptcy during firms' financial distress periods. On the one hand, managers with higher abilities are more likely to understand the firm deeply and lead the firm with better resources and environment. For example, Bonsall, et al. (2017) find that higher managerial ability is associated with more consistent stock returns and higher credit ratings. Baik, et al. (2018) report that managerial ability is positively related to firms' information environment. Yung and Chen (2018) suggest that high-ability managers are more willing to take risks and invest in R&D projects, thus increasing firm value. Furthermore, Lee, et al. (2018) document evidence that managers with high abilities are able to gain better investment opportunities, which results in more profits for the company. Therefore, it is expected that, for firms with financial distress, if their managers are more capable of making adequate investment decisions, they may be less likely to go bankrupt.

On the other hand, several prior studies document that the effect of managerial ability may not be favorable to firm value. For example, Mishra (2014) reports that managers with better skills may result in more agency problems and higher required returns from investors. Moreover, Cho, et al. (2016) argue that the effect of management on corporate innovation may be limited, compared to firm characteristics.

Therefore, the impact of managerial ability on bankruptcy is not certain. To sum up, we state our hypothesis in null form as follows:

H2: *There is no association between bankruptcy and managerial ability for financially distressed firms.*

Investment Decisions

A company's capital and non-capital investment may influence its going-concern operations. For example, capital expenditures are expected to generate positive net present value in the long run, leading to higher firm value (McConnell and Muscarella, 1985; Chung, et al., 1998). However, they are generally associated with long-term contract obligations that a financially distressed firm may be unable to pay. Thus, this type of investment is considered an illiquid asset, which may become a problem leading to bankruptcy (Darrat, et al., 2016).

On the other hand, non-capital expenditures, such as the R&D expenditure, are generally without the long-term obligations and may significantly contribute to innovation, productivity, and new product lines, benefiting distressed firms' survival (Mairesse and Mohnen, 2004). Consistently, we state our hypothesis in null form as follows:

H3: *There is no association between bankruptcy and capital/non-capital investment for financially distressed firms.*

SAMPLE SELECTION AND REGRESSION MODELS

Sample

Our sample starts with all U.S. public companies in COMPUSTAT from 2000 to 2014. The bankruptcy data is obtained from the Audit Analytics Bankruptcies database, which tracks bankruptcy declarations since 2000. Following Campbell, et al. (2008), we use those bankruptcy declarations under Chapters 7 or Chapter 11. The institutional shareholder data is from Thomson Reuters Database. We exclude firms in financial services or utility industries as well as observations with missing data required for our analysis.

Measurement

Financially Distressed Firms

To obtain the firms' financial situation, we calculate the Altman *Z_score*, a proxy for financial distress and bankruptcy risk, based on five financial ratios using the formula below (Altman, 1968):

$$Z\_score = 1.2A + 1.4B + 3.3C + 0.6D + 1.0E \quad (1)$$

where: A = working capital/total assets; B = retained earnings/total assets; C = earnings before interest and tax/total assets; D = market value of equity/total liabilities; and E = sales/total assets

Following Altman (1968), a *Z_score* larger than 2.67 implies financial soundness, while a score smaller than 1.81 suggests financial distress. A *Z_score* between 1.81 and 2.67 often represents the grey area. We define a financially distressed firm as its *Z_score* smaller than 1.81. Our final sample consists of 9,854 financially distressed firm-years from 2000 to 2014. Table 1 summarizes the sample selection procedure.

Institutional Ownership

Institutional ownership is measured as the number of shares owned by institutional shareholders divided by the total shares outstanding (Darrat, et al., 2016). Higher institutional ownership indicates a more sufficient external monitoring for the firm.

TABLE 1
SAMPLE SELECTION

Description	Observations
Compustat listed firms from the year 2000 to 2014	72,659
Less: Firm-year observations with missing data to calculate *MA_score*	(21,105)
Less: Firms in utility and financial industry (SIC 4400-5000 and SIC 6000–6999)	(2,739)
Less: Not financially distressed firm-years (i.e. *Z_score* >= 1.81)	(32,191)
Less: Firm-year observations with missing data to calculate variables	(6,770)
Final financially distressed firm sample	9,854

Managerial Ability

To measure managerial ability, we followed Demerjian, et al. (2012). First, for all the firm years on Compustat, we use sales revenue (*Sales*) as the output and the following variables as inputs: cost of goods sold (*COGS*), selling, general, and administrative expenses (*SG&A*), net property, plant, and equipment (*PPE*), capitalized operating leases (*OpsLease*), capitalized research and development (*R&D*), purchased goodwill (*Goodwill*), and other intangibles (*OtherIntan*). Using those inputs and outputs, we solves the following optimization problem within each industry:

$$\max_v \theta = \frac{Sales}{v_1 COGS + v_2 SG\&A + v_3 PPE + v_4 OpsLease + v_5 R\&D + v_6 Goodwill + v_7 OtherIntan} \quad (2)$$

Second, the firm efficiency scores obtained in Equation (2) are regressed on firm characteristics using the following model:

$$Firm\ Efficiency = \alpha_0 + \alpha_1 In(Assets) + \alpha_2 Market + \alpha_3\ Free\ Cash\ Flow + \alpha_4 Ln(Age) + \alpha_5 Business\ Segment + \alpha_6 Foreign + Year\ Indicators\ + \varepsilon \quad (3)$$

Assets is a firm's total assets; *Market* is the percentage of a firm's revenue within its industry; *Free Cash Flow* equals to one if a firm reports nonnegative free cash flow; *Age* is a firm's age; *Business Segment* is the ratio of individual business segment sales to total sales; *Foreign* equals to one if a firm reports a nonzero value for foreign currency adjustment.

The residuals from Equation (3) is our measure of managerial ability.

Capital vs. Non-Capital Expenditure

Following Biddle, et al. (2009), we divide investment between capital expenditure (*Capex*) and non-capital expenditure (*NonCapex*). *Capex* is capital expenditure multiplied by 100 and scaled by lagged property, plant, and equipment. *NonCapex* is the sum of research and development expenditure and acquisition expenditure multiplied by 100 and scaled by lagged total assets.

Regression Model

To examine our hypotheses, we perform the logit regression of firm bankruptcy on institutional ownership, managerial ability, capital expenditure, and non-capital expenditure using Equation (4):

$$Bankruptcy = \alpha_0 + \alpha_1 Ins_{Shares} + \alpha_2 MA_{Score} + \alpha_3\ Capex + \alpha_4 NonCapex + \sum Controls\ +\ IndustryFE\ +\ YearFE\ + \varepsilon \quad (4)$$

where the dependent variable is *Bankruptcy*, which is a dummy variable that equals 1 if the firm bankrupts within two years of the financial reporting date, and 0 otherwise. We control for an array of firm characteristics, including size (*LogAT*), book to market ratio (*BM*), leverage (*Leverage*), and return on assets

(*ROA*). Industry and year-fixed effects are included to control for industry and time-level factors. Detailed variable definitions are presented in APPENDIX.

EMPIRICAL RESULTS

Descriptive Statistics

Panel A of Table 2 presents the descriptive statistics of the variables. The mean and median *Z_score* is -9.461 and -1.026, consistent with our sample only consisting of financially distressed firms. Approximately 6.40 percent of firms in our sample file bankruptcy, suggesting the economic significance of this phenomenon. The average institutional ownership (*Ins_shares*) is 17.6 percent. The mean *MA_score* is -0.015, indicating the managerial ability in financially distressed firms is lower than healthy firms. For example, the mean managerial ability is -0.004 in Demerjian, et al. (2012) and 0.00 in in Demerjian, et al. (2013). And the means of Capex and Noncapex are 43.585 and 22.799, respectively. For control variables, the means of *LogAT, BM, and Leverage* are 3.920, -0.101, and 1.108, respectively. The majority of the sample firms experience negative *ROA* with a mean of -0.496, again consistent with the financially distressed firm sample.

The Pearson correlation matrix of all variables is shown in Panel B of Table 2. We find that *Bankruptcy* is negatively correlated with institutional ownership (*Ins_shares*), managerial ability (*MA_score*), and non-capital expenditures (*NonCapex*). Results also indicate a significant correlation between control variables. For example, firm size (*LogAT*) is positively correlated with *BM* and *ROA* and negatively correlated with *Leverage*.

TABLE 2
DESCRIPTIVE STATISTICS AND CORRELATION MATRIX

Panel A: Descriptive Statistics

Variable	N	Mean	Std	Q1	Median	Q3
Z_score	9,854	-9.461	22.507	-7.752	-1.026	0.904
Bankruptcy	9,854	0.064	0.244	0.000	0.000	0.000
Ins_shares	9,854	0.176	0.296	0.000	0.000	0.254
MA_score	9,854	-0.015	0.112	-0.083	-0.029	0.031
Capex	9,854	43.585	96.744	6.753	16.922	39.440
Noncapex	9,854	22.799	42.516	1.601	9.344	24.714
LogAT	9,854	3.920	2.523	2.166	3.757	5.599
BM	9,854	-0.101	2.799	-0.070	0.278	0.755
Leverage	9,854	1.108	1.495	0.458	0.701	1.019
ROA	9,854	-0.496	0.869	-0.553	-0.200	-0.027

Panel B: Pearson Correlation Matrix

	1)	2)	3)	4)	5)	6)	7)	8)	9)	10)
1) *Z_score*	1	0.00	**0.23**	**-0.13**	-0.01	**-0.26**	**0.55**	**0.25**	**-0.76**	**0.70**
2) *Bankruptcy*		1	**-0.06**	**-0.07**	0.00	**-0.03**	**0.03**	**-0.13**	**0.04**	**-0.03**
3) *Ins_shares*			1	**-0.06**	**-0.03**	**-0.04**	**0.53**	**0.12**	**-0.16**	**0.23**
4) *MA_score*				1	**0.04**	**0.15**	**-0.24**	**-0.04**	**0.10**	0.01
5) *Capex*					1	**0.32**	**-0.03**	**0.04**	0.00	**-0.12**
6) *NonCapex*						1	**-0.16**	-0.01	**0.20**	**-0.36**
7) *LogAT*							1	**0.14**	**-0.41**	**0.52**
8) *BM*								1	**-0.41**	**0.16**
9) *Leverage*									1	**-0.63**
10) *ROA*										1

Bold indicates significant correlation coefficients at 1% level. The variable definitions are in APPENDIX.

Multivariate Results

Table 3 presents the logit regression results of Equation (4). We find a negative and significant coefficient of *Ins_shares*, suggesting that larger institutional ownership leads to fewer future bankruptcies for financially distressed firms. The results are consistent with prior studies that institutional investors perform as an external monitoring mechanism and may have incentives, capability, and resources to provide more efficient governance, helping firms to survive during financial distress years.

Results also show a negative association between managerial ability and the likelihood of future bankruptcy. As an essential player in the years of financial distress, an efficient management team is more capable of generating resources and making decisions to help firms survive the financial distress, leading to less bankruptcy filing.

Regarding investment decisions, we find that capital expenditures have no impact on bankruptcy while non-capital expenditures are negatively related to bankruptcy. Companies devoting into R&D and acquisition expenditures are likely to develop additional markets, which helps firms pass through the financial distress period.

Additionally, the results of control variables suggest that firms with a higher book-to-market ratio and ROA are less likely to file bankruptcy during their financial distress years. Larger firms are found to have a higher probability of filing bankruptcy. We do not find a significant relationship between bankruptcy and leverage of financial distressed firms, possibly because financial distressed firms already bear a high level of leverage.

TABLE 3
MULTIVARIATE REGRESSION RESULTS

Dependent Variable: Bankruptcy		
Parameter	Coefficient	T-value
Intercept	-3.137	-6.49***
Ins_shares	-0.894	-5.09***
MA_score	-2.072	-3.54***
Capex	0.000	0.48
NonCapex	-0.003	-1.83*
LogAT	0.124	5.95***
BM	-0.085	-6.13***
Leverage	0.052	1.46
ROA	-0.204	-3.07***
Industry Fixed Effects	Yes	
Year Fixed Effects	Yes	
N	9,854	
Adj. R-squared	7.20%	

, **, * indicate significance at 0.10, 0.05, and 0.01 level, respectively.*
Standard errors are clustered by year and industry.
The variable definitions are in APPENDIX A.

ROBUSTNESS TESTS

We perform several robustness tests to reexamine the viability of our results. First, we use the *BSM_score* to reclassify financially distressed firms. *BSM_score* is a market-based measure of the probability of bankruptcy that Hillegeist, et al. (2004) developed based on the Black-Scholes-Merton option-pricing model. The SAS code of the *BSM_score* is in Appendix A of Hillegeist, et al. (2004).We chose the highest quartile of *BSM_score* among all the firm years from 2000-2014, representing those firms years with the highest probability of bankruptcy. There are 5,915 firm-years classified as financially

distressed firms during our sample period. We rerun our main test using Equation (4) and results are shown in Table 4. We find consistent results for our main variables. Specifically, institutional ownership (*Ins_shares*), managerial ability (*MA_score*), and non-capital expenditures (*NonCapex*) are negatively associated with bankruptcy. The adjusted R square is higher than using accounting-based measures (i.e. *Z_score*), consistent with Hillegeist, et al. (2004) that *BSM_score* provides significantly more information than accounting-based bankruptcy measures.

TABLE 4
ROBUSTNESS TEST USING ALTERNATIVE FINANCIAL DISTRESS MEASURE

Dependent Variable: Bankruptcy		
Parameter	Coefficient	T-value
Intercept	-3.864	-4.03***
Ins_shares	-1.573	-4.58***
MA_score	-2.158	-2.04**
Capex	0.000	0.11
NonCapex	-0.021	-2.39**
LogAT	0.095	1.75*
BM	0.086	0.69
Leverage	1.790	6.05***
ROA	-2.241	-6.55***
Industry Fixed Effects	Yes	
Year Fixed Effects	Yes	
N	5,916	
Adj. R-squared	20.38%	
, **, * indicate significance at 0.10, 0.05, and 0.01 level, respectively.* *Standard errors are clustered by year and industry.* *The variable definitions are in APPENDIX.*		

Second, we alternatively measure the dependent variable (*Bankruptcy*) as the firm filing for bankruptcy within three or five years to examine whether the impact of institutional ownership, managerial ability, and investment decisions holds in more extended periods. As shown in Table 5, the results are consistent with our main findings, suggesting that the prediction power of institutional ownership, managerial ability, and investment decisions on bankruptcy are not influenced by our measure of bankruptcy.

TABLE 5
ROBUSTNESS TEST USING ALTERNATIVE BANKRUPTCY MEASURES

	Bankruptcy in 3 years		*Bankruptcy in 5 years*	
Parameter	Coefficient	T-value	Coefficient	T-value
Intercept	-2.643	-7.92***	-2.011	-6.69***
Ins_shares	-1.141	-6.92***	-1.315	-8.64***
MA_score	-2.088	-3.89***	-1.542	-3.32***
Capex	0.000	-0.25	0.000	0.29
NonCapex	-0.003	-2.48**	-0.003	-2.40**
LogAT	0.135	6.75***	0.141	7.21***
BM	-0.081	-6.81***	-0.060	-5.57***
Leverage	0.030	0.86	0.046	1.43
ROA	-0.282	-4.35***	-0.254	-4.32***
Industry Fixed Effects	Yes		Yes	

Year Fixed Effects	Yes		Yes	
N	9,348		8,347	
Adj. R-squared	10.00%		7.33%	
*, **, *** indicate significance at 0.10, 0.05, and 0.01 level, respectively. Standard errors are clustered by year and industry. The variable definitions are in APPENDIX.				

Third, SOX, which was issued after the early 2000s financial scandals, focuses on the efficiency of corporate governance, such as the independence and expertise of the board and audit committee. We eliminate these transition periods and rerun the main regression using only the sample after 2004. As shown in Table 6, the coefficients of *Ins_shares*, *MA_score*, and *NonCapex* are still negative and significant, consistent with the main results.

TABLE 6
ROBUSTNESS TEST USING ALTERNATIVE SAMPLE YEARS

Dependent Variable: Bankruptcy		
Parameter	Coefficient	T-value
Intercept	-0.798	-1.29
Ins_shares	-1.180	-6.36***
MA_score	-1.592	-2.73***
Capex	0.001	1.11
NonCapex	-0.004	-2.47**
LogAT	0.171	6.10***
BM	-0.342	-12.00***
Leverage	-0.103	-2.16**
ROA	-0.277	-3.07***
Industry Fixed Effects	Yes	
Year Fixed Effects	Yes	
N	5,768	
Adj. R-squared	4.11%	
, **, * indicate significance at 0.10, 0.05, and 0.01 level, respectively.* *Standard errors are clustered by year and industry.* *The variable definitions are in APPENDIX.*		

CONCLUSION

Given its significant economic impact, bankruptcy prediction has attracted attention from regulators, practitioners, and academics. Empirical literature mainly focuses on the impact of accounting, marketing, and corporate governance on firm bankruptcy decisions. However, there has been a call for incorporating the potential omitted variables in the bankruptcy prediction model (Chancharat and Chancharat, 2013). This study aims to improve this model and explores whether and how a firm's external monitoring, managerial ability, and investment decisions play a role in its probability of future bankruptcy.

Our results show that institutional investors, managerial ability, and non-capital expenditures are significantly related to bankruptcy of financially distressed firms and suggest that these factors should be included in the bankruptcy prediction model. Specifically, we find that the probability of bankruptcy is negatively associated with institutional ownership, managerial ability, and non-capital expenditures. This study fills in a gap in the bankruptcy literature by incorporating external and internal factors as well as investment decisions in bankruptcy prediction. Our results have significant implications for regulators, investors, and financial institutions.

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APPENDIX

Variable	Definitions
Bankruptcy	An indicator variable that equals 1 if the a files bankruptcy within two years of the financial reporting date, and 0 otherwise;
Ins_shares	The number of shares owned by institutional shareholders divided by the total shares outstanding;
MA_score	Managerial ability calculated following Demerjian, et al. (2012);
Capex	Capital expenditure multiplied by 100 and scaled by lagged property, plant, and equipment;
NonCapex	Sum of research and development expenditure and acquisition expenditure multiplied by 100 and scaled by lagged total assets;
LogAT	The natural logarithm of the firm's total assets;
Leverage	Liability divided by total assets;
ROA	Income before extraoridiary item divided by total assets;
Z_score	Equal to 1.2A + 1.4B + 3.3C + 0.6D + 1.0E, where A = working capital/total assets; B = retained earnings/total assets; C = earnings before interest and tax/total assets; D = market value of equity/total liabilities; and E = sales/total assets.