



Article

# Does Competition Affect Financial Distress of Non-Financial Firms in India: A Comparison Using the Lerner Index and Boone Indicator

Jagjeevan Kanoujiya <sup>1</sup>, Shailesh Rastogi <sup>1</sup> , Rebecca Abraham <sup>2,\*</sup> and Venkata Mrudula Bhimavarapu <sup>3</sup>

<sup>1</sup> Symbiosis Institute of Business Management, Symbiosis International (Deemed University), Pune 412115, India; jagjeevan24288@yahoo.co.in (J.K.); krishnasgdas@gmail.com (S.R.)

<sup>2</sup> Huizenga College of Business, Nova Southeastern University, 3301 College Ave., Fort Lauderdale, FL 33314, USA

<sup>3</sup> Symbiosis School of Banking and Finance, Symbiosis International (Deemed University), Pune 412115, India; mrudulabhimavarapu@gmail.com

\* Correspondence: abraham@nova.edu

**Abstract:** Firms' financial distress (FD) is a major issue for smooth business activities. Timely recognition of FD should be a prime concern; otherwise, it may cause a nasty bankruptcy situation. The FD issue is paramount to researchers, policymakers, and investors. Several factors, whether they are financial or non-financial, may be responsible for financial distress. Such aspects specific to the firms have been explored. Exogenous factors such as competition can also be responsible for a firm's FD situation. In view of this, this study proposes to determine competition's impact on financial distress in the Indian context. BSE 100 ("Bombay Stock Exchange")-listed non-financial firms (NFFs) in India, over a timeframe of 2016–2020, are incorporated in this study. Panel data econometrics is performed for hypothesis testing. This study is novel in its approach, employing multi-technique analysis for measuring financial distress. FD is measured using Altman Z-scores, BOS, and AC distress scores variants. The Boone index (BI) and Lerner index (LI) are undertaken for the competition assessment of NFFs in India. The findings have contrasting views based on BI and LI; BI is positively connected to Z-scores; however, LI negatively connects to Z-scores. The findings suggest that competition (reverse of BI) positively affects financial distress (reverse of Z-score), while competition (reverse of LI) has an adverse effect on FD. It is also found that competition as BI affects FD non-linearly (inverted U shape connection). This means that competition (or market power) initially increases financial distress (or financial stability), and after a specific limit, it reduces financial distress. It can also be said that market power improves financial soundness to a specific limit, and after that, it starts decreasing financial stability. The study's findings provide fresh and exciting evidence for the connectivity of competition and financial distress. This situation has noticeable implications for all stakeholders and policymakers concerned with the survival of Indian listed firms. The significant connection of competition with financial distress implies that all stakeholders should consider competition an essential element for a firm's financial distress.

**Keywords:** competition; default risk; market power; bankruptcy; financial distress



**Citation:** Kanoujiya, Jagjeevan, Shailesh Rastogi, Rebecca Abraham, and Venkata Mrudula Bhimavarapu. 2023. Does Competition Affect Financial Distress of Non-Financial Firms in India: A Comparison Using the Lerner Index and Boone Indicator. *Journal of Risk and Financial Management* 16: 340. <https://doi.org/10.3390/jrfm16070340>

Academic Editors: Thanasis Stengos and Shigeyuki Hamori

Received: 5 May 2023

Revised: 12 July 2023

Accepted: 18 July 2023

Published: 20 July 2023



**Copyright:** © 2023 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

## 1. Introduction

Competition and financial distress are critical elements in any business activity. If they are not handled correctly and in time, then they may lead to business failure. Although FD does not always lead to bankruptcy or business failure, it is the key indicator of such an undesirable situation in the future (Gordon 1971). Traditionally, a firm's financial distress and market competition are studied in isolation. However, financial experts and industrial economists mostly admit that a firm's finance and the market's competitive behavior may be interconnected (Brander and Lewis 1986; Showalter 1995).

The existing literature explicates several causes responsible for firms' FD, as [Habib et al. \(2020\)](#) described. The majority of the literature on financial distress subscribes to three broad reasons ([Lizal 2002](#); [Habib et al. 2020](#)) for a firm's financial distress: (1) financial causes; (2) governance affairs; and (3) exogenous determinants. Among these three causes, the last category, the exogenous factors, is not given much attention as these factors are beyond the boundaries of a firm's domain ([Habib et al. 2020](#)). However, these factors and their connection with financial distress must be examined ([Ikpesu 2019](#); [Zhang et al. 2016](#); [Habib et al. 2020](#); [Amendola et al. 2015](#)).

Furthermore, many factors are included in the big basket of exogenous variables ([Lizal 2002](#); [Habib et al. 2020](#)). Competition is among the most critical factors which may be responsible for a firm's FD. This situation has become an intensified subject of interest since the global financial crisis (GFC) ([Reinhart and Rogoff 2011](#)), as many questions arise about whether to blame competition, regulations, or recapitalization for the failure of specific business activities. Many studies explore the connectivity of competition and FD ([Habib et al. 2020](#); [Ikpesu 2019](#)). However, these studies have no common consensus regarding their association. One set of studies advocates that competition improves a firm's financial stability ([Obembe and Soetan 2015](#); [Saha and Dutta 2020](#); [Noman et al. 2018](#)); other studies argue that competition harms a firm's financial stability ([Beck et al. 2013](#); [Alam et al. 2019](#); [Berger et al. 2009](#); [Gyimah et al. 2021](#); [Kanoujiya et al. 2022](#); [Chen et al. 2023](#)); and other studies indicate no association between competition and FD ([Yazdanfar and Öhman 2020](#)).

It is evident from the available studies that there are contrasting viewpoints on the connectivity of competition and a firm's FD. This situation may be because corporate activities are not similar in all countries. These corporate activities might differ due to a country's context-specific features such as culture, legal system, institutions, and developmental stages ([La Porta et al. 2000a, 2000b](#); [Gaud et al. 2007](#)). The central portion of such studies is concentrated on the financial sector and developed economies. Therefore, fresh evidence of competition's impact on financial distress must be delved into, particularly in NFFs in emerging economies such as India.

In the Indian set of affairs, the country is believed to be a greatly growing economy. It faced several business failure situations in the nation's corporate world even after the reform period in 1991 ([Kanoujiya et al. 2022](#)). All efforts are being made by the government to lessen such unwanted conditions of business collapses. Therefore, the causes behind such issues should be identified to resolve such a situation. Competition can be an influential factor in a firm's FD ([Kanoujiya et al. 2022](#)). However, the literature lacks empirical evidence for competition's connectivity to FD, particularly for NFFs in India.

Moreover, the earlier pieces of evidence, which have mostly proxied competition as a concentration measure, are also contrasting. [Fischer \(2000\)](#) indicates that higher concentration leads to more financial strength, whereas [Chong et al. \(2013\)](#) contradict this claim. However, few studies question the adoption of concentration as a proxy for competition. [Claessens and Laeven \(2004\)](#) and [Maudos and Fernandez de Guevara \(2006\)](#) argue that the concentration measure leads to entry threat (or level of contestability). That concentration cannot sufficiently predict the competition. They advocate using non-structural measures such as LI and BI to assess the competition.

In the above discussion, it is observed that there exists an abundance of literature discussing competition and financial distress. However, studies on how competition relates to financial distress are significantly fewer. Therefore, in this context, two questions remain unanswered: (1) How does competition relate to a firm's financial distress? (2) Do different measures of competition and distress scores have different outcomes for the competition's impact on FD?

The study's main focus is to find answers to the questions described above regarding the competition's connectivity to FD and to provide fresh evidence of their connection. As discussed earlier, different views exist concerning competition's impact on a firm's FD due to countries' differentiated context-specific features. Hence, fresh evidence is essential for a specific nation. There are some significant contributions made by this study. First, it gives

competition's measures of NFFs using popularly used non-structural competition measures LI (Lerner 1934) and BI (Boone 2008). Studies using both approaches to give the measure of the competition level of NFFs in India do not yet exist. Second, the current study finds fresh evidence for the external (non-financial) causes of firms' FD from the perspective of competition. Investigating competition's impact on FD is essential to delivering reliable evidence in emerging economies such as India. Third, the conflicting views on competition and FD connection also motivate us to look for non-linear relationships between the two. However, such investigations are not available in the literature. Thus, this study estimates both linear and non-linear relationships between the FD and competition. A significant impact of competition on FD is obtained. Hence, the study significantly contributes to the existing knowledge body on financial distress and competition of NFFs.

Furthermore, a firm's FD follows the Altman Z-score (Altman 1968) multivariate models. Additionally, FD from investors' viewpoints based on BOS and AC distress scores are undertaken (Al-Hadi et al. 2017). Hence, this study is a unique investigation using the multi-technique approach to provide comparable and robust outcomes.

The study's critical implications are as follows: (1) policymakers would acquire insights into the competition issues for FD in the listed firms in India (Tripathy et al. 2016); (2) the recent beginning of a firm's consolidation may augment it as a long-term policy, especially from a firm's stability viewpoint (Jasrotia and Agarwal 2021); (3) existing different corporate activities may also become accepted as long-term policy (Misra 2006; Jayadev et al. 2017).

The paper is further segmented into five sections. Section 2 dives deep into the literature relevant to the current study to identify research gaps and in service to hypothesis formation. Section 3 discusses the data and methodology. The results are presented in Section 4. Section 5 discusses the current results compared to earlier relevant work. The paper marks its conclusion in Section 6.

## 2. Literature Review

The literature on financial distress is enormous. It is not a new challenge that a firm may face. Studies on FD issues have been a vital research interest since 1966 (Ward and Foster 1997). Our grip on this area has become more critical since the global financial crisis of 2008, which pushed the whole corporate world into the ring of financial challenges (Reinhart and Rogoff 2011). This paper presents a literature survey regarding financial distress in several categories to identify the research gaps and better comprehend the problem confronted in the present study.

### 2.1. Factors Specific to Firms and Firm's Financial Distress

A firm's FD and the factors specific to the firm are woven together. One of the essential types of firm-specific factors is financial factors, and these factors and FD are companions. The existing literature on financial distress is filled with studies mentioning only financial causes specific to the firm, and these factors are internal to the firm. However, financial distress may have other causes, such as non-financial and external causes (Waqas and Rus 2018; Balasubramanian et al. 2019).

In the studies regarding firm-specific factors (internal), Jahur and Quadir (2012) find financial factors to be a crucial cause of firms' FD in SMEs ("Small and Medium Enterprises") in Bangladesh. Similarly, Baimwera and Muriuki (2014), in their research on Nairobi listed firms, advocate for financial factors being responsible for firms' financial distress. On a similar line, Jaafar et al. (2018) and Ikpesu (2019) present similar evidence on firms' financial distress in Malaysia and Nairobi, respectively. Gebreslassie (2015) has explored many financial factors, such as NPAs ("non-performing assets"), CLR ("capital-loan ratio"), and NIM ("net interest margin"), and suggested that these are the essential factors of banks' financial distress in Ethiopia.

Likewise, Farooq et al. (2018) indicated that issues of mild liquidity and depletion in profit provide early signals of a firm's financial distress. In a recent study of 1742 firms listed

in India for the period 2010–2016, [Sehgal et al. \(2021\)](#) developed a model incorporating five important financial ratios (i.e., cash–total liability ratio) for describing a firm’s financial distress. [Shi and Li \(2021\)](#) advocated that leverage, profitability, and liquidity are the significant causes of FD in European Airline firms. [Rafatnia et al. \(2020\)](#) also find that liquidity, profitability, and leverage are the prime causes of FD in Iranian firms. [Waqas and Rus \(2018\)](#) also indicate similar results for Pakistani listed firms.

Existing studies mainly focus on financial factors, as discussed earlier. However, non-financial factors may also be essential to financial distress, and they should be appropriately managed to overcome the issue of financial distress in a timely manner. Many studies, such as [Balasubramanian et al. \(2019\)](#), [Agrawal \(2015\)](#), [Waqas and Rus \(2018\)](#), and [Obradović et al. \(2018\)](#), have also advocated that combining financial and non-financial determinants provides better predictive ability with respect to financial distress. [Jabeur and Fahmi \(2018\)](#) used only financial information and suggested that non-financial parameters should be considered ([Mselmi et al. 2017](#); [Restianti and Agustina 2018](#)).

[Bakar and Noordin \(2021\)](#) conducted a study on firms listed in Malaysia. They found that institutional and independent ownership improves a firm’s financial distress. [Zeitun and Tian \(2007\)](#), in a study on 59 listed firms in Jordan, found that ownership of the top five large shareholders and foreign and government ownership is negatively associated with a firm’s FD.

[Yousaf et al. \(2021\)](#) have explored the demographic attributes of the board as a non-financial determinant in a study of firms listed in China. They found that demographic attributes such as age, gender, education, competence, and liberty affect a firm’s financial distress and improve its health. Similarly, [Kristanti et al. \(2016\)](#) indicate the importance of corporate governance (CG) in improving financial distress in their study on the firms listed in Indonesia. [Zeitun and Tian \(2007\)](#), [Manzaneque et al. \(2016\)](#) and [Udin et al. \(2017\)](#), in their research on CG, have also indicated the importance of the ownership framework on financial performance. Likewise, [Vosoughi et al. \(2016\)](#) have found a positive association between institutional ownership and FD. In an exciting study by [Whitaker \(1999\)](#), the CG of firms did not relate to the financial distress issue. However, CG and managerial activities help firms exit from the early stages of FD.

The above discussion shows numerous causes for a firm’s FD. These causes can be internal or external to the firm. Among the several factors pertaining to a firm’s FD condition are financial and non-financial factors. It is observed that firms are more capable of dealing with internal factors; however, external (exogenous) factors are challenging for them to deal with. The current study mainly focused on finding competition’s impact (one of the essential exogenous factors) on a firm’s FD.

## 2.2. Incorporation of Exogenous Variables as the Determinants of Financial Distress

Apart from firm-specific financial or non-financial determinants of FD, exogenous factors also have equal importance to the causes of a firm’s FD. Hence, the macroeconomic signals, market structure, competition, and regulations are significant reasons for a firm’s financial distress ([Kristanti and Herwany 2017](#); [Ikpesu 2019](#)). This is practically evident from the global crisis of 2008, which has shaken the whole world economy and affected many business activities, particularly in finance. Thus, it is logical and reasonable to contend that a mix of these three broad categories (firm-specific determinants (financial and non-financial) and exogenous determinants) might be the actual set of causes for a firm’s financial distress ([Kristanti and Herwany 2017](#); [Ikpesu 2019](#)). However, exogenous factors such as non-financial factors are also given less attention in the existing literature.

According to [Wanderi \(2016\)](#), CG and macroeconomic factors such as IT and globalization have significantly affected the FD of Kenyan banks according to research from 2011–2015. Similarly, [Zhang et al. \(2016\)](#) studied 629 US listed banks from 2010–2013. They explored the reasons described above (i.e., financial, non-financial, and exogenous factors), and found non-performing assets, such as financial factors specific to a firm, ownership as a non-financial factor specific to a firm, and capital regulation and housing prices as



exogenous macroeconomic factors. All are associated with banks' financial distress in US banking. Providing evidence from 3865 listed firms (Swedish) for 2008–2015, [Yazdanfar and Öhman \(2020\)](#) advocate that exogenous and firm-specific factors affect a firm's financial distress. Similarly, [Elloumi and Gueyié \(2001\)](#) find evidence from listed firms in Canada for all the reasons above—firm-specific and macroeconomic—being connected to a firm's financial distress. [Kristanti and Herwany \(2017\)](#) and [Ikpesu \(2019\)](#) also advocate for the importance of macroeconomic factors. However, few studies explore the exogenous factors responsible for a firm's FD. Hence, the current paper fills this particular gap.

### 2.3. Theoretical Framework on Competition and Financial Distress and Hypothesis Formation

Among exogenous variables, competition may be a vital issue causing the problem of financial distress. [Beck et al. \(2006\)](#) and [Cetorelli \(2001\)](#) have pointed this out in studies in the existing literature. In these studies, it is observed that competition as an exogenous determinant is not considered to be the sole the cause of financial distress; instead, it is one of the essential elements considered to be the cause of financial distress. There exists an abundance of literature discussing competition and financial distress. However, studies on how competition relates to financial distress are significantly fewer. The literature also fails to establish a connection between the two as no standard view on their relationship exists. One compendium advocates that competition significantly affects a firm's FD, either positively or negatively. However, others indicate that competition has no link to a firm's FD. With the contrasting views on the link between competition and FD, two hypotheses exist in the literature. One is the “competition-fragility hypothesis” (CFH), and the other is the “competition-stability hypothesis” (CSH). CFH proposes that competition leads to a higher risk of financial distress, while CSH assumes that competition lowers financial distress and improves financial stability ([López-Penabad et al. 2021](#); [Cuestas et al. 2020](#)).

In support of CFH, [Alam et al. \(2019\)](#) conducted a study on banking in 10 Islamic countries, including 200 banks. They found that the CFH favors only conventional banking. Similarly, [Cipollini and Fiordelisi \(2012\)](#), in a study of 308 banks operating in Europe during 1996–2009, have also advocated that competition is an essential attribute of bank value for a bank in stressed conditions, supporting CFH. [Berger et al. \(2009\)](#) have also found evidence for CFH, considering 8235 banks of 23 economies. Similar support for CFH has also been found by [Leroy and Lucotte \(2017\)](#) and [Hanggraeni \(2018\)](#).

In support of CSH, [Boyd and De Nicolo \(2005\)](#) advocate that market power (or lower competition) reduces financial stability. [Beck et al. \(2013\)](#) provided blended evidence for CFH and CSH. CSH is accepted if regulations and supervision are effective; otherwise, CFH is followed. Similar outcomes were also identified by [Alam et al. \(2019\)](#), who explored the connection of competition with FD for the banking system in 10 leading Islamic nations during 2006–2016, including both Islamic and conventional banks. They have indicated that Islamic banks accept CSH while conventional banks reject it. In Indian banks, [Kanoujiya et al. \(2022\)](#) provide supportive evidence for CFH and indicate that competition enhances FD. [Ugur et al. \(2022\)](#) and [Chen et al. \(2023\)](#) also found a similar outcome in support of CFH. [Hagen et al. \(2019\)](#) and [Anand and Venkataraman \(2016\)](#) have also found evidence regarding the both the CFH and CSH views on a firm's FD and competition. Hence, two essential theories provide contradictory conclusions on the connectivity of competition and a firm's FD. First, the market power theory (in line with CSH) argues that competition reduces financial distress and improves financial stability by reducing financing costs and increasing the chances of credit availability ([Boyd and De Nicolo 2005](#); [Alam et al. 2019](#)). However, the second, the information theory (in line with CFH), argues that competition deteriorates financial stability (increases financial distress) due to information asymmetry and agency costs ([Petersen and Rajan 1995](#); [Marquez 2006](#)). Based on these theories, earlier studies have mixed empirical evidence regarding the connection between a firm's competition and FD level.

Concerning the contrasting viewpoints on the connectivity of competition and financial distress, there is a requirement to further investigate the link between competition and

financial distress to provide fresh evidence, especially in emerging economies such as India. Hence, competition's connection to FD must be tested via different lenses. This study looks for the non-linear (quadratic) association of competition with FD. It is evident from the existing literature that both viewpoints mostly regard financial firms; non-financial firms are less investigated. Thus, the following hypothesis has been assumed:

**Hypothesis 1a (H1a):** *Competition non-linearly affects the financial distress of listed non-financial firms in India.*

### 3. Data and Methodology

#### 3.1. Data

The present paper utilizes the panel data of 78 listed NFFs in India (BSE 100) with a five-year (2015–16 to 2019–20) time dimension. In order to provide novel evidence on non-financial firms and to have a sufficient amount of all the required data, we have chosen this cross-section and timeframe. A few of the firms are avoided due to the absence of accurate data. The timeframe above is taken to have the most recent available data to provide fresh and reliable evidence. The data (secondary) are sourced mainly from the CMIE (“Centre for Monitoring Indian Economy”) Prowess database of Indian listed firms. Supplementary sources of data retrieval are the official websites of BSE, MoneyControl, and the firms’ annual reports. The list of variables by which the data are retrieved is mentioned in Table 1.

**Table 1.** List of Variables.

SN	Variable (Type)	Code	Definition	Citations
1	ZS (original) (DV)	ZS1	It is the originally developed Altman Z-score by Altman (1968). It is an assessment of firms’ financial distress. Higher Z-score signifies lower FD (See Appendix A.1).	Altman (1968), Pradhan (2014)
2	ZS (without sales) (DV)	ZS2	It is an amended version of Altman Z-score to consider non-manufacturing firms (see Appendix A.1).	Altman and Hotchkiss (2006), Pradhan (2014)
3	ZS (for emerging economies) (DV)	ZS3	It is further improved version of existing Z-score particularly for developing economies (see Appendix A.1).	Heine and Altman (2011), Pradhan (2014)
4	Distress Score (from investor’s perspective) (DV)	BOS_DIS	It is another version of distress score having investor’s perspective (see Appendix A.2). Higher score signifies lower FD.	Al-Hadi et al. (2017), Berger et al. (1996)
5	Distress Score (from investor’s perspective)	AC_DIS	It is an amended version of distress score (BOS_DIS), including the investors’ perspective (see Appendix A.3).	Al-Hadi et al. (2017) Almeida and Campello (2007)
6	Lerner’s Index (IV)	LI_comp	It is the computation of market power and competition (see Appendix A.4).	Paktinat and Javid (2015), Praveena and Samsai (2014), Lerner (1934).
7	Boone Index (IV)	BI_comp	It is another measure of competition and market power (see Appendix A.5).	Boone (2008), Tan (2018)
8	Market Capitalization (CV)	l_mcap	It is the representative of a firm’s value and computed as multiplying the number of a firm’s shares by current market price of the share.	Abdolmohammadi (2005), Dias (2013)

Table 1. Cont.

SN	Variable (Type)	Code	Definition	Citations
9	Sales (CV)	l_sales	Firms' sales are the exchange of firms' products or services for money. It is measured in INR (in crore).	Putra et al. (2021), Lee et al. (2020)
10	Operating margin (CV)	op margin	Operating margin is computed as the ratio of net income to total sales.	Park et al. (2013)

Note: DV, IV, and CV signify the dependent variables, independent variables, and control variables, respectively.

### 3.2. Methodology and Model Design

Panel data analysis (PDA) is undertaken as the regression analysis to examine the assumed hypothesis. The rationale behind applying PDA concerns its advantageous attributes over the ordinary time series or cross-sectional regression analysis. Baltagi (2008) and Hsiao (2007) state that PDA includes time series and cross-section information. Hence, PDA exhibits more information and variability comparatively. We have employed a static PDA model as no endogeneity exists (Wooldridge 2015). Having five dependent variables representing a firm's financial distress and two exogenous variables representing competition, ten models ( $5 \times 2$ ) are developed by which to investigate the linkage of competition to financial distress. As this study looks for a quadratic connection between the competition and FD, the model specification follows the standard quadratic equation discussed in Baltagi (2008), Wooldridge (2015), and other authenticated studies. The following model specification is built to examine this competition's impact on financial distress:

(Financial distress =  $f$  (competition, control variables))

$$Y_{it} = \alpha + \beta_1 X_{it} + \beta_2 X_{2it} + \delta_1 l\_mcap_{it} + \delta_2 l\_sales_{it} + \delta_3 opmargin_{it} + u_{it} \quad (1)$$

where  $Y_{it}$  is the representative of financial distress as the dependent variable, which can be ZS1, ZS2, ZS3 (Altman's Z-score), BOS\_score, or AC\_score; and  $X_{it}$  is the representative of exogenous variable competition, which can have LI\_comp or BI\_comp. The competition is computed in the two most popular ways: Lerner's index (LI\_comp) and Boone index (BI\_comp). Ten models are designed using different pairs of financial distress variables and exogenous variables.  $X_{2it}$  can have BI\_2 or LI\_2. "BI\_2" and "LI\_2" are the squares of BI\_comp and LI\_comp. The squared values are incorporated to test the non-linear connection between financial distress and competition. Moreover, also present are three control variables: l\_mcap, l\_sales (indicating, respectively, the natural-log values of market capitalization and sales), and op margin (operating margin). The control variables are kept in the model to ascertain the model's good fit, and these variables are controlled to observe the sole impact of competition on financial distress (Wooldridge 2015). The  $\alpha$  is constant. The  $u_{it}$  is the error term, including  $\mu$  and  $v$ , signifying the individual effect and regular error term. Moreover, in the fixed-effect (FE) model, the unobserved error is added to the constant term, while in the random-effect (RE) model,  $u_{it}$  also incorporates the unobserved individual cross-section or time effect (Baltagi 2008).

### 3.3. Variables

As discussed in the model specification, the dependent variable is the distress scores representative of a firm's financial distress level. Five variables in total are incorporated, including three variants of Altman Z-score (ZS1, ZS2, and ZS3) and two distress scores (BOS\_DIS and AC\_DIS). A detailed discussion of these variables is presented in the Appendices A.1–A.3. The main exogenous variable is competition, with the two most acceptable competition measures: Boone Index (Boone 2008) and Lerner Index (Lerner 1934). These two variables are explained in detail in the Appendices A.4 and A.5. The control variables are market capitalization (l\_mcap), sales (l\_sales), and operating margin (op margin). Market capitalization is computed by multiplying the current market price

of an equity share by a firm's total number of outstanding shares (Abdolmohammadi 2005; Dias 2013). A firm's sales are exchanging a firm's products or services for money (Putra et al. 2021; Lee et al. 2020). The operating margin is the net income ratio to total sales (Park et al. 2013). These variables are kept controlled solely for observing the influence of competition. These variables are taken as a control to avoid endogeneity and to omit variable biasedness issues (Wooldridge 2015).

## 4. Results

### 4.1. Descriptive Statistics

Descriptive statistics of the applied variables in the regression models are presented in Table 2. The mean values of ZS1, ZS2, and ZS3 are 14.098, 27.966, and 31.2163, respectively. This result indicates that firms listed in India are not in the class of financially distressed firms in all cases of Altman Z-scores. BOS\_DIS and AC\_DIS have average scores of 0.5504 and 0.588. This result means that from the investors' viewpoint, Indian listed firms are in a moderate situation regarding financial distress. Hence, all distress scores show a similar classification of the firms. The mean value of 0.445 for BI signals moderate competition, and 0.139 for LI indicates high competition in Indian listed firms. The firms' market capital (l\_mcap) averages amount to 10.927 (logarithmic). The firms' sales (l\_sales), on average, amount to 9.598 (logarithmic). Both are at a moderate level, having values in the middle of Min and Max. The "Op margin" is 20.83% on average (slightly close to Min), indicating a lower operating margin.

**Table 2.** Descriptive statistics.

Variable	Mean	SD	Min	Max
ZS1	14.098	41.302	−38.898	449.491
ZS2	27.966	74.476	−65.693	790.090
ZS3	31.216	74.476	−62.443	793.340
BOS_DIS	0.550	2.196	0.003	24.537
AC_DIS	0.588	2.193	0.025	24.545
BI_comp	0.445	0.605	0	4.291
LI_comp	0.139	0.285	0	0.973
l_mcap	10.927	0.938	8.890	13.832
l_sales	9.598	1.336	5.303	13.330
Op margin	0.208	0.138	−0.061	1.211

Note: SD stands for standard deviation.

For the correlation, ZS1 positively correlates with other distress scores (ZS2, ZS3, BOS\_DIS, and AC\_DIS) (see Table 3). It also positively correlates with op margin. ZS2 and ZS3 also correlate similarly with other distress scores, positively correlating with LI\_comp and op margin. BOS\_DIS and AC\_DIS correlate significantly and positively with other distress scores and LI\_comp. BI\_comp positively correlates with l\_mcap and l\_sales but negatively correlates with op margin. However, the LI\_comp only has a positive correlation with op margin. Furthermore, mcap positively correlates to sales, but sales negatively correlate to op margin. The correlation between the BI\_comp and LI\_comp is negative (−0.025) but insignificant at 5% significance. This result means that both competition measures do not correlate significantly.

### 4.2. Financial Distress and Competition as Boone Indicator

Table 4 demonstrates the results of Model 1, 2, 3, 4, and 5. These models are set to examine the connectivity of BI\_comp (as competition) to ZS1, ZS2, ZS3, BOS\_DIS, and AC\_DIS (as financial distress), respectively. Regarding the suitability of the model, the random effect (RE) is well suited for all these models as the Hausman test confirms it (insignificant values with  $p$ -value > 0.05). The Hausman test is applied due to the significant outcome of the F-test (FE) and BP test (RE) (Baltagi 2008; Wooldridge 2015). Furthermore, both the Wald test (testing heteroscedasticity) and the Wooldridge test (testing



autocorrelation) reject the null hypothesis of no heteroscedasticity and autocorrelation of account of their having significant  $p$ -values ( $<0.05$ ) in each model; hence, the robust estimates are also fetched concerning the findings.

**Table 3.** Correlation matrix.

	ZS1	ZS2	ZS3	BOS_DIS	AC_DIS	BI_comp	LI_comp	l_mcap	l_sales	Op Margin
ZS1	1									
ZS2	0.996 *	1								
ZS3	0.996 *	1 *	1							
BOS_DIS	0.273 *	0.352 *	0.352 *	1						
AC_DIS	0.274 *	0.353 *	0.353 *	0.999 *	1					
BI_comp	−0.017	−0.018	−0.018	0.097	0.094	1				
LI_comp	0.097	0.154 *	0.154 *	0.647 *	0.646 *	−0.025	1			
l_mcap	0.060	0.064	0.064	0.064	0.064	0.100 *	0.030	1		
l_sales	−0.046	−0.048	−0.048	0.055	0.051	0.570 *	−0.082	0.527 *	1	
Op margin	0.139 *	0.136 *	0.136 *	−0.084	−0.084	−0.270 *	0.261 *	0.078	−0.216 *	1

Note: \* indicates the significant correlation coefficient at 0.05.

In Model 1 (Table 4), the coefficient of BI\_comp is 3.726, with  $p$ -value 0.043 ( $<0.05$ ). The coefficient of BI\_comp is significant at 5% sig. level. This result indicates a significant linear connection between ZS1 and BI\_comp in the same direction (positive relationship). It implies that competition (reverse of BI) lowers financial stability and increases financial distress. At the same time, BI\_2 (squared BI\_comp) has a negative coefficient (−0.906), with a  $p$ -value 0.053 ( $<0.10$  sig. level). This result indicated that there also exists a non-linear relationship between ZS1 and BI\_comp, indicating that competition positively influences financial distress to a threshold, and then it reduces financial distress. Among the control variables (l\_mcap, l\_sales, and op margin), only l\_mcap is a significant control variable, with a positive coefficient (5.312) and a  $p$ -value of 0.004.

Model 2 also exhibits the coefficient of BI\_comp, with a positive value (6.220) significant at 10% ( $p$ -value = 0.070  $< 0.10$ ) (Table 4). Similarly, the coefficient of BI\_2 is negative (−1.555) and significant at 10% ( $p$ -value = 0.081). This result again shows significant connectivity between ZS2 and BI\_comp (both linear and non-linear), as found in Model 1. In this model, only l\_mcap is positive and significant out of the control variables (l\_mcap, l\_sales, and op margin).

In Model 3, the coefficient of the BI\_comp is also positive and significant (6.220 with  $p$ -value = 0.07) (see Table 4). BI\_2 also has a negative and significant coefficient (−1.555 with  $p$ -value = 0.081). Therefore, this model also exhibits that BI\_comp has significant linear and non-linear relations to ZS3. This result implies that competition has a significant impact on FD. Only l\_mcap is a significant positive control variable in the model. Therefore, Model 3 presents similar results to previous models. Table 4 presents the results of Model 4. This model considers the value of distress scores BOS\_DS (Berger et al. 1996) as the proxy for FD. The coefficient of BI\_comp in this model is positive (0.212) but insignificant ( $p$ -value = 0.317  $> 0.10$ ). BI\_2 has a negative coefficient value (−0.066), but this is also insignificant ( $p$ -value = 0.331  $> 0.05$ ). Hence, this model exhibits no linear or non-linear connection between FD and competition. Furthermore, no control variables have a significant coefficient.

The paper also puts the results of Model 5 in Table 4. This model takes the dependent variable of financial distress as the AC\_DIS (Almeida and Campello 2007). The coefficient of BI\_comp is 0.168 with  $p$ -value = 0.428 (positive but insignificant). The coefficient of BI\_2 is −0.565 with  $p$ -value = 0.406 (negative but insignificant). Like the previous model, similar results are also seen in this model. This situation again signifies that neither a linear nor a non-linear connectivity exists between FD and competition. All three control variables are found to be insignificant in this model also. Here, all of the above five models (Models 1, 2, 3, 4, and 5) examining the connection between financial distress and BI\_comp exhibit similar results, indicating a linear and a non-linear connection of BI\_comp to financial distress.

**Table 4.** Result of regression analysis (static panel data analysis) (financial distress vs. BI as competition).

	<b>Model 1</b> <b>DV: ZS_1</b> <b>(RE)</b>	<b>Model 2</b> <b>DV: ZS_2</b> <b>(RE)</b>	<b>Model 3</b> <b>DV: ZS_3</b> <b>(RE)</b>	<b>Model 4</b> <b>DV: BOS_DIS</b> <b>(RE)</b>	<b>Model 5</b> <b>DV: AC_DIS</b> <b>(RE)</b>
	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>
BI_comp (exp_var)	3.726 ** (0.043)	6.220 *** (0.070)	6.220 ** (0.070)	0.212 (0.317)	0.168 (0.428)
BI_2 (Quadratic)	−0.906 *** (0.053)	−1.555 *** (0.081)	−1.555 *** (0.081)	−0.066 (0.331)	−0.056 (0.406)
l_mcap	5.312 * (0.004)	9.761 * (0.005)	9.761 * (0.005)	0.114 (0.357)	0.120 (0.333)
l_sales	−3.115 (0.250)	−5.301 (0.256)	−5.301 (0.256)	0.129 (0.282)	0.123 (0.305)
Op margin	16.3620 (0.273)	28.729 (0.278)	28.729 (0.278)	−0.368 (0.348)	−0.415 (0.298)
Cons.	−17.59 (0.419)	−33.831 (0.402)	−33.831 (0.402)	−1.916 (0.392)	−1.860 (0.406)
F-test (Model)	11.80 ** (0.037)	11.48 ** (0.048)	11.48 ** (0.048)	3.02 (0.696)	2.94 (0.709)
F-test (FE)	44.07 * (0.000)	41.93 * (0.000)	41.93 * (0.000)	15.96 * (0.000)	15.90 * (0.000)
BP-test (RE)	622.03 * (0.000)	615.29 * (0.000)	615.29 * (0.000)	432.04 *(0.000)	440.5 * (0.000)
Hausman Test	1.94 (0.857)	2.04 (0.843)	2.04 (0.843)	4.16 (0.526)	4.35 (0.500)
Wald test for Heteroscedasticity <sup>1</sup>	$1.3 \times 10^7$ * (0.000)	$1.6 \times 10^7$ * (0.000)	$1.6 \times 10^7$ * (0.000)	$5.4 \times 10^7$ * (0.000)	$4.3 \times 10^7$ * (0.000)
Wooldridge Autocorrelation Test <sup>2</sup> AR (1)	89.522 * (0.000)	53.355 * (0.000)	53.355 * (0.000)	$5.51 \times 10^6$ * (0.000)	$6.49 \times 10^6$ * (0.000)
Sigma_u <sub>i</sub>	39.555	71.061	71.061	1.914	1.911
Sigma_v <sub>i</sub>	13.045	24.063	24.063	1.085	1.085
rho	0.901	0.897	0.897	0.756	0.756
R-Square	0.038	0.039	0.039	0.025	0.024

Note: <sup>1</sup> Wald test of heteroscedasticity has the null hypothesis of no heteroscedasticity. <sup>2</sup> Wooldridge test of autocorrelation in panel has the null hypothesis of no autocorrelation (with 1 lag). BP test refers to the Bruesch-Pagan test for random effect. RE and FE stand for random effect and fixed effect model, respectively. Sigma\_u<sub>i</sub> and Sigma\_v<sub>i</sub> are the variance of individual effect (firms in this case) and error term, respectively. The rho is the fraction of variance due to ui. Robust estimates are estimated due to significant heteroscedasticity and/or autocorrelation. Parenthesis has *p*-value. The exp\_var signifies the explanatory variable and BI\_comp is the measure of competition using the Boone index. BI\_2 is the square of BI\_comp, used to obtain non-linear (quadratic) relation. \*, \*\*, and \*\*\* are significant at 1%, 5%, and 10%.

#### 4.3. Financial Distress and Competition as Lerner's Index

Table 5 presents the results of Models 6, 7, 8, 9, and 10. These models have used LI\_comp as a competition proxy. The models estimate competition's impact on financial distress. All the five models (Model 6, 7, 8, 9, and 10) use financial distress as ZS1, ZS2, ZS3, BOS\_DIS, and AC\_DIS, respectively. Among these five models, Models 6, 7, and 8 are consistent with RE, as the Hausman test indicates the suitability of RE in these models due to insignificant *p*-value at 5% significance. This test is required as both F-test for FE and BP test for RE are significant at 5% (see Table 5) (Baltagi 2008; Wooldridge 2015). However, Models 9 and 10 are suitable for financial distress as the F-test test for FE is significant, and the Hausman test also confirms that the FE in these two models has a significant *p*-value

(<0.05). The availability of heteroscedasticity and autocorrelation (significant  $p$ -value of the Wald test for the heteroscedasticity and the Wooldridge test for autocorrelation) indicates the robust standard error estimates to be considered in all five models.

**Table 5.** Result of regression analysis (static panel data analysis) (financial distress vs. LI as competition).

	<b>Model 6</b> <b>DV: ZS_1</b> <b>(RE)</b>	<b>Model 7</b> <b>DV: ZS_2</b> <b>(RE)</b>	<b>Model 8</b> <b>DV: ZS_3</b> <b>(RE)</b>	<b>Model 9</b> <b>DV: BOS_DIS</b> <b>(FE)</b>	<b>Model 10</b> <b>DV: AC_DIS</b> <b>(FE)</b>
	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>	<b>Robust</b>
LI_comp (exp_var)	−25.076 *** (0.065)	−52.324 *** (0.079)	−52.324 *** (0.079)	−3.757 (0.192)	−3.809 (0.185)
LI_2 (Quadratic)	28.110 (0.141)	63.154 (0.156)	63.154 (0.156)	4.493 (0.237)	4.511 (0.235)
l_mcap	5.145 * (0.004)	9.335 * (0.004)	9.335 * (0.004)	0.136 (0.215)	0.146 (0.187)
l_sales	−3.077 (0.250)	−5.351 (0.246)	−5.351 (0.246)	0.151 (0.345)	0.138 (0.388)
Op margin	25.256 (0.145)	48.759 (0.123)	48.759 (0.123)	1.425 (0.186)	1.402 (0.194)
Cons.	−15.449 (0.550)	−28.517 (0.383)	−28.517 (0.383)	−2.510 (0.322)	−2.426 (0.337)
F-test (Model)	27.71 * (0.000)	37.36 * (0.000)	37.36 * (0.000)	13.18 * (0.000)	13.21 * (0.000)
F-test (FE)	39.91 * (0.000)	37.08 * (0.000)	37.08 * (0.000)	2.24 * (0.000)	2.25 * (0.000)
BP-test (RE)	595.46 * (0.000)	583.57 * (0.000)	583.57 * (0.000)	0.06 (0.404)	0.05 (0.401)
Hausman Test	5.57 (0.350)	6.06 (0.300)	6.06 (0.300)	77.13 * (0.000)	77.33 * (0.000)
Wald test for Heteroscedasticity <sup>1</sup>	$8.9 \times 10^6$ * (0.000)	$5.3 \times 10^6$ * (0.000)	$5.3 \times 10^6$ * (0.000)	$1.5 \times 10^8$ * (0.000)	$1.7 \times 10^8$ * (0.000)
Wooldridge Autocorrelation Test <sup>2</sup> AR (1)	40.002 * (0.000)	22.575 * (0.000)	22.575 * (0.000)	89.038 * (0.000)	87.994 * (0.000)
Sigma_u <sub>i</sub>	36.967	64.932	64.932	1.417	1.420
Sigma_v <sub>i</sub>	12.860	23.482	23.482	0.983	0.984
Rho	0.892	0.884	0.884	0.674	0.675
R-Square	0.144	0.182	0.182	0.181	0.181

Note: As in Table 4, exp\_var signifies the explanatory variable, and LI\_comp is a measure of competition using the Lerner index. LI\_2 is the square of LI\_comp used to obtain non-linear (quadratic) relation. \* and \*\*\*, respectively, show significance at 1% and 10%. <sup>1</sup> Wald test of heteroscedasticity has the null hypothesis of no heteroscedasticity. <sup>2</sup> Wooldridge test of autocorrelation in panel has the null hypothesis of no autocorrelation (with 1 lag).

In Model 6, the coefficient of LI\_comp is negative and significant (−25.076 with  $p$ -value = 0.065) at 10%. Hence, LI\_comp negatively associates with ZS1 (see Table 5). This result implies that higher market power lowers the distress score (financial stability), or higher competition (reverse of LI) improves financial health. It further means that competition reduces FD. However, looking at the non-linear relationship, LI\_2 (square of LI\_comp) has a positive value of coefficient (28.110 with  $p$ -value = 0.141). This result indicates an insignificant non-linear association between LI\_comp and the financial distress score. Among the control variables (l\_mcap, l\_sales, and op margin), l\_mcap is positive and significant.

Similarly, in Model 7, the coefficient of LI\_comp is -52.324 with  $p$ -value = 0.079 (Table 5). The coefficient of LI\_comp is significant at 10% sig. level. This result indicates a significant and negative linear connection between ZS2 and LI\_comp. This result implies that higher market power lowers the distress score (financial stability), or that higher competition improves financial health. At the same time, LI\_2 (squared LI\_comp) has a positive coefficient (63.154) with  $p$ -value 0.156 ( $>0.10$  sig. level). This result indicates that there does is no non-linear relationship between ZS2 and LI\_comp. Among the control variables (l\_mcap, l\_sales, and op margin), only l\_mcap is the significant control variable, with a positive coefficient (9.3, having a  $p$ -value of 0.004).

Like Models 6 and 7, in Model 8, the coefficient of LI\_comp is negative and significant (-52.324 with  $p$ -value 0.079) (Table 5). Hence, an opposite linear connection exists between LI\_comp and ZS3, indicating that higher market power lowers financial stability (increasing financial distress), or higher competition improves financial health. At the same time, LI\_2 (squared LI\_comp) has an insignificant coefficient. This result shows no significant non-linear relationship between ZS2 and LI\_comp. The control variable l\_mcap is positive and significant, as in Model 7.

Model 9 uses BOS\_DIS as financial distress for the dependent variable, and its outcome is also presented in Table 5. The coefficient of LI\_comp is -3.757, with a  $p$ -value of 0.192. Therefore, this exhibits a negative but insignificant linear link between BOS\_DIS and LI\_comp. This result indicates that increasing market power does not influence financial stability (or FD). Further, the coefficient of LI\_2 (squared LI\_comp) is 4.493, with a  $p$ -value of 0.237. As the coefficient of LI\_2 is insignificant, this does not show a significant non-linear association between LI\_comp and financial distress score. None of the control variables (l\_mcap, l\_sales, and op margin) are significant in this model.

Using AC\_DIS as the dependent variable (the proxy for financial distress), Model 10 investigates the link between competition and financial distress (Table 5). LI\_comp has a negative but insignificant coefficient (-3.809 with a  $p$ -value of 0.185). This result indicates no significant linear relation of LI\_comp to AC\_DIS. This result further implies that higher market power does not affect financial stability (or distress). Further, the coefficient of LI\_2 (squared LI\_comp) is 4.511, with a  $p$ -value of 0.235. As the coefficient of LI\_2 is insignificant, this shows no non-linear association between LI\_comp and financial distress score. These results are similar to the previous model. No control variable is found significant in the model. Thus, the answer to Question 1 is that competition exhibits linear and non-linear relations, indicating that competition affects a firm's FD. However, comparing BI and LI, they do not exhibit similar outcomes. This result answers Question 2.

#### 4.4. Endogeneity and Robustness Check

This study also tests for endogeneity issues due to the main explanatory variables in the models. The Wu-Hausman test and Durbin Chi-2 test are run to confirm it (Baltagi 2008; Wooldridge 2015). The "Instrumental regression" is applied with lag 3 values as instruments. The outcomes of these tests are presented in Table 6. The insignificant values ensure that the explanatory variables are not endogenous. Hence, no biasedness comes through endogeneity. In addition, it also ensures that there is no omitted variable biasedness (Baltagi 2008; Wooldridge 2015).

**Table 6.** Endogeneity Test.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9	Model 10
<b>Durbin Chi-2</b>	0.3732 (0.5412)	0.4248 (0.5145)	0.4248 (0.5145)	0.5910 (0.4420)	0.6634 (0.4154)	0.8164 (0.3662)	1.2919 (0.2557)	1.2919 (0.2557)	1.2668 (0.1008)	1.4182 (0.1007)
<b>Wu-Hausman Test</b>	0.3593 (0.5498)	0.4092 (0.5234)	0.4092 (0.5234)	0.5699 (0.4515)	0.6400 (0.4250)	0.7884 (0.3760)	1.2516 (0.2651)	1.2516 (0.2651)	1.6884 (0.1008)	1.8581 (0.1007)

Note: all values are insignificant at 5% significance. Both tests have null hypotheses of exogenous variables.

This study's novelty lies in the techniques applied to evaluate firms' financial distress and competition. As the model specification mentions, five variables are employed to assess a firm's financial distress score and two competition proxies (LI\_comp and BI\_comp). There are, overall, ten models developed using  $5 \times 2$  combinations. There are thus two sets of outcomes: one with financial distress and BI\_comp, and the other with financial distress and LI\_comp. Models 1 to 5 (for financial distress vs. BI\_comp) (Table 4) exhibit a significant linear relation and a non-linear association between financial distress and competition. Hence, this set of five models gives robust results. However, Models 6 to 10 (for financial distress vs. LI\_comp) (Table 5) exhibit similar results but are opposite to the earlier five models (Models 1 to 5). Unlike the previous models, these models show a significant but inverse linear connection of competition to financial distress scores. However, the non-linear connection is insignificant in all these models (Models 6 to 10). The outcomes of the models of both sets exhibit robustness of results. However, as a whole, these two sets indicate two different viewpoints.

## 5. Discussion

### 5.1. Hypothesis Discussion

The current paper assumes the alternative hypothesis  $H_a$ : competition non-linearly affects the financial distress in Indian listed non-financial firms. In several models (Models 1, 2, and 3), the hypothesis assumed in the current study has enough evidence in its support. Hence,  $H_a$  cannot be refused. In most cases, it is found that competition somehow influences a firm's FD. However, financial distress concerning competition as the Boone index has positive connectivity. It supports the CSH proposition. A firm's FD concerning competition as the Lerner's index has negative connectivity. It supports the CFH proposition. The quadratic association confirms that initially, competition enhances financial distress; beyond a threshold, it improves financial health by reducing distress.

### 5.2. Comparison with Previous Studies

The outcomes of the present study recognize that competition affects a firm's FD, favoring the findings indicated by [Beck et al. \(2013\)](#), [Alam et al. \(2019\)](#), [Berger et al. \(2009\)](#), and [Gyimah et al. \(2021\)](#). Moreover, the outcomes also support the findings of [Saha and Dutta \(2020\)](#), [Noman et al. \(2018\)](#), and [Obembe and Soetan \(2015\)](#). They have indicated that competition influences FD. Furthermore, the findings do not support [Yazdanfar and Öhman \(2020\)](#), who argue that there is no connection between competition and a firm's FD.

### 5.3. Contribution

The current study identifies the connection of competition to a firm's FD. It has employed a multi-technique approach, measuring financial distress and competition using different methods to provide accurate and comparative results. The study finds answers to the framed questions in the present paper: (1) How does competition relate to a firm's financial distress? (2) Do different measures of competition and distress scores have different outcomes for the competition's impact on FD? The findings indicate that competition significantly influences a firm's FD. However, from the investors' viewpoint on financial distress, competition does not influence a firm's FD. The authors believe that this study's findings are novel and exciting; they contribute to the existing body of knowledge in the literature considering the link between competition and FD to be an important area of research.

### 5.4. Implications

Financial distress is not a desirable situation for the firm with respect to the proper execution of the business; it is not only limited to the firm itself; it may also disturb the whole economy in which it works ([Freeman et al. 2010](#); [Barney and Harrison 2020](#)). Therefore, it is imperative to eliminate such a phenomenon in time so as to avoid it leading to business failure ([Lizal 2002](#); [Habib et al. 2020](#)). Market competition is recognized as



a critical exogenous factor for the firm. The study's findings imply that competition significantly affects a firm's FD. The study found that the firm with higher market power has greater capability to refine its profits by commanding the pricing. Hence, market gains enhance financial health and reduce the chance of default risk. However, a sustainable level of competition also encourages a firm's financial stability. With the implementation and amendments of the IBC ("Insolvency and Bankruptcy Code") 2016 Acts in India, many reforms were witnessed by firms listed in India. However, empirical evidence of competition's impact on financial distress in Indian listed firms (BSE100) is unavailable. Therefore, the study's findings have important implications for policymakers seeking to establish such corporate and economic policies to promote sustainable and healthy competition and thus to improve the financial health of the firms listed in India. Moreover, the necessary implication for the stakeholders concerns monitoring the management to ensure proper business activities, command pricing, and refine profits. This situation will result in a strong stand in tough competition. The findings also have important implications for investors, who will make their investment decisions in consideration of competition not being critical to a firm's FD if seen from an investor's viewpoint (BOS\_DIS and AC\_DIS). Hence, they must also consider other essential exogenous factors, including financial and non-financial determinants, which may influence a firm's FD.

## 6. Conclusions

The current paper examines the influence of market competition on a firm's FD (or financial health), controlling the worth (market cap), performance (op margin), and sales of listed non-financial firms in India. This study transforms the prevailing literature in many respects. First, it uses the extensive data of listed non-financial firms in India as the most recent available data (2016–2020). This timeframe allows us to account for economic changes due to the global financial crisis and IBC Act 2016 for Indian listed firms. Second, this is a unique study as it provides several pieces of evidence showing the influence of competition (based on two popular competition measures) on different financial distress profiles (based on Altman Z-scores and distress scores having investor's viewpoint). Third, the paper specifies ten models using a panel data framework to establish linear and non-linear associations. The first five models (Model1, 2,3,4, and 5) use the Boone Index as a competition measure to find its influence on five different financial distress scores; the other five models (Models 6, 7, 8, 9 and 10) use the Lerner index as competition.

The upshots of these regression models are interesting as they indicate two different conclusions based on two different measures of market competition. Considering Boone Index as competition, it significantly and positively affects a firm's financial distress. LI, as a competition measure, also influences a firm's FD, signaling that higher competition promotes a firm's financial stability via a linear association. However, in a non-linear relationship, competition adversely affects financial health, or the higher market power enhances financial stability (showing an inverted U curve for competition and financial distress connection). Hence, the current findings support both the CFH and CSH hypotheses (Cuestas et al. 2020; López-Penabad et al. 2021) via linear and non-linear relationships. This situation indicates that in the case of LI, in cases of a linear relationship, a higher level of competition improves a firm's financial health (reducing FD). While considering BI, competition enhances financial distress; however, after a threshold in the quadratic establishment, it starts reducing the financial distress in cases of a non-linear relationship. This situation also means that higher market power enhances financial stability. Both indices (LI and BI) indicate that competition influences a firm's financial distress. However, Lerner's index and the Boone indicator present different outcomes with respect to competition's connection to financial distress. Lerner's index supports the "competition stability view" in line with Boyd and De Nicolo (2005) and Beck et al. (2013), but the Boone indicator supports the "competition fragility view", in line with Kanoujiya et al. (2022), Chen et al. (2023), and Hagen et al. (2019). However, the current study is quite different in its approach.

The current findings have noticeable policy implications, as policymakers should understand the competition's importance for a firm's health. There should be a healthy competitive environment, and equal opportunities should be available to all participants in the market. Managers should understand that competition is crucial to participating in the market; hence, they should try their best to gain the advantage of competition and vigorously face it to survive.

This study should not be generalized because its scope is limited to NFFs listed in India. Financial firms or nations with different economic and market structures may have different outcomes. However, this study provides insights into other emerging economies comparable to India. Therefore, this study opens doors to the study's future scope being extended in this direction for other economies. The current paper can be further extended to incorporate other measures of competition in order to provide more robust results. Other firms' specific or exogenous determinants (financial or non-financial), such as corporate governance, market strategies, and political dominance, should also be explored in order to determine their influence on a firm's FD.

**Author Contributions:** Conceptualization: J.K. and S.R.; Methodology: J.K. and S.R.; Software: J.K. and V.M.B.; Validation: S.R. and V.M.B.; Formal Analysis: J.K. and S.R.; Investigation: J.K. and V.M.B.; Resources: R.A.; Data Curation: J.K. and S.R.; Writing—Original Draft Preparation: J.K. and S.R.; Writing—Review and Editing: R.A.; Visualization: J.K.; Supervision: S.R.; Project Administration: S.R.; Funding Acquisition: N/A. All authors have read and agreed to the published version of the manuscript.

**Funding:** The research received no external funding.

**Data Availability Statement:** Data are available from the first author upon request.

**Acknowledgments:** We would like to take this opportunity to acknowledge the time and efforts devoted by the reviewers, whose valuable comments improved the quality of this work prior to publication.

**Conflicts of Interest:** The authors declare no conflict of interest.

## Appendix A

### Appendix A.1. Altman Z-Score

Beaver (1966) began the investigation into predicting a firm's bankruptcy and suggested that the cash flow-to-debt ratio was the primary determinant of FD. However, this study has incorporated the most popular distress scores developed by Altman (1968). All three variants of Z-scores are used in the present paper. Altman (1968) developed this model to classify distressed and non-distressed firms using multivariate discriminant analysis. He found the five financial ratios that are most significant and included these ratios in the model. As per Altman et al. (2017), his model has an accuracy of approximately 90% in classifying distressed or non-distressed firms. The original model, based on the most significant financial ratios, is presented as follows:

$$ZS1 = 1.2 \times A1 + 1.4 \times A2 + 3.3 \times A3 + 0.6 \times A4 + 1.0 \times A5, \quad (A1)$$

where:

A1 = WC/TA (working capital to total asset ratio), representing the liquid assets regarding the firm size;

A2 = RE/TA (retained earnings-to-total asset), representing a firm's power of earnings;

A3 = EBIT/TA (operating profit -to-total assets), showing a firm's operating efficiency;

A4 = MVE (equity's market value)/BVTL (total liabilities' book value), representing variations in the security price;

A5 = sales/TA, indicating a firm's turnover regarding total assets (TA).

The value of the Z-score determines the class of a firm, as set out below:

If  $ZS1 > 2.67$ , then the firm is safe;  
 If  $1.81 < ZS1 < 2.67$ , then the firm may face FD in the near future;  
 If  $ZS1 < 1.81$ , then the firm is in FD.

Altman (1968) only considered manufacturing firms in his original model. Hence, Altman and Hotchkiss (2006) amended the existing model, introducing non-manufacturing firms. The ratio “A5” has been removed from the original model for improvement regarding the industrial effect. The amended model is as follows:

$$ZS2 = 6.56 \times A1 + 3.26 \times A2 + 6.72 \times A3 + 1.05 \times A4, \quad (A2)$$

where A1, A2, A3, and A4 have the same meaning in the original model (Equation (A1)).

Classification:

$ZS2 > 2.6$  = the firm is safe;  
 $1.1 < ZS2 < 2.6$  = the firm may face FD in future;  
 $ZS2 < 1.1$  = the distressed firm.

The above two models were specified for the developed market. Hence, Heine and Altman (2011) further amended the model presented in Equation (A1) for emerging markets. In this model, they added a constant value of +3.25 to equalize the scores to 0, indicating default (D) rated bonds. The amended model for emerging markets is as follows:

$$ZS3 = 3.25 + 6.56 \times A1 + 3.26 \times A2 + 6.72 \times A3 + 1.05 \times A4, \quad (A3)$$

where A1, A2, A3, and A4 have the same meaning as in the original model, and the firm classification is the same as for the previous model (Equation (A2)).

#### Appendix A.2. BOS Distress Score

Following Al-Hadi et al. (2017), we have also incorporated the BOS distress score. Berger et al. (1996) have developed a financial distress model known as the BOS distress score. They have considered the investors' viewpoint using receivables, inventory, Net PPE (property + plant + equipment), and TA as inputs in the model. The FD based on the BOS model is computed as follows:

$$BOS\_DIS = (0.715 \times \text{Receivable} + 0.547 \times \text{Inventory} + 0.535 \times \text{Net PPE})/TA. \quad (A4)$$

#### Appendix A.3. AC Distress Score

In this direction, Almeida and Campello (2007) have further amended the BOS model by Berger et al. (1996). As per Al-Hadi et al. (2017), they included cash as an input variable in the BOS model to provide more accuracy in results. The amended model is known as the AC model (as per the names of authors: Almeida and Campello). The following is the AC model used to compute firm's financial distress:

$$AC\_DIS = ((\text{Cash} + 0.715\text{Receivable} + 0.547 \times \text{Inventory} + 0.535 \times \text{Net PPE})/TA). \quad (A5)$$

The model shows the inverse relation, i.e., a higher value of AC\_DIS indicates lower financial distress.

#### Appendix A.4. Lerner's Index

The study uses the Lerner's index (Lerner 1934), the most popular measure of competition or market power. Following Paktinat and Javid (2015) and Praveena and Samsai (2014), the Lerner's index (LI) is computed as follows:

$LI = (\text{Price} - \text{Marginal cost})/\text{price}$ , where marginal cost is proxied by firm's total operating expenses and price is revenue;

or

$LI = \text{profit of the firm } i / \text{Revenue of the firm } i$ .

$LI$  shows the market power of a firm's product but does not adjust industry specific factors. Therefore, following Gaspar and Massa (2006) and Sharma (2010), an improved version of Lerner index is applied in the present study (Sharma 2010):

$$LI_{IA} = LI_i - \sum_{i=1}^N \omega_i LI_i \quad (A6)$$

where  $LI_{IA}$  represents industry-based Lerner index;  $LI_i$  is Lerner index of firm  $i$ ; and  $\omega_i$  represents the proportion of sales of firm  $i$  to total sales of the industry. A higher value indicates low competition.

#### Appendix A.5. Boone Index

The other competition measure this study employed is the Boone Indicator (Boone 2008) based on the efficiency theory given by Demsetz (1973). As price–mc has different connectivity, it may not be a robust determinant regarding the competition assessment. Where mc is marginal cost. According to Boone (2008), several studies have examined similar models, indicating that a higher competition level converges to more differences in the price–mc. However, due to firms' high inefficiency, the Lerner index focuses on competition and seeks profit maximization, especially in emerging economies.

Boone (2008) developed a model considering the efficiency effect. The Boone indicator indicates that, concerning profit, competition improves efficient firms' performance and abates inefficient firms' performance. The Boone Indicator model is as follows:

$$\ln_{MS_{it}} = \alpha + \beta \ln_{MC_{it}} \quad (A7)$$

where  $\ln (MS_{it})$  is the log value of the market share of firm  $i$  at time  $t$ ;  $\ln (MC_{it})$  is the marginal cost;  $\alpha$  is the constant; and  $\beta$  is the coefficient representing the Boone Index. A lower value indicates higher competition in the market (Tan 2018).

## References

- Abdolmohammadi, Mohammed J. 2005. Intellectual capital disclosure and market capitalization. *Journal of Intellectual Capital* 6: 397–416. [CrossRef]
- Agrawal, Khushbu. 2015. Default prediction using Piotroski's F-score. *Global Business Review* 16: 1755–86S. [CrossRef]
- Alam, Nafis, Hamid Baharom Abdul, and Tan Dyi Ting. 2019. Does competition make banks riskier in dual banking system? *Borsa Istanbul Review* 19: S34–S43. [CrossRef]
- Al-Hadi, Ahmed, Chatterjee Bikram, Yaftian Ali, Taylor Grantley, and Monzur Hasan Mostafa. 2017. Corporate social responsibility performance, financial distress and firm life cycle: Evidence from Australia. *Accounting and Finance* 59: 961–89. [CrossRef]
- Almeida, Heitor, and Murillo Campello. 2007. Financial constraints, asset tangibility, and corporate investment. *The Review of Financial Studies* 20: 1429–60. [CrossRef]
- Altman, Edward I. 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. *The Journal of Finance* 23: 589–609. [CrossRef]
- Altman, Edward I., and Edith Hotchkiss. 2006. *Predict and Avoid Bankruptcy, Analyze and Invest in Distressed Debt*. New York: John Wiley.
- Altman, Edward I., Malgorzata Iwanicz-Drozdzowska, Erkki K. Laitinen, and Arto Suvas. 2017. Financial distress prediction in an international context: A review and empirical analysis of Altman's Z-score model. *Journal of International Financial Management and Accounting* 28: 131–71. [CrossRef]
- Amendola, Alessandra, Restaino Maraluisa, and Sensini Luca. 2015. An analysis of the determinants of financial distress in Italy: A competing risks approach. *International Review of Economics and Finance* 37: 33–41. [CrossRef]
- Anand, Amber, and Kumar Venkataraman. 2016. Market conditions, fragility, and the economics of market making. *Journal of Financial Economics* 121: 327–49. [CrossRef]
- Baimwera, Bernard, and Antony Muriu Muriuki. 2014. Analysis of corporate financial distress determinants: A survey of non-financial firms listed in the NSE. *International Journal of Current Business and Social Sciences* 1: 58–80.
- Bakar, Suzaida, and Bany Ariffin Amin Noordin. 2021. The Dynamic Impacts of Financial Determinants and Ownership Concentration Toward Firm Survival in Malaysia. In *Recent Developments in Asian Economics International Symposia in Economic Theory and Econometrics*. Edited by William A. Barnett and Bruno S. Sergi. Bradford: Emerald Publishing Limited.
- Balasubramanian, Senthil Arasu, G. S. Radhakrishna, and Thamaraiselvan Natarajan. 2019. Modeling corporate financial distress using financial and non-financial variables: The case of Indian listed companies. *International Journal of Law and Management* 61: 457–84. [CrossRef]
- Baltagi, Badi H. 2008. *Econometric Analysis of Panel Data*. Chichester: John Wiley & Sons, vol. 4.

- Barney, Jay B., and Jeffrey S. Harrison. 2020. Stakeholder theory at the crossroads. *Business and Society* 59: 203–12. [CrossRef]
- Beaver, William H. 1966. Financial ratios as predictors of failure. *Journal of Accounting Research* 4: 71–111. [CrossRef]
- Beck, T., A. Demirgüç-Kunt, and R. Levine. 2006. Bank concentration, competition, and crises: First results. *Journal of Banking & Finance* 30: 1581–603.
- Beck, Thorsten, Olivier De Jonghe, and Glenn Schepens. 2013. Bank competition and stability: Cross-country heterogeneity. *Journal of Financial Intermediation* 22: 218–44. [CrossRef]
- Berger, Allen N., Klapper Leora, and Turk-Ariss Rima. 2009. Bank Competition and Financial Stability. *Journal of Financial Services Research* 35: 99–118. [CrossRef]
- Berger, Philip. G., Ofek Eli, and Swary Itzhak. 1996. Investor valuation of the abandonment option. *Journal of Financial Economics* 42: 259–87. [CrossRef]
- Boone, Jan. 2008. A new way to measure competition. *The Economic Journal* 118: 1245–61. [CrossRef]
- Boyd, John H., and Gianni De Nicolò. 2005. The theory of bank risk-taking and competition revisited. *The Journal of Finance* 60: 1329–43. [CrossRef]
- Brander, James A., and Tracy R. Lewis. 1986. Oligopoly and Financial Structure: The Limited Liability Effect. *The American Economic Review* 76: 956–70.
- Cetorelli, Nicola. 2001. Competition among banks: Good or bad? *Economic Perspectives-Federal Reserve Bank of Chicago* 25: 38–48.
- Chen, H., W. W. Dou, H. Guo, and Y. Ji. 2023. *Feedback and Contagion through Distressed Competition*. No. 30841. Cambridge: National Bureau of Economic Research, Inc.
- Chong, Terence Tai Leung, Lu Liping, and Ongena Steven. 2013. Does banking competition alleviate or worsen credit constraints faced by small-and medium-sized enterprises? Evidence from China. *Journal of Banking and Finance* 37: 3412–24. [CrossRef]
- Cipollini, Andrea, and Franco Fiordelisi. 2012. Economic value, competition and financial distress in the European banking system. *Journal of Banking and Finance* 36: 3101–09. [CrossRef]
- Claessens, Stijn, and Luc Laeven. 2004. Competition in the financial sector and growth: A cross-country perspective. In *Financial Development and Economic Growth: Explaining the Links* (Papers from the 2003 Meeting of the British Association for the Advancement of Science, Section F (Economics)). Palgrave Macmillan. pp. 66–105. Available online: [https://www.researchgate.net/profile/Stijn-Claessens-2/publication/304683548\\_Competition\\_in\\_the\\_Financial\\_Sector\\_and\\_Growth\\_A\\_Cross-Country\\_Perspective/links/577a7a1308aee6c20fbd219/Competition-in-the-Financial-Sector-and-Growth-A-Cross-Country-Perspective.pdf](https://www.researchgate.net/profile/Stijn-Claessens-2/publication/304683548_Competition_in_the_Financial_Sector_and_Growth_A_Cross-Country_Perspective/links/577a7a1308aee6c20fbd219/Competition-in-the-Financial-Sector-and-Growth-A-Cross-Country-Perspective.pdf) (accessed on 30 November 2021).
- Cuestas, Juan Carlos, Lucotte Yannick, and Reigl Nicholas. 2020. Banking sector concentration, competition and financial stability: The case of the Baltic countries. *Post-Communist Economies* 32: 215–49. [CrossRef]
- Demsetz, Harold. 1973. Industry structure, market rivalry, and public policy. *The Journal of Law and Economics* 16: 1–9. [CrossRef]
- Dias, Alexandra. 2013. Market capitalization and Value-at-Risk. *Journal of Banking and Finance* 37: 5248–60. [CrossRef]
- Elloumi, F., and J. P. Gueyie. 2001. Financial distress and corporate governance: An empirical analysis. *Corporate Governance: The International Journal of Business in Society* 1: 15–23. [CrossRef]
- Farooq, Umar, Jibran Qamar, Muhammad Ali Jibran, and Haque Abdul. 2018. A three-stage dynamic model of financial distress. *Managerial Finance* 44: 1101–16. [CrossRef]
- Fischer, Karl-Hermann. 2000. Acquisition of information in loan markets and bank market power—An empirical investigation. *SSRN Electronic Journal*. [CrossRef]
- Freeman, R. Edward, Jeffrey S. Harrison, Andrew C. Wicks, Bidhan L. Parmar, and S. De Colle. 2010. *Stakeholder Theory: The State of the Art*. Cambridge: Cambridge University Press.
- Gaspar, J. M., and M. Massa. 2006. Idiosyncratic volatility and product market competition. *The Journal of Business* 79: 3125–52. [CrossRef]
- Gaud, Philippe, Hoesli Martin, and Bender Andrew. 2007. Debt-equity choice in Europe. *International Review of Financial Analysis* 16: 201–22. [CrossRef]
- Gebreslassie, Ephrem. 2015. Determinants of financial distress conditions of commercial banks in Ethiopia: A case study of selected private commercial banks. *Journal of Poverty, Investment and Development* 13: 59–74.
- Gordon, Myron J. 1971. Towards a theory of financial distress. *Journal of Finance* 26: 347–56. [CrossRef]
- Gyimah, Daniel, Siganos Antonios, and Veld Chris. 2021. Effects of financial constraints and product market competition on share repurchases. *Journal of International Financial Markets, Institutions and Money* 74: 101–392. [CrossRef]
- Habib, Ahsan, Mabel D'Costa, Hedy Jiaying Huang, Md Borhan Uddin Bhuiyan, and Li Sun. 2020. Determinants and consequences of financial distress: Review of the empirical literature. *Accounting and Finance* 60: 1023–75. [CrossRef]
- Hagen, Birgit, Zucchella Antonella, and Ghauri Pervez N. 2019. From Fragile to Agile: Marketing as a Key Driver of Entrepreneurial Internationalization. *International Marketing Review* 36: 260–88. [CrossRef]
- Hanggraeni, Dewi. 2018. Competition, bank fragility, and financial crisis. *Banks and Bank Systems* 13: 22–36. [CrossRef]
- Heine, Max L., and Edward I. Altman. 2011. *Predicting Financial Distress of Companies: Revisiting the Z-Score and Zeta Models*. Working Paper. New York: New York University.
- Hsiao, Cheng. 2007. Panel data analysis—Advantages and challenges. *Test* 16: 1–22. [CrossRef]
- Ikpesu, Frederick. 2019. Firm specific determinants of financial distress: Empirical evidence from Nigeria. *Journal of Accounting and Taxation* 11: 49–56.



- Jaafar, Mohamad Nizam, Muhamat Amirul Afif, Alwi Sherifah Faigah Syed, and Karim Norzital Abdul. 2018. Determinants of Financial Distress among the Companies Practise Note 17 Listed in Bursa Malaysia. *International Journal of Academic Research in Business and Social Sciences* 8: 798–809. [\[CrossRef\]](#)
- Jabeur, Sami Ben, and Youssef Fahmi. 2018. Forecasting financial distress for French firms: A comparative study. *Empirical Economics* 54: 1173–86. [\[CrossRef\]](#)
- Jahur, Mohammad Saleh, and S. Nasrul Quadir. 2012. Financial distress in small and medium enterprises (SMES) of Bangladesh: Determinants and remedial measures. *Economia Seria Management* 15: 46–61.
- Jasrotia, Sahil Singh, and Tarun Agarwal. 2021. Consolidation of Indian PSU banks and the way forward. *Journal of Public Affairs* 21: e2133. [\[CrossRef\]](#)
- Jayadev, M., Singh Himanshu, and Kumar Pawan. 2017. Small finance banks: Challenges. *IIMB Management* 29: 311–25.
- Kanoujiya, Jagjeevan, Shailesh Rastogi, and Venkata Mrudula Bhimavarapu. 2022. Competition and distress in banks in India: An application of panel data. *Cogent Economics & Finance* 10: 2122177.
- Kristanti, Farida T., Rahayu Sri, and Huda Akhmad Nurul. 2016. The determinant of financial distress on Indonesian family firm. *Procedia-Social and Behavioral Sciences* 219: 440–47. [\[CrossRef\]](#)
- Kristanti, F. T., and A. Herwany. 2017. Corporate governance, financial ratios, political risk and financial distress: A survival analysis. *Accounting and Finance Review (AFR)* 2: 26–34. [\[CrossRef\]](#)
- La Porta, Rafael, Lopez-de-Silanes Florencio, Shleifer Andrei, and Robert W. Vishny. 2000a. Investor protection and corporate governance. *Journal of Financial Economics* 58: 3–27. [\[CrossRef\]](#)
- La Porta, Rafael, Lopez-de-Silanes Florencio, Shleifer Andrei, and Robert W. Vishny. 2000b. Agency problems and dividend policies around the world. *Journal of Finance* 55: 1–33. [\[CrossRef\]](#)
- Lee, Chien-Chiang, Wang Chih-Wei, and Ho Shan-Ju. 2020. Financial inclusion, financial innovation, and firms' sales growth. *International Review of Economics and Finance* 66: 189–205. [\[CrossRef\]](#)
- Lerner, Abba P. 1934. The concept of monopoly and the measurement of monopoly power. *The Review of Economic Studies* 1: 157–75. [\[CrossRef\]](#)
- Leroy, Aurelian, and Yannick Lucotte. 2017. Is there a competition-stability trade-off in European banking? *Journal of International Financial Markets, Institutions and Money* 46: 199–215. [\[CrossRef\]](#)
- Lizal, Lubomir. 2002. Determinants of Financial Distress: What Drives Bankruptcy in a Transition Economy? The Czech Republic Case. Available online: [https://web.archive.org/web/20170816093346id\\_/https://deepblue.lib.umich.edu/bitstream/handle/2027.42/39835/wp451.pdf?sequence=3](https://web.archive.org/web/20170816093346id_/https://deepblue.lib.umich.edu/bitstream/handle/2027.42/39835/wp451.pdf?sequence=3) (accessed on 12 December 2021).
- López-Penabad, Maria Cella, Iglesias-Casal Ana, and Neto Jose Fernando Silva. 2021. Competition and financial stability in the European listed banks. *SAGE Open* 11: 21582440211032645. [\[CrossRef\]](#)
- Manzanegue, Montserrat, Priego Alba Maria, and Merino Elena. 2016. Corporate governance effect on financial distress likelihood: Evidence from Spain. *Revista de Contabilidad* 19: 111–21. [\[CrossRef\]](#)
- Marquez, Pablo. 2006. Cost Benefit Analysis, Value of a Statistical Life and Culture: Challenges For Risk Regulation. Munich Personal RePEc Achieve (MPRA). Available online: [https://mpra.ub.uni-muenchen.de/2632/1/MPRA\\_paper\\_2632.pdf](https://mpra.ub.uni-muenchen.de/2632/1/MPRA_paper_2632.pdf) (accessed on 30 November 2021).
- Maudos, Joaquin, and Juan Fernandez de Guevara. 2006. Banking Competition, Financial Dependence and Economic Growth. Munich Personal RePEc Achieve (MPRA), pp. 1–42. Available online: <https://core.ac.uk/download/pdf/213909202.pdf> (accessed on 30 November 2021).
- Misra, Alok. 2006. *Micro Finance in India and Millennium Development Goals: Maximising Impact on Poverty*. Victoria: University of Wellington.
- Mselmi, Nada, Lahiani Amine, and Hamza Tahar. 2017. Financial distress prediction: The case of French small and medium-sized firms. *International Review of Financial Analysis* 50: 67–80. [\[CrossRef\]](#)
- Noman, Abu Hanifa Md, Gee Chan Sok, and Isa Che Ruhana. 2018. Does bank regulation matter on the relationship between competition and financial stability? Evidence from Southeast Asian countries. *Pacific-Basin Finance Journal* 48: 144–61. [\[CrossRef\]](#)
- Obembe, Olufemi Bodunde, and Rosemary O. Soetan. 2015. Competition, corporate governance and corporate performance: Substitutes or complements? Empirical evidence from Nigeria. *African Journal of Economic and Management Studies* 6: 251–71. [\[CrossRef\]](#)
- Obradović, Bešlić, Dragana Jakšić Dejan, Bešlić RupiĆ Ivana, and Andrić Mirko. 2018. Insolvency prediction model of the company: The case of the Republic of Serbia. *Economic Research-Ekonomska Istraživanja* 31: 139–57. [\[CrossRef\]](#)
- Paktinat, Zeinab, and Darush Javid. 2015. Investigating the effect of product market competition on earning quality in the listed companies in the Tehran stock exchange. *International Journal of Management, Accounting and Economics* 1: 60–70.
- Park, C. Whan, Andreas B. Eisingerich, Gratiana Pol, and Jason Whan Park. 2013. The role of brand logos in firm performance. *Journal of Business Research* 66: 180–87. [\[CrossRef\]](#)
- Petersen, Mitchell A., and Raghuram G. Rajan. 1995. The effect of credit market competition on lending relationships. *The Quarterly Journal of Economics* 11: 407–43. [\[CrossRef\]](#)
- Pradhan, Rudra P. 2014. Z score estimation for Indian banking sector. *International Journal of Trade, Economics and Finance* 5: 516–25. [\[CrossRef\]](#)
- Praveena, S., and Thangarasu Samsai. 2014. Market based financial measures of sugar industry in India. *Economic Affairs* 59: 635–40. [\[CrossRef\]](#)

- Putra, Ayman S., Dismita C. Dewi, and Kariyanto Hendi. 2021. The Effect of Ease of Application and Ease of Payment in Online Sales to Increase Sales. *International Journal of Science, Technology and Management* 2: 1841–47.
- Rafatnia, Ali Akbar, Suresh L. Ramakrishnan, Dewi F. B. Abdullah, Fazal M. Nodeh, and Farajnezhad Mohammad. 2020. Financial distress prediction across firms. *Journal of Environmental Treatment Techniques* 8: 646–51.
- Reinhart, Carmen M., and Kenneth S. Rogoff. 2011. From financial crash to debt crisis. *American Economic Review* 101: 1676–706. [CrossRef]
- Restianti, Tya, and Linda Agustina. 2018. The effect of financial ratios on financial distress conditions in sub industrial sector company. *Accounting Analysis Journal* 7: 25–33.
- Saha, Mallika, and Kumar D. Dutta. 2020. Nexus of financial inclusion, competition, concentration and financial stability: Cross-country empirical evidence. *Competitiveness Review: An International Business Journal Incorporating Journal of Global Competitiveness* 31: 669–92. [CrossRef]
- Sehgal, Sanjay, Ritesh K. Mishra, F. Deisting, and Rupali Vashisht. 2021. On the determinants and prediction of corporate financial distress in India. *Managerial Finance* 47: 1428–47. [CrossRef]
- Sharma, V. 2010. Analyst recommendations, brokerage firm revenue and product market power. *International Journal of Revenue Management* 4: 119–30. [CrossRef]
- Shi, Yin, and Xiaoni Li. 2021. Determinants of financial distress in the European air transport industry: The moderating effect of being a flag-carrier. *PLoS ONE* 16: e0259149. [CrossRef]
- Showalter, Dean. M. 1995. Oligopoly and financial structure: Comment. *The American Economic Review* 85: 647–53.
- Tan, Yong. 2018. The impacts of competition and risk on profitability in Chinese banking: Evidence from Boone Indicator and Stability Inefficiency. *Annals of Economics and Finance* 19: 523–54.
- Tripathy, Trilochan, Sahoo Debadutta, Kesharwani Ankir, and Ajay K. Mishra. 2016. Competition, intellectual capital efficiency and firms' performance outcome in India: A structural equation modelling. *International Journal of Learning and Intellectual Capital* 13: 72–95. [CrossRef]
- Udin, Shahab, Khan Muhammad Arshad, and Javid Attiya Yasmin. 2017. The effects of ownership structure on likelihood of financial distress: An empirical evidence. *Corporate Governance: The International Journal of Business in Society*. Available online: [https://www.researchgate.net/profile/Shahab-Udin-2/publication/317783263\\_The\\_Effects\\_of\\_Ownership\\_Structure\\_on\\_likelihood\\_of\\_Financial\\_Distress\\_An\\_Empirical\\_Evidence/links/5b1cc3ebaca272021cf47b33/The-Effects-of-Ownership-Structure-on-likelihood-of-Financial-Distress-An-Empirical-Evidence.pdf](https://www.researchgate.net/profile/Shahab-Udin-2/publication/317783263_The_Effects_of_Ownership_Structure_on_likelihood_of_Financial_Distress_An_Empirical_Evidence/links/5b1cc3ebaca272021cf47b33/The-Effects-of-Ownership-Structure-on-likelihood-of-Financial-Distress-An-Empirical-Evidence.pdf) (accessed on 21 November 2021). [CrossRef]
- Ugur, Mehmet, Solomon Edana, and Zeynalov Ayaz. 2022. Leverage, competition and financial distress hazard: Implications for capital structure in the presence of agency costs. *Economic Modelling* 108: 105740. [CrossRef]
- Vosoughi, Mehdi, Derakhshan Hojat, and Alipour Mohammad. 2016. Investigating the relationship between financial distress and investment efficiency of companies listed on the Tehran Stock Exchange. *Accounting* 2: 167–76. [CrossRef]
- Wanderi, Rachel G. 2016. Influence of Corporate Governance Practice on Financial Distress among Commercial Banks in Kenya. Unpublished Master's thesis, University of Nairobi, Nairobi, Kenya.
- Waqas, Hamid, and Md Rohani Rus. 2018. Predicting financial distress: Importance of accounting and firm-specific market variables for Pakistan's listed firms. *Cogent Economics and Finance* 6: 1545739. [CrossRef]
- Ward, Terry J., and Benjamin P. Foster. 1997. A note on selecting a response measure for financial distress. *Journal of Business Finance and Accounting* 24: 869–79. [CrossRef]
- Whitaker, Richard B. 1999. The early stages of financial distress. *Journal of Economics and Finance* 23: 123–32. [CrossRef]
- Wooldridge, Jeffrey M. 2015. *Introductory Econometrics: A Modern Approach*. New York: Cengage Learning.
- Yazdanfar, Darush, and Peter Öhman. 2020. Financial distress determinants among SMEs: Empirical evidence from Sweden. *Journal of Economic Studies* 47: 547–60. [CrossRef]
- Yousaf, Umair Bin, Jebran Khalil, and Wang Man. 2021. Can board diversity predict the risk of financial distress? *Corporate Governance: The International Journal of Business in Society* 21: 663–84. [CrossRef]
- Zeitun, Rami, and Gary G. Tian. 2007. Does ownership affect a firm's performance and default risk in Jordan? *Corporate Governance* 7: 66–82. [CrossRef]
- Zhang, Zichao, Xie Li, Lu Xiangyun, and Zhang Zhuang. 2016. Determinants of financial distress in large financial institutions: Evidence from US bank holding companies. *Contemporary Economic Policy* 34: 250–67. [CrossRef]

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.