Financial Crisis and Leverage Determinants : A Juxtaposition of Pre and Post-Crisis Periods Using HLM

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Abstract

The present study examined the direct and indirect influences of firm-level and industry-level determinants on capital structure for all BSE-listed firms in India. The study analyzed financial data from 2000 – 2019 and employed the hierarchical linear modeling technique of regression as firms are a subset of industries. The output demonstrated that a few capital structure determinants either did not have any impact or had the same effect in both pre and post-crisis periods. However, a few determinants such as short-term liquidity, firm profitability, and *Z* - score had a conflicting impact on leverage in the two time periods. Determinants such as median industry tangibility, median industry leverage, industry munificence, industry liquidity, and industry dynamism had a significant impact in one period and an insignificant impact in another period. This showed that the direct effect of capital structure determinants changed when equity market and credit supply conditions varied. We showed that industry-level factors moderated the relationship between leverage and firm-level factors. Further, it was exhibited how economic conditions affected not just the direct influences of firm and industry level factors but also the indirect influences of industry-level factors. The results of the present study highlighted the complexity of corporate leverage decisions by exhibiting how changes in economic conditions and industry characteristics led to changes in leverage levels.

Keywords : **capital structure, determinants, pre-crisis, post-crisis, India**

JEL Classification Codes: G3, G32, G320

Paper Submission Date : August 10, 2021 ; Paper sent back for Revision : November 20, 2022 ; Paper Acceptance Date : April 5, 2022 ; Paper Published Online : June 15, 2022

The global financial crisis originated in 2007 in the United States and impacted almost all countries, big or small, across the globe. It was one of the most severe crises that negatively affected the whole world's economy (Kahle & Stulz 2013). A large number of research studies then analyzed the reasons and impacts of this global financial crisis. Extant research specifically exhibited that the global financial crisis led to market disruption, which eventually worsened both the demand and supply of credit (Campello et al., 2010). Due to the crisis, the demand for superior and normal goods was adversely affected, which affected firm-level characteristics such as sales, profit, cash, debt service capacity, and even fund requirements for future investment purposes. Hence, adverse macro-economic conditions affected the leverage decisions.

Research studies have analyzed the effect of the crisis on corporate financing decisions, however, their main focus is on the direct impact of leverage determinants for primarily European and American economies. Most studies that have analyzed leverage determinants in pre and post-crisis periods have analyzed the direct impact of

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DOI : https://doi.org/10.17010/ijf/2022/v16i6/169924

firm and industry-level determinants and attempted to explain the phenomenon using pre-existing capital structure theories (Dimitropoulos & Koronios, 2021; Tripathy & Asija, 2017; Wagenvoort, 2016). The research is still inconclusive as capital structure decisions are highly complex and the leverage determinants not only have a direct impact but also an indirect influence on leverage decisions.

The present study demonstrates that leverage determinants identified through econometric models do not behave independently. They interact with each other such that the magnitude and direction of impact may change. The paper aims to show the dynamics of capital structure behavior when industry factors are included and when credit supply conditions change from good to worse. This will help firms better plan their financing decisions in light of changing industry characteristics and economic conditions. The present study adds to the current literature by showing how the interaction between firm and industry level determinants affects leverage levels in the pre and post-crisis periods.

Literature Review and Framework

Extant research shows that economic conditions affect corporate financing decisions in multiple ways (Ivashina & Scharfstein, 2010; Thakor, 2015). Campello et al. (2010) showed that the financial crisis disrupted the financial markets and institutions, significantly reducing the firm's supply of credit and net worth, which negatively affected the firm's fundraising ability. This impact is of greater magnitude for highly levered firms (Claessens et al., 2000). On the contrary, Trinh and Phuong (2016) examined the impact of the economic downturn on leverage decisions of Vietnamese firms from 2006 – 2013 and found that the financial crisis did not significantly affect the capital structure of firms in Vietnam.

The impact of the crisis on firm debt levels is equivocal, however, its impact on equity is relatively straightforward. The equity market gets adversely affected due to hostile economic conditions. Due to negative market sentiments, there is a slump in the share market. There is a supply shock as equity investors predict a fall in the share prices and, therefore, sell their holdings for investment in safer options (Kahle & Stulz, 2013). During such times, it is costly for firms to raise funds through equity shares (Kashyap et al., 2008; Myers, 1977).

Research is ambivalent on the impact of adverse economic conditions on leverage levels. On the one hand, studies showed that due to the economic crisis, there was a fall in demand for debt due to reduced debt service capacity, lower expansion needs, and also reduced supply of credit from banks (Fosberg, 2012). During the economic downturn, there is a negative market sentiment, which reduces lenders' confidence and supplies funds at highly unfavorable rates, leading to a supply shortage in the debt market (Fosberg, 2012). Hence, debt levels are likely to be low during adverse economic conditions (Mokhova & Zinecker, 2014). At the same time, Chari et al. (2008) examined Bloomberg data till October 2008 on various parameters and showed that the availability of bank credit did not reduce during the period of the financial crisis.

On the other hand, research studies exhibited increased debt requirements due to limited cash available to meet basic needs (Fosberg, 2012). In times of crisis and post-crisis, demand for a firm's goods falls, and so do its cashflows. Hence, to meet the fund requirements, a firm may require external borrowings in case of inadequacy of retained earnings.

The first research question that we attempt to answer is whether the average leverage levels of firms listed in India have increased or decreased in the post-crisis period compared to the pre-crisis period. We hypothesize that the average leverage will reduce in the post-crisis period due to limited expansion opportunities, and panic makes information asymmetry problems worse (Mishkin, 1999). Hence, we formulate our first set of hypotheses as follows:

↳ **H01 :** There is no change in average leverage in the pre and post-crisis periods for firms listed in India.

↳ **Ha1 :** There is a fall in the average leverage in the post-crisis period compared to the pre-crisis period for firms listed in India.

Going further, research shows that the financial crisis has led firms to reduce the structure and maturity of loans due to problems of information asymmetry, risk, as well as transaction costs. The previous literature has also promulgated that firms make intense modifications to their capital structures and debt maturity levels (D'Amato, 2019; Demirgüç-Kunt et al., 2020; González, 2015; Mimouni et al., 2019). This happens because of a fall in both demand and supply of credit (Alves & Francisco, 2015; González, 2015). As the demand and structure of debt get affected due to crisis, this exhibits that the factors which determine leverage also get altered in the two time periods. Moreover, the global financial crisis period may be utilized to ascertain the impact of supply-side variables on the relationship between capital structure and its determinants during the crisis and post-crisis periods. Hence, we formulate our second set of hypotheses as follows:

↳ **H02 :** There is no change in firm and industry level capital structure determinants in the pre and post-crisis periods.

↳ **Ha2 :** Capital structure determinants (firm and industry level) change in pre and post-crisis periods.

Several research studies have empirically tested the second hypothesis in the past in the context of different countries and corporate settings. The impact of the global financial crisis is expected to be equally strong at the economy, industry, and firm levels. Therefore, the financial crisis may have both a direct and indirect impact on the functioning of the firms. So, we hypothesize that leverage determinants identified through econometric models do not behave independently. They interact with each other such that the magnitude and direction of impact may change. Hence, we formulate our third set of hypotheses as follows:

↳ **H03 :** Change in the equity market and credit supply conditions do not affect the indirect impact of industry-level leverage determinants.

↳ **Ha3 :** The indirect impact of industry-level leverage determinants changes when equity market and credit supply conditions are favorable (pre-crisis period) and unfavorable (post-crisis period).

Method

Data Source, Time, and Periodicity of Data

Firm and industry-level data for 20 years (2000 – 2020) were sourced from the CMIE Prowess database. Annual data were collected for each variable as leverage decisions are long term in nature and unlikely to alter every year.

(1) ***Sample Firms*****.** The present study uses financial data of all non-financial and non-utility BSE-listed firms. For the period 2000 – 01 to 2006 – 07, there were 8,302 firm-year observations belonging to 1,735 firms, and for the period 2009 – 10 to 2019 – 20, there were 11,867 firm-year observations belonging to 2,048 firms for which data on market leverage was available.

(2) ***Variable Specification.*** In line with past literature (Agyei-Boapeah, 2015; Fama & French, 2002), the main dependent variable in the study is market leverage as it is considered to be more objective and forward-looking (Morellec & Zhdanov, 2008) and based on total debt (Kieschnick & Moussawi, 2018).

Concerning leverage determinants, the present study is a modest attempt to incorporate maximum variables for the maximum period. So, the data were collected for all variables, however, only those variables could be included in the model for which continuous data were available for the sample period. Table 1 lists the variables that have been used in the present study along with their definitions, sources of definition, and their respective codes.

(3) ***Method Used.*** The study examines leverage determinants for pre-crisis (2000 – 2007) and post-crisis (2010 – 2019) periods. The year 2000 has been chosen because the late 1990s was turbulent due to the Asian crisis and the Kargil war. The Indian economy functioned well till the onset of the Global Financial Crisis in 2007. The

Table 1. ***Details of Variables Used in the Present Study***

S.No.	Variable Name	Definition	Reference	Code used
1	Market Leverage	Total Debt/ (Total Debt + Market Value of Equity)	Kieschnick & Moussawi (2018)	*MKT_LEV1*
2	Industry Median Leverage	Median leverage of all firms in a given industry	Frank & Goyal (2009), Hanousek & Shamshur (2011)	*I_LEV*
3	Industry Tangibility	The median tangibility of all firms in a given industry	Braun & Larrain (2005)	*I_TANG*
4	Industry Profitability	Median profitability of all firms in a given industry	Ahsan et al. (2016)	*I_PROF*
5	Industry Liquidity	Median liquidity of all firms in a given industry	Sibilkov (2009)	*I_LIQ*
6	Industry Market Concentration	HH index	Kayo and Kimura (2011)	*I_MC*
7	Munificence	Regress time against sales of industry over the last 5 years and then divide regression slope coefficient by average sales	Boyd (1995), Kayo & Kimura (2011)	*MUNIF*
8	Dynamism	Standard error of munificence regression slope coefficient /average sales	Boyd (1995) , Kayo & Kimura (2011)	*DYNAM*
9	Firm's Short Term Asset Liquidity	Current Ratio	Al-Najjar & Taylor (2008)	*F_ASSET_LIQ*
10	Firm Age	2019 – Year of incorporation	Pfaffermayr et al. (2013)	*F_AGE*
11	Distance from Bankruptcy	Altman *Z* - score	Kayo & Kimura (2011)	*F_ZSCORE*
12	Government Ownership	1 in presence, 0 in absence	Fraser et al. (2006)	*F_GOVT.*
13	Foreign Ownership	1 in presence, 0 in absence	Li et al. (2009)	*F_FO*
14	Group Affiliation	1 in presence, 0 in absence	Chakraborty (2013)	*F_GA*
15	Firm Tangibility	Net Fixed Assets/ Total Assets	Santhosh Kumar & Bindu (2018)	*F_TANG*
16	Firm Profitability	Profit After Tax/ Total Assets	Igbinosa (2015)	*F_PROF*
17	Firm Size	Natural Log of Total assets	Joshi (2021)	*F_SIZE*
18	Firm Non Debt Tax Shield	(Depreciation + Amortization) / Total Assets	Chakraborty (2010)	*F_NDTS*
19	Market Structure	Tobin's *Q*	Pandey (2004)	*F_MS*
20	Firm Free Cash Flow	(Net operating Cash flow – Capex)	Doorasamy (2016)	*F_FCF*
21	Firm High Growth Type	1 if firm is high growth type, otherwise 0	Wu &Yeung (2012)	*F_HGT*
22	Firm Low Growth Type	1 if firm is low growth type, otherwise 0	Wu & Yeung (2012)	*F_LGT*

Indian economy was impacted primarily in 2008 and 2009 (Mohan, 2008; Subbarao, 2009). The impact of the crisis started fading away in late 2009, and hence, 2010 onwards has been termed as the post-crisis period. The data for the year 2020 has not been considered due to the global pandemic and its impact on the stock market. The direct and indirect influences of leverage determinants have been analyzed and compared for the two periods, along with the possible reasons.

In line with Kayo and Kimura (2011), the present study uses HLM to analyze leverage determinants because it recognizes the impact of an individual's behavior in the presence of group membership and the impact of differences across groups on the dependent variable. While applying HLM, it is assumed that firms belonging to one industry follow a similar financing pattern, although this pattern may vary across industries.

The HLM process begins with the estimation of the Null Model to analyze whether multilevel regression is required to understand hierarchical levels in the variance of leverage. The null model shows Intraclass correlations (ICC1 and ICC2). The ICC1 tells the percentage of variance explained in the dependent variable, which is due to group membership, while ICC2 measures the reliability of the group mean (Bliese, 2004). The second step is to develop a random intercept model in which variables of each level are sequentially added from the lower level onwards. The third step examines the random intercept and random slope variance. The analysis was carried out in STATA 14.

(4) *Econometric Models.* In the random intercept and slope model, both intercept and slope of firm variables are assumed to be random and influenced by higher-level (industry) factors. To understand the indirect effects of industry-level variables, we hypothesize that at least one industry-level factor affects at least one firm-level factor. So, we statistically examine the influence of all industry-level factors on each firm-level variable and report only statistically significant combinations. Though the combinations are broadly similar, they are not exactly similar in both pre and post-crisis periods. This has led to different econometric models of a random intercept and random slope model.

(5) *Random Intercept and Random Slope Model for the Pre-Crisis Period.* To assess the impact of firm variables in the presence of industry-level factors on corporate leverages, we assume that the intercept and slope of firm variables are random and are affected by industry factors. However, not all firm-level variables which determine capital structure seem to be directly affected by industry-level variables employed in the present study. So, interactions that logically hold have been tested and only the ones found to be significant have been reported. For example, we hypothesize that industry concentration may significantly impact firm size. When industry concentration is high, there are a few large players in the market. So, we hypothesize a positive influence of industry concentration (I_MC) on firm size (F_SIZE). Therefore, we assess the influence of industry concentration on firm size and their overall impact on firm capital structure. Such statistically significant relationships between firm and industry level variables have been shown in the combined mixed-effects model in Eq (1), which includes hierarchical variables at time, firm, and industry levels.

$$LEV_{ijk} = \delta_{000} + \sum_{i=1\ \text{to}\ 26}(\sigma_{ioo} * \text{Year}_{i00}) + \beta_{1jk}(F\_ASSET\_LIQ_{ijk}) + \gamma_{20k}(F\_AGE_{ijk}) + \beta_{3jk}(F\_ZSCORE_{ijk}) + \beta_{4jk}(F\_GOVT._{ijk}) + \beta_{5jk}(F\_FO_{ijk}) + \beta_{6jk}(F\_GA_{ijk}) + \beta_{7jk}(F\_TANG_{ijk}) + \gamma_{80k}(F\_PROF_{ijk}) + \gamma_{90k}(F\_SIZE_{ijk}) + \gamma_{100k}(F\_NDTS_{ijk}) + \gamma_{110k}(F\_MS_{ijk}) + \beta_{12jk}(F\_FCF_{ijk}) + \beta_{13jk}(F\_HGT_{ijk}) + \beta_{14jk}(FLGT_{ijk}) + \gamma_{01k}(I\_LEV_{00k}) + \gamma_{02k}(I\_TANG_{00k}) + \gamma_{03k}(I\_PROF_{00k}) + \gamma_{04k}(I\_LIQ_{00k}) + \gamma_{05k}(I\_MC_{00k}) + \gamma_{06k}(MUNIF_{00k}) + \gamma_{07k}(DYNAM_{00k}) + \gamma_{21k}(I\_PROF_{00k} * F\_AGE_{ijk}) + \gamma_{81k}(MUNIF_{00k} * F\_PROF_{ijk}) + \gamma_{91k}(I\_LEV_{00k} * F\_SIZE_{ijk}) + \gamma_{92k}(I\_MC_{00k} * F\_SIZE_{ijk}) + \gamma_{93k}(MUNIF_{00k} * F\_SIZE_{ijk}) + \gamma_{101k}(I\_PROF_{00k} * F\_NDTS_{ijk}) + \gamma_{111k}(MUNIF_{00k} * F\_MS_{ijk}) + u_{00k} + e_{ijk} + r_{0jk} + r_{2jk}(F\_AGE_{ijk}) + r_{8jk}(F\_PROF_{ijk}) + r_{9jk}(F\_SIZE_{ijk}) + r_{10jk}(F\_NDTS_{ijk}) + r_{11jk}(F\_MS_{ijk}) \quad (1)$$

(6) *Random Intercept and Random Slope Model for the Post-Crisis Period.* As mentioned earlier, when industry-level factors moderate the influence of firm variables on debt, the intercept and slope of firm variables are assumed to be random and influenced by industry variables. Hence, Eq (2) shows statistically significant relationships between firm and industry level variables through a combined mixed-effects model, which includes hierarchical variables at time, firm, and industry levels.

$$LEV_{ijk} = \delta_{000} + \sum_{i=1\ to26}(\sigma_{ioo} * \text{Year}_{i00}) + \gamma_{10k}(F\_ASSET\_LIQ_{ijk}) + \beta_{2jk}(F\_AGE_{ijk}) + \gamma_{30k}(F\_ZSCORE_{ijk}) + \beta_{4jk}(F\_GOVT._{ijk}) + \beta_{5jk}(F\_FO_{ijk}) + \gamma_{60k}(F\_GA_{ijk}) + \gamma_{70k}(F\_TANG_{ijk}) + \beta_{8jk}(F\_PROF_{ijk}) + \gamma_{90k}(F\_SIZE_{ijk}) + \beta_{10jk}(F\_NDTS_{ijk}) + \gamma_{110k}(F\_MS_{ijk}) + \beta_{12jk}(F\_FCF_{ijk}) + \gamma_{130k}(F\_HGT_{ijk}) + \gamma_{140k}(FLGT_{ijk}) + \gamma_{01k}(I\_LEV_{00k}) + \gamma_{02k}(I\_TANG_{00k}) + \gamma_{03k}(I\_PROF_{00k}) + \gamma_{04k}(I\_LIQ_{00k}) + \gamma_{05k}(I\_MC_{00k}) + \gamma_{06k}(MUNIF_{00k}) + \gamma_{07k}(DYNAM_{00k}) + \gamma_{11k}(I\_LEV_{00k} * F\_ASSET\_LIQ_{ijk}) + \gamma_{31k}(I\_LEV_{00k} * F\_ZSCORE_{ijk}) + \gamma_{61k}(I\_LEV_{00k} * F\_GA_{ijk}) + \gamma_{71k}(I\_LEV_{00k} * F\_TANG_{ijk}) + \gamma_{72k}(I\_PROF_{00k} * F\_TANG_{ijk}) + \gamma_{73k}(MUNIF_{00k} * F\_TANG_{ijk}) + \gamma_{91k}(I\_PROF_{00k} * F\_SIZE_{ijk}) + \gamma_{92k}(I\_MC_{00k} * F\_SIZE_{ijk}) + \gamma_{111k}(I\_LEV_{00k} * F\_MS_{ijk}) + \gamma_{112k}(I\_PROF_{00k} * F\_MS_{ijk}) + \gamma_{131k}(I\_PROF_{00k} * F\_HGT_{ijk}) + \gamma_{141k}(I\_PROF_{00k} * FLGT_{ijk}) + u_{00k} + e_{ijk} + r_{0jk} + r_{1jk}(F\_ASSET\_LIQ_{ijk}) + r_{3jk}(F\_ZSCORE_{ijk}) + r_{6jk}(F\_GA_{ijk}) + r_{7jk}(F\_TANG_{ijk}) + r_{9jk}(F\_SIZE_{ijk}) + r_{11jk}(F\_MS_{ijk}) + r_{13jk}(F\_HGT_{ijk}) + r_{14jk}(FLGT_{ijk}) \quad (2)$$

Data Analysis and Results

Results in the Pre-Crisis Period

Table 2 shows that ICC1 is 0.748 and ICC2 is 0.9342, indicating that 74.8% of the variance in leverage can be explained through group membership, and high ICC2 is indicative of the significant difference between industry groups in terms of average leverage. The Null Model shows an intercept of 0.37, indicating a grand mean of leverage. Now, we add covariates leading to Model 2 and Model 3. Model fitment improves with each subsequent model as AIC and BIC fall and the log-likelihood ratio increases.

In Table 3, Model 4 examines the indirect influences of industry variables during the pre-crisis period. The results show a negative impact of the *Z* - score on debt levels as during pre-crisis, economies witness prosperous times, and share prices of financially healthy firms are at an all-time high (De & Banerjee, 2017). Similarly, firm size negatively affects leverage as large firms witness lower information asymmetries and are likely to have more retained earnings. Further, foreign ownership negatively influences leverage as foreign firms have mechanisms to control managerial self-interest and do not need debt for this, and have access to other financing channels (Li et al., 2009). Lastly, firm growth type negatively affects leverage. High growth firms have lower debt service capacity due to unpredictable cash flows and do not need debt to control managerial self-interest as they do not keep idle cash (Jensen, 1986). They also make risky investments due to which they obtain loans at high rates of interest (Udomsirikul et al., 2011). The reverse is true for low-growth firms, and additionally, they are defined by high tangibility, which may be used for collateral against a loan.

Concerning industry-level determinants, industry tangibility positively affects leverage as firms in such industries are more tangible and witness lower growth with predictable cash flows and high debt-service capacity. Further, industry munificence negatively affects leverage as these firms are highly profitable with surplus retained earnings and witness favorable share prices during the pre-crisis period. Other determinants at the firm and industry levels are found to be insignificant for the pre-crisis period. All model fit statistics show that Model 4 is the best; hence, interactions play a significant part in explaining variance in leverage levels in the pre-crisis period. In Table 3 (Model 4), we present only statistically significant interactions.

Table 2. ***Random Intercept Model for the Pre-Crisis Period***

	Random Intercept Model								
	Model 1			Model 2			Model 3		
	Null Model			Time Dummies and Firm Level Determinants			Time Dummies and Firm, Industry Level Determinants		
	Coeff	Std. Error	*p* - value	Coeff	Std. Error	*p* - value	Coeff	Std. Error	*p* - value
(Intercept)	0.37009	0.0074	0	0.696	0.026	0	0.696	0.048	0
Year Fixed Effects		No			Yes			Yes	
Firm Liquidity				–0.00092	0.0003	0.0008	–0.0009	0.00027	0.0008
Firm Age				0.0003	0.0004	0.3901	0.000298	0.00036	0.4098
Firm Z - score				–0.0164	0.002	0	–0.0158	0.0021	0
Govt.				0.018	0.05	0.7232	0.0266	0.04995	0.5949
Ownership									
Foreign				–0.109	0.033	0.0008	–0.1012	0.0326	0.0019
Ownership									
Group Affiliation				0.0044	0.015	0.7713	0.003524	0.01507	0.8152
Firm Tangibility				–0.059	0.0199	0.0027	–0.0784	0.02022	0.0001
Firm Profitability				0.0021	0.017	0.8997	0.00617	0.01642	0.7072
Firm Size				–0.055	0.003	0	–0.0539	0.00344	0
NDTS				–0.106	0.103	0.3014	–0.1019	0.1025	0.3202
Market Structure				0.004	0.0014	0.0025	0.0056	0.00145	0.0001
Free Cash Flows				0.0000019	0.0000005	0	0.000002	0.0000005	0
High Growth Type				–0.08	0.0056	0	–0.0825	0.0055	0
Low Growth Type				0.0673	0.005	0	0.069	0.005	0
Industry_Leverage							0.00017	0.00005	0.0015
Industry_Tangibility							0.1474	0.054	0.0064
Industry_Profitability							–1.08141	0.1842	0
Industry_Liquidity							–0.0292	0.0213	0.1713
Industry_Market Concentration							–0.6477	0.24213	0.0075
Industry_Munificence							–0.066	0.0465	0.1557
Industry_Dynamism							0.0724	0.1444	0.6163
ICC1		0.748							
ICC2		0.9342							
AIC		–1595.152			–4592.125			–4632.836	
BIC		–1574.08			–4430.626			–4422.21	
Loglikelihood Ratio		800.5761			2319.063			2346.418	
Observations					8302				
Groups					1735				

Table 3. ***Random Slope Model for the Pre-Crisis Period***

	Model 4		
	Value	**Std. Error**	***p* - value**
(Intercept)	0.750535	0.064241	0**
Year Fixed Effects		Yes	
Firm Liquidity	0.00118	0.000746	0.1138
Firm Age	0.00121	0.000715	0.0907
Firm Z - score	–0.018569	0.007446	0.0127*
Govt. Ownership	0.09292	0.10037	0.3547
Foreign Ownership	–0.134411	0.062889	0.0327*
Group Affiliation	0.040034	0.029924	0.1811
Firm Tangibility	0.001133	0.047941	0.9811
Firm Profitability	0.06944	0.04803	0.1483
Firm Size	–0.076996	0.007957	0**
NDTS	–0.235934	0.300532	0.4325
Market Structure	0.000814	0.004611	0.8598
Free Cash Flows	–0.000002	0.000003	0.4228
High Growth Type	–0.056635	0.013723	0**
Low Growth Type	0.060885	0.01295	0**
Industry_Leverage	–0.000419	0.000264	0.1122
Industry_Tangibility	0.149819	0.05285	0.0046**
Industry_Profitability	–0.843341	0.828529	0.3088
Industry_Liquidity	0.003018	0.019437	0.8766
Industry_Market Concentration	–6.774766	4.886451	0.1657
Industry_Munificence	–0.108817	0.045362	0.0165*
Industry_Dynamism	0.038572	0.163524	0.8135
Industry_Leverage × Firm Size	0.000118	0.000035	0.0008**
Industry_Profitability × Firm Age	–0.02022	0.009037	0.0253*
Industry_Profitability × NDTS	–11.441612	5.49991	0.0375*
Industry_Market Concentration × Firm Size	0.838919	0.405347	0.0385*
Industry_Munificence × Firm Profitability	–0.53294	0.272084	0.0502
Industry_Munificence × Firm Size	0.09229	0.019058	0**
Industry_Munificence × Market Structure	–0.05946	0.016953	0.0005**
AIC		–5978.617	
BIC		–5410.339	
Loglikelihood Ratio		3070.309	
Observations		8302	
Groups		1735	

Note. ** means significant at 1% and * means significant at 5%.

Results in the Post-Crisis Period

Table 4 shows ICC1 as 0.8531 and ICC2 as 0.9712, and Model 1 is the Null Model with an intercept of 0.33, indicating a grand mean of leverage. Now, we add covariates in two steps leading to Model 2 and Model 3. With each subsequent model, model fitment improves. To examine the indirect influences of industry variables during the post-crisis period, we develop a random slope model, known as Model 4.

The mean leverage of firms in the pre-crisis period is 0.37, and it has reduced to 0.33 in the post-crisis period. This supports the Ha1 that there is a fall in the average leverage in the post-crisis period compared to the pre-crisis period. These findings align with previous literature (D'Amato, 2019; Kahle & Stulz, 2013; Zeitun et al., 2017).

Table 5 shows that liquidity negatively affects leverage, in line with the pecking order theory. In the post-crisis period, problems of information asymmetries become worse, so firms may prefer to utilize accumulated funds for financing future investment opportunities (Mishkin, 1999). Further, *Z* - score positively affects leverage as financially healthy firms have better debt service capacity due to less volatile earnings; these firms build credit-taking capacity for the future by keeping lower leverages in the past. Further, results show that firm ownership negatively affects leverage as these firms prefer other financing channels rather than raising domestic debt at high-interest rates in the post-crisis phase (Li et al., 2009). The output exhibits the negative influence of a firm's profitability on leverage, as during the post-crisis phase, firms witness volatility in earnings, which reduces their debt service capacity and also the need for a non-debt tax shield. Also, profitable firms usually have greater accumulated reserves which they would prefer to utilize due to worse information asymmetries (Vijayalakshmi & Manoharan, 2014) during the post-crisis period.

Further, the output shows a negative impact of a firm's size on leverage as credit supply is both limited and expensive; hence, bigger firms prefer to utilize accumulated reserves. Going forward, the firm's growth type negatively affects leverage as credit availability is limited and expensive. Also, high-growth firms get loans at high-interest rates due to their risky investments. When both the factors are at play, debt discontinues being a cheaper source of finance. Also, high-growth firms usually witness a high risk of bankruptcy, and as per trade-off theory, such firms usually do not prefer debt (Harris & Raviv, 1991; Myers, 1984).

Concerning industry-level determinants in the post-crisis period, results show that median industry leverage positively impacts firm leverage. The reason could be the capital intensive nature of the industry, and in the recovery phase, share prices may not be favorable due to worse information asymmetries. Hence, firms in need of funds may prefer debt over equity. Further, output demonstrates that industry liquidity negatively affects leverage as firms in this industry are cash rich, and due to expensive debt and worse information asymmetries in the recovery phase, the firms prefer to employ retained earnings for meeting future capital requirements (Mishkin, 1999). The results further exhibit the negative influence of industry dynamism on leverage as the post-crisis period is characterized by increased uncertainties and greater business risk leading to greater difficulty in servicing debt.

All model fit statistics show that Model 4 is the best; hence, interactions play a significant part in explaining variance in leverage in the post-crisis period. In Table 5 (Model 4), we only report statistically significant interactions.

As the firm and industry level determinants that directly impact leverage are not the same in the pre and post-crisis periods, we support Ha2 that capital structure determinants (firm and industry level) change in the pre and post-crisis periods.

Table 4. ***Random Intercept Model for the Post-Crisis Period***

	Random Intercept Model								
	Model 1			**Model 2**			**Model 3**		
	Null Model			**Time Dummies and Firm Level Determinants**			**Time Dummies and Firm, Industry Level Determinants**		
	Coeff	**Std. Error**	***p* - value**	**Coeff**	**Std. Error**	***p* - value**	**Coeff**	**Std. Error**	***p* - value**
(Intercept)	0.3354	0.0069	0	0.665	0.0242	0	0.781479	0.044	0
Year Fixed Effects		No			Yes			Yes	
Firm Liquidity				–0.00011	0.00007	0.1431	–0.0001	0.00007	0.147
Firm Age				–0.000213	0.00036	0.5522	–0.00027	0.0004	0.4445
Firm Z - score				–0.010084	0.0015	0	–0.00973	0.0015	0
Govt. Ownership				–0.00364	0.0534	0.9457	0.000207	0.053	0.9969
Foreign Ownership				–0.15519	0.0348	0	–0.14041	0.035	0
Group Affiliation				–0.022971	0.01483	0.1214	–0.01948	0.0147	0.1856
Firm Tangibility				–0.091506	0.01555	0	–0.10003	0.0158	0
Firm Profitability				–0.099226	0.01476	0	–0.09897	0.01473	0
Firm Size				–0.038355	0.00284	0	–0.04025	0.00286	0
NDTS				0.194105	0.08547	0.0232	0.179347	0.08533	0.0356
Market Structure				–0.006032	0.00087	0	–0.00563	0.00087	0
Free Cash Flows				–0.0000002	0.00002	0.4029	–1E-07	0.00002	0.5487
High Growth Type				–0.0759008	0.00413	0	–0.07678	0.00414	0
Low Growth Type				0.0708162	0.0039	0	0.072252	0.0039	0
Industry_Leverage							0.000135	0.00002	0
Industry_Tangibility							–0.02735	0.0506	0.589
Industry_Profitability							–0.90934	0.2166	0
Industry_Liquidity							–0.05558	0.0197	0.0049
Industry_Market Concentration							–0.00558	0.5138	0.9913
Industry_Munificence							–0.01837	0.0435	0.6725
Industry_Dynamism							–0.47235	0.1419	0.0009
ICC1		0.8531							
ICC2		0.9712							
AIC		–8458.412			–10362.61			–10398.64	
BIC		–8436.268			–10192.88			–10177.27	
Loglikelihood Ratio		4232.206			5204.305			5229.32	
Number of Observations		11867							
Number of Groups		2048							

Table 5. ***Random Slope Model for the Post-Crisis Period***

	Model 4		
	Random Slope Model		
	Value	**Std. Error**	***p* - value**
(Intercept)	0.674932	0.059755	0**
Year Fixed Effects	Yes		
Firm Liquidity	–0.000782	0.000238	0.001**
Firm Age	–0.000332	0.000646	0.6069
Firm Z - score	0.0087	0.004109	0.0328*
Govt. Ownership	–0.017	0.1015	0.8655
Foreign Ownership	–0.126	0.06202	0.0423*
Group Affiliation	0.003818	0.026989	0.8875
Firm Tangibility	–0.059361	0.039708	0.135
Firm Profitability	–0.077169	0.03925	0.0493*
Firm Size	–0.0347	0.00575	0**
NDTS	–0.01368	0.245867	0.9556
Market Structure	–0.003395	0.002205	0.1237
Free Cash Flows	0	0.000001	0.829
High Growth Type	–0.080715	0.012268	0**
Low Growth Type	0.085687	0.011456	0**
Industry_Leverage	0.000384	0.000125	0.0021**
Industry_Tangibility	–0.027793	0.050516	0.5822
Industry_Profitability	0.084889	1.006842	0.9328
Industry_Liquidity	–0.045092	0.019153	0.0186*
Industry_Market Concentration	0.060812	0.53195	0.909
Industry_Munificence	0.006501	0.044066	0.8827
Industry_Dynamism	–0.526621	0.142671	0.0002**
Industry_Leverage × Liquidity	0.000004	0.000001	0.0004**
Industry_Leverage × Z - score	–0.000075	0.000019	0.0001**
Industry_Leverage × Group Affiliation	–0.000131	0.00006	0.0281*
Industry_Leverage × Tangibility	–0.000336	0.000107	0.0018**
Industry_Leverage × Market Structure	–0.000021	0.000009	0.0193*
Industry_Profitability × Tangibility	3.334027	0.930542	0.0003**
Industry_Profitability × SIZE	–0.345823	0.113308	0.0023**
Industry_Profitability × Market Structure	0.286657	0.068477	0**
Industry_Profitability × High Growth Type	0.864909	0.287419	0.0026**
Industry_Profitability × Low Growth Type	–0.751922	0.270331	0.0054**
Industry_Munificence × Tangibility	0.7595972	0.2130937	0.0004**
Industry_Market Concentration × Size	1.333137	0.532903	0.0124*
AIC		–10621.68	
BIC		–10156.94	

Loglikelihood Ratio	5373.84
Observations	11867
Groups	2048

Note. ** means significant at 1% and * means significant at 5%.

Discussion : Juxtaposition of Leverage Determinants Using HLM in Before and After Crisis Periods

A few leverage determinants either do not have any impact or have the same effect before and after the crisis phase. Hence, we juxtapose the remaining factors. We first begin with firm-level factors. The impact of liquidity and profitability in the pre-crisis period is insignificant, while it is negative in the post-crisis period as firms with excess liquidity and/or profitability prefer to finance their fund requirements using liquidity and/or accumulated funds instead of limited and expensive debt. Further, *Z* - Score has a significantly negative influence on debt during the pre-crisis period due to favorable equity markets in a booming economy, whereas it positively affects debt in the post-crisis period as firms distant from bankruptcy utilize their unused debt capacity when equity markets are at an all-time low.

We now compare the impact of industry-level factors in the pre and post-crisis periods. In the pre-crisis period, median industry tangibility has a positive impact due to the availability of low-cost secured loans; in the post-crisis period, median industry leverage positively affects leverage due to long-term fund requirements and reluctance to issue equity due to worse information asymmetries. In the pre-crisis period, industry munificence negatively affects leverage as firms in munificent industries command high share prices due to booming economic conditions. In the post-crisis period, industry liquidity negatively affects leverage as firms use liquidity for meeting financing needs and avoiding high-cost debt. Also, industry dynamism negatively impacts leverage as increased business risk reduces debt service capacity.

We now analyze the indirect influences, that is, how the influence of firm variables on debt gets altered in the pre and post-crisis periods in the presence of industry-level variables. As mentioned earlier, the relationship between financially healthy firms and leverage is negative in the pre-crisis period and positive in the post-crisis period. However, in the post-crisis period, the impact changes from positive to negative for financially healthy firms in the high median leverage industry. This could be because financially healthy firms are healthy under less debt, so they might prefer debt, however, when under high industry leverage, their leverage is already high, so they do not prefer debt as that would reduce their distance from bankruptcy.

Similarly, the impact of liquidity on leverage in the post-crisis period changes from negative to positive in the presence of high median industry leverage. The reason could be high debt service capacity and non-availability of sufficient liquid assets/ retained earnings to meet the financing needs of capital intensive industries. Further, the results show that a firm's age does not significantly affect leverage during pre and post-crisis periods. However, older firms in profitable industries do not prefer debt in the pre-crisis period. This could be either due to the availability of accumulated reserves or a preference for equity during the economic boom.

Further, group affiliation is found to have an insignificant influence in both pre and post-crisis periods. However, firms in the high median leverage industry and affiliated with a business group do not prefer debt in the post-crisis phase. In cases of group affiliation, information asymmetries are high due to the concurrence of the interests of the managers and the majority shareholders (Chakraborty, 2013). To circumvent the possibility of insolvency, especially during the post-crisis period, managers of group affiliated firms prefer less than optimum debt.

The results show an insignificant influence of firm tangibility on leverage in pre and post-crisis scenarios. However, when industry median leverage and tangibility are high, it may indicate that firms have loans against tangible assets. Such firms, especially in the post-crisis period, would not prefer debt. Nevertheless, highly tangible firms in munificent/profitable industries share a positive relationship with debt as they have high debt service capacity and debt offers a tax shield (Jagannathan & Suresh, 2017).

The results further show the negative influence of profitability on debt in the post-crisis period. This could be due to volatility in a firm's earnings which, in turn, reduces their debt service capacity and also the need for a non-debt tax shield. In the pre-crisis period, profitability has an insignificant impact on leverage, however, profitable firms in the munificent industry during the pre-crisis period did not prefer debt. This could be either due to the availability of retained earnings or equity at attractive prices owing to the economic boom.

The output shows that firm size negatively affects leverage in the pre and post-crisis periods as large firms prefer equity issues due to low information asymmetries and accumulated reserves. However, in the pre-crisis period, for a large firm in high median leverage/ munificent/ concentrated industries, the relationship changes to positive to exploit the advantages of debt (like tax shield, increased EPS). Similarly, in the post-crisis phase, when a large firm is a market leader, it prefers debt due to its several advantages. However, when a large firm belongs to a profitable industry, its financing needs may be met by undistributed profits during the post-crisis period.

The output further shows the insignificant influence of NDTS on leverage in the pre and post-crisis phases. However, in the pre-crisis period, firms with high NDTS in profitable industries do not prefer debt due to multiple reasons. One, these firms have accumulated large reserves in the form of depreciation, amortization, etc., which may be used to meet financing needs. Two, these firms do not need debt for a tax shield, so the effective debt cost is high. Third, these firms witness lower information asymmetries, making equity a preferred choice, especially during the pre-crisis period.

The results show the insignificant influence of market structure on leverage in the pre and post-crisis periods. However, in the pre-crisis phase, firms with a high market structure in munificent industries did not prefer debt as they enjoyed favorable share prices due to economic boom and industry munificence. During the post-crisis period, firms with a high market structure in a high median leverage industry do not prefer debt as leverage levels are already high in their industry. Also, these firms witness favorable equity share prices, so they prefer equity over debt. In addition, during the post-crisis period, when high market structure firms belong to profitable industries, they prefer debt because of its low cost and interest tax deductibility, which helps raise EPS. Moreover, during the post-crisis period, equity share prices are ordinarily unfavorable for equity issues.

Further, the results demonstrate a negative influence of firm growth type on leverage in pre and post-crisis phases due to uncertainty in cash flows and less debt service capacity for high growth firms. However, high-growth firms in profitable industries prefer debt as cash flows are predictable. Similarly, low-growth firms in profitable industries prefer to utilize accumulated reserves for financing growth opportunities.

The above juxtaposition provides support for Ha3 that the indirect impact of industry-level capital structure determinants changes when equity market and credit supply conditions are favorable (pre-crisis period) and when they are unfavorable (post-crisis period).

Conclusion

The discussion shows that the supply of credit is normal before the onset of a crisis, however, fundraising becomes expensive and challenging in the post-crisis period. The output shows that these factors affect a firm's financing decisions. The results show that a few capital structure determinants either do not have any impact or have the same effect in both pre and post-crisis periods. However, a few determinants such as short-term liquidity, firm profitability, and *Z* - Score have a conflicting impact on leverage in the two time periods. Determinants such as

median industry tangibility, median industry leverage, industry munificence, industry liquidity, and industry dynamism have a significant impact in one period and an insignificant impact in another period. Hence, we empirically show that the direct effect of capital structure determinants changes when equity market and credit supply conditions vary.

After a thorough analysis of the indirect impact that industry factors have on leverage during the pre-crisis and post-crisis periods, it is found that except for one, there are no common interactions in the pre and post-crisis periods. The fact that the significant indirect industry influences in pre and post-crisis periods are completely different proves that economic conditions have a strong influence even on the indirect impact of industry factors in different economic conditions. The output demonstrates how industry-level factors moderate the relationship between leverage and firm-level factors. Further, it is exhibited how economic conditions affect not just the direct influences of firm and industry level factors but also the indirect influences of industry-level factors. As suggested by previous studies (Akbar et al., 2013; Judge & Korzhenitskaya, 2012; Lemmon et al., 2008), along with demand-side factors, supply-side factors of capital structure have a significant influence on leverage decisions.

Theoretical and Managerial Implications

The output of the present study helps researchers recognize that the direct impact of firm and industry factors in determining capital structure is overemphasized in extant literature. The current study has empirically shown how the direct impact of firm-level determinants modify in the presence of industry factors, and the same leverage determinants behave differently in favorable and adverse economic conditions.

The results of the present study highlight the complexity of corporate leverage decisions by exhibiting how changes in economic conditions and industry characteristics lead to changes in leverage levels. The output of the present study also provides meaningful insights for firms to better plan their capital structure in light of changing industry characteristics and economic conditions rather than following the traditional capital structure determinants and theories.

Limitations of the Study and Scope for Further Research

The present study is based only on firms listed in India. There could be more countries in the Asian region for which this study could have been undertaken. By doing so, future research can analyze the indirect effects of economy-level factors such as GDP growth, inflation, stock market development, bond market development, tax rates, etc., on leverage levels.

Authors' Contribution

Prof. (Dr.) Amit Kumar Singh conceived the idea and developed the quantitative design to commence the empirical study. Dr. Preeti Bansal extracted research papers from journals of high repute, filtered them based on keywords, and thoroughly reviewed them. Prof. (Dr.) Amit Kumar Singh then verified the analytical methods and supervised the study. Dr. Preeti Bansal collected the data from the CMIE Prowess database. The data were analyzed using STATA 14 by Dr. Preeti Bansal under the able guidance of Prof. (Dr.) Amit Kumar Singh. Dr. Preeti Bansal wrote the manuscript in consultation with Prof. (Dr.) Amit Kumar Singh.

Conflict of Interest

The authors certify that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this manuscript.

Funding Acknowledgement

The authors received no financial support for the research, authorship, and/or the publication of this article.

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