

Creditor Rights and Firm's Cost of Debt: Empirical Evidence from Indian Firms

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Abstract

India has introduced Insolvency and Bankruptcy Code (IBC) in 2016, which is applicable to all listed firms. This law aims to empower debtholders, including secured, unsecured, operational, and financial, to recover their debts unlike SARFAESI Act of 2002 that allowed secured financial debtholders to recover the loans from distressed firms. We use IBC as an exogenous shock to examine the impact of IBC on firm's cost of debt. By employing difference-in-differences (DiD) combined with matching technique on firm-level data for the period 2010-2023, we find that financially distressed firms (treatment group) tend to have lower cost of debt post-IBC reforms as compared to non-financially distressed firms (control group). We also find firm's performance and increase in debt as two potential channels through which IBC impacts firm's cost of debt. Our findings are robust across alternative econometric specifications and alternative definitions.

Keywords: Insolvency and Bankruptcy Code; distressed firms; cost of debt; bankruptcy reform.

1. Introduction

“IBC has brought in better credit culture in borrowers.”¹

[Remarks by the Justice N V Ramana of the Supreme Court, dated Mar 9, 2020]

N V Raman’s comments highlight the importance of Insolvency and bankruptcy code (IBC) for firms in India. IBC has revitalized the credit culture by achieving higher recovery rates and resolving substantial volumes of distressed assets as compared to other mechanisms like the Debt Recovery Tribunal (DRT), Securitization and Reconstruction of Financial Assets and Enforcement of Security Interest Act (SARFAESI). and Lok Adalat.² While traditionally, India failed to provide an efficient revival system and an exit strategy for firms - IBC proposes an early detection of distress and efficient restructuring mechanisms for firms to recover from insolvency. This enabling environment protects stakeholder interests, preserves operational continuity, and promotes high standards of corporate governance for the borrower (Agarwal et al. 2020). Lenders also feel more confident about lending money to firms as the law assures them faster and fairer recovery in case the firm defaults (Bose et al. 2021). Therefore, by allowing the firm to operate as a going concern³ and instilling a sense of confidence among the lenders, an efficient insolvency law prevents job losses, thereby contributing to higher employment and economic stability (Dalton, 2012). Corroborating evidence is provided by CRISIL (2019) report, which highlights that there is an enhancement of creditor rights in India post IBC and is being regarded as a creditor-friendly regime. Since the inception of IBC, researchers have shown keen interest in understanding the impact of IBC on firm’s outcomes,

¹ <https://www.barandbench.com/news/the-code-has-brought-in-better-credit-culture-in-borrowers-justice-nv-ramana-at-the-colloquium-of-members-of-nclt-and-nclat>

² <https://www.crisilratings.com/en/home/newsroom/press-releases/2023/11/in-7-years-ibs-has-improved-credit-culture-room-for-strengthening-remains.html>

³ The going concern value of a business is more than its piecemeal value.

such as leverage (Singh et al. 2021; Ramesh, 2022; Jadiyappa and Kakani, 2023; Singh et al. 2023), cost of debt (Bose et al. 2021), and cash ratio (Jadiyappa & Shrivastav, 2021).

The objective of this study is to examine the impact of IBC on firm's borrowing cost (especially distressed firms) in India. In this regard, we discuss two contrasting hypotheses in investigating the relation between IBC and firm's cost of debt. The first strand of literature advocates that the impact of IBC helps firms in reducing cost of debt due to a few reasons. For example, a well-established literature suggests that stronger creditor rights lead to increased supply of credit at lower interest rates.⁴ Also, the Interim Report⁵ of The Bankruptcy Law Reform Committee (BLRC) mentions that a pro-creditor law incentivizes creditors to provide capital to businesses and cuts down the cost of the capital for companies. The existing literature and the underlying objective of IBC explains why IBC reduces firm's cost of debt. In the Indian context, Bose et al. (2021), Jose et al. (2020) & Ghosh (2023) find that the implementation of IBC helps distress firms in reducing firm's cost of debt.

The second strand of literature advocates that post IBC firms might have to incur higher costs on their borrowings. For example. Agarwal & Singhvi (2023) argue that even under a pro-creditor regime the higher probability of a sub-optimal liquidation increases the manager's expected bankruptcy cost. This in turn reduces the demand for credit in high-tangibility firms. Such a scenario might cause an increase in the cost of debt by creditors. In a similar vein, Kulkarni (2017) finds that post-SARFAESI low quality borrowers faced higher interest rates. The author argues in line with "supply-side credit reallocation hypothesis" where creditors increase interest rates for riskier borrowers.

To empirically investigate two competing hypotheses, we employ a sample of 23,125 firm-year observations from 2010 to 2023. To measure cost of debt of firms, we use interest expenses

⁴ See: Porta et al. (1998), Houston et al. (2010), Ponticelli & Alencar (2016), Haselmann et al. (2010)

⁵ https://msme.gov.in/sites/default/files/Interim_Report_BLRC.pdf

paid to borrowings. We measure our main variable of interest, IBC dummy, as one from 2017 onwards and zero otherwise. In order to test for causal inference between IBC and cost of debt, we employ DiD combined with matching technique. Our findings suggest that our treatment firms (i.e., distressed firms) tend to have lower cost of borrowings than control firms (i.e., non-distressed firms). Our findings are robust to the alternative definitions of cost of debt, and econometric specifications.

Our findings might be prone to endogeneity. Hence, it is important to show that our findings are robust even after using different econometric techniques. First, we employ firm-fixed effects in DiD specification to control for time-invariant unobserved factors. Second, we employ propensity score matching (PSM) before DiD technique to control for selection bias due to observable firm-level characteristics. Additionally the Randomisation Inference test provides credence to our propensity matched DiD coefficients.⁶ Our findings are robust even after controlling for different forms of endogeneity. After documenting a negative effect of IBC on firm's cost of debt, we investigate the potential channels through which IBC can impact firm's cost of debt. In this regard, we identify two channels. First, we show that there is an improvement in firm's performance for treatment group firms (i.e., distressed firms) post IBC period, which has resulted in decrease in the cost of debt for distressed firms. Second, we also find distressed firms tend to borrow more after the introduction of IBC. Our findings are similar to Ghosh (2023), who find an increase in short-term debt and Singh et al. (2023), who find an increase in secured debt. This result implies that creditor rights have become stronger after the introduction of IBC and hence lenders lend money more to firms.

We contribute to the related literature in different ways. First, we contribute to the existing literature to show that IBC helps distressed firms in reducing cost of debt. Considering

⁶ Our randomised p-value is 0.003 which lies at the tail of the distribution. We outline the process in the Robustness section of this paper

firms in distress as our treatment group, we undertake a propensity score matched DiD technique to investigate the impact of IBC on firms' cost of debt. In this paper, we primarily focus on determining the extent of impact that IBC has on firms' cost of debt. Even though most of the papers that looked into the impact of IBC on firm's cost of debt followed a quasi-natural experiment approach, there remains ample scope to use more robust econometric techniques to show our findings are credible.

Second, we also contribute to the literature by identifying channels, such as Return on Total Assets (ROA) and Amount of Debt, through which IBC impact cost of debt for distressed firms. Distress motivates operational-efficiency enhancing actions for firms (Jensen 1989). The actions might include seeking greater loans to improve their performance. IBC provides lenders the confidence to lend to these distressed borrowers at a cheaper cost. We argue that it is the motive to improve their performance that leads distressed firms to seek more loans and in turn enjoy lower cost of debt; thanks to the creditor-friendly law in place. Corroborating evidence is provided by Bose et al., (2021) and Singh et al., (2023).

The remainder of the paper is organised as follows. Section 2 reviews the related literature and develops hypotheses. Section 3 discusses institutional settings w.r.t the evolution of IBC in India. Sections 4 and 5 describe the data and methodology used in the study. Section 6 presents the empirical results. Section 7 explores the potential channel analysis. Section 8 discusses robustness checks and section 9 concludes the paper.

2. Related literature and hypotheses development

Bankruptcy reform can either increase or decrease a firm's cost of borrowing. Prior literature shows that while in most cases a "debtor-friendly" insolvency regime increases firms' cost of debt (Alanis & Quijano 2019) a "creditor-friendly" regime, on the other hand, decreases firms'

cost of debt (Rodano et al. 2016; Araujo et al. 2012). An insolvency legislation that provides a cushion of safety against lenders from taking over the management in case of a default or when a firm is under the insolvency resolution process is regarded as a debtor-friendly insolvency regime. Contrary to this, if lenders can enforce actions pertaining to a law that mandates dissolution of the management board and appointment of an external administrator (Insolvency Resolution Professional in case of India), such a regime is regarded as creditor-friendly (Franken, 2004). However, Gurrea-Martínez (2023) argues that the strict classification of debtor-friendly or creditor-friendly is misleading. In fact, it is the attractiveness of the restructuring procedure that should determine the “friendliness” of the law in place. Nevertheless, we build our hypothesis considering that a unique feature of IBC is its “creditor in control” approach⁷, for which it is been “hailed as creditor-friendly legislation” (Baxi, 2023). In this paper, to investigate whether IBC has any effect on firm’s cost of debt, we propose two contrasting hypotheses based on literature.

The first strand of literature advocates that IBC helps firms to reduce cost of debt. In this regard, we first discuss some theoretical underpinnings⁸, limiting ourselves to the relation between bankruptcy law and distressed firms’ borrowing costs. A bankruptcy law’s ineffectiveness in rescuing a distressed firm creates more loss for the lenders. Hence, a lender will charge a higher price for the capital due to this perceived risk. The higher cost will then be not restricted to the distressed firms only but will affect the efficient ones as well. On the other hand, increased profits arising out of lower interest rates fosters investments. The underlying assumption as to why lenders should offer low interest rates to distressed borrowers is that in the business world, we assume that most firms are solvent based on going concern concept

⁷ “Understanding the IBC”, <https://ibbi.gov.in/uploads/whatsnew/e42fddce80e99d28b683a7e21c81110e.pdf>

⁸ Zhang (2020), in his book “*Insolvency Law and Multinational Groups: Theories, Solutions and Recommendations for Business Failure*” offers a comprehensive account of the existing theories. We draw inspiration from Zhang(2020) to put forward our intuitive argument.

(Butler & Gilpatric, 1994). It is this certainty, that a typical firm will recover from its temporary state of distress, is what an efficient insolvency law assures its lenders.

There are empirical studies around the world that document the impact of insolvency and bankruptcy laws on lender's rights of the firm and subsequently firm's cost of borrowings. For example, Araujo et al. (2012) find that a creditor-protective environment in Brazil gives the lender greater confidence to recover the debt in case of a default. This leads to a higher credit supply at lower costs. Corroborating evidence is provided by Gopalan et al., 2016; Qian & Strahan, 2007; and Visaria, 2009. On the other hand, the creditor's right to acquire or liquidate the lender's asset or to gain control of the firm (in case of a default) instills a sense of fear among the borrowers. Afraid of losing control over the firm, a borrower avoids risky projects (Acharya et al., 2009), reduces bank borrowings (Vig, 2013), and can substitute bank debt for corporate bonds (Jose et al. 2020). *Ceteris paribus*, an increase in credit supply and a fall in demand for credit lower interest rate (Houston, 2010). In line with the above argument, Chakrabarti and Pattison (2019) find that a pro-creditor change to the 2005 Bankruptcy Abuse Prevention and Consumer Act (BAPCA) in the US, not only led to a reduction in the cost of credit but the gains were shared with the debtors. In Italy, strengthening creditor rights significantly reduced the cost of bank financing thereby increasing firm investment (Rodano et al. 2016). Similarly, in the case of Brazil, Araujo et al. (2012) & Funchal (2008) find that the 2005 Bankruptcy Reform has increased firm borrowings and lowered the cost of debt. In India, too, researchers have been curious to understand the impact of strengthening creditor rights on firms' borrowing costs. In this regard, Vig (2013) finds that as a response to SARFAESI⁹, firms moved away from the use of secured credit, there was a reduction in the cost of secured borrowing, and it also exposed firms to the threat of premature liquidation. Interestingly, the detrimental impact of liquidation bias on private benefit overshadows the

⁹ Under SARFAESI, once a creditor identifies a loan as NPL, the creditor can takeover the borrower's secured asset in case a borrower fails to repay the outstanding amount within a period of 60 days (Ghosh, 2019).

positive impacts arising from the reduced cost of borrowing (Kariya, 2021). In a similar vein, Chakraborty et. al (2022) find that IBC increases both outside equity and debt at a lower cost, thereby providing firms with additional capital to invest more. In a similar vein, Kamal (2022), also finds evidence of lower cost of credit and increased borrowing, post IBC, in states with high bank transformation risk¹⁰. Ghosh (2023), in line with Vig (2013) results, reported a 2.4% reduction in firm's cost of borrowing. Bose et al. (2021), categorizing firms as treated based on the definition of distressed firm from Companies (Second Amendment) Act (2002), find a sharp decline in distressed firms' debt cost and an improvement in the credit supply. In this regard, Singh et al. (2022) find an increase in corporate risk taking, post IBC, which eventually impacts distressed firms' operating performance. An efficient bankruptcy reform assures a viable solution for both the creditor and debtor, where the protected creditor will not hesitate to supply more credit to its distressed borrower. This might lead to an increased credit supply at a lower cost, even when the borrower is distressed.

Based on aforementioned arguments, we formulate our hypothesis as follows.

H1a: Distressed firms in India enjoy a reduced cost of debt after the introduction of IBC.

The second of literature suggests that the introduction of IBC results in increase in firm's cost of debt, which is due to a few reasons. First, Ramesh et al. (2022) show that firms' cost of debt increased due to excess promoter ownership post-IBC period. Evidence of an increase in cost of debt is not surprising but is more prevalent under "debtor-friendly" regimes. However, Closset et al. (2023), in their analysis of 15 European countries which moved towards a restructuring-oriented insolvency reform, find a 50bps increase in cost of debt. Such an increase in cost of debt might arise if the manager's desire to stay in control motivates him to restructure an economically non-viable business. Therefore, whether an insolvency reform increases or

¹⁰ For more details see Kamal (2023).

reduces firms' cost of debt depends on "whether positive effects from increased efficiency due to improved creditor coordination outweigh negative implications by agency problems and forgone alternatives" (Closset et al. 2023).

Based on aforementioned arguments, we propose the hypothesis as mentioned below.

H1b: Distressed firms in India face an increased cost of debt after the introduction of IBC.

3. Institutional Setting: The Evolution of IBC in India

According to the Indian Economic Survey 2016-17, the era of economic boom in the mid-2000s saw Indian firms growing at the expense of bank credit and overseas inflow of funds.¹¹ Firms were on an expansion spree and banks lent generously in anticipation of continued growth. But, with the onset of the Global Financial Crisis (GFC), the projected growth rates were halved. During the same time, Reserve Bank of India (RBI) increased interest rates to counter inflation, and the Rupee depreciation. While the former affected the firms that borrowed from domestic sources, the latter affected those who borrowed from overseas. Although the Indian banking sector remained quite resilient to GFC shocks, the deteriorating macroeconomic conditions in India caused the transactions of the mid-2000s to originate as Non-Performing Assets (NPAs) in the years that followed. In 2015, companies with an interest coverage ratio of less than one owed 40% of the corporate debt in India (Indian Economic Survey 2016-17). Additionally, India continued to rank poorly in the World Bank's Ease of Doing Business¹², with the time taken to resolve insolvency staying at around 4.3 years. The recovery rate was estimated to be 20% of the value of debt on Net Present Value (NPV basis), one of the poorest in the world.¹³ India's existing bankruptcy and insolvency framework proved

¹¹ <https://www.indiabudget.gov.in/budget2017-2018/es2016-17/echap04.pdf>

¹² <https://documents1.worldbank.org/curated/en/688761571934946384/pdf/Doing-Business-2020-Comparing-Business-Regulation-in-190-Economies.pdf>

¹³ https://ibbi.gov.in/BLRCReportVol1_04112015.pdf

inadequate, ineffective, and time-consuming. The government realized that an efficient Insolvency Law is a prerequisite to addressing the problems. In response, the Bankruptcy Law Reform Committee (BLRC) was set up in August 2014 based on whose recommendation the Insolvency and Bankruptcy Code (hereafter, IBC), 2016 was passed by the Parliament on 11th May 2016. The Code received Presidential assent on 28th May 2016 and became operational in December 2016.¹⁴ For a detailed chronological understanding of the events that led to the introduction of IBC, see Appendix B, Table B2

The bankruptcy and insolvency frameworks can be traced back to sections 23 and 24 of the Government of India Act, 1800, in pre-independent India. In the years that followed, the country witnessed the introduction of several laws, among which the most crucial predecessors of IBC were Sick Industrial Companies (Special Provisions) Act 1985 (SICA), The Recovery of Debts due to Banks and Financial Institutions Act, 1993 (RDDBFI), Securitisation and Reconstruction of Financial Assets and Enforcement of Securities Interest Act, 2002 (SARFESI), and the Companies Act, 2013. Exhibit 1 shows the Acts that preceded IBC in chronological order.

Figure 1



Source: Compiled using data and sources from IBBI website

¹⁴ <https://www.mca.gov.in/Ministry/pdf/TheInsolvencyandBankruptcyofIndia.pdf>

The frameworks that existed before IBC failed to provide a time-bound and equitable resolution. Under SICA and SARFAESI, the defaulting company's promoter, who remained in charge, would often intentionally drag the insolvency process for years until much of the company's net worth was depleted. This "debtor in control" framework was a deterrent to the creditor's rights. In this context, the fragmented frameworks were consolidated to create a single law for insolvency and bankruptcy. The four major procedural reforms brought in by the introduction of IBC are – 1. The creditors are in possession of assets and not debtors¹⁵, 2. Once the Corporate Insolvency Resolution Process (CIRP) starts, the board of directors' power shifts to the Insolvency Professional (IP) and Committee of Creditors (CoC), 3. The CoC can monitor the IP's actions, and 4. Admitted cases should get resolved within 180 days (extendable to 330 days).

The National Companies Law Tribunal (NCLAT), which is the Adjudicating Authority (AA) for Corporate affairs under IBC stated¹⁶ three sacrosanct objectives of the Code – First order objective is rescuing a distressed company, 2) Second order objective is maximizing value of the company's assets, and 3) Third order objective is promoting entrepreneurship, credit availability and balancing stakeholders' interests. Apart from the above-mentioned key reforms and objectives – IBC intends to curb the culture of casual defaults on loans and advances by creating a nudge in the mindset of the creditors and debtors. The fear that the promoter will be ousted from the management (once the CIRP starts) compels them to manage the company efficiently and keep it default-free. This behavioural change has led promoters to resolve their stress before being pushed into the CIRP process. Promoters, who want to prevent their businesses from being taken over have several opportunities to settle their debts. Even if an

¹⁵ In case of a MSME, since a promoter often solely looks after various operations of the company an IP may not be able to run the organization as a going concern in the absence of the promoter. So, the promoter stays in his position while the creditors control the process.

¹⁶ Binani Industries v. Bank of Baroda & Ors., Company Appeal No. 81/2018.

application has been submitted to the NCLAT to start an insolvency process against a CD, the AA can allow withdrawal of an application admitted under Section 7 or Section 9 or Section 10, with the approval of ninety percent voting share of CoC (as stated in Section 12(A) of IBC). Applications can be withdrawn at three stages – 1. Prior to admission of the application under sections 7 or 9, or 10 2. After admission but before the formation of CoC 3. After CoC’s formation but before an invitation is issued for expression of interest, and 4. After an invitation for expression of interest is issued.

According to the Indian Economic Survey (2022-2023¹⁷), the behavioural change observed among debtors is a far-reaching spillover effect of IBC. The recent survey states – “Until 30th September 2022, 23,417 applications for initiating the corporate insolvency process (CIRP) of corporate debtors having underlying defaults of Rs. 7.3 lakh crore were disposed of before their admission into CIRP.” Sixty-seven percent of the 5,893 CIRPs that commenced have been closed. Among this 67%, 21% were closed on appeal or review or settled, 19% were withdrawn, 14% went into resolution, and 46% were liquidated. IBC, compared to all other recovery channels, has the highest recovery rates for Scheduled Commercial Banks (SCBs). Also, between 2017 and 2020, India’s Ease of Doing Business¹⁸ ranking jumped from 130 to a promising 63.

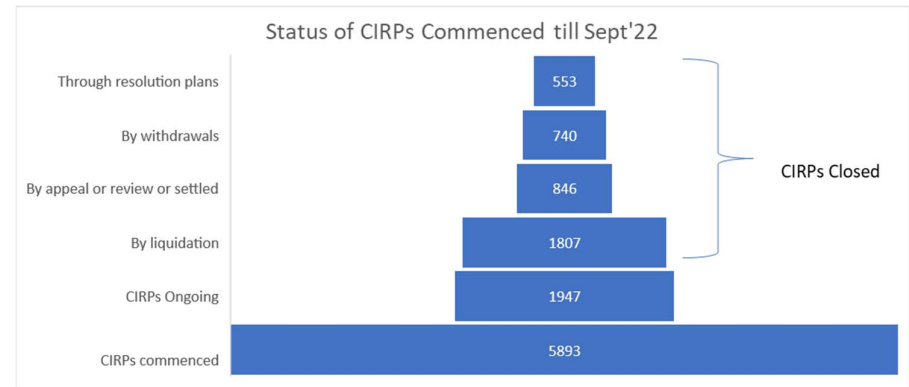
Since its inception in 2016, IBC has come a long way in establishing itself as “the biggest economic reform next only to GST.” IBC is hailed as crucial tool that will drive India’s economic growth in years to come. The Regulatory Body, Insolvency and Bankruptcy Board of India (IBBI) is open to ideas and welcomes suggestions for the improvement in the Code. So far, with five Amendments and series of insolvency cases registered under IBC, the Code is expected to change the creditor-debtor relation in the Indian context.

¹⁷ <https://www.indiabudget.gov.in/economicsurvey/doc/echapter.pdf>

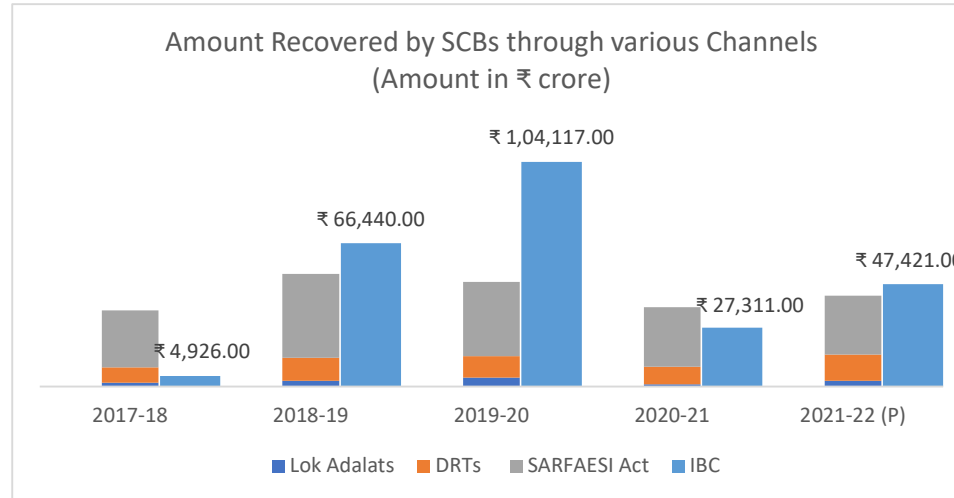
¹⁸ In September 2021, World Bank Group decided to discontinue Doing Business Report.



Source: Collated from World Bank Doing Business Report



Source: Indian Economic Survey 2022-2023



Source: Indian Economic Survey 2022-2023, (P): Provisional, Data Label is for IBC

4. Data:

We extract data for all NSE listed non-financial¹⁹ firms from the Prowessdx database (Vig 2013; Bose et al. 2021) for a period of 13 years between 2010 and 2023. Interest incidence variable is defined as interest expense paid to borrowing. This is used as a proxy for firm's cost of debt, which is our dependent variable. The main explanatory variable of interest is the IBC Dummy, which takes a value of 1 for years 2017 to 2023 and 0 for years 2010 to 2016. All accounting ratios used in our analysis have been winsorized at 1st and 99th percentiles to mitigate the impact of outliers.

5. Methodology:

Firm-level characteristics can also play vital role in determining a firm's cost of debt. Therefore, we control for firm-level characteristics, such as *size*, *firm age*, *liquidity*, and *collateral* in cost of debt equation. Binsbergen (2010) finds that large firms tend to use less debt and face higher costs of debt. Valta (2012) however find that large firms which operate in competitive product markers pay significantly lesser loan spreads than the small firms. In investigating the impact of firm age on cost of debt, Hyytinen & Pajarinen (2007) conclude that younger firms tend to have higher cost of debt. Again, an interesting classification of firms into young, mature, and old leads Amin et al. (2023) find young firms pay at least 15 bps more cost than mature firms. Whereas, mature firms pay at least 11 bps more than old firms. The relation between firm's liquidity and its cost of debt is inconclusive. For example, Chava & Roberts (2008) suggest that strengthening creditor rights can reduce investments, thereby increasing cash holdings. Under the same context of stronger creditor rights, Djankov et al. (2007) find that firms decrease cash holdings as the cost of external financing reduces.

¹⁹ We delete observations whose NIC Product code starts with 641,642,643,649,651,652, 653,661, 662, and 663. This is as per the NIC classification available at National Industrial Classification (2008), Section K, Page 20, https://www.ncs.gov.in/Documents/NIC_Sector.pdf

Moreover, Minton (1999) associates liquidity “with a lower cost of accessing capital markets.” . Again, creditors might be more willing to extend credit if the law grants them the power to possess the borrower’s collateral in case of a default (Aghion & Bolton, 1992). The stronger creditor rights lessen the debtor-creditor agency conflict whereby firms try to attract more debt by using additional tangible assets (Hall, 2012). In this regard, Singh et al. (2023) find that distressed firms in India borrow more secured debt as the collateral’s value increase with introduction of IBC.

Firm-level fundamental differences between treatment and control group can influence our findings. To address this issue, we apply DiD technique on our sample matched by propensity scores. This matching technique increases the covariates balance and helps fulfil the criteria of near-random assignment of treatment and control groups. In our sample, each distressed firm is matched (closest propensity score) with its non-distressed counterpart based on five firm-level pre-treatment variables viz. *Size*, *Leverage*, *Tangibility*, *Liquidity* and *Growth*, following Singh et al. (2023).

We compute propensity score matching using logit regression as follows –

$$Distress_i = \alpha + \beta X_i + \delta_i + \tau_t + \epsilon_i \quad (1)$$

where, *Distress* is a dummy variable that takes the value 1 for distressed firms and zero for non-distressed firms. X_i is the vector of firm-level controls: *Size*, *Leverage*, *Tangibility*, *Liquidity*, and *Growth*. We account for firm (δ_i) and year (τ_t) fixed effects as well. *Size*, can have mixed impact on firm’s distress as depicted in the extant literature. For example, Parker et al. (2002) posit that larger distressed firms might find it difficult to maintain their operations, as is evident from a positive relation between firm size and firm’s distress. Again, Tinoco & Wilson (2013) document a negative association between firm’s size and its distress. Their argument in line with Agarwal and Taffler (2008), who argue that the likelihood of a bankruptcy

implies the value of the assets (as proxied by size) falls short of the face value of liabilities. Hence, “a relatively small-sized company should have higher probability of financial distress.” Adding to this strand of literature, Yazdanfar & Ohman (2020) in their analysis of Swedish small and medium-sized enterprises (SMEs) find no significant relation between firm’s size and financial distress. A company might find itself stranded in the excessive leverage zone pertaining to its high debt levels. In this regard, the association between firm’s leverage and its distress can be ambiguous. Gathecha (2016), Chancharat (2008) & Isayas (2021) indicate a positive relation between leverage and firm’s distress. Again, Kristanti et al. (2016) show that leverage and distress share a negative relation. A firm faces financial constraints when fewer tangible assets restrict it from communicating its value to investors (Bhagat et al., 2005). Therefore, firms with lower tangible assets are more likely to face higher distress. When the liquid assets of a firm fail to cover its current liquidity requirements, it indicates that the firm is in distress (John,1993). Distress might also arise due to falling growth rate arising out of a fall in sales (Laitinen 2005). Falling sales might create additional stress for firms to honour their commitments.

We employ logit regression model to determine the propensity score of being assigned (where, assignment is equally likely) to treatment or control group. Matching criteria was ensured by kernel-based matching algorithm. Fulfilling two assumptions viz. “conditional independence” (Khandker et al. 2010) and “common support” is crucial to validate PSM estimates. While the former assumption ascertains that firms are allocated into the treatment group solely based on observed firm-level characteristics, the latter implies similarity across observed characteristics of the matched treatment and control groups. The common support graph (Figure 2) and mean tests across groups (Table 6: Panel A) validate the assumptions.

The application of PSM along with DiD takes into account both selection on firm-level observables and time-invariant unobserved heterogeneity. Some recent studies (not only related

to IBC) that use this technique are Srivastava et al. (2022), Bose et al. (2021) and Singh et al. (2023). The impact of IBC is analysed using DiD for those firms that get matched under the PSM approach. To estimate the impact of treatment, DiD first compares how much the average outcome of the treatment group in the post-intervention period differs from the average outcome of the same in the pre- intervention period. Similarly for control it computes the difference in average outcomes. Then, the difference between these computed differences for treatment and control groups, are compared. We consider FY 2017 to 2023 as our post-intervention period and FY 2010 to 2016 as our pre-intervention period. The following regression equation is estimated -

$$COD_{it} = \alpha + \beta_1 IBC_t + \beta_2 Distress_i + \beta_3 IBC_t \times Distress_i + \beta_4 X_{it} + \delta_i + \tau_t + \epsilon_{it} \quad (2)$$

Where, COD_{it} , is firm`s cost of debt, which is our dependent variable. $IBC_t \times Distress_i$ is our variable of interest. IBC_t is a dummy variable that takes the value 1 for years 2017 to 2023 and 0 for years 2010 to 2016. $Distress_i$ takes the value 1 if i^{th} firm falls in the treatment group (distressed), and 0 otherwise. Time-varying controls – *Size, Liquidity, Firm Age, and Collateral* constitute the vector X_{it} . Our choice of variables is in tandem with extant literature where each has been considered as a possible determinant of firm`s cost of debt. In equation (2), we control for firm fixed effects and year fixed effects and our standard errors are clustered at the firm level.

Identification strategy in DiD requires parallel trend to be present in our outcome variable of interest. i.e. cost of debt, before the passage of IBC. Here, we use an event-study design to test that that there exists no differential pre-trends in our sample of matched firms.

We follow Alok et al. (2022) and employ the below mentioned equation,

$$\begin{aligned}
COD_{it} = & v_i + \delta_{it} + \beta_0 \times Treatment_i + \sum_{t=2011, t \neq 2017}^{2023} \beta_t \times I_t \times Treatment_i \\
& + \sum_{t=2011, t \neq 2017}^{2023} \theta_t \times I_t + \beta_1 \times X_{it} + \epsilon_{it} \quad (3)
\end{aligned}$$

Year t is identified by our dummy variable I_t . The coefficients $\beta_{2018}, \beta_{2019}, \dots, \beta_{2023}$ measures the marginal responses upto 6 years after the implementation of IBC in 2017. Similarly, $\beta_{2010}, \beta_{2011}, \dots, \beta_{2016}$ represents the difference in trend in the outcome variable across treatment and control groups in the preceding 6 years before the implementation of IBC. The coefficients of $\beta_t, t = 2010, 2011, \dots, 2023$ along with the confidence intervals are plotted in Figure 3. As expected, we do not observe any significant difference between our treatment and control groups in the pre-IBC period. This confirms the parallel trend assumption in the pre-intervention period, required for DiD.

Additionally, we consider FY 2013 as the pseudo intervention period, where in we restrict our sample between 2010 & 2015²⁰. This exercise is line with the concept of placebo trial. To satisfy the claim that in absence of IBC our treatment and control groups exhibit similar trend, the coefficient of interaction i.e., β_3 in equation (2) should be insignificant.

6. Empirical Results

Our unmatched sample consists of 25,220 firm-year observations, of which 3,881 observations belong to the treatment group, and 21,339 observations belong to the control group. The sample is well distributed, with each year contributing around 7% to the total sample. Table 1 shows the summary statistics of the entire sample between 2010-2023.

< Insert Table 1 here >

²⁰ Our results remain qualitatively similar when we considered the sample period 2009-2016 for the same pseudo intervention 2013.

Panel B of Table 2 shows the mean and median values of our key variables of the treatment and control groups in the post-IBC period. The difference in mean and median values of cost of debt is significantly different from the control firms, at 1% level of significance. The mean of size for distressed firms (treatment) is higher and statistically significant than the mean of the non-distressed firms (control). This implies that large firms tend to be in distress compared to smaller firms. The finding is consistent with the findings of Altman (1993), which documents that irrespective of their size a firm can enter distress (Altman, 1993). Our treatment firms' obligations surpass its assets as is evident from the negative and significantly different mean and median *Liquidity*. We also observe that firms in our treatment group are slightly older, and have significantly higher collaterals as compared to control group firms. Panel C reports the difference in mean and median across treatment and control groups in the pre-IBC period. As expected, we do not find any significant difference for cost of debt across the treatment and control groups in the pre-IBC period. Again comparing results from Panel B with Panel C, we see that the distressed firms in post-IBC period pay 16% lesser cost of debt than what they used to pay in the pre-IBC period.

< Insert Table 2 here >

The correlation matrix is one of the ways to check for multicollinearity problems in our sample. A correlation coefficient of greater than 0.5 indicated high collinearity between two variables (Dormann et al. 2013). In our sample, all variables, except Firm Age and Size, have a correlation coefficient below 0.5. In fact, the correlation coefficient between *Firm Age and Size (0.507)* is just at the margin. We can conclude that there exists no high multicollinearity across our variables in our paper. See Table 3 for details

< Insert Table 3 here >

At first, we test the impact of IBC on firm's cost of debt for the entire sample, as reported in Table 4. The results indicate that, IBC helped distressed firms reduce their cost of debt by 2.5% than their non-distressed counterparts. The results are significant at 1% level, except while controlling for other firm level characteristics it is significant at 10% level.

< Insert Table 4 here >

Following the propensity score matching proposed by Rosenbaum & Rubin (1983), we conduct our DiD analysis on firms matched based on firm level characteristics. We use kernel technique to match each distressed firm with its non-distressed counterpart. Results in Table 5 show, that after the introduction of IBC distressed firms enjoy 2.5% lesser cost of debt than the non-distressed firms. The results stay almost similar to our unmatched sample.

< Insert Table 5 >

Before initiating the propensity score matched DiD analysis, we run the test of balance to make sure that there was no significant difference in covariates across our treatment and control groups. All covariates used in the logit regression, satisfy the test of balance and are not statistically significant at conventional levels.

< Insert Table 6: Panel A >

This implies PSM is feasible as matched treatment and control groups share similar (in terms of average) firm-level observable characteristics in the year before intervention (2016).

< Insert Figure 2 >

To test the validity of our DiD estimation results on matched sample, we restrict our sample between 2010 and 2015 with FY 2013 as the pseudo intervention period. The interaction term (Treatment \times IBC) in PSM combined with DiD regression is statistically insignificant. This

result implies that firms in both treatment and control groups have similar trends during pre-intervention period.

< Insert Table 6: Panel B >

Also, our event-study design shows the coefficients in the pre-intervention period to be insignificant thus further establishing no similar trends between the treatment and control groups.

< Insert Figure 3 >

7. Channel analysis

Theoretically, bankruptcy reforms affect the performance of all firms irrespective of whether they are distressed or not, but a significant impact is however observed for distressed firms as compared to non-distressed firms (Gutiérrez et al. 2011). The firm's existing financial situation also plays an important role in determining what impact the bankruptcy law will have on its performance (Franks et al., 1996; White, 1996; Cornelli & Felli, 1997). In the IBC context, Singh et al. (2022) find an increase in firms performance resulting from an increase in corporate risk taking. In a similar vein, Bose et al. (2021) also find that distressed firms improve their performance in the post-IBC period as long-term borrowing became more accessible and cost of debt reduced. However, in this paper we propose firm performance as a channel for reduction in firm's cost of debt. Following Jensen's (1989) hypothesis, we argue that managers of financially distressed firms might undertake operational-efficiency enhancing actions to improve firm performance. As a part of this efficiency-enhancing mechanism, managers might reach out to banks for more loans. Given strong creditor friendly environment, banks feel secured to extend loans at cheaper cost to distressed firms in post IBC period than pre-IBC period. Therefore, it is the intention to improve firm performance that leads to more loans and hence lower cost of debt. Using Return on Assets as a proxy for firm performance,

we find performance of distressed firms increase by 1.88% compared to non-distressed firms in the post-IBC period.

Prior studies²¹ provide ample evidence that under strong creditor rights, the lender is more willing to extend loans at a cheaper cost. The distressed firm too is willing to take loans so that it can recover from its distressed situation by channelising the loans into profitable investments. The proof of an increase in amount of debt after the implementation of IBC is well documented in the related literature (Bose et al., (2021); Singh et al., (2023). But, Agarwal & Singhvi (2023) report a reduction in use of secured debt by high tangibility firms. This result implies that the amount of debt plays an important role in determining firm`s cost of debt. In this regard, we find that distressed firms have borrowed 24.7% more than their non-distressed peers in the post IBC period. Consistent with the supply-side literature, this increased borrowing is an important channel for the reduction in firm`s cost of debt.

< **Insert Table 7 here** >

8. Robustness check

We conduct various robustness checks to check whether our results are qualitatively similar using different econometric techniques, alternative definitions of cost of debt, and excluding COVID years from our sample. The Tables are reported in Appendix A.

8.1. Randomisation Inference Test

First, we assess the robustness of our propensity score matched DiD coefficient by using the exact randomisation inference test. In this test the numerous replications²² (1000 in our

²¹ See: Porta et al. (1998), Houston et al. (2010), Ponticelli & Alencar (2016), Haselmann et al. (2010)

²² We use “randcmd” command in Stata 16 for the randomisation inference test

case) of placebo experiments generate a statistical distribution of the coefficient in question. We outline the steps of the test as follows – First, random reallocation of treatment firms (distressed) to control firms (non-distressed) and vice-versa is done for each replication of the placebo experiment. Second, using this newly assigned treatment, we estimate the propensity score matched DiD equation (2). Third, we generate the DiD coefficient’s distribution under the null hypothesis of no treatment effect and locate our estimated coefficient in this empirical distribution.

< **Insert Table A1 here** >

A low *p-value* (our randomized *p-value* is 0.003) or propensity score matched DiD coefficient being located in the distribution’s tail indicates a statistically significant DiD coefficient. Figure 4, the estimated coefficient (indicated by the straight line) lies towards the tail, and hence it is statistically distinguishable from zero. This evidence arising out of the randomisation inference test adds further credibility to our main propensity score matched DiD coefficient.

< **Insert Figure 4 here** >

8.2. Alternative Definition of Cost of Debt

Second, we report the results using alternative definitions for our dependent variable cost of debt following the definition by Vig (2013) & Bose et al. (2021) in Table 9. The results are qualitatively similar to the baseline results as reported in Table 5.

< **Insert Table A2 here** >

8.3. Alternative Definition of Size

Third, we use alternative definition of *Size* following Jادیyappa & Srivastava (2021) as natural logarithm of total sales and find that our results do not vary with the change in the definition of the covariate. See Table A3.

< Insert Table A3 here >

8.4. Controlling for COVID-19 years

Fourth, because IBC was suspended for one year in 2021 due to COVID-19 we run our regressions using three combinations – a) excluding years 2020 & 2021 b) excluding only year 2020, and c) excluding only year 2021. In all three scenarios our findings are qualitatively similar.

< Insert Table A4 here >

9. Conclusion and Policy Implications

Our investigation into what impact a movement from debtor-friendly to creditor-friendly insolvency regime have on firm's cost of debt led us to find that after the implementation of the IBC in India. In this regard, we find that we find that the cost of debt for distressed firms have reduced as compared to non-distressed firms. Our findings add to the existing literature (Chakrabarti and Pattison (2019); Rodano et. al. (2016); Araujo et al. (2012); Funchal (2008); Bose et al. (2021); Jose et al. (2020); and Ghosh (2023)). However, we provide a more robust inference based on econometric techniques such as, DiD combined with matching and randomisation inference test. The reduction in cost of debt comes through the channels of improved performance of distressed firms and their willingness to seek more debt. The creditor-debtor environment in India has struck the right balance where the reform has successfully instilled a confidence among the creditors to lend to the distressed borrower at cheaper costs. Infact, adding to the works of Rodano et. al. 2016 in Italy, and Araujo et al. (2012) and Funchal (2008) in Brazil – the evidence we gather from India suggests pro-creditor insolvency reforms to hold special significance in emerging economies. According to the 'Global Bankruptcy

Report-2023’ – three in every five economies monitored by Dun & Bradstreet, witnessed an increase in business failures during 2022.²³ While at the same time they predict business profitability (akin to performance) to be one of the reasons why India is expected to witness lower bankruptcy cases in 2023. Policy makers around the world can take inspiration from the results that our research provide, where a creditor-friendly regime might help distressed firms access cheaper credit and avoid business failures.

²³ https://www.dnb.co.uk/content/dam/english/economic-and-industry-insight/2023_Global_%20Bankruptcy_Report.pdf

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Tables

Table 1: Sample Composition

Panel A: Sample distribution for the full sample

Year	Total		Distressed Group		Non-distressed Group	
	N	%	N	%	N	%
2010	1,570	6.23	266	6.85	1,304	6.11
2011	1,642	6.51	275	7.09	1,367	6.41
2012	1,701	6.74	289	7.45	1,412	6.62
2013	1,754	6.95	290	7.47	1,464	6.86
2014	1,829	7.25	293	7.55	1,536	7.20
2015	1,859	7.37	297	7.65	1,562	7.32
2016	1,899	7.53	301	7.76	1,598	7.49
2017	1,919	7.61	298	7.68	1,621	7.60
2018	1,942	7.70	294	7.58	1,648	7.72
2019	1,946	7.72	286	7.37	1,660	7.78
2020	1,950	7.73	277	7.14	1,673	7.84
2021	1,938	7.68	273	7.03	1,665	7.80
2022	1,917	7.60	265	6.83	1,652	7.74
2023	1,354	5.37	177	4.56	1,177	5.52
Total	25,220	100	3881	100	21,339	100

Notes: This table represents the sample distribution of firms. Distressed Group comprise of firms whose Interest coverage ratio was less than one in 2016 and non-distressed group constitutes firms with an Interest coverage ratio greater than one in 2016

Table2: Summary statistics of key variables of sample firms between 2010 and 2023 (across firm-year observations)

Panel A: Summary Statistics for the full sample

	N	Mean	Median
Cost of Debt	23,125	0.114	0.094
Size	25,199	8.348	8.473
Liquidity	24,970	0.082	0.084
Firm Age	25,176	3.115	3.258
Collateral	24,757	0.274	0.248

Panel B: Comparison of Variables across distressed and non-distressed groups in the post-IBC period

	1. Distressed Group			2. Non-distressed			3. Difference = 1 - 2	
	N	Mean	Median	Mean	Median	N	Mean	Median
Cost of Debt	1,839	0.095	0.093	0.119	0.091	10,362	-0.024***	0.002***
Size	1,870	8.838	8.788	8.588	8.709	11,087	0.025***	0.079***
Liquidity	1,868	-0.113	-0.041	0.118	0.115	11,047	-0.231***	-0.156***
Firm Age	1,870	3.302	3.332	3.198	3.332	11,078	0.104***	0
Collateral	1,860	0.293	0.281	0.256	0.225	10,968	0.037***	0.056***

Panel C: Comparison of Variables across distressed and non-distressed groups in the pre-IBC period

	1. Distressed Group			2. Non-distressed			3. Difference = 1 - 2	
	N	Mean	Median	Mean	Median	N	Mean	Median
Cost of Debt	1,908	0.113	0.105	0.112	0.095	9,016	0.001	0.010***
Size	2,011	8.582	8.672	7.953	8.163	10,231	0.629***	0.509***
Liquidity	1,983	-0.006	0.001	0.097	0.084	10,072	-0.103***	-0.083***
Firm Age	2,008	2.991	3.091	3.015	3.178	10,220	-0.024	-0.087***
Collateral	1,969	0.290	0.266	0.286	0.264	9,960	0.003	0.002

Note: This table presents summary statistics of key variables of sample firms between 2010 and 2023 across distressed and non-distressed groups. Distressed group (category 1 in Panels B and C of Table 2) includes all firms whose interest coverage ratio is less than one in 2016. Non-distressed group (category 2 in Panels B and C of Table 2) includes firms whose interest coverage ratio is greater than one in 2016. The variable definitions are provided in Appendix B: Table B1. In all panels, column 3 presents difference in mean (t-test) and median (Mann-Whitney-Wilcoxon test). ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 3: Correlation Matrix

Variables	Size	Liquidity	Firm Age	Collateral
Size	1.000			
Liquidity	-0.085* (0.000)	1.000		
Firm Age	0.507* (0.000)	-0.002 (0.730)	1.000	
Collateral	0.072* (0.000)	-0.331* (0.000)	0.035* (0.000)	1.000

Notes: This table represents the correlation among our control variables. *** indicate 1% level of significance, ** indicate 5% level of significance and *indicate 10% level of significance

Table 4: Difference-in-differences (DiD) for the full sample

	Cost of Debt		
	(1)	(2)	(3)
Treatment	-	-	-
Post	0.007** (0.003)	0.018*** (0.006)	0.017* (0.009)
Treatment × Post	-0.025*** (0.006)	-0.024*** (0.006)	-0.014* (0.008)
Size			0.004 (0.004)
Liquidity			0.052*** (0.008)
Firm age			-0.005 (0.008)
Collateral			-0.013 (0.011)
Constant	0.112*** (0.003)	0.103*** (0.003)	0.077*** (0.028)
Firm fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Adjusted R^2	0.002	0.005	0.010
No of observations	23,125	23,125	22,941

Note: This table reports the DiD estimation results for the full sample. In columns 1 to 3, the dependent variable is *Cost of Debt*, measured using the *Interest Incidence* variable. *Liquidity* and *Collateral* have been winsorized at the 1% and 99% levels. The variable definitions are provided in Appendix: Table A1. Column 1 reports the results of DiD estimation without controls, without firm fixed effects, and without year fixed effects. Column 2 presents the results of DiD estimation without controls, with firm fixed effects, and with year fixed effects. Column 3 reports the results of DiD estimation with matching for the augmented model (with additional covariates *size*, *liquidity*, and *collateral*). Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 5: Difference-in-differences (DiD) combined with matching results

	Cost of Debt		
	(1)	(2)	(3)
Treatment	-	-	-
Post		0.020*** (0.005)	0.018** (0.008)
Treatment × Post	-0.026*** (0.006)	-0.026*** (0.006)	-0.018** (0.008)
Size			0.004 (0.004)
Liquidity			0.042*** (0.007)
Firm age			0.001 (0.008)
Collateral			-0.001 (0.009)
Constant	0.107*** (0.002)	0.099*** (0.002)	0.059** (0.030)
Firm fixed effects	No	Yes	Yes
Year fixed effects	No	Yes	Yes
Adjusted R^2	0.002	0.007	0.104
No of observations	20,843	20,843	20,793

Note: This table reports the DiD estimation results combined with matching for firm value. In columns 1 to 3, the dependent variable is *Cost of Debt*, measured using the *Interest Incidence* variable. *Liquidity* and *Collateral* have been winsorized at the 1% and 99% levels. The variable definitions are provided in Appendix: Table A1. Column 1 reports the results of DiD estimation combined with matching and without controls, without firm fixed effects, and without year fixed effects. Column 2 presents the results of DiD estimation with matching and without controls, with firm fixed effects, and with year fixed effects. Column 3 reports the results of DiD estimation with matching for the augmented model (with additional covariates *size*, *liquidity*, and *collateral*). Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Table 6: Test of balance results for matching and parallel trend for difference-in-differences combined with matching

Panel A: Test of balance results for matching

Independent Variables	1. Treatment (Distressed group)	2. Control (Non-distressed group)	3. t-Stat
Size	8.898	8.893	0.03
Leverage	0.525	0.507	0.61
Firm Age	3.135	3.096	0.64
Tangibility	0.301	0.281	1.13
Liquidity	-0.109	-0.097	-0.52
Sales Growth	0.082	0.105	-0.44
Observations			

Note: All variables are measured for FY 2016. Difference in means test are reported in column 3. Results are generated using kernel algorithm

Panel B: Tests of parallel trend

	Cost of Debt	
	(1)	(2)
Treatment	-	-
Post	0.001 (0.008)	0.020*** (0.007)
Treatment × Post	0.001 (0.007)	0.001 (0.007)
Size	-0.004 (0.004)	-0.003 (0.005)
Liquidity	0.027** (0.012)	0.033*** (0.012)
Firm age	0.023** (0.011)	0.018 (0.011)
Collateral	0.012 (0.012)	0.016 (0.012)
Constant	0.073** (0.034)	0.057 (0.039)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Adjusted R^2	0.006	0.008
No of observations	11,374	8,508

Note: Panel A of this table presents the results of test of balance for matching. The independent variables are measured in 2016 (pre-treatment). All the variables (except *size and firm age*) are winsorized at the 1% and 99% levels. The difference in means between treatment (Distressed) and control (Non-distressed) groups are reported in column 3 and its statistical significance (t-stat) are reported in column 4. Panel B of this table presents the results of parallel trend assumption of DiD with matching (kernel using 2016 data). In the columns 1 and 2, the dependent variable is *Cost of Debt measured using Interest incidence variable*. Liquidity and collateral have been winsorized at the 1% and 99% levels. The variable definitions are provided in Appendix: Table A1. Column 1 presents the results of parallel trend with pseudo adoption year being 2013, pre-treatment period (2009-2012), and post-treatment period (2013-2016). Column 2 presents test results with pseudo adoption year being 2013, pre-treatment period (2010-2012), and post-treatment period (2013-2015). In columns 1 and 2, we control for firm and year fixed effects. Robust Standard errors clustered at the firm level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10%, respectively.

Table 7: Channel Analysis

	Performance	Amount of Debt
	(1)	(2)
Treatment	-	-
Post	-0.016*** (0.005)	-0.888*** (0.075)
Treatment × Post	0.020*** (0.005)	0.247*** (0.056)
Size	0.004 (0.003)	0.975*** (0.035)
Liquidity	0.141*** (0.007)	-1.539*** (0.074)
Firm age	0.009 (0.006)	0.169** (0.073)
Collateral	-0.030*** (0.009)	0.893*** (0.127)
Constant	0.024 (0.021)	-1.704*** (0.273)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Adjusted R^2	0.104	0.280
No of observations	21,426	20,879

Note: This table reports the DiD estimation results combined with matching for the channels affecting *Cost of Debt*. In column 1 the dependent variable is *Performance*, measured using *Return on Assets*. In column 2 the dependent variable is *Amount of Debt*, measured using *natural logarithm of Total Debt*. *Liquidity* and *Collateral* have been winsorized at the 1% and 99% levels. Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively

Appendix A : Robustness tests

Table A1: Randomization inference test results

Treatment \times Post	Lower	Upper
-0.0179	-0.029	0.0002

Note: This table presents the results for DiD with matching using randomization inference aka Bertrand et al. (2002).

Table A2: Alternate Definitions of Cost of Debt

	Cost of Debt	
	(1)	(2)
Treatment	-	-
Post	0.061*** (0.0135)	0.060*** (0.0137)
Treatment × Post	-0.018** (0.009)	-0.019** (0.009)
Size	-0.018*** (0.006)	-0.017*** (0.006)
Liquidity	0.097*** (0.013)	0.097*** (0.013)
Firm age	0.009 (0.010)	0.008 (0.010)
Collateral	-0.002 (0.016)	-0.008 (0.017)
Constant	0.202*** (0.041)	0.202*** (0.041)
Firm fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
Adjusted R^2	0.009	0.009
No of observations	20,186	20,187

Note: This table reports the DiD estimation results combined with matching for alternate definitions *Cost of Debt*. In column 1 the dependent variable Cost of Debt is measured using *Interest Expense/Total Debt* as suggested in Vig (2013). In column 2 the dependent variable is Cost of Debt is measured using *Total Interest Expense/Total Debt* as suggested in Bose et al. (2021). *Liquidity and Collateral* have been winsorized at the 1% and 99% levels. Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively

Table A3: Alternate Definition of Size

	Cost of Debt
	(1)
Treatment	-
Post	0.020** (0.008)
Treatment × Post	-0.014** (0.007)
Size	0.007*** (0.002)
Liquidity	0.033*** (0.008)
Firm age	-0.014* (0.008)
Collateral	-0.006 (0.009)
Constant	0.080*** (0.023)
Firm fixed effects	Yes
Year fixed effects	Yes
Adjusted R^2	0.011
No of observations	20,537

Note: This table reports the DiD estimation results combined with matching for alternate definition of *Size*. In column 1 the dependent variable Cost of Debt is measured using *Interest incidence*. The independent variable *Size* is measured as natural logarithm of Total Sales. *Liquidity and Collateral* have been winsorized at the 1% and 99% levels. Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively

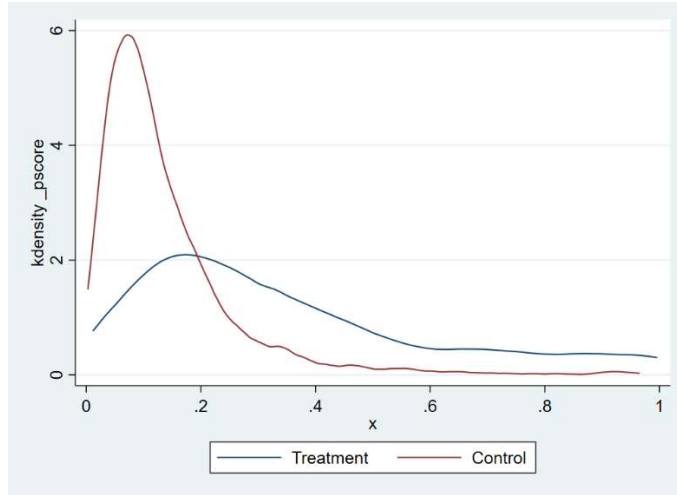
Table A4: Accounting for COVID-19

	Cost of Debt		
	(1)	(2)	(3)
Treatment	-	-	-
Post	0.018** (0.008)	0.018** (0.008)	0.018** (0.008)
Treatment × Post	-0.018** (0.007)	-0.017** (0.008)	-0.019** (0.008)
Size	0.003 (0.004)	0.003 (0.004)	0.004 (0.004)
Liquidity	0.045*** (0.008)	0.040*** (0.007)	0.046*** (0.007)
Firm age	0.002 (0.008)	0.002 (0.008)	-6.77e-05 (0.008)
Collateral	-0.003 (0.010)	-0.003 (0.009)	-0.001 (0.009)
Constant	0.059* (0.031)	0.064** (0.030)	0.055* (0.030)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Adjusted R^2	0.009	0.010	0.010
No of observations	17,620	19,196	19,217
Excluded year	2020 & 2021	2020	2021

Note: This table reports the DiD estimation results combined with matching for firm value. In columns 1 to 3, the dependent variable is *Cost of Debt*, measured using the *Interest Incidence* variable. *Liquidity* and *Collateral* have been winsorized at the 1% and 99% levels. The variable definitions are provided in Appendix: Table A1. Column 1 reports the results of DiD estimation combined with matching and without years 2020 & 2021. Column 2 presents the results of DiD estimation with matching and without year 2020. Column 3 reports the results of DiD estimation with matching and without year 2021. Robust standard errors clustered at the firm-level are in parentheses. ***, **, * indicate statistical significance at the 1%, 5% and 10% levels, respectively.

Figures

Figure 2: Kernel density plots of propensity scores for firms across treatment and control



Note: Graphs show propensity scores generated using kernel density

Figure 3: Plot showing cumulative estimated coefficients

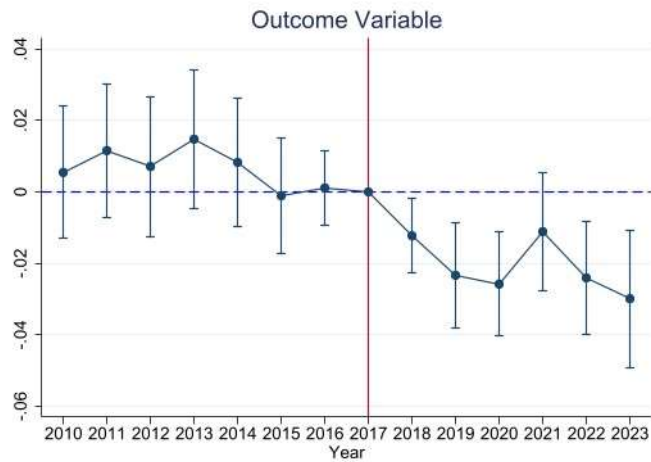
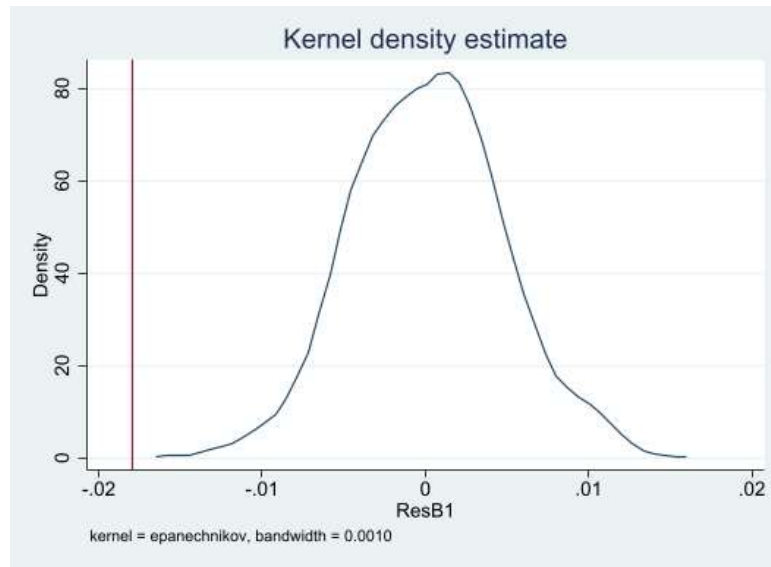


Figure 4: Distribution of propensity score-matched DiD coefficient's distribution



Appendix B

Table B1: Definition of variables

Variables	Definition of the variable
<i>Cost of Debt</i>	Ratio of firm's interest paid during the year to its borrowings (Vig, 2013; Bose et al., 2021).
<i>IBC</i>	Dummy variable that takes value 1 for years after 2016 and 0 otherwise. Intervention period is taken as 2017 (Jose et al., 2020; Singh et al., 2022; Sengupta & Vardhan, 2023)
<i>Treatment</i>	Dummy variable that takes the value 1 for firms whose Interest coverage ratio is less than 1 in the year 2016, and 0 otherwise (Chakraborty et al., 2020)
<i>Treatment × IBC</i>	Dummy variable that takes the value 1 if the firm is distressed (that is Interest coverage ratio is less than 1) and the year belongs to the post-intervention period
<i>Size</i>	Natural logarithm of total assets (Jose et al., 2020; Bose et al., 2021; Singh et al., 2023)
<i>Liquidity</i>	Current Assets minus Current Liabilities divided by Total Assets (Bose et al., 2021; Singh et al., 2023)
<i>Firm Age</i>	Difference between Current Year and Year of Incorporation (Bose et al., 2021; Singh et al., 2023)
<i>Collateral</i>	Ratio of Net Fixed Assets to Total Assets (Bose et al., 2021; Singh et al., 2023)
<i>Leverage</i>	Ratio of Total Debt to Total Assets (Singh et al. 2022)
<i>Tangibility</i>	Ratio of Net Fixed Assets to Total Assets (Singh et al., 2021; Jادیyappa & Srivastav, 2021; Singh et al., 2022; Singh et al. 2023)
<i>Growth</i>	Percentage change in Sales (Singh et al., 2023)

<i>ROA</i>	Ratio of Earnings Before Interest and Taxes to Total Assets (Singh et al., 2021; Jadiyappa & Srivastav, 2021; Jadiyappa & Kakani, 2022)
<i>Amount of Debt</i>	Natural logarithm of Total Debt

Note: This table defines variables used in our analysis.

Table B2: Flow of Events

D a t e s	8/22/2014	11/4/2015	12/21/2015	4/28/2016	5/5/2016	5/11/2016	5/28/2016	10/1/2016	12/1/2016
E v e n t s	Bankruptcy Law Reforms Committee was set up	The Committee submitted its Report and draft Bill	'The Insolvency and Bankruptcy Code, 2015' was introduced and referred to Joint Committee of Parliament	The Joint Committee of Parliament submitted its report	The Insolvency and Bankruptcy Code, 2016 was passed by Lok Sabha	The Insolvency and Bankruptcy Code, 2016 was passed by Rajya Sabha	The Insolvency and Bankruptcy Code, 2016 received the assent of the President and thereby published in 'The Gazette of India'	The Insolvency and Bankruptcy Board of India (IBBI) was set up	IBC became operational with the commencement of Corporate Insolvency Proceedings
S o u r c e s	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://pib.gov.in/newsite/printrelease.aspx?relid=145286	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://dea.gov.in/sites/default/files/Year%20End%20Review%20Final%20.pdf	https://ibbi.gov.in/uploads/publication/6adaf64e3d3221399cfda795de38a23.pdf	https://ibbi.gov.in/webadmin/pdf/legalframework/2019/Mar/Application_to_Audicating_Authority_Rules-upto%2019.03.2019_2019-03-28%2013:12:13.pdf
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