

Impact of IBC on Credit Networks and Firm Performance: An analysis of pre and post IBC era

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*Abstract: An inefficient insolvency and bankruptcy regime acts as a stumbling block to the progress and development of credit markets. India introduced the IBC in 2016 to reform its insolvency and bankruptcy framework to reduce the NPA burden and improve credit and GDP growth rate of the economy. It was a shift towards a creditor-in-control regime which promised to reduce the cost of debt, improve credit supply and nudge firms towards long-term loans. Using the Difference-in-Differences methodology, we tested for the impact of IBC on credit networks and on performance and innovation through the transmission channel of 'credit networks'. We find that IBC has resulted in a significant reduction in cost of debt and improvement in debt structure and through these channels, an improvement in the overall performance of distressed firms vis-à-vis non-distressed firms. The results reported are robust.*

Keywords: Insolvency and Bankruptcy Law, creditor, cost of debt, debt structure, difference-in-differences

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## **Introduction**

Institutional factors in general and financial frictions in particular play a major role in the subdued performance of investment, risk taking, innovation and overall development of an economy (Banerjee and Duflo, 2005). A weak and an outdated bankruptcy and insolvency law acts as an important financial friction (La Porta et al., 1997) in the financial markets. The bankruptcy law deals with the reorganization and liquidation of firms in case of default on contractual agreements by the concerned parties. Bankruptcy law deals with two agents i.e. creditors and debtors whose interests are in conflict with each other. A sound bankruptcy law tries to find a perfect balance between the two and thus establishes formal rules to enhance efficiency (ex-ante, interim and ex post efficiency). The law facilitates the exit of most unproductive firms from the market and reallocation of factors of production to the most productive firms (thereby promoting creative destruction). In India, the bankruptcy law was mired with problems of complexity, multiplicity of laws and enforcing authorities, arbitrariness, significant delays and debtor-in-control tilt. Economic Survey (2021) highlights that it took around 1550 days for a firm to undergo liquidation in India, even under normal circumstances. The delay was persistent even after the introduction of various reforms such as establishment of DRTs, SARFAESI Act etc. Therefore, the creation of a unified insolvency and bankruptcy law was the need of the hour in order to boost business, investment, FDI and long term growth of the economy. The lack of a unified law also created the macroeconomic problems of growing NPAs and falling credit growth which impacted the prospects of high growth rate. It was within the backdrop of this that the Indian government introduced the Insolvency and Bankruptcy Code in 2016 with the objective of solving the problem of NPAs in the short run and improving the ease of doing business and growth in medium and long term respectively. The reform shifted the outlook of Indian bankruptcy law from the debtor-in-control to creditor-in-control by enhancing the creditor rights during the insolvency proceedings. With the introduction of these reforms, various studies popped up in the field analyzing the impact of reforms on firm behavior (Gopalakrishnan and Mohapatra, 2020), firm performance (Lopez et al, 2011), firm debt structure (Acharya et al., 2011), access to finance (Ponticelli and Alencar, 2016), innovation (Mann, 2015), investment (Rodano et al., 2016). These studies mostly cover the

demand side impacts of the bankruptcy reforms in various contexts. On the other hand, some studies examine the impact of bankruptcy reforms from the supply side perspective such as: impact of Brazilian Bankruptcy reforms of 2005 on money market and capital market (Kadiyala, 2009), cost of credit (Beck, Demirgüç-Kunt, & Levine, 2004) and on bank behavior (Jose et al., 2020).

Keeping in view these impacts of the insolvency and bankruptcy laws, we try to examine the impact of IBC-2016 on credit networks such as cost of debt and debt structure in Indian case using the data from Prowess CMIE database on manufacturing firms over 2010-2020 period. We also tested for the causal impact of IBC on the performance and innovation through the transmission channel of credit networks. We find that IBC has resulted in a significant reduction in the cost of debt and an improvement in the debt structure of distressed firms vis-à-vis non-distressed firms. These effects in turn have resulted in better performance of these firms and has also contributed to significant rise in R & D expenditure. These results are in conformity with the existing literature.

The remaining paper is divided into 5 sections. Survey of relevant literature is present in section 1, section 2 presents discussion on data sources and empirical methodology and section 3 provides the preliminary analysis of macroeconomic data. Empirical results are present in section 4 which is followed by conclusion.

## 1. Literature Survey

A dynamic market economy is always in a state of flux, some firms exit from the market and some enter. Ideally, the forces of ‘creative destruction’ should ensure the orderly entry and exit of firms. However, in case there are distortions created by market imperfections such as coordination problems, incomplete contracts and information asymmetries, the private market will not facilitate the exit of unproductive and unviable firms. Therefore, the case for public intervention arises

to facilitate the exit of unproductive and insolvent firms from the market to enhance efficiency. Adalet McGowan and Andrews (2016) argue that the design of insolvency regimes determines the outcomes of public intervention in this case. Gurrea-Martínez (2020) argues that unattractive insolvency regimes can end up destroying the wealth, jobs and growth and may promote opportunism and risk aversion among the stakeholders, both detrimental to progress. The main parties involved are the creditors and debtors whose interests are in conflict with each other and an insolvency regime that favors the former leads to ‘too many’ liquidations and one that favors latter, leads to ‘too many’ continuations (Acharya et al., 2011). In a creditor friendly insolvency regime, there is always a liquidation bias or inefficient liquidation (Aghion et al. 1992) because of higher creditor tendency to liquidate firms even if the value is higher as a going on concern. On the other hand, if the insolvency regime favors debtors, it can lead to the reorganizations of firms whose liquidation value is greater than the going on concern. The debtors can also indulge in opportunistic behavior that can destroy the value of a firm at the expense of creditors (Gurrea-Martínez, 2020). Therefore, a sound bankruptcy regime ensures the rights of both the parties are protected and overall efficiency is attained. Insolvency and bankruptcy framework is primarily designed to deal with the distressed firms (because they are more responsive to its design (Rodano et al., 2016)), however it has overarching effects on all firms. It aims to promote both ex-ante and ex-post efficiency. Agrawal et al (2022) in the context of Danish insolvency reforms which strengthened creditor rights, argue that it led to reduction in the liquidation of distressed firms. They also offer the ex-ante and ex-post incentive effect as an explanation for this kind of behavior. According to authors, ex-ante incentives under creditor-in-control regimes have a disciplinary effect on the management which prevents them from taking decisions that can land the firm in financial trouble, while ex-post incentives reduce the agency costs for creditors and lead to more restructuring than liquidation. In addition, law and financial literature provides ample evidence of the impact of insolvency and bankruptcy laws on credit channels and firm behavior (see La Porta et al., 1998; Vig, 2013).

### ***Cost of Credit and Bankruptcy Reforms***

The introduction of IBC in 2016 marked a shift away from the debtor-in-control to creditor-in-control regime under which creditors enjoy enormous powers on the reorganization and liquidations of distressed firms. There is ample literature available on the impacts of creditor friendly regimes on the firm behavior, credit channels and overall macroeconomic development. Financial frictions stymie developmental efforts is not new to financial and developmental research (Banerjee and Duo, 2005; La Porta et al., 1997). Higher creditor protection leads to higher debt recovery, higher credit supply and lower interest rates (Demirguc-Kunt and Huizinga, 2000). Rodano et al. (2016) using the 2005-06 Italian bankruptcy reforms to test the impact of liquidation and reorganization on firm credit conditions and investment, found that interest rates on bank financing increased by around 12 basis points after the 2005 reorganization reforms. They find that this rise in credit conditions led to a reduction in investment by an average of 2.5%. On the other hand, they find that liquidation reforms led to a decline in the cost of bank financing by around 2%. The authors concluded that reorganization reforms exacerbates opportunistic behavior among entrepreneurs while liquidation reforms have a disciplinary effect as it reduces credit constraints and improves investment. Ponticelli and Alencar (2016) argue that the creditor friendly regime in Brazil led to higher recovery rate and increased the borrowing capacity of the firms. It led to higher investments because firms undertook the projects with positive NPV because of increased borrowing capacity. Araujo et al. (2012) used the quasi-experimental approach, by comparing Brazilian firms (our treatment group) to non-Brazilian firms from Argentina, Chile and Mexico (our control group), with respect to the behavior of debt related variables. They find that policies that strengthen creditors' rights and increase bankruptcy efficiency have a positive impact on lenders' willingness to supply credit, improving firms' access to external finance and expanding firms' investments capability (Araujo et al., 2012). Acharya and Subramanian (2009) and Acharya et al. (2011), on the credit demand side, find that creditor friendly regimes lead to low risk taking, innovation and investment by firms. However, Agrawal et al. (2022) provided evidence for an increase in credit supply in the post reform period. They find that the creditors' willingness to offer credit on more generous terms outweighs the negative effect the creditor-in-control insolvency regime might have on the credit demand. Gross et al (2021) using the BAPCPA reforms find evidence for a reduction in the interest rates on credit cards.

BAPCPA made the bankruptcy more onerous, more expensive and financially less beneficial and authors using the event-study and difference-in-difference regression models find that bankruptcy filings and interest rates reduced after 2005 across the credit scores. They also find evidence for the reduction in the insurance value of bankruptcy through a reduction in the likelihood of filing for bankruptcy in case of uninsured hospitalization or any other adverse shock. Bose et al. (2020) have studied the impact of IBC on the performance of distressed firms through the credit channels. They showed that introduction of IBC has resulted in a reduction in the cost of debt for distressed firms compared to non-distressed firms. Using a two stage difference in differences methodology and various robustness tests, they have shown that distressed firm's performance has gone up in the post IBC era with transmission channels being the 'credit channels'. Chakrabarti and Pattison (2019) exploiting the 2005 Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) in the US provide evidence that creditor protection is likely to reduce the cost of credit and lead to sharing of the gains with the debtor. Since, IBC is an overarching legislation that strengthens the creditor rights and provides for a uniform and timely resolution of insolvent firms, we expect distressed firms to benefit from it in terms of lower cost of credit which is summarized in the hypothesis below:

*Hypothesis I: The introduction of IBC led to a fall in the cost of credit because of higher recovery rates and more security offered to the creditor.*

### ***Debt Structure and Bankruptcy Reforms***

The design of insolvency and bankruptcy regime also impacts the debt structure of firms. Acharya et al. (2011) developed a theoretical model that relates a firm's capital-structure choice to the bankruptcy code under which a firm operates. They showed that a key factor influencing capital-structure choice is the firm's anticipated liquidation value. Their main result was that the difference in optimal debt levels under "equity-friendly system" and "debt-friendly system" should itself be a decreasing function of the degree of liquidation values. Araujo et al. (2012) find evidence of changing debt structure in the context of Brazilian bankruptcy reforms. They find that long term debt increases while short term debt

remains stable leading to a higher proportion of long term debt in average capital structure of firms. Similar results were found by Qian and Strahan (2007) and Bae and Goyal (2009) in similar contexts. Gilson (1997) also finds evidence that bankruptcy costs can induce managers to maintain a capital structure with lower leverage to avoid the possibility of financial distress. Funchal and Clovis (2009) studies the effect of changes in creditors' priority defined by the Brazilian bankruptcy law on firms' capital structure. They find an increase of approximately 8.4 percent, on average, of the share of debt in the capital structure out of which the short and long-term debt increased by around 3.6 and 4.8 percent respectively. Diamond (2004) also argued that a creditor friendly regime should lead to a debt structure with long maturity.

In the Indian context, various studies came up dealing with various bankruptcy related reforms introduced in the last three decades. Gopalan et al. (2016) using the introduction of DRTs in the 1990s as a natural experiment found that firms increased their long term debt proportionally while decreasing their reliance on the short term debt through the channel of reduction in enforcement costs. They find an increase (decrease) in long-term (short-term) debt after DRT implementation is confined to the sub-sample of firms that had multiple banking relationships in the pre-DRT period. Firms with multiple banking relationships experience saw a 18.7% fall in short term debt in the four years after establishment of a DRT. Vig (2013) using the introduction of Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests Act of 2002 (SARFAESI Act henceforth) as a quasi-natural experiment in India to study its impact on corporate capital structure. He finds that stronger creditor rights under SARFAESI Act reduced the use of secured debt by around 5.2%. The author also finds evidence for the shortening of corporate debt maturity, a reduction in total firm investments, and an increase in profitability. Bose et al (2020) have studied the impact of IBC on the performance of distressed firms through the credit channels. Using the difference in differences methodology, they showed that the introduction of IBC has led to a rise in the supply of short term and long term credit for distressed firms compared to non-distressed firms and consequently, to higher performance. Jose et al. (2020) using the firm-level data on 4,531 firms for the period 2012–2018, found that the

implementation of IBC led to a reduction in leverage as firms' reliance on borrowings both long-term or short-term declined. This result was significantly strong for weak and large firms because the threat of liquidation forced these firms to reduce their borrowings. Therefore, we expect IBC to have a significant impact on the debt structure of distressed firms, formerly expressed in the second hypothesis below;

***Hypothesis II: Implementation of IBC has led to a change in the debt structure of distressed firms, increasing the share of long-term debt to short term debt.***

In addition to the above effects, another subtle impact of a strong insolvency regime is that it impacts innovation. Acharya et al. (2011) find that stronger creditor regimes lead to a decline in risk taking, investment and innovation. On the other hand, Mann (2015) used novel data recording patents as collateral and showed that stronger creditor rights facilitate financing of innovation. The author employs the random timing of court decisions as a source of exogenous variation in creditor rights, and shows that patenting companies raised more debt financing when creditor rights to patents strengthened. Stronger creditor rights assigns more value to the collateral which in case of innovative firms is mostly patents, and ensures sufficient finance is available for them to perform R & D expenditure. Consequently, investment and patenting output also increased, as did the technological diversity of the patents produced. This brings us to our third hypothesis which we will try to address briefly in this study as;

***Hypothesis III: The introduction of IBC has led to a rise (or decline) in the innovation activity in distressed firms compared to non-distressed firms.***

## **2. Data Sources and Empirical Methodology**

Data for this study has been taken from the Prowess database, a privately maintained



firm-level database by CMIE. It contains data on majority of the formal sector enterprises (around 60-70 percent of the formal sector) obtained from their annual financial statements. Companies are required to publish their annual financial statements under the Companies Act, 1956. We obtained data for the manufacturing sector at firm level for the period of 2010-2020. We restricted our analysis period deliberately to ten years (2010-2020) to give us the sufficient number of years before and after the IBC intervention to carry our analysis. We also deflated all the required variables by the WPI (MP) with base year 2011-12. There are various missing values in our sample, we dealt with them through the listwise deletion method.

IBC was introduced in 2016 and is an overarching intervention that subsumes many historical legislations related to insolvency and bankruptcy procedures in India. We take IBC intervention as a quasi-natural experiment and use the differences in differences methodology to test for the hypothesis developed in the previous section. IBC-2016 is a shift in our insolvency thinking towards putting the creditor in control from a debtor in control regime. This thinking is in sync with the established international experience. The increased security given to the creditors (both operational and financial creditors) under IBC should lead to lower cost of debt (lower interest rates) and a change in the debt structure of firms towards long terms debt. The former effect is the result of the increased security and power assigned to the creditors in the resolution process, while the later effect takes into account the incentive for the firms to engage in long term debt to finance their operations because now banks (main source of external finance in our case) are now willing to lend for long. In case of the default, the creditor takes the control of resolution, which creates the ex-ante incentive for the firm to efficiently manage its affairs.

Since it is only the distressed firms that face the threat of insolvency and bankruptcy, we used the IBC to test its causal impact on the credit channels and firm performance for the distressed firms vis-à-vis non-distressed firms. We defined

“distressed firm” as one with a debt-to-equity ratio of greater than ‘5’.<sup>2</sup> Debt to equity ratio is an indicator of how leveraged a firm is and shows the proportion of borrowed funds to own funds. It is defined as the company’s total debt divided by shareholder’s equity. A firm with a higher debt to equity ratio is therefore, more leveraged, more risky and more likely to be under distress. From the empirical and theoretical literature discussed above, we focused on the specific credit networks such as cost of debt and debt structure to study the impact of IBC. Cost of debt is defined as the ratio of total interest expenses to total debt (Araujo et al., 2012; Bose et al., 2020) and debt structure as the ratio of long-term borrowings to short term bank borrowings.<sup>3</sup> We introduced a dummy “Distress” which equals 1 if the firm has a debt-to-equity ratio of more than five and zero otherwise. In order to test the causal impact of IBC on ‘credit networks’ defined above; we estimated the following model in our first stage regression:

$$CN_{int} = \alpha + \beta_0 Distress_{int} + \beta_1 Distress_{int} * IBC_t + \gamma Control_{int} + \delta_i + (\pi_n * \theta_t) + \varepsilon_{int} \quad 1$$

Where  $CN$  is the credit networks with cost of debt and debt structure as outcome variable alternatively.  $i=1,2,\dots,N$  is the number of firms in ‘n’ sectors and  $t$  is time.  $IBC$  is a dummy variable which takes the value of 1 in post IBC era (year $\geq$  2016) and zero otherwise.  $\delta_i$ ,  $\pi_n$  and  $\theta_t$  are firm, industry and time specific effects respectively.  $\beta_1$  is our coefficient of interest for it shows the causal impact of IBC on the outcome variable which in our case is either cost of debt or debt structure. It gives us the differential impact of IBC on the credit networks of Distressed and non-Distressed firms. We estimated the above model using firm fixed effects to

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<sup>2</sup> Our mean value of debt-to-equity ratio is 5.13, therefore, we our definition of the distressed firms account for all those firms whose debt-to-equity ratio is in the top 50 percent of the distribution approx.

<sup>3</sup> Long-term debt includes debt from banks and financial institutions, bonds and debentures that is not expected to be repaid within the next 12 months from the balance sheet date. Short-term debt includes borrowings from banks and financial institutions, and current portion of long-term debt that must be repaid within a period of 12 months. Total debt is the sum of long-term and short-term borrowings. (Prowess definition).

account for the unobservable heterogeneity and time fixed effects take care of the macroeconomic shocks that might have impacted our outcome variable (Bose et al., 2021; Rodano et al., 2016).

We have also included a set of control variables such as age, size and collateral (*Control<sub>int</sub> is a vector of control variables*). Age is calculated as the logarithm of the number of years since incorporation. Klapper et al. (2002) argued that younger firms grow and innovate, take more risks and therefore are more leveraged than old firms. Younger firms may also face the problem of asymmetric information in the credit market and most times, face a higher interest rate. Size is measured as the log of total sales. Larger firms have greater access to the external sources of finance, are less financially constrained and show better performance compared to smaller firms (Bougheas et al., 2006; Bose et al., 2021). We also controlled for the firm collateral which is defined as the ratio of net fixed assets to total assets. Vig (2013) argue that firms with higher collateral value, have higher borrowing capacity. A bankruptcy regime with better creditor control rights also increases the collateral value of firms and can lead to better performance (Bester, 1985).

Identification of the causal effects requires controlling of systematic shocks that might be correlated with financial distress and the legal change (Bose et al., 2021). In order to account for that, we have introduced an interaction of time and industry fixed effects in our main specification following Vig (2013) and Thapa et al. (2020). This is a non-parametric approach for controlling for time-varying industry specific shocks.

In the second stage of our empirical methodology, we studied the impact of IBC on firm performance through the channel of 'credit networks'. We used the three measures of performance for the robustness of our results. We used Tobin's Q, net profit margins and return on total assets as our measures of performance. While the latter two measures are the accounting measures of performance, Tobin's Q is a hybrid measure which includes the financial market data and accounting data and

therefore is a better measure of performance (López-Gutiérrez et al., 2011; Khan and Chakraborty, 2022; Mukhopadhyay and Chakraborty, 2017). The performance variables are calculated as:

$$Q = \frac{(\text{market value of equity} + \text{book value of total liabilities})}{(\text{book value of the assets})}$$

$$ROA = \frac{\text{Earnings before interest and taxes}}{\text{total assets}}$$

$$npm = \frac{\text{profit before tax}}{\text{net sales of each firm}}$$

In order to study the impact of IBC on these performance indicators, we obtained the predicted values of ‘credit networks’ (cost of debt and debt structures) from the first stage regression (equation 1) and introduced that in the below regression model:

$$P_{int} = \alpha_0 + \alpha_1 Distress_{int} + \alpha_2 Distress_{int} * IBC_t * \hat{C}N_{int} + \gamma Control_{int} + \delta_i + (\pi_n * \theta_t) + \varepsilon_{int} \quad 2$$

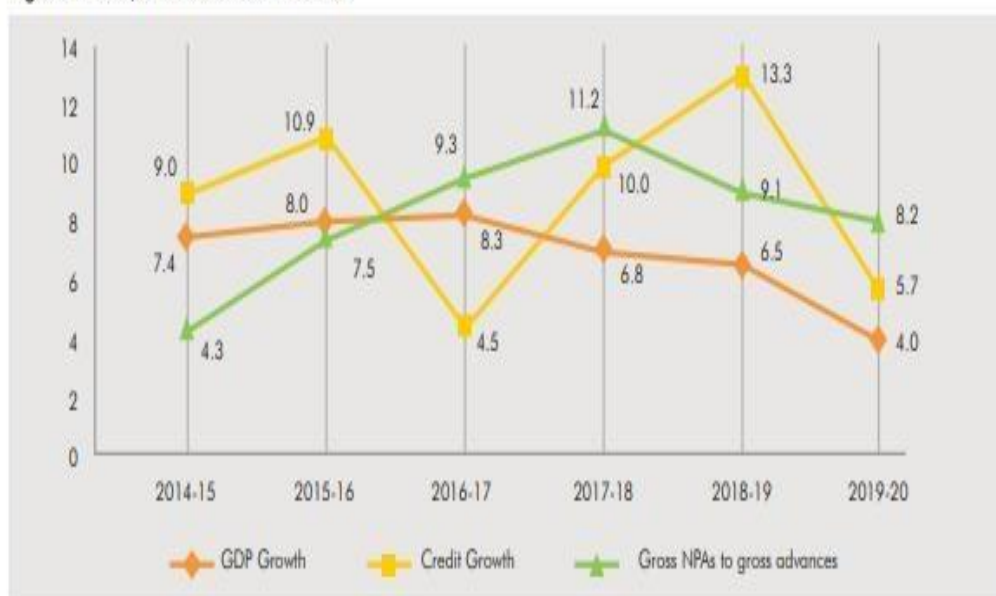
$P_{int}$  is the outcome variable (performance variable) for firm ‘i’ in sector ‘n’ at time ‘t’. Here the main coefficient of interest is  $\alpha_2$  which captures the impact of reduced cost of debt and increased debt structure (more long-term borrowing compared to short term borrowing) on the performance of distressed firms in post IBC era. This is the main focus of this study.

However, for the unbiasedness of the difference in differences coefficient, the pre-treatment dynamics should be same for both the treatment and the control group. In order to validate that assumption, we have followed Bose et al. (2020) to run the Placebo tests by creating a fake treatment period and restricting the sample period to pre actual treatment. The intuition is to check whether the relevant coefficients are significant due to the fake treatment year that it has been subjected to. We restricted our sample to pre 2016 and assumed that fake intervention took place in 2013.

### 3. Preliminary Analysis of the impact of IBC

The introduction of IBC in 2016 came as a response to the rising NPAs in the second decade of 21<sup>st</sup> century which constricted the GDP growth rate of Indian economy by affecting the much-needed credit supply. Figure 1 plots the GDP growth rate, credit growth rate and Gross NPAs to gross advances from 2014-15 to 2019-20. As we can see that growth rate is continuously falling along with rising NPAs. We can also see a sudden dip in credit growth in 2016-17 which gained momentum with the introduction of IBC but has gain come down in recent years reflecting the weak demand and rising risk aversion among banks. IBC was brought in to strengthen the creditor rights during the resolution of the defaulting firms and therefore guaranteed a higher recovery of the creditors' assets. Figure 2 plots the recovery rates of the amount involved of SCBs through various channels. The recovery rate under the IBC has been the highest compared to other channels and has averaged around 46 percent.

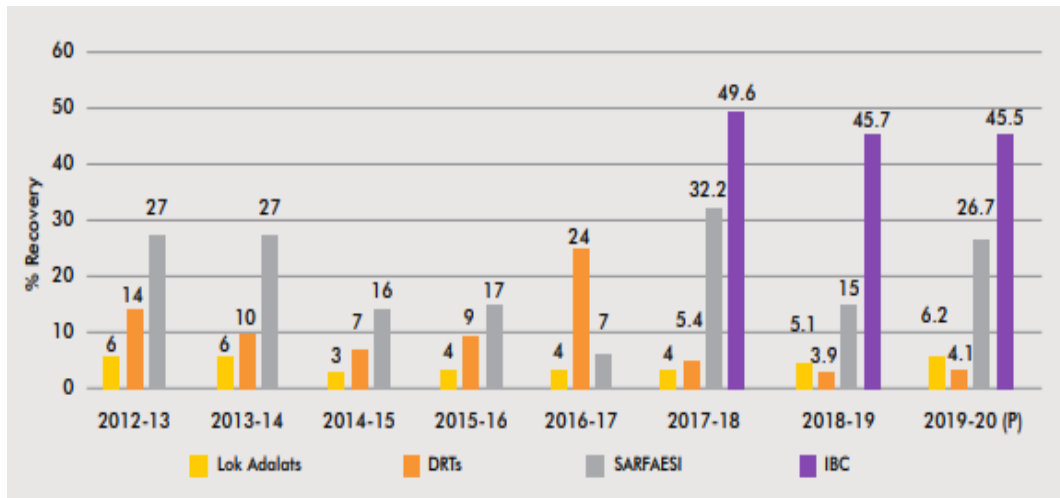
Figure 1: GDP, Credit and NPA Growth



Source: Economic Survey, RBI database, NSSO database

This recovery rate shows the confidence and the efficacy of this code. One must bear in mind that the primary focus of IBC is resolution, recovery is only

Figure 2: NPAs of SCBs Recovered through Various Channels



Note: P: Provisional  
Source: Off-site returns, RBI and IBBI

incidental (Annual Report, 2019-20). Aghion et al.(1992) argue that a creditor friendly insolvency framework has a liquidation bias and since IBC can fairly be categorized so, we see that around 46 percent of the cases admitted under IBC end up being liquidated and the main reason being the ‘decision by Committee of Creditors (CoCs)’. Figure 3 provides a picture of the result of Corporate Insolvency Resolution Processes (CIRPs).

Figure 3

Corporate Insolvency Resolution Processes

Modes of Closure of CIRPs

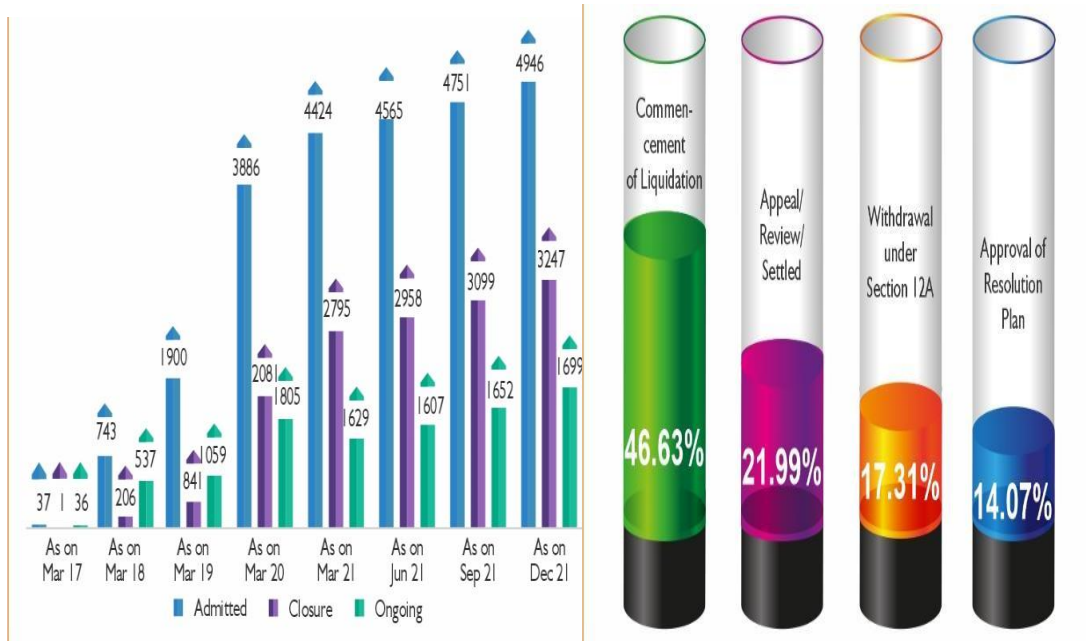
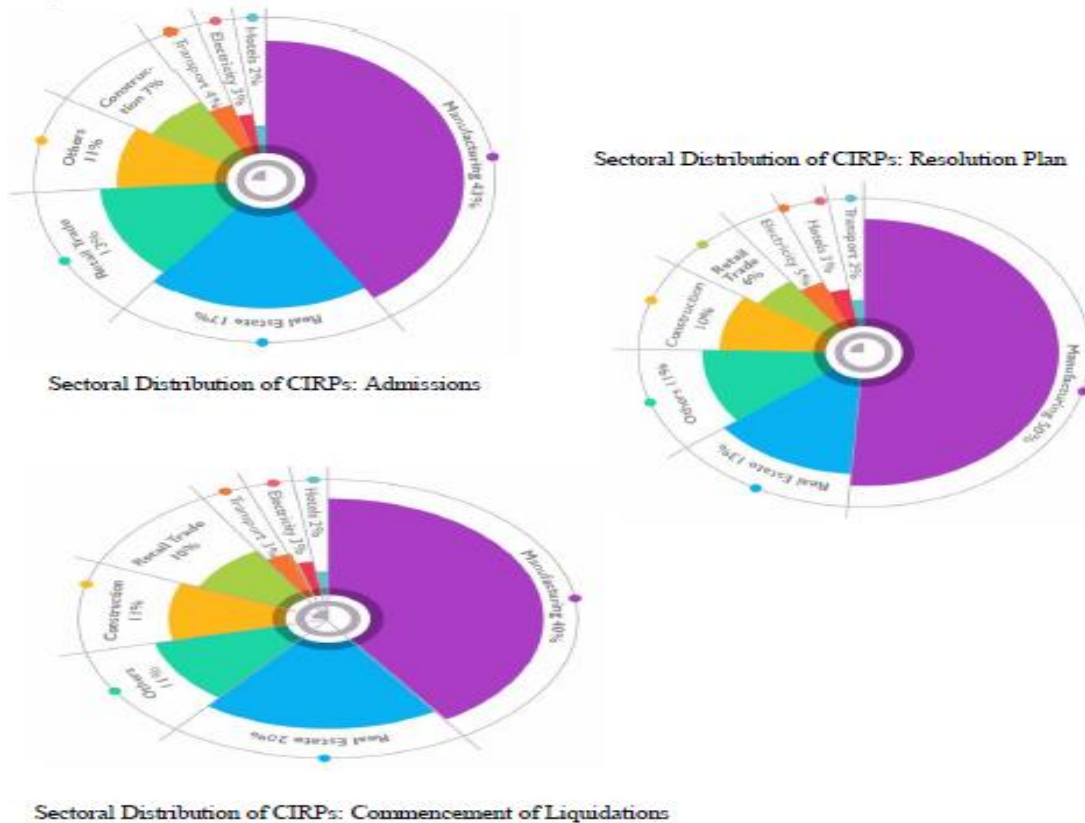


Figure 4 gives the sectoral distribution of the CIRPs and it can be seen that around 60 percent of the cases admitted are from manufacturing and real estate. Out of the total manufacturing cases admitted, 50 percent cases are put for a resolution plan and 40 percent are liquidated. Therefore, manufacturing sector provides a good sample for testing the impact of IBC on credit channels and performance of firms. IBC provides incentives for all the stakeholders to initiate the insolvency proceedings as early as possible so that the concerns of the distressed firm are appropriately and efficiently addressed. As on 31st December, 2021, out of the total number of cases admitted by the corporate debtor under IBC, 75 percent of them were put out for liquidation and 20 percent for the approval of the resolution plan. Similarly, out of the total cases admitted under IBC by Financial creditors, 52% ended up with the commencement of liquidation and that of Operational Creditors, 39% ended up with liquidation.<sup>4</sup>

Figure 4: Sectoral Distribution of CIRPs



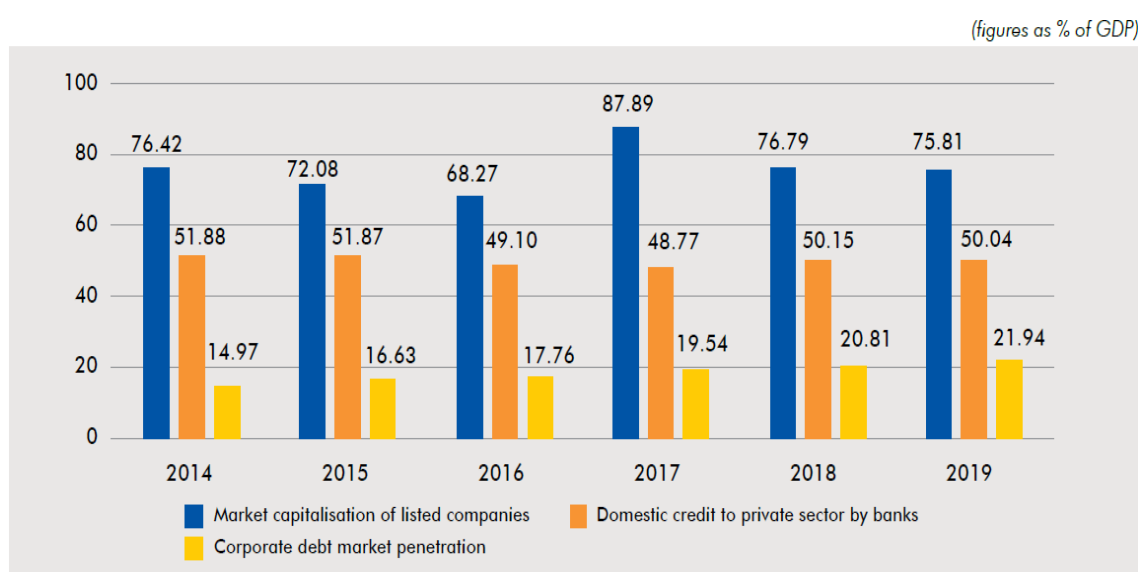
Source: Quarterly Newsletter of IBBI, October-December, 2021.

<sup>4</sup> A corporate debtor is defined as any person that owes a debt to another. The Code defines, financial creditors as those who have entered into financial contract with the company, such as a loan or debt security. Section 5 (20) of Code defines Operational creditor as a person to whom an operational debt is owed and includes any person to whom such debt has been legally assigned or transferred.



Bose et al. (2021) argued that IBC has impacted the credit structure of firms. Figure 5 shows the patterns of firm financing in India. It shows market capitalization of listed companies along with domestic bank credit to private sector and corporate debt market penetration. Overall, bank financing remains the dominant source of external financing in case of India. However, with the introduction of IBC, there is now an increase in the use of bond market and unsecured credit. This shift in capital structural is one of the desirable long-term objectives of the IBC.

Figure 5: Changing Debt Structure and overall financial development in India



Source: World Bank Database and SEBI

Figure 6 plots the graph of cost of debt over time for both the control and the treatment group. It can be seen from the graph that cost of debt has fallen for the distressed firms in the post IBC period. Figure 7 plots the debt structure for both the groups, which again provides an idea about the increased proportion of long-term debt to short term debt in post IBC era. Figure 8 plots the graph of Tobin's Q for both the groups and again it provides a preliminary idea that performance of distressed firms has gone up slightly in post IBC period.

Figure 6: Cost of Debt (Treatment vs Control Group)

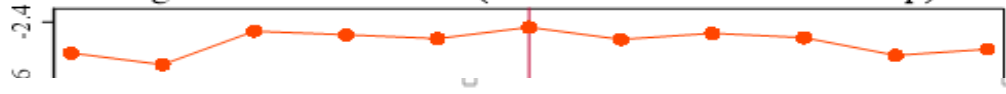
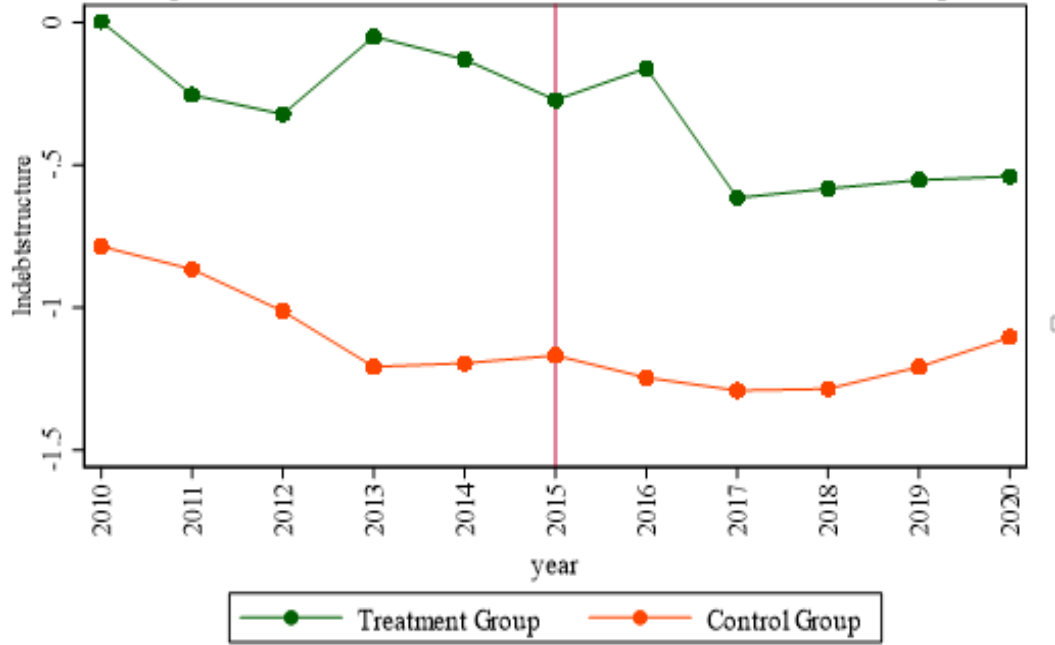
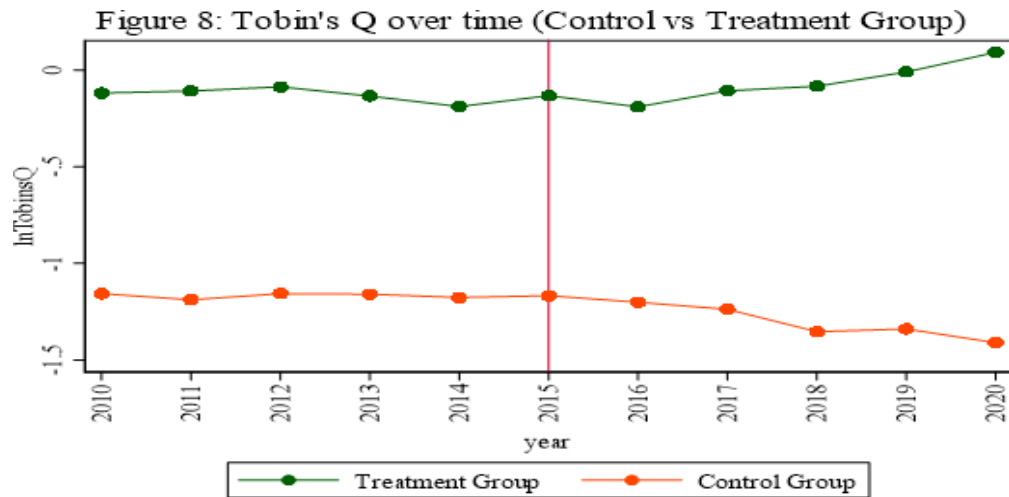


Figure 7: Debt Structure (Treatment vs Control Group)



Source: Author's Calculations



#### 4. Empirical Results:

Table 1 reports the descriptive statistics of the entire sample for the main variables of interest. We have reported mean, standard deviation, minimum and maximum values for all the variables. In Table 2, we have presented the summary statistics separately for control and treatment group. It can be seen from the table that distressed firms have lower R & D expenditures, return on total assets, lower size and lower cost of debt. Contrary to our expectations, they are older in age, have higher collateral, higher mean debt structure ratio and surprisingly higher Tobin's Q.

**Table 1: Descriptive Statistics**

Variable	Obs	Mean	Std. Dev.	Min	Max
Saled	24683	49.447	218.521	.001	6407.679
Lnage	42060	2.839	.473	0	4.942
Collateral	26198	.596	.706	0	33.051
firm size	24683	2.252	1.951	-7.105	8.765
Rnd	3718	1.912	17.842	-.26	1022.362
returnontotalassets	26078	.39	44.96	-4222.22	504.76
Tobins Q	27564	1.103	17.131	0	2326.5
netprofitmargin de~d	26867	-.047	.521	-11.284	4.338
debtstructure1	14286	.048	.61	-.006	46.332
cost of debt	22294	.182	3.238	0	434

**Table 2: Summary statistics by Control and Treatment Group**

Control Group	N	mean	sd	min	max
saled	21383	52.769	226.977	.001	6407.679
lnage	23096	2.834	0.448	0	4.718
collateral	22370	.528	0.343	0	4.974
firm size	21383	2.385	1.852	-7.088	8.765
Rnd	1610	2.407	26.264	-.26	1022.362
returnontotalassets	18627	3.076	11.249	-450	178.02
Tobins Q	23187	.45	0.842	0	29.626
netprofitmargin	19281	-.011	0.415	-11.284	4.338
debtstructure1	12409	.039	0.437	-.006	27.867
cost of debt	19301	.194	3.448	0	434
<b>Treatment Group</b>					
saled	3300	27.924	151.045	.001	4331.567
lnage	18964	2.845	0.501	0	4.942
collateral	3828	.991	1.594	0	33.051
firm size	3300	1.389	2.318	-7.105	8.374
Rnd	2108	1.534	5.877	-.044	94.225
returnontotalassets	7451	-6.323	81.829	-4222.22	504.76
Tobins Q	4377	4.565	42.784	0	2326.5
netprofitmargin	7586	-.138	0.716	-10.156	2.679
debtstructure1	1877	.107	1.252	0	46.332
cost of debt	2993	.106	1.203	0	64.5

### ***Impact of IBC on ‘Credit Networks’***

In this section, we will discuss the results of our first stage regression based on difference in differences model. The results are shown in Table 3. Our outcome variables are debtstructure which is defined as the ratio of long term debt to short term debt and cost of debt defined as the ratio of total interest expenses to total debt. In column 1, we show the results for the outcome variable debt structure and in second, that of cost of debt. Our main variable of interest is ‘interaction’ which shows the impact of IBC on the outcome variables. It can be seen that IBC has led to an increase in the debtstructure by 10 percent or a higher proportionate increase in long term borrowings compared to short term borrowings. The coefficient is significant at This finding is consistent with the results of Araujo et al. (2012) and Funchal and Clovis

(2009). Bose et al. (2021) and Gopalan et al. (2016) found similar results in case of India.

Table 3: Impact of IBC on Credit Networks		
	(1)	(2)
	debtstructure	lncostofdebt
treat	0.0232 (0.74)	-0.277*** (-8.62)
interaction	0.102** (2.88)	-0.329*** (-9.27)
lnage	0.0616 (1.02)	0.100 (1.72)
collateral	-0.0246 (-0.81)	-0.0121 (-0.37)
firm_size	-0.0251* (-2.34)	0.269*** (27.72)
_cons	-0.0808 (-0.42)	-3.504*** (-18.83)
<i>N</i>	13877	21668
<i>R</i> <sup>2</sup>	0.255	0.494
adj. <i>R</i> <sup>2</sup>	0.085	0.407
Firm FE	Yes	Yes
Time FE	Yes	Yes
Industry FE	Yes	Yes
Time*Industry FE	Yes	Yes
<i>t</i> statistics in parentheses		
* $p < 0.05$ , ** $p < 0.01$ , *** $p < 0.001$		

We have controlled for size, age and collateral. Age and collateral is having an insignificant effect on our outcome variable. Size is having a negative effect on debt structure variable. In the second column, our outcome variable is cost of debt. We find that IBC has reduced the cost of debt by around 32 percent and result is highly significant. This is consistent with the existing literature such as Agrawal et al (2021); Gross et al (2021); Ponticelli and Alencar (2016) etc. Size here is having a positive and a statistically effect on cost of debt. This is contrary to our expectations of size having a negative impact on cost of debt which implies that larger firms face lower

cost of debt. We have controlled for firm, time and industry fixed effects.

***Impact of IBC on Performance and Innovation through ‘credit networks’***

Table 4: Impact of IBC on Firm Performance through reduction in Cost of Debt				
	(1) returnontotalassets	(2) lnnetprofit	(3) logTobinsq	(4) lnrnd
Treat	0.206 (0.51)	-0.0212 (-0.37)	0.166*** (13.36)	0.0467 (0.35)
costhat_ibc_treat	-0.114 (-0.88)	-0.0291 (-1.45)	-0.0626*** (-4.60)	-0.0834* (-1.98)
Lnage	-0.376 (-0.46)	-0.00539 (-0.06)	-0.193*** (-3.61)	0.0531 (0.32)
firm_size	0.494*** (4.67)	-0.0294* (-2.00)	-0.0251** (-3.20)	0.0771* (2.38)
collateral	-0.690* (-2.26)	-0.00912 (-0.18)	0.178*** (7.91)	0.0455 (0.30)
_cons	2.850 (1.37)	-3.601*** (-15.20)	-0.639*** (-4.70)	-2.552*** (-5.65)
<i>N</i>	19774	15934	22947	1655
<i>R</i> <sup>2</sup>	0.616	0.628	0.508	0.936
adj. <i>R</i> <sup>2</sup>	0.546	0.546	0.429	0.901
Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Time*Industry FE	Yes	Yes	Yes	Yes

*t* statistics in parentheses  
 \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 4 reports the results of our second stage regression where we used the triple interaction between IBC, treatment dummy and predicted value of cost of debt. The coefficient of this interaction term shows the impact of ‘credit networks’ on the performance and innovation of distressed firms after the implementation of IBC. We find robust evidence of the impact of IBC on firm performance due to reduction in cost of debt. The coefficient of interest is “costhat\_abc\_treat” which in case of Tobin’s Q and R & D is negative (-0.0626 and -0.0834, respectively) and significant. It shows that a fall in cost of debt leads to better performance and more innovation by distressed firms compared to non-distressed firms in the post-IBC period. We find no significant effect on return on assets and net profit margin. This may be because these are accounting based measures of performance while Tobin’s Q is a broad-based measure including both accounting and market-based information. Bose et al. (2021) find similar results for the performance of Indian manufacturing firms. There is mixed evidence of the effect of size on performance but large sized firms definitely increased innovative activities with the relaxation credit constraints. Older and more collateralized firms saw an improvement of performance in post IBC era. We have controlled for firm, industry and time fixed effects.

Table 5: Impact of IBC on Performance and Innovation

	(1)	(2)	(3)	(4)
	logTobinsq	lnnetprofit	returnontotalassets	lnrnd
Treat	0.389*** (14.35)	0.00693 (0.12)	0.462 (1.21)	0.0880 (0.70)
destructure_abc_treat	0.641*** (4.67)	0.215 (0.63)	-0.801 (-0.42)	0.862# (1.83)
Lnage	-0.190*** (-3.56)	-0.00496 (-0.05)	-0.358 (-0.44)	0.0495 (0.30)
firm_size	-0.0245** (-3.11)	-0.0302* (-2.05)	0.475*** (4.48)	0.0749* (2.32)
collateral	0.185*** (8.26)	-0.00604 (-0.12)	-0.664* (-2.19)	0.0803 (0.54)
_cons	-0.746*** (-4.41)	-3.574*** (-12.26)	2.750 (1.06)	-2.320*** (-4.23)
<i>N</i>	22947	15934	19774	1655
<i>R</i> <sup>2</sup>	0.616	0.628	0.508	0.936
adj. <i>R</i> <sup>2</sup>	0.546	0.546	0.429	0.901

Firm FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Time*Industry FE	Yes	Yes	Yes	Yes

*t* statistics in parentheses

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$ , # $p < 0.1$

Table 5 presents the results of second stage regression in which we have used predicted value of improvement in debt structure as the transmission channel for performance improvement. Our main coefficient of interest is again the interaction term which gives us an estimate of how performance and innovative efforts of distressed firms have improved in post IBC period due to change in debt structure. Again we find a significant and a positive impact of IBC on Tobin's Q (coefficient of 0.641) and on R & D, taken as a proxy for innovation. Again, we find insignificant effect on return on total assets and net profit margin. Older, small and more collateralized firms improved their performance in the post IBC period through increased availability of long term credit. This is in consistent with theory which tells us that long term credit will improve in creditor friendly insolvency regimes.

### ***Robustness Tests***

In order to validate our results of main regression, we run the placebo test to check the parallel trends assumption. Bose et al. (2020) argue that if homogeneity across time periods is assumed, then similar results should hold in pre-treatment period as well. We have shown graphically in second section that pre-treatment dynamics of our relevant variables appears to be same in both the groups, here we have presented a formal Placebo tests where we estimated the model again but restricted it to pre-treatment years and also introduced a fake treatment year. The results are shown in Table 6 and we find coefficient of interaction term to be insignificant and therefore, fail to reject the null hypothesis of same change. Similarly, the results for our second stage regression are reported in Table 7 and Table 8, and we find the support for parallel trends assumption. Therefore, we can conclude to a fair degree that our results are robust.

	(1)	(2)
	debtstructure1	lncostofdebt
treat	0.107	-0.176*



	(1.95)	(-2.48)
faketreat	0.0223 (0.40)	-0.113 (-1.67)
lnage	0.0724 (0.59)	0.0489 (0.48)
collateral	0.0396 (0.52)	0.309 (1.67)
firm_size	-0.0151 (-0.84)	0.307*** (8.87)
_cons	-0.139 (-0.44)	-3.504*** (-12.63)
<hr/>		
<i>N</i>	8126	12275
<i>R</i> <sup>2</sup>	0.285	0.605
adj. <i>R</i> <sup>2</sup>	-0.005	0.476
<hr/>		
<i>t</i> statistics in parentheses		
* <i>p</i> < 0.05, ** <i>p</i> < 0.01, *** <i>p</i> < 0.001		
<hr/>		

Table 7: Test for Parallel Trends Assumption for Credit Channel Cost of Debt

	(1) returntotalassets	(2) lnnetprofit	(3) logTobinsq	(4) lnrmd
Treat	0.353 (0.52)	-0.0949 (-1.03)	0.110 (1.73)	0.0317 (0.18)
fakecosttriple	-0.198 (-0.85)	-0.0227 (-0.64)	-0.0262 (-1.11)	-0.0196 (-0.34)
Lnage	-0.622 (-0.39)	-0.0613 (-0.35)	-0.0280 (-0.17)	-0.0187 (-0.07)
firm_size	0.658*** (3.82)	-0.0442 (-1.94)	-0.00868 (-0.31)	0.0986*** (3.72)
Collateral	-2.975*** (-5.52)	-0.0249 (-0.29)	0.877* (2.33)	-0.179 (-0.48)
_cons	4.227 (1.04)	-3.416*** (-7.69)	0.111 (0.25)	-2.393** (-3.27)
<i>N</i>	10966	8780	13670	876
<i>R</i> <sup>2</sup>	0.706	0.693	0.622	0.953
adj. <i>R</i> <sup>2</sup>	0.604	0.564	0.507	0.909

*t* statistics in parentheses  
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

Table 8 Test for Parallel Trends for Credit Channel Debt Structure

	(1) logTobinsq	(2) lnnetprofit	(3) returntotalassets	(4) lnrmd
Treat	1.860 (1.05)	-0.0781 (-0.93)	0.192*** (4.12)	-0.0146 (-0.09)
fakedebtriple	-13.55 (-1.10)	0.186 (0.46)	-0.504 (-1.31)	0.676 (1.18)
Lnage	-0.744 (-0.25)	-0.0590 (-0.34)	-0.0254 (-0.15)	0.00284 (0.01)
firm_size	0.582* (2.11)	-0.0450* (-1.97)	-0.0130 (-0.46)	0.0983*** (3.82)
Collateral	-2.887 (-0.71)	-0.0266 (-0.31)	0.879* (2.39)	-0.189 (-0.51)
_cons	4.479 (0.61)	-3.420*** (-7.69)	0.102 (0.24)	-2.434*** (-3.33)
<i>N</i>	10966	8780	13670	876
<i>R</i> <sup>2</sup>	0.027	0.020	0.077	0.217
adj. <i>R</i> <sup>2</sup>	0.015	-0.392	0.068	0.121

*t* statistics in parentheses  
\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## **Conclusion**

IBC was brought in to cure the malaise of rising NPAs of banks and to help the development of credit markets in India. It was a shift away from the mostly debtor-in-control regime to a creditor-in-control regime where creditors were given powers to confiscate the assets of the defaulting firm to recover its dues. More importantly, creditors were given more powers in the insolvency and resolution proceedings through the Committee of Creditors (CoCs). CoCs have the power to liquidate or continue the defaulting firm as a 'going on concern' under IBC. Theoretical and empirical literature suggests that such a creditor friendly regime should result in the decline in cost of debt and a change in credit structure. Applying the difference in differences methodology, we tested for the causal impact of IBC on cost of credit and debt structure on distressed firms vis-à-vis non-distressed firms and through these channels on firm performance and innovation. We find that IBC has resulted in a decline cost of credit and improvement in debt structure towards long term borrowing by firms and the results are significant at 5 percent level. We also find significant impact of IBC on performance and innovation through these credit networks. Thus, we conclude that IBC has impacted the credit networks favourably, which acted as a transmission channel to affect the performance of the distressed firms in the post IBC period. We also tested for the pre-treatment dynamics and found our results robust. However, our study suffers from the limitation of defining our treatment group a bit arbitrarily. As a result, our results may be driven by some fundamental differences between the two groups of firms which we are not accounting. We plan to use the PSM DiD methodology to account for any fundamental differences between the two groups. We also want to test the robustness of our results by changing the definition of our 'distressed firms' and see whether our results hold or not.

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