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Financial Constraints and Export Behavior: An Analysis of Indian Manufacturing Firms

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Abstract:

This paper examines the effect of financial constraints on the extensive and intensive margins of exports for a large sample of manufacturing firms in India during the period 2000-2020. Using two multivariate indices of financing constraints proposed by Whited and Wu (2006) and Hadlock and Pierce (2010) along with conventional measures like liquidity and leverage, we examine whether changes in firms' financial health influence the decision to exports as well as the level of exports. We also test the learning by exporting hypothesis. Finally, we examine whether the implementation of bankruptcy code, IBC-2016, helped to reduce the financial constraints of firms in India. We find that an increase in the degree of financing constraints affects the decision to exports adversely. Moreover, as the financing constraints increase, the level of exports decreases. We also observe that export starters display better financial health than their non-exporting competitors, even before they start to export. Our findings also show that after the implementation of IBC-

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2016, financial constraint was decreased. Hence, it suggests that exporting manufacturing firms in India have been benefitted from the bankruptcy reform law, IBC-2016, which helped them to have better access to credit and to get out of financial constraints.

Keywords: Financial constraints, exports, bankruptcy code, difference-in differences, India

JEL Classification: C13; C23; C54; F14; G28; L60

1. Introduction

Export promotion and integration with the global economy through the calibrated use of various policy instruments have shaped the economic fortunes of last four decades.[1] The liberalization of world trade through tariff reduction, currency convertibility and quota removal led to increase in allocative efficiency, facilitated technological change and improved firm level productivity (Topalova and Khandelwal, 2011). Thanks to the widespread availability of unit level data, the focus of trade economists recently has shifted to firm level determinants of trade flows (Tyboutet. al..,1991; Harrison, 1994; Tybout and Westbrook, 1995; Pavcnik, 2002; Fernandes, 2003).

Beginning with the *Ricardian General Equilibrium model of international trade* to the *New New Trade Theory* of Melitz (2003), the free trade has been the perfect guide of trade economists. Melitz (2003) made a breakthrough in the literature by recognizing the firm level heterogeneity as the main unit of analysis. The model recognized the existence of sunk costs and productivity to be the important determinants of firm level exports. The existence of sunk costs brings in focus the role of financial constraints in determining the export status of a firm and the relevant policy of export promotion. Credit constraints

1. Be it the success of East Asian Tigers, rise of China and India's growth story, most of it can be attributed to the liberalized trade policies

will be all pervasive in a developing country characterized by imperfect capital markets and information asymmetry. Bernini (2014) shows that in transition economies where information asymmetries are prevalent, firms exposed to greater domestic or foreign competitive pressure are more likely to report serious financial constraints.Beck and Levine (2002) argue that financial constraints assume greater significance under the financial globalization.In an emerging economy like India, the risk in financing under informational asymmetry and imperfect capital markets is all pervasive.

Given the institutional structure of India, most of the lending is done by public sector banks (PSBs)with market share of 70% in national banking market. The market share of PSBs is declining owing to the growing presence of “New Private Banks” (NPBs), which were licensed in the early 1990s after the liberalization of licensing rules (Economic Survey, 2020). Despite the huge presence of PSBs, Indian banking sector is characterised by under-lending or sub-optimal lending on account of regulatory overburden, less strategic and operating freedom, distorted incentive structure of loan officers and general dwarfism of banking sector compared to other emerging economies (see Banerjee et al., 2004). PSBs in pre-global financial crisis 2008 advanced huge loans especially to infrastructure projects without proper monitoring and evaluation mechanism in place which ultimately culminated into growing Non-Performing Assets (NPAs). In 2019, PSBs account for 85% of bank frauds, their gross NPAs stood at ₹ 7.4 lakh crores or 12% of total advances and a collective loss of over ₹ 66,000 crores due to bad loans (for more on PSBs see Economic Survey, 2020). These developments contributed greatly to the recent decline in credit growth of PSBs affecting the overall growth of Indian economy. In order to address the problem of bourgeoning NPAs and other structural inefficiencies (especially with NBFCs), the govt. has introduced the Insolvency and Bankruptcy Code 2016 (IBC-2016). The law aims at strengthening the bargaining position of

creditors and thus shifting the pendulum away from borrowers to the creditors in the process of liquidation. Under IBC, a creditor with just 1 lakh default can roll the company into liquidation. The IBC provides a 180-time frame for recovering the insolvent firms with creditor enjoying the discretion of whether to restructure the loan or sell firm's assets to recover the amount. IBC-2016 was comprehensive in scale which has surpassed the Debt Recovery Tribunal Act of 1993 (DRT Act) and the Securitization and Reconstruction of Financial Assets and Enforcement of Security Interests Act of 2002 (SARFAESI Act).[2] Using this exogenous change, we will try to analyze the effect of IBC-2016 reforms on financial constraints faced by Indian firms.

More specifically, in this study, we will try to analyze the impact of financial constraints on the intensive and extensive margin of exports of Indian firms. The debate on causality is still in its nascent stage. In this context, we will test the relevant hypotheses of learning by exporting with respect to exports and financial constraints. We would like to utilize IBC-2016 as a natural experiment and try to analyze its impact on the financial health of firms. The study period of our analysis covers 2000-2020 based on 4434 manufacturing firms. We expect that IBC will improve the financial positions of the firms which in turn will lead to improved export participation and performance.

This study has several contributions in the literature. First, we have extended the earlier studies on the relationship between financial constraints and exports in Indian manufacturing by considering the recent year data by systematically examining the role of financial constraints in this regard. The existing literature shows that the relationship is inconclusive in terms of causality. An extension of the earlier studies by including a long period of

2. DRT Act did not allow creditors to advance their priority claims on a defaulting firm without a court/tribunal, the SARFAESI Act strengthened creditors" rights by allowing them to take possession of the assets of a defaulting firm without a court/tribunal trial (Bose et al., 2020).

data spanned over 20-year period and analyzing a rich panel of 4434 manufacturing firms by using novel techniques adds further rigour to the earlier studies. Second, to the best of our knowledge there are no Indian studies which have examined the learning by exporting hypothesis in this context. Third, no studies have considered the role of IBC-2016 in reducing credit constraints of exporting firms, as we have studied in this paper. Fourth, we have used two multivariate indices along with the traditional measures like liquidity and leverage in this paper and it distinguishes our study from most of the existing empirical research on this topic. Finally, we have used the difference-in-differences methodology along with the propensity score matching technique for analyzing the impact of IBC-2016 on financial constraints of exporting firms, which deal with selection and endogeneity issues, is a novel one.

The major finding of our analysis shows that an increase in the degree of financing constraints affects the decision to exports adversely. Moreover, as the financing constraints increase, the level of exports decreases. These results are consistently observed for alternative measures of financing constraints. We also observe that export starters display better financial health than their non-exporting competitors, even before they start to export. Moreover, we also found that exports lead to faster improvements in the financial health of starters, possibly through a signaling effect to financial markets by reducing informational asymmetries (Ganesh-Kumar et. al., 2001; Greenaway et. al., 2007). Our findings also show that after the implementation of IBC-2016, financial constraint was decreased for the measure WWI whereas it increased for HPI. It indicates that the findings are sensitive to the choice of the measures of financing constraints.

The remaining of the paper is organized as follows: In Section2, we present a survey of the existing literature. In Section 3, we discuss the empirical strategy. In Section 4, we discuss the

data and descriptive statistics. In Section 5, we present the empirical analysis. Finally, we conclude in Section 6 with policy implications.

2. Literature Review

Theoretical literature linking the financial constraints and firm level export determinants kick started with the Melitz (2003) model. Chaney (2005, 2016), Muuls (2008) and Manova (2013) extended the Melitz model to account for firm level heterogeneity in terms of financial constraints. Chaney (2005) accounted for internal finance while Manova (2010) included the external credit constraint in her extension. Chaney (2016) developed a model of international trade with liquidity constraints. He shows that only the most productive firms that generate enough liquidity from their domestic sales and wealthier firms are more likely to export. Manova (2010) focused on the heterogeneous firms across different countries and sectors and finds that firms with better financial conditions are more likely to export. Manova (2013) shows that financial constraints can hurt export volumes (intensive margin) to the extent of firm's financial dependence on external finance. Muuls (2008) builds an extended model based on Melitz (2003) to account for both internal and external finance and finds that financially constrained firms are less likely to export. She finds that financially constrained firms either are prevented from exporting or serve few destinations. While testing her model on Belgian firms, she finds that firm's productivity and liquidity constraints are important determinants of firm level exports for both intensive and extensive margins. Furthermore, Li and Yu (2009) extend Melitz' (2003) model and consider credit constraints across different types of firms. They find that independent firms are more likely to get affected by external credit constraints than the affiliates of MNCs. These theoretical models posit financial constraints to be an important determinant of both extensive and intensive margin of exports.

The theoretical literature was followed by huge empirical work on

the nexus between financial constraints and exports beginning with Greenaway et al. (2007). Kiendrebeogo and Minea (2012; 2017) based on a panel of Egyptian manufacturing firms find that unlike financial liquidity, financial constraints reduce the export participation of Egyptian firms. Bellone et al. (2010) find that firms enjoying better financial health are more likely to become exporters. They argue that financial constraints act as a barrier to enter into export markets and ex-post export status has no effect on financial health of a firm. Jarreau and Poncet (2014) investigate the influence of credit constraints on the export performance of Chinese firms. They found that credit constraints affect the sectoral composition of exports and provide an advantage to foreign-owned firms over private domestic firms. Paravisini et al.(2012) in case of Peruvian firms find that financial constraint has a negative impact on intensive margin of exports but no effect on extensive margin. Qasim et al. (2020) study the relationship between financial constraints and the export entry decision of the firms in the context of Pakistan. Using the Whited–Wu index and assets tangibility as measures of financial constraints, they find that being less financially constrained is a vital determinant of the Pakistani firms' export participation decision irrespective of the high firm leverage before entry. Wagner (2014;2019) in a survey of related literature and analysis of comparable data across 25 European countries argues that contrary to the big picture revealed by a comprehensive literature survey, a statistically significant negative relationship between financial constraints and exports is only rarely found.Egger and Kesina (2013) assess the role of credit constraints for exports at the firm level using Chinese data. Their empirical results support the negative relationship between exports and credit constraints suggested by previous theoretical work.

In case of India, Kapoor et al. (2012) look at the causal impact of credit constraints on exporting firms by utilizing a natural experiment provided by two policy changes in India. First, the introduction of subsidized direct credit scheme for small-scale

firms in 1998 and its subsequent reversal in 2000. Using a suitable control group, they find that expansion of subsidized credit increased the bank borrowing by 20 percent and export earnings by around 22 percent. However, when the policy was reversed, there was no noticeable decline in either of the above two indicators. Nagaraj (2014) using liquidity and leverage ratio as measures of financial constraints and multiple estimation techniques, finds strong correlation between financial health and export participation decision i.e. extensive margin of exports. Padmaja & Sasidharan (2020) examines the impact of financing constraints on the extensive and intensive margins of exports using Prowess database. Using liquidity ratio and leverage ratio as financial constraint variables and controlling for initial conditions, endogeneity and selection bias, they find that financial constraints have a significant impact on the extensive margin of exports. They also tested the learning by exporting hypothesis using propensity score matching and difference- in-differences approaches and find significant positive post-entry effects of exports on firm financial performance. Mukherjee and Chanda (2020) examine the relationship between external financing constraints and the intensive margin of exports for manufacturing firms in India. Using a multivariate index proposed by Musso and Schiavo (2008) for external financing constraints, they find that an increase in the degree of external financing constraints is associated with lower firm-level exports. They looked at different types of firms and find that financing constraints are a significant binding factor even for firms with access to internal capital markets i.e. business group firms.

Financial factors also affect the firm's capability to import. Bas & Berthou (2012)developed a theoretical model linking financial constraints to import of capital goods and then empirically tested their model using Indian data. They find an important role played by financial factors on the decision to import. They find that an improvement of liquidity or leverage ratio by 10% increases the probability of importing capital goods by 3% to 5% respectively,

independently of productivity. Muûls (2015) analyzes the interaction between credit constraints and trading behavior. He finds that firms are more likely to be exporting or importing if they enjoy lower credit constraints. However, the impact varies across margins i.e. in case of exports; both intensive and extensive margins are associated with credit constraints whereas for imports it is only extensive margin that is affected by credit constraints.

The issue of causality assumes great significance in this context especially for policy making. On one hand, if causality runs from financial constraints to exports, then financial reforms promoting easy access to credit will promote exports. On the other hand, if causality runs from exports to financial constraints, then direct intervention to promote exports will lead to better financial performance of firms. Bernini (2014) argues that the relationship between firm's financial attributes and export behavior is likely to be characterized by bidirectional causation. Silva (2011) analyzes the links between financial constraints and firm export behavior using data on Portuguese manufacturing enterprises. Using the propensity score matching and difference-in-differences methodology, he found positive impact of exports on the financial health of firms. He further argues that such positive effects are especially important for small firms. Padmaja & Sasidharan (2020) also find support for positive effect of exports on financial health of firms[3]. Few studies such as Bellone et al. (2010) and Manole & Spatareanu (2010) find no impact of exports on financial health of a firm.

There are also some studies which have addressed the impact

3. Main reasons for it are: (i) exporting firms benefit from more stable cash flows through international diversification of their sales (Campa and Shaver, 2002). (ii) As a result of informational asymmetries and imperfect capital markets, exporting sends a signal about firm efficiency. (iii) exporting increases access to international financial markets. (iv).

of bankruptcy laws on financial health of firms. Evidence on bankruptcy laws are mostly country specific. Rodano et al. (2016) using the 2005–2006 Italian bankruptcy law reforms find that bankruptcy reforms that strengthen the creditor rights in liquidation lead to significant reduction in cost of bank financing and spur firm level investment while reforms that increase borrower rights does the opposite.La Porta et al. (1998) show that countries with poorer investor protections have smaller and narrower capital markets, both equity and debt markets. They argue that because of a creditor friendly ecosystem, financiers are more willing to surrender funds in exchange for securities which expands the scope of capital markets. Managers under strong creditor rights tend to be more risk averse, i.e. engage in harmful diversifying mergers, have lower cash flow risk, and lower leverage (Acharya et al.,2011), than under weak creditor rights.

In case of India, Vig (2013) shows the evidence that stronger creditor rights induced lower use of secured debt. Acharya and Subramanian (2009) and Acharya et al. (2011) show that firms operating under more creditor friendly bankruptcy codes tend to reduce corporate risk-taking and invest less in innovative activity. Chatterjee et al. (2017) looking at how creditors and firms as debtors respond to the new bankruptcy law. They find significant behavioral changes among the participants in credit market. Bose et al. (2020) investigate how the IBC has supported the financially distressed firms in mitigating their intrinsic vulnerability during the post-IBC period. Using the difference-in-differences methodology, they find that due to the expanded credit availability and a lower cost of debt financing during the post-IBC period, distressed firms are able to improve their performance relative to non-distressed firms.

3. Empirical Strategy

3.1 The Measure of Financial Constraints

A firm is considered financially constrained if it doesn't have

access to sufficient external finance and whose productivity is not enough to generate sufficient internal liquidity. Financial constraint can be a measure of firm's financial health or its balance sheet conditions such as cash flow, leverage and size (Silva and Carreira, 2012). It is very difficult to define an objective and a quantitative measure of financial constraints due to its unobservable and multidimensional character. However, a long list of proxy measures has been suggested in trade and corporate finance literature. The most common proxy is investment-cash flow sensitivity which builds on Fazzari et al. (1988). Later Kaplan and Zingales (1997) questioned the usefulness of investment-cash flow sensitivity as a measure of financial constraints[4]. McVanel and Perevalov (2008) discusses various potential measures of financial constraints like size (Almeida et al., 2004; Acharya et a., 2007), Dividend payment (Fazzari et al., 1988; Cleary, 1999), age (Schaller, 1993; Hovakimian and Titman, 2006), Leverage and Cash flow (Cleary, 1999). A good measure of financial constraint should satisfy the following three characteristics. First, it should be firm-specific, secondly, time-varying and finally not necessarily binary in nature i.e. it should consider that there are different degrees of constraints (Silva and Carreira, 2012). Musso and Schiavo (2008) build a time-varying and firm-specific index to measure financial constraints-based on size, profitability, liquidity, cash flow, solvency, and trade credit. The other two popular measures of financial constraints are liquidity ratio and the leverage ratio as employed by Greenaway et al. (2007).

We have used three measures of financial constraints which are very popular in financial literature (and not so popular in trade

4. The investment cash flow sensitivity was based on the assumption that firms' current revenue is uncorrelated with future investment opportunities which Kaplan and Zingales (1997) proved to be wrong.

literature)[5] such as WW index, HP Index and asset tangibility index. Whited and Wu (WW) construct an index based on structural intertemporal investment model. This index is an improvement over Kaplan and Zingales index (henceforth, KZ index) and is constructed as:

$$WWindex = -0.091CFit - 0.062DIVPOSit + 0.021TLTDit - 0.044LNTAit + 0.102ISGit - 0.035SGit$$

where CF is ratio of cash flow to total assets (with negative loading); DIVPOS is a dummy variable which takes value of 1 if firm pays cash dividends and 0 otherwise (negative loading); TLTD is ratio of long-term debt to total assets (positive loading); LNTA is natural log of total assets or size (negative); ISG is the 2-digit industry sales growth (positive); SG is firm sales growth (Whited and Wu, 2006). The coefficients are taken from original Whited and Wu (2006) paper following a number of studies mentioned in Farre-Mensa and Ljungqvist (2016) which have used the out-of-sample extrapolation of index coefficients. Higher the WW index, more the firm financially constrained.

In an attempt to reevaluate KZ index, Hadlock and Pierce (2010) (HP) estimate an ordered logit model in which financial constraint is modeled as a function of five variables used in KZ index. They found that only two of five components of KZ index, cash flow and leverage, are consistently significant with KZ index. The index is constructed as:[6]

$$\textbf{\textit{HP Index}} = -0.737Size + 0.043Size^2 - 0.040Age$$

where Size equals the log of inflation-adjusted log of total assets.,

5. In finance literature, neither leverage nor liquidity is used as a measure of financial constraints because high liquidity doesn't necessarily mean good financial health of a firm (see Almeida et al. (2004), Qasim et al. (2020)).

6. Hadlock and Pierce (2010) argue that our measure of financial constraints have many advantages over other indices such as its intuitive appeal, its independence from various theoretical assumptions, and the presence of corroborating evidence from an alternative approach.

and Age equal to year minus incorporation year. The higher the value of HP index, more the firm financially constrained. Following the tradition, we ranked firms based on HP index into terciles in which top tercile is classified as 'constrained' firms and bottom as 'unconstrained' firms.

In addition to the above two measures, we have also used the two standard measures of financial constraints; liquidity and leverage ratio (Greenaway et al. 2007; Padmaja and Sasidharan, 2020). These indicators mostly reflect the status of firm's internal funds. Higher the liquidity with the firm, better its financial condition and higher the leverage of a firm, the more financially constrained it is. We expect liquidity to have positive effect and leverage to have negative effect on both extensive and intensive margin of exports.

3.2 Extensive margin and financial constraints: An Econometric Model

We begin with the comparison of financial health of exporters and non-exporters by following Bernard and Jensen (1999). We estimate the following model.

$$LnFin_{it} = \beta_0 + \beta_1 Expdum_{it} + \beta_2 TFP_{it} + \beta_3 Size_{it} + + \beta_4 Lnlab + e_{it} \ldots\ldots (1)$$

Where 'Fin' is one of the four measures of financial constraints. 'Expdum' is a dummy variable which equals 1 if firm exports and zero otherwise. Size is calculated as natural log of assets.TFP is the log of total factor productivity obtained from Cobb-Douglas production function following Olley and Pakes (1996), following a non-parametric approach. Lnlab is the log of total employees. We also include time and industry dummy to control for time and industry specific effects.

In order to test the ex-ante financial health of new exporters and non-exporters as it might be the case that financially sound firms self-select into the export market, we compare the financial health of export starters and non-exporters a year before the

former starts to export. Following Wagner (2007), we write the above specification with a slight modification as:

$$LnFin_{(i,t-s)} = \beta_0 + \beta_1 Expdum_{it} + \beta_2 Z_{(i;t-s)} + e_{it} \quad \text{.....(2)}$$

Where t is the beginning year of exporting in case of export starters and median year in case of non-starters. This will tell us about the ex-ante performance of new exporters before they start to export. Zit-s represents the control variables.

Secondly, we test for the impact of financial constraints on the extensive margin of exports. Following Qasim et al. (2020) and Bharat (2019), our main specification is given as:

$$Expdum_t = \alpha + \beta_1 Expdum_{(i,t-1)} + \beta_2 Size_{(I,t-1)} + \beta_3 Lnlabi,t\text{-}1 + \beta_4 TFP_{(i,t-1)} + \beta_5 Age_{it} + \beta_6 Subsid_i + \beta_7 Fin_{(i,t-1)} + \beta_8 Foreign\ dummy_i + Control\ variables + e_{it} \quad \text{.....(3)}$$

Here we have included lagged dependent variable as one of the explanatory variables as firms that were already exporting in previous year will not incur sunk costs in the current year. This makes current year exporting decision a function of previous year export status. Size, age and productivity are used as control variables (Greenaway et al., 2007). *Foreign dummy* is a dummy variable which equals 1 for foreign ownership and zero otherwise. We also introduced time and industry specific dummy variables. 'Fin' is a measure of financial constraints which is introduced in its lagged form. We expect WW index and HP index to have a negative impact on export decision and asset tangibility to have a positive impact (Almeida and Campello, 2007; Whited and Wu, 2006). Since our dependent variable is binary in nature, the estimation suffers with issue of endogeneity. To address the issue, we lagged all thetime-variant explanatory variables once (e.g., Nagaraj, 2014; Greenaway et al., 2007; Bernard & Jensen, 1999, 2004;Qasim et al., 2020). We use the logit estimation technique given the binary nature of our dependent variable.

3.3 Learning by Exporting (LBE) Hypothesis: PSM-DID Methodology

According to Learning by Exporting (LBE) hypothesis, exporting improves the firm's financial condition. Literature suggests various reasons in support of the argument that exports reduce financial constraints such as more stable cash flow due to international diversification (Campa and Shaver, 2002), export participation as a signal of efficiency under information asymmetry (Ganesh-Kumar et al., 2001), opening up of international financial markets to firms (Tornell and Westermann, 2003) and exporters tend to be young, more efficient and as a result get easy access to external finance (Bernard and Jensen, 1999). On the other hand, studies like Bellone et al., (2010), Manole and Spatareanu, (2010) find no such evidence.

In order to test the ex-post effect of exports on financial health of firms, we employed the Propensity Score Matching with Difference in Differences (PSM-DID) estimation technique (Rosenbaum and Rubin, 1983). This technique is useful to deal with endogeneity and unobserved effects. Silva (2012) adopts the PSM-DID method to test the ex-post effect of exports on financial health of Portuguese firms. He finds significant effect of exports on financial constraints. Serti and Tomasi (2008) adopts the PSM-DID approach to find the effect of exporting on size and productivity of firms in the context of Italian manufacturing firms. The ideal situation for evaluation studies is to have a 'control' and a 'treatment' group to look at the differential impact, in this case of differential impact of exporting on financial health of exporters and non-exporters. However, such group is not available. Matching Technique tries to artificially create such a scenario (comparison group) based on some observable variables. This model helps in solving the problem of selection bias and provide valid estimates of average treatment effects (Guo and Fraser, 2015)[7]. The use of this technique rests on the appropriate

7. Rosenbaum and Rubin (1983) defined the propensity score for participant i (i = 1, . . . , N) as the conditional probability of assignment to a particular treatment (Wi = 1) versus nontreatment (Wi = 0) given

selection of covariates. We included the following firm specific covariates such as size, age, productivity and ownership. We use the Stata command psmatch2 (Leuven and Sianesi, 2003) for matching. Guo and Fraser (2015) argue that propensity score is a balancing measure (the coarsest score), we performed the balancing test proposed by Becker and Ichino (2002) and a standard T-test for equality of means. Both the tests ensure the quality of the matching performed.

3.4 Bankruptcy reforms and credit constraints

We also examined the effect of IBC-2016 on the credit constraints of firms by employing the PSM-DID methodology. We estimate the following model:

$$FC_{int} = \alpha + \beta_0\, Constrained_{int} + \beta_1\, IBC + \beta_2\ \ Constrained_{int} * IBC_t + \beta_3 X_{int} + \gamma_i + [\delta n * \theta t] + \varepsilon_{int} \quad \ldots\ldots\ldots\ldots\ldots\ldots (4)$$

'i' is a cross-sectional unit, t-time dimension and n-industry.

Where FC represents any of the above-mentioned measure of financial constraint of a firm. In order to create the control and treatment group, we employed the PSM technique based on some of the covariates such as firms' size, liquidity, age and ownership. Constrained is a dummy variable which takes value of 1 if firm is financially constrained, zero otherwise. IBC is a time dummy variable which takes value of 1 for period's post 2016 and zero before the implementation of IBC-2016. γ_i, δn, and θt denote the firm, industry and time specific effects. ε_{int} is the disturbance term. Our variable of interest is β_2 which measures the causal impact of IBC-2016 implementation on the financial constraints of the firms in different industries. In order to identify the treatment effect, we have followed Vig (2013) and Thapa et al. (2020) and introduced an interaction term $[\delta n * \theta t]$, which is a non-parametric way of accounting for time and industry specific effects. Finally, we have also controlled for size, liquidity and ownership.

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a vector of observed covariates, xi (Guo and Fraser, 2015).

3.5 Intensive margin of exports and financial constraints: Empirical Model

In order to analyze the impact of financial constraints on the intensive margin of exports, we estimated the following model:

$$Exp_{(i\,t)} = \beta_1 + \beta_2\, FC_{(i\,,t-1)} + \beta_3\, X_{(i\,,t-1)} + u_i + n_t + \varepsilon_{(i\,t)} \quad \ldots\ldots\ldots\ldots (5)$$

Here Exp is the value of exports, FC represents measure of financial constraints, X denotes the vector of control variables, $ui,\ nt$ and εit represent firm fixed effects,year fixed effects and the idiosyncratic error term, respectively. We estimate the above model using GMM estimation technique in order to account for possible endogeneity.

4. Data

Our sample is drawn from PROWESS, a database provided by the Centre for Monitoring Indian Economy (CMIE). This database has been widely used in reputable studies on Indian firms (e.g., Khanna and Palepu, 1999; Khanna and Palepu, 2000,Padmaja and Sasidharan, 2020, Mukherjee and Chanda, 2020 and many others). The database includes all Indian firms listed on the Bombay Stock Exchange (BSE) and the National Stock Exchange (NSE) during 2000-2020.period. Our sample consists of 4434 manufacturing firms out of which 2469 firms are exporters, and we are considering an unbalanced panel covered during the period 2000-2020. For the difference-in difference analysis of IBC, we have restricted the study period to 2010-2020 to get the same number of years pre and post-intervention.

We provide descriptive statistics for the variables in Table 1. We observe that the sample firms on average are large, old, less export oriented, have less liquidity and have low leverage. Table 2 provides the descriptive statistics separately for exporters and non-exporters. It can be seen that exporters tend to have higher sales, are bigger in terms of employment and are more productive than the non-exporters. The table also shows that exporters are mostly the older firms and young firms tend to

serve the domestic markets only for many theoretical reasons. Table 3 reports the correlations between the variables in this study. Firm size is negatively correlated with WWI, positively correlated with HPI and negative correlated with liquidity and positively correlated with leverage. Thus, the relation between firm size and financial constraints is dependent on the measures of financial constraints. Similar observation appears for all other variables too. However, none of the correlations among the variables raises multicollinearity concerns.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
size	88680	1538.127	17307.405	0	1682856.4
exports sales	79942	52.473	4120.652	-8.33	789947.38
age	88680	36.2	17.261	10	157
lnsales	64009	3.636	3.043	-4.773	13.166
lnlabor	74003	.751	2.797	-4.773	10.885
lnTAssets	80087	4.109	2.532	-4.773	15.022
TFP	53243	190.073	431.027	.001	17803.219
HPI	88680	12980941	6.802e+08	-8.835	1.218e+11
liquidity	80087	-152.857	7232.809	-1144741.5	11923.803
leverage	80087	26.687	1282.165	0	253421.05
WWI	88680	-1.368	335.67	-62578.813	54153.094

Table 2: Descriptive Statistics of Exporters vs Non-Exporters

Non-Exporters

Variable	Obs	Mean	Std. Dev.	Min	Max
size	34,937	1064.149	15282.73	0	1347611
age	34,937	32.91828	14.07766	10	141
lnsales	17,566	1.370118	2.978136	-4.773224	9.831215
emp	6,751	1695.708	8681.966	0	264041
lnta	34,937	4.208734	2.546759	-4.773224	14.70924
TFP	10,708	106.0342	259.0695	.0021007	9217.309

Exporters

Variable	Obs	Mean	Std. Dev.	Min	Max
size	42,765	964.9845	5985.69	0	338022.2
age	42,765	38.5534	18.68217	10	157
lnsales	38,037	4.531211	2.437049	-4.773224	12.96388
emp	17,072	2583.489	9704.239	0	455685
lnta	42,765	4.199193	2.416829	-4.773224	15.02153
TFP	35,310	197.3985	408.8836	.0066836	17803.22

Table 3: Correlation Matrix

	size	age	Exports.sales	lnl	lnsales	lnta	TFP	WWI	HPI	liquidty	leverage
size	1										
age	0.123	1									
Exports_sales	-0.083	-0.002	1								
lnl	0.204	0.288	0.009	1							
lnsales	0.237	0.203	-0.015	0.841	1						
lnta	0.0368	0.0124	-0.005	0.0300*	0.0254*	1					
TFP	0.399	0.0583	-0.006	0.26	0.458	0.0363	1				
WWI	-0.015	-0.0302	-0.001	-0.0485	-0.0492	0.0246	-0.0442	1			
HPI	0.765	0.0296	-0.001	0.0454	0.0774	0.0132	0.243	0.00205	1		
liquidty	-0.186	-0.108	0.001	-0.252	-0.223	0.22	-0.205	0.185	-0.03	1	
leverage	0.0389	0.0308	0.001	0.201	0.192	-0.163	0.104	-0.005	0.01	-0.294	1

5. Empirical estimation

First, we analyse how financial constraint impact extensive margin of trade. In other words, does the presence of financial constraints hinder a firm's decision to export. Table 4 presents the results from fixed effects estimation of our baseline model, eqn. (1), on the dummy variable distinguishing between exporters and non-exporters (Export Dummy). The findings show that as firms

TABLE 4: Difference between exporters and non-exporters in terms of financial status

	(1) lnWWI	(2) lnHPI	(3) lnliq	(4) lnlev
Export Dummy	0.0085	-0.154***	-0.131	0.0724*
	(0.91)	(-5.68)	(-1.26)	(2.19)
TFP	-0.0292***	0.305***	-0.0108	0.0702***
	(-6.30)	(11.31)	(-0.17)	(3.37)
Lnta (total Assets)	-0.154***	-0.00174	-1.004***	-1.000***
	(-58.31)	(-0.88)	(-117.44)	(-335.80)
Lnlabor	0.0313***	1.349***	0.497***	0.295***
	(5.99)	(59.98)	(4.85)	(10.72)
_cons	-0.144***	2.917***	2.380***	1.993***
	(-7.56)	(22.94)	(8.52)	(17.98)
N	43001	39184	1107	19843
R^2	0.294	0.586	0.925	0.865
adj. R^2	0.294	0.586	0.925	0.865

t statistics in parentheses

*p< 0.05, **p< 0.01, ***p< 0.001

exports increases, the financial constraints measured by WWI and leverage increases. On the other hand, this relationship is negative for the measures HPI and liquidity. However, the coefficients for HPI and leverage are statistically significant only. These imply that,as the firms export increases, financial

constraints decrease, with respect to the measure HPI. However, the implication is the opposite for the measure leverage. Thus, the effects of exports on financing constraints is dependent on the measure of financing constraints. Thus, we observe that financing constraints assume an important role in influencing firm-level exports. For the firm specific determinants, we observe most of the results are consistent with our expectations. Number of employees are more in exporting firms. Size of firms are smaller in exporting firms and the exporting firms are productive when using the measures HPI and leverage.

Next, we compare ex-ante financial health of new exporters and non-exporters, 1 year before the former starts to export. The results are reported in Table 5. Such comparison tells us whether future exports were less financially constrained than their non-exporting counterparts even before entering into the export market. The findings are similar to the findings in Table 4 with respect to the variable Export Dummy. The coefficient of this variable is negatively significant for HPI and positively significant for leverage. It indicates that compared to non-exporting firms, in the cases of exporting firms, the financial health was better, one year before the entry into export markets, according to the measure HPI. However, the results are opposite for leverage. Moreover, we observe that starters are more productive with respect the measures HPI and leverage but less productive with respect to the measure WWI. All these coefficients are statistically significant. Further, firm size, measured by log of total assets, shows that the starters are smaller in size, which contradicts earlier finding by Silva (2011). However, in terms of number of employees, the starters have more employees, irrespective of the measures of financial constraints.

TABLE 5: Ex-ante Difference between exporters and non-exporters in terms of financial status

	(1) lnWWI(-1)	(2) lnHPI(-1)	(3) Lnliq(-1)	(4) Lnlev(-1)
ExportDummy	0.00288	-0.174***	-0.172	0.0690*
	(0.30)	(-6.68)	(-1.82)	(2.25)
TFP(-1)	-0.0292***	0.321***	-0.00185	0.0541*
	(-5.97)	(11.47)	(-0.03)	(2.42)
Lnta(-1)	-0.153***	-0.00105	-1.004***	-0.999***
	(-57.46)	(-0.52)	(-120.15)	(-336.23)
lnlabor(-1)	0.0348***	1.343***	0.496***	0.285***
	(6.44)	(56.79)	(4.87)	(9.70)
_cons	-0.149***	2.855***	2.344***	2.117***
	(-7.27)	(21.59)	(8.67)	(18.22)
N	40963	37129	829	17910
R^2	0.293	0.584	0.927	0.875
adj. R^2	0.293	0.584	0.927	0.875

t statistics in parentheses

*p< 0.05, **p< 0.01, ***p< 0.001

Then we estimate the impact of financial constraints on the extensive margin of exports. The results are reported in Table 6. This is based on eqn. (3) and estimated as a logit model. The results show that lagged value of HPI has a negatively significant effect on exports. Thus, as the firm becomes more financially constrained, exports decreases confirming that financial constraints is a significant determinant of firms' export decision. This finding is as expected. However, the results are not significant with respect to other measures of financial constraints used in this study. The lagged export status dummy is always

significant and positive. Lagged value of TFP is also positively significant in all the models. Lagged value of employment is positively significant in model (1) and model (2) only. However, the variable age is significant in none of the models.

Table 6: Determinants of the decisions to export: financial constraints

	(1) xd	(2) xd	(3) xd	(4) xd
Expdum(t – 1)	4.521*** (124.05)	4.583*** (117.91)	4.576*** (131.05)	4.575*** (131.05)
L.lnta	-0.00829 (-0.96)	0.00354 (0.48)	0.00184 (0.28)	0.00143 (0.22)
L.lnl	0.0425*** (4.00)	0.138*** (7.61)	0.0178 (1.84)	0.0181 (1.87)
L.TFP	0.116*** (8.76)	0.179*** (10.25)	0.114*** (8.97)	0.114*** (8.98)
Age	0.000287 (0.28)	0.00179 (1.77)	0.00113 (1.20)	0.00112 (1.19)
L.lnWWI	-0.0470 (-1.64)			
1.ownc	0.147 (1.47)	0.0931 (0.95)	0.160 (1.74)	0.159 (1.73)
L.lnHPI		-0.102*** (-10.14)		
L.liquidty			-0.000000175 (-0.06)	
L.leverage				-0.0000106 (-0.95)
_cons	-2.853*** (-39.06)	-2.744*** (-31.90)	-2.884*** (-41.66)	-2.883*** (-41.63)
/ lnsig2u	-10.31* (-2.15)	-13.89 (-1.07)	-12.28 (-1.55)	-12.27 (-1.55)
N	40963	37129	45654	45654

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

Next, we empirically test the learning by exporting (LBE) hypothesis, i.e. if exporting improves firm's financial health. Here we are using the DID approach combined with propensity score matching (PSM) method, as discussed earlier. Before the estimation from DID, we carry out a balancing test, which assess the matching quality and the results are reported in Table 7. We observe that after the matching the percentage (%) of bias between the treated group and the control group have been reduced for all the variables largely. As the percentage (%) of bias is less than 20 for all the variables, it suggests that the matching is done properly (Rosenbaum and Rubin, 1985; Girma and Gorg, 2007).We also carry out a t-test for equality of means between control and treated groups with respect to the variables and reported in Table 8. We observe that these differences are significant only for the variables HPI, age and size.

Table 9 reports the results for DID estimation between starters and non-exporters (control) for the measures of financial constraints, observed cumulatively from t-1 to that year. By using ln, values in Table 9 are percentage point differences in growth rates between starters and controls for each variable. We observe that the effect of exports on HPI, WWI and leverage are negative and statistically significant from one year after export entry up to four years later. On the other hand, this effect is positive and statistically significant for the measure liquidity. All these findings indicate that financial constraints are relatively less for starters relative to non-exporters in all the years.

Table 7: Assessing the Matching Quality: Balancing Test

Variables 1	Treated Group	Control Group	%bias	%reduction in bias
Age	3.6189	3.5982	5.1	83.0
TFP	211.28	204.77	1.7	91.2
Total Assets(t-1)	4.1492	4.2153	-2.7	64.1
Total employees	2.4138	2.4612	-2.3	97.0
Foreign	.05084	.03994	5.9	65.4
Industry Dummies	31.943	32.023	-0.4	98.9
N	21,804	24,214	-	

Mean Reduction in Bias from Unmatched to matched: 31.8 to 3.0 (<5%)

Table 8: Two-sample t-test

Weighted variables	Mean Control	Mean Treated	Difference	t- stat
lnHPI	5.903	10.997	5.094	129.03***
age	39.750	41.984	2.234	5.67***
lnTFP	5.446	5.429	-0.016	0.69
lnta	4.848	4.540	-0.309	7.01***
ownc	0.042	0.045	0.003	0.90

Table 9: PSM-DID Estimations

Variables	T+1/t-1	T+2/t-1	T+3/t-1	T+4/t-1
lnHPI	-.358***	-.308***	-.263***	-.195***
	(.028)	(0.0276)	(0.0271)	(0.0273)
WWI	-.545***	-.369***	-.373***	-.301**
	(0.090)	(0.083)	(0.083)	(0.085)
Leverage	-.642***	-.793***	-.816***	-.794***
	(0.080)	(0.078)	(0.075)	(0.075)
Liquidity	.019***	.024***	.018***	.011**
	(.005)	(0.006)	(0.007)	(0.005)

Standard errors are reported in parentheses, ***Significant at 1%; **Significant at 5%.

Then we estimate eqn. (4) in order to examine the effect of IBC-2016 on the credit constraints of firms' by applying the PSM-DID methodology. The results are reported in Table 10. The variable ***_diff*** represents the β_2 coefficienti.e., the difference-in-difference effect. It appears that this coefficient is negatively significant for WWI and positively significant for HPI. Therefore, in the post-treatment period, that is after the implementation of IBC-2016 the financial constraint as measured by WWI decreased whereas it increased for HPI. Therefore, we get opposite results for the two measures of financial constraints. It indicates that the findings are sensitive to the measures of financial constraints. Results for all other variables are as expected.

Table 10: Difference in Difference Estimates with Kernel PSM: IBC intervention

	(1) WWI	(2) Leverage	(3) HPI	(4) Liquidity
IBC	1.023***	-0.0317	-0.449***	0.000465
	(9.92)	(-0.20)	(-11.06)	(0.19)
Treatwwi	2.080***			
	(20.70)			
_diff	-0.731***	-0.00220	0.658***	-0.00323
	(-5.13)	(-0.01)	(11.87)	(-0.95)
Treatlev1		7.721***		
		(48.43)		
Treathpi			5.072***	
			(131.76)	
Treatliqi				-0.0460***
				(-19.30)
_cons	-1.094***	0.0654	5.734***	6.845***
	(-15.05)	(0.58)	(209.76)	(4032.15)
N	23982	23258	23329	23482
R2	0.028	0.166	0.620	0.032
Controls	Yes	Yes	Yes	Yes
Firm Specific Effects	Yes	Yes	Yes	Yes
Year Specific Effects	Yes	Yes	Yes	Yes

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

As a next step, we test to see if financial health of the firms has an impact on intensive margin of exports i.e., on their ability to export more than before. In Table 11 we report the results

Table 11: Baseline model (GMM estimator)

	(1) lnes	(2) lnes	(3) lnes	(4) Lnes
EXPORTS(-1)	0.664*** (0.0315)	0.654*** (0.0274)	0.664*** (0.0310)	0.664*** (0.0310)
EXPORTS(-2)	0.113*** (0.0217)	0.102*** (0.0213)	0.113*** (0.0214)	0.112*** (0.0214)
Lnage	-0.141*** (0.0357)	-0.174*** (0.0366)	-0.165*** (0.0385)	-0.165*** (0.0385)
TFP	0.00000517 (0.0000208)	-0.0000428* (0.0000249)	-0.0000409 (0.0000262)	-0.0000390 (0.0000259)
Lnta	-0.00166 (0.00276)	-0.00229 (0.00282)	-0.00197 (0.00276)	-0.00300 (0.00287)
Log HPI	-0.0138*** (0.00445)			
Foreign	-0.0650 (0.0474)	-0.0668 (0.0484)	-0.0702 (0.0481)	-0.0718 (0.0482)
WWI		0.00107 (0.00130)		
lnliquidity			0.0871*** (0.0164)	
Leverage				-0.00145 (0.00102)
Constant	1.206*** (0.230)	1.287*** (0.210)	0 (.)	1.218*** (0.228)
Year Dummies	Yes	Yes	Yes	Yes
Observations	14507	14507	14507	14507
Instruments	26	26	25	26
Firms	1978	1978	1978	1978
AR1 (p-value)	2.73e-35	9.55e-38	1.76e-35	1.74e-35
AR2 (p-value)	0.549	0.416	0.551	0.554
Hansen-J (p-value)	0.169	0.194	0.152	0.189

Robust standard errors reported. Our specification for the GMM estimation is as follows: Firm age, log of total assets, foreign ownership and year dummies are treated as strictly exogenous; lagged values of exports and firm productivity are treated as potentially endogenous; and log of HPI, WWI, liquidity and leverage are our measures of financial constraints and all are treated as weakly exogenous.
Standard errors in parentheses: * p<0.10, ** p<0.05, *** p<0.010

for eqn. (5) and we apply GMM estimation technique here. The findings show that lagged exports have positive significant effect on intensive margin. Moreover, HPI has a negative significant effect and liquidity has a positive significant effect on intensive margin. These findings indicate that as financial constraints increase, intensive margin of exports decreases. Therefore, our finding supports the prediction that financial health of the firms has an important impact on intensive margin of exports.

6. Conclusion

The paper examines the effect of financing constraint on the extensive and intensive margins of exports for a large sample of manufacturing firms in India during the period 2000-2020. Using two multivariate indices of financing constraints proposed by Whited and Wu (2006) and Hadlock and Pierce (2010) along with conventional measures like liquidity and leverage, we examine whether changes in firms' financial health influence the decision to exports as well as the level of exports. We also examine whether the implementation of bankruptcy code, IBC-2016, helped to reduce the financial constraints of firms in India. We also examine if exports help to promote financial health. We find that an increase in the degree of financing constraints affects the decision to exports adversely. Moreover, as the financing constraints increase, the level of exports decreases. These results are consistently observed for alternative measures of financing constraints. Therefore, both extensive and intensive margins of exports are influenced by financial constraints. We also observe that export starters display better financial health than their non-exporting competitors, even before they start to export. Moreover, we also found that exports lead to faster improvements in the financial health of starters, possibly through a signaling effect to financial markets by reducing informational asymmetries (Ganesh-Kumar et. al., 2001; Greenaway et. al., 2007). Our findings also show that after the implementation of IBC-2016, financial constraint was decreased for the measure

WWI whereas it increased for HPI. It indicates that the findings are sensitive to the choice of the measures of financing constraints.

This paper adds to the literature providing new insights into the role of firm-level determinants of exports in India and bring into focus the challenges faced by the manufacturing firms. It highlights that inadequate access to external finance is a major challenge for Indian manufacturing firms. Our finding also highlight that after the implementation of IBC-2016, financing constraint of manufacturing firms has been reduced which has some important policy implications. It suggests that the implementation of IBC-2016 helped to ease out the credit constraints of the exporting firms to reorganize their business.Through the reform of the bankruptcy law, bargaining position of creditors has been strengthened which in turn helped the manufacturing firms to get rid of credit constraints and consequently it helped to improve their exports. This supports the findings from earlier literature that those firms that are more likely to be in distress are more responsive to the design of insolvency and bankruptcy reform (Rodano et. al., 2016). Our findings suggest that exporting manufacturing firms in India have been benefitted from the bankruptcy reform law, IBC-2016, which helped them to have better access to credit and to get out of financial constraints. Our findings provide a novel evidence on the impact of the bankruptcy reform on the export performance of the financially distressed Indian manufacturing firms. Therefore, the implementation of IBC-2016 became effective to enhance the export promotion policy of the government, particularly for the manufacturing firms in India since 2016. Hence, this is a positive step towards the right direction which will promote exports further. Existing studies show that there was no speedy resolution mechanism until 2016. The IBC-2016 helped to address the deficiencies in the earlier laws like DRT Act, 1993 and SARFAESI Act, 2002 and strengthened the creditor rights which became instrumental to relax the financial constraints of exporting firms. We conclude

that the results of this study are relevant for the policy makers to safeguard and preserve businesses in manufacturing firms in India, especially if they are subject to bankruptcies due to financial distress. Moreover, our study highlight that an effective public policy could play an important role to mitigate the sunk costs involved in exporting in emerging economies like India.

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