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Business cycle effect on leverage: A study of Indian non-financial firms

Arpita Pattanaik, Rajeswari Sengupta

Indira Gandhi Institute of Development Research, Mumbai
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Email(corresponding author): rajeswari.sen@gmail.com

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Keywords: Capital structure, Firm leverage, Financial constraints, Business cycle, Leverage determinants, Indian firms

JEL Code: E32, G32, G1

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Arpita Pattanaik (Finance Research Group, IGIDR) &
Rajeswari Sengupta (IGIDR) *

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In this paper we analyse the effect of business cycle fluctuations on firms' capital structure using a large panel of non-financial firms in India. In particular, we explore the dynamics of firm leverage across business cycle expansions and recessions for financially constrained and unconstrained firms. We find that the leverage of unconstrained firms exhibits counter-cyclical dynamics. Leverage of financially constrained firms does not show any cyclical pattern. These results are robust across different empirical methods of estimation. A healthy financial system is one where all firms are able to access the external debt market especially in a downturn. Our analysis shows that in the Indian financial system, external capital goes only to a certain category of firms. This has important policy implications for further developing the domestic financial markets and institutions.

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1 Introduction

Finance is the lifeblood of firms. Any modern economy experiences business cycle booms and busts. Finance is the tool using which firms adjust to the cyclical fluctuations in the economy. Cashflow and profitability of firms tend to be procyclical - they increase during business cycle expansions and decrease during recessions. A capable financial system is one where the investment of firms is immune to cashflow and hence not affected by the cyclical fluctuations. This requires a financial system in which firms are better able to access the external capital markets during business cycle downturns.

Another aspect of the impact of business cycle fluctations on firms' capital structure is related to bankruptcy costs. During a downturn, fundamentally healthy firms may face a situation of declining profitability. If they are able to access external financing, they can tide over the short-term fluctuations and survive. If they get denied access to the external capital markets when times are bad, then they may go bankrupt and this imposes a cost on the economy.

In an emerging economy like India with weak macro-finance institutions, business cycle downturns are deeper and longer and the domestic financial system is weak. In such a system it maybe possible that during recessions, a large number of firms are denied access to the external capital markets. These firms may have investment opportunities but they may not be able to access external financing during cyclical downturns. This in turn would have adverse implications for their growth.

In this paper we quantify the effect of business cycles on the capital structure of Indian firms. External capital is a combination of debt and equity. In this paper we study debt or leverage as that seems to be the main instrument of external financing used by majority of Indian firms (see Table 2). The question we ask is whether the leverage of Indian firms evolves pro-cyclically or counter-cyclically i.e. whether the leverage of Indian firms is higher during business cycle expansions or during recessions. A related issue that we explore in the paper is the extent to which variations in firms' leverage across business cycles differ with the degree of their external capital market access. Specifically we ask whether the leverage of financially constrained firms is higher during recessions than during expansions. Ideally, all firms should be able to add debt when faced with a downturn for defensive as well as investment reasons.

Financially constrained firms are those that face higher costs when accessing the external capital markets. These firms do not choose capital structure in the same manner as financially unconstrained firms. According to the balance sheet credit channel literature, firms facing greater financial constraints find it difficult to borrow to smooth cash flows following negative shocks to the economy. Gertler and Gilchrist (1993) find that aggregate net debt issues, following recessions associated with a monetary contraction, increase for large firms and remain stable for small firms. Gertler and Gilchrist (1994) find that aggregate net short-term debt issues are less sensitive to the business cycle for small firms. Kiyotaki and Moore (1997) and Suarez and Sussman (1999) build general equilibrium models in which constrained firms borrow more when collateral values are highest, that is, following high returns in the equity market or high corporate profits. The pro-cyclical value of collateral, against which they borrow, results in pro-cyclical leverage.

Given the evidence from the credit channel literature that firms with differential access to financial markets have different debt issue patterns, it is interesting to ask to what extent the financial constraints faced by Indian firms affect the cyclicality of their leverage. Our hypothesis is that during recessions, financially constrained firms in India are not able to gain better access to the external capital markets.

Since the Global Financial Crisis of 2008 there has been renewed interest in the link between the capital structure dynamics of firms and macroeconomic conditions (Halling et al. 2016, Bhamra, Kuehn, and Strebulaev, 2010, Chen, 2010, Korteweg and Strebulaev, 2013 among others). The impact of business cycles on the leverage of firms has emerged as an interesting question. Macroeconomic conditions and in particular business cycles, can affect the optimal capital structure and hence leverage ratio of firms both from the demand and the supply side. Firms demand for debt and equity may change due to capital structure changes induced by say a business cycle recession. Likewise, the supply of debt and equity may also change owing to changes in the capital market conditions triggered by business cycle fluctuations.

Most of the empirical analysis in this context has been done for the advanced economies. Even in the international literature empirical evidence on the cyclicality of firms' capital structures is scarce. Variations across papers are primarily in the research methodologies applied. The findings however are not unanimous. Korajczyk and Levy (2003) explore the effect of macroeconomic variables on firms' leverage ratios. They find that leverage of financially unconstrained firms varies counter-cyclically (increases during recessions) and it varies pro-cyclically (increases during expansions) for constrained firms. Korteweg and Strebulaev (2013) show that leverage evolves procyclically over the business cycle. Begenau et al (2016) show that large US firms use equity instead of debt financing during recessions. In good times they pay out to their shareholders. Smaller firms use more debt and equity financing during booms and do not substitute external financing sources over the business cycle. Halling et al. (2016) explore the effect of business cycles on the determinants of firm leverage using a sample of US firms. They find that leverage is counter-cyclical i.e. higher during recessions than during expansions. They find no difference between financially constrained and unconstrained firms.

Our paper is closest to the work done by Korajczyk and Levy (2003) and Halling et al. (2016). To the best of our knowledge the effect of business cycles on firms' leverage has not been explored for emerging economies such as India. The existing literature on firm financing in India throws some light on the kind of financial constraints faced by firms. A few papers have looked into the leverage patterns of Indian non-financial firms and explored the determinants of firms' capital structure (Bhaduri, 2010, Chakraborty, 2010, Handoo and Sharma, 2014). However no work has been done so far to combine empirical corporate finance with business cycle dating and fluctuations.

For an emerging economy like India this is an important issue because it throws light on the kinds of firms that are able to access the external debt markets during cyclical downturns. In an ideal world, all firms with investment opportunities should be able to increase their leverage during business cycle recessions. Our analysis has important policy implications in terms of building better and more capable financial markets and institutions geared towards improving firms' access to external capital markets.

Since liberalisation in the 1990s, India has graduated from an agricultural economy vulnerable to monsoon shocks, to a market economy that experiences business cycle fluctuations. Active research is now being conducted to date the business cycle turnarounds in the Indian economy (Pandey et al. 2016). Using these dates of business cycles and extensive firm level data over a 15-year period, it is now possible to empirically examine whether the leverage of Indian firms is pro-cyclical or counter-cyclical. Our paper also relates more generally to the literature studying leverage dynamics, especially with regard to the determinants of firms' capital structure.

We estimate both the direct and indirect effect of business cycle recessions on firm leverage. A cyclical downturn can directly affect firms' capital structure. It may also have an indirect impact through the

effect on firm-specific factors that in turn influence leverage. We document these indirect channels of transmission as well. While estimating the effect of business cycles, we control for firm-specific determinants of leverage. Firms' choice between debt and equity arises from agency costs as well as costs arising from information asymmetries. Several firm-specific variables have been shown in the literature to act as proxies for the information asymmetry costs such as firm size, profitability, asset tangibility, and growth prospects (Titman and Wessels, 1988, Rajan and Zingales, 1995). Our choice of firm-specific conditioning variables is also governed by the same motivation.

In our baseline model, we use a panel fixed effects estimation strategy, following Halling et al.(2016) and Korajczyk and Levy (2003). We also look at the heterogeneity across firms in different quantiles of the leverage distribution. An ordinary least squares regression model estimates a conditional mean and gives an average effect of business cycle on firm leverage irrespective of the firm's position in the entire distribution of the sample. Yet the distribution of firms may matter substantially (Fattouh et al. 2004, 2008). The effect of a business cycle recession on firm leverage may vary depending on whether the firm is already highly leveraged. In other words, leverage of firms in different quantiles may have different sensitivity to business cycle fluctuations and other explanatory variables. To assess this possibility, we use a conditional quantile regression model to estimate the direct and indirect effects of recession on firm leverage.

To examine whether differential access to external capital markets affects the impact of business cycles on firm leverage we classify firms into financially constrained and unconstrained groups. We use the methodology applied by Halling et al.(2016) and Almeida et al.(2004) to identify financially constrained firms. This identification is based on the concept that financially constrained firms hold more cash when they have investment opportunities because they are not able to access the external capital markets as easily as the unconstrained firms. Using this method we split the sample into constrained and unconstrained firms and examine the effect of business cycles as well as firm-specific explanatory variables on leverage.

We find that on average leverage of all the firms in our sample is counter-cyclical i.e their leverage is higher in business cycle recessions than in expansions. This pattern is more pronounced for the financially unconstrained sample and is absent in the financially constrained sample. For the latter observations, leverage across recessions and expansions are not statistically different. This leads us to conclude that financially constrained firms in India are not able to access the external debt markets and increase leverage during a downturn. The results from the panel fixed-effects model are corroborated by the conditional quantile regression model. We also find that all the firm-specific factors that we incorporate in our analysis as conditioning variables have the expected effect on firm leverage. Finally, we find that profitability and tangibility of firms are the two most important channels through which business cycle fluctuations seem to affect leverage of firms, mostly the financially unconstrained firms.

The paper is structured as follows. In section 2 we provide a detailed description of the data used in our analysis including sample selection, choice of the firm-specific determinants of leverage, categorising firms into groups based on financial constraints. We discuss our empirical specification and present summary statistics. In section 3 we summarise the results of our estimation. Finally, in section 4 we conclude.

2 Data and empirical methodology

2.1 Data and sample selection

We use annual data on listed, non-financial, non-oil firms from the Prowess database of the Centre for Monitoring Indian Economy. All the firms in our sample are listed at either of the two main stock exchanges in India.[1] We work with listed firms because their data is reliable. We exclude financial firms because their balance sheet reporting formats are likely to be different from that of the other firms in our sample as they follow different accounting concepts. The nature of their liabilities and capital structure is also different from those of the non-financial firms. We exclude oil firms because they have a very large balance sheet size and any variation in the financials of these firms may lead to distorted numbers for the overall sample. They also get affected by the government's decisions on administered prices as well as by the global oil price cycles which may be different from domestic business cycle shocks.

Our sample period is from 2001 to 2015. The time period in our sample selection is dictated by the business cycle dates from Pandey et al.(2016). They use quarterly data on gross domestic product (GDP) to define the dates. They date three recessions in the sample period from 1999 to 2015. We define that a firm-year is in a recession if a firm's entire fiscal year overlaps with a recession. In other words, we select those quarters that fall wtihin a full fiscal year. Accordingly the recessions periods in our sample are 2001 to 2003, 2008 to 2009 and 2012. The expansion years are 2004 to 2007, 2010 to 2011 and 2013 to 2015, as shown in Table 1.

Figure 1 depicts the evolution of the net sales growth of firms across the business cycle upturns and downturns. During the first recession in the early 2000s, there was a sharp drop in net sales followed by some recovery. The two subsequent recessions witnessed a consistent decline in net sales growth. In other words the decline in firms' net sales broadly corresponds to the recession periods identified by Pandey et al.(2016) using GDP as the reference series.

2.1.1 Refinancing sample

To estimate the effect of business cycles on leverage, we use a sample of firms that make substantial changes to their capital structure. If firms do not adjust their leverage at all during the sample period or adjust very little, then they would not add any value to our analysis because we are interested in firms that adjust their capital structure in response to cyclical fluctuations. Also this is common practice in the literature (Hovakimian et al. 2001, 2004, Korajczyk and Levy, 2003, Halling et al. 2016) where a 5% cut-off is considered substantial to define Leverage adjustments are costly and in a way this accounts for such costly adjustments. We compute the change in debt and change in equity between periods t-1 and t and define the capital structure change as the sum of net changes in debt and equity. While in the literature the difference between these two components is defined as the net change in capital strcuture, we instead use the sum because we want to look at the overall capital structure change and at the same time not lose too many observations. We classify a firm-year observation as a refinancing observation if we we observe a change in the capital structure that exceeds 5% of last period's total assets.

To avoid outliers, we drop the observations that are at the extreme ends of our sample (lower than 1

[1]The two main stock exchanges in India are the National Stock Exchange (NSE) and the Bombay Stock Exchange (BSE).

percentile and greater than 99 percentile).[2] We further drop observations with negative net worth (3,700 observations) and negative assets (15 observations). We started with a full sample of 31,047 firm-year observations after making the outlier and other data adjustments. Post refinancing calculation, our sample consists of 14,700 firm-year observations and 3,030 unique firms. These are the observations exhibiting substantial capital structure changes during the sample period. Table 2 shows that out of these 14,700 refinancing observations, about 67% correspond to an increase in debt whereas around 27% correspond to an increase in equity. Debt changes are more common than equity adjustments. The distribution of the type of capital structure adjustments is fairly even across periods of recession and expansion. The distribution of the variables of interest in the refinancing sample is given in the appendix. All analyses going forward have been conducted on the refinancing sample.

2.2 Empirical specifications

Business cycle fluctuations may affect firms' capital structure through various channels. Following the empirical design of Halling et al.(2016), we capture both the direct and indirect effects of business cycle recessions on firm leverage. To capture the direct effect we estimate equation (1) which describes firms' leverage ratios as a function of both macroeconomic and firm-specific factors. In our empirical specification, we assume (following Korajczyk and Levy, 2003) that a firm's actual leverage ratio is equal to its optimal or target leverage ratio, plus a measurement error that is orthogonal to the explanatory variables.

$$LR_{i,t} = \alpha_0 + \alpha_1 REC + \alpha_2 X_{i,t-1} + f_i + d_t + \epsilon_{i,t} \tag{1}$$

$LR_{i,t}$ denotes leverage ratio of firm i at time t. REC is a dummy variable that takes the value 1 when there is a recession and 0 if there is an expansion in year t. $X_{i,t-1}$ is a vectore of firm-specific determinants of leverage which we discuss in detail in the next sub-section. All these explanatory variables have been lagged by one period following the literature (Halling et al. 2016, Korajczyk and Levy, 2003). f_i are firm-specific time-invariant fixed effects. These are incorporated in the regressions in order to capture the unobserved heterogeneity across firms in the manner in which the control variables affect the response variable. They account for the idiosyncratic factors that may affect leverage. d_t are the time fixed effects that are included to control for unobserved time-varying determinants of firm leverage. The estimated coefficient α_2 captures the direct effect of recession on leverage.

Business cycles may also affect firm leverage through the various firm-specific factors. In other words, the impact of the firm-specific determinants of leverage may itself change across the business cycle. We estimate equation (2) to capture this indirect effect of cyclical flucutations on firms' capital structure.

$$LR_{i,t} = \beta_0 + \beta_1 REC + \beta_2 X_{i,t-1} + \beta_3 X_{i,t-1} * REC + f_i + d_t + \epsilon_{i,t} \tag{2}$$

[2]Given the skewed distribution of several firm-specific variables in our sample, we also estimated robust regressions on the refinancing sample without deleting outliers. The results of the robust regressions are very similar to that of the panel fixed effects model estimated on the sample without outliers. We have not reported the results here for brevity but they are available upon request.

All variables in the equations are as defined above. The estimated coefficient β_2 captures the indirect effect of recession on leverage.

We first estimate equations (1) and (2) using a panel fixed effects model. This yields conditional mean estimates for all the variables. Such an estimation strategy assumes that there is a common response of the dependent variable to the conditioning variables throughout the entire distribution of the firms. In other words, the estimated regression coefficients remain constant across the distribution of the firms. This maybe a simplistic assumption because the estimated coefficients, and hence the effect of the conditoning variables on the dependent variable may very well vary across the distribution of firms. For example, the effect of recession on firm leverage may be different for firms that are already highly leveraged as compared to firms that have low levels of leverage when they are hit by the cyclical downturn. The constant coefficients of the panel ordinary least squares estimation will overlook this possibility.

Accordingly we estimate a conditional quantile regression model (Koenker and Basset, 1978, Fattouh et al. 2005, 2008, Ferrarini et al. 2017). This allows for different values of the estimated regression coefficients across different quantiles in the distribution of firms. In particular we estimate equation (3) where $LR_{i,t}$ is our dependent variable i.e. leverage of firms i at time t at quantile θ.

$$Quant_{\theta}(LR_{i,t}|x_{i,t}) = \gamma_0 + \gamma 1_{\theta} REC + \gamma 2_{\theta} X_{i,t-1} + z_t + \epsilon_{i,t} \tag{3}$$

Likewise, $\gamma 1_{\theta}$ is the estimated coefficient of the recession dummy and $\gamma 2_{\theta}$ is the estimated coefficient of the firm-specific leverage determinants at quantile θ. We include time dummies z_t to control for time-varying factors that similarly affect all the firms in the same quantile at a given point in time. This estimation strategy is able to capture the non-linearities in the effect of the conditioning variables on the response variable, in our case the effect of the business cycle fluctuations as well as firm-specific factors on firm leverage.

2.3 Leverage measure and determinants

To estimate the effect of macroeconomic conditions and on firms' capital structure it is necessary to define leverage. As explained in Frank and Goyal (2004), there are different empirical definitions of leverage. Most studies use some form of a debt ratio and focus on a single measure of leverage. According to Myers (1977), managers focus on book leverage because debt is better supported by assets in place than it is by growth opportunities. Book leverage is also preferred because financial markets fluctuate a great deal and managers are said to believe that market leverage numbers are unreliable as a guide to corporate financial policy.

We use the standard definition of book leverage which is the ratio of total debt to total assets (book value). We remove firm-year observations with leverage ratio greater than one (84 observations). Observations showing debt greater than the sum of debt and equity (i.e. total assets) are clearly anomalies in the data. In robustness checks, we use alternative definitions of leverage such as short term and long term leverage.

To control for other factors that may affect leverage, we incorporate several firm-specific variables that are

potential determinants of firm leverage. All the condtioning variables included in our regression models are drawn from the set of variables used in earlier empirical studies of capital structure (Titman and Wessels 1988, Harris and Raviv 1991, Rajan and Zingales, 1995, Frank and Goyal, 2004 among others) and are also grounded in the theories of capital structure. These include size, profitability, tangibility, capital expenditure and market to book ratio.

Large firms face lower default risk due to greater diversification of investment, have less volatile cash flows and are less likely to become financially distressed (Rajan and Zingales,1995). According to the trade-off theory of capital structure, they are likely to have relatively more debt and hence higher leverage. Firms with higher profits tend to have lower leverage. This is because firms passively accumulate profits (Kayhan and Titman, 2007). Also the pecking order theory suggests that firms prefer internal finance to external finance. So more profitable firms tend to have lower leverage over time holding investment constant (Frank and Goyal, 2004).

Tangibility measured using the ratio of net property plant and equipment to total assets is included as a measure of collateral for loans (Titman and Wessels, 1988). Firms with more tangible assets tend to have higher leverage because these assets are easier to value and hence they lower the expected cost of default. Capital expenditure (capex) represent outflows and increase the financing deficit (Shyam-Sunder and Myers, 1999). So higher the capex of a firm, higher will be the leverage. Finally, firms' MTB is the most commonly used proxy for long-term performance and growth opportunities (Titman and Wessels, 1988). Firms with higher growth opportunities face higher costs of financial distress. So according to the trade-off theory, higher MTB lowers leverage. The definitions of all variables are provided in the appendix.

2.4 Financial constraints

The effect of financial constraints on firms' financing patterns has recently received a lot of attention in the literature (Korajczyk and Levy, 2003, Almeida et al. 2004, Whited and Wu, 2006, Acharya, et al. 2007, Byoun, 2008, Halling et al. 2016 among others). The impact of business cycle fluctuations on firm leverage may also depend on the financial constraints faced by firms. Firms with differential access to external capital markets are likely to adjust their leverage differently when faced with a recession. During a cyclical downturn, firms that find it harder to access the external capital markets to raise debt or equity may not be able to adjust their leverage at all which in turn may hamper their investments going forward. Korajczyk and Levy (2003) find that leverage of financially unconstrained firms varies countercyclically with macroeconomic conditions while that of constrained firms shows pro-cyclical dynamics.

A firm is considered more financially constrained as the wedge between its internal and external cost of funds increases. A number of alternative definitions of financial constraints have been proposed in the relevant literature. The measure of financial constraint that we use is based on Almeida et al.(2004) and Korajczyk and Levy (2003). We categorise a firm-year observation as financially constrained if the firms hoard cash and have significant investment opportunities. The rationale is that firms that have significant investment opportunities but face relatively high costs of external capital should choose to hoard cash. We condition on investment opportunities in order to ensure that firms in the constrained sample are not financially distressed.

MTB is a good proxy for representing investment opportunities. Accordingly, firm-year observations in

our sample that belong to the highest quartile (Q4) of market to book ratio as well as the highest quartile of cash are labeled as financially constrained. The remaining observations that do not meet this criteria are labeled as financially unconstrained. We classify 1,855 firm-year observations as constrained (roughly 12.6% of the full sample) and 12,852 firm-year observations as financially unconstrained (roughly 87.4% of the full sample).

Figure 2 shows the evolution of the leverage ratio for the constrained and unconstrained samples across the business cycles in our sample. The leverage of the constrained sample is consistently less than that of the unconstrained sample. While it is hard to discern any clear pattern, it seems that for the constrained sample, leverage either goes down during a recession or remains stable, but it does not increase during the downturns. It seems to mostly go up during expansions, hinting at a procyclical pattern. For the unconstrained sample, leverage declines in the first recession, goes up in the second as well as in the last recession of the sample.

2.5 Summary statistics

Table 3 summarizes the descriptive statistics of the key firm characteristics for all the firm-years as well as separately for the recessions and expansions, for the refinancing sample. The table also reports the mean leverage for the financially constrained and unconstrained samples across the business cycles. Since the firm-specific explanatory variables are not the main focus on our analysis we do not report their summary statistics for the constrained and unconstrained samples.

Of the 14,700 total firm-year observations, 5,772 are recessionary firm-years and 8,928 are expansionary firm-years. So roughly 40% of the firm-years in our sample are in a cyclical downturn. The last column of the table report the difference in the mean of the variables between the recessions and expansions. Mean leverage for the full sample over the period from 2001 to 2015 is 0.34 which is the same as the median leverage. The mean difference of leverage between recessions and expansions is positive and statistically significant. On the mere basis of eyeballing the data it seems that leverage for the full sample of firm-year observations is counter-cyclical.

The other firm-specific leverage determinants seem to vary across the business cycle. For example firm size is procyclical i.e. higher in expansions than in recessions which seems intuitive. MTB is also procyclical implying that during recessions market value of assets deteriorate relative to their book value. Profitability is procyclical as well though the difference is not statistically significant between recessions and expansions. Tangibility and capital expenditure both exhibit counter-cyclical dynamics. Among the financially constrained and unconstrained samples, mean leverage appears counter-cyclical for the latter but does not exhibit any significant cyclical dynamics for the former.

3 Estimation

3.1 Panel fixed effects regression model

Tables 4 and 5 present the results of the panel fixed effects model estimation. Table 4 corresponds to equation (1) and Table 5 shows the results of estimating equation (2). The first column in both

tables pertains to the full refinancing sample. The last two columns show the results for the financially constrained and unconstrained samples, respectively. All the models include firm and year fixed effects. Standard errors are clustered at the firm level and are robust to heteroskedasticity and autocorrelation.

The recession dummy in Table 4 is supposed to capture the direct effect of business cycle flucutation on firm leverage. Once the effect of the firm-specific factors is controlled for, the estimated coefficient of the recession dummy is positive and statistically significant, both for the full sample and the financially unconstrained sample but it is insignificant for the constrained sample. This shows that Indian non-financial, non-oil, listed firms have a counter-cyclical leverage in general but the counter-cyclicality is observed primarily for the financially unconstrained firms who constitute the bulk of the sample. These are the firms that can access the external capital markets without much difficulty. On average the leverage of unconstrained firms is 2.8 percentage points higher in recession than in expansion.

Our hypothesis that financially constrained firms in India may not be able to access the external debt markets during recessionary periods is not rejected. The leverage of these firms during recessions is not statistically different from their leverage during business cycle expansions. In a capable financial system, all firms should be able to add to leverage in downturns both for defensive reasons so that they do not go under despite being healthy, and also for investment reasons. That does not seem to be happening in case of the Indian firms. The adjusted R-squared values show that the model is able to explain the variations in the leverage of the unconstrained sample better than that of the constrained sample.

The effect of all firm-specific determinants of leverage is consistent with the literature (Titman and Wessels, 1988, Frank and Goyal, 2004 among others). Their effect on firm leverage is similar to that in the US and other developed countries. For example, firm size, tangibility and capital expenditure positively affect leverage whereas profitability and MTB negatively affect leverage, exactly as per the theoretical predictions detailed in Section 2.3.

In a panel fixed effects regression model the effect of the explanatory variables on leverage is constant over the business cycle. In reality, the estimated coefficients of the firm-specific factors may vary across recessions and expansions. This is captured through the interaction terms in Table 5. The recession dummy by itself though positive, is no longer statistically significant for any of our samples. Profitability and tangibility are two firm-specific channels through which recession seems to be affecting leverage. These are the firm-specific determinants whose estimated effect on leverage seems to vary with the recession. The counter-cyclicality of firm leverage gets muted in case of firms with higher profitability. More profitable firms in general tend to have lower leverage because firms passively accumulate profits and prefer internal finance to external finance. Table 5 shows that recessions further reinforce this negative effect of profitability on firm leverage. Higher (lower) profitability leads to lower (higher) leverage during cyclical downturns.

An alternative way of interpreting this result could be that profitability itself tends to be procyclical, increasing during business cycle expansions and decreasing during recessions. As profitability is typically lower in downturns, firms adjust to this by having a higher leverage in order to keep investment unaffected. Financially unconstrained firms are better able to do this to shield themselves against the effect of lower profits during recessions. For the constrained firms we do not observe this effect. In fact for the constrained sample, profitability seems to have a positive effect on leverage, both in Tables 4 and 5. It is possible that more profitable firms in the constrained sample face lower costs of financial distress and hence have higher leverage.

The other firm-specific channel through which recession affects leverage is tangibility. The positive effect of recession on leverage is reinforced in case of firms that have tangible assets. Once again it is the financially unconstrained firms with tangible assets that can be pledged as collateral for loans, who exhibit higher leverage in downturns. In other words, these firms are able to take advantage of their tangible assets to get more debt when faced with a recession. This channel does not work in case of the financially constrained firms.

3.2 Conditional quantile regression model

The conditional quantile regression estimation acts as a robustness check for our baseline results from the panel fixed effects model. Tables 6 and 7 report the results from the panel quantile regression models both for the financially constrained and unconstrained samples. The two tables present the direct and indirect effects of business cycles on firm leverage respectively. We estimate the coefficients at different points of the distribution of firm leverage. (10th, 25th, 50th, 75th and 90th quantiles).

Table 6, the counter-cyclicality of leverage of the financially unconstrained firms holds across different quantiles. At various levels of leverage, the estimated coefficient of the business cycle recession dummy is positive and statistically significant. The magnitude of the counter-cyclical effect increases till the 75th quantile and decreases for the 90th quantile. For the financially constrained firms, leverage during recessions is not statistically different from leverage during expansions across the entire distribution of firms. These results confirm the findings from the constant coefficient fixed effects estimation model.

For the other firm-specific conditioning variables, we find that the estimated coefficients vary across the quantiles. For the unconstrained sample, while size, profitability and tangibility have the same expected effect on leverage at different quantiles, the effects of capital expenditure and MTB become statistically insignificant at higher levels of leverage. The same holds for the financially constrained firms as well where capital expenditure positively affects leverage only in the 25th quantile and the positive effect of size on leverage goes away at the higher quantiles of the distribution. Like in the panel fixed effects model, profitability has a positive effect on the leverage of financially constrained firms perhaps because higher profits signal lower costs of financial distress making it easier for firms to access the debt markets.

The estimated coefficients from these regression models are graphically shown in Figures 3 and 4 for the financially constrained and unconstrained samples, respectively. Tables 6 and 7 also report the F-test for the equality of quantile slope coefficients across various quantiles. These tests are based on bootstrapped standard errors using 1000 replications. The F-tests reject the null hypothesis of homogeneous coefficients at the 1% significance level for all quantiles. This implies that the impact of the explanatory variables is different across the distribution of firms.

When we use the quantile model to estimate the indirect effect of recession we find that for the financially constrained sample, the estimated effect of the firm-specific factors on leverage does not vary with the business cycle fluctuations for any quantile of the firm distribution (Table 7). This corroborates our finding from the panel fixed effects model. The only firm-specific channel through which recession may have some effect on leverage is size. At higher quantiles of the distribution, recession is found to have a positive effect on the leverage of these firms but this effect gets somewhat moderated by size. For the financially unconstrained firms on the other hand, the counter-cyclicality of leverage is observed only at the 90th quantile and this gets muted by profitability. The profit channel is found effective only at the

higher quantile and not across the entire distribution of the firms. As in the panel fixed effects model, the other firm-specific factor through which recession seems to be affecting leverage is tangibility. Tangible assets reinforce the positive effect of a business cycle recession on firm leverage at all levels of leverage except the 90th quantile.

4 Conclusion

In this paper we empirically analyse the dynamics of firms' capital structure across business cycles for a large panel of Indian non-financial firms. Although India is a modern, market economy experiencing business cycle booms and busts, not much is known about how Indian firms adjust their capital structure in general and leverage ratio in particular in response to such cyclical fluctuations. A healthy financial system is one in which more external capital goes into firms during a downturn. This is because cashflow and profitability tend to be procyclical and hence, during a downturn, firms need access to external capital markets in order to shield themselves against the adverse macroeconomic shocks and also to maintain their long-term investments. The interesting question to ask therefore is whether the Indian financial system has been succeeding in delivering external capital to all firms when the latter are hit by business cycle shocks.

To throw light on this issue, we undertake a comprehensive empirical anlaysis using panel fixed effects regression model as well as conditional quantile regression model on samples of financially constrained and unconstrained firms. We use business cycle dates identified in the Indian literature to isolate periods of expansions and recessions. Specifically we look into the debt dynamics of firms across the cyclical downturns. We also account for variations in several firm-specific determinants of leverage during the business cycle fluctuations.

We find that the leverage of firms in our financially unconstrained sample varies counter-cyclically i.e. leverage is higher during recessions than during expansions. This pattern is not observed in the financially constrained sample which exhibits no cyclicality of leverage. Our results suggest that firms' financing decisions reflect the state of the economy but only for certain categories of firms that are able to more easily access the external capital markets. This contradicts the fundamental function of a healthy financial system which is to deliver external capital to all firms during a cyclical downturn to prevent them from going under and to protect their long-term investments. The findings of our analysis have important policy implications in terms of developing the Indian financial markets and strengthening the financial institutions such that all firms are able to access external financing when faced with adverse macroeconomic shocks.

As a next step we plan to use alternative definitions of financial constraints as well as other measures of leverage to assess the robustness of our results. In this study we have worked with a refinancing sample of firms that exhibit substantial capital structure adjustments during the sample period. For our future work, we plan to explore the non-refinancing sample as well and look into the levers they use to respond to business cycle shocks. It might also be worthwhile to use a sample of unlisted, non-financial Indian firms and ask similar questions about their capital structure dynamics across business cycle fluctuations.

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6 Tables

Table 1 Business cycle dates

This table shows the business cycle dates used in our analysis based on Pandey, Patnaik and Shah (2016). They use quarterly data on gross domestic product (GDP) to define the business cycle dates. They date three recessions in the sample period from 1999 to 2015. We use annual data and classify a firm-year in a recession if the firm's entire fiscal year overlaps with a recession i.e. we select those quarters that fall wtihin a full fiscal year.

Recession	
Quarters	Years
1999Q4 - 2003Q1	2001 - 2003
2007Q2 - 2009Q3	2008 - 2009
2011Q2 - 2012Q4	2012
Expansion	
2003Q1 - 2007Q2	2004 - 2007
2009Q3 - 2011Q2	2010 - 2011
	2013 - 2015

Table 2 Refinancing sample

This table shows some summary statistics on the refinancing events during our sample period. To identify the refinancing sample, we compute the change in debt and change in equity between periods t-1 and t and define the change in capital structure as the sum of net changes in debt and equity. We classify a firm-year observation as a refinancing observation if we observe a change in the capital structure that exceeds 5% of last period's total assets.

All Δs in (%)

	All	Expansion	Recession
$\Delta Debt \uparrow$	67.26	67.38	67.07
$\Delta Debt \downarrow$	32.64	32.56	32.76
$\Delta Equity \uparrow$	27.48	28.14	26.47
$\Delta Equity \downarrow$	3.32	3.15	3.59
$\Delta Cap.Struc.$	100.00	100.00	100.00
Obs	14700	8928	5772

Table 3 Summary statistics

This table presents the summary statistics of all the variables for the 2001-2015 period as well as separately for expansion and recession periods for all the listed, non-financial, non-oil firms in our sample. In addition it also shows the difference in the mean values of the variables between recession and expansion periods and t-test results of whether the mean differences are statistically significant. A positive mean difference for leverage would imply counter-cyclicality i.e. leverage is higher during recessions than during expansions. It shows the mean leverage for all periods and for the recessions and expansions for the financially constrained and unconstrained samples as well.

	All				Recession				Expansion				Rec - Exp
	Mean	Median	Std. Dev.	Obs.	Mean	Median	Std. Dev.	Obs.	Mean	Median	Std. Dev.	Obs.	Rec - Exp
Full sample													
Leverage	0.34	0.34	0.18	14700	0.35	0.35	0.18	5772	0.33	0.33	0.18	8928	0.01***
Size	7.29	7.27	1.76	14700	7.18	7.14	1.73	5772	7.37	7.35	1.77	8928	-0.19***
Profitability	0.36	0.13	15.67	14700	0.43	0.13	14.04	5772	0.31	0.12	16.64	8928	0.12
Tangibility	0.45	0.48	0.22	14700	0.46	0.49	0.22	5772	0.45	0.47	0.22	8928	0.02***
Capex	0.05	0.03	0.18	14700	0.05	0.03	0.22	5772	0.04	0.02	0.16	8928	0.01**
MTB	3.16	1.25	23.37	14700	2.20	0.89	9.77	5772	3.79	1.54	28.93	8928	-1.59***
Constrained sample													
Leverage	0.32	0.32	0.18	1855	0.33	0.33	0.18	525	0.32	0.32	0.18	1330	0.01
Unconstrained sample													
Leverage	0.34	0.34	0.18	12852	0.35	0.35	0.18	5251	0.34	0.34	0.18	7601	0.01***

Table 4 Baseline estimation: Panel fixed effects model

This table presents the results from estimating a panel fixed effects model using the refinancing sample. The objective is to capture the direct effect of business cycles on firm leverage. The model includes a contemporaneous business cycle dummy (Recession) and one-period lagged firm characteristics. It also includes firm-specific fixed effects and year fixed effects. Standard errors are clustered at the firm level. Variable definitions are given in the appendix.

	Dependent variable: Debt/Assets		
	Full	Constrained	Unconstrained
Recession	0.030***	0.018	0.028***
	(0.004)	(0.014)	(0.005)
Size	0.023***	0.013**	0.028***
	(0.002)	(0.006)	(0.002)
Profitability	-0.048***	0.080*	-0.068***
	(0.017)	(0.040)	(0.017)
Tangibility	0.188***	0.148***	0.189***
	(0.014)	(0.036)	(0.014)
Capex	0.133***	0.128	0.141***
	(0.030)	(0.082)	(0.031)
Market to book	-0.006***	-0.003**	-0.004***
	(0.001)	(0.001)	(0.001)
Constant	0.091***	0.135**	0.066***
	(0.015)	(0.057)	(0.015)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	7980	1053	6927
Adjusted R^2	0.118	0.051	0.137
Note:		*p<0.1; **p<0.05; ***p<0.01	

Table 5 Baseline estimation: Panel fixed effects model with interactions

This table presents the results from estimating a panel fixed effects model using the refinancing sample. The objective is to capture the indirect effect of business cycles on firm leverage. The model includes a contemporaneous business cycle dummy (Rec), one-period lagged firm characteristics and the interaction of these conditioning variables with the recession dummy. It also includes firm-specific fixed effects and year fixed effects. Standard errors are clustered at the firm level. Variable definitions are given in the appendix.

	Dependent variable: Debt/Assets		
	Full	Constrained	Unconstrained
Recession	0.019	0.177	0.025
	(0.023)	(0.125)	(0.024)
Size*Rec	-0.002	-0.016	-0.003
	(0.003)	(0.013)	(0.003)
Profitability*Rec	-0.072***	-0.027	-0.068**
	(0.026)	(0.083)	(0.028)
Tangibility*Rec	0.061***	-0.040	0.069***
	(0.021)	(0.073)	(0.023)
Capex*Rec	0.023	-0.054	0.026
	(0.068)	(0.195)	(0.070)
MTB*Rec	0.003*	0.002	0.003
	(0.002)	(0.003)	(0.002)
Size	0.024***	0.015**	0.028***
	(0.002)	(0.006)	(0.002)
Profit	-0.034*	0.081**	-0.053***
	(0.018)	(0.041)	(0.019)
Tangibility	0.174***	0.153***	0.172***
	(0.015)	(0.037)	(0.016)
Capex	0.130***	0.134	0.138***
	(0.032)	(0.085)	(0.034)
Market to book	-0.006***	-0.004**	-0.005***
	(0.001)	(0.002)	(0.001)
Constant	0.095***	0.115*	0.067***
	(0.016)	(0.059)	(0.016)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Observations	7980	1053	6927
Adjusted R^2	0.120	0.049	0.139
Note:		*p<0.1; **p<0.05; ***p<0.01	

Table 6 Quantile regression to estimate the direct effect of recessions

This table presents the results from estimating a conditional quantile regression model using the refinancing sample. Results are shown for both the financially constrained and unconstrained samples. The objective is to capture the direct effect of business cycles on firm leverage at different levels of leverage. The model includes a contemporaneous business cycle dummy (Recession) and one-period lagged firm characteristics. It also includes year fixed effects. Standard errors are clustered at the firm level. Variable definitions are given in the appendix.

	10th	25th	50th	75th	90th
Panel A: Constrained sample					
Recession	0.020	0.001	0.029	0.020	0.009
	(0.016)	(0.019)	(0.025)	(0.019)	(0.024)
Size	0.022***	0.022***	0.013**	0.010	0.003
	(0.005)	(0.006)	(0.007)	(0.007)	(0.009)
Profitability	0.060	0.068**	0.104**	0.123**	0.129**
	(0.039)	(0.034)	(0.048)	(0.060)	(0.064)
Tangibility	0.074*	0.157***	0.205***	0.196***	0.110**
	(0.042)	(0.041)	(0.032)	(0.035)	(0.048)
Capex	0.218	0.288***	0.175	0.079	−0.017
	(0.167)	(0.111)	(0.109)	(0.086)	(0.093)
MTB	−0.004***	−0.004***	−0.004**	−0.003*	0.000
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	−0.133***	−0.085*	0.096	0.255***	0.446***
	(0.052)	(0.055)	(0.066)	(0.067)	(0.085)
*F-test (Joint Test of Equality of Slopes for quantiles 0.1 0.25 0.5 0.75 0.9): 2.707 *****					
Panel B: Unconstrained sample					
Recession	0.015**	0.023***	0.031***	0.032***	0.028***
	(0.008)	(0.005)	(0.006)	(0.007)	(0.008)
Size	0.025***	0.030***	0.033***	0.031***	0.025***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Profitability	−0.049***	−0.064***	−0.092***	−0.083***	−0.064**
	(0.014)	(0.013)	(0.022)	(0.026)	(0.026)
Tangibility	0.154***	0.226***	0.220***	0.21***	0.163***
	(0.015)	(0.013)	(0.015)	(0.015)	(0.018)
Capex	0.237***	0.192***	0.158***	0.091**	0.035
	(0.046)	(0.040)	(0.038)	(0.041)	(0.042)
MTB	−0.007***	−0.006***	−0.005***	−0.002	−0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Constant	−0.110***	−0.082***	0.009***	0.142***	0.311***
	(0.014)	(0.013)	(0.014)	(0.017)	(0.020)
*F-test (Joint Test of Equality of Slopes for quantiles 0.1 0.25 0.5 0.75 0.9): 5.119 *****					
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 7 Quantile regression to estimate the indirect effect of recessions

This table presents the results from estimating a panel conditional quantile regression model using the refinancing sample. Results are shown for both the financially constrained and unconstrained samples. The objective is to capture the indirect effect of business cycles on firm leverage at different levels of leverage. The model includes a contemporaneous business cycle dummy (Rec), one-period lagged firm characteristics and their interaction with the recession dummy. It also includes year fixed effects. Standard errors are clustered at the firm level. Variable definitions are given in the appendix.

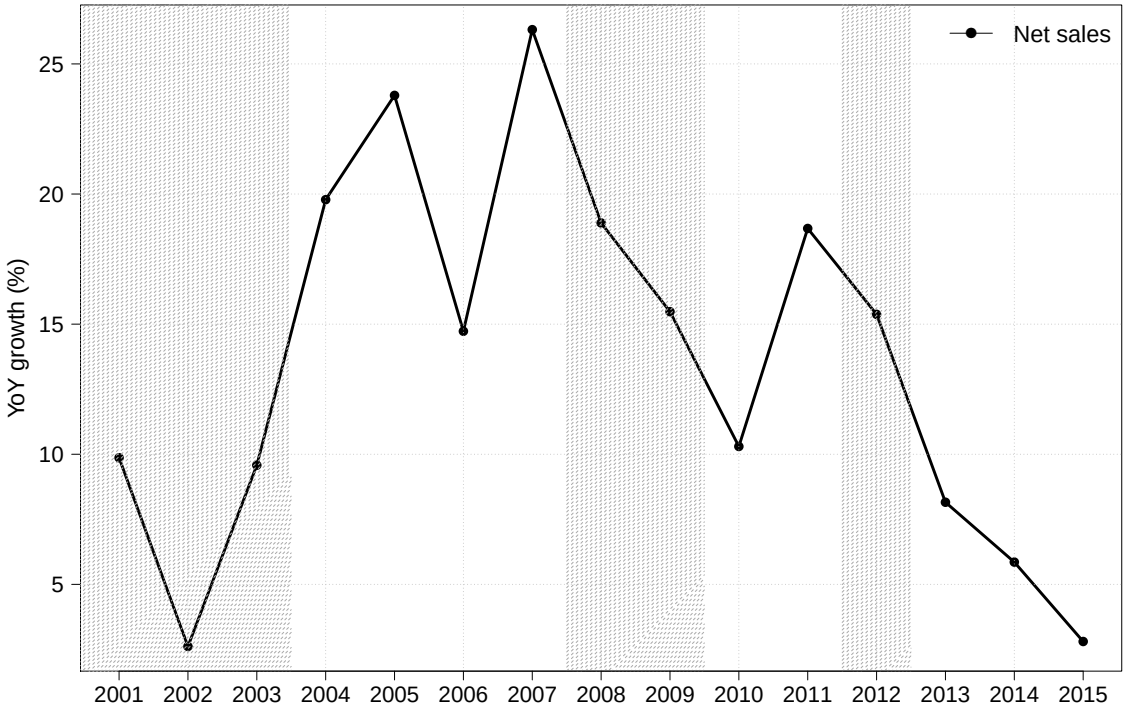
	10th	25th	50th	75th	90th
Panel A: Constrained sample					
Recession	0.017	0.009	0.221	0.483**	0.473*
	(0.174)	(0.162)	(0.203)	(0.233)	(0.307)
Size*Rec	−0.003	−0.005	−0.012	−0.044*	−0.047*
	(0.016)	(0.017)	(0.021)	(0.024)	(0.030)
Profitability*Rec	−0.111	−0.018	−0.089	0.042	0.044*
	(0.145)	(0.122)	(0.114)	(0.161)	(0.187)
Tangibility*Rec	0.096	0.066	−0.101	−0.062	−0.011
	(0.127)	(0.119)	(0.107)	(0.129)	(0.124)
Capex*Rec	0.127	0.030	−0.341	−0.571	−0.509
	(0.303)	(0.260)	(0.299)	(0.432)	(0.411)
MTB*Rec	0.001	0.004	0.000	0.001	−0.004
	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
Size	0.021***	0.022***	0.016**	0.013*	0.008
	(0.005)	(0.006)	(0.007)	(0.007)	(0.010)
Profitability	0.089**	0.070**	0.120**	0.114**	0.127*
	(0.044)	(0.038)	(0.044)	(0.063)	(0.061)
Tangibility	0.072	0.149***	0.202***	0.217***	0.130***
	(0.044)	(0.043)	(0.034)	(0.031)	(0.049)
Capex	0.145	0.295**	0.242**	0.143*	−0.016
	(0.193)	(0.124)	(0.112)	(0.073)	(0.100)
MTB	−0.004***	−0.005***	−0.004*	−0.003*	0.001
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)
Constant	−0.124**	−0.084	0.068	0.213***	0.388***
	(0.051)	(0.058)	(0.059)	(0.070)	(0.097)
*F-test (Joint Test of Equality of Slopes for quantiles 0.1 0.25 0.5 0.75 0.9): 3.427 *****					
Panel B: Unconstrained sample					
Recession	−0.019	−0.042	0.006	0.061	0.117**
	(0.027)	(0.028)	(0.035)	(0.046)	(0.045)
Size*rec	0.000	0.005	−0.004	−0.009*	−0.009
	(0.005)	(0.004)	(0.005)	(0.005)	(0.005)
Profitability*Rec	−0.056	−0.037	−0.032	−0.039	−0.156**
	(0.039)	(0.032)	(0.044)	(0.057)	(0.050)
Tangibility*Rec	0.087***	0.075***	0.108***	0.070*	0.010
	(0.032)	(0.028)	(0.036)	(0.040)	(0.038)
Capex*Rec	0.029	−0.075	−0.027	0.056	0.023
	(0.105)	(0.078)	(0.092)	(0.110)	(0.115)
MTB*Rec	0.006*	0.005	0.006**	0.000	−0.003
	(0.004)	(0.003)	(0.003)	(0.003)	(0.004)
Size	0.025***	0.029***	0.034***	0.032***	0.026***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Profit	−0.027	−0.051***	−0.071***	−0.076**	−0.039
	(0.017)	(0.018)	(0.028)	(0.032)	(0.024)
Tangibility	0.131***	0.208***	0.200***	0.200***	0.169***
	(0.016)	(0.014)	(0.016)	(0.016)	(0.020)
Capex	0.229***	0.219***	0.169***	0.075**	0.030
	(0.055)	(0.048)	(0.047)	(0.045)	(0.045)
MTB	−0.008***	−0.007***	−0.007***	−0.002	0.000
	(0.002)	(0.001)	(0.002)	(0.002)	(0.002)
Constant	−0.100***	−0.065***	0.014	0.140***	0.296***
	(0.014)	(0.015)	(0.016)	(0.020)	(0.021)
*F-test (Joint Test of Equality of Slopes for quantiles 0.1 0.25 0.5 0.75 0.9): 4.733 *****					
Note:					*p<0.1; **p<0.05; ***p<0.01

7 Graphs

7.1 Y-o-Y growth in net sales of firms

Figure 1 Y-o-Y net sales growth

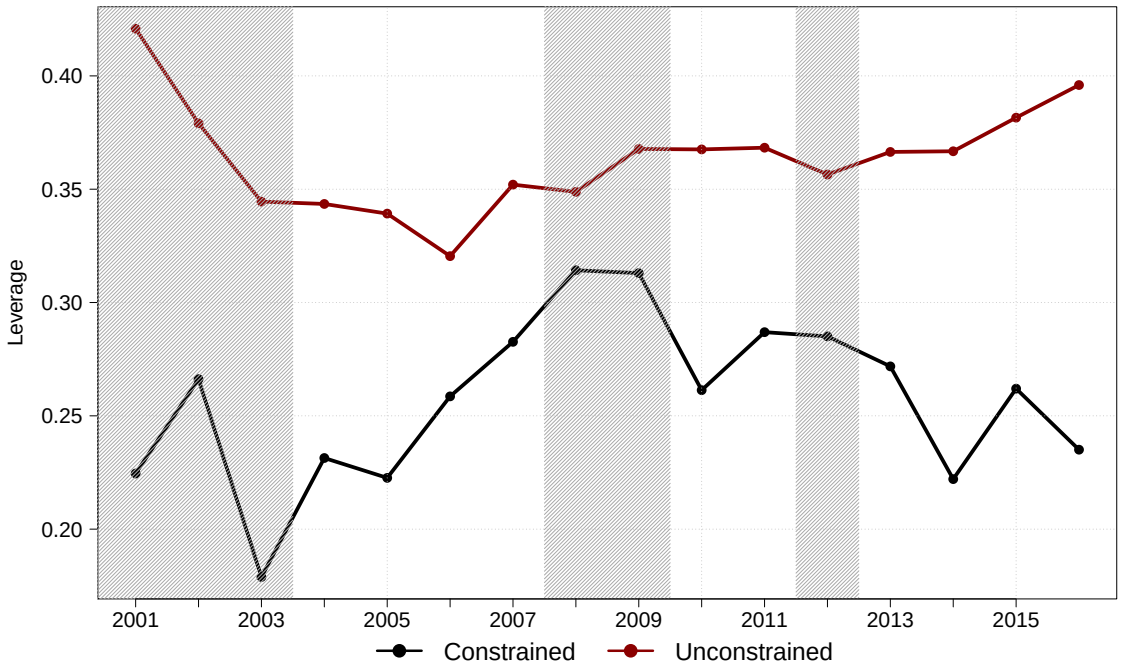
The graph below shows the year on year growth in net sales of the non-financial, non-oil, listed firms in our sample over the period 2001-2015. The shaded areas correspond to the business cycle recession dates as identified by Pandey et al. (2016) using GDP as the reference variable. To get the growth in net sales, we construct a panel of firms that are observed in the sample for two consecutive years. We then calculate the percentage change in the sum of net sales across all these firms.



7.2 Yearwise leverage of constrained and unconstrained firms

Figure 2 Leverage of constrained and unconstrained samples across business cycles

The graph below shows the evolution of leverage of the financially constrained and unconstrained samples across the business cycles during the sample period 2001-2015. The shaded areas correspond to the business cycle recession dates as identified by Pandey et al. (2016) using GDP as the reference variable. Leverage is measured as the ratio of total debt and total assets. Financially constrained firms are identified using the classification method described in section 2.4 in the paper.

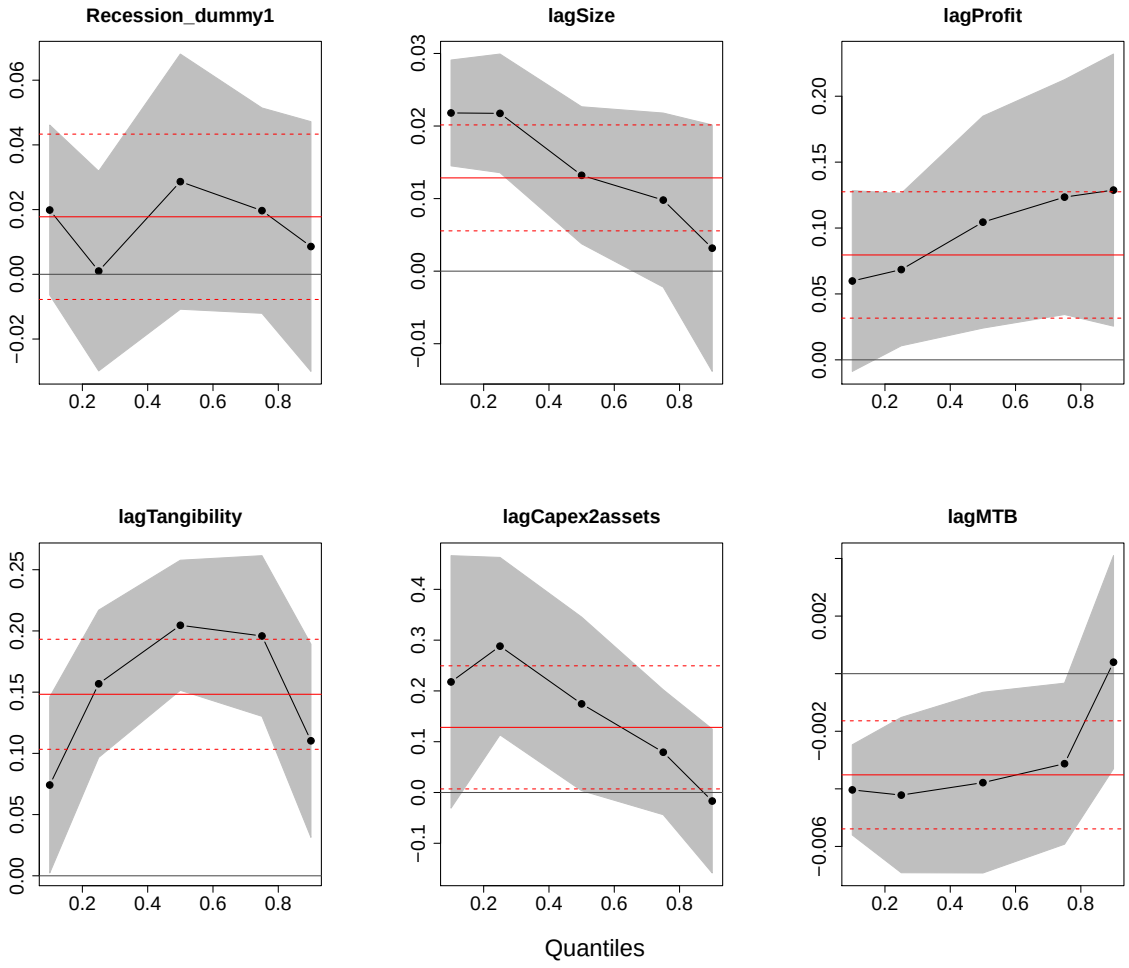


7.3 Quantile regression results: Direct effect of recession

7.3.1 Constrained sample

Figure 3 Quantile regressions: Constrained sample

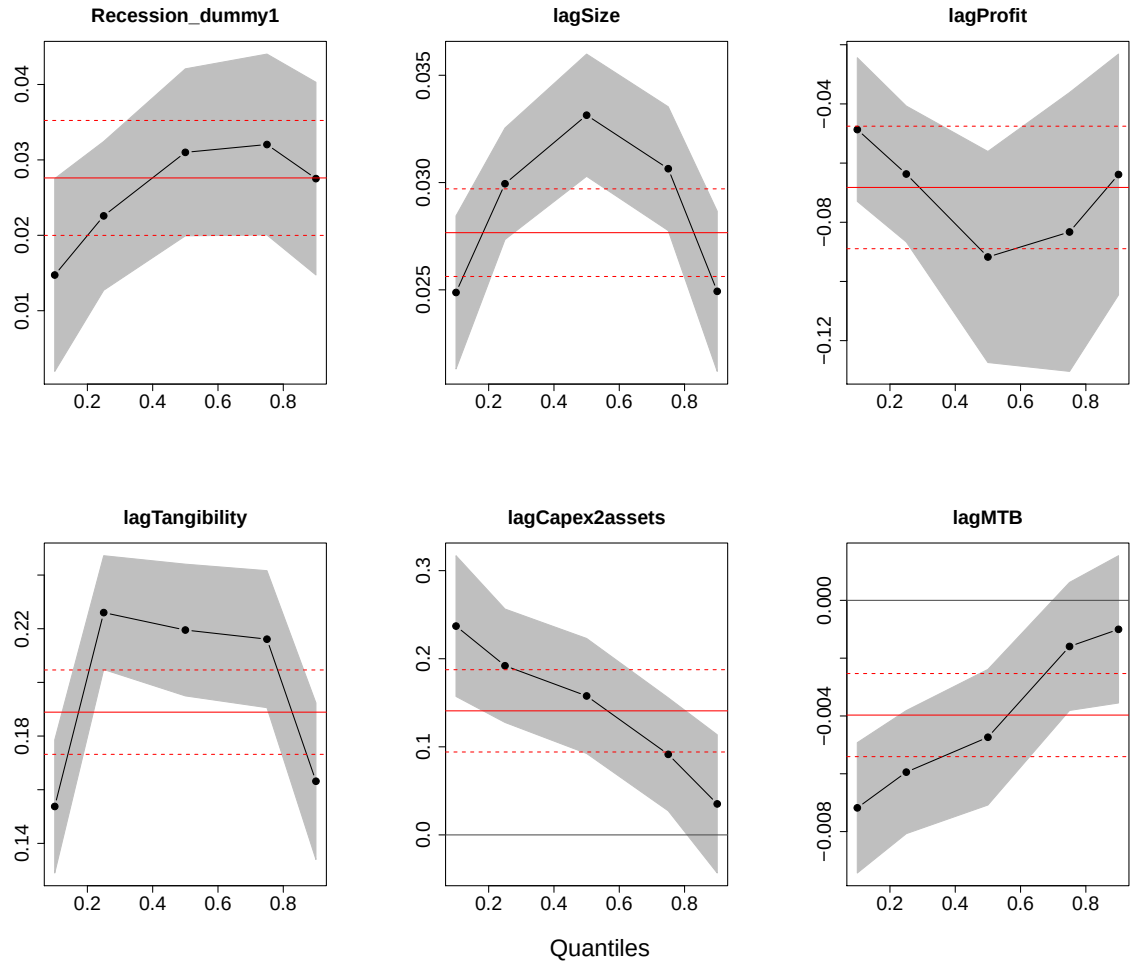
The graph below plots the estimated coefficients from the conditional quantile regression model against the various quantiles for the financially constrained sample. It also shows the 95% confidence interval. The graph corresponds to the regression results presented in Table 6, Panel A.



7.3.2 Unconstrained sample

Figure 4 Quantile regressions: Unconstrained sample

The graph below plots the estimated coefficients from the conditional quantile regression model against the various quantiles for the financially unconstrained sample. It also shows the 95% confidence interval. The graph corresponds to the regression results presented in Table 6, Panel B.



8 Appendix

8.1 Variable descriptions

- Leverage: Total Debt/Total Assets

- Size: log(Net Sales + Total Assets)/2
- Market-to-book ratio: Market value of equity/Book value of equity i.e. Market cap/Net worth
- Profit: PBDIT/Total Assets
- Tangibility: Net plant and machinery/Total Assets
- Capex: Change in Gross Fixed Assets/Total Assets
- Cash : Net cash flow from operating activities

8.2 Distribution of variables

Table 8 Distribution of variables in the refinancing sample

	0%	25%	50%	75%	95%	99.9%	100%	Mean	Std. Dev.	Obs
Leverage	0.00	0.20	0.34	0.47	0.64	0.79	0.79	0.34	0.18	14700
Size	0.30	6.05	7.27	8.51	10.24	11.89	13.28	7.29	1.76	14700
Profitability	-353.29	0.07	0.13	0.20	0.47	29.89	1497.49	0.36	15.67	14523
Tangibility	0.00	0.30	0.48	0.62	0.77	0.93	1.00	0.45	0.22	14700
Capex	-10.48	0.00	0.03	0.08	0.24	0.77	1.25	0.05	0.18	9323
Market2book	0.00	0.57	1.25	2.92	10.16	107.02	2252.51	3.16	23.37	14623

8.3 Yearwise median values of variables

Table 9 Median values of variables in the refinancing sample

Year	Leverage	Size	Profitability	Tangibility	Capex	MTB	Firms
2001	0.38	6.44	0.13	0.56	0.02	0.47	856
2000	0.34	6.63	0.14	0.51	0.02	0.51	759
2003	0.33	6.64	0.13	0.54	0.02	0.44	691
2004	0.31	6.76	0.13	0.53	0.02	0.85	766
2005	0.33	6.90	0.13	0.51	0.02	1.88	901
2006	0.33	7.03	0.14	0.49	0.03	2.59	1033
2007	0.35	7.25	0.14	0.47	0.01	2.12	1081
2008	0.34	7.43	0.14	0.47	0.03	1.98	1172
2009	0.35	7.63	0.13	0.45	0.04	0.82	1160
2010	0.33	7.62	0.14	0.45	0.03	1.85	1109
2011	0.32	7.58	0.13	0.46	0.03	1.62	1174
2012	0.34	7.64	0.12	0.44	0.03	1.23	1134
2013	0.35	7.64	0.11	0.46	0.02	0.93	1075
2014	0.35	7.63	0.10	0.46	0.02	1.01	922
2015	0.33	7.54	0.10	0.46	0.01	1.36	867