Firm Characteristics, Financial Composition and Response to Monetary Policy: Evidence from Indian Data

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Abstract

The article examines the evidence for credit channel on the composition of corporate finance during tight and loose periods of monetary policy, using micro-level data on Indian firms for 1995-2007. The findings provide evidence in favor of the relationship lending view, although the magnitude and extent of the response varies according to firm characteristics.

JEL Classification*: E 52, G 32

Key words: monetary policy; corporate finance; leverage; Altman-Z; relationship lending; India

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Introduction

A significant body of literature has emerged in the recent period that explores the credit channel of monetary transmission (Romer and Romer, 1990; Bernanke and Gertler, 1995). The influence of this channel is felt through the balance sheet (Gertler and Gilchrist, 1994), the effects of bank lending on firms that are particularly bank-dependent (Kahsyap *et al*., 1993) and through the stimulation of endogenous cycles or accelerator effects (Kiyotaki and Moore, 1997). Financial health is used as an indicator to determine firms' access to internal and external funds, so that when monetary policy tightens, real variables are influenced by higher interest rates and by contracting credit supply (Fazzari *et al*., 1998). In general, access to credit is determined by firm characteristics and therefore, the effect of monetary tightening is unlikely to be uniform across firms.

A key empirical issue has been the identification of the credit channel as a separate influence from other channels – such as the interest rate channel - for example. Early attempt to measure the influence of policy tightening on bank lending did not distinguish between demand-side influences, operating through the liabilities side of banks' balance sheets (*via* the interest rate channel) and supply shifts and therefore, could not establish beyond doubt the existence of a separate credit channel. In a seminal contribution, Kashyap *et al.* (1993) isolated the influence of monetary policy contractions on bank lending by measuring the *relative* changes of bank lending on non-bank sources of funds. They did so by constructing a 'mix' variable, defined as the ratio of bank lending to total external finance (defined as bank lending *plus* commercial paper). With such a relative measure based on the mix, the effect of interest rate channel on all types of finance could be distinguished from a credit channel on bank lending alone.

Subsequent analysis by Oliner and Rudebusch (1996) offered a critique of Kashyap *et al*. (1993). They argued that the mix variable, as employed by Kashyap *et al.* (1993) did not take on board a sufficiently wide range of alternative sources of finance and did not account for the differential effects on small versus large firms. Small firms are almost entirely bank-dependent and therefore, their mix is likely to be invariant to monetary contraction. With a wider measure of alternative funds and a distinction between small and large firms, Oliner and Rudebusch (1996) showed that there was less evidence of a credit channel and greater support for a broad credit channel, which implies that all sources of funds contract simultaneously as monetary policy tightens, leaving the mix unaffected.

The interchange between Kashyap *et al.* (1993) and Oliner and Rudebusch (1996) touches on an important issue for the credit channel: the influence of firm characteristics on the response to monetary

policy. Given that micro data is presently available on varied aspects of firm characteristics such as their size, age, riskiness, indebtedness and profitability spanning periods both tight and benign monetary policy, it becomes possible to consider their effects. The influence of the above factors on firms' access to finance in response to changes in monetary policy is central to the empirics of the present paper. Towards this end, we examine the interface between firm characteristics and financial composition, using a sample of listed Indian firms for the period 1995-2007. Empirical analyses of the corporate response to monetary tightening for India focus on the response of firms by size (Prasad and Ghosh, 2005), neglecting other important characteristics such as leverage, age and riskiness. The issue as to how different firm characteristics, in addition to size, interplay with monetary policy to influence debt composition is central to the present analysis.

The reminder of the analysis unfolds as follows. Section 2 explains the data sources and methodology, whereas Section 3 discusses the results. The final section concludes.

2. Data and methodology

2.1 Data source

For the purpose of the analysis, we exploit the *Prowess* database, generated and maintained by the Centre for Monitoring the Indian Economy (CMIE), a leading private think-tank in India. The dataset contains financial information on around 8,000 companies, which are either listed on the stock exchanges. In addition, if an entity is not listed, it qualifies for inclusion in the database if the average sum of sales and total assets is at least Rs.200 million (≈US $4 million) as per the latest audited financial results. Accordingly, the firms in the sample generally do not include the smallest firms due to the requirements for firms to be included in *Prowess.*[1] Thus, in effect, the sample is skewed towards large Indian firms. The database contains detailed information on the financial performance of these companies culled out from their profit and loss accounts, balance sheets and stock price data.

Table 1: Sample composition

Industry	Number of Firms	Percent to Total Sample
Textiles	63	11.2
Food	43	7.6
Cement	26	4.6
Chemicals	75	13.3
Drugs	42	7.4
Electronics	66	11.7
Electronics	10	1.8
Rubber	27	4.8
Metal and metal products	42	7.4
Automobiles	9	1.6
Auto parts	51	9.0
Wood and paper	30	5.3
Others	81	14.3
Total	565	100

The selection of the sample firms proceeds in three steps. In the first step, we select all firms listed on the National Stock Exchange for the period 1995-2007 [2]. This provided us with a total of 851 companies. We subsequently delete several firms from the sample. First, we delete firms which do not report their ownership figures or do not report data for at least three consecutive years, lowering the sample firms to 797. In the second and final step, all variables are winsorized at 1% at both ends of the sample. This filtering criterion reduces the final sample to 565 firms. The composition of the sample is presented in Table 1.

2.2 Variables

We derive three different measures of financial mix that correspond to access to external finance: total debt to total asset (MIX 1), short-term borrowing to total borrowings (MIX 2) and short-term bank borrowings to total bank borrowings (MIX 3). *Total debt* refers to all kinds of debt, interest bearing or otherwise. Therefore, it includes debt from banks (short-term and long-term) and financial institutions, inter-corporate loans, fixed deposits, foreign loans, government loans, etc. Funds raised in capital markets through debt issues such as debentures (convertible and non-convertible) and commercial paper are also included. *Bank borrowings* refer to total loans from banks, e.g., cash credit, bank overdraft facilities, term loans, etc. *Short-term bank borrowings* refer to bank loans with maturities of less than one year.

We use a variety of firm characteristics, namely size, perceived riskiness, age and profitability. The database contains rich information about these firm characteristics. Size is defined as the logarithm of total real asset. The measure of risk is the *Altman Z* score. We also have information on the year of incorporation of all firms. Based on this information, we introduce age as an explanatory variable and classify firms by age to measure the importance of track record for the change in the composition of firm's external finance. Finally, firm profitability is measured as after tax profit to total asset ratio.

Table 2 provides the descriptive statistics for all firms. It also provides the values of the relevant variables in the top and bottom 25 percentile. Based on this available information, we classify firms according to their various characteristics: size, debt, profitability, riskiness and age. A firm is classified as *large* if its real asset is in the highest quartile of the distribution; small firms are those with values obtaining for the lowest quartile. Using this criterion, we classify firms as exhibiting high *vs.* low profitability, and highly or lowly indebted, where debt is measured as MIX 1. According to theory, firms with Altman Z below 1.8 are perceived as risky whereas those with score above 3 are perceived as secure. Accordingly, riskier firms are those with Altman Z-score below 1.8; secure firms are those having Altman Z score in excess of 3. Finally, following Rajan and Zingales (1998), a firm is classified as old if its age is in excess of 15 years; firms less than or equal to 5 years old are classified as young firms.

In Kashyap *et al.* (1993), monetary policy is measured with refer to Romer dates (Romer and Romer, 1990). There are no equivalents to Romer dates in India, and therefore, we employ the real lending rate as our monetary policy measure.

Table 2: Descriptive statistics across firms

Variable	Definition	Mean	Std.dev	Max.	Min.
MIX 1	Borrowings/Asset	0.352	0.174	1.149	0
MIX 2	Short-term borrowings/Borrowings	0.376	0.246	1	0
MIX 3	Short-term bank borrowings/Bank borrowings	0.753	0.293	1	0
Log Asset	Log (total asset/WPI)	0.165	0.536	1.753	-1.127
Altman Z	3.3*(PBIT/Asset)+0.999*(Sales/Asset)+1.4*(retained profit/Asset)+1.2*(Working capital/Asset) + 0.6*(MVE/Liabilities)	2.208	1.332	10.386	-1.443
Log Age	Log (number of years since firm incorporation)	1.326	0.351	2.158	0
RoA	Profit after tax/Asset	0.049	0.061	0.269	-0.344
RoI	Real interest rate = [(1+Lending rate)/(1+WPI inflation)-1]	0.064	0.022	0.097	0.021

2.3 Methodology

Our sample offers a natural laboratory to evaluate the influence of firm-specific characteristics on the response of corporate financial mix to monetary policy. The first three years of the sample, 1995-97, relates to the period when real interest rates were high. The subsequent period, 1997-2004, witnessed sustained economic growth and falling inflation, alongside a period of declining interest rates. The final phase of the sample is one where interest rates once again witnessed an upward trend, in response to global economic uncertainties. Therefore, we have a complete interest rate cycle consisting of three phases: rising interest rates, followed by declining rates and a subsequent period of rising interest rates, wherein the macroeconomic environment for corporate borrowing would be quite different, which, in turn, is likely to affect the financial mix as well.

In this context, the model employed is:

$$MIX = f(MPS, MPR_p, FCD_j, MPS * FCD_j, MPS * MPR_p, FCD_j * MPR_p,$$
$$MPS * FCD_j * MPR_p; \ Controls, OD, GDPGR) \tag{1}$$

MPS denotes the monetary policy stance. Two dummies are assigned to reflect the tight (TP) monetary policy period (1995-97, 2005-07) and the loose (LP) monetary policy period (1998-2004), respectively.

MPR_p = 1, if *p* = TP, LP

= 0, *otherwise*

We then define dummies for firm-characteristics. FCD consists of ten different binary variables (j=1,2,…, 10) reflecting ten different firm characteristics, i.e., small, large, risky, secure, young, old, high indebted, low indebted, high profitability and low profitability, respectively.

FCD = 1, *j* = 1, 2,…, 10

= 0, *otherwise*.

Having introduced these period and firm group dummies, we interact them with the monetary stance (MPS) variable. The interaction of MPS with concerned firm characteristic is denoted as *MPS*FCD*, the corresponding one for sub periods is *MPS*MPR*, and the one that includes both firm characteristics and sub-periods, *MPS*FCD*MPR* (See for instance, Kashyap *et al.*, 1994).

The remaining are controls variables, including log(asset), *Altman*-Z, firm age and RoA. *GDPGR* is the growth rate of real gross domestic product that is invariant across firms to control for the business cycle and *OD* are (ownership) dummies that classify firm by ownership. In the sample, 60% are firms belonging to business groups, 6% are foreign, 31% are Indian private entities and the remaining are state-owned firms.

We estimate the relationship between financial choice of firms and their characteristics using a panel framework that enables us to control for firm-specific unobservable effects and to account for firm heterogeneity. The specification for firm *i* at time *t* is given by the expression:

$$y(i,t) = \alpha(i) + \beta X(i,t) + \varepsilon(i,t)$$ **(2)**

where ε represents the error term and α captures firm-specific effects. When we compared a random effects (RE) model against a fixed effects (FE) alternative, we rejected the hypothesis of no systematic difference between the coefficients obtained from RE and FE model, using the Hausman test. Therefore, we report the FE model, since it is more efficient than the RE model.

3. Results and discussion

3.1 Basic characteristics across periods

Table 3 presents the basic characteristics of the relevant variables across the two periods. The results show a clear tendency for the dependent variables as also most of the independent variables to exhibit clear variation across periods. For instance, the average leverage ratio for firms during tight periods of monetary policy equals 34%, roughly double of those obtaining during the loose period. This difference is statistically significant at 0.01 level. Likewise, firm profitability is also found to be higher during loose periods as compared to tight periods of monetary policy and this difference is statistically significant, as well.

3.2 Response of control variables

Table 4 provides the results of the FE regression. Three sets of results are exhibited in each table. The first set (Panel A) shows the response of total debt and the next two sets (Panels B and C) provides the response of short-term borrowings and short-term bank borrowings, respectively. For

reasons of brevity, we present the response of the control variables only under the first case (Panel A); in the other two instances, the response is similar and hence, not reported.

Table 3: Basic statistics across periods

Variables	MIX1	MIX2	MIX3	Altman Z	Log Asset	Log Age	RoA
Tight period							
Obs	2968	2924	2852	2968	2968	3317	2968
Mean	0.343	0.370	0.728	2.492	0.180	1.330	0.062
Std. dev.	0.173	0.248	0.306	1.461	0.543	0.357	0.057
Loose period							
Obs	3462	3425	3342	3462	3462	3953	3462
Mean	0.159	0.380	0.773	1.964	0.153	1.323	0.038
Std. dev.	0.175	0.244	0.281	1.157	0.529	0.346	0.063
Tight *vs.* loose							
(t-stat)	-3.677***	-1.664*	-5.963***	15.845***	2.021**	0.881	16.212***

*** ** and * denote statistical significance at 1, 5 and 10%, respectively

3.3 Response to monetary policy

We report the detailed findings of FE estimates. The columns separate out the responses of firms according to type based on various characteristics as elucidated earlier. We report estimation results with interaction terms that allow us to test the reactions of the financial mix to changes in the monetary policy regime. Estimation results without using any interaction term that includes firm characteristics are reported in Col.1. The subsequent columns separate out the responses of firms according to size – small and large; *Altman Z* –risky and secure; age – young and old; gearing – high- *vs.* low debt and profitability – high *vs.* low.

The coefficient on monetary policy stance (Col.2) for the whole sample is positive and significant. The results confirm the fact that changing monetary policy stance alters the liability composition of non-financial firms. More specifically, a monetary tightening by 100 basis points (bps) increases overall debt by 0.12 percent. This evidence of a rise in debt in response to monetary contraction negates the interest rate channel, which suggests that debt declines as interest rates rise. Looking at the response of the sub-components, the evidence indicates that short-term bank debt increases, whereas short-term debt falls. Intuitively, a monetary policy induced rise in short-term interest rate means that firms face tough conditions for overall debt. However, to the extent corporates exhibit relationship lending with banks, they obtain some kind of emergency loans, centered on short-term bank loans. Therefore, although short-term debt declines, overall debt rises, owing to a rise in short-term bank debt. This evidence is suggestive of relationship lending on the part of corporates.

Next, as mentioned earlier, we create a binary variable for each firm-specific characteristic FCD_j and interact this with the monetary policy stance variable, $MPS*FCD_j$. The overall response of a change in monetary policy stance on firm leverage (and its components) can be obtained by adding the coefficient of respective interaction terms to the coefficient of *MPS*. Take, for instance, the response to monetary policy of high-debt firms. Without taking into account firm characteristics, the response of

high debt firms is approximately -0.3% points (0.266-0.551=-0.285). However, if firm characteristic is taken into account, the point estimates approximately equals 0.03% points (-0.285+0.258=-0.027). Therefore, taking on board both the direct response of monetary policy and the indirect response operating through firm characteristics, a monetary tightening increases overall debt by 0.03 percentage points. Terms for risky and high debt firms that are subject to supply constraints exhibit greater response to a monetary tightening.

Table 4: MYP interacted with firm characteristics and tight period

Variables	Small	Large	Risky	Secure	Young	Old	High debt	Low debt	High profit	Low profit
Dep. Var= MIX 1										
MYP	0.288	0.396	0.434	0.323	0.332	0.364	0.573	-0.088	0.367	0.399
	(0.108)***	(0.107)***	(0.114)***	(0.105)***	(0.109)***	(0.105)***	(0.089)***	(0.089)	(0.114)***	(0.102)***
MYP*FCH*TP	0.248	-0.133	-0.161	0.207	0.100	0.061	-0.677	0.525	0.017	-0.183
	(0.169)	(0.164)	(0.175)	(0.195)	(0.169)	(0.139)	(0.123)***	(0.124)***	(0.199)	(0.284)
FCH*TP	-0.029	-0.017	0.018	-0.036	0.004	-0.015	0.262	-0.268	0.008	0.009
	(0.015)*	(0.018)	(0.014)	(0.015)***	(0.018)	(0.016)	(0.011)***	(0.009)***	(0.016)	(0.023)
R-squared	0.417	0.417	0.416	0.419	0.414	0.417	0.644	0.672	0.416	0.416
Firms, Obs.	564, 2952	564, 2952	564, 2952	564, 2952	564, 2944	564, 2944	564, 2952	564, 2952	564, 2952	564, 2952
Dep. Var= MIX 2										
MYP	0.331	-0.055	0.158	-0.034	0.142	0.006	0.016	0.067	0.107	0.027
	(0.137)**	(0.144)	(0.184)	(0.139)	(0.148)	(0.136)	(0.159)	(0.119)	(0.144)	(0.137)
MYP*FCH*TP	-0.826	0.626	-0.183	0.601	-0.214	0.306	0.158	0.316	-0.149	0.425
	(0.319)***	(0.311)**	(0.307)	(0.435)	(0.299)	(0.313)	(0.272)	(0.482)	(0.347)	(0.442)
FCH*TP	0.019	-0.045	-0.044	-0.068	0.018	-0.023	-0.103	0.048	-0.051	-0.059
	(0.028)	(0.029)	(0.023)*	(0.031)**	(0.029)	(0.029)	(0.019)***	(0.031)	(0.025)**	(0.033)***
Firms, Obs.	564, 2908	564, 2908	564, 2908	564, 2908	564, 2900	564, 2900	564, 2908	564, 2908	564, 2908	564, 2908
R-squared	0.134	0.132	0.138	0.133	0.132	0.133	0.152	0.141	0.137	0.133
Dep. Var= MIX 3										
MYP	1.057	0.664	0.472	0.873	0.891	0.905	0.553	1.161	1.091	0.471
	(0.176)***	(0.182)***	(0.231)**	(0.172)***	(0.180)***	(0.174)***	(0.199)***	(0.159)***	(0.183)***	(0.172)***
MYP*FCH*TP	-0.975	0.453	0.724	-0.609	-0.435	-0.456	0.779	-1.781	-1.178	1.869
	(0.374)***	(0.382)	(0.391)*	(0.477)	(0.379)	(0.363)	(0.384)**	(0.481)***	(0.409)***	(0.541)***
FCH*TP	0.039	-0.022	-0.031	-0.014	0.099	0.095	-0.086	0.131	0.042	-0.133
	(0.030)	(0.041)	(0.032)	(0.039)	(0.037)**	(0.038)***	(0.031)***	(0.033)***	(0.031)	(0.043)***
Firms, Obs.	564, 2836	564, 2836	564, 2836	564, 2836	564, 2828	564, 2828	564, 2836	564, 2836	564, 2836	564, 2836
R-squared	0.073	0.072	0.072	0.074	0.076	0.077	0.074	0.076	0.073	0.075

All equations include the set of controls as in Table 4, including dummies for firm ownership, industry and year, but these are not reported to save space.
Standard errors (clustered by firm) are within parentheses; ***. ** and * denote significance at 1, 5 and 10%, resp.

Turning to MIX 2, across all firm characteristics, it is typically the indirect response operating through firm characteristics that is significant. Consider the case of high-debt firms. A 100 bps monetary contraction lowers short-term borrowings by 0.11 percentage points, although in case of low-debt firms, the response is the opposite. Combining these results with MIX 3, the evidence indicates that old, high-debt and low profit firms increase bank lending, in response to a monetary contraction.

Turning to short-term borrowings, for small firms, the net effect of monetary contraction is a decline in short-term debt. Finally, in case of bank borrowings, the direct effect of a monetary contraction is a rise in bank debt, irrespective of firm characteristics. Including the indirect effect, the *net* effect of a monetary contraction is an increase in short-term bank borrowings for high-debt and low profit firms.

Looking at the loose period, a monetary contraction is found to raise overall debt in most cases. The *net* effect differs across firm characteristics. Thus, low-debt firms lower overall debt, whereas high profit firms increase their debt levels. In terms of components, while there is limited effect of monetary contraction on short-term debt, the *net* response of bank debt, in most cases, is observed to be negative. In sum, relationship lending is manifest mostly most under tight monetary policy; under conditions of loose monetary policy, broad credit channel assumes prominence.

4.   Concluding remarks

The paper examines the evidence for credit channels on the composition of corporate finance during tight and loose periods of monetary policy. Using firm-level data on over 500 firms for an extended time span allows us to test the predictions based on several firm-level variables including size, age, leverage, riskiness and profitability to ascertain whether monetary policy impacts the mix between different kinds of financing.

The balance of evidence provides support in favor of a relationship lending view: while short-term debt typically declines in response to a monetary contraction, banks find it useful to provide temporary succor in form of bank debt, so that in the aggregate, overall debt increases. Although the magnitude and extent of the response varies across firm types with risky and high debt firms exhibiting greater response to a monetary tightening, this evidence is manifested in most cases.

Further disaggregation of firm response during episodes of tight and loose periods of monetary policy indicates that the *net* effect of a monetary contraction is an increase in short-term bank borrowings for high-debt and low profit firms during tight periods; in case of loose period, the *net* effect, differs across firm characteristics. Thus, low-debt firms lower overall debt, whereas high profit firms increase their debt levels.

Overall, we find limited evidence in support of the credit view, but much more empirical support for relationship lending by banks. While this is not entirely surprising since banks are the mainstay of financial intermediation in India, it also calls for greater research into the interaction of the bank lending and the relationship lending channels, which requires a broader availability of relationship indicators. Contextually, using cross-section data for 2001, Berger *et al.* (2008) document that Indian banks forge relationship typically with transparent firms; additionally, firms having relationship with foreign banks

are more likely to engage in multiple banking relationships. While these do not necessarily negate the role of the interest rate channel as an important tool of monetary transmission, it does call for much more deeper investigation into the *relative importance* of various channels, especially under alternate market structures and financial systems. These remain important elements for future research.

Endnotes

[1] As per the revised classifications, the micro, small and medium (MSM) manufacturing firms, as classified by the Indian Ministry of Industry, are those with investment in plant and machinery (excluding land and building) up to INR 2.5 million (micro enterprise), from INR 2.5-50 million (small enterprise) and from INR 50-100 million (medium enterprises).

[2] The National Stock Exchange is the state-of-the-art exchange for listed companies.

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