



Did financial liberalization ease financing constraints? Evidence from Indian firm-level data

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Abstract

Using a panel dataset of over 1000 listed Indian manufacturing firms for the period 1995–2004, the paper examines whether financial liberalization led to an easing of financial constraints. The results indicate that financial liberalization led to a significant easing of financing constraints. This easing was particularly notable in the case of small firms and in fact, became more pronounced during the latter half of the sample period. The analysis concludes with several robustness checks of the baseline results.

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1. Introduction

Risk in financing is one of the major impediments facing manufacturing establishments. The problem tends to be all the more acute in emerging economies owing to imperfections in financial markets and significant informational asymmetries between borrowers and lenders. As part of the process to mitigate such risks, several developing countries have, over the last decade or so, undertaken significant measures in liberalizing their financial sector. These reforms have encompassed a large number of areas including deregulating the administered interest rate regime, liberalizing the barriers to entry and thereby promoting greater competition, dismantling of credit controls and scaling down the high levels of statutory pre-emptions. Although the main objective of such deregulation has been to ease the constraints on the supply of funds for investment, the consequence of such liberalization on the ease of finance to firms is not well established.

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The present paper presents the case of India and examines as to whether the process of financial liberalization in India effected since the beginning of the 1990s have had any effect of mitigating the financing constraints for firms. Using a panel of annual data on Indian firms, the findings indicate that, financial liberalization led to a significant easing of financing constraints. This easing was particularly notable in the case of small firms and in fact, became more pronounced during the latter half of the sample period.

The paper comprises of seven sections after this introduction. Section II presents an overview of the literature. A brief description of the Indian financial system is contained in Section III. The empirical strategy and the database employed are detailed in Section IV. This is followed by a description of the estimation technique. Section V discusses the results, followed by the robustness checks and policy implications. The final section gathers the concluding remarks.

2. Literature review

The financial position of firms affects investment when there exists a wedge between the costs of external and internal finance in an imperfect capital market. The literature focuses on three reasons for costly external finance. First, market participants have differential access to information. Myers and Majluf (1984) demonstrate that the cost of external funds is higher than that of internal funds owing to informational asymmetry between lenders and borrowers. Second, managerial agency problems arise when managers who are not owners pursue their own interests (Jensen and Meckling, 1976). The firm is required to pay a premium for external financing if outside investors suspect that managers might not pursue the interests of shareholders. Finally, transactions costs associated with the issuance of debt and equity might raise the cost of external financing.

The combined effects of asymmetric information, managerial agency problems and transactions costs suggest a disparity between the cost of internal and external funds. Under such financial constraints, investment decisions depend on the availability of internal funds. Furthermore, the heterogeneity of firms implies that investment of financially constrained firms' is more likely to be affected by the availability of internal funds.

A large body of empirical literature has examined whether financial constraints influence corporate capital investments. Utilizing the dividend–payout ratio as a measure of financial constraint faced by firms, Fazzari et al. (1988) had demonstrated that investments of financially constrained firms respond more sensitively to changes in cash flow. Since then, it has become a basic research methodology to examine the difference in sensitivities of investment to cash flow between a priori segmented firms. Existing empirical studies have used various segmenting variables to identify unobservable financial constraints, for example, group affiliation in Hoshi et al. (1991), firm size in Devereux and Schiantarelli (1990), issuing commercial paper and bond ratings in Gilchrist and Himmelberg (1995) and Whited (1994) and exchange listing in Oliner and Rudebusch (1992)¹. Despite the differences in datasets and estimation techniques, most studies arrive at the conclusion that the sensitivity of investment to cash flow is higher for constrained firms.

In an influential study, Rajan and Zingales (1998) argued that industrial sectors that are naturally heavy users of external finance due to technological factors grow disproportionately faster in countries with developed financial systems. Using the ratio of domestic credit and stock

¹ More recently, Gomes et al. (2002) use GMM to estimate a stochastic investment Euler equation and show that investment and financing frictions provide a significant factor in explaining the cross-section of expected returns.

market capitalization to GDP and country accounting standards as measures of financial development, their analysis suggests that ex ante development of financial markets facilitates the ex post growth of sectors dependent on external finance. The evidence is consistent with the view that financial development lowers the cost of external finance and exerts a positive influence on industries with comparatively greater reliance on external finance.²

There have been a handful of country case studies documenting the effects of financial liberalization on financing constraints in developing countries. Thus, [Harris et al. \(1994\)](#) find that for Indonesia, borrowing costs increased after liberalization dampening the sensitivity of cash flows to investment. In the case of Ecuador, [Jaramillo et al. \(1994\)](#) report an increase in the flow of credit accruing to technically more efficient firms post liberalization, after controlling for other firm-specific features. These findings might be driven by the fact that the panel dataset in these studies was relatively short, while the effects of liberalization are felt over an extended time span. Evidence for Mexico by [Gelos and Werner \(1999\)](#) suggests that liberalization eased the financing constraints for small firms, but not for large firms, which they attribute to the political economy considerations that large firms has preferential access to directed credit before deregulation. [Gallego and Loayza \(2000\)](#) find evidence to support the easing of financing constraints during the period of deregulation for Chilean firms. Using a cross-country study covering 12 developing countries, [Galindo et al. \(2003\)](#) finds evidence to support a significant and sizeable effect of financial liberalization on the efficiency of investment.

Several studies have recently examined the issue of financing constraint in a cross-country context. Employing Euler equation methodology, [Laeven \(2003\)](#) finds that, in a sample of 13 developing countries for the period 1988–98, progress in financial liberalization reduces firms financing constraints, especially for small firms. Around the same time, using a similar methodology on a firm-level sample of 40 countries, [Love \(2003\)](#) finds a strong negative relationship between the sensitivity of investment to the availability of internal finance and concludes that financial development reduces the effect of financing constraint on investment. In addition, [Bekaert et al. \(2005\)](#) find that financial liberalization affects growth particularly through its effect on financial development, thus emphasizing the important of financial development for economic growth. However, the cross-sectional variability in these studies suggests that the resultant estimates are more in the nature of ‘average’ relationships, which often makes the empirical results less appealing. Focusing on a single country enables to bypass the limitations of cross-country studies ([Rodrik, 2005](#)). The findings so obtained may be representative of the role of financial liberalization in alleviating financing constraints in other emerging markets.

The Indian case provides a suitable background to test the interlinkage between financial liberalization and financing constraints. India is one of the largest and fastest growing emerging economies with a wide array of manufacturing firms, and offers a unique laboratory among emerging markets to test the effect of financial liberalization on financing constraints. Second, the time period of the study spans a decade roughly coinciding with the inception of financial sector reforms and enables to clearly isolate the impact of financial liberalization on financing constraints. And finally, the firm-level information employed for the purpose provides an ideal vehicle to clearly discern the impact of financial liberalization on financing constraints across different categories of firms.

² The RZ methodology has subsequently been applied by several authors. [Fisman and Love \(2003\)](#), for instance, study whether industries that depend more on trade credit benefit more or less from financial development, while [Claessens and Laeven \(2003\)](#) examine whether industries that rely more on tangible assets benefit more or less from the protection of property rights.

3. Financial sector liberalization in India

The Indian banking system is characterized by a large number of banks with mixed ownership.³ The commercial banking segment presently comprises 27 state-owned banks in which Government has majority ownership, 40 private sector banks and 33 foreign banks. Total bank assets constituted a little over 70% of GDP in 2004. State-owned banks had a 75% share in the assets of the banking system in 2004, while private and foreign banks constituted 25%. In the pre-reform period, the Indian financial system essentially catered to the needs of planned development in a mixed-economy framework where the Government had a predominant role in every sphere of economic activity. The two rounds of bank nationalization, first in 1969 and thereafter in 1980, led to the creation of a massive branch network with the avowed purpose of not only mopping up potential savings, but also meet the credit gaps in agriculture and retail trade, thereby enabling to bring large stretches of economic activity within the organized banking system.⁴ The pre-emption of a large proportion of bank deposits and an administered interest rate regime resulted in high cost and low quality financial intermediation. The spreads between deposit and lending rates of commercial banks increased, while the administered lending rates did not factor in credit risk. The directed and concessional availability of bank credit with respect to certain sectors resulted not only in distorting the interest rate mechanism, but also adversely affected the viability and profitability of banks. The directed lending requirements at subsidized rates of interest coupled with large statutory pre-emptions at low remuneration compelled banks to look for riskier avenues of lending to the private sector. The lack of recognition of the importance of transparency, accountability and prudential norms in the operations of the banking system led also to a rising burden of non-performing assets. On the expenditure front, inflexibility in licensing of branches and management structures constrained the operational independence and functional autonomy of banks and raised overhead costs. The environment in the financial sector during this period was thus characterized by segmented and underdeveloped financial markets coupled with paucity of instruments. On the price front, the existence of a complex structure of interest rates arising from economic and social concerns of providing concessional credit to certain sectors resulted in ‘cross subsidization’ which implied that higher rates were charged from non-concessional borrowers. The system of administered interest rates was characterized by detailed prescription on the lending and the deposit side leading to multiplicity and complexity of interest rates. The regulation of lending rates, led to regulation of deposit rates to keep cost of funds to banks at reasonable levels, in order to ensure that the spread between cost of funds and return on funds is maintained. In 1991, public sector banks’ share in the total assets of the banking system was a little over 90%.

The period 1992–97 witnessed the laying of the foundations for reforms in the banking system (Rangarajan, 1998). The period saw the introduction of prudential norms pertaining to capital adequacy, income recognition, loan classification and provisioning, exposure norms, etc. The difficult task of ushering in some of the structural changes accomplished during this period provided the bedrock for further reforms. While these reforms were being implemented, the world economy also witnessed significant changes, ‘coinciding with the movement towards global

³ The banking system in India consists of commercial and co-operative banks, of which the former accounts for around 98% of banking system assets. The entire segment is referred to as Scheduled Commercial Banks, since they are included in the Second Schedule of the RBI Act, 1934.

⁴ Burgess and Pande (2005) argue that the bank nationalization program engendered primarily by rural branch expansion had a salutary effect on reducing rural poverty.

integration of financial services' (Government of India, 1998). Against such backdrop, a second >>>Government-appointed >>>Committee on banking sector reforms provided the blueprint for the current reform process (Government of India, 1998).

Critical and noteworthy reforms in the financial system during the reform period included (Bhide et al., 2001; Ahluwalia, 2002):

- (a) Lowering of statutory pre-emptions to the current levels 5.0% and 25.0% for the cash reserve and statutory liquidity ratios, respectively.
- (b) Liberalizing the interest rate regime, allowing banks the freedom to choose their deposit and lending rates.
- (c) Infusing competition by allowing more liberal entry of foreign banks and permitting functioning of de novo private banks.
- (d) Introducing micro-prudential measures (capital adequacy requirements, income recognition, asset classification and provisioning norms for loans, exposure norms, accounting norms).
- (e) Diversifying ownership of state-owned banks. Several of the relevant acts were amended to enable the state-owned banks to raise capital up to 49% from the public. Seventeen state-owned banks accessed the capital market and raised around Rs. 82 billion till end-March 2004.
- (f) Mandating greater disclosures in balance sheets to ensure increased transparency.
- (g) Adopting a consultative approach to policy formulation with measures being ushered in after discussions with market participants to provide useful lead-time to market players to make necessary adjustments.

As a consequence of the reforms, the share of public sector banks in total assets of the banking system reduced from 90% to 75% (Table 1). Evidence of competitive pressures in the Indian banking industry can be discerned from the decline in the five bank asset concentration ratio from 0.51 in 1991–92 to 0.44 in 1995–96 and thereafter to 0.43 in 2003–04.

Table 1
Summary of the banking industry: 1990–91 to 2003–04 (in Rs. billion)

Year /bank group	1990–91			1996–97			2003–04		
	SOB	Pvt.	Forgn.	SOB	Pvt.	Forgn.	SOB	Pvt.	Forgn.
No. of banks	28	25	23	27	34	42	27	30	33
Total asset	2929	119	154	5563	606	561	14714	3673	1363
Total deposit	2087	94	85	4493	498	373	12268	2685	798
Total credit	1306	50	51	2202	281	265	6327	1709	605
Credit–deposit ratio	0.63	0.52	0.60	0.49	0.56	0.71	0.52	0.64	0.76
<i>Share (in%)</i>									
Total asset	92	4	4	83	9	8	75	19	6
Total deposit	92	4	4	84	9	7	74	16	10
Total credit	93	4	3	80	10	10	73	20	7
Total income	246	11	15	536	74	76	1376	332	130
<i>of which: interest income</i>	239	9.3	12.7	465	64	62	1095	255.4	90
Total expenditure	241	10.7	13	540	61	56	1211	297	108
Net profit	5	0.3	2	71	13	20	165	35	22

SOB. State-owned Banks; Pvt. Private Sector Banks; Forgn: Foreign Banks.

In the capital market likewise, until the inception of reforms, the corporate sector faced several constraints on its choices regarding sources of funds. Access to the equity market was regulated by the Controller of Capital Issues (CCI), an agency under the Government, which imposed stringent restrictions on corporate houses intending to raise funds through the equity route. Long-term debt was largely under the purview of state-owned development banks, which, either through direct lending or through refinancing arrangements, virtually monopolised the supply of debt finance to the corporate sector. Consequent upon the reforms introduced in 1992, companies have been given the freedom, subject to stringent disclosure requirements, to price their issues and raise funds to meet various types of business requirements.⁵ In order to ensure that promoters' interests are closely integrated with those of minority shareholders, SEBI guidelines also contain a stipulation as to minimum promoters' contribution and lock-in period.

4. Empirical strategy and database

4.1. Methodology

The investment model employed is similar to Laeven (2003), which builds on Gilchrist and Himmelberg (1999). In their framework, the firm maximizes its present value, which is equal to the expected value of dividends subject to capital accumulation and external financing constraints. Financial frictions are embodied in the assumption that the shareholders regard debt as a marginal source of external finance and that the external finance premium is an increasing function of the amount borrowed. We also adopt the specification of the adjustment cost function proposed by Love (2003) to capture persistence in investment. Finally, we can derive the Euler equation for investment by using Tobin's Q and cash flow to capital ratio (CF/K) as proxies for marginal productivity of capital and financial constraints, respectively. We include the debt ratio (LEV) as another explanatory variable.⁶

Accordingly, the baseline investment model we estimate is as follows:

$$I_{it}/K_{it} = \alpha + \beta_1(I_{it-1}/K_{it-1}) + \beta_2Q_{it} + \beta_3(CF/K)_{it} + \beta_4LEV_{it} + d_t + u_{it} \quad (1)$$

where i denotes firm and t represents year. (I/K) is investment to capital ratio, d_t is time-specific effects and u_{it} is the white noise term. A description of the variables along with the data source is contained in Table 2.

In the absence of financial restrictions, firm investment depends exclusively on the marginal profitability of capital as measured by Q . In case a firm faces constraints on external financing, its investment will be determined partly by its internal resources (CF/K) and to the extent that capital markets are imperfect, the degree of leverage (LEV) would also affect the availability of external finance. Specifically, positive and significant coefficient on β_3 is indicative of no finance constraint. Additionally, a better functioning financial system would imply investment is less determined by the firm's internal resources and less negatively affected by its leverage, which, in turn, would imply, significant and non-negative magnitudes on the coefficients β_2 and β_4 respectively.

⁵ The activities of the stock market are regulated by the Securities and Exchange Board of India (SEBI), whose functions are similar in scope to the Securities Exchange Commission in the US. The SEBI Act, 1992 imparted SEBI with statutory powers to protect the interests of investors in securities and to promote the development of, and regulate, the securities market.

⁶ The degree of leverage may affect the availability of external financing after controlling for Tobin's Q .

Table 2
Variables and data source

Variable	Definition	Source
K	Capital at the beginning of period t =Plant property assets at end of $t-1$ minus capital expenses during period $t-1$ plus accumulated depreciation and amortization until the end of period $t-1$	Computed from Prowess
S	Net sales at end of period $t-1$	Prowess
$SIZE_t$	Logarithm of total asset	Computed from Prowess
I	$K_{t+1} + Depcn_t - K_t(1 + \pi_t)$	Computed from Prowess
$Depcn$	Depreciation during period t	Prowess
π_t	Inflation over the period t	Handbook of statistics
LEV	Firm leverage =total borrowing/total asset	Computed from Prowess
Q_t	Average Q at the beginning of period t = MV_t/D_t	Computed from Prowess
D_t	Book value of total debt at the beginning of period t	Prowess
MV_t	Market value of equity at the beginning of period t =Number of shares outstanding at end of period $t-1$ * market price of per share at the end of period $t-1$	Computed from Prowess
FIN_t	Financial variable related to financing constraint = CF_t/K_t	Computed from Prowess
CF_t	Cash flow during period $t-1$ =(Net profit in period $t-1$ + depreciation in period $t-1$)	Computed from Prowess
FLI_t	Financial liberalization dummy, which takes value zero, one, two or three, depending on whether the financial sector is fully repressed, partially repressed, largely liberalized or fully liberalized along each of the following seven dimensions in a particular year. These dimensions include (a) reserve requirements, (b) interest rate controls, (c) credit controls, (d) entry barriers, (e) privatization, (f) prudential regulations and (g) international financial transactions. The index ranges from a score of zero (fully repressed along all dimensions) to 21 (fully liberalized along all dimensions). For convenience, the numerical value of the index in a particular year is scaled by 21 to arrive at a number between zero and one, with zero corresponding to fully repressed and one corresponding to fully liberalized.	RBI annual report RBI report on trend and progress of banking in India

4.2. Database and variables

The source of the data is the publicly available *Prowess* database (Release 2.4), generated and maintained by the Centre for Monitoring the Indian Economy (CMIE), a leading private think-tank in India. This database is broadly similar to the *Compustat* database of US firms and is increasingly employed in the literature for firm-level analysis on Indian industry for analysis of issues like the effect of foreign ownership on the performance of Indian firms (Chibber and Majumdar, 1999), the performance of firms affiliated to diversified business groups (Khanna and Palepu, 2000), the interlinkage between monetary policy and corporate governance (Ghosh and Sensarma, 2004) and the association between banks' non-performing loans and corporate leverage (Ghosh, 2005). The dataset contains financial information on around 8000 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 (\approx US \$4.6 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

Table 3
Distribution of sample firms by industry classification

Industry	Number of firms	Percent to total sample
Heavy	39	3.4
Drugs and pharmaceuticals	75	6.6
Chemicals	178	15.6
Cement	36	3.2
Textile and textile products	143	12.5
Auto ancillaries	84	7.4
Food, sugar and beverages	97	8.5
Electrical machinery	133	11.7
Diversified	36	3.2
Others	320	28.0
Total	1141	100.0

Prowess.⁷ 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.

The selection of the sample firms proceeds in three steps. In the first step, we select all firms listed on the National Stock Exchange⁸. This provided us with a total of 1538 companies. In step two, given the focus on financing constraints encountered by manufacturing firms, we only retain firms whose main activity is in manufacturing, but exclude those for which their main activity is in the service sector, including finance. This classification left us with a total of 1210 firms in the manufacturing sector. In the last step, we delete 69 firms for which data on the dependent variable are not reported for all least three consecutive years of the sample. Following from this criterion, we were finally left with a total of 1141 manufacturing firms for the entire sample period. The composition of the sample is presented in Table 3. It can be observed from the table that around 40% of the firms belong to chemicals, machinery and textile, indicating that given the classification adopted for incorporation of firms in the database, a significant proportion belong to these three sectors.

To construct the financial liberalization index, following *Abiad and Mody (2005)*, we proceed as follows. We consider seven policy dimensions as inputs to the creation of an aggregate index of the degree of financial liberalization. These include:

- Reserve requirements (RR), such as high levels of cash reserve ratio (CRR) and statutory liquidity ratio (SLR);
- Interest rate controls (IRC), including whether the government directly controls interest rates;
- Credit controls (CRC), such as directed credit towards preferred sectors or industries;
- Entry barriers (EB), such as limits on participation of foreign banks and restrictions on bank specialization or the establishment of universal banks;
- Privatization (PRIV) in the financial sector, enabling banks to reduce majority government shareholding in banks;
- Prudential regulation (PR), such as income recognition, asset classification and provisioning norms for loans in lines with international best practices and capital adequacy norms on the lines of the Basel accord; and finally,

⁷ The small and medium-sized firms (SME), as classified by the Indian Ministry of Industry, are those with gross fixed assets less than Rs.100 million (about US\$ 2.3 million).

⁸ The National Stock Exchange is the state-of-the-art exchange for listed companies.

Table 4
Correlation among the financial liberalization components

	RR	IRC	CRC	EB	PRIV	PR	IFT
RR	1.00						
IRC	0.81	1.00					
CRC	0.88	0.81	1.00				
EB	0.87	0.61	0.89	1.00			
PRIV	0.36	0.25	0.36	0.41	1.00		
PR	0.82	0.83	0.87	0.76	0.62	1.00	
IFT	0.84	0.92	0.70	0.67	0.27	0.76	1.00

Restrictions on international financial transactions (IFT), such as capital and current account convertibility and the use of multiple exchange rates.

Along each dimension in a particular year, a country is given a score on a graded scale, with zero corresponding to being fully repressed, one to partially repressed, two to largely liberalized and three to fully liberalized. Policy changes therefore denote shifts in the country's score on this scale in a given year. Information on identifying the various policy changes included in the database was culled from the two yearly statutory reports of the Reserve Bank: the *Annual Report [RBI (a)]*, which documents the announcement date of important policy measures and the *Report on Trend and Progress of Banking in India [RBI (b)]* which reports the significant policy changes in the financial sector during the year.

Table 4 reports the correlations among the seven components of financial liberalization. Some sub-components show a high correlation, indicating that liberalization along these dimensions tended to occur together. The most frequently employed indicators of financial repression—reserve requirements, credit controls, interest rate controls and prudential regulations—are all highly correlated with each other, with the correlations ranging from 0.81 to 0.88. Less correlated are the measures of financial liberalization relating to entry barriers and international financial transactions. Privatization bears the lowest correlation with all the other components, an indication that privatization does not coincide with the other reforms.

5. Estimation technique

The ordinary least squares (OLS) estimation of Eq. (1) may yield unsatisfactory results, because dynamic investment models are likely to suffer from both endogeneity and heterogeneity problems. Since the error term captures a technology shock to the profit function, it may be correlated with explanatory variables such as output and cash flow. The presence of lagged endogenous variables for investment will also bias the coefficient estimates for the OLS estimation. Moreover, substantial differences in investment behavior across firms may result in heterogeneity problems.

The generalised method of moments (GMM) estimation is widely used for dynamic panel data models. If there are no unobserved firm effects, we can apply the GMM technique to Eq. (1) in levels by using lagged right hand side variables as instruments.

The consistency of the GMM estimator depends on whether the lagged values of the micro variables are valid instruments in the regression procedure. A necessary condition for the validity of such instruments is that the error term be serially uncorrelated. To address these issues, we present two specification tests suggested by Arellano and Bond (1991). The first is the Sargan test

Table 5
Descriptive statistics — all firms

	I/K	Q	S/K	CF/K	LEV
Mean	0.126	3.532	0.219	1.429	0.171
Median	0.039	0.509	0.105	1.269	0.139
Maximum	0.875	11.686	2.720	5.748	3.949
Minimum	0.011	0.021	0.881	2.196	0.000
S.D.	0.195	1.321	4.493	2.197	0.177
Observations	962	1004	1063	1063	1014

of over-identifying restrictions, which tests for the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process. The second test examines the hypothesis that the error term differenced regression is not second-order serially correlated, which implies that the error term in the level regression is not serially correlated. The failure to reject the null hypotheses in both cases provides support to the model.

6. Results and discussion

Table 5 presents the descriptive statistics for all firms. We have data for the years 1995–2004 for 1141 firms. The average data coverage for each firm is 4.3 years, hence the total number of observations is 4997. As regards the descriptive statistics, it is evident that the mean leverage of all firms is 0.171 with a maximum of 3.949. The high range in leverage ratios may reflect the differential recourse to borrowings by firms in the sample. Table 6 reports the correlation matrix of the main variables. The correlation is the highest between our measure of the importance of financial factors: operating cash flow and the measure of Q . In the first case, the correlation is 33%; in the second case, it is slightly lower at 20%. Investment appears to be marginally correlated with sales (correlation of 6%) and less so with Q ; it is negatively correlated with leverage.

We estimate several specifications of the structural model (Table 7). We first estimate the baseline model with Q as the marginal profitability of capital and cash flow as measure of financial factor terms. We present only the two-step GMM estimates, since they are more efficient than one-step estimates and additionally, the Sargan test of overidentifying restrictions is heteroskedasticity-consistent only if based on the two-step estimates. The results can be summarised as follows. First, it is evident that investment is not responsive to changes in Tobin's Q , which indicates that firms with better investment opportunities do not invest more. Second, we find firms to be less constrained over the entire period, along with a gradual easing of the constraint over time. All else being equal, a 10% increase in cash flow implies a rise in investment by about 0.3%. These magnitudes are similar to those reported by Harris et al. (1994) for large Indonesian firms and lower than those reported by Devereux and Schiantarelli (1990) for UK

Table 6
Correlation matrix of the variables

	I/K	Q	S/K	CF/K	LEV
I/K	1.00				
Q	-0.0002	1.00			
S/K	0.0006	-0.0151	1.00		
CF/K	0.0004	0.3350	0.2004	1.00	
LEV	-0.0087	-0.0017	0.0010	-0.0014	1.00

Table 7
Financial liberalization and financing constraints: baseline results

Variables	Model 1	Model 2	Model 3
Constant	−0.159 (0.001)*	−0.003 (0.001)*	−0.203 (0.001)*
Lagged dependent variable	0.0006 (6.5×10^{-6})*	0.0006 (0.00001)*	0.0008 (6.2×10^{-6})*
Q_t	−0.002 (0.004)	−0.05 (0.002)	−0.004 (0.007)
(CF/K) _t	0.027 (0.002)*	0.143 (0.003)*	0.165 (0.015)*
(LEV) _t	0.449 (0.011)**	0.798 (0.068)*	0.576 (0.238)*
FLI7 * Q_t		0.0008 (0.003)	
FLI7 * (CF/K) _t		−0.506 (0.070)**	
FLI7 * (LEV) _t		0.616 (0.085)*	
Small * Q_t			0.00003 (0.0004)
Small * (CF/K) _t			0.202 (0.015)*
Small * (LEV) _t			0.986 (0.239)*
<i>Diagnostics</i>			
No. of observations, time period	4997; 1995–2004	4997; 1995–2004	4997; 1995–2004
Sargan test (<i>p</i> -values)	59.96 (0.15)	89.52 (0.13)	130.18 (0.12)
m1 (<i>p</i> -values)	−1.00 (0.31)	−1.01 (0.31)	−1.00 (0.32)
m2 (<i>p</i> -values)	−0.38 (0.71)	−0.10 (0.92)	−0.49 (0.62)

Standard errors in parentheses.

* and ** denote significance at 1% and 5%, respectively.

In the regression specifications, Q is taken as $Q \times 100$.

m1 and m2 stand for first and second order residual autocorrelation tests and follow $N(0,1)$.

firms for the period 1972–86. Third, investment is positively affected by the firm's leverage, which suggests that the accumulation of debt does not deter outside financing.⁹ Also, we find a strong persistence in investment, which supports the GMM model employed in the analysis.

To test whether financial liberalization has affected the financing constraints of firms, we interact the variables of model 1 with the financial liberalization index. This variable is FLI7, which varies between zero and one, depending on whether the country is fully repressed or fully liberalized along all the seven dimensions of financial sector reforms. We find that financial liberalization has, in fact, led to a significant reduction in financing constraints: financial liberalization reduced the estimated effect of cash flow on investment from the earlier level to 5%. Evidence also suggests that investment becomes less positively affected by the leverage of firms: a 10% increase in leverage implies a rise in investment of 7% before financial liberalization, and only 6.2% after liberalization.

In the third specification, we distinguish between small and large firms to identify whether investment behavior and finance constraints differ across firm size. Small firms are those with sales below the median sales in the sample. We construct a dummy which assumes value one if the firm is small and else, zero and interact this dummy with the financial liberalization index. The results (model 3) suggest that a 10% decline in cash flow implies a decline in investment by about 1.7% before liberalization and roughly 2.0%, post liberalization. These magnitudes are akin to those reported by Harris et al. (1994) and are supportive of studies that suggest that financial liberalization eased financing constraints for small firms (Gelos and Werner, 1999).

⁹ If external financing costs increase with the degree of leverage, the leverage ratio should be negatively associated with investment. Harris et al. (1994) find a negative association between investment and the debt-to-capital ratio for Indonesian data.

Summing up, the results suggests (a) strong persistent of investment ratios, (b) financial liberalization leads to a significant easing of financing constraints and (c) financial liberalization has a perceptible effect on the cash flow of small firms.

7. Robustness tests

As robustness checks, we examine the impact of three changes to the baseline specification. First, we assess the sensitivity of the results to the financial liberalization index (model 4). Instead of using the financial liberalization index for seven dimensions, we include only six dimensions along the lines reported by Laeven (2003). Second, we explore whether financial liberalization has had a positive impact on small firms and interact the baseline specification with both small firm and financial liberalization index (model 5). Finally, we examine whether financial liberalization has had any differential effect on firms in the latter half of the sample period (model 6). Table 8 reports the results.

The results can be summarized as under. When we consider the revised financial liberalization index, the findings indicate that, as earlier, financial liberalization leads to a significant reduction in financing constraints: a 10% rise in cash flow implies a rise in investment by about 1.5%. Under the revised financial liberalization index, the sensitivity of cash flows to financial liberalization is smaller than earlier, suggesting that the omitted dimension of financial liberalization in influencing the cash flow sensitivity of firms. These magnitudes are akin to those reported by Laeven (2003) in the cross-country study covering the period 1988–98. Likewise, as earlier, investment is positively affected by the firm's leverage.

Table 8
Financial liberalization and financing constraints: robustness tests

Variables	Model 4	Model 5	Model 6
Constant	-0.291 (0.002)*	-0.209 (0.001)*	-0.503 (0.276)***
Lagged dependent variable	0.0006 (0.00001)*	0.0006 (9.3×10^{-6})*	0.00002 (0.002)
Q_t	0.06 (0.01)	-6.8×10^{-4} (0.007)	-0.04 (0.07)
$(CF/K)_t$	0.151 (0.035)*	0.075 (0.031)*	0.331 (0.075)*
$(LEV)_t$	0.249 (0.068)*	0.396 (0.091)*	0.665 (0.499)
$FLI6 * Q_t$	-0.001 (0.003)		
$FLI6 * (CF/K)_t$	-0.280 (0.088)*		
$FLI6 * (LEV)_t$	0.859 (0.098)*		
Small * $Q_t * FLI7$		0.0001 (0.0005)	
Small * $(CF/K)_t * FLI7$		-0.119 (0.052)**	
Small * $(LEV)_t * FLI7$		0.154 (0.056)*	
$FLI7 * Q_t$			0.069 (0.104)
$FLI7 * (CF/K)_t$			-0.772 (0.380)**
$FLI7 * (LEV)_t$			0.070 (0.611)
<i>Diagnostics</i>			
No. of observations, time period	4997; 1995–2004	4997; 1995–2004	1837; 2000–2004
Sargan test	61.33 (0.19)	115.23 (0.14)	5.61 (0.34)
m1 (<i>p</i> -Values)	-1.01 (0.31)	-1.00 (0.31)	-0.49 (0.62)
m2 (<i>p</i> -Values)	-0.15 (0.88)	-0.43 (0.67)	-1.04 (0.29)

Standard errors in brackets.

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

In the regression specifications, Q is taken as $Q * 100$.

m1 and m2 stand for first and second order residual autocorrelation tests and follow $N(0,1)$.

In the second specification, looking at the coefficients on the multiplicative terms, we find that financial liberalization significantly eases financing constraints for small firms. More specifically, small firms that face serious financing obstacles before liberalization, appear to encounter lower financing constraints after liberalization. In terms of magnitudes, all else being equal, a 10% decline in cash flow implies a decline in investment by about 0.7% before financial liberalization and a 1.2% increase for small firms, post liberalization. In other words, for small firms, financial liberalization reduces financing constraints by 70% for small firms. Laeven (2003) reported an 80% reduction in financing constraints across all firms post liberalization in their cross-country study.

In the third and final specification, we compare financing constraints of firms during the second half of the sample. Financial liberalization is a gradual process and its effects are often felt over an extended time span. Therefore, it might well happen that while financial liberalization alleviates financing constraints, the effect is much more pronounced during the second half of the sample period, when significant progress was effected along the several dimensions of financial sector reforms. Accordingly, we split the sample into two sub-periods: 1995–1999 and 2000–2004. It may be mentioned that in India, subsequent upon the initiation of financial sector reforms in 1992, a committee was appointed in 1997 to do a stock-taking of the first phase of financial sector reforms and suggest the course for future path of reforms (Government of India, 1998). These reforms which began to be effected around from the year 2000 are widely heralded as the ‘second generation’ reforms and encompassed areas like adoption of 90-day norm for recognition of sticky loans, further rationalization of reserve requirements, significant progress towards capital account convertibility and further relaxation in credit and interest rate controls (Mohan, 2005; Reddy, 2005).

The revised set of estimation results supports the fact that financing constraints were substantially eased during the latter half of the sample period. A 10% decline in cash flow implied a decline in investment by 3.3% before 1999 and by nearly 8%, post 1999. However, the persistence in investment was noticeable by its absence. There is also evidence to suggest that while investment was positively affected by firm leverage, it was not significant at conventional levels.

To summarize, the results lend credence to the fact that financial liberalization led to a significant reduction in financing constraints, especially for small firms. The effect of the easing of financing constraints was more pronounced during the latter half of the sample period.

8. Concluding remarks

The impact of financial liberalization measures, which have recently been implemented in several emerging economies have received significant attention. The present study investigates whether financial liberalization affects corporate investment in India. More specifically, we tested for the hypothesis that financial liberalization had an impact on firms’ investment behavior. Towards this end, we estimated a dynamic investment model using panel data on over 1000 firms for the period 1995–2004 coinciding with a decade of liberalization. The main finding is that cash flow variable has become less important for the firms’ investment since liberalization. This implies that financial liberalization improves the access of financially constrained firms to external finance. This easing was particularly notable in the case of small firms and in fact, became more pronounced during the latter half of the sample period. Pre-liberalization, large firms often tend to corner a significant chunk of the preferential credit by virtue of political economy considerations, which tends to disappear once liberalization begins to take effect, when commercial considerations become paramount. Gradual financial liberalization tailored to country-specific considerations therefore, seems to be a good prescription for removing financing constraints. The Indian case seems to validate this point.

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