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Abstract

This study investigates the key drivers of corporate investment in India. Specifically, we analyze the relative importance of investment opportunities available to firms, measured by Tobin's Q, and financial constraints they face in capitalizing on these opportunities. We show that capital expenditure responds positively to investment opportunities, especially after the financial sector reforms in the mid-2010s, consistent with the idea that these reforms have improved the allocative efficiency of the Indian financial system. Yet, there is strong evidence of financial frictions that Indian firms face as evidenced by a significant correlation between investments and the availability of internal cash flows. Our findings highlight the quality-quantity tradeoff of corporate investment in India: quality of investment have improved in the past decade but it has come at the expense of quantity of investment for firms without access to wider credit markets.

Keywords: Financial Constraint, Corporate Investment

JEL Classification:

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1 Introduction

Capital investments by the private sector is vital for a country's economic growth. For India to achieve a sustained level of growth in the range of 6-8% per annum over a long period of time, its private sector must invest at a consistent pace in the coming decades. What drives investments by Indian corporations and what frictions do they face in doing so? At a very broad level, corporate investments are driven by two primary factors: the investment opportunities available to the firms and their ability to capitalize on these opportunities by raising enough external funds. Lack of opportunities or lack of funds to capitalize on them can both have severe implications for corporate investments, and consequently on economic growth, employment generation, and overall development of the country. Our paper analyzes the drivers of corporate investment in India within this overarching framework, and provides suggestions for policy initiatives to boost growth. We pay special attention to the effect of financial sector reforms in mid-2010s to shed light on the effectiveness of these policies and draw lessons for future reforms.

We build our empirical work under the framework of classical Tobin's Q model of corporate investment, augmented further with theories of investment under the presence of financial frictions (Tobin, 1969; Hayashi, 1982). The core idea of the Tobin's Q model is simple and intuitive: if the market value of a firm is higher than the replacement value of its assets, then the assets are valued higher inside the firm as compared to outside. Therefore, firms with a higher ratio of market value to replacement value, popularly known as the Tobin's Q, should invest more. While the precise measurement of a firm's replacement cost and market value, especially for the marginal assets, remains a contentious issue in the literature, a well-known first approximation of Q is the ratio of market-to-book value of a firm's asset. Tobin's Q provides a succinct measure of the firm's investment opportunity set. If firms face no financial frictions, then their investment should solely respond to variation in their investment opportunity set: firms with higher Q should invest more and periods with higher

Q should see more corporate investments in aggregate.

Unfortunately, firms might not be able to invest as much as is dictated by their investment opportunity set because of various financial frictions they face. A large literature in finance and economics emphasizes the role of information and agency frictions that limit a firm's ability to raise funds to fully capitalize on their investment opportunities as captured by their Tobin's Q. For example, firms might face credit rationing due to information frictions as in Stiglitz and Weiss (1981), or they may be limited in their ability to raise external funds due to agency conflicts as in Holmström and Tirole (1997).

Seminal work by Fazzari, Hubbard, and Petersen (1988) develop this idea rigorously by introducing the idea of "investment-cashflow sensitivity". The core idea is simple: if firms are unable to raise external capital to fund all of their profitable investments, then their investment would be sensitive to their internal cashflows in addition to Q. Specifically, they show that firms invest more when they have higher internal funds, after accounting for differences in their investment opportunity set as captured by Tobin's Q. Since internal funds are least costly in terms of financial friction cost – for example, they do not suffer from the adverse selection cost faced by an informed insider – Fazzari et al.'s finding suggests the presence of large financial frictions for the private corporations in the U.S. (see Hubbard (1998) for further discussions).[1] A natural implication of this line of research is that policies, both at the macro level and at the firm level, that can alleviate financial frictions can help boost corporate investment and thus aid in economic growth. How large are these frictions for the Indian corporations? What factors exacerbates and helps alleviate these frictions? What implications have recent policy reforms, such as cleaning up of the banking sector's balance sheet, had on investment growth in India? Our empirical study is geared towards addressing these questions for Indian corporations using recent data.

[1]Fazzari et al. (1988) spurred a voluminous literature on corporate investments and financial constraints. They can be broadly categorized into three categories: (a) mis-measurement of marginal Q, (b) the endogenous relation between a firm's internal cashflows and investment opportunity set, and (c) measures of financial constraint. Notable contributions include Kaplan and Zingales (1997); Alti (2003); Erickson and Whited (2000); Gomes (2001); Whited (1992); Rauh (2006).

Our primary sample covers all publicly listed Indian companies in the CMIE Prowess database between 2006 and 2024 since the data availability became better after 2005. Our focus on listed firms is driven solely by the fact that we need market prices of firm's equity to compute their Q, our main proxy for investment opportunity. In some analysis, we also make use of a subset of unlisted companies for which sufficient data is available for the particular analysis. We measure the intensity of investment by the ratio of annual capital expenditure scaled by the beginning of the year total assets of the firm. During our sample period of 2006-2024, the investment rate has averaged around 7% of the asset value of the firm, with a large cross-sectional and time-series variation. Notably, the average investment rate was between 8-10% during 2006-2008, i.e., before the global financial crisis, and it gradually declined to a level below 6% by 2020, i.e., before the COVID-19 pandemic. After a significant decline to a level of 4% during the pandemic year, there has been some recovery in corporate investments in the recent years. These patterns present a clear aggregate picture: corporate investment declined in the last decade, but they are on a recovery path since the post-pandemic period.

In our core empirical analysis, we show that the Indian corporations invest more when they have higher Q consistent with the basic theory of investments proposed by Tobin (1969); Hayashi (1982). One standard deviation increase in Q is related to almost 0.20 standard deviation higher investments in the following year. The estimate translates into a 1.4% higher investment for a unit increase in Q. As a benchmark, Fazzari et al. (1988) find a corresponding estimate of 3%, suggesting that the investments by the Indian firms are relatively less sesitive to their Q in India compared to their U.S. counterparts.[2] Further, we find that Indian firms invest more when they have higher internal cashflows, a finding consistent with the presence of financial constraints they face in raising external fund. One standard deviation increase in internal cashflows is associated with an increase of almost 0.06 standard deviation higher investments.

[2]A natural caveat in comparing these sensitivities across countries is that they differ in their accounting standard and hence we should interpret them with caution.

A key empirical question, both from academic and policy perspective, concerns with the nature of firms who exhibit higher investment-cashflow sensitivity as it allows us to better understand the kind of firms that are more constraint. Various proxies and measures of financial constraints have been proposed in the literature. We focus on two key measures of financial constraints. Our first measure is a firm's listing status since listed firms have wider access to the public equity market and arguably suffer from lower asymmetric information problem due to enhanced disclosure requirements they face. Surprisingly, we do not find any differential sensitivity across listed and unlisted firms when we estimate a model of investment-cashflow regression after dropping the Q variable.[3] Therefore, access to public equity market does not ameliorate the average Indian firm's dependence on internal cashflows when it comes to their investment decision.

We next consider a firm's age as a proxy for financial constraint motivated by the work of Hadlock and Pierce (2010) who show that firm age, i.e., how young a firm is, is a strong indicator of financial constraint a firm faces. The investment-cashflow sensitivity is significantly higher for younger firms, consistent with the idea that young firms face larger frictions in raising external capital to fund their positive net present value (NPV) projects. A newly born firm exhibits almost 30% higher sensitivity compared to the firm with the median age in our sample. Combined with our earlier result that access to public equity market doesn't seem to affect the investment-cashflow sensitivity, the finding suggests that younger firms face higher frictions in accessing other sources of external funds such as bank loans or bond market. Therefore, policy designs that can help smaller and young firms get better access to credit markets can be helpful in spurring investment growth in the economy.

In the remainder of our analysis, we turn to two important events during our sample period, one related to a structural reform in the Indian financial sector and the other to a crisis in the system. The first event, namely the Indian Bankruptcy Code of 2016, is a bankruptcy

[3]We cannot control for Q in these regressions since these are unobserved for unlisted firms. Instead, we include industry-year fixed effects in these model to account for industry-time specific variation in investment opportunity sets.

reform act that was aimed at faster resolution of distressed assets and consequently improving access to external finance. The implementation of this act roughly coincided with the cleaning up of the non-performing assets of the Indian banking system. We consider these two events as a step towards a structural reform of the Indian financial system, and analyze how firms invested in capital expenditure after these reforms. We first document that corporate investments have become more sensitive to Q after 2015, a finding consistent with the idea that after these reforms the quality of investments has improved: firms with better projects are investing more. The quantitative magnitude of the effect is strong as well: almost 50% increase in investment-Q sensitivity after the reform compared to before. Second, we show that post-reform, investment-cashflow sensitivity has come down considerably, indicating that firms rely less on internal funds compared to before. On average this is indicative of relaxation of financial constraints over time; however, the constraints remain large in the absolute sense.

The average effects masks an important variation across firms: we show that firms that depended heavily on bank borrowings experienced significantly stronger investment-cashflow sensitivity after the reforms. Bank borrowing is a major source of financing for most Indian firms, including the listed companies. The evidence is consistent with the idea that the banking sector was less willing to extend credit to borrowers dependent on them, and lacking any other source of funds these firms cut their investments when they had little-to-no cashflows to invest. The finding is consistent with both increased level of screening and heightened risk-aversion of the banking sector in the post-2015 period. Collectively these results show that in the post-reform period, the financial constraints become more binding for firms that were bank dependent; but less binding for firms with other sources of credit such as corporate bond market or NBFIs. Therefore, firms with access to broader credit markets, i.e., beyond bank financing, faced lower constraints and as a result they were able to invest at a higher rate even when they had relatively small amount of internal cashflows. A plausible policy prescription that emerges from these analyses is that improving access to market based

credit can enhance private investment in the country. Policies geared towards deepening the corporate bond market or non-bank sources of lending can be beneficial from this perspective.

Of course, such a policy is not without its own risk. We shed some light on this issue on the final part of the paper. NBFIs have become an important source of financing for Indian firms over the years (Agarwal, 2024). In our final set of tests, we use the NBFI crisis of 2018-19 in India as a shock to access to external funds. We now compare firms that borrowed from the NBFIs with firms that never borrowed from them to estimate our base model in a difference-in-difference setting. Such an empirical specification is relatively less immune to the critique of investment-cashflow literature such as mis-measurement in Q or endogenous relation between cashflows and investment opportunity set. We find that after the collapse of ILFS, firms that borrowed from the NBFIs decreased their investment by a significant amount, compared to before the collapse. Therefore, while accessing non-bank sources of funds can be a useful tool to increase credit and investments on average, it also comes with the risk of increased vulnerability to these shocks, as would be expected in any economy that increases its reliance on non-bank sources of funds. While beyond the scope of this paper, a plausible policy prescription to balance these conflicting effects of non-bank lenders is to require them to hold more equity capital that can limit the occurrence of stress in this sector. Wider access to a well-capitalized non-bank lending system can be a potential mechanism to improve investment growth in the country.

A limitation of our study is that our cross-sectional regressions cannot precisely pin down the drivers of aggregate patterns in investments. However, our results are consistent with the economic intuition that the banking sector increased their credit standards after the reform. Only the most creditworthy borrowers or firms with access to non-bank sources of funds, for example the largest firms, could obtain credit from banks. Consequently, investments occurred at the most valued firms, i.e., the investments became more sensitive to Q on average, and firms with access to non-bank credit became less constrained. Our study cannot tease out the effect of macroeconomic shocks on corporate investments since we cannot aggregate

the micro effects without properly considering the role of macro events and aggregation across firms. The aggregate investment can come down due to broader macro trends, for example, due to aggregate decline in demand or unexpected shocks such as COVID-19 for all firms, whereas our study only allows us to comment on distribution of investments across firms. A careful examination of these overall effects is beyond the scope of this paper as it requires a detailed examination of these macro trends and a model that can capture the aggregate effects, including the effect of reallocation of credit and investments across firms.

In sum, our paper makes three key points. First, Indian firms, especially younger firms, face significant frictions in raising external capital. Therefore, alleviating frictions in access to small firms can be a reasonable approach to improve corporate investment in India. Second, equity-market dependence does not seem to matter much for investment cash flow sensitivity, suggesting that it is primarily the credit market friction that needs to be addressed for achieving higher growth. Third, after the bankruptcy code reform and NPA clean up, firm investment has become more sensitive to Q and less to their internal cashflows. Part of this effect comes from increased importance of market-based sources of credit that bring with them the element of market discipline and better screening of projects. Therefore, in a cross-sectional sense, the allocative efficiency of financial markets have improved. However, in the aggregate, the level of investment has come down. Policy initiatives that can widen the access to market-based credit to smaller and younger firms can be an effective tool in boosting investments.

2 Data and Sample

In this study we use firm-level data from the Prowess database, maintained by the Centre for Monitoring Indian Economy (CMIE). Prowess is a comprehensive financial database covering over 50,000 Indian companies, including both publicly listed and a substantial number of unlisted firms. The database provides detailed information on financial statements

and market indicators, allowing for the construction of key variables used in our analysis.

We start with annual financial data for all firms available in the database. We exclude firms classified under financial services (NIC codes: 64–66) and drop observations with non- positive equity-to-asset ratios to remove firms that are likely to be insolvent or financially distressed. The dataset is further augmented with firm-year information on market capitalization. Our sample consists of non-financial firms in India spanning the period 2006–2024. We further restrict the sample to firms with non-missing and strictly positive values of Tobin's Q, which serves as a proxy to identify listed firms. The resulting panel of listed firms comprises over 2,000 companies, covering more than 20,000 firm-year observations. The effective sample size varies across key variables due to missing financial information.

Our key dependent variable, investment, is measured as the ratio of additions to gross fixed assets to lagged total assets. Investment opportunities are measured by Tobin's Q, calculated as the ratio of the market value of assets to the book value of assets. Bank borrowing is defined as the sum of short-term and long-term borrowings from banks. NBFI borrowing and market borrowing are constructed analogously, based on borrowings from non-bank financial institutions and market sources, respectively. Bank dependency is measured as the ratio of bank borrowing to total borrowing, where total borrowing is the sum of short-term and long-term borrowings from all sources. Firm size is proxied by the natural logarithm of the book value of lagged total assets. All continuous variables are winsorized at the 2.5th and 97.5th percentiles to mitigate the influence of extreme outliers.

Table 1: Summary Statistics - Listed Firms

	N	Mean	SD	p25	Median	p75	p90
CashFlow/ Asset	19,821	0.07	0.11	0.01	0.07	0.13	0.19
Equity/ Asset	22,486	0.47	0.22	0.30	0.45	0.63	0.78
Investment/ Asset	17,862	0.07	0.08	0.01	0.04	0.09	0.17
Collateral/ Asset	22,422	0.31	0.19	0.15	0.29	0.44	0.58
Q	22,486	1.64	1.29	0.89	1.15	1.84	3.28
BankBorrowing	18,272	2,069.19	3,011.80	35.80	474.75	2,708.20	8,743.10
NBFIborrowing	18,272	17.47	44.54	0.00	0.00	0.00	142.00
MarketBorrowing	18,272	110.94	266.41	0.00	0.00	0.00	846.40
BankBorrowing/totborrowing	17,117	0.60	0.39	0.23	0.68	0.96	1.06
NBFIborrowing/totborrowing	17,117	0.03	0.10	0.00	0.00	0.00	0.09
MarketBorrowing/totborrowing	17,117	0.06	0.16	0.00	0.00	0.00	0.21

Note: Borrowing-related variables are summarized for post-2010 observations. Sample of all listed firms covered in Prowess database. Ratio variables are winsorized at 2.5% from both tails.

Table 1 reports summary statistics for the key variables used in our analysis of listed firms, the sample that forms most of our empirical tests. The average investment-to-asset ratio is 0.07, with a standard deviation of 0.08. The average equity-to-asset ratio is 0.47 and standard deviation is 0.22. Investment opportunities, as measured by Tobin's Q, average 1.64. The median value of Tobin's Q is 1.15, while the 90th percentile is approximately 3.28. Cash flow-to-asset and collateral-to- asset ratios average 0.07 and 0.31, respectively. Regarding financing sources, average bank borrowing is 2,069 million rupees, with a median of 475 million rupees. Borrowing from non-bank financial institutions (NBFIs) and market-based sources averages 17.47 million rupees and 110.94 million rupees, respectively. Bank borrowing constitutes approximately 60% of total borrowings on average, whereas the shares of NBFI and market borrowings are 3% and 6%, respectively. Since firms also borrow from multiple other sources, such as inter-corprorate loans or loans from promoters, these fractions do not add up to 1.

We also report comparable statistics for a large sample of unlisted firms in Table 2. Unlisted firms display slightly lower investment rates, averaging 0.06, with similar dispersion. The average equity-to-asset ratio is 0.45, with a standard deviation of 0.24.

Table 2: Summary Statistics -Unlisted Firms

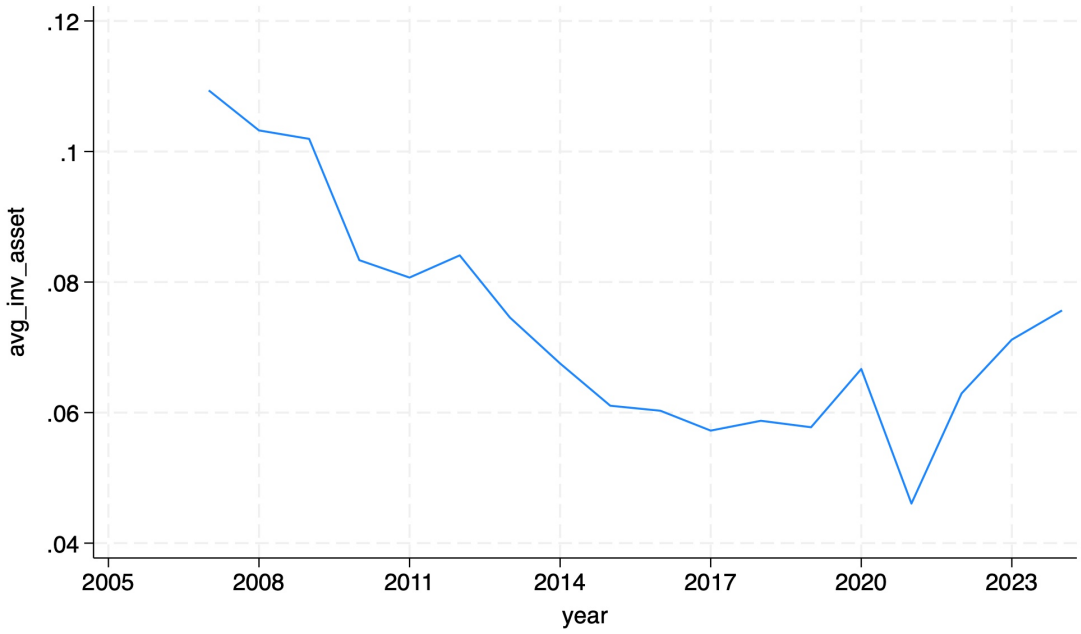
	N	Mean	SD	p25	Median	p75	p90
CashFlow/ Asset	23,821	0.06	0.12	0.00	0.06	0.13	0.21
Equity/ Asset	34,238	0.45	0.24	0.27	0.43	0.63	0.81
Investment/ Asset	24,598	0.06	0.08	0.01	0.03	0.07	0.16
Collateral/ Asset	33,658	0.26	0.20	0.08	0.22	0.39	0.56

Note: Sample of all unlisted firms. Variables are winsorized at 2.5% from both tails

3 Empirical Analysis

We first present some summary statistics to motivate our empirical work that exploits cross-sectional and time-series variation with the panel data. Figure 1 presents the evolution of corporate investment in India over time based on the sample of listed firms. In the early parts of our sample, i.e., just before the onset of the global financial crisis (GFC), Indian firms invested at a high rate of over 10% on average. There has been a steady decline since 2011 when the investment rate fell below 8% and finally to a level below 6% between 2015 and 2018. The COVID-19 pandemic further decelerated the decline, with an all time low investment rate of just over 4% in 2021. Since then the private sector capital expenditure has improved, reaching a level of 7% by 2024.

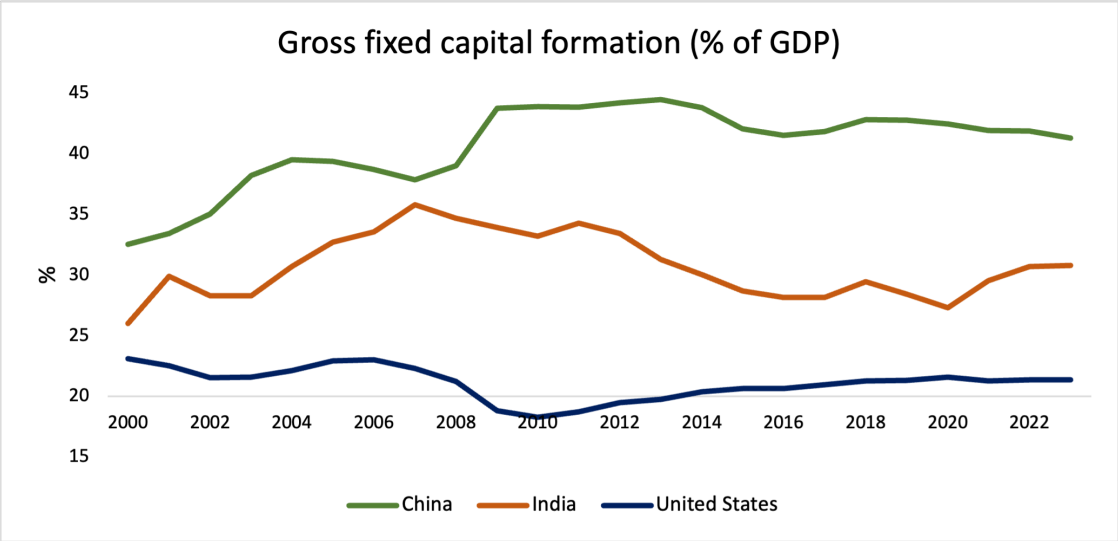
Figure 1: Average Investment/Assets over time



The aggregate statistics reveals the challenges faced by the Indian economy in terms of low capital investment, especially considering the important role of these investment in aiding the aggregate economic growth. For example, China has a significantly higher rate of private investment compared to India, as shown in Figure 2.[4]

[4]The figure plots the aggregate private sector capital expenditure as a fraction of GDP. Therefore, we cannot directly compare it with our base measure, the investment rate, used in the rest of the paper. The figure, however, provides a broad sense of private investments in these economies.

Figure 2: Cross-Country Comparison



3.1 Base Model

What are the primary drivers of investment in India? We address the central question of our paper with the following regression model using the panel data of all listed firms covered in the CMIE database over 2006-2024 period:

$$\frac{I_{it}}{A_{i,t-1}} = \alpha_i + year_t + \alpha Q_{i,t-1} + \beta \frac{CF_{i,t}}{A_{i,t-1}} + \epsilon_{it}; \tag{1}$$

where $\frac{I_{it}}{A_{i,t-1}}$ measures the capital expenditure of firm i in year t scaled by its asset value at the end of year $t-1$, $Q_{i,t}$ measures the market-to-book ratio of the firm's asset, $CF_{i,t-1}$ is the net operating cash flow of the firm. We include year and firm fixed effect in the model to soak away broad macroeconomic trends and firm-specific skills. We include control variables such as firm size in different specifications that we describe later as we present the results. We standardize all the variables in the study so that our coefficients can be interpreted in terms of units of standard deviation of each variable. All standard errors are clustered at the firm level

Table 3: Investment-Q and Cash Flow Regression

	Investment/Asset		
	(1)	(2)	(3)
Lagged Q	0.1994***	0.1920***	0.1921***
	(0.0168)	(0.0169)	(0.0171)
Internal CashFlow		0.0592***	0.0572***
		(0.0121)	(0.0121)
Log(Assets)			-0.3404***
			(0.0522)
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Sample	Listed Firms	Listed Firms	Listed Firms
Nobs	16,898	16,612	16,612
Adjusted R-squared	0.2541	0.2551	0.2590

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Table 3 provides the regression estimation results. Column (1) only uses the lagged value of the firm's Q as the explanatory variable in addition to firm and year fixed effects. We find a positive and significant coefficient of 0.1994: firms with one standard deviation higher Q invest almost 0.2 standard deviation more. The effect translates to an increase of almost 1.4% higher investment for every unit increase in Q. A positive and significant coefficient on Q is expected, and is consistent with the basic economic theory that firms with greater access to good projects should invest more. Efficient economies should have higher sensitivity of investment to Q as it measures how efficiently is the capital deployed in the economy. Lower sensitivity of investment to Q corresponds to a system where investments across firms are distributed in accordance to opportunities they have. Hence, firms with poor opportunity invest more compared to the ones with better opportunity, resulting in a loss of economic efficiency. While we cannot directly compare these coefficients across countries due to inherent differences in accounting standards and economic structure, the estimated coefficient for the Indian economy is lower than the coefficient estimated for the U.S. firms in various studies.

For example, Fazzari et al. (1988) find a corresponding estimate of 3% compared to 1.4% that we document for our sample.

In Column (2), we add the internal cash flow of a firm as an additional explanatory variable. We find a positive and significant coefficient on cashflows, suggesting that firms with higher cashflows invest more even after holing their investment opportunities constant. The effect is economically large: an increase of almost 0.06 standard deviation in investment for a standard deviation higher cash flows. In an ideal frictionless benchmark, investments should only depend on the extent of projects a firm has. Said differently, firms with good project should be able to raise money to fund their positive NPV projects (Modigliani and Miller, 1958). But in reality firms face frictions in raising capital even for good projects; therefore, those with more internal cashflows invest more. The positive and significant coefficient on cashflow variable is consistent with the idea of large financial constraints that the Indian firms face. Column (3) shows that the coefficients on either Q or cashflows do not change with the inclusion of firm size, as proxied by log of their total assets, as a control variable.

3.2 Variation across firms

Early work on investment-cashflow sensitivity focused on sorting firms based on ex ante characteristics and then studying whether firms that more likely to be constrained exhibit higher investment-cashflow sensitivity. For example, the work by Fazzari et al. (1988) and several that followed focussed on firms that pay dividends versus firms that don't. Since dividend payment can be a residual decision, net of investment decision of a firm, we choose other firm characteristics that have more natural and economically appealing properties in terms of sorting firms along the financial constraints dimension. We first study whether a firm is listed on the BSE or NSE stock exchange or not. Financial frictions are likely to be lower for the listed firms: they have access to the public equity market and they also provide better disclosure to the public, making a key source of frictions, namely the asymmetric

information problem between the insiders and outsiders of the firms, less acute. A natural limitation of this specification is that we are unable to control for Q. Therefore, we include fixed effects for time-varying industry level investment opportunity by including fixed effects for industry-year pair in the regression model.

Table 4: Investment-Listed and Unlisted Firms

	Investment/Asset	
	(1)	(2)
Listed Firm	0.1818***	0.1749***
	(0.0423)	(0.0421)
Internal CashFlow	0.0536***	0.0520***
	(0.0088)	(0.0089)
Listed Firm * Internal CashFlow	0.0111	0.0086
	(0.0143)	(0.0144)
Log(Assets)	-0.5708***	-0.5952***
	(0.0316)	(0.0319)
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Industry-Year Fixed Effects	No	Yes
Sample	Full Sample	Full Sample
Nobs	37,920	37,824
Adjusted R-squared	0.2807	0.2925

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

We estimate the model by including the interaction of a firm's listing status with its cashflows. Results are provided in Table 4. We find no differences in investment-cashflow sensitivity across listed and unlisted firms in our sample. These results suggest that dependence on internal cash flows is not due to differential access to equity markets; rather, firms' access to credit markets seem to be driving the results. Therefore, policy decisions aimed at improving access to credit are likely to be helpful in allowing firms with lower cashflow, but better opportunities, to invest more.

We now consider a firm's age as another ex ante characteristic for its financial constraints.

Young firms face higher information and agency frictions since both their business and their managers are less likely to be well established in financial markets. Hadlock and Pierce (2010) provide compelling evidence that firm age is one of the strongest measure of financial constraints used in the empirical literature. Using the date of incorporation of a firm as its founding date, we create a measure of firm age in years and repeat the regression model used earlier with listing status as the proxy for constraints. Results are provided in Table 5. We find a significant negative coefficient on the interaction term $cashflows \times age$. Therefore, younger firm's investments are more sensitive to their internal cashflows compared to their older, more established counterparts.

Table 5: Investment-Firm Age

	Investment/Asset	
	(1)	(2)
Internal CashFlow	0.0772***	0.0927***
	(0.0130)	(0.0248)
Internal CashFlow * Firm Age	-0.0007**	-0.0011**
	(0.0003)	(0.0005)
Log(Assets)	-0.5518***	-0.3393***
	(0.0313)	(0.0523)
Lagged Q		0.1932***
		(0.0170)
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Sample	Full Sample	Listed Firms
Nobs	37,920	16,612
Adjusted R-squared	0.2803	0.2592

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Overall these results show that access to external funds is a critical factor impeding investments by the Indian firms, and the younger firms face higher frictions. Access to the public equity market is unlikely to be an inhibiting factor.

3.3 Reforms in the financial sector

We now analyze the effect of two key reforms in the mid-2010s on our base case estimates: the 2016 Bankruptcy and Insolvency Code that reformed the bankruptcy procedure for Indian businesses and the cleaning up of the non-performing loans of the banking sector. Agarwal (2024) provides a comprehensive discussion of these reforms and the institutional background. In a nutshell, these reforms were aimed at improving creditor rights by improving the resolution of distressed assets in a timely manner, and improving the risk-culture of the Indian banking sector. While the specifics of these two reforms are different and they target different objective, a connecting theme across the two reforms is to improve the allocation of capital by the Indian credit markets. Streamlining the bankruptcy resolution can increase access to credit by all creditors, but specially by arms length or non-relationship creditors who may lack access to precise information about the borrowers prospect. Seminal work by La Porta, Lopez-de Silanes, Shleifer, and Vishny (1998) shows the importance of creditor rights on credit creation in an economy. However, increased creditor rights might also result in a bias for liquidation and it may also change the composition of debt structure a firm obtains Vig (2013).

Motivated by this line of work, we ask whether the Indian banking sector's reform change the key drivers of investment decisions of firms. There are two, not mutually exclusive, channels that can affect firms investment decisions. If creditors are more confident in their ability to recover the distressed debt, then firms with better projects can obtain credit even if they don't have enough internal cashflows. Therefore, the investment-cashflow sensitivity should decrease after the reforms. At the same time, if banks are more prudent in their lending decisions then credit, and by extension investment, is more likely to flow to firms with higher Q. On the other hand if banks make imprudent lending decisions, as was evident by large hidden losses of the Indian banks due to their lending decisions in the late 2000s, then firms with poor investment opportunity might get credit and over-invest. Therefore, the

investment-Q sensitivity is likely to go up after these reforms.

We create a dummy variable $postNPA$ that equals one for years after 2015 and zero otherwise. We estimate the following model:

$$\frac{I_{it}}{A_{i,t-1}} = \alpha_i + year_t + \alpha_1 Q_{i,t-1} + \alpha_2 Q_{i,t-1} \times postNPA + \beta_1 \frac{CF_{i,t}}{A_{i,t-1}} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} \times postNPA + \epsilon_{it}; \quad (2)$$

α_2 and β_2 allow us to estimate the differential effect of Q and cashflows on investments before and after the process of reform started.

Table 6: Investment-NPA Reform

	Investment/Asset	
	(1)	(2)
Lagged Q	0.1469***	0.1388***
	(0.0286)	(0.0285)
postNPA * Lagged Q	0.0524*	0.0678**
	(0.0269)	(0.0276)
Internal CashFlow	0.0574***	0.0951***
	(0.0121)	(0.0202)
Log(Assets)	-0.3569***	-0.3511***
	(0.0531)	(0.0531)
postNPA * Internal CashFlow		-0.0596**
		(0.0232)
Firm Fixed Effects	Yes	Yes
Year Fixed Effects	Yes	Yes
Sample	Listed Firms	Listed Firms
Nobs	16,612	16,612
Adjusted R-squared	0.2593	0.2598

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

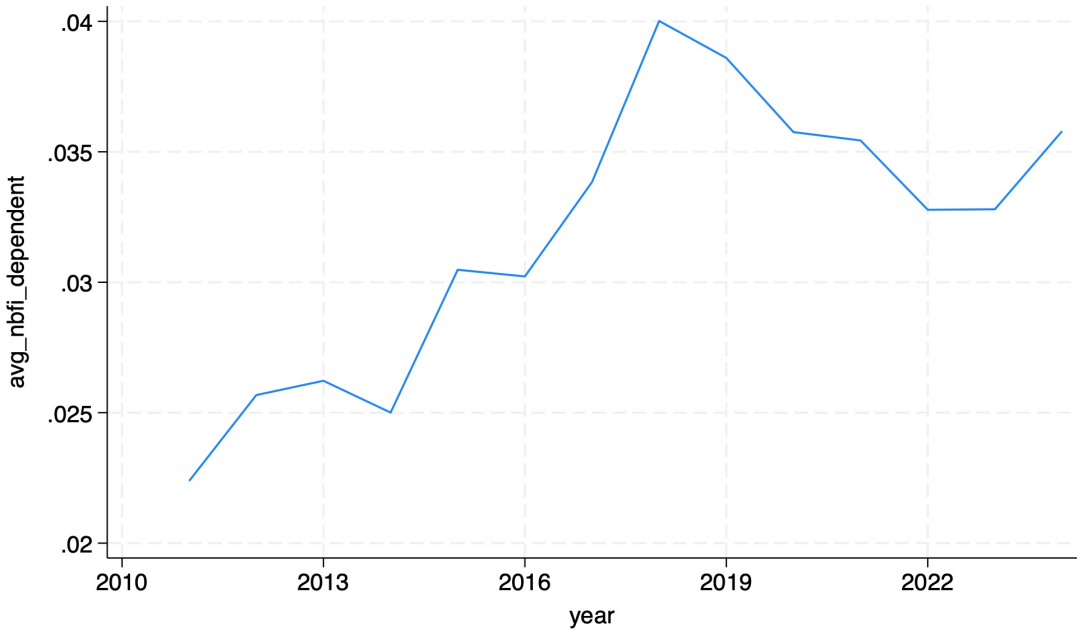
Table 6 presents the results. Column (1) shows that the sensitivity of investment to Q increased significantly after the reforms. The economic magnitude is meaningful as well. The

unconditional coefficient (i.e., β_1 in the model above) is about 0.15, whereas the coefficient on the interaction term is 0.05. Therefore, the sensitivity increased by almost 1/3rd of the earlier level after the reforms. Higher sensitivity of investment to Q is indicative of more efficient capital allocation in the economy after the reforms since firms with better investment opportunities are investing more compared to the pre-reform era.

Column (2) includes the interaction of post-reform dummy variable with the cashflow measure. After the reform, the investment-cashflow sensitivity has come down. Therefore, the financial constraints faced by firms has come down for the average firm as well. Where did these firms obtain funds during this period?

We now consider variation in their sources of funds. There are three primary sources of credit for our sample firms: bank credit, credit from corporate bond market, and credit from non-bank Financial Institutions (NBFIs). We create measures of borrowings from these sources by dividing a firm's borrowing from each source to the firm's total borrowings. Since there are some other categories of borrowing, for example inter-corporate loans, loans from promoters, deferred long term tax credit, and so on, the sum of these three categories does not equal one. As shown in Table 1, bank borrowing represents an overwhelmingly large fraction of the firm's total borrowing, followed by market and NBFI borrowing. Interestingly, borrowing from the NBFI has been rising over time as shown in Figure 3. The average firm's borrowing from the NBFI sector reached a peak of 4% in 2018 in our sample before a significant drop after the collapase of ILFS.

Figure 3: Borrowing from NBFI



We now estimate the following triple-difference model to assess how investment-cashflow sensitivity has evolved before and after the reform for firms that depend on banks versus other sources of credit:

$$\frac{I_{it}}{A_{i,t-1}} = \alpha_i + year_t + \alpha_1 Q_{i,t-1} + \beta_1 \frac{CF_{i,t}}{A_{i,t-1}} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} \times postNPA + \gamma_1 Bank_{i,t} + \gamma_2 postNPA \times Bank_{i,t} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} \times Bank_{i,t} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} \times postNPA \times Bank_{i,t} + \epsilon_{it}; \quad (3)$$

$Bank_it$ measures the percentage of borrowing that a firm obtains from banks. Results are provided in Table 7. We estimate the model by including different interaction terms in steps, and document these results in different columns of the Table. Column (1), that omits the triple-interaction term, shows that bank dependence does not have any additional explanatory power in explaining the investment-cashflow sensitivity for the entire sample. Column (3) presents the key finding. The double interaction term between $postNPA$ and $cashflow$ variable is negative and significant, indicating that firms that do not rely on bank borrowings

are the ones that experienced a significant decline in their investment-cashflow sensitivity after the reform. Bank dependent firms, on the other hand, experienced a significant increase in investment-cashflow sensitivity after reforms. Said differently, after the financial sector reforms started in India, there was a divergence in financial constraints that firms faced. Firms with access to other sources of credit - corporate bond market of NBFI - saw a relaxation in their constraint, whereas bank dependent borrowers experienced an increase.

These results show that the average decrease in investment-cashflow sensitivity after the reform masks an important distributional effect. On average, larger firms have better access to non-bank sources of funds. These firms experienced improved access to credit as the reform process started. On the other hand, smaller and younger firms that lack access to winder markets experienced a decline.

Table 7: Investment-Bank Dependence

	Investment/Asset		
	(1)	(2)	(3)
Lagged Q	0.1926***	0.1923***	0.1961***
	(0.0170)	(0.0170)	(0.0172)
Internal CashFlow	0.0512**	0.0573***	0.1380***
	(0.0205)	(0.0121)	(0.0374)
Bank Borrowing	-0.0219	-0.0341	-0.0384
	(0.0233)	(0.0408)	(0.0411)
Bank Borrowing ∗ Internal CashFlow	0.0086		-0.0652
	(0.0236)		(0.0433)
Log(Assets)	-0.3409***	-0.3412***	-0.3343***
	(0.0522)	(0.0522)	(0.0525)
postNPA ∗ Bank Borrowing		0.0167	0.0228
		(0.0429)	(0.0431)
postNPA ∗ Internal CashFlow			-0.1207***
			(0.0426)
postNPA ∗ Bank Borrowing ∗ Internal CashFlow			0.0988**
			(0.0502)
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Sample	Listed Firms	Listed Firms	Listed Firms
Nobs	16,612	16,612	16,612
Adjusted R-squared	0.2590	0.2590	0.2595

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

Our results so far indicate a key benefit of access to winder sources of funds. These benefits come at a cost as firms become more vulnerable to shocks in non-bank financial sector. Indeed, after the collapse of ILFS, the flow of credit came down significantly from the NBFI sector as shown in Figure 3. We use this collapse to shed light on the flip side of dependence on alternative sources of funds. We create a dummy variable $postILFS$ that equals one for 2019 and after, and zero otherwise. We estimate the following difference-in-difference regression:

$$\frac{I_{it}}{A_{i,t-1}} = \alpha_i + year_t + \alpha_1 Q_{i,t-1} + \alpha_2 Q_{i,t-1} \times postILFS + \beta_1 \frac{CF_{i,t}}{A_{i,t-1}} + \beta_2 \frac{CF_{i,t}}{A_{i,t-1}} \times postILFS + \epsilon_{it}; \quad (4)$$

Results are provided in Table 8. As shown in Columns (1) and (2), that uses a dummy variable on whether a firm has accessed funds from the NBFI sector or not, we do not find any meaningful difference in investment across firms with or without access to NBFI before and after the collapse of ILFS. However, Column (3) uses the extent of borrowing from the NBFI sector as the measure of dependence on NBFI and find a strong result: firms that borrowed heavily from NBFI experienced a significant decline in their investments in the post-2019 period.

Overall, our results show that firms with access to non-bank credit markets have experienced lower constraints in recent years. However, dependence on these sources of funds do come with their own risk as firm's investment become more sensitive to shocks in this market.

Table 8: Investment-NBFI Borrowing Regression

	Investment/Asset		
	(1)	(2)	(3)
Lagged Q	0.1926***	0.1927***	0.1924***
	(0.0170)	(0.0171)	(0.0170)
Internal CashFlow	0.0576***	0.0559***	0.0573***
	(0.0121)	(0.0160)	(0.0121)
Log(Assets)	-0.3428***	-0.3427***	-0.3443***
	(0.0522)	(0.0528)	(0.0523)
NBFI Dummy	0.0773**	0.0782**	
	(0.0338)	(0.0342)	
NBFI Dummy ∗ postILFS	-0.0686	-0.0695	
	(0.0475)	(0.0476)	
NBFI Dummy ∗ Internal CashFlow		0.0088	
		(0.0422)	
postILFS ∗ Internal CashFlow		-0.0037	
		(0.0224)	
NBFI Dummy ∗ postILFS ∗ Internal CashFlow		0.0227	
		(0.0603)	
NBFI Borrowing			0.0165**
			(0.0075)
postILFS ∗ NBFI Borrowing			-0.0199**
			(0.0099)
Firm Fixed Effects	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes
Sample	Listed Firms	Listed Firms	Listed Firms
Nobs	16,612	16,612	16,612
Adjusted R-squared	0.2592	0.2591	0.2593

standard errors in parentheses

* $p < .10$, ** $p < .05$, *** $p < .01$

4 Discussion and Conclusion

We document that Indian firms face significant friction in raising enough external capital for investments. Frictions are especially binding for younger firms of the economy. We do

not find any meaningful difference in financial constraints faced by listed firm versus their unlisted counterparts. The results suggest that a primary source of external financing friction is lack of access to credit markets.

Our results show that investment decisions have become more efficient, i.e., they respond more to a firm's investment opportunity set, after the series of financial sector reforms that were initiated in the mid-2010s. However, firms without access to wider non-bank credit markets face substantially higher financial constraint after the reform. A possible reason for these findings is that banks have tightened their lending standards, whereas nonbank credit institutions are more willing to lend as a result of reforms such as IBC, 2016. As a result, our evidence suggests that the quality of lending from the banking sector to the non-financial sector has improved compared to the pre-reform period. Therefore, banks are likely to have better portfolio of credit risk, as evidenced by a continued decline in their NPA ratio in the recent years. At the same time, firms that depend heavily on banks face more frictions in raising funds for their investments in the post-reform period.

Our results, at a broad level, show a tradeoff between financial stability and credit creation. As banks tighten their lending standards to the corporate sector, financial stability improves. However, it comes with a decline in credit and investment for firms without access to other sources. Though our study cannot quantify the optimal balance across these two objectives, our analysis does provide some tangible recommendations. First, policy initiatives that can facilitate wider access to non-bank credit for smaller and younger firms can help in boosting private investment in India. Second, as firms move towards alternate sources of funds, it becomes more important to pay careful attention to financial stability concerns that might emanate from the non-bank sector. Increased monitoring of NBFIs and their adequate capitalization can be critical as the economy moves towards a more efficient frontier of credit quantity and financial stability trade off.

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