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Corporate Investments, Liquidity and Bank Financing: Empirical Evidence from an Emerging Market

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CORPORATE INVESTMENTS, LIQUIDITY AND BANK FINANCING: EMPIRICAL EVIDENCE FROM AN EMERGING MARKET*

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ABSTRACT

A number of studies in the prior literature have found a link between cash flow and firm investment [Hubbard (1998) and cites therein]. Findings of most of these studies have the caveat that cash flow could simply be capturing expectations of future profitability because the empirical proxy (typically a version of average Q or market to book ratio) for marginal Q is imperfect. This study removes this caveat while retaining the Fazarri, Hubbard and Petersen's (1988) a-priori sorting of firms into liquidity constrained and non-liquidity constrained regression framework.

This study focuses on inventory investments of two sets of Indian manufacturing firms: issuers and non-issuers of short-term arm's length debt during 1996-97, a time period of robust economic growth and simultaneously an inward shift in the supply of bank loans instituted by the Reserve Bank of India (RBI). Non-issuer firms have significantly higher investment-liquidity sensitivities vis-à-vis issuer firms for inventory investments in 1996-97. Issuer and non-issuer firms investing less than their internal funds have no differences in liquidity coefficients while firms investing more than their internal funds do. Issuer and non-issuer firms that do not face an increase in the cost of external debt (ergo not an increase in inferred external and internal cost of funds wedge) have no differences in liquidity coefficients while the two set of firms that face an increase do. Differences in investment-liquidity sensitivities between the two set of firms arise from their differences in bank dependence and hypotheses including pure bank dependence, priority lending and loans above banks' rule for estimating a firm's debt capacity find empirical support. Bank characteristics based hypotheses including single banking relationship and weak banks with below Basle capital standards cannot explain differences in liquidity constraints. Alternative explanations including agency problems, the flypaper effect, over-investment, legal regimes of parent companies and crony capitalism do not find empirical support. Debt overhang hypothesis is supported by the data. The findings are consistent with Almeida, Campello and Weisbach (2002) and represent differences in liquidity demand by firms explaining differences in liquidity constraints between issuers and non-issuers. Relatively pristine sub-sample of new short-term public debt issuers in 1996-97 (who were non-issuers till 1996), sub-sample of potentially 'misclassified' liquidity constrained non-issuers firms and a holdout sample of government owned firms that have access to state budgetary support provide results consistent with differences in liquidity constraints between issuers and non-issuers. Propensity score regressions match issuer and non-issuer firms on three dimensions: Q, net profit and age of the firm. In 4 out of 5 blocks the liquidity coefficient of non-issuer firms is higher than that of issuer firms. The results confirm that non-issuer firms face higher liquidity constraints and that the differences in liquidity coefficients are not subject to the caveat that firm characteristics, differences in mismeasurement of Q or differences in expectations of future firm profitability between issuers and non-issuers. In sum, relative differences in inventories investment-liquidity sensitivities represent differences in liquidity constraints. Empirical evidence is consistent with a causal link between differences in liquidity constraints and RBI's regulatory fiat in 1996-97. The allocation of bank debt during 1996-97 is not consistent with maximizing economic efficiency measured by either ratio of value added to capital or ratio of operating profits to capital. Results from examining components of inventories: raw materials, work-in-process and finished goods are not supportive of differences in investment liquidity sensitivities between issuers and non-issuers.

Differences in investment liquidity sensitivities between issuer and non-issuer firms in capital investments and total firm investments regressions provide support for the findings that the investment liquidity sensitivities documented earlier represent liquidity constraints driven by bank dependence. However, using propensity scores to match issuers and non-issuers on profitability, Q and age of the firm the results on capital investments and total firm investments are consistent with the differences in liquidity coefficients being potentially driven by differences

in the mismeasurement of Q or that non-issuer firms are less liquidity constrained than issuer firms.

1. Introduction

Blinder and Maccini (1991) document that, in post-World War II recessions, declines in inventory investments account for an average of 87 percent of the peak to through movements in United States GNP.[1] Guasch and Kogan (2001) using macro-level data find in their sample of 52 countries levels of inventory investments of manufacturing firms in developing countries are substantially higher than those in the U.S. Therefore examining inventory investments at a micro-level is an important question and inventory investments are an important sub-set of firm investments in an emerging market. In the fiscal year 1996-97, this study focuses on inventory investments of two sets of Indian manufacturing firms a priori expected to face differing levels of information asymmetries and having differential access to capital markets. For this study's sample of Indian manufacturing firms inventory investment is an important sub-set of firm investments and the mean (median) level of inventories scaled by total assets for issuers is 0.199 (0.18) and for non-issuers is 0.175 (0.154) [Table 1]. The link between financing constraints and investments is an important research question reflected by the number of studies in corporate finance, macro-economics, public economics and industrial organization that focus on it [See Hubbard (1998) for a comprehensive review of this literature]. A number of these prior studies based on Tobin's Q framework and testing the neo-classical model of corporate investment are subject to the caveat that liquidity captures future expectations of firm profitability that are due to mismeasurement of Q. For studies following the Fazzari, Hubbard and Petersen (FHP, 1988) methodology the critique is equally valid if empirical measures of Q perform worse for certain classes of firms (typically firms a-priori sorted as constrained firms) relative to other classes of

[1] Ramey and West (1997) provide a detailed review of the prior studies in this literature.

firms (typically firms a-priori sorted as unconstrained firms). We remove this caveat while retaining the FHP methodology by using propensity score regressions that match a-priori sorted constrained and unconstrained firms on firm dimensions that are related to potential differences in mismeasurement of Q. By examining only the sub-set of constrained and unconstrained firms that match on these multiple dimensions, we can provide robust evidence on the relation between corporate investments: inventories, capital and total firm investments, and liquidity.

Kaplan and Zingales (2000) re-examine the sample of FHP (1988) focusing on capital investments in FHP's constrained sub-sample and note that a number of those firms could have invested more in a year if they wanted to. FHP (2000) recommends that the correct comparison is whether those firms could have increased their total investments or not? Given the agreement on the importance of a financing gap (i.e. difference between total investments and liquidity) by both these sets of authors, it is surprising that no study has reported a formal hypothesis test of this issue till date. We make this criterion operational in cross-sectional regressions and confirm that issuers and non-issuers that invest less than their liquidity have no differences in liquidity coefficients while firms investing more than their liquidity have differences.

Further, Kaplan and Zingales (1997) re-examine the entire methodology pioneered by FHP (1988) and present evidence that suggests that differences in investment-liquidity sensitivities across two sets of firms sorted by an a priori measure of access to capital markets and information asymmetries cannot necessarily be interpreted as evidence that one set of firms is more liquidity constrained than the other. Kaplan and Zingales (2000) also note that an important question is if differences in investment liquidity sensitivities do not reflect differences in liquidity constraints then what causes these differences in investment-liquidity sensitivities? To address the first concern, we argue that to interpret the relative differences in liquidity coefficients as differences in liquidity constraints between two sets of firms sorted by an a priori measure of access to capital markets and information asymmetries they should reflect (and more importantly be seen to reflect) differences in the wedge between external and internal cost of

funds. Issuers and non-issuers that do not face an increase in cost of new external debt (ergo not an increase in inferred wedge between external and internal cost of funds) have no differences in liquidity constraints while the two set of firms that face an increase in cost of external funds have differences.

In response to the second concern, alternative hypotheses that could explain differences in liquidity constraints are examined. Kaplan and Zingales (2000), Cleary (1999), Kadapakkam, Kumar and Riddick (1998) and Hennessy and Levy (2002) have put forth various potential answers to this question i.e. alternative explanations to explain differences in investment liquidity sensitivities across firms. The alternative explanations include differences in agency problems, the flypaper effect, over-investment, differences in legal contracting environment, crony capitalism. We examine these explanations and explanations based on financial intermediation i.e. bank dependence, priority lending, loans above bank loan limit rules, single banking relationships and weak bank health explanation in this study.

To do so, we take advantage of a natural economic experiment. 1996-97 was a time period of overall robust economic growth in India but simultaneously Reserve Bank of India (RBI) instituted a policy of (and engineered a) contraction of bank loans supply to the total commercial sector in India. Among the Indian manufacturing firms in 1996-97 one set of firms had access to short-term arm's length debt markets and the other set did not.

The results from this study are simple and straightforward to summarize. By examining the bank dependence hypotheses within the two sets of firms with differential access to the short-term arm's length debt markets, we find results consistent with the differences in liquidity sensitivities reflecting differences in liquidity constraints driven by differences in bank dependence. Findings of bank dependency could potentially by driven not by the firms but by characteristics of the banks themselves i.e. differences in bank health and single versus multiple banking relationships [Hubbard, Kuttner and Palia, (2002) and Sharpe (1990)]. These explanations do not find empirical support. Alternative explanations based on agency problems,

over-investment, non-Indian legal regime through foreign parent companies and crony capitalism does not explain differences in liquidity constraints. The flypaper effect explains differences in liquidity coefficients but the firms with above industry-adjusted liquidity are less liquidity constrained i.e. flypaper effect is not present. Rather it is firms with valuable investment opportunities i.e. above industry-adjusted liquidity that have higher liquidity coefficients reflecting higher liquidity constraints. The alternative explanation based on debt overhang explains differences in liquidity constraints. Non-issuer firms have higher liquidity coefficients relative to issuer firms. These findings are consistent with differences in liquidity constraints representing differences in corporate demand for liquidity. Propensity score regressions (that control for differences in firm characteristics that impact differences in expectations of future profitability and mismeasurement of Q problems), results confirm differences in liquidity constraints between issuers and non-issuers. A caveat to these results is provided by non-issuer firms that are potentially 'misclassified' as liquidity constrained, this is the large sample cross-sectional equivalent of the Hewlett Packard case that Kaplan and Zingales (1988) note in their study.

After finding empirical results consistent with inventory investment liquidity sensitivities representing liquidity constraints three question still remain. Do the differences in liquidity constraints reflect differences in overall firm financial constraints? This question can be split into two parts. First part is are the firms identified as facing higher liquidity constraints for inventory investments (non-issuer firms) facing higher liquidity constraints in overall total firm investments? Second part, are the firms identified as facing higher liquidity constraints for inventory investments (non-issuer firms) also facing higher liquidity constraints in capital investments? Or is their higher inventory investment liquidity sensitivities a result of systematically higher opportunity costs of forgoing capital investments vis-à-vis inventory

investments such that non-issuers firms (which have higher sales growth rates) choose to bear higher liquidity constraints in their inventory investments at the margin.[2]

Second question, are the differences in liquidity constraints affecting inventory investments between the two set of firms in 1996-97 a result of RBI's policy of contraction of bank loan supply? If yes, is the allocation of bank debt across firms efficient? Third question, do the differences in investment-liquidity sensitivities in aggregate inventory investments reflect differences in investment liquidity sensitivities within individual components of inventories and are these differences homogenous across various inventory components?

Firms are sorted on an a priori measure of differences in information asymmetries and differential access to capital markets i.e. issuers of short-term arm's length debt and non-issuers of short-term arm's length debt. Non-issuer firms face higher liquidity constraints relative to issuer firms across all three investments i.e. inventories, capital and total investments in ordinary regressions. However, when propensity score regressions (that control for differences in mismeasurement of Q between issuers and non-issuers problem), the results are reversed. Non-issuer firms face lower liquidity constraints as compared to issuer firms. When inventories are desegregated into individual components of raw materials, work-in-process and finished goods the results are not consistent with non-issuer firms facing higher liquidity constraints.

A causal connection between RBI's policy of constraining bank loans supply and the bank dependence based explanation for differences in investment liquidity constraints receives support in the data. In the prior fiscal year 1995-96, issuer and non-issuer firms face lower and insignificant liquidity constraints relative to 1996-97. However in the subsequent fiscal year 1997-98 non-issuer firms face higher liquidity constraints relative to 1996-97. The allocation of bank debt during 1996-97 is not consistent with maximizing the economic efficiency of capital

[2] Alternatively the higher investment liquidity sensitivities of non-issuer firms could reflect their having systematically higher valued call options to delay capital investments.

employed as measured by value added to capital or operating profits to capital employed criterion.

The rest of the paper proceeds as follows. Section 2 briefly discusses the monetary conditions prevailing in India during 1996-97. Section 3 enumerates the data and presents the hypotheses tested. Section 4 provides the empirical results. Section 5 concludes.

2. Indian Monetary Conditions In 1996-97

The Reserve Bank of India (RBI), in its 1996-97 annual report (p. 50) states "The pressure of high liquidity necessitated active liquidity management." RBI, in order to contain potential inflation, reduced by regulatory fiat the total bank credit available to the commercial sector in India its fiscal year 1996-97. This contraction in total bank loans makes 1996-97 a natural setting to examine the impact of access to bank financing on the inventory investment behavior of firms. RBI notes in its annual report for 1996-97 that, "Thus the total flow of funds from banks to the commercial sector amounted to rupees 346,560 million as compared with rupees 447,750 million in 1995-96. Besides, the commercial sector received funds from 'other' sources, viz. bills rediscounted by banks with financial institutions, capital issues, Global Depositary Receipt issues, funds from foreign currency convertible bonds and borrowing from financial institutions. Together with these sources, funds flow to commercial sector was rupees 984,760 million in 1996-97 compared with rupees 1,077,930 million in 1995-96 (pg. 51)." This implies that even if we take a conservative assumption of no growth of total funds needed by the commercial sector from 1995-96 i.e. the financing needs were constant; the decrease in the total funds available to the commercial sector was of the order of roughly 92 percent of the bank loan supply cut engineered by RBI i.e. increases in other sources of financing could not make up for the shortfall in bank financing available to Indian firms.

While the total amount of bank loans available to the commercial sector was reduced in 1996-97, the overall Indian economy was in an expansionary mode. The Reserve Bank of India

in its annual report for 1996-97 on page 38 notes that, "The overall economic activity during the fiscal year 1996-97, as reflected in the growth of real gross domestic product (GDP), continued to be distinctly higher than the trend rate of growth recorded during the past decade and a half beginning with 1980-81. The initial estimate that the growth in the real GDP would be 6.8 percent in 1996-97 has been confirmed by the Central Statistical Organization (CSO)."

The minimum lending rate for banks as prescribed by the RBI was 16.50% in 1995-96 while it declined to 14.50% to 15.00% in 1996-97 [Report on Currency and Finance, RBI (1997-98)]. In other words, the bank loan supply cut was not enforced through changes in bank lending rates (though spread on actual bank loans over the minimum lending rate might have increased). The average interest rate on commercial paper during 1996-97 was 192 basis points lower than the minimum lending rate for banks. Given that the average non-issuer of short-term public debt was unlikely to get bank loans at the prime rate (and that both sets of firms issuers and non-issuers have bank debt) implies that the a-priori sorting of firms into issuers and non-issuers is a robust method of identifying differences in information asymmetries and access to capital markets. A macro-measure measure of the changes in collateral values in the economy is the change in market capitalization of the major stock exchange. The market capitalization of the Bombay stock exchange declined from 526, 4760 million rupees in 1995-96 to 463,9150 million rupees in 1996-9797 [Report on Currency and Finance, RBI (1997-98)].

This combination of a time period of robust economic growth and a simultaneous decline in bank credit availability provides a convenient setting, to construct an empirical test of the impact of differing levels of information asymmetries and credit market imperfections on inventory investments of firms.

3. Data Description and Hypotheses Tested

This section presents the basic sample construction and research method adopted in this study.

3.1. Database and Sample Construction

The primary empirical focus of this study is on a cross-sectional analysis of firm-level inventory investments during the year 1996-97. The data for the analysis comes from the PROWESS database. PROWESS is a publicly available database maintained by the Center for Monitoring the Indian Economy (CMIE). The database is analogous to an abridged version of COMPUSTAT and CRSP. Khanna and Palepu (2000) note that this database has become a standard one used by researchers and management professionals to analyze Indian companies. The PROWESS database covers firms operating on various stock exchanges in India. PROWESS has accounting information drawn from annual reports and other company filings required by Indian regulatory authorities. PROWESS in addition has data on daily stock prices and information on corporate news items from press releases.

The starting point for sample construction for the current study is the set of publicly listed firms with the most current financial statements in the period 1996-97. This time period matches the RBI's budgetary fiscal year. As a further screen 1446 firms were eliminated from the 1996-97 sample since they changed their accounting year or did not have their financial statements on an annual basis for 1996-97. Fazzari, Hubbard and Petersen (2000) note that the coefficient of liquidity in financially distressed firms is downward biased and findings from financially distressed firms cannot be generalized to a cross-section of firms. Therefore, 118 firms that had total borrowings higher or equal to total assets were eliminated since these are very likely financially distressed firms. While checking for obvious data errors, 222 firms with interest expenses higher than total borrowings (which had other data errors also) were eliminated. The requirement that the firms have accounting data for 1996-97 and 1997-98 for the baseline regressions resulted in a sample of 1888 firms. This sample comprises of 621 firms that have short-term arm's length debt outstanding (issuer firms) and 1267 firms that do not have short-

term arm's length debt outstanding (non-issuer firms). However, some regressions have fewer observations due to missing data needed to calculate particular independent variables.

3.2. Model specifications and hypotheses tested

We analyze the relation between various types of corporate investments (focusing for most part on inventories) and liquidity by sorting firms on the basis of an a priori measure of access to capital markets and information asymmetries i.e. firms that have commercial paper and/or short-term fixed deposits (issuers) outstanding and firms that do not have commercial paper and/or short-term fixed deposits (non-issuers) outstanding following Kashyap, et. al. (1994) and Calomiris, Himmelberg, and Wachtel (1995) which yields a clear prediction as to the sorting criterion's effect on firm investments. Non- issuer firms are predicted to face higher liquidity constraints relative to issuer firms. Kaplan and Zingales' (1997) criticism of a number of prior studies in this strand of the literature based on the theoretical ambiguity of the sorting criterion used by those studies does not apply here.

. The baseline regression models are estimated as,

$$\begin{aligned} \text{Ln}\,(I_{it} - I_{i,t-1}) = {} & \alpha_0 + \beta_1\,[\text{Ln}\,(I/S)_{i,t-1}] + \beta_2\,(\text{Ln}\,S_{it} - \text{Ln}\,S_{i,t-1}) + \beta_3\,(\text{Ln}\,S_{i,t-1} - \text{Ln}\,S_{i,t-2}) \\ & + \beta_4\,L_t + \beta_5\,(I_{i,t-1} - I_{i,t-2}) + \beta_6\,[(BD/TA)_{i,t-1} + \beta_7\,[(TC/TA)_{i,t-1} \\ & + \beta_7\,\text{Group}) + \beta_8\,(\text{Industry 1}) + \ldots \beta_{27}\,(\text{Industry 20}) + e_{it} \qquad \text{-(1)} \end{aligned}$$

The raw change in inventory investments data for issuer firms has a mean (median) of 6.39 (0.33) and non-issuers mean (median) of 0.711 (0.11) [Table 1] and are highly skewed. Therefore, the dependent variable in the inventory models used is the change in the natural log of inventory investments. Kaplan and Zingales (1997) note that while prior studies have used cash flow or cash stock as their measures of liquidity, the theory does not distinguish between cash flow and cash stock: the effect of an extra dollar of funds should be the same, independent of whether it enters the firm this period as cash flow or was present in the firm at the beginning of

the period as cash stock. The key explanatory variable of interest is liquidity, which is defined as cash flow generated during the period, plus the beginning of the year starting liquidity stock available scaled by beginning of the year total assets. Kaplan and Zingales (1997) note that any splitting criterion that sorts firms into sub-samples with differential outliers in growth rates of sales may be biased towards finding a difference in the coefficients on liquidity. To address this concern the baseline regression models are estimated using the minimum sum of absolute errors regression [See Narula and Wellington, 1982 for a detailed survey of the statistical and computational properties of minimum absolute deviation estimators]. Detailed description of all variables used in this study is available in Appendix 1. Prowess user manual (1997) notes that in general firms having marketable securities of their peer group firms will not divest their holdings. Hence such holdings of marketable securities may not be truly liquid in nature. Therefore, a robust measure of liquidity that subtracts marketable securities owned in group firms by other firms in the same group is used in the baseline regression specification.

The first set of control variables following Kashyap, et. al. (1993) include a constant term, the log of inventory-sales ratio at the beginning of the period, the change in the log of firm sales over the current and preceding period as well as 20 industry dummy variables which are constructed to be analogous to 2-digit SIC codes in the U.S. (See Khanna and Palepu, 2000). The beginning of the period inventory sales ratio and change in log sales terms are motivated by a target adjustment inventory model [Lovell, 1961]. This specification is also consistent with a cost-minimization model that assumes quadratic costs of producing output and deviating from a target- inventory sales ratio (See Kashyap and Wilcox, 1993). The lagged change in the log of inventories variable controls for the possibility that the behavior of inventories is a gradually adjusting process in an emerging market like India. The industry dummies and the coefficient terms are included to subsume any industry wide or economy effects for example effect of interest rates. This set of variables is intended to control for non-financial determinants of inventories.

In addition a group dummy, bank debt to total assets ratio and trade credit to total assets ratio variables are included as further controls. The group dummy variable is equal to 1 if the firm is part of a business group and 0 otherwise. Khanna and Palepu (2000) note that the absence of well-developed intermediary institutions in India makes it costly for Indian firms to acquire necessary inputs and the scale and scope of business groups could allow groups to internally replicate functions not provided by intermediary institutions in India. Fafchamps, Gunning and Oostendorp (1997) examine inventories in a developing country i.e. Zimbabwe and find evidence consistent with concerns about timeliness of input deliveries being a significant determinant of inventory levels. Business groups could reduce concerns about timeliness of input deliveries partially i.e. among transaction with peer firms within a group.

The bank debt to total assets ratio is included for two reasons. First, bank debt is the largest source of debt financing for firms in India, the mean (median) bank debt to total assets ratio for issuer firms is 0.166 (0.155) compared to their mean total borrowings to total assets ratio of 0.363 (0.368). Similarly, the mean (median) bank debt to total assets ratio for non-issuer is 0.163 (0.140) compared to their mean total borrowings to total assets ratio of 0.356 (0.350). Therefore controlling for any potential impact of bank credit on a firm's ability to invest in inventories is needed. Banks are also important in the corporate capital acquisition process and perform information production and monitoring functions [See Diamond (1984) and (1991), Fama (1985), Gorton and Pennacchi (1990), Rajan (1992) and Sharpe (1991) among others]. Second to control for the possibility that there could be differences in collateral characteristics of inventories within industry categories for example collateral characteristics might be driven by differences in product mix across firms within the 2-digit industry categories. Finally, trade credit to total assets ratio is included for the following reason. Trade credit is an important source of debt financing, second in magnitude only to bank financing for the sample Indian firms. Petersen and Rajan (1997) find that small firms whose access to capital markets may be limited use more trade credit. Further specifications estimated in this study sort firms by

differing access to short-term arm's length debt markets so controlling for a cross-sectional differences in access to an important source of substitute financing represented by trade credit is important. This set of variables is intended to control for the financial determinants of inventories besides liquidity.

Stated formally the two research hypotheses investigated using the baseline regression models are as follows.

Wedge between internal and external financing costs hypothesis which is stated as,

$H_0 = \beta_4 = 0$ for both sets of firms

$H_A = \beta_4 > 0$ for both sets of firms

Differences in liquidity constraints hypothesis with non-issuer firms facing higher liquidity constraints,

$H_0 = \beta_4$ (non-issuer firms) $\leq \beta_4$ (issuer firms)

$H_A = \beta_4$ (non-issuer firms) $> \beta_4$ (issuer firms)

Similar baseline models with individual components of inventory terms instead of aggregate inventories are tested. In addition within industry regressions for non-issuer firms are estimated for industries with more than 30 observations to check if differences in investment-liquidity sensitivities are broad based results or driven by a few industries.

The baseline results follow FHP's methodology. Kaplan and Zingales (1997 and 2000) criticize the FHP methodology by stressing that firms which have internal funds (i.e. liquidity) higher than their firm investments are unconstrained and presumably findings of relative differences for any two sets of such firms are potentially spurious. Stiglitz (Discussion and Comments, 1988) in commenting on the original FHP study makes a related point. He suggests that a more powerful method to test for the importance of the cash flow constraint is to check if the cash flow constraint is actually binding. Moyen (2002) presents models and simulation data on two firm types, unconstrained firms that can raise funds on external markets and the

constrained firms that cannot do so. She finds results consistent with Kaplan and Zingales (1997) that absolute levels of investment cash flow sensitivities are lower for unconstrained firms than for constrained firms. Whether unconstrained firms have lower or higher investment cash flow sensitivities is ultimately an empirical question best addressed by actual data. Moreover, it is possible that within two sets of a priori sorted firms unconstrained firms have higher (and not significantly different relative levels) absolute levels of investment cash flow sensitivities and constrained firms have lower (but significantly different relative levels) absolute levels of investment cash flow sensitivities.

We divide both issuer and non-issuer firm sub-samples into two sets of firms: firms that had total investments higher than their internal funds (i.e. liquidity) which presumably had to access the external markets (unconstrained firms in Moyen's terminology) and firms that had total investments equal to or lower than their internal funds (constrained firms in Moyen's terminology and firms for which the liquidity constraint was binding in Stiglitz's terms). This provides a direct test of whether the absolute levels of liquidity constraints are higher or lower for firms that had to access the external markets. More important, in our view, it provides evidence on whether the differences in relative liquidity constraints among issuer and non-issuer firms are driven by firms that did not access external markets (in which case it would be difficult to interpret them as differences in liquidity constraints) or whether the differences in relative liquidity constraints are driven by firms that accessed the external markets (and given that they are sorted a priori on differing levels of information asymmetries, it is relatively safe to interpret them as differences in liquidity constraints).

However, even findings consistent with only firms that accessed external markets having relative differences in liquidity constraints with issuer firms having lower investment liquidity sensitivities than non-issuers is not necessarily conclusive evidence in favor of liquidity constraints. Kaplan and Zingales (1997) note that prior studies of liquidity constraints interpret greater investment cash flow sensitivity for firms considered more likely to face a larger wedge

between the internal and external cost of funds as evidence that the firms are indeed constrained. They note further that no study has verified directly whether higher investment cash flow sensitivity is related to financing problems, and if it is, in what way. Therefore, we attempt to provide evidence that links the presence of observed higher wedge between external and internal finance (by inferring it from higher interest rates on changes in firm debt) and the findings of relative differences in investment liquidity sensitivities between two sets of firms a priori expected to have differing levels of information asymmetries.

The cost of debt unlike equity is easily observable and is not subject to the debate on whether markets are efficient or not. Therefore, we divide both issuer and non-issuer firm sub-samples into firms that pay a higher interest rate on firm debt relative to the prior year and firms that pay equal or lower interest rate. Firms paying a higher interest rate on firm debt (under the assumption of no change in costs of internal funds from prior year) are firms that face an increase in the wedge between external and internal finance. If relative differences in investment liquidity sensitivities between issuer and non-issuer firms represent liquidity constraints, in a year where a bank loan supply cut was present, they should be driven by (or present in) firms that face an increase in the wedge between external and internal finance.

However, skeptical readers could justifiably argue that unless first, the sources of relative differences in investment liquidity sensitivities are identified and second, plausible alternative explanations for differences in investment liquidity sensitivities are examined they cannot be reliably interpreted as liquidity constraints. To identify the sources of relative differences in investment liquidity sensitivities for aggregate inventories, the baseline regression models are further augmented to test for explanations for investment-cash flow sensitivities (if any) based on financial intermediation found in the baseline results. First, the pure bank dependence model is tested. Appendix 2 details the various other hypotheses tested that parallel pure bank dependence hypothesis.

The pure bank dependence regression models are estimated as,

$$\text{Ln}\,(I_{it} - I_{i,t-1}) = \alpha_0 + \beta_1\,[\text{Ln}\,(I/S)_{i,t-1}] + \beta_2\,(\text{Ln}\,S_{it} - \text{Ln}\,S_{i,t-1}) + \beta_3\,(\text{Ln}\,S_{i,t-1} - \text{Ln}\,S_{i,t-2})$$
$$+ \beta_4\,L_t + \beta_5\,(I_{i,t-1} - I_{i,t-2}) + \beta_6\,[(BD/TA)_{i,t-1} + \beta_7\,[(TC/TA)_{i,t-1}$$
$$+ \beta_8\,(\text{Group}) + \beta_9\,(L_t{*}\text{AMBD}) + \beta_{10}\,(\text{Industry 1})$$
$$+ \ldots \beta_{28}\,(\text{Industry 20}) + e_{it} \qquad \text{-(2)}$$

L_t*AMBD is an interaction term defined as the product of an above median bank debt dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a non-issuer firm should be bank dependent if three conditions are satisfied: (1) it has a low level of liquidity and (2) it does not have access to arm's length short-term debt market and (3) it has a high level of bank debt to total assets ratio. A positive coefficient is predicted on the liquidity term and also on the interaction term for non-issuers. As a benchmark to see if the interaction term is not simply picking up differences in access to bank financing the corresponding interaction term for an issuer firm represents a firm that: (1) has a low level of liquidity and (2) has a high level of bank debt to total assets ratio. A positive coefficient is predicted on the liquidity term and an insignificant coefficient is predicted on the interaction term for issuers. More pertinent, if bank dependence hypothesis is the reason for differences in investment-liquidity sensitivities then after controlling for bank dependence the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Stated formally the bank dependency based explanation hypothesis is,

$H_0 = \beta_9 = 0$ for both sets of firms or β_9 (non-issuer firms) $\leq \beta_9$ (issuer firms)

$H_A = \beta_9 > 0$ for non-issuer firms and β_4 (non-issuer firms) = β_4 (issuer firms)

A couple of hypotheses are related to the pure bank dependence hypothesis. The first is priority lending hypothesis. The mean (median) total assets of a sample issuer firm are 439.569 (87.23) in contrast the mean (median) total assets of a non-issuer firm is 116.559 (20.420). The conventional argument applicable to firms in developed countries is that internal funds are more

important for smaller firms because of their limited access to capital markets (Eisner, 1978). However, one of the five major objectives of Indian government's industrial policy is the promotion of small industry (Sandesara, 1988, p. 640). Athey and Laumas (1994) and Athey and Reeser (2000) find results consistent with internal funds being less important for investments for small firms in their sample vis-à-vis large firms in their sample. To be eligible for priority lending assistance the sum of a firm's paid up capital and free reserves must not exceed 10 million rupees. Therefore, we use a benchmark of net worth equal to or less than 10 million to identify small firms. Banerjee and Duflo (2001) find results based on the lending policy of an Indian bank, which are consistent with firms that are part of a priority sector getting preferential access to bank credit.

The regression models to test for the priority lending based explanation has Liquidity*TABD an interaction term defined as the product of a firm with net worth below 10 million dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a firm that has less than 10 million in net worth is eligible for preferential credit availability and therefore has lower reliance on internal funds. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. The set of non-issuer firms have a higher number and percentage of smaller firms. Therefore, if priority lending based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

A related explanation for observed liquidity coefficients that is not driven by a bank loan supply cut is the decline in a firm's debt capacity (or collateral value). Under this explanation, a decrease in collateral value of a firm could increase the costs of external finance even if bank's willingness to supply loans for a fixed amount of debt capacity of a firm. It is difficult to come up with reasonable micro-level empirical proxies for a firm's collateral value. Luckily for Indian firms during this time period Banerjee and Duflo (2001) have documented bank loan decision

rules followed by an Indian public sector bank to estimate the maximum amount of bank loans a firm in our sample is eligible for. The bank loan limit hypothesis tests whether the differences in liquidity coefficients reflect simply differing debt capacities of the two sets of firms. In other words, if say non-issuer firms appear to be bank dependent they may actually simply have lower debt capacities. Firms which at the beginning of the year had bank loans above their maximum bank loan limit (Banerjee and Duflo document that in 20% of the cases an Indian bank grants a higher bank loans than the official policy) are assumed to be at their maximum debt capacity especially since bank debt is the major source of debt for Indian firms.

The regression models to test for the loans above the bank limit hypothesis based explanation has Liquidity*LABL an interaction term defined as the product of a firm with bank loans above the estimated bank loan limit dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a firm that has reached its bank loan limit is more reliant on it's internal funds. This leads to a prediction of a positive coefficient on the liquidity term and a positive coefficient on the interaction term. Further, since the limit on bank loans is likely to be binding on non-issuer firms relatively more than on issuer firms (which have access to public arm's length short-term debt markets), the coefficient on the interaction term is hypothesized to be higher for non-issuers. Further, if the loans above the bank lending limit based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

An alternative possibility is that if non-issuer firms that are bank dependent do have higher investment-liquidity sensitivities it is driven by a higher number of non-issuer firms having single bank relationships in the sample. In this line of reasoning banks exploit an exclusive bank relationship and charge client firms a higher cost of debt financing [following Sharpe (1990) and Rajan (1991)] i.e. make them more liquidity constrained which may lead to $\beta_9 > 0$ for non-issuer firm i.e. a rejection of the null bank dependence hypothesis. Alternatively

following Myers and Majluf (1984) single bank relationships may play a positive role in reducing information asymmetries and therefore may lead to β_9 (non-issuer firms) < β_9 (issuer firms) i.e. an incorrect rejection of the alternative bank dependence hypothesis. Houston and James (1995) find that U.S. firms that rely on a single bank have a much greater sensitivity of investment to cash flow than do firms that have multiple banking relationships or that borrow in public debt markets. In sum, empirically examining the impact of single bank relationships is important.

The regression models are estimated including Liquidity*SBD an interaction term defined as the product of a firm with a single bank relationship dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that if single banking relationships aggravate liquidity constraints then the firms with single banking relationships should face higher investment-liquidity sensitivities. In this case the interaction term is predicted to have a positive coefficient. If this is the reason behind non-issuer firms facing higher liquidity constraints then the coefficient on the interaction term should be higher for non-issuer firms. If single banking relationships mitigate liquidity constraints then firms with single banking relationships should face lower investment-liquidity sensitivities. In this case, the interaction term is predicted to have a negative coefficient. More important, if single banking relationship hypothesis is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Gibson (1995) using Japanese firm data found that firm investment is sensitive to the financial health of the firm's main bank holding constant Q and cash flow. Hubbard et. al. (2002) find that even after controlling for proxies for borrower risk and information costs, the cost of borrowing from low capital banks is higher than borrowing from well capitalized banks. Second and more pertinent to our study, this cost difference is traceable to borrowers for which information costs and incentive problems are a priori important i.e. potentially for non-issuers.

This line of reasoning suggests that independent of the bank dependence and individual firm characteristics, if non-issuers are more likely to have their main banking relationship with a low capital bank then differences in investment liquidity sensitivities might reflect simply weak bank health spillovers.

The regression models are estimated including Liquidity*WBD an interaction term defined as the product of a firm with a main bank relationship with a below 8 percent capital adequacy ratio (as per Basle standards) dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that if a weak banking relationship aggravate liquidity constraints then the firms with such banking relationships should face higher investment-liquidity sensitivities. In this case the interaction term is predicted to have a positive coefficient. If this is the reason behind non-issuer firms facing higher liquidity constraints then the coefficient on the interaction term should be higher for non-issuer firms. More pertinently, if this hypothesis is driving the differences in liquidity constraints between issuers and non-issuers controlling for it will eliminate these differences.

Kaplan and Zingales (2000) put forth the flypaper effect (Hines and Thaler, 1995) based explanation for why unconstrained firms in their sample have higher investment liquidity sensitivities. Cleary (1999) confirms the findings of Kaplan and Zingales (1997) in a larger sample of firms and finds that unconstrained firms in his sample also have higher investment liquidity sensitivities. Cleary presents a free cash flow problem based explanation which states that firms increase investment in response to availability of higher levels of free cash flows (Jensen, 1986). Kadapakkam et. al. (1998) find that the investment cash flow sensitivities are highest in the large firm size group and lowest in the small firm size group for their sample of firms in six OECD countries. They interpret their findings as being consistent with agency problems between managers and shareholders that are more severe for firms with lower levels of insider equity ownership.

The regression models to test for the agency problems based explanation are estimated with Liquidity*BMICFR is an interaction term defined as the product of a firm with below median insider's cash flow rights (equity ownership) dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that firms that have lower levels of insider cash flow rights (equity ownership) should have a higher propensity to over-invest. This leads to a prediction of a positive coefficient on the liquidity term and a positive coefficient on the interaction term. More pertinent, if the agency problems based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

The regression models to test for the second agency problems based explanation i.e. the flypaper effect and/or free cash flow problems based explanation are estimated with Liquidity*AMIALD an interaction term defined as the product of a firm with above median industry adjusted liquidity dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a firm that has higher liquidity on an industry-adjusted basis is more susceptible to the flypaper effect and/or free cash flow problems. This leads to a prediction of a positive coefficient on the liquidity term and a positive coefficient on the interaction term. More important, if the flypaper effect and/or free cash flow based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Most models of investment imply that information and incentive problems lead firms to under-invest. However, Jensen (1986) has argued that if managers prefer growth to profitability they may invest free-cash flow in negative net present value projects. In this view, the investment liquidity sensitivities reflect over-investment rather than under-investment. While the agency problems and flypaper effect explanations address this concern, we adopt a further

test to mitigate any remaining concerns. According to the over-investment theory the difference in inventory investment liquidity coefficients of issuers and non-issuers should be larger for firms with lower opportunity costs of under-investment i.e. lower operating margins. To explore this possibility, we divide the sample into firms with above median operating margins and those with below median operating margins.

The regression models to test for this third agency problems based explanation i.e. the over-investment explanation are estimated with Liquidity*AMOP an interaction term defined as the product of a firm with above median operating margins dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a firm that has higher operating margins is less subject to the over-investment and/or cash flow problems. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. If the over-investment explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Almeida and Campello (2001) analysis suggests that firms should be examined using criterion beyond their financial characteristics to determine liquidity constraints. They suggest examining differences in the underlying conditions governing investment and contractibility. La Porta, Lopez de Silanes, Shleifer and Vishny (1997) present evidence on legal regimes affecting the extent of agency problems in firms around the world. We use the criterion of splitting our sample into domestic firms and foreign firms, which have non-Indian legal regime for their parent companies.

The regression models to test for this fourth agency problems/legal regimes based explanation are estimated with Liquidity*FD an interaction term defined as the product of a foreign firm dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a foreign firm i.e. a firm publicly listed on Indian stock exchange but which is controlled by and has it's parent firm outside India might

have stronger rule of law and better governance and contractibility standards and therefore lower liquidity constraints. Khanna and Palepu (1999) find that Indian firms with higher foreign ownership have higher market values. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. If the legal regimes based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Krueger (2002) presents evidence on South Korean firms where large group firms receive higher bank credit and expand more because their firm size is a political asset. Khanna and Palepu (2000) designate Indian business groups with more than 17 firms as large groups. We use Khanna and Palepu's criterion to divide the sample into large group firms and others firms. If large group firms have easier and higher access to credit due to crony capitalism than their investment liquidity sensitivities should be reduced.

The regression models to test for this fourth agency problems based legal regimes based explanation are estimated with Liquidity*LGD an interaction term defined as the product of a large group firm dummy and liquidity that is included in the regression models for issuers and non-issuers. The interpretation of this interaction term is that a large group firm is potentially subject to problems of crony capitalism and can have access to higher credit from banks. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. If the crony capitalism based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Almeida, Campello and Weisbach (2002) examine firm's propensity to save cash out of cash inflows, which they refer to as the cash flow sensitivity of cash. They find that for their sample U.S. firms, the cash flow sensitivity of cash is not significantly different from zero for unconstrained firms, but positively and significantly different from zero for constrained firms.

Their findings could imply that liquidity in any given year represents different proportions of precautionary liquidity between issuer firms (unconstrained firms) and non-issuer firms (constrained firms) for our analysis. In order to test for the differences in propensity to save cash, we test for a version of the debt overhang problem that incorporates this concern. The debt overhang regressions are estimated with Liquidity*DO an interaction term defined as the product of a firm that has above median debt overhang and liquidity. The interpretation of this interaction term is that if a firm faces a relatively large portion of its debt coming due for redemption in the current and next three years (since these redemptions are fully anticipated by the firm) it will lead to higher precautionary savings of cash out of liquidity, therefore the liquidity constraint should be decreased. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. If the debt overhang based explanation is the reason for differences in investment-liquidity sensitivities then after controlling for it the differences in investment-liquidity sensitivities between the two set of firms should be eliminated.

Baseline and pure bank dependency regression models are estimated for 1995-96 and 1997-98 to shed light on the issue of a causal link between RBI's policy to engineer a bank loan supply cut and the investment liquidity sensitivities faced by Indian manufacturing firms during 1996-97.

Further regression models explore the relation between capital investments and liquidity. The regression models are estimated with dependent variable as the capital investments undertaken by the firm. The specification broadly follows Hoshi et. al. (1991) and includes beginning of the period Q to control for growth opportunities, log change in sales and lagged change in sales to control for the accelerator effects. An interaction term defined as the product of above median q dummy and liquidity is included. Bank debt and trade credit terms are included following similar reasoning as for inventory investments. The interpretation of this interaction term is if a firm has above median growth opportunities it should have a lower

propensity to over-invest. This leads to a prediction of a positive coefficient on the liquidity term and a negative coefficient on the interaction term. Further, to examine what explains relative differences in capital investment liquidity sensitivities between issuer and non-issuer firms, the pure bank dependency hypothesis is examined. Similar regression models with the dependent variable firm total investments are estimated.

4. Addressing the differences in mismeasurement of Q between unconstrained and constrained firms

Poterba (1988) in his discussion of FHP (1988), points out that measurement problem in Q can cloud the interpretation of their empirical results. Alti (2002) notes that if Q performs worse for constrained firms relative to unconstrained firms, higher sensitivities of liquidity to investment might arise for these firms simply because liquidity reflects information about investment opportunities. Other studies including Hubbard (1998), Erikson and Whited (2000) and Stein (2001) have noted that this is a problem for studies in the literature on corporate investments which use the neo-classical Q framework.

The problem of mismeasurement of Q can be re-cast as:

a. the problem that liquidity (or cash flow for a number of prior studies) reflects the expectations of future profitability that have not been captured by empirical proxies of marginal Q
b. and the fact that due to the high correlation between current profitability and liquidity current profitability cannot be used to control for expectations of future profitability not captured by Q in a regression setting.

Alti (2002) presents simulation results consistent with younger firms facing higher mismeasurement of

Q problems due to potentially higher growth rates and more valuable long-term growth options. In essence, if a method can control for the multi-dimensional differences between unconstrained and constrained firms while allowing for a regression framework that does not suffer from multicollinearity problems the relationship between investments and liquidity can be examined in a robust manner.

In labor economics, Lalonde (1986) finds that non-experimental methods for assessing the treatment effects may yield biased estimates because a 'truly' matched sample of control observations is required to infer causality. However, there are several characteristics in which the treatment and control groups differ, the task of constructing a matched sample becomes virtually impossible by conventional means – which is often referred to the curse of dimensionality (Villalonga, 2000). The problem of the curse of dimensionality is similar to the problem that is faced by studies that want to interpret liquidity coefficients affecting corporate investments while controlling for the mismeasurement of Q problem (since differences in mismeasurement of Q between samples of unconstrained and constrained firms could differ across various dimensions).

Dehejia and Wahba (1998 and 1999) develop an algorithm that deals with the problem of the curse of

dimensionality. I adept their method for examining the issue of corporate investments and liquidity constraints. Specifically, propensity scores - the predicted values from a probit model of a firm's decision to issue short-term public debt (or any other sorting criterion used by a study to a-priori sort firms into constrained and unconstrained firms) that relates to future expectations of profitability- are used to match groups of issuers and non-issuers firms and then baseline regression specifications for inventory, capital and total firm investments are run within these sub-samples of matched propensity scores to estimate liquidity coefficients.

The propensity score is defined as the probability of assignment to treatment (i.e. sorting criterion for studies following FHP methodology) conditional on a vector of independent variables X_i :

$$P(X_i) = Pr\ (D_i = 1 \mid X_i) = E\ (D_i \mid X_i) \qquad -(3)$$

The propensity score theorem states that if the treatment assignment is ignorable conditional on X, then it is also ignorable conditional on the propensity score:

$$Y_{i1,}\ Y_{i0} \perp D_i \mid X_i \Rightarrow Y_{i1,}\ Y_{i0} \perp D_i \mid p\ (X_i) \qquad -(4)$$

The theorem implies that observations with the same propensity score have the same distribution of vectors of variables X_i. By matching on Q and potential alternative variables that might capture expectations of future profitability i.e. current net profit and age of the firm maximum comparability between treatment and control groups is attained. Briefly, the steps taken in estimating the propensity regressions are:

1. Estimating the propensity to issue short-term publicly listed debt that relates to expectations of future profitability: where the X_is used are empirical proxy for firm Q, net profits and age of the firm. Readers should note that future studies could expand the set of X_is as needed for their analysis.
2. Computing propensity scores for treated (issuers) and control (non-issuers) observations as the predicted values from the probit model in step 1.
3. Discarding all control (non-issuers) firms that cannot be compared to a treatment (issuer) firm and vice versa.
4. Classifying all firms into blocks defined by the classes of propensity score distribution that have matching treated (issuer) and control (non-issuer) firms.
5. Estimating the baseline regressions for treated (issuers) and control (non-issuer) firms within each block with minimum 15 observations for each sub-sample of firms.

5. Empirical Results

Table 1 presents summary statistics on the sample firms for the year 1996-97. Support for a macro-level liquidity constraint on inventory investment is provided by a median increase of 0.077 in sales for issuers and 0.087 for non-issuers (means are driven by outliers). The corresponding median inventory to total assets ratio remains roughly constant. Issuer firms whether measured by beginning of the period total assets or sales are bigger than non-issuer firms. At the summary statistics level interpreting which set of firms is more liquidity constrained is ambiguous. Issuer firms have higher mean (median) liquidity of 0.201 (0.198) than the corresponding number for non-issuer firms of 0.155 (0.150) but this difference is not significantly different. A more complete interpretation of liquidity is only possible in a multivariate regression setting. Bank debt, perhaps not too surprisingly in an emerging market, is the biggest source of debt financing for both set of firms. The mean (median) bank debt is 0.166 (0.155) for issuer firms and the mean (median) bank debt for non-issuer firms is 0.163 (0.131). The difference in bank debt among issuer and non-issuer firms is not significant which implies it is an equally important source of financing for both sets of firms on average. Trade credit is the second largest source of debt financing. The high reliance of Indian manufacturing firms on trade credit is consistent with Khanna and Palepu (2000) explanation that India does not have well-developed intermediary institutions and Petersen and Rajan (1997) findings that firms use more trade credit when credit from financial institutions is not available. Alternative sources of short-term debt financing besides bank debt are a lot smaller. However, 32.8% of the sample firms are issuer firms i.e. they have access to the short-term arm's length debt market represented by having commercial paper and/or short-term fixed deposits outstanding.

Consistent with Indian manufacturing firms being financially constrained during 1996-97 with non-issuers more so than issuers are the mean (median) finance gap to total assets ratio of –0.004 (-0.001) for issuers and –0.0132 (-0.006) for non-issuers. This indicates that the mean and median firm for issuers invested close to their internal funds while the mean and median non-

issuer firms invested less than their internal funds. The finance gap is significantly different with issuer firms having a lower finance gap. The mean (median) issuer firm faced an increase in external internal cost of financing wedge of 0.015 (0.006) i.e. the interest rate on total debt for 1996-97 was 150 basis points higher relative to 1995-96 while the mean (median) non-issuer firm faced an increase in the external internal cost of financing wedge of 0.017 (0.010). The increase in external internal cost of financing wedge was not significantly different possibly becuase the increase in the wedge is conditional on whether a firm accesses the external debt market and for how much debt.

Table 2 presents results of a baseline OLS regression, median regression and OLS regression using a conservative measure for liquidity for issuer and non-issuer firms. In Table 1 summary statistics show raw changes in inventory investments are skewed and have outliers. Therefore the dependent variable used is the change in the log of inventories over the year 1996-97. The findings of a negative coefficient on the start of the period's inventory to sales ratio for non-issuers and a positive coefficient on the change in the log sales terms for all specifications are consistent with Kashyap and Wilcox's (1993) cost minimization model which assumes that firms face quadratic costs of producing output and of deviating from a target inventory-sales ratio. The findings of a positive coefficient (for both sets of firms) on the change in log of firm sales term are consistent with accelerator effects where inventory adjusts with a lag to prior sales growth. The key explanatory variables of interest are liquidity. Not too surprisingly, the absolute wedge between internal and external financing costs hypothesis fails to be rejected since liquidity is positive and significantly different for both set of firms for all baseline regression specifications. The differences in relative liquidity constraints is confirmed since the liquidity coefficient for non-issuer firms (which are a priori expected to face higher levels of information asymmetry and lower access to capital markets) is higher than the coefficient for issuer firms for all three baseline OLS regression models. The summary statistics show differences in changes in sales ratio i.e. sales growth in both sets of firms. To address Kaplan and Zingales (1997)

concern that the differences in sales growth may bias towards finding a differences in investment liquidity sensitivities across two sets of firms a median regression specification is used. The differences in investment liquidity sensitivities are robust to using a median regression specification, which uses minimum absolute deviation estimators (Narula and Wellington, 1982). The differences in investment liquidity sensitivities remain significantly different at the 0.1 percent level. [3] An explanation of our findings till now could be that accounting measures of liquidity for group firms could be more polluted and this could induce a bias. In the third specification one source of pollution in liquidity measures is controlled for. Group firms invest in marketable securities of other firms in their group along with marketable securities of other firms. It is not clear how liquid these marketable securities really are. Therefore, a robust measure of liquidity that subtracts out marketable securities of peer group firms owned by firms in the same group is used. The magnitude of liquidity coefficients are approximately similar to the baseline OLS regression and the differences in investment liquidity sensitivities are between issuer and non-issuer firms is still significantly different at the 5% level of confidence.

The beginning of the period trade credit to total assets ratio is negative for all specifications in Table 2. These findings are consistent with Petersen and Rajan's (1997) findings that suppliers tend to lend to constrained firms since they have a comparative advantage in getting information about buyers, which should lead to lowered liquidity constraints.

An issue regarding these results is that the findings of non-issuer firms facing higher liquidity

constraints i.e. investment liquidity sensitivities might be driven by only a few industries. To address this concern baseline regression for sub-samples, which have more than 30 observations within a 2-digit industry classification, are estimated. Table 7 presents these results. 10 out of 14 industries have positive coefficients for liquidity. Assuming that the findings of positive and

[3] In an unreported specification observations with DFBETA's for liquidity coefficients greater than 2/square root of observations were eliminated and OLS regressions estimated. The magnitudes of liquidity coefficients decline

negative estimates are equally likely, the probability of obtaining 10 or more positive coefficients out of 14 is 9%. Further, these findings demonstrate that the presence of liquidity constraints is a widespread phenomenon not restricted to a few industries.

The differences in liquidity coefficients between issuers and non-issuers are statistically significant as is the liquidity coefficient of 0.545 for non-issuer firms. However, whether the magnitude of the difference is economically meaningful has to be addressed. The following calculations are only approximations since a structural interpretation of the baseline regressions is not recommended. The mean non-issuer firm cut their inventories/total assets ratio by 5.01% in real terms with inflation assumed at 5% on average during this time period in India (Banerjee and Duflo, 2001). The mean value of the liquidity/total assets variable for non-issuers is 15.5% with a standard deviation of 14.8%. This means for a non-issuer firm, a one standard deviation change in liquidity results in an increase of inventories of 14.8% multiplied by 0.545 = 8.07% approx.

Consistent with investment liquidity sensitivities not being spurious and representing liquidity constraints are the results from the financing gap and no financing gap regressions [Table 2]. There is no difference in the investment liquidity sensitivities between issuer and non-issuer firms among firms that had no financing gap i.e. firms which had total investments equal to or below their level of internal funds. There is a significant difference in the investment liquidity sensitivities with non-issuer firms having higher sensitivities for firms that faced a financing gap i.e. firms that had to access the external markets since their total investments were above their level of internal funds. Unlike Moyen's (2002) findings based on simulated data, the absolute level of investment liquidity sensitivities is higher for firms that had no financing gap (i.e. unconstrained firms). A caveat to drawing parallels with Moyen (2002) is that in the actual data we only observe the realized no financing gap, whether a firm could have financed higher investments by accessing external markets but choose not to do so and therefore should be

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modestly and differences in liquidity coefficients remain significantly different at the 1% level of confidence.

included in the (able to finance) financing gap category of firms is unclear. However this misclassification implies noisier estimates and therefore biases against our finding differences in liquidity sensitivities in the financing gap sub-sample. Further, presumably firms that choose not to finance higher investments by accessing external markets face higher costs relative to firms that do access the external markets, which is precisely what the presence of liquidity constraints would imply.

To draw a direct connection between a higher external internal cost of financing wedge and liquidity constraints, the regressions on sub-samples with increase and no increase in external internal wedge sub-samples are examined [Table 2]. Consistent with investment liquidity sensitivities representing liquidity constraints, the sub-sample of issuer and non-issuer firms that face no increase in external internal cost of financing wedge have no significant differences in liquidity constraints. The sub-sample of issuers and non-issuers that face an increase in the external internal cost of financing wedge show non-issuers having significantly higher investment liquidity sensitivities. The financing gap and external internal financing wedge results buttress the interpretation that investment liquidity sensitivities are liquidity constraints.

The results from first three regression specifications in Table 3 confirm the presence of and differences in liquidity coefficients among non-issuer and issuer firms and test whether these differences are due to liquidity constraints arising out of dependence on bank financing. The regression specifications, which include an interaction term of the beginning of the period above median bank debt to total assets ratio, and liquidity is examined in model 1. The pure bank dependence explanation hypothesis fails to be rejected. The interaction term is positive for non-issuer firms which confirm that firms that face higher levels of information asymmetries face higher liquidity constraints due to bank dependence. Further, once the effect of bank dependence is controlled for, the differences in liquidity coefficients between issuers and non-issuers are no longer significantly different. This is consistent with bank dependent borrowers among non-

issuer firms driving the differences in investment liquidity sensitivities found in the baseline regressions.

According to Indian industrial policy, firms with less than 10 million rupees in net worth are eligible for priority bank financing. These firms therefore, should not face a decrease in bank financing and ergo should face lower or no liquidity constraints. Consistent with this hypothesis and with bank dependency in general after controlling for priority lending the differences in liquidity constraints between issuers and non-issuers are eliminated. However, neither liquidity nor the interaction term of liquidity with a dummy variable for firms eligible for priority lending is significant. The bank lending channel view confirmed in the prior two regression models could also be due to simply firms facing a collateral shock and therefore receiving a lower amount of bank financing (for the same level of collateral). Model 3 presents results based on the bank loan limit rule, which is a convenient measure of the bank(s) estimate of individual firm debt capacities for purposes of granting bank loans. Firms with above bank loan limits are likely to be at their maximum debt capacity and therefore likely to be driving the differences in liquidity constraints. However, since this debt capacity determination is based on only bank lender rules it is another form of bank dependence. Results confirm that after controlling for above bank loan limit firm dummy interacted with liquidity the differences in liquidity coefficients between issuers and non-issuers are no longer significant. The underlying liquidity coefficients remain significant for both issuers and non-issuers representing absolute levels of liquidity constraints faced by both set of firms.

Model 4 examines the possibility that the bank dependence hypothesis results from model 1 are a result of single bank relationships among non-issuer firms. 11.4% of non-issuer firms have a single banking relationship as compared to 7.5% of issuer firms with the difference significant at the 1% level of confidence. The findings fail to support the single banking relationship based explanation. The interaction term of single banking relationship dummy and liquidity is insignificant for non-issuer firms and the differences in investment liquidity

sensitivities between issuer and non-issuer firms are robust to including the single banking relationship terms. The results from single bank relationship regressions are subject to the caveat that the identification of banking relationships is done on the basis of Sept 23, 2002 version of Prowess which contains the most recent available information for firms in this regard. To the extent that non-issuer firms are smaller firms and hence are more likely to be coded as having multiple banking relationships when in fact they had single bank relationships in the fiscal year 1996-97 i.e. the number of single banking relationships for non-issuer firms might be under-estimated more than for issuer firms, the coefficient on the single banking relationship interaction term is biased more downwards towards zero for non-issuer firms than for issuer firms.

If under-capitalized and weak banks charge a higher rate of interest or cut back credit more relative to healthy banks, their borrowers could face higher liquidity constraints regardless of whether the firms are issuers or non-issuers. Model 5 presents results on the weak banks hypothesis. The interaction term of weak banks dummy and liquidity is insignificant for issuer firms and significant but surprisingly negative for non-issuer firms. However, the weak bank dummy itself has a positive coefficient for non-issuer firms, combined with the interaction term, it is consistent with firms dependent on weak banks carrying higher liquidity stocks (Hubbard et. al., 2002) and therefore facing lower liquidity constraints. More pertinent, the differences in investment liquidity sensitivities between issuer and non-issuer firms are robust to including the weak bank terms and therefore bank health does not explain the differences.

A related question that arises from documenting that bank dependence is driving the differences in liquidity coefficients between issuers and non-issuer firms is whether the allocation of bank debt is efficient? In order to shed light on this issue, we follow Galindo, Schiantarelli and Weiss (2002) in assuming that the marginal product of capital is proportional to empirical measures of the average product of capital. The two proxies for a measure of the average product of capital used are the ratio of value added to capital and the ratio of operating

profits to capital. The value added proxy is consistent with a production function of Cobb-Douglas type and the operating profit proxy is consistent with a production function which is homogenous of degree one.[4] Table 3b presents correlation coefficients between the ratio of the actual total return to capital to the hypothetical 'optimal' return to capital and the bank debt quartiles (or change in bank debt allocation over the year 1996-97 quartiles). Both the correlations are negative, regardless of which proxy for the average product of capital is used. These findings are consistent with bank debt not being allocated to the most capital efficient firms in a year when a bank loan supply cut was instituted.

Till this stage, all specifications are aimed at both establishing liquidity constraints primarily due to information asymmetries and tracing the source of these liquidity constraints by examining various characteristics of the financial intermediation process. Table 4 reports results of testing six alternative explanations of the findings of differences in investment liquidity sensitivities.

In model 1 of table 4, the agency problems based explanation hypothesis is not supported by the data. The below median insider's cash flow rights interaction term is insignificant and negative for non-issuer firms. This demonstrates that firms facing higher levels of agency problems do not face higher liquidity constraints among non-issuer firms. However, for issuer firms the interaction term is positive and the liquidity term becomes insignificant. This is consistent with investment liquidity sensitivities being significant for firms with relatively low insider ownership. However, the differences in investment liquidity sensitivities between issuers and non-issuers remain significantly different at the 0.1 percent level.

[4] To arrive at the measure of efficiency of investment allocation between issuer and non-issuer firms, we proceeded as follows. First we calculated the return to investment for each firm by multiplying investment by the firm by one of our proxies of the firm's marginal product of investment. We added the return to investment by each firm across all firms to get an estimate of the total return to investment for issuer or non-issuer firms. Next, this measure of total return on investment is divided by the total return that would have been realized if investment funds had been allocated among firms in proportion to their share of capital in the sample. Our measure of the efficiency of the allocation of investment is the ratio of our estimate of the actual total return on investment to this hypothetical estimate of the total return that would have been achieved if investment funds were allocated according to each firm's share of the capital stock.

The flypaper effect hypothesis is not supported by the data either. The above median industry adjusted liquidity dummy multiplied with liquidity interaction term has a negative coefficient for both issuers and non-issuers. This implies that firms that have higher industry-adjusted liquidity levels have lower investment liquidity sensitivities, which is consistent with these sensitivities representing liquidity constraints that are relaxed for firms with higher levels of internal funds. It is not consistent with firms with higher levels of internal funds being more susceptible to free cash flow problems (Jensen, 1986) or the flypaper effect (Hines and Thaler, 1995).

Another possibility is that investment liquidity sensitivities represent over-investment rather than under-investment implied by liquidity constraints. Firms with higher operating margins face an higher opportunity cost of under-investing in inventory investments. In regression model 3, we examine the over-investment hypothesis. The interaction term of liquidity with above median operating margin is insignificant for issuer firms and is significant and negative for non-issuer firms. This implies that non-issuer firms with above median operating margins face lower investment liquidity sensitivities which is consistent with liquidity constraints being reduced for these firms. This result is not consistent with over-investment hypothesis. The differences in liquidity coefficients remain significantly different and higher for non-issuers relative to issuers over-investment does not explain differences in investment liquidity sensitivities.

Regression 4 examines the differences in contracting and governance environment between firms by dividing the sub-samples of issuers and non-issuers into foreign firms (i.e. firms publicly listed on Indian stock exchange but which are controlled by and have parent firms outside India) and domestic Indian firms. The interaction term of foreign firms and liquidity is insignificant for both issuers and non-issuer firms. The differences in liquidity coefficients remain between issuer and non-issuer firms.

Regression 5 examines the crony capitalism hypothesis. The overwhelming majority of the Indian banking sector is comprised of Indian government owned banks. If firms belonging to large group firms in India have access to higher bank credit due to political connections or lobbying efforts this could explain the differences in liquidity constraints. The hypothesis finds mixed support. The differences in liquidity coefficients between issuers and non-issuers remain so crony capitalism is not driving the differences in liquidity constraints. However, the interaction term of liquidity and large group firm dummy is significant and negative which implies that non-issuers that are members of large groups face lower liquidity constraints due to higher access to bank credit.

Regression 6 examines the debt overhang hypothesis. The above median debt overhang dummy multiplied with liquidity interaction term has a negative coefficient for both issuers and non-issuers. The interaction coefficient is significant for issuers. This implies that issuer firms with an anticipated need for redeeming relatively high proportion of debt which has or will become due in the next three years have higher precautionary savings in their liquidity relative to non-issuer firms. The findings are consistent with Almeida et. al. (2002) and represent differences in liquidity demand explaining differences in liquidity constraints between issuers and non-issuers.

In order to buttress the arguments that the differences in liquidity coefficients represent differences in liquidity constraints, Table 4b examines sub-samples that can potentially provide relatively unambiguous evidence on this issue. Previous regression frameworks a-priori sort firms into issuers and non-issuers. It is possible that among non-issuers are some firms that can issue short-term public debt if they wanted to and might do so in a year when they face a bank loan supply cut. Regression 1 framework presents results from a sub-sample of non-issuers firms which became issuers over the year 1996-97. Consistent with the sorting of firms into issuers and non-issuers representing a-priori differences in potential information asymmetry and access to capital markets, the liquidity coefficient on new 1996-97 issuers of short-term public

debt is negative and significant. In contrast the rest of the non-issuers have a liquidity coefficient positive and significant. The difference in liquidity coefficients between the two set of firms is significantly different at the 5 percent level of confidence.

Kaplan and Zingales (1997) read the management's discussion of operations for their sample of U.S. firms and find that a number of firms like Hewlett Packard could have invested more if they wanted to and therefore they are unlikely to be liquidity constrained regardless of their liquidity coefficients. In order to implement the equivalent of such a 'reality' check in a large cross-section of Indian firms we use the fact whether during 1996-97 a non-issuer firm extended new loans in the inter-corporate debt markets. If an non-issuer firm extended such loans they are likely to be not liquidity constrained even though they are in the a-priori set of firms likely to be liquidity constrained. Regression 2 in table 4b examines non-issuer firms that are potentially 'misclassified' as liquidity constrained since they extend new loans in the inter-corporate debt markets. Consistent with Kaplan and Zingales (1997) concerns this set of 'misclassified' firms have high positive liquidity coefficients. However, the underlying liquidity coefficient of the rest of non-issuer firms remains positive and significant. Further, while economically the liquidity coefficients are different between 'misclassified' non-issuer firms and rest of non-issuer firms, the liquidity coefficients are not significantly different. These results present a caveat to the over-interpretation of the a-priori sort of firms into issuers and non-issuers of short term public debt representing perfectly unconstrained and constrained firms respectively.

Stein (2001) in his comprehensive survey of corporate investment notes that corporate investment is influenced by both information and agency problems. In FHP (1988) a-priori sorting of firms regression framework the interpretation of liquidity coefficients as liquidity constraints implicitly implies that for the differences in liquidity coefficients between the two set of firms it is information asymmetry differences that are important and not agency problems. In order to provide direct evidence on this issue a holdout sample of Indian government owned firms is examined. Government firms have access to budgetary support from the government

and therefore do not face information asymmetry problems but suffer from agency problems. Regression 3 in table 4b examines the liquidity coefficients of Indian government owned firms which are not significant and are significantly different from the sample privately owned issuers and non-issuer firms at the 5 percent level of confidence. The results are consistent with information asymmetry driving the differences in liquidity constraints.

Table 6 reports the coefficients of liquidity variables of baseline regressions for inventory investments from propensity score regressions that are not subject to the problem of liquidity variables capturing differences in expectations of future profitability effects. The propensity scores match issuer and non-issuer firms on three dimensions: Q, net profit and age of the firm. 5 blocks have adequate number of matching observations for issuers and non-issuers for inventories regressions. In 4 out of 5 blocks the liquidity coefficient of non-issuer firms is higher than that of issuer firms. The results confirm that non-issuer firms face higher liquidity constraints and that the differences in liquidity coefficients are not subject to the caveat that firm characteristics or future expectations of firm profitability might be different between issuers and non-issuers. However, a majority of observations for inventory investments do not find matches for non-issuer and issuer firms. This is consistent with differences in firm characteristics (as captured by the 3 dimensions of firm Q, firm net profits and firm age) between issuers and non-issuers.

Till this stage the results of investment liquidity sensitivities are based on inventory investments. It is conceivable that non-issuer firms, which have a higher percentage of high growth firms in terms of increased sales, need to invest more in capital investments. Further, non-issuer firms may have their ratio of opportunity costs of forsaking capital investments over opportunity costs of forsaking inventory investments to be higher than their ratio of adjustment costs of capital investments over adjustment costs of inventory investments. This implies that non-issuer firms choose to face higher liquidity constraints for their inventory investments rather than facing higher liquidity constraints for their capital investments. Issuer firms on the other

hand engage in a vice-versa decision. This line of reasoning predicts that capital investment liquidity sensitivities should be lower for non-issuer firms versus issuer firms. Table 5 reports the results of examining capital investments. Non-issuer firms face higher liquidity constraints relative to issuer firms for capital investments, which rejects the above rationale. The regression model 1 parallel the over-investment model except that above median Q proxies for higher growth opportunities and therefore higher opportunity costs for such firms if they face liquidity constraints. The interaction term is negative and insignificant which does not support the over-investment hypothesis. The differences in liquidity constraints remain between non-issuers and issuers for this class of firm investments though only at the 10% level of confidence. Model 2 examines the pure bank dependency hypothesis for capital investments; recall that this hypothesis found the most support in explaining the differences in inventory investment liquidity sensitivities between issuers and non-issuers. Paralleling the results from inventory investments, capital investment liquidity sensitivities are also driven by firms with above median bank debt. This is true for both issuers and non-issuers which implies in contrast to inventory investments where only non-issuers faced higher liquidity constraints due to higher bank dependence for capital investments both sets of firms do. More important, similar to inventory investment results the differences in capital investments liquidity sensitivities between issuers and non-issuers are no longer significant after controlling for the pure bank dependency terms.

Another issue is that maybe issuer firms are adjusting their investments at other margins i.e. research & development, advertising or investments in labor and therefore there are no differences in overall financial constraints that issuer and non-issuer firms face. Unfortunately data on number of employees is not available in Prowess. However data on investments in research & development and advertising are available. Table 5 presents results based on total firm investments that address these concerns. Non-issuer firms are liquidity constrained in terms of their total investments, which includes inventories, capital, research & development and advertising investments while issuer firms are not in the over-investment hypothesis. The

difference in liquidity constraints is significantly different at the 2.7 percent level of confidence. However these findings are subject to the caveat that total investments include four different types of investments that have potentially different adjustment costs.

Once again, the pure bank dependency hypothesis is examined for total investments. It finds mixed support in the data. The interaction term of liquidity and above median bank debt and the underlying liquidity term are insignificant for both issuers and non-issuers. However, the addition of pure bank dependency terms leads to the differences in total investments liquidity sensitivities between issuers and non-issuers being no longer significant. The overall evidence from various hypotheses tested for inventories, capital investments and total investments support the investment liquidity sensitivities arising from bank dependency and representing liquidity constraints.

Table 6 reports the coefficients of liquidity variables of baseline regressions for capital investments and total firm investments from propensity score regressions that are not subject to the problem of liquidity variables capturing differences in mismeasurement of Q effects. The propensity scores match issuer and non-issuer firms which have the data required to estimate the capital investment regressions on 3 dimensions: Q, net profit and age of the firm. A majority of observations for capital investments do not find matches for non-issuer among issuer firms. This is consistent with differences in firm characteristics (as captured by the 3 dimensions of firm Q, firm net profits and firm age) between issuers and non-issuers. 3 blocks have adequate number of matching observations for issuers and non-issuers for capital investment regressions. In 2 out of 3 blocks the liquidity coefficient of issuer firms is higher than that of non-issuer firms. The results reverse the results for capital investment regressions since now non-issuer firms face higher liquidity constraints and are consistent with differences in mismeasurement of Q driving the prior findings on differences in capital investment liquidity constraints. The non-matching of the majority of the issuers and non-issuer firms in the sub-sample of capital investments provides an additional caveat to interpreting the differences in liquidity coefficients between issuer and

non-issuer firms as liquidity constraints. This caveat may or may not be a more general version of the concerns raised by Kaplan and Zingales (1998) regarding interpreting a greater sensitivity of investment to liquidity as a reliable measure of differences in the liquidity constraints.

Similar to the findings on capital investments from propensity regressions are the findings on total firm investments. A majority of observations for total firm investments do not find matches for non-issuer and issuer firms. This is consistent with differences in firm characteristics (as captured by the 3 dimensions of firm Q, firm net profits and firm age) between issuers and non-issuers. 3 blocks have adequate number of matching observations for issuers and non-issuers for capital investment regressions. In 2 out of 3 blocks the liquidity coefficient of issuer firms is higher than that of non-issuer firms. The results reverse the results for total firm investment regressions since non-issuer firms face higher liquidity constraints.

Now, we switch the discussion back to the set of corporate investments that is the main focus of this study i.e. inventory investments. If the findings of differences in liquidity constraints due to bank dependent borrowers are a causal effect of RBI's policy of instituting a cut in the bank loan supply curve than in the prior year, 1995-96 and in the subsequent year, 1997-98 firms across both categories of same firms as in 1996-97 should face lower liquidity constraints. Table 8 reports the results of the baseline regression specifications and the pure bank dependency hypothesis for 1995-96 and 1997-98. The results from 1995-96 are consistent with such an explanation. Issuer firms and perhaps surprisingly non-issuer firms are not liquidity constrained in the baseline and bank dependent regressions and have lower magnitudes of liquidity coefficients than the 1996-97 baseline regression liquidity coefficients. Somewhat surprisingly, the interaction term for above bank median debt and liquidity is significant at 5% level of confidence for issuer firms while it is not significant for non-issuer firms. Results from 1997-98 baseline show higher levels of liquidity constraints for non-issuer firms. A potential explanation for this finding is that perhaps RBI's policy of 1996-97 and contractionary bank loan supply shocks similar to contractionary money supply shocks [See Christiano, Eichenbaum and

Evans (1997)] have a spillover effects in 1997-98, which ended up constraining non-issuer firms. The differences in liquidity constraints between issuer and non-issuer firms in 1997-98 are significant for both baseline and bank dependent regressions. In sum, the evidence supports the causal effect of RBI's bank loan supply cut increasing liquidity constraints for Indian manufacturing firms

Table 9 reports results of specifications that examine individual components of inventories. The differences in investment liquidity sensitivities across non-issuer and issuer firms found for aggregate inventories are no longer significant for individual component of inventories: raw materials, work-in-process and finished goods specifications. In addition, the coefficients of liquidity for issuer firms are higher in magnitude, though they are not significantly different, than those of non-issuer firms for raw material inventories and finished goods inventories. The coefficients for liquidity in work in progress inventories are not significant for both sets of firms. The number of observations for each individual component of inventories is lower due to missing data compared to aggregate inventories. Therefore, regressions for matching samples for aggregate inventories are presented. For work-in-progress the seemingly anomalous results of findings of non-significant liquidity constraints and no significant difference in liquidity constraints is explained by sample selection bias induced by missing data since the matching aggregate inventories regressions also have similar findings. The findings for raw materials and finished goods need to be investigated further.

6. Conclusions

The empirical methodology pioneered by Fazzari, Hubbard and Petersen (1988) has come under criticism from Kaplan and Zingales (1997 and 2000) who present theoretical arguments and empirical evidence against interpreting differences in investment liquidity sensitivities between two sets of firms sorted on an a prior basis of differences in information asymmetries

and access to capital markets as liquidity constraints. We use a comprehensive plan of empirical investigation to figure out whether the investment liquidity sensitivities represent liquidity constraints? We use a sorting criterion that provides an unambiguous prediction as to the direction of the differences in liquidity constraints in an emerging market where bank financing is a major source of capital for firms and in a time period of bank loan supply contraction engineered by RBI in India. Using propensity score regressions that are not subject to the caveat (that expectations of future firm profitability or firm characteristics might be different between issuer and non-issuer firms such that interpreting differences between inventory investment liquidity coefficients as liquidity constraints may not be robust), we find evidence consistent with non-issuer firms facing higher liquidity constraints in inventory investments relative to issue firms. We directly test for whether the liquidity constraints are binding or not by examining sub-samples of firms that had total investments lower than their internal funds and firms that had total investments higher than their internal funds. The differences in inventory investment liquidity sensitivities are driven by firms facing a financing gap i.e. firms that had investments higher than internal funds. Results from sub-samples of firms with observed increase in external and internal financing cost wedge and firms with no increase in the said wedge are driven by firms that face an increase in the wedge between external and internal cost of financing. Further, using the two sets of firms generated by this sorting criterion, we use the empirical strategy of investigating how the differences in investment liquidity sensitivities arise by examining various financial intermediations based explanations. The results from examining aggregate inventory investments are consistent with non-issuer firms having higher investment liquidity sensitivities vis-à-vis issuer firms. It is characteristics of borrowers i.e. bank dependent non-issuer firms that drive the differences in liquidity constraints between the two sets of firms. Explanations based on lender characteristics are not supported. Next, we examine alternative explanations for investment liquidity sensitivities including agency problems, flypaper effect, over-investment, non-Indian legal regime based contracting and governance environment, crony capitalism and

debt overhang. None of these alternative hypotheses except debt overhang explain differences in investment liquidity sensitivities. Results from debt overhang regressions support the interpretation of differences in liquidity coefficients as representing differences in liquidity constraints but due to the differences in liquidity demand. The findings illustrate that even unconstrained firms can have a higher propensity to save cash out of liquidity (by inference) if they face the fully anticipated prospects of having to redeem a rather large current portion of long term debt outstanding in the current and next three years. These findings add to Almeida et. al.'s (2002) results. The identification of potentially 'misclassified' non-issuer firms as liquidity constrained based on their extending inter-corporate loans to other firms during 1996-97 provides support for Kaplan and Zingales (1998) who note that the final implication of their study is that a great deal can be learned about corporate liquidity through direct observations (beyond liquidity coefficients). With that caveat in mind, it is clear that inventory investment liquidity sensitivities represent liquidity constraints.

The picture that emerges from examining capital investments and total firm investments is cloudy. The results from capital investments and total investments regressions support the bank dependence hypothesis driving differences in investment liquidity sensitivities. However, results from propensity score regressions that control for differences in mismeasurement of Q between issuers and non-issuers present contradictory and ambiguous results. The matching observations findings are consistent with non-issuers facing lower liquidity constraints than issuer firms and/or differences in mismeasurement of Q driving the prior documented differences in capital and total firm investment liquidity constraints. The non-matching observations provide evidence consistent with firm characteristics and future expectations of profitability being different between a set of issuer and non-issuer firms.

India is an emerging market with bank financing representing a major source of financing for firms. Whether bank dependence is the source of differences in liquidity constraints, if any, in samples of firms in developed countries is an unanswered question. A potential topic for

future research is studying sample(s) of firm year observations at the time of monetary policy regime shifts and examining alternative explanations for differences in investment liquidity sensitivities in order to identify the source(s) of liquidity and financial constraints faced by firms in developed countries. Further empirical tests that directly tie investment liquidity sensitivities to their interpretation as liquidity constraints, examination of a comprehensive array of alternative hypotheses to explain differences in investment liquidity sensitivities, and conducting the two direct empirical hypotheses tests of financing gap and changes in wedge between external and internal financing used in this study in other countries and for other samples would be useful.

The propensity score regression framework and the manner in which it has been used in this study have potential implications both narrow and broad. In the narrow sense, for studies utilizing FHP (1988) methodology it provides a way to control for differences in firm characteristics (in multiple dimensions) that can control for mismeasurement of Q problems that arise due to the sorting criterion used to a-priori sort firms into liquidity constrained and non-liquidity constrained firms. In the broad sense, the particular manner of use of the propensity score method in this study to match firms in multiple dimensions, which builds on prior studies like Lalonde (1986), Dehejia and Wahba (1998, 1999) and Villalonga (2000), provides a way to construct a 'better' set of benchmark control firms. Two examples illustrate this point. The ability to construct a set of benchmark firms matched on multiple sources of risk characteristics using propensity scores might be useful for studies that examine IPO and SEO long-run under-performance. The ability to construct a set of benchmark firms matched on propensity to be taken-over or merged could be useful for studies examining either post-merger performance of bidders or merger waves.

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Table 1.

Summary statistics on the 1996-97 sample of Indian manufacturing firms. All mean (median) are in ten million of Rupees (Crore of Rupees) and U.S. $1 = 35.50 Rupees approximately. T-test column shows the t-stat (p-value). **Variable definitions are given in Appendix 1.**

Variables	Issuer Firms	Non-Issuer Firms	T-test for diff.
Total Assets	439.569 (87.23)	116.559 (20.420)	-5.795 (0.000)
Sales	391.464 (92.275)	71.010 (17.670)	-6.515 (0.000)
Inventories/Total Assets	0.199 (0.180)	0.175 (0.154)	-4.489 (0.000)
Change in Inventories	6.398 (0.330)	0.711 (0.110)	-3.649 (0.000)
Inventories/Total Assets Change 9796	-0.012 (-0.010)	-0.001 (0.000)	4.296 (0.000)
Liquidity/Total Assets	0.201 (0.198)	0.155 (0.150)	-7.349 (0.000)
CAPEX/Total Assets	0.197 (0.129)	0.350 (0.127)	3.409 (0.001)
Total Investments/Total Assets	0.487 (0.426)	0.617 (0.404)	2.787 (0.005)
Total Borrowings/Total Assets	0.363 (0.368)	0.356 (0.350)	-0.803 (0.425)
Bank Debt/Total Assets	0.166 (0.155)	0.163 (0.140)	-0.575 (0.565)
Trade Credit/Total Assets	0.166 (0.138)	0.131 (0.101)	-6.762 (0.000)
Short-term arm's length debt/Total Assets	0.020 (0.011)	0.00 (0.00)	-28.865 (0.000)
Insider's cash flow rights	31.329 (32.310)	29.452 (28.440)	-1.698 (0.089)
Q	1.216 (1.037)	1.048 (0.927)	-5.245 (0.000)
Salechange9796	0.225 (0.077)	2.465 (0.088)	0.862 (0.388)
Single bank dummy	0.075 (0.000)	0.114 (0.000)	2.980 (0.003)
Below Basle Banking Relationships Dummy	0.158 (0.000)	0.080 (0.000)	-6.038 (0.000)
Above bank limit Dummy	0.186 (0.000)	0.264 (0.000)	4.273 (0.000)
Foreign firm dummy	0.070 (0.000)	0.033 (0.000)	-3.771 (0.000)
Large group firm dummy	0.118 (0.000)	0.038 (0.000)	-8.009 (0.000)
Operating Margin	0.224 (0.250)	0.149 (0.207)	-2.908 (0.004)
Finance gap/Total assets	-0.004 (-0.001)	-0.0132 (-0.006)	-4.26 (0.000)
Change in external wedge	0.015 (0.006)	0.017 (0.010)	0.307 (0.0759)

Table 2.

Baseline regression analysis of Indian manufacturing firms for the year 1996-1997. The dependent variable in the regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. **Variable definitions are given in Appendix 1.**

Variables	OLS issuer firms	OLS Non-issuer firms	Median Issuer firms	Median Non-issuer firms	OLS robust liquidity Issuer firms	OLS robust liquidity Non-issuer firms	No Finance gap analysis issuer firms	No Finance gap analysis Non-issuer firms	Finance gap analysis issuer firms	Finance gap analysis Non-issuer firms	No increase in external wedge analysis issuer firms	No increase in external wedge analysis non-issuer firms	Increase in external wedge analysis issuer firms	Increas in externa wedge analysi non-issuer firms
Constant	0.247 (0.183)	0.243 (0.235)	0.322 (0.185)	0.222 (0.170)	0.239 (0.183)	0.253 (0.235)	0.123 (0.411)	-0.091 (0.646)	0.077 (0.221)	0.260 (0.242)	0.273 (0.490)	0.540 (0.317)	-0.132 (0.221)	0.192 (0.261)
Group	-0.005 (0.029)	-0.051 (0.029)	-0.032 (0.033)	-0.038 (0.025)	0.004 (0.030)	-0.045 (0.029)	0.051 (0.123)	0.231 (0.106)	-0.017 (0.029)	**-0.065 (0.029)**	0.009 (0.049)	0.021 (0.050)	-0.037 (0.037)	-0.092 (0.038)
Ln Inv/Sales	0.007 (0.024)	**-0.113 (0.017)**	0.016 (0.027)	**-0.088 (0.014)**	0.007 (0.024)	**-0.115 (0.017)**	-0.034 (0.096)	**-0.169 (0.055)**	-0.033 (0.025)	**-0.131 (0.017)**	**-0.067 (0.029)**	0.008 (0.043)	-0.038 (0.030)	**-0.137 (0.021)**
Change in Ln Sales	**0.399 (0.046)**	**0.294 (0.031)**	**0.289 (0.052)**	**0.232 (0.025)**	**0.399 (0.047)**	**0.296 (0.031)**	0.078 (0.171)	0.169 (0.113)	**0.387 (0.047)**	0.302 (0.030)	**0.373 (0.048)**	**0.199 (0.088)**	**0.455 (0.064)**	**0.249 (0.042)**
Lagged change in ln sales	0.002 (0.041)	0.020 (0.017)	0.033 (0.046)	0.016 (0.014)	0.001 (0.041)	0.020 (0.017)	0.217 (0.300)	-0.017 (0.053)	-0.061 (0.038)	**0.037 (0.017)**	-0.024 (0.029)	**0.171 (0.076)**	-0.035 (0.054)	0.038 (0.021)
Lagged change in Ln Inv.	**-0.281 (0.038)**	-0.014 (0.023)	**-0.164 (0.041)**	0.007 (0.019)	**-0.284 (0.038)**	-0.015 (0.023)	**-0.592 (0.103)**	0.047 (0.088)	**-0.146 (0.039)**	-0.031 (0.022)	-0.050 (0.037)	**-0.382 (0.061)**	**-0.161 (0.049)**	0.001 (0.030)
Liquidity	**0.496 (0.139)**	**0.545 (0.105)**	0.220 (0.153)	**0.461 (0.085)**			0.581 (0.432)	**0.746 (0.286)**	**0.605 (0.145)**	**0.664 (0.111)**	**0.415 (0.167)**	**0.397 (0.240)**	**0.506 (0.168)**	**0.567 (0.137)**
Robust Liquidity					**0.507 (0.145)**	**0.509 (0.106)**								
Bank debt/Total Assets	-0.028 (0.156)	0.034 (0.112)	-0.083 (0.172)	0.142 (0.092)	-0.036 (0.156)	0.030 (0.113)	-0.664 (0.533)	0.024 (0.517)	0.017 (0.154)	-0.057 (0.107)	**-0.381 (0.196)**	0.026 (0.251)	-0.068 (0.195)	0.257 (0.138)
Trade Credit/Total Assets	**-0.516 (0.134)**	**-0.331 (0.109)**	**-0.362 (0.150)**	**-0.209 (0.084)**	**-0.518 (0.135)**	**-0.339 (0.109)**	-0.567 (0.508)	-0.709 (0.526)	**-0.475 (0.131)**	**-0.330 (0.103)**	**-0.384 (0.168)**	**-0.470 (0.233)**	**-0.467 (0.160)**	**-0.353 (0.147)**
No. of firms Adjusted R^2	621 0.233	1267 0.174	621 0.097	1267 0.082	621 0.232	1267 0.171	84 0.427	163 0.194	537 0.231	1102 0.229	524 0.185	253 0.289	368 0.0241	740 0.195

Notes:

F-test for equality of liquidity coefficients of issuer and non-issuer firms' OLS: 5.35 (p-value 0.020)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' median regression: 10.92 (p-value 0.001)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' robust liquidity: 3.77 (p-value0.052)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' no financing gap <=0: 1..42 (p-value 0.235)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' financing gap > 0: 7.04 (p-value 0.008)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' external wedge no-increase <=0: 0.93 (p-value 0.334)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' external wedge increase >0 3.91: (p-value 0.048)

Table 3.

Interpretations of liquidity coefficients: Bank dependence, single bank, weak banks, priority lending and bank loan limit explanations. OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. **Variable definitions are given in Appendix 1.**

Variables	Pure bank dependence Issuer Firms	Pure bank dependence Non-Issuer Firms	Priority lending Issuer firms	Priority lending Non-issuer Firms	Above loan limit issuer firms	Above loan limit Non-issuer firms	Single bank Issuer Firms	Single bank Non-Issuer Firms	Weak banks Issuer Firms	Weak banks non-issuer Firms
Constant	0.293 (0.187)	0.295 (0.236)	0.239 (0.685)	0.222 (0.249)	0.178 (0.188)	0.226 (0.235)	0.227 (0.184)	0.259 (0.235)	0.226 (0.184)	0.199 (0.235)
Group	-0.004 (0.029)	-0.510 (0.029)	-0.014 (0.029)	-0.064 (0.031)	-0.008 (0.030)	-0.050 (0.029)	-0.002 (0.029)	-0.050 (0.030)	-0.002 (0.029)	-0.055 (0.030)
Ln Inv/Sales	0.009 (0.024)	**-0.113** **(0.017)**	-0.016 (0.024)	-0.117 (0.018)	-0.002 (0.024)	**-0.117** **(0.018)**	0.008 (0.024)	**-0.112** **(0.017)**	0.009 (0.024)	-0.116 (0.018)
Change in Ln Sales	**0.393** **(0.047)**	**0.289** **(0.031)**	**0.311** **(0.062)**	**0.294** **(0.033)**	**0.414** **(0.047)**	**0.293** **(0.031)**	**0.393** **(0.046)**	**0.294** **(0.031)**	**0.399** **(0.046)**	**0.295** **(0.031)**
Lagged change in ln sales	0.004 (0.042)	0.020 (0.17)	**0.120** **(0.047)**	0.022 (0.017)	0.003 (0.041)	0.020 (0.017)	-0.006 (0.041)	0.020 (0.017)	-0.000 (0.041)	0.018 (0.017)
Lagged change in Ln Inv.	**-0.284** **(0.038)**	-0.014 (0.023)	**-0.257** **(0.038)**	-0.023 (0.023)	**-0.276** **(0.038)**	-0.015 (0.023)	**-0.272** **(0.038)**	-0.015 (0.023)	**-0.285** **(0.038)**	-0.015 (0.023)
Liquidity	0.345 (0.189)	**0.370** **(0.144)**	0.263 (3.29)	0.634 (0.485)	**0.561** **(0.156)**	**0.475** **(0.114)**	**0.429** **(0.145)**	**0.508** **(0.110)**	**0.641** **(0.160)**	**0.664** **(0.112)**
Above median bank debt	-0.042 (0.069)	-0.067 (0.049)								
Above median bank debt*liquidity	0.301 (0.258)	**0.331** **(0.047)**								
Single bank							-0.088 (0.087)	-0.047 (0.053)		
Single bank*liquidity							0.764 (0.404)	0.299 (0.278)		
Weak banks									0.091 (0.069)	**0.115** **(0.055)**
Weak banks*liquidity									-0.494 (0.281)	**-0.668** **(0.239)**
Priority lending			-0.112 (0.663)	0.022 (0.096)						
Priority lending*liquidity			0.354 (3.29)	-0.052 (0.495)						
Bank overlimit					0.096 (0.067)	-0.020 (0.048)				
Bank overlimit*Liquidity					-0.110 (0.328)	0.563 (0.256)				

Bank debt/total assets	-0.109 (0.215)	0.067 (0.156)	-0.098 (0.158)	0.035 (0.121)	-0.114 (0.164)	-0.019 (0.121)	-0.025 (0.156)	0.037 (0.113)	-0.42 (0.156)	0.035 (0.113)
Trade credit/total assets	**-0.518 (0.134)**	**-0.331 (0.109)**	**-0.510 (0.138)**	**-0.418 (0.136)**	**-0.486 (0.136)**	**-0.318 (0.110)**	**-0.522 (0.135)**	**-0.332 (0.109)**	**-0.503 (0.135)**	-0.335 (0.109)
No. of firms	621	1267	615	1194	621	1267	621	1267	621	1267
Adjusted R^2	0.233	0.175	0.204	0.171	0.234	0.177	0.236	0.174	0.235	0.178

Notes:
F-test for equality of liquidity coefficients of issuer and non-issuer firms' bank dependence: 1.28 (p-value 0.257)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' priority lending: 0.26 (p-value 0.609)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' bank loan limit: 1.96 (p-value 0.162)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' single bank: 3.03 (p-value 0.082)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' weak banks: 5.77 (p-value 0.016)

Table 3b.

Bank debt allocation efficiency. Correlation analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. Kratio1 = Actual average product of capital (based on value added) to the hypothetical 'optimal' average product of capital. Kratio2 = Actual average product of capital (based on operating profits) to the hypothetical 'optimal' average product of capital**. Variable definitions are given in Appendix 1.**

Variables	Kratio1	Kratio2
Bank debt quartile 1996	-0.069	-0.066
Bank debt change quartile 1996-97	-0.033	-0.031

Table 4.

Interpretations of liquidity coefficients: Agency problems, Flypaper effect, Over-investment, Non-Indian legal regime, crony capitalism and debt overhang explanations. OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. Variable definitions are given in Append. 1.

Variables	Agency Issuer firms	Agency Non-issuer firms	Flypaper Issuer firms	Flypaper Non-issuer firms	Over-investment Issuer firms	Over-investment Non-issuer firms	Non-Indian Issuer firms	Non-Indian Non-issuer firms	Crony Issuer firms	Crony Non-issuer firms	Debt overhang issuer firms	Debt overhand non-issuer firms
Constant	0.325	0.196	0.223	0.145	0.218	0.271	0.241	0.223	0.227	0.221	0.124	0.146
	(0.185)	(0.236)	(0.182)	(0.238)	(0.185)	(0.234)	(0.183)	(0.234)	(0.185)	(0.234)	(0.174)	(0.212)
Group	-0.001	-0.050	-0.004	-0.049	-0.04	-0.049	-0.006	-0.055	-0.008	-0.034	-0.021	-0.036
	(0.030)	(0.030)	(0.030)	(0.029)	(0.030)	(0.029)	(0.030)	(0.030)	(0.032)	(0.031)	(0.029)	(0.031)
Ln Inv/Sales	0.006	**-0.114**	0.009	**-0.113**	0.008	**-0.109**	0.007	**-0.110**	0.007	**-0.113**	-0.016	**-0.130**
	(0.024)	**(0.017)**	(0.023)	**(0.017)**	(0.024)	**(0.017)**	(0.024)	**(0.017)**	(0.024)	**(0.017)**	(0.024)	**(0.019)**
Change in Ln Sales	**0.388**	**0.294**	**0.389**	**0.291**	**0.392**	**0.289**	**0.398**	0.290	**0.399**	**0.290**	**0.271**	**0.293**
	(0.046)	**(0.031)**	**(0.046)**	**(0.031)**	**(0.047)**	**(0.031)**	**(0.046)**	(0.031)	**(0.047)**	**(0.030)**	**(0.063)**	**(0.036)**
Lagged change in ln sales	-0.005	0.022	-0.003	0.020	0.002	0.015	0.002	0.019	0.002	0.019	**0.175**	0.050
	(0.041)	(0.017)	(0.041)	(0.017)	(0.004)	(0.374)	(0.041)	(0.017)	(0.041)	(0.017)	**(0.048)**	(0.030)
Lagged change in Ln Inv.	**-0.285**	-0.014	**-0.283**	-0.014	**-0.284**	-0.018	**-0.281**	-0.015	**-0.282**	-0.015	**-0.250**	-0.041
	(0.038)	(0.023)	**(0.037)**	(0.023)	**(0.038)**	(0.023)	**(0.037)**	(0.023)	**(0.038)**	(0.023)	**(0.037)**	(0.026)
Liquidity	0.131	**0.679**	**1.125**	**0.856**	**0.721**	**1.025**	**0.534**	**0.612**	**0.523**	**0.619**	**0.901**	**0.506**
	(0.199)	**(0.145)**	**(0.225)**	**(0.170)**	**(0.229)**	**(0.148)**	**(0.148)**	**(0.109)**	**(0.143)**	**(0.109)**	**(0.206)**	**(0.125)**
Below Median Ownership	**-0.150**	0.076										
	(0.061)	(0.041)										
Below Median Ownership *Liquidity	**0.653**	-0.219										
	(0.259)	(0.188)										
Above median industry liquidity			0.099	0.065								
			(0.060)	(0.040)								
Above median industry liquidity* Liquidity			**-0.878**	**-0.464**								
			(0.277)	**(0.202)**								
Above Median Operating Margin					0.049	**0.109**						
					(0.062)	**(0.043)**						
Above Median Operating Margin*Liquidity					-0.328	**-0.856**						
					(0.276)	**(0.193)**						
Foreign							0.087	0.015				
							(0.134)	(0.113)				
Foreign* Liquidity							-0.359	-0.685				
							(0.450)	(0.384)				

Large group Firm									0.109 (0.121)	0.029 (0.089)		
Large group firm* Liquidity									-0.415 (0.486)	**-0.752 (0.319)**		
Above median debt overhang											**0.164 (0.061)**	0.055 (0.044)
Above median debt overhang*liquid											**-0.513 (0.252)**	-0.083 (0.195)
Bank debt/total assets	-0.031 (0.155)	0.039 (0.112)	-0.039 (0.156)	0.027 (0.112)	-0.042 (0.157)	0.026 (0.112)	-0.037 (0.157)	0.034 (0.113)		0.023 (0.112)	-0.112 (0.107)	0.077 (0.090)
Trade credit/total assets	**-0.561 (0.136)**	**-0.350 (0.109)**	**-0.518 (0.133)**	**-0.319 (0.109)**	**-0.528 (0.136)**	**-0.346 (0.109)**	**-0.509 (0.136)**	**-0.304 (0.109)**		**-0.324 (0.109)**	**-0.436 (0.131)**	**-0.584 (0.131)**
No. of firms	621	1267	621	1267	621	1267	621	1267	621	1267	619	1165
Adjusted R^2	0.239	0.175	0.247	0.176	0.233	0.186	0.232	0.177	0.232	0.179	0.213	0.174

Notes:
F-test for equality of liquidity coefficients of issuer and non-issuer firms' agency problems: 11.26 (p-value 0.001)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' flypaper effect: 1.90 (p-value 0.167)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' over-investment: 11.72 (p-value 0.001)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' legal origin: 6.50 (p-value 0.010)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' crony capitalism: 7.22 (p-value 0.007)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' debt overhang: 0.11 (p-value 0.735)

Table 4b.

Robustness checks on the interpretations of liquidity coefficients: New issuers in 1996-97, 'misclassified' non-issuer firms and government owned firms explanations. OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. **Variable definitions are given in Appendix 1.**

Variables	New 1996-97 issuers among non-issuer firms	Rest of the non-issuer firms	Misclassified Non-issuer firms	Rest of the non-issuer firms	Government firms regressions
Constant	0.160 (0.395)	0.157 (0.211)	**-0.827** **(0.334)**	0.192 (0.213)	**0.857** **(0.358)**
Group	-0.011 (0.115)	-0.041 (0.030)	-0.047 (0.070)	-0.042 (0.034)	
Ln Inv/Sales	**-0.155** **(0.066)**	**-0.141** **(0.018)**	**-0.118** **(0.043)**	**-0.142** **(0.019)**	0.041 (0.070)
Change in Ln Sales	**0.558** **(0.220)**	**0.286** **(0.031)**	**0.269** **(0.071)**	**0.296** **(0.035)**	-0.352 (0.289)
Lagged change in ln sales	-0.043 (0.189)	**0.063** **(0.029)**	0.119 (0.069)	0.038 (0.032)	-0.195 (0.206)
Lagged change in Ln Inv.	-0.005 (0.107)	-0.031 (0.025)	0.037 (0.055)	-0.054 (0.028)	**0.427** **(0.163)**
Liquidity	**-0.917** **(0.431)**	**0.422** **(0.102)**	**0.913** **(0.310)**	**0.354** **(0.110)**	0.069 (0.528)
Bank overlimit					
Bank overlimit*Liquidity					
Bank debt/total assets	0.205 (0.495)	0.084 (0.089)	-0.288 (0.222)	0.135 (0.097)	
Trade credit/total assets	-0.580 (0.739)	**-0.571** **(0.129)**	**-0.992** **(0.305)**	**-0.516** **(0.144)**	
No. of firms Adjusted R^2	48 0.065	1211 0.176	225 0.248	986 0.169	88 0.056

Notes:

F-test for equality of liquidity coefficients of new 1997 issuer firms and rest of non-issuer firms: 7.59 (p-value 0.006)

F-test for equality of liquidity coefficients of misclassified non-issuer firms and rest of non-issuer firms: 0.28 (p-value 0.596)

F-test for equality of liquidity coefficients of government firms and privately owned sample firms: 3.86 (p-value 0.049)

Table 5.
Capital investments and total firm investments

OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions above is the ln of capital investments for first 2 models and ln of firm investments for the next 2 models. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. **Variable definitions are given in Appendix 1.**

Variables	Capex and Q Issuer firms	Capex and Q Non-issuer firms	Capex and bank dependent Issuer firms	Capex and bank dependent Non-issuer firms	Total and Q Issuer firms	Total and Q Non-issuer firms	Total and bank dependent Issuer firms	Total and bank dependent Non-ssuer firms
Constant	**-1.624**	**-1.633**	**-1.335**	**-1.428**	-1.594	**-1.294**	**-1.533**	**-1.216**
	(0.412)	**(0.512)**	**(0.407)**	**(0.519)**	(0.224)	**(0.329)**	**(0.223)**	**(0.332)**
Group	0.053	-0.018	0.068	0.019	0.004	-0.089	0.011	-0.080
	(0.085)	(0.077)	(0.084)	(0.077)	(0.046)	(0.049)	(0.046)	(0.049)
Change in Ln sales	**0.349**	**0.463**	**0.335**	**0.466**	**0.361**	**0.303**	**0.347**	0.296
	(0.125)	**(0.070)**	**(0.123)**	**(0.070)**	**(0.067)**	**(0.045)**	**(0.067**)	(0.045)
Lagged change in Ln sales	0.077	**0.124**	0.096	**0.133**	0.082	**0.078**	0.085	**0.081**
	(0.109)	**(0.037)**	(0.108)	**(0.038)**	(0.059)	**(0.024)**	(0.059)	**(0.024)**
Liquidity	0.847	**1.283**	-0.717	0.032	-0.236	**0.551**	0.457	0.441
	(0.625)	**(0.404)**	(0.563)	(0.373)	(0.339)	**(0.257)**	(0.385)	(0.319)
Q	0.016	0.069	0.035	**0.126**	0.055	0.071	**0.085**	**0.088**
	(0.083)	(0.057)	(0.076)	**(0.052)**	(0.045)	(0.037)	**(0.041)**	**(0.033)**
Above Median Q	0.219	**0.364**			0.028	0.073		
	(0.167)	**(0.115)**			(0.090)	(0.073)		
Above median Q* Liquidity	-1.037	-1.040			0.141	-0.236		
	(0.795)	(0.541)			(0.432)	(0.346)		
Above median bank debt			**-0.413**	-0.174			-0.065	0.051
			(0.191)	(0.125)			(0.104)	(0.080)
Above median bank debt* Liquidity			**1.73**	**1.070**			0.457	0.441
			(0.705)	**(0.502)**			(0.385)	(0.319)
Bank debt/Total assets	**-1.102**	**-0.578**	-0.883	-0.498	**0.655**	**0.850**	0.535	0.490
	(0.491)	**(0.293**)	(0.704)	(0.417)	**(0.263)**	**(0.186)**	(0.377)	(0.262)
Trade Credit/Total assets	**-2.361**	**-1.569**	**-2.36**	**-1.487**	0.204	**0.972**	0.196	0.958
	(0.415)	**(0.347)**	**(0.412)**	**(0.347)**	(0.226)	**(0.223)**	(0.225)	(0.222)
No. of firms	475	1002	475	1002	477	1006	477	1006
Adjusted R^2	0.127	0.146	0.136	0.141	0.146	0.124	0.147	0.129

Notes:
F-test for equality of liquidity coefficients of issuer and non-issuer firms' capex and Q: 2.76 (p-value 0.0966)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' capex and bank dependent: 2.02 (p-value 0.155)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' total and Q: 4.89 (p-value 0.027)
F-test for equality of liquidity coefficients of issuer and non-issuer firms' total and bank dependent: 2.39 (p-value 0.122)

Table 6.
Propensity score regressions

OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by propensity score block i.d. with minimum 15 observations for issuers and non-issuers in each block. The dependent variable in the OLS regressions above is the change in the ln of firm inventories over the year. The regression specifications are baseline inventories regressions, baseline capex regressions or baseline total investments regressions. **Variable definitions are given in Appendix 1.**

Specification	Issuer firms liquidity coefficient	Non-issuer firms Liquidity coefficient	Observations
Inventories first block	-2.359	0.130	121
Inventories second block	0.476	0.046	89
Inventories third block	1.169	0.440	51
Inventories fourth block	1.538	1.626	58
Inventories fifth block	-1.293	1.109	91
Capex first block	2.923	1.098	155
Capex second block	2.109	-0.422	123
Capex third block	-0.966	-2.216	131
Total investments first block	0.657	0.530	155
Total investments second block	1.421	-0.374	123
Total investments third block	-0.626	-1.417	131

Table 7.
Within industry liquidity constraints

OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by industries. The dependent variable in the OLS regressions above is the change in the ln of firm inventories over the year. **Variable definitions are given in Appendix 1.**

Industry	Liquidity Coefficient	R^2	No. of firms
Agricultural products	0.508	0.242	50
Mineral products	1.102	0.163	51
Fats, Oils and derived products	1.424	0.475	60
Food products, beverage and tobacco	0.817	0.116	103
Textiles	0.855	0.194	324
Pulp and paper products	-0.099	0.472	69
Chemicals	0.446	0.106	322
Plastics and rubber	0.712	0.284	161
Non metallic mineral products	0.295	0.141	104
Base metals	0.766	0.229	229
Non electrical machinery	-0.016	0.043	106
Electrical machinery except for electronics	-0.411	0.126	104
Electronics	-0.956	0.277	108
Transport equipment	0.864	0.004	39

Table 8.

Pre and post 1996-97 liquidity constraints with same firms as in 1996-97.

OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. Variable definitions are in Appendix 1.

Variables	1995-96 baseline issuer firms	1995-96 baseline non-issuer firms	1995-96 bank dependent issuer firms	1995-96 bank dependent non-issuer firms	1997-98 baseline issuer firms	1997-98 baseline non-issuer firms	1997-98 bank dependent issuer firms	1997-98 bank dependent non-issuer firms
Constant	**-0.606** **(0.199)**	0.184 (0.208)	**-0.547** **(0.199)**	0.214 (0.210)	-0.003 (0.153)	-0.298 (0.220)	-0.076 (0.152)	-0.315 (0.222)
Group	-0.024 (0.032)	**-0.069** **(0.033)**	-0.023 (0.032)	**-0.067** **(0.033)**	-0.008 (0.029)	-0.014 (0.030)	-0.011 (0.029)	-0.018 (0.030)
Ln Inv/Sales	**-0.147** **(0.027)**	**-0.151** **(0.023)**	**-0.147** **(0.027)**	**-0.151** **(0.023)**	**-0.053** **(0.021)**	**-0.086** **(0.019)**	**-0.074** **(0.021)**	**-0.106** **(0.018)**
Change in Ln Sales	**0.493** **(0.095)**	**0.314** **(0.053)**	**0.473** **(0.095)**	**0.313** **(0.053)**	**0.189** **(0.046)**	**0.216** **(0.030)**	**0.180** **(0.046)**	**0.187** **(0.030)**
Lagged change in ln sales	0.080 (0.061)	0.048 (0.035)	0.083 (0.061)	0.046 (0.035)	**0.136** **(0.061)**	**0.151** **(0.040)**	0.057 (0.063)	**0.127** **(0.41)**
Liquidity	0.097 (0.124)	0.170 (0.109)	-0.091 (0.148)	0.078 (0.137)	**0.483** **(0.136)**	**0.753** **(0.107)**	0.284 (0.171)	**0.494** **(0.140)**
Lagged change in Ln Inv.	**-0.198** **(0.048)**	**-0.110** **(0.032)**	**-0.197** **(0.048)**	**-0.112** **(0.032)**	**-0.097** **(0.042)**	**-0.130** **(0.032)**	0.045 (0.033)	-0.017 (0.024)
Above median bank debt			-0.069 (0.079)	-0.038 (0.066)			-0.084 (0.059)	**-0.131** **(0.050)**
Above median bank debt* Liquidity			**0.560** **(0.242)**	0.228 (0.201)			**0.457** **(0.221)**	**0.557** **(0.182)**
Bank debt/Total assets	-0.010 (0.121)	0.051 (0.105)	-0.209 (0.170)	-0.001 (0.161)	-0.085 (0.111)	-0.042 (0.091)	-0.063 (0.157)	0.108 (0.135)
Trade Credit/Total assets	-0.208 (0.144)	**-0.361** **(0.146)**	-0.240 (0.144)	**-0.352** **(0.147)**	-0.103 (0.140)	**-0.564** **(0.119)**	-0.077 (0.142)	**-0.629** **(0.120)**
No. of firms	547	812	547	812	622	1103	621	1100
Adjusted R^2	0.137	0.148	0.148	0.147	0.172	0.231	0.1711	0.224

F-test for equality of liquidity coefficients of issuer and non-issuer firms' 1995-96 baseline: 1.87 (p-value 0.172)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' 1995-96 bank dependent: 1.43 (p-value 0.233)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' 1997-98 baseline: 15.3 (p-value 0.000)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' 1997-98 bank dependent: 3.84 (p-value 0.05)

Table 9.
Components of Inventories: Raw Materials, Work-In-Process and Finished Goods.

OLS regression analysis of Indian manufacturing firms for the year 1996-1997 sorted by issuance of short term arm's length debt. The dependent variable in the OLS regressions is the change in the ln of firm inventories over the year. Industry dummies are suppressed for brevity of exposition. Standard errors are in parentheses below the coefficient estimates. Variable definitions are in Appendix 1.

Variables	RAW issuer firms	RAW non-issuer firms	Matching inv. issuer firms	Matching inv. non-issuer firms	WIP issuer firms	WIP non-issuer firms	Matching inv. issuer firms	Matching inv. non-issuer firms	Fgoods issuer firms	Fgoods non-issuer firms	Matching inv. issuer firms	Matching inv. non-issuer firms
Constant	0.340 (0.357)	0.070 (0.371)	0.200 (0.245)	0.396 (0.241)	-0.263 (0.312)	0.561 (0.413)	0.035 (0.186)	0.427 (0.239)	0.151 (0.408)	0.067 (0.436)	0.297 (0.253)	0.462 (0.257)
Group	0.034 (0.40)	-0.067 (0.040)	-0.031 (0.028)	-0.048 (0.028)	-0.065 (0.052)	-0.064 (0.052)	-0.044 (0.029)	-0.027 (0.030)	-0.014 (0.047)	**-0.123 (0.050)**	-0.003 (0.029)	**-0.062 (0.029)**
Ln Component Inv./Sales	-0.040 (0.026)	**-0.138 (0.019)**	-0.045 (0.025)	**-0.115 (0.017)**	**-0.115 (0.024)**	**-0.118 (0.020)**	-0.034 (0.025)	**-0.136 (0.020)**	**-0.148 (0.024)**	**-0.192 (0.020)**	-0.026 (0.025)	**-0.071 (0.017)**
Change in Ln. Sales	**0.361 (0.075)**	**0.377 (0.047)**	**0.227 (0.055)**	**0.269 (0.031)**	0.121 (0.101)	**0.279 (0.058)**	**0.191 (0.057)**	**0.259 (0.036)**	**0.193 (0.092)**	0.319 (0.053)	**0.230 (0.058)**	**0.260 (0.032)**
Lagged Change in Ln. Sales	0.087 (0.062)	0.021 (0.024)	0.047 (0.043)	**0.041 (0.016)**	0.057 (0.086)	**0.145 (0.037)**	0.076 (0.048)	0.034 (0.022)	0.111 (0.073)	0.082 (0.031)	**0.105 (0.045)**	**0.048 (0.018)**
Lagged Change in Inv. Component	**-0.220 (0.039)**	**-0.115 (0.024)**	-0.128 (0.040)	**-0.051 (0.023)**	**-0.160 (0.047)**	**-0.265 (0.030)**	**-0.134 (0.044)**	-0.055 (0.030)	**-0.151 (0.039)**	**-0.179 (0.029)**	**-0.283 (0.040)**	-0.029 (0.027)
Liquidity	**0.870 (0.194)**	**0.545 (0.146)**	**0.525 (0.137)**	**0.502 (0.099)**	0.336 (0.258)	0.335 (0.190)	**0.514 (0.145)**	**0.362 (0.114)**	**0.532 (0.225)**	0.187 (0.173)	**0.620 (0.142)**	**0.623 (0.104)**
Bank debt/Total assets	0.197 (0.211)	-0.011 (0.162)	0.033 (0.148)	0.019 (0.106)	0.385 (0.270)	-0.312 (0.213)	0.101 (0.151)	-0.079 (0.125)	0.025 (0.244)	**0.441 (0.191)**	0.030 (0.155)	0.033 (0.113)
Trade credit/Total assets	**-0.511 (0.185)**	**-0.396 (0.156)**	**-0.442 (0.129)**	**-0.425 (0.100)**	**-0.789 (0.246)**	**-0.482 (0.191)**	**-0.485 (0.136)**	**-0.435 (0.111)**	-0.355 (0.212)	**-0.397 (0.181)**	-0.457 (0.133)	**-0.254 (0.107)**
No. of firms Adjusted R^2	595 0.166	1182 0.154	595 0.144	1182 0.187	540 0.098	874 0.193	540 0.138	874 0.181	604 0.200	1176 0.179	604 0.207	1176 0.180

Notes:

F-test for equality of liquidity coefficients of issuer and non-issuer firms' Raw materials: 0.31 (p-value 0.579)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' matching firms inventories: 3.96 (p-value 0.046)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' work-in-progress: 0.94 (p-value 0.334)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' matching firms inventories: 0.88 (p value:0.348)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' 1997-98 finished goods: 0.09 (p-value 0.766)

F-test for equality of liquidity coefficients of issuer and non-issuer firms' matching firms inventories: 6.09 (p-value 0.013)

Appendix 1. Variable definitions.
All log transformations used in regressions are natural logs.

Total Assets: Total firm assets as on March 31, 1996.

Sales: Total firm sales variable over the period April 1, 1995 to March 31, 1996.

Change in Sales: (Total firm sales variable over the period April 1, 1996 to March 31, 1997 minus total firm sales variable over the period April 1, 1995 to March 31, 1996) divided by total firm sales variable over the period April 1, 1995 to March 31, 1996.

Inventories/Total Assets: Aggregate Inventories minus stocks & spares as on April 1, 1996 scaled by total assets as on April 1, 1996 i.e. inventories=raw materials + work-in-process + finished goods.

Change in Inventories = Inventories (as defined above) as on April 1, 1997 minus inventories as on April 1, 1996.

Change in Inventories/Total Assets = Inventories (as defined above) divided by total assets as on April 1, 1996 minus inventories (as defined above) divided by total assets as on April 1, 1996.

Lagged Change in Inventories = Inventories (as defined above) as on April 1, 1996 minus inventories as on April 1, 1995.

[Inventory component terms i.e. raw material inventories, work-in-process and finished goods are correspondingly defined].

Liquidity: Marketable securities plus cash and bank balances as on April 1, 1996 plus earnings before interest, depreciation and taxes for the period April 1, 1996 to March 31, 1997.scaled by total assets as on April 1, 1996.

Robust liquidity=Liquidity minus marketable securities invested in group firms by peer group firms as on April 1, 1996 scaled by total assets as on April 1, 1996.

Capital Investment/Total Assets: (Net fixed assets as on March 31, 1997 minus net fixed assets as on March 31, 1996 plus depreciation over the period April 1,1996 to March 31, 1997-revaluation of fixed assets as on March 31, 1997) scaled by total assets as on April 1, 1996.

Research & Development Expenditure: Research & development current expenditures over the period April 1, 1996 to March 31, 1997 plus research & development capital expenditures over the period April 1, 1996 to March 31, 1997. Indian firms split their annual research & development expenditures into current and capital expenditures.

Advertising Expenditures: Advertising expenditures over the period April 1, 1996 to March 31,1997.

Total Investments/Total Assets: (Capital investments plus inventories plus research Expenditures plus advertising expenditures) scaled by total assets as on April 1, 1996.

Total Borrowings/Total Assets: Total borrowings debt as on March 31, 1996 scaled by total assets as on April 1,1996.

Bank Debt/Total Assets: Total bank debt as on April 1, 1996 scaled by total assets as on April 1, 1996.

Short-Term Arm's Length Debt/Total Assets: (Commercial paper plus short-term fixed deposits as on April 1, 1996) scaled by total assets as on April 1, 1996.

Short-Term Arm's Length Debt Dummy: Dummy variable equal to 1 if short-term arm's length debt outstanding and 0 otherwise.

Trade Credit/Total Assets: Accounts payable as on April 1, 1996 scaled by total assets as on April 1, 1996.

Operating Margin: Sales minus cost of goods sold as on April 1, 1996 scaled by total assets as on April 1, 1996.

Finance gap: Liquidity as on March 31, 1997 – total investments over the period April 1, 1996 to March 31, 1997.

Change in External Internal Finance Wedge: (Interest expense for the period April 1, 1996 to March 31, 1997 scaled by average of total borrowings as on April 1, 1996 and total borrowings as on March 31, 1997) minus (Interest expense for the period April 1, 1995 to March 31, 1996 scaled by average of total borrowings as on April 1, 1995 and total borrowings as on March 31, 1996).

Insider's cash flow rights: Equity ownership in percentage terms of board of directors.

Single bank dummy: Dummy variable equal to 1 if firm has a single banking relationship and 0 otherwise.

Weak banks/below Basle banking relationship dummy: Dummy equal to 1 if firms has main banking relationship with bank with below 8 percent capital adequacy ratio and 0 otherwise.

Above bank loan limits dummy: Dummy variable equal to 1 if firm has bank debt above the maximum prescribed by the bank loan limit rules and 0 otherwise.

Foreign firm dummy: Dummy equal to 1 if firm is a foreign controlled firm listed on Indian stock exchange and 0 otherwise.

Group Dummy: Dummy variable equal to 1 if firm is part of a business group and 0 otherwise.

Large group dummy: Dummy variables equal to 1 if firm is part of a business group with more than 17 firms and 0 otherwise.

Above Median Bank Debt Dummy: Dummy variable equal to 1 if firm has above sample median bank debt/total assets.

Above Median Industry Adjusted Liquidity Dummy: Dummy variable equal to 1 if firm has above sample median industry adjusted liquidity/total assets and 0 otherwise.

Below Median Insider's Cash Flow Rights Dummy: Dummy variable equal to 1 if firm has below sample median insider's cash flow rights and 0 otherwise.

Priority lending dummy: Dummy variable equal to 1 if firm has equity capital plus free reserves (i.e. net worth) as on April 1, 1996 equal to or below 10 million rupees and 0 otherwise.

Q = (Market value of equity as on the nearest day to April 1, 1996 available plus total assets as on April 1, 1996 minus book value of equity as on April 1, 1996) scaled by total assets as on April 1, 1996.

Above median Q dummy = Dummy variable equal to 1 if firm has above sample median Q and 0 otherwise.

Debt overhang = (Current portion of long term debt due in 1996-97 + current portion of long-term debt due in 1997-98 + current portion of long term debt due in 1998-99 + current portion of long-term debt due in 1999-00) / Total assets in 1996-97.

Above median debt overhang dummy= Dummy variable equal to 1 if the firm has above median debt overhang.

Age of the firm = 1996 – incorporation year of the firm.

Net profit = Profit after tax from April 1, 1996 to March 31, 1997 divided by total assets as on April 1 1996.

Kratio 1 = Actual value added on capital employed divided by hypothetical value added on capital employed (if it was allocated according to current firm's share of capital stock among issuers or non-issuers)

Kratio 2 = Actual operating profit to capital employed divided by hypothetical operating profit to capital employed (if it was allocated according to current firm's share of capital stock among issuers or non-issuers)

Appendix 2. Research hypotheses tested.

Table 1 a. Baseline hypotheses

Baseline Hypotheses	Absolute liquidity constraints: External – Internal Wedge	Relative differences in liquidity constraints
Baseline hypothesis	$H_0 = \beta_{Liquidity} = 0$ for both sets of firms $H_A = \beta_{Liquidity} > 0$ for both sets of firms	$H_0 = \beta_{Liquidity}$ (non-issuer firms) $\leq \beta_{Liquidity}$ (issuer firms) $H_A = \beta_{Liquidity}$ (non-issuer firms) $> \beta_{Liquidity}$ (issuer firms)
No finance gap firms hypothesis	$H_0 = \beta_{Liquidity} = 0$ for both sets of no finance gap firms $H_A = \beta_{Liquidity} > 0$ for both sets of no finance gap firms	No relative differences hypothesized
Finance gap firms hypothesis	$H_0 = \beta_{Liquidity} = 0$ for both sets of finance gap firms $H_A = \beta_{Liquidity} > 0$ for both sets of finance gap firms	$H_0 = \beta_{Liquidity}$ (non-issuer finance gap firms) $\leq \beta_{Liquidity}$ (issuer firms) $H_A = \beta_{Liquidity}$ (non-issuer finance gap firms) $> \beta_{Liquidity}$ (issuer firms)
No increase in external internal wedge hypothesis	$H_0 = \beta_{Liquidity} = 0$ for both sets of no increased wedge firms $H_A = \beta_{Liquidity} > 0$ for both sets of no increased wedge firms	No relative differences hypothesized
Increase in external internal wedge hypothesis	$H_0 = \beta_{Liquidity} = 0$ for both sets of increased wedge firms $H_A = \beta_{Liquidity} > 0$ for both sets of increased wedge firms	$H_0 = \beta_{Liquidity}$ (non-issuer increased wedge firms) $\leq \beta_{Liquidity}$ (issuer firms) $H_A = \beta_{Liquidity}$ (non-issuer increased wedge firms) $> \beta_{Liquidity}$ (issuer firms)

Table 1 b. Interaction terms based hypotheses

Interaction terms based hypotheses	Interaction term definition	Interaction term explaining relative differences in liquidity constraints
1. Pure bank dependency hypothesis	1.Liquidity*Above Median Bank Debt Dummy	$H_0 = \beta_{liquidity*hypothesis\ dummy} = 0$ for both sets of firms or $\beta_{liquidity*hypothesis\ dummy}$ (non-issuer firms) ≤ $\beta_{liquidity*hypothesis\ dummy}$ (issuer firms) $H_A = \beta_{liquidity*hypothesis\ dummy} > 0$ for non-issuer firms And $\beta_{liquidity*hypothesis\ dummy}$ (non-issuer firms) > $\beta_{liquidity*hypothesis\ dummy}$ (issuer firms). After controlling for the interaction effect, $\beta_{Liquidity}$ (non-issuer firms)= $\beta_{Liquidity}$ (issuer firms)
2. Weak banks hypothesis	2.Liquidity*Below Basle capital standards bank dummy	
3. Above bank loan limit hypothesis	3.Liquidity*above bank(s) loan limit borrowing firm dummy	
4. Priority lending hypothesis	4.Liquidity*Below 10 million net worth firm dummy	
5. Single bank hypothesis	5.Liquidity*Single bank dummy	
6. Agency problems hypothesis	6.Liquidity*below median insider cash flow rights ownership dummy	
7.Flypaper Effect hypothesis	7.Liquidity*Above industry adjusted liquidity dummy	
8.Over-investment hypothesis	8.Liquidity*Above median operating margin dummy	
9. Non-Indian legal regime parent firm hypothesis	9.Liquidity*Foreign firm dummy	
10. Crony Capitalism hypothesis	10.Liquidity*Firm belonging to a large Indian business group	
11. Debt Overhang hypothesis	11. Liquidity*Firm having above median debt overhand dummy	

Table 1 c. Capex and Total Investments hypotheses

Interaction terms based hypotheses	Interaction term definition	Interaction term explaining relative differences in liquidity constraints
1.Over-investment hypothesis	2.Liquidity*Above median Q dummy	$H_0 = \beta_{liquidity*hypothesis\ dummy} = 0$ for both sets of firms or $\beta_{liquidity*hypothesis\ dummy}$ (non-issuer firms) ≤ $\beta_{liquidity*hypothesis\ dummy}$ (issuer firms) $H_A = \beta_{liquidity*hypothesis\ dummy} > 0$ for non-issuer firms And $\beta_{liquidity*hypothesis\ dummy}$ (non-issuer firms) > $\beta_{liquidity*hypothesis\ dummy}$ (issuer firms). After controlling for the interaction effect, $\beta_{Liquidity}$ (non-issuer firms)= $\beta_{Liquidity}$ (issuer firms)
2. Pure bank dependency hypothesis	1.Liquidity*Above Median Bank Debt Dummy	

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