Chapter 5: Methodology

5.1 Variables and their measurement

5.1.1 Dependent variables

For leverage analysis we consider two measures of leverage, since theory as well as practice reveals that there is no standard definition of leverage (Agca et al., (2007), Rajan and Zingales (1995) and Booth et al. (2001)). Though finance theory emphasizes the use of market based leverage measures, we are unable to use this measure as our data consists of both listed and unlisted firms. We adopt the following two measures of book leverage:

i. Total leverage, defined as the ratio of total debts to total assets.

ii. Long term debt, defined as the ratio of total long term debt to total assets.

For debt maturity analysis, Barclay and Smith (2001) use the proportion of debt with more than three years to maturity to the total debt as the long term debt maturity ratio in their study. They, argue that results would be qualitatively same for the debt portion with more than one year to maturity. Prowess database provides data on long term debt which is debt with a remaining maturity of more than one year. Hence, we consider the debt with maturity period of more than one year as the long term debt and the ratio of long term debt to total debt is the long term maturity ratio (LTM) which is taken as a proxy for debt maturity structure.

For hypothesis 9, we require to calculate Formal Debt Ratio (FDR), which is defined as the ratio of debt from institutional sources of debt to total assets. These institutional sources include bank
debt, debt from financial institutions, foreign borrowings, bonds and debenture debt and Government debt.

For hypothesis 14, we require to estimate the Group Debt Ratio (GDR) which is defined as the ratio of debt from internal group source to total assets. This internal source includes inter-corporate loans, debt from promoters and trade credits.

We calculate Debt Specialization Ratios (DSR) for debt specialization hypothesis H11. We define DSR as the sum of the squared proportion of individual type of debts\(^1\) in the total debt (Colla, Ippolito and Li (2011)).

In summary, we use five dependent variables they are leverage ratio (total leverage, long term leverage ratio), long term debt maturity ratio, formal debt ratio, group debt ratio and debt specialization ratios as dependent variables to test our hypotheses.

### 5.1.2 Independent and control variables

The main independent variable in this study is the index of financial liberalization adopted from Abiad et al., (2008) who developed a database of financial reforms for many economies/countries that captures gradual and stepwise developments in seven broad subsystems of the financial market; they are

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\(^1\) We consider eight types of debt they are bank debt, debt from financial institutions, government debt, loans from promoters, inter-corporate loans, deferred credit, trade credit and foreign currency borrowings
i. Credit control and reserve requirement,  
ii. External finance control,  
iii. Interest rate controls,  
iv. Bank entry barriers,  
v. Bank privatization,  
vi. Securities markets and  
vii. Bank supervision dimension.

Abiad et al., (2008) assign a financial liberalization score for each of the seven dimensions based on the extent of liberalization, and then individual scores are summed up to arrive at the final score for each year. The index value changes over the years based on the liberalization measures adopted in any particular year. Additionally, the use of a dynamic measure of liberalization allows for fewer restrictions on data availability. Standardized, comprehensive firm level archival data is only available from 1988 which would not allow for a sufficient pre-event base period given that reforms in India were instituted as early as 1991. As long as our liberalization measure has sufficient time variance and this variation is significant enough to prompt a response, we should be able to conduct effective tests of the hypotheses laid out in the preceding section. Detailed description of the index/database is given in the Appendix I.

Abiad et al., (2008) index is an equally weighted index with all the sub-dimensions receiving equal weight in the final index. We devise a weighting scheme in which individual sub-dimensions receive weights according to their importance in the final index. This we achieved through factor analysis, we used factor analysis on the yearly values of seven sub-dimensions and using principle component analysis and obtained one factor. We used the factor loadings
obtained for individual sub-dimensions as the weights to devise a weighted index for India. Next, we repeated the factor analysis exercise using maximum likelihood estimation procedure and obtained a separate set of factor loadings. The results of the factor analysis are provided in table 2. The progress of financial reforms as measured through three liberalization indices (one equally weighted and two factor loadings as weights) is depicted in figure 2.

As shown in table 2 both the methods could extract only one factor but the variation explained by the extracted factor in the principal component analysis (92.12%) is higher than the maximum likelihood method (90.56%). In these analyses the privatization variable was to be omitted since it did not had any variation in its values (since there was no reform in the area of banking privatization thus this sub-dimension had zero for all the years).

Table 1: Factor analysis results

<table>
<thead>
<tr>
<th>Variables</th>
<th>Max. likelihood</th>
<th></th>
<th>Pri. component</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Factor loadings</td>
<td>Commun.</td>
<td>Factor loadings</td>
<td>Commun.</td>
</tr>
<tr>
<td>Credit controls</td>
<td>0.951</td>
<td>0.904</td>
<td>0.961</td>
<td>0.924</td>
</tr>
<tr>
<td>Interest rate</td>
<td>0.951</td>
<td>0.905</td>
<td>0.962</td>
<td>0.925</td>
</tr>
<tr>
<td>Entry barriers</td>
<td>0.923</td>
<td>0.853</td>
<td>0.938</td>
<td>0.88</td>
</tr>
<tr>
<td>Banking supervision</td>
<td>0.965</td>
<td>0.931</td>
<td>0.968</td>
<td>0.936</td>
</tr>
<tr>
<td>International</td>
<td>0.966</td>
<td>0.934</td>
<td>0.971</td>
<td>0.942</td>
</tr>
<tr>
<td>Capital</td>
<td>0.953</td>
<td>0.908</td>
<td>0.959</td>
<td>0.919</td>
</tr>
<tr>
<td>Number of factors</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>extracted</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Variance explained</td>
<td>90.56</td>
<td>90.56</td>
<td>92.12</td>
<td>92.12</td>
</tr>
<tr>
<td>KMO test</td>
<td>0.88</td>
<td>0.88</td>
<td>0.88</td>
<td>0.88</td>
</tr>
<tr>
<td>Bartlett test</td>
<td>325</td>
<td>325</td>
<td>325</td>
<td>325</td>
</tr>
</tbody>
</table>

2 Variable Privatization was not considered since there was no variation in that variable

3 Varimax method has been used

4 Variance explained by the extracted factor
As we observe from fig 2, both the non-weighted and weighted indices show identical movement over the years, the difference exists only with respect to the actual value of the index. As we are not observing any differences in the movement of different indices (the correlation coefficient for any two indices i.e. between IMF\(^5\) and PC, PC and ML and IMF and ML was 0.999) the results will be almost similar except for the magnitude of the coefficients, this we confirmed econometrically from our base model (1). The actual values for three indices are given in Appendix II. In our thesis we use weighted index based on the Principal Component\(^6\) factor analysis weights. The results are very much the same, qualitatively, even if we use IMF and Maximum likelihood\(^7\) factor analysis indices.

\[ \text{Figure 1: Financial liberalization indices} \]

\(^5\) Abiad et al.,(2008) index

\(^6\) Principle component

\(^7\) Maximum likelihood
In the following part of this section, we discuss about the various firm level variables, their importance in capital structure studies and how do we measure them.

Size: Size is supposed to proxy for financial distress, the bigger the size, the lesser will be the probability of financial distress and hence bigger firms are expected to have more debt in their capital structure. Size also proxies for the degree of information asymmetry, greater information asymmetry for small firm affects accessibility to credit impacting their financial leverage. Rajan and Zingales (1995) use sales as a proxy for size. We use log of firm sales as the proxy for size.

Growth opportunities: Growth opportunities affect the financing decisions of firms through various channels. Market to book ratio is the most widely used measure to proxy future growth opportunities. We have two problems in using this measure. First, our data has a large number of unlisted firms and hence market data is not available for these firms. As an alternative, we use the annual growth rate in total assets, a growth proxy that has been used in prior studies (e.g., Fama and French, 2002).

Tangibility: Rajan and Zingales (1995) document that tangibility of assets, a proxy for collateral, is positively related to leverage. We use the ratio of fixed assets (net) to total assets as a measure of tangibility.

Profitability: To proxy for performance (Profitability) we use Return on Assets (ROA) calculated as profit before interest and taxes divided by total assets.
Agency costs: Finance literature uses, predominantly, shareholding patterns and ownership concentration to measure agency costs. In the absence of such information for Indian firms, we use the ratio of bank debt to total assets as a measure of agency costs. In general, the agency costs are lower for those firms where banks is a major debt contributor and the costs are even lower if the bank debt is of short term nature because bank debt carries with it provisions for monitoring of managers’ activities by the bank and short term debt increases the frequency of such monitoring activities (Demirguc-Kunt and Maksimovic (1994)). Thus, we use the ratio of bank debt to the total assets to proxy agency costs. Financial theories suggest a negative relationship between the bank debt and the agency costs. For hypothesis 9 we require to estimate Bank Debt Ratio (BDR) which is defined as the ratio of bank debt to total assets.

For categorizing the firms based on their size, we first estimate the average sales of firms over the period 1989-2005 then based on the median value of the average sales value, we group firms into large firms which have sales above the median value and small firms otherwise. Similarly we group firms based on ROA into better performing and poor performing and on AGR into high growth firms and low growth firms.

Hypotheses H1, H1A, H2 and H2A require that pre-reform firms be classified into two groups. First group consists of those firms which were under government subsidy schemes and thus benefitted from regulations, these we call as priority sector firms. The other group consists of all those firms which were outside this priority schemes and thus subjected to negative effects of regulations (higher interest rates, restricted access to credit and like so). The regulation system
was very complex and took many forms therefore any credible classification scheme should take into account this complexity. But, in the absence of actual classification data we have to rely on other indirect measures, one such measure is the actual average long term leverage ratio of firms in the pre-reform period. It is expected that firms under the priority sector would have higher long term leverage ratio than non-priority sector firms. By following Bertrand et al., (2007), we presume that the firms with above median average leverage for the period (1988-1992) belong to priority sector and other firms to non-priority sector.

5.2 Models and estimation

5.2.1 The base model

In this section we present the basic model which we use in our analysis. Modeling the impact of financial liberalization requires controlling for the influence of other variables on the phenomenon of interest so that the marginal impact of the financial liberalization could be gauged. The base model for estimation is presented in model (1) which forms a base for all other subsequent models in our study.

\[ Y_{jit} = \alpha_j + \beta_1 Size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 Tangibility_{jit} + \beta_5 Index_t + \varepsilon_{jit} \] (1)

Where,

\( Y_{jit} \) is the corporate finance measure (CFM) of the jth firm of the ith industry at time “t”.

\( \alpha_j \) is the coefficient for firm fixed effects,

\( \varepsilon_{jit} \) is a random error term with mean zero and a constant variance.
We use five measures of CFM. They are leverage, debt specialization ratio and long term maturity ratio, formal debt ratio and group debt ratio depending on the hypothesis to be examined. Our analysis involves mainly studying the influence of financial liberalization on the CFM measures, index is the main liberalization variable, adopted in the modified form from Abiad et al., (2008). Various firm level characteristics such as size, performance, growth opportunities and tangibility also influence leverage decisions hence included in the model as control variables. For analyzing the mediating effect of firm specific variables on the adjustment process, we multiply (interact or product) the interested firm specific variable with the financial liberalization variable (i.e. product term involving the interested variable and the financial liberalization index). The sign and significance of the interaction term would indicate the influence of firm variable on the adjustment process. We take one year lagged value of ROA for two reasons 1) to adjust for the endogeneity problem which arises because the variables size and performance are causally related and 2) the leverage decisions of a firm depend on the previous years’ performance not on current year’s performance.

We make distinction between the effects of firm specific and time invariant variables which remain constant throughout the period of our analysis such as corporate governance, management ability, organization culture and time variant random errors by allowing for the separate coefficients for the fixed effects. We account for the possible heteroscedasticity problem by adopting newey-west correction procedure⁸.

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⁸ Robust estimation
5.2.2 Hausman’s test for determining the panel data estimation procedure

Our study uses unbalanced panel data which spans the period 1988 through 2005. There are two estimation procedures for estimating the parameters in a panel data. One is fixed effects estimation which provides for controlling the effects of time invariant independent variables which might affect the dependent variable. This procedure assumes error terms of the model and time invariant variant variables are correlated, in the presence of such correlation fixed effect estimation gives consistent parameters. Random effects model assumes that intercept of the regression model is random i.e. there are no time invariant factors which affect the independent variable and hence the correlation between error term of the model and the time invariant factors are assumed to be zero. We use Hausman’s test to determine the suitable estimation procedure for our panel data. The null of this test is that parameters estimated from random effects procedure are consistent. This test for our data rejected the null at 1% level and hence we adopted the fixed effects estimation procedure.

5.2.3 Normality, heteroscedasticity and multicollinearity assumptions

The inferences from the multivariate regression analysis are drawn with the assumptions that the errors of the model have constant variance, the error terms are distributed normally. Also, the independent variables are assumed to be uncorrelated with each other and with the error terms.

**Heteroscedasticity:** In the presence of heteroscedasticity and non-normal error distribution, though the parameters are consistent the standard errors will be larger and thus will lead to misleading results. We adopt newey-west robust estimation procedure to adjust for possible heteroscedasticity; this procedure will yield robust standard errors in the presence of
heteroscedasticity. All of our models are estimated using newey-west robust estimation procedure.

**Normality test:** Fig. 3 gives the distribution of residuals obtained by estimating the parameters of our model (1). We observe that the residuals are not normally distributed. The distribution is leptokurtic with fat tails, this problem is encountered in all most all empirical research in the corporate finance in general and capital structure in particular. The main reason behind this pattern is that we force our dependent variables to take values within a range of zero to one. For example: in our study all the dependent variables like leverage ratio, FDR, GDR, LTM are the ratios which take value between 0 and 1 under normal circumstances. We conducted the S-wilkies test to check for normality using for our model (1) econometrically. The null of this test is that residuals are normally distributed. This test rejected the null hypothesis at 1% level, thus, the residuals are not normally distributed for our data. The results of our models have to be interpreted with this caution in mind.
Multicollinearity test: We make inferences from the multivariate regression model on the assumption that independent variables are neither correlated with each other not correlated with the residuals. In the presence of multicollinearity the estimated standard errors will not be robust and thus leading to misleading results. We use Variance Inflated Factor (VIF) for each and every model to assess the extent of multicollinearity problem.

In all the models which include an interaction variable involving the index variable and other firm level variables such as size, ROA and growth, a high level of correlation was noted between the interaction variable and the original variable (size, ROA and growth). In order to control for the observed high correlation, we divide firms into two groups based on the median values of
these variables and represent this division through a dummy variable in the model and then this dummy variable is interacted with the reforms index (RI). Since we are interested only with the differential slope coefficient, the original dummy variable was not included in the model as it gives the differential intercept. This procedure of using the dummy variable instead of continuous values reduces the problem of multicollinearity. After this procedure multicollinearity was not a serious problem as the range of VIF was from 1.1 to 4 for our models.

5.3 Specific Models for hypotheses

In this section, functional models for each of the hypothesis are provided and discussed about the likely signs and significance of the coefficients. We list the models according to the hypothesis number to be examined.

5.3.1 Leverage Analysis

H1: The leverage ratio of firms decreases due to financial liberalization.

H1A: The leverage ratio of priority sector (non-priority sector) firms decreases (increases) due to liberalization.

\[ Y_{jit} = \alpha_j + \beta_1 \text{size}_{jit} + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{tangibility}_{jit} + \gamma \text{Index}_t + \epsilon_{jit} \]  

(2)

\[ Y_{jit} = \alpha_j + \beta_1 \text{size}_{jit} + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{tangibility}_{jit} + \gamma \text{Index}_t + \beta_5 \text{RI_PR} + \epsilon_{jit} \]  

(3)

We test H1 and H1A using the models specified in (2) and (3) respectively, where Y is a measure of leverage. Testing the H1A involves grouping of firms into priority and non-priority sector firms. Priority sector firms consist of all those firms which had above median average
leverage for the period 1988-1992 and rest of the firms are grouped under non-priority group. We expect the interaction (index and priority dummy, $RI_{PR}$) variable to behave oppositely for these two subgroups with priority coefficient taking a negative sign while non-priority coefficient taking a positive sign.

H2: The Equity ratio of firms increases due to financial liberalization.

H2A: The equity ratio of priority sector (non-priority sector) firms increases (decreases) due to financial liberalization.

$$ER_{jit} = \alpha_j + \beta_1 size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 tangibility_{jit} + \gamma Index_t + \varepsilon_{jit} \quad (4)$$

$$ER_{jit} = \alpha_j + \beta_1 size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 tangibility_{jit} + \gamma Index_t + \beta_5 RI_{PR} + \varepsilon_{jit} \quad (5)$$

To test H2 and H2A, we use models (4) and (5) which are obtained by replacing the leverage ratio with equity ratio in the models (2) and (3) respectively. Equity ratio is defined as the ratio of total equity (Paid up + Preference) to total assets. $RI_{PR}$ is the interaction variable for RI and PR. For aggregate level and priority sector firms, we expect the net effect to be positive and for non-priority sector firms we are not sure what sign and significance of the coefficient.

H3: The rate of decrease of leverage ratio for high performing firms is greater than the rate of decrease for poor performing firms due to financial liberalization.
\[ LEV_{jit} = \alpha_j + \beta_1 \text{size}_{jit} + \beta_2 \text{Growth}_{jit} + \beta_3 \text{tangibility}_{jit} + \gamma \text{Index}_t + \delta (\text{Index}_t \times \text{ROA Dum}) + \epsilon_{jit} \] (6)

The effect of performance on leverage adjustment is evaluated by allowing the index variable to interact with a performance variable dummy (ROA dummy) taking value one for better performing firms and zero otherwise. Assuming that firms choose to reduce (increase) their leverage, we expect the interaction coefficient to be negative (positive) and significant if the static trade off/the pecking order explanations be true, a positive (negative) and significant coefficient is expected under the agency hypotheses.

H4: The rate of decrease of Leverage ratio for large firms is greater than the rate of decrease of leverage for small firms due to financial liberalization.

\[ LEV_{jit} = \alpha_j + \beta_2 \text{ROA}_{jt-1} + \beta_3 \text{Growth}_{jt} + \beta_4 \text{tangibility}_{jt} + \gamma \text{Index}_t + \delta (\text{Index}_t \times \text{Size Dum}) + \epsilon_{jit} \] (7)

The differential response of larger firms is captured by providing for an interaction term between the financial liberalization index and the size dummy variable taking value one for larger firms and zero otherwise. A negative and significant coefficient is expected for both the index variable as well as for interaction term in model (7).

H5: The rate of decrease of leverage ratio for growth oriented firms is greater than the rate of decrease for non-growth oriented firms in response to financial liberalization process.
\[ LEV_{jit} = \alpha_j + \beta_1 size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 tangibility_{jit} + \gamma Index_t + \delta (Index_t \times \text{GrowthDum} ) + \varepsilon_{jit} \] (8)

To test the effect of growth opportunities on the adjustment process, we include an interaction term by interacting the financial liberalization index and the growth dummy variable taking value one for high growth firms and zero otherwise. The coefficient of this variable would convey us which theory is explaining the behavior of firms. The Pecking order and the static trade off theories predict a significant and negative coefficient whereas the agency theory predicts a significant and positive coefficient.

H6: Group affiliated firms show different leverage response to financial liberalization process compared to non-affiliated firms.

\[ LEV_{jit} = \alpha_j + \beta_1 size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 \text{GrowthDum}_{jit} + \beta_4 tangibility_{jit} + \gamma Index_t + \delta (Index_t \times \text{Group Dum}) + \varepsilon_{jit} \] (9)

To test the effect of group affiliation on the adjustment process, we include a dummy variable taking value one for group affiliation and zero otherwise into our model (9). Then we provide for an interaction term by interacting the financial liberalization index and the group dummy. The coefficient of this variable would convey us what is the response of group affiliated firms for the financial liberalization.

5.3.2 Debt maturity and specialization analysis

H7: The proportion of long term debt in the total debt decreases due to financial liberalization.
\[ LTR_{jit} = \alpha_j + \beta_1 \text{Size}_{jit} + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{Tangibility}_{jit} + \beta_5 \text{Quality}_{jit} + \gamma \text{Index}_t + \epsilon_{jit} \]  

(10)

LTR is the ratio of long term debt to total debt of \( j^{th} \) firm belonging to \( i^{th} \) industry at time “t”. Since most of the firms in our sample do not have credit ratings, measuring firm quality through credit ratings is not possible therefore we use firm leverage ratio as a measure of credit quality by following (Aivazian and Booth (2005)). Index is the variable of interest, the sign and significance of its coefficient would determine the rejection or acceptance of H7.

H8: The share of long-term debt to total debt decreases at a faster rate for firms with higher ratio of bank debt to total assets compared to firms with lower ratio of bank debt to total assets in response to financial liberalization.

\[ LTM_{jit} = \alpha_j + \beta_1 \text{Size}_{jit} + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{Tangibility}_{jit} + \beta_5 \text{Quality}_{jit} + \gamma \text{Index}_t + \]  

\[ \delta \ (\text{Index}_t \times \text{Bankratio}_{jit}) + \beta_5 \text{Bank ratio}_{jit} + \epsilon_{jit} \]  

(11)

In order to evaluate how banks are influencing the debt maturity structure, we use the ratio of bank debt to total assets as a proxy for effectiveness of bank monitoring (Demirguc-Kunt and Meskimovic (1994)). Our assumption is that high bank debt ratio indicates higher incentives for banks in structuring the maturity aspects as they have higher stakes at risk. The interaction term between bank ratio and liberalization index would then indicate how bank debt is influencing the maturity structure along with the liberalization process. We predict, using the agency framework,
that higher the bank debt ratio the lower will be the long-term ratio, so a negative and significant interaction coefficient is expected.

H9: The ratio of long term debt to total debt decreases (increases) for small (large) firms due to financial liberalization.

\[ LTR_{jit} = \alpha_j + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 Tangibility_{jit} + \beta_5 Quality_{jit} + \gamma Index_t + \beta_6 (Index_t \times Size dum) + \epsilon_{jit} \]  

(12)

To test H9, we divide the firms into two groups based on the median value of firm size. Size dummy is a dummy variable which takes value one for large firms and zero otherwise. Index coefficient is the slope coefficient for small firms and it is expected to take a negative value while the interaction coefficient is expected to take a positive value such that the adjusted coefficient will be positive.

H10: The decrease in the ratio of long term debt to total debt due to financial liberalization is higher for listed firms with higher growth opportunities compared to listed firms with low growth opportunities.

\[ LTR_{jit} = \alpha_j + \beta_1 Size_{jit} + \beta_2 ROA_{jit-1} + \beta_4 Tangibility_{jit} + \beta_5 Quality_{jit} + \gamma Index_t + \delta (Index_t \times Growth dum) + \epsilon_{jit} \]  

(13)
We consider only listed firms for this analysis, we interact growth dummy variable with that of financial liberalization variable and examine for its sign and significance. A priori we expect this interaction term to have a negative and significant coefficient in order to reject the null. Failure to reject null implies that firms with more growth opportunities started using more of short term debt due financial liberalization.

**H11:** The degree of debt specialization at firm level does not change following financial liberalization.

$$DSI_{jit}= \alpha_j + \beta_1 Size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 Tangibility_{jit} + \beta_5 Lev_{jit} + \gamma Index_t + \epsilon_{jit} \quad (14)$$

DSI (Debt Specialization Index) is an index which measures the degree of debt specialization. It is calculated as the summation of squared share of different types of debts in the total debt. This ratio has a direct relationship with the degree of debt specialization, the higher the value of DSI the higher will be the debt specialization. There are two debt classification systems in the Indian context. First one is Love and Peria’s (2005) taxonomy of debt which consists of six debt sources. They are bank loans, foreign borrowings, borrowings from non-bank financial institutions, borrowings from corporations, public borrowings and other borrowings. The second one is Allen et al., (2012) classification of debt sources which consists of three major sources of debt for Indian firms. They are, bank debt, market debt (mainly bonds and debentures) and alternative sources. We use our own debt classification system consisting of eight types of debts
to calculate DSI as explained earlier. The sign and significance of the index variable would determine the rejection or acceptance of null.

**H12:** The ratio of formal debt to total assets increases following financial liberalization.

**H13:** The increase in the ratio of formal debt to total assets is higher for small firms compared to large firms.

\[
FDR_{jit} = \alpha + \beta_1 \text{Size}_{jit} + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{Tangibility}_{jit} + \gamma \text{Index}_t + \epsilon_{jit} \tag{15}
\]

\[
FDR_{jit} = \alpha + \beta_2 \text{ROA}_{jit-1} + \beta_3 \text{Growth}_{jit} + \beta_4 \text{Tangibility}_{jit} + \gamma \text{Index}_t + \delta(\text{Index}_t \times \text{Size dum}) + \epsilon_{jit} \tag{16}
\]

FDR is the Formal Debt Ratio defined as the ratio of formal sources of debt to total assets. H12 evaluates the overall trend and H13 adjusts it for firm size. Formal sources of debt comprises of bank debt, debt from institutional sources, government debt and bond debt and debentures. Size dummy is a dummy variable taking value one if firm has size value above median size value of the all the firms and zero if the size value is below the median value. For H12 we expect a positive relationship between the index and FDR and for H13 we expect the interaction term to have a negative and significant coefficient.

**H14:** Group affiliated firms do not show any change in their ratio of group component of debt to the total assets following financial liberalization.

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9 They are bank debt, debt from financial institutions, government debt, loans from promoters, inter-corporate loans, deferred credit, trade credit and foreign currency borrowings.
$GDR_{jit} = \alpha_j + \beta_1 Size_{jit} + \beta_2 ROA_{jit-1} + \beta_3 Growth_{jit} + \beta_4 tangibility_{jit} + Index_t + \epsilon_{jit}$ (17)

To test H14 the analysis will be conducted only on group affiliated firms. Our dependent variable is Group Debt Ratio (GDR) which is the ratio of informal debt (Inter-corporate debt and loans from the promoters) plus trade credits to total assets. Our GDR measure might overestimate the extent of actual group financial relationship since we assume that input/output business transactions are carried out among group firms only so trade credits would capture this form resource sharing. But to the extent that group firms have outside business to that extent our measure of GDR (trade credits part) overestimates group sharing. The main variable of interest is the index, we expect that GDR to decline with financial liberalization if imperfections in the capital markets are corrected. Therefore, we expect index to have a negative and significant coefficient. If imperfections in the capital markets are not corrected then we expect either non-significant or positive and significant coefficient for the index.

\[10\] It includes trade credits, inter-corporate loans and promoters debt