CHAPATER 4: RESEARCH METHODOLOGY AND DATA

4.1. Research Methodology

4.1.1 Variable Construction

Since our study data includes unlisted firms, market based measures of performance cannot be used as dependent variables. Hence we use an accounting based measure of performance, Return on Assets (ROA). However for analyzing listed firms, SAL and BGL firms we use ROA and Natural log of price to book value ratio (LPBR) as dependent variable. We use the data for actual promoter’s holding for analyzing listed firms. However, for unlisted firms data on promoter’s holding is not available. Therefore to analyze all firms, SA firms, and BG firms we include a dummy variable, dummy for promoters’ holding (DPH), for analyzing impact of promoters holding on firm performance. Unlisted firms have concentrated ownership. Thus, DPH takes value 1 for all unlisted firms; and for listed firms if the actual promoter’s holding is more than the mean of promoters’ holding calculated for each year, or zero otherwise. We include the dummies BGLD, BGULD and SALD to represent business group listed firms, business group unlisted firms and standalone listed firms respectively in regression equation. The intercept term captures the performance of standalone unlisted firms. In order to examine whether the mean performance of BGL firms, BGUL firms and SAL firms are different from the mean performance of standalone unlisted firms, the significance of the coefficients of BGLD, BGULD and SALD are tested statistically.

Differing from previous studies we use lagged value of leverage (as current value of leverage is impacted by current performance and vice versa resulting in endogeneity of variables (Rajan and Zingales (1995)) in the regression to explain firm performance. Selling and Distribution Expenses (SDE) may impact the firm performance for more than one year. Following Lev and
Sougiannis (1996) and Chan et al. (2001) we compute selling and distribution expenses as a sum of current year and past four years of expenses. Selling and distribution expense for each firm is then standardized by dividing the sum of current and past four years of average industry selling and distribution expenses, where the average is calculated for each year.

As quadratic relationship might exist between firm size and the firm performance, we include squared term of size (in terms of net sales) as an independent variable in the regression. However, the squared term of any variable is highly correlated with the variable itself. Thus following Reddy (1978) we reduce the variable Ln (size) with the mean of Ln (size) and denote it as ‘Size’. Squared term of ‘Size’ has less correlation with ‘Size’.

Construction of variables is given in table 4.1.
Table 4.1: Notations and Measures of the Variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Notation</th>
<th>Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dependent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Return on Assets</td>
<td>ROA</td>
<td>PBITDA / Total Assets</td>
</tr>
<tr>
<td>Natural log of Price to Book</td>
<td>LPBR</td>
<td>( \ln(\text{Market Price per Share} / \text{Book Value per Share}) )</td>
</tr>
<tr>
<td>Value Ratio</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Independent Variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Promoters' Holding</td>
<td>PH</td>
<td>Promoters' Holding / Total Shares</td>
</tr>
<tr>
<td>Dummy for Promoters' Holding</td>
<td>DPH</td>
<td>DPH takes value 1 for all unlisted firms; and for listed firms if the actual promoter's holding is more than the mean of promoters' holding calculated for each year, or zero otherwise.</td>
</tr>
<tr>
<td>Leverage</td>
<td>LEV_{t-1}</td>
<td>One year lagged values of long term debt to total assets ratio</td>
</tr>
<tr>
<td>Size</td>
<td>SIZE</td>
<td>( \ln(\text{Net Sales}) - \text{Mean of } \ln(\text{Net Sales}) )</td>
</tr>
<tr>
<td>Squared Term of Size</td>
<td>SIZE^2</td>
<td>( (\ln(\text{Net Sales}) - \text{Mean of } \ln(\text{Net Sales}))^2 )</td>
</tr>
<tr>
<td>Firm Efficiency</td>
<td>FIRMEFF</td>
<td>( \frac{\text{Net Sales}_i/\text{Net Sales}_j}{\text{Total Assets}_i/\text{Total Assets}_j} )</td>
</tr>
<tr>
<td>Where the firm “i” is excluded from the industry j.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age of the firm</td>
<td>AGE</td>
<td>Respective year - Year of Incorporation</td>
</tr>
<tr>
<td>Export Intensity</td>
<td>EXP</td>
<td>(Net Exports / Gross Profit)</td>
</tr>
<tr>
<td>S&amp;D Expenses</td>
<td>SDE</td>
<td>( \frac{\text{SD}_i}{\text{SD}_j} ) Where ( \text{SD}_i ) and ( \text{SD}_j ) are Sum of current and last four years of selling and distribution expenses for the firm i, and sum of current and last four years of average selling and distribution expenses for the industry j respectively, where the firm “i” is excluded from the industry j and average is calculated for each year.</td>
</tr>
<tr>
<td>Concentration</td>
<td>HHI</td>
<td>Herfindahl-Hirschman Index is calculated as ( \sum_{i=1}^{n} S_i^2 )</td>
</tr>
<tr>
<td>Where, ( S_i ) = Market share of the firm i; and Market share is Net Sales of the firm i operating in the industry j/ Net sales of all the firms operating in the industry j other than the firm itself.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business Group Listed Dummy</td>
<td>BGLD</td>
<td>Takes value ‘1’ if the firm is business group listed or ‘0’ otherwise.</td>
</tr>
<tr>
<td>Standalone Listed Dummy</td>
<td>SALD</td>
<td>Takes value ‘1’ if the firm is standalone listed or ‘0’ otherwise.</td>
</tr>
<tr>
<td>Business Group Unlisted Dummy</td>
<td>BGULD</td>
<td>Takes value ‘1’ if the firm is business group unlisted or ‘0’ otherwise.</td>
</tr>
<tr>
<td>Time Dummy 2</td>
<td>TD2</td>
<td>Takes value ‘1’ if year is from 2005 to 2008 or ‘0’ otherwise.</td>
</tr>
<tr>
<td>Time Dummy 3</td>
<td>TD3</td>
<td>Takes value ‘1’ if year is from 2009 to 2013 or ‘0’ otherwise.</td>
</tr>
</tbody>
</table>
4.1.2 Univariate Analysis

To examine the unconditional mean difference of study / dependent variables, ROA (Return on Assets), among four categories of firms (SAUL, BGUL, SAL and BGL), we use analysis of variance test (ANOVA). However, ANOVA only tests whether mean ROA is different for at least one category out of four categories of firms. It does not provide information on which category mean ROA is different. Therefore we compute Tukey's HSD (honestly significant difference) test for multiple comparisons of means. However, ANOVA and Tukey’s HSD can be applied only if variances of study / dependent variables are equal among four categories of firms. In case the variances are found to be unequal, Welch’s ANOVA and Tukey – Kramer test will be applied which will account for unequal variance. Equality of variance will be examined through Levene’s test. We divide the entire period of thirteen years into three sub-periods to analyze the factors impacting firm performance. They are sub-period 1 – from April 2000 to March 2004, sub-period 2 – from April 2004 to March 2008 and sub-period 3 – from April 2008 to March 2013. Similar analysis will be conducted to examine the unconditional mean difference of ROA and LPBR (natural log of price to book value ratio) among three time periods.

In order to investigate the yearly growth rates in ROA, LPBR and natural log of net sales, trend analysis is performed considering all the firms available in prowess. Results of trend analysis for all nine categories of firms are produced in appendix – D.

4.1.3 Multivariate Analysis

In order to examine the impact of independent variables on dependent variable, we estimate panel data regression for the entire period of 13 years (April 2000 to March 2013) including year and industry effects. Similar regressions are estimated for each of the three sub-periods. While analyzing firm performance for full panel, we include time dummies as independent variables.
TD2 and TD3 to represent sub-period 2 and sub-period 3 respectively. The intercept term captures the impact of sub-period 1 on the dependent variable i.e. mean of the dependent variable for the sub-period 1. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The difference between the coefficients of TD2 and TD3 is tested statistically. Variance inflation factor is calculated to examine the multi-co-linearity among independent variables. Following Petersen (2009) t statistics for coefficients are estimated by clustering firms and years. Regressions are estimated for full panel period as well as for each of the three sub-periods. This is done to examine whether the impact of independent variables changes during three sub-periods.

We begin the analysis with SAL and BGL firms at classified levels and compare these results with the regression results obtained for listed firms at aggregate level. Similarly, the regression results of SAUL and BGUL firms are analyzed and compared with unlisted firms. Further, the regression results of listed firms, unlisted firms, SA firms and BG firms are analyzed and compared with regression results of all firms. This is done to detect any changes of the impact of independent variables on dependent variable for different categories of firms arising out of group affiliation and listing status. This is in line with our research objective 2. We provide the complete regression results including VIFs in appendix – B and show sign and significance in the main text so that we can fit the required information in the table.

The regressions for SAL and BGL firms considering full panel period are as follows:

$$ROA_{it}/LPBR_{it} = \beta_0 + \beta_1 PH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^{2}_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} + \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{it} + \beta_{10} TD2_{it} + \beta_{11} TD3_{it} + \epsilon_{it}$$

............ (4.1)
Where, ‘it’ denotes $i^{th}$ firm at time $t$ and ‘ijt’ denotes $i^{th}$ firm in $j^{th}$ industry at time $t$. The coefficients of $TD_2$ and $TD_3$ represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively.

For the purpose of interpretation of beta coefficients of size and size$^2$, we compute beta for Ln (net sales) and (Ln (net sales))$^2$, as follows.

The regression equations in its partial form considering only size and size$^2$ as independent variables are given below.

$$ROA_{it}/LPBR_{it} = \beta_0 + \beta_1 SIZE_{it} + \beta_2 SIZE^2_{it} + \epsilon_{it}$$ .................................(4.2)

$$ROA_{it}/LPBR_{it} = \beta_0 + \beta_3 (\text{Ln}(NS) - \text{Ln}(NS)) + \beta_4 (\text{Ln}(NS) - \text{Ln}(NS))^2 + \epsilon_{it}$$ .................................(4.3) The equation 4.3 can be written as follows.

$$ROA_{it}/LPBR_{it} = \beta_0 - \beta_3 \text{Ln}(NS) + \beta_4 \text{Ln}(NS)^2 + (\beta_3 - 2\beta_4 \text{Ln}(NS))\text{Ln}(NS) + \beta_2 (\text{Ln}(NS))^2 + \epsilon_{it}$$ .................................(4.4)

Thus the coefficient of Ln (net sales) is $(\beta_3 - 2\beta_4 \text{Ln}(NS))$, and the coefficient of $(\text{Ln (net sales)})^2$ is $\beta_2$.

The regression equation 4.4 accommodates six types of relationships between firm performance and firm size. These relationships are explained as follows.

1. If the coefficient of Ln (net sales) is positive and significant but the coefficient of $(\text{Ln (net sales)})^2$ is not significant, it shows positive and significant relationship between firm performance and firm size.
2. If the coefficient of Ln (net sales) is negative and significant and the coefficient of \((\text{Ln (net sales)})^2\) is not significant, it shows negative and significant relationship between firm performance and firm size.

3. If the coefficient of Ln (net sales) and the coefficient of \((\text{Ln (net sales)})^2\) both are positive and significant, it shows that firm performance increases with accelerating speed with the increase of firm size.

4. If the coefficient of Ln (net sales) and the coefficient of \((\text{Ln (net sales)})^2\) both are negative and significant, it shows that firm performance decreases with accelerating speed with the increase of firm size.

5. If the coefficient of Ln (net sales) is positive and significant and the coefficient of \((\text{Ln (net sales)})^2\) is negative and significant, it shows inverted U shape relationship between firm performance and firm size as portrayed in figure 4.1 (A) given below.

6. If the coefficient of Ln (net sales) is negative and significant and the coefficient of \((\text{Ln (net sales)})^2\) is positive and significant, it shows U shape relationship between firm performance and firm size as depicted in figure 4.2 (B) given below.

**Figure 4.1: Inverted U and U shape Relationship between Firm Performance and Firms Size**
Figure 4.1 (A) shows that firm performance increases with increase in firm size\(^1\). However, it is difficult for any business to increase profits indefinitely with the increase in its size. Therefore firm performance decreases after a certain level of firm size. Figure 4.1 (B) shows that firm performance may decrease initially with the increase in firm size. However, after attaining a minimum scale in firm operations, the firm performance increases.

The coefficient of \(\text{Ln} (\text{net sales})\) and \((\text{Ln} (\text{net sales}))^2\) is calculated for each of the following regression and reported in appendix – C.

Regressions for SAL and BGL firms for each of the three sub-periods take following form.

\[
ROA_{it} / LPBR_{it} = \beta_0 + \beta_1 PH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^2_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} \\
+ \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{ijt} + \varepsilon_{it}
\]

\[\text{………… (4.5)}\]

Where, ‘it’ denotes \(i^{th}\) firm at time \(t\) and ‘ijt’ denotes \(i^{th}\) firm in \(j^{th}\) industry at time \(t\).

Regressions for SAUL and BGUL firms considering full panel period take the following form.

\(^1\) Firm size has been measured with net sales.
\[
ROA_i = \beta_0 + \beta_1 LEV_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SIZE^2_{i,t} + \beta_4 FIRMEFF_{i,t} + \beta_5 AGE_{i,t} + \beta_6 EXP_{i,t} + \\
\beta_7 SDE_{i,t} + \beta_8 HHI_{ij,t} + \beta_9 TD2_{it} + \beta_{10} TD3_{it} + \epsilon_{it} \\
\]

……….. (4.6)

Where, ‘it’ denotes i\textsuperscript{th} firm at time t and ‘ijt’ denotes i\textsuperscript{th} firm in j\textsuperscript{th} industry at time t. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively.

Regressions for SAUL and BGUL firms for each of the three sub-periods take following form.

\[
ROA_i = \beta_0 + \beta_1 LEV_{i,t-1} + \beta_2 SIZE_{i,t} + \beta_3 SIZE^2_{i,t} + \beta_4 FIRMEFF_{i,t} + \beta_5 AGE_{i,t} + \beta_6 EXP_{i,t} + \\
\beta_7 SDE_{i,t} + \beta_8 HHI_{ij,t} + \epsilon_{i,t} \\
\]

……….. (4.7)

Where, ‘it’ denotes i\textsuperscript{th} firm at time t and ‘ijt’ denotes i\textsuperscript{th} firm in j\textsuperscript{th} industry at time t.

Regression for listed firms (which include SAL and BGL firms) for full panel period takes following form.

\[
ROA_i / LPBR_i = \beta_0 + \beta_1 PH_{i,t} + \beta_2 LEV_{i,t-1} + \beta_3 SIZE_{i,t} + \beta_4 SIZE^2_{i,t} + \beta_5 FIRMEFF_{i,t} + \beta_6 AGE_{i,t} + \beta_7 EXP_{i,t} + \\
\beta_8 SDE_{i,t} + \beta_9 HHI_{ij,t} + \beta_{10} BGLD_{i,t} + \beta_{11} TD2_{i,t} + \beta_{12} TD3_{i,t} + \epsilon_{i,t} \\
\]

……….. (4.8)

Where, ‘it’ denotes i\textsuperscript{th} firm at time t and ‘ijt’ denotes i\textsuperscript{th} firm in j\textsuperscript{th} industry at time t. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The coefficient of BGLD represents difference between conditional means of dependent variable for business group listed firms and standalone listed firms.

Regressions for listed firms for each of the three sub-periods take following form.
$$ROA_{it} / LPBR_{it} = \beta_0 + \beta_1 PH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^2_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} + \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{it} + \beta_{10} BGULD_{it} + \epsilon_{it}$$

\[ \ldots \ldots (4.9) \]

Where, 'it' denotes \(i^{th}\) firm at time \(t\) and 'ijt' denotes \(i^{th}\) firm in \(j^{th}\) industry at time \(t\). The coefficient of \(BGULD\) represents difference between conditional means of dependent variable for business group listed firms and standalone listed firms.

Data for promoters’ holding and LPBR (Natural log of Price to Book value Ratio) is not available for unlisted firms. Hence regression for unlisted firms (which include SAUL and BGUL firms) takes the following form.

$$ROA_{it} = \beta_0 + \beta_1 LEV_{it-1} + \beta_2 SIZE_{it} + \beta_3 SIZE^2_{it} + \beta_4 FIRMEFF_{it} + \beta_5 AGE_{it} + \beta_6 EXP_{it} + \beta_7 SDE_{it} + \beta_8 HHI_{it} + \beta_9 BGULD_{it} + \beta_{10} TD2_{it} + \beta_{11} TD3_{it} + \epsilon_{it}$$

\[ \ldots \ldots (4.10) \]

Where, 'it' denotes \(i^{th}\) firm at time \(t\) and 'ijt' denotes \(i^{th}\) firm in \(j^{th}\) industry at time \(t\). The coefficients of \(TD2\) and \(TD3\) represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The coefficient of \(BGULD\) represents difference between conditional means of dependent variable for business group unlisted firms and standalone unlisted firms.

Regressions for unlisted firms for each of the three sub-periods take following form.

$$ROA_{it} = \beta_0 + \beta_1 LEV_{it-1} + \beta_2 SIZE_{it} + \beta_3 SIZE^2_{it} + \beta_4 FIRMEFF_{it} + \beta_5 AGE_{it} + \beta_6 EXP_{it} + \beta_7 SDE_{it} + \beta_8 HHI_{it} + \beta_9 BGULD_{it} + \epsilon_{it}$$

\[ \ldots \ldots (4.11) \]

Where, 'it' denotes \(i^{th}\) firm at time \(t\) and 'ijt' denotes \(i^{th}\) firm in \(j^{th}\) industry at time \(t\). The coefficient of \(BGULD\) represents difference between conditional means of dependent variable for business group unlisted firms and standalone unlisted firms.
SA firms include SAUL and SAL firms. Data for promoters’ holding and LPBR (Natural log of Price to Book value Ratio) is not available for SAUL firms. Hence we use dummy variable DPH in place of actual promoters’ holding for estimating regression. Regression for SA firms takes the following form.

\[
ROA_{it} = \beta_0 + \beta_1 DPH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^2_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} \\
+ \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{it} + \beta_{10} SALD_{it} + \beta_{11} TD2_{it} + \beta_{12} TD3_{it} + \epsilon_{it}
\]

\[\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots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Where, ‘it’ denotes ith firm at time t and ‘ijt’ denotes ith firm in jth industry at time t. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The coefficient of BGLD represents difference between conditional means of dependent variable for business group listed firms and business group unlisted firms.

Regressions for BG firms for each of the three sub-periods take following form.

\[ ROA_{it} = \beta_0 + \beta_1 DPH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^2_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} \\
+ \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{ijt} + \beta_{10} BGLD_{it} + \varepsilon_{it} \]

.......... (4.15)

Where, ‘it’ denotes ith firm at time t and ‘ijt’ denotes ith firm in jth industry at time t. The coefficient of BGLD represents difference between conditional means of dependent variable for business group listed firms and business group unlisted firms.

Regression for all firms (which include SA and BG firms; alternatively, it includes listed and unlisted firms) takes following form.

\[ ROA_{it} = \beta_0 + \beta_1 DPH_{it} + \beta_2 LEV_{it-1} + \beta_3 SIZE_{it} + \beta_4 SIZE^2_{it} + \beta_5 FIRMEFF_{it} + \beta_6 AGE_{it} \\
+ \beta_7 EXP_{it} + \beta_8 SDE_{it} + \beta_9 HHI_{ijt} + \beta_{10} BGLD_{it} + \beta_{11} SALD_{it} + \beta_{12} BGULD_{it} + \beta_{13} TD2_{it} + \beta_{14} TD3_{it} + \varepsilon_{it} \]

.......... (4.16)

Where, ‘it’ denotes ith firm at time t and ‘ijt’ denotes ith firm in jth industry at time t. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The coefficient of BGLD, SALD and BGULD represent difference between conditional means of dependent variable for business group listed firms and business

......... (4.14)
group unlisted firms, standalone listed firms and standalone unlisted firms, and; business group unlisted firms and standalone unlisted firms.

Regressions for each of the three sub-periods take following form.

\[ \text{ROA}_{it} = \beta_0 + \beta_1 \text{DPH}_{it} + \beta_2 \text{LEV}_{it-1} + \beta_3 \text{SIZE}_{it} + \beta_4 \text{SIZE}^2_{it} + \beta_5 \text{FIRMEFF}_{it} + \beta_6 \text{AGE}_{it} \\
+ \beta_7 \text{EXP}_{it} + \beta_8 \text{SDE}_{it} + \beta_9 \text{HHI}_{ijt} + \beta_{10} \text{BGLD}_{it} + \beta_{11} \text{SALD}_{it} + \beta_{12} \text{BGULD}_{it} + \varepsilon_{it} \]

\[ \ldots \ldots (4.17) \]

Where, 'it' denotes \( i^{th} \) firm at time \( t \) and 'ijt' denotes \( i^{th} \) firm in \( j^{th} \) industry at time \( t \). The coefficient of \( \text{BGLD}, \text{SALD} \) and \( \text{BGULD} \) represent difference between conditional means of dependent variable for business group listed firms and business group unlisted firms, standalone listed firms and standalone unlisted firms, and; business group unlisted firms and standalone unlisted firms.

4.2. Data

We use the relevant data from Prowess maintained by CMIE. Data for promoter’s holding is available only from April 2000 onwards in prowess. So we limit our analysis for 13 years covering a period from April 2000 to March 2013.

Changes in economic environment may have an impact on firm performance. Further, impact of independent variables on firm performance may change during different time periods. India has recently experienced a cyclical phase. Figure 4.2 shows growth of GDP in India from financial year 2000-01 to 2012-2013.

Figure 4.2: GDP Growth Rate of Indian Economy from the Financial Year April 2000 to March 2013
As depicted by Figure 4.2, GDP growth rate of Indian economy ranged from 3.88 percent to 7.97 percent during April 2000 to March 2004. This period of low growth rate was followed by a period of high growth rate. GDP growth rate during April 2004 to March 2008 ranged from 7.05 percent to 9.57 percent. Indian economy was negatively impacted by global financial crisis. As a result we see GDP growth rate ranging from 4.47 percent to 8.91 percent during April 2008 to March 2013.

We divide the entire period of thirteen years into three sub-periods to analyze the factors impacting firm performance. They are sub-period 1 – from April 2000 to March 2004, sub-period 2 – from April 2004 to March 2008 and sub-period 3 – from April 2008 to March 2013. These three time periods coincide with the low growth period followed by high growth period and finally subdued growth of Indian economy due to global recession. We have four panel periods to analyze the firm performance. These are as follows. Full panel period (P) covers full time period of 13 years from April 2000 to March 2013. Panel 1 (P1) – consisting of sub-period 1 covering period from April 2000 to March 2004, panel 2 (P2) – consisting of sub-period 2 covering period from April 2004 to March 2008 and panel 3 (P3) – consisting of sub-period 3 covering period from April 2008 to
March 2013. While analyzing firm performance for full panel, we include time dummies as independent variables TD2 and TD3. The coefficients of TD2 and TD3 represent difference between conditional means of dependent variable for sub-periods 2 and 1 and sub-periods 3 and 1 respectively. The difference between the coefficients of TD2 and TD3 is also tested statistically to test the mean difference of study / dependent variable for sub-periods 2 and 3.

There are 124037 observations for which total assets are available for all firms in prowess for our study period of thirteen years. However, the observations for PBITDA (profits before interest, tax, depreciation and amortization) are only 112810. Hence our sample size reduces for calculation of our dependent variable, return on assets. Further, the observations available for borrowing are 85452 for all firms. This further reduces our sample size to 85452 for calculation of firm leverage. Following Levine et al. (2000) we remove the outliers which lie beyond the 3 standard deviations of standardized error terms of the regression estimation. We remove 1068 such outliers from our sample and our final sample size is 84384. Year-wise observations and mean values of the variables of interest are given in appendix – A for all categories of firms.