# Inter-Industry Differences in Capital Structure: The Evidence from India

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## Abstract

The purpose of this paper is to investigate empirically the existence of inter-industry differences in the capital structure of Indian firms and identify the possible sources of such variations in capital structure. The technique used for this cross-sectional analysis is one way analysis of variance and the analysis covers the pre and post-liberalization periods separately to indicate if there is a clear break in the financing pattern of the Indian firms due to the policy shift. Though differences is firm size contributes to the existing variation in financial leverage ratio across industry-classes to some extent, it is the nature of the industry itself or more precisely the differences in the fund requirement of industry groups based on the technology used, which is a potential source of the existing variation.

Key words: financial leverage, external finance.
*JEL* classification: G32

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## Introduction

The relationship between industry membership and capital structure has received considerable attention. The industry in which a firm operates is likely to have a significant effect on its capital structure. Besides the corporate capital structure characteristics like non-debt tax shields, research and development, fixed assets, individual products that are parts that sum to a whole; Kahle and Walking (1996) noted four additional applications of industrial classification. They are applied, first to identify control firms within the same industry; second, to describe the industrial composition of the sample; third, to filter firms for specific investigations; and fourth to determine whether mergers and acquisitions are horizontal, vertical or conglomerate. Harris and Raviv (1991) in their review of the capital literature noted that it is generally accepted that firms in a given industry have similar proportions of individual assets and liabilities. They have summarized findings of four studies, Bowen and Daely and Huber (19820, Bradley, Jarrel and Kim (1984), Long and Matiz (1985) and Kester (1986), which investigated leverage ratios for selected industries. These studies all found that specific industries have a common leverage ratio which, over time is relatively stable. The correlation of capital structure and industry membership also received empirical support in Schwartz and Arson (1967), Scott and Martin (1975). Hamada (1972), using industry membership as proxy for risk class found that levered beta values within different industries varied more than unlevered beta values. DeAngelo and Masulis (1980) and Masulis (1983) use the documentation of this industry effect as one argument for the presence of an industry-related optimal capital structure and imply that it is the tax code and tax rate differences across industries that cause the intra-industry similarities in leverage ratios. Lev (1974) compared operating leverage to industry membership and to systematic risk and found a positive relationship. Building on Lev's study, Mandelker and Rhee (1984) empirically lends support to the conjecture that firms engage trade-off between operating leverage and financial leverage and argued that due to this trade-off a firm's industry may have some influence on capital structure decisions. Bradley, Jarrel and Kim (1984) find that the volatility of earnings is a strong inverse determinant of debt and that earnings volatility may be industry related, this may also affect the relation ship the industry membership and capital structure decisions. Again, following Jenson and Mecking (1976) the free cash flow argument, it seems that individual industries may be characterized by their growth rates which may influence debt levels in their capital structure.

In this paper we are interested in investigating empirically the extent to which a firm's observed capital structure is similar to other firms across different industry classes and identify the possible sources of variation in the capital structure.

All the prior research on the relationship between industry and capital structure are mostly focused on capital structure of the public, non-financial corporations with access to U.S or developed capital markets; virtually we have not come across any similar work

analyzing the variation of leverage across industry groups and over time in the Indian context. The objective of this paper is to provide evidence from India in this area.

This paper is organized into four sections. In the first section we discuss the data source, methodology and the variables used in the analysis and the descriptive statistics. The second section is devoted to report empirical evidence on the cross-sectional differences in capital structure of firms from twelve different industry groupings belonging to the Indian corporate sector. In the third section we try to identify the possible sources of variation. The fourth concludes.

## Section 1

## Variables and Database

Our sample consists of firms from a heterogeneous set of twelve Indian manufacturing industries provided by the RBI data source. To make the sample representative of the population we consider an unbalanced panel. Hence the total number of firms vary with time. The time period under consideration is along time –span of twenty-year 1979-80 to1998-99. We divide the entire time-period into pre-liberalization period: 1979-80 to1989-90 and post-liberalization period: 1992-93 to 1998-99, to capture the effect of policy break on the capital structure of firms. We drop out the first two years of the post-liberalization period, during which there was severe financial crisis following the gulf war, depletion of foreign exchange reserves; then there was the share scam of 1991, popularly known as the "hawala scam" which immensely harmed the credibility of the India's economic system. This was reflected in the rise in inflation and general prices, decline in the growth rate both in industry and agriculture, decline in investment rate, decline in exports simultaneously with negative balance of trade. The communal hysteria that rocked the very foundation of Indian national polity after the demolition of the disputed masjid in Ayodhya in 1992 and early 1993 also badly affected the Indian economic system.
The list of twelve selected industries is given in Table1 of the Appendix.

## The leverage variable.

The term leverage may be defined, as the employment of an asset or sources of funds for which the firm has to pay a fixed cost or fixed return. Consequently the earnings available to the shareholders of a firm and also the risk are affected. There are two types of leverage—"operating leverage" and "financial leverage". The leverage associated with investment (asset acquisition) activities is referred to as operating leverage, while leverage associated with financing activities is called financial leverage. Though the two types of leverage are closely related, this paper is basically concerned with financial leverage for the purpose of analyzing the financing decisions of firms at different industry levels. So, we consider variation in the stock measure of financial leverage or total debt divided by total assets. The descriptive statistics and trend in the leverage variable over time is given in Table 2 a ,b and c of the Appendix.

The analysis of the mean industry financial structure ratios point out that among the highly-leveraged industries in our sample are the cement industry followed by metal

products, paper and chemical fertilizer. At the other extreme the industries with lowest debt-ratios are paints & varnishes, electrical machinery, breweries and distilleries. Table 2c indicates that there is a clear break in the amount of debt raised by Indian corporate at two time points. Though during the pre-liberalization period almost all the industries showed a consistently proportional rise in the level of debt included in their capital structure in general, but in the years immediately after the reforms majority of the industries did not follow any systematic trend in their external financing pattern. Rather the tempo which was reflected in the pre-liberalization period was not maintained over the years.

## Section 2. Cross-sectional tests

In this section we attempt to test the differences in capital structure across industry groups using the leverage ratio, debt to assets. The null hypothesis to be tested is that firms in different industries have the same financial structures. We obtain the results of the cross-sectional tests by using one-way parametric analysis of variance (ANOVA), Since, ANOVA is robust to departure from normality, the generality of the results is extended by performing a nonparametric Kruskal-Wallis test on the same leverage ratio. On the basis of the industry classification scheme the entire sample is stratified into twelve industry or treatment groups. These groups are then compared in "one way" by the mean industry -leverage ratio representing their financial structure. The F-statistic demonstrates significant differences when any two (or more) industry means are different. Unlike a regression analysis where the effects on the pre and the post liberalization periods can be distinguished by using a time dummy, here we perform both the parametric and non-parametric tests for the pre-liberalization period and post-liberalization periods separately to capture the effect of liberalization policies on the capital structure of the firms. Table 3a&b show the results of the parametric tests in the pre-and post liberalization periods respectively.

The parametric tests based on the stock measure of financial leverage, debt to total assets results in the rejection of the null hypothesis that the firms in different industries have the same financial structure in all the years of the pre-liberalization as well as post-liberalization period at the .01 level. Since, the results of both the parametric and non-parametric test reinforce each other perfectly in both the periods thereby rendering greater degree of reliability in the inferences drawn; we have provided only the results of the parametric tests.

## Section 3.1

In this section we try to identify the sources of the existing variation in financial leverage ratio across industry groups. In the paper by Sarkar and Sarkar (2000), where they have presented a disaggregated picture of the trends in the financing pattern of the Indian companies, they have observed that on the average young companies sourced relatively less proportion of funds from external sources than mature companies in the years just before the reforms. Subsequent to the reforms, the importance of external sources increased for both young and mature companies, but the extent of increase was much

more pronounced for young companies than it was for mature companies. We introduce the age of firms into our analysis, and examine whether the differences in the capital structure of firms across industries arise because of the fact that some are young and some are mature firms who have distinctly different financing patterns at least in the post-liberalization period. We identify firms which are consistently present in the respective industries for the entire time period under our study as mature firms. Basically here we design a balanced panel to distinguish the mature firms from that of the others. Since the age of incorporation is directly unavailable from the RBI data, we have used a proxy for the young firms. A firm is classified as young if data for it is available for any year greater than or equal to 1991 and continues at least till 1999. We perform one way analysis of variance (ANOVA) across the mature and young firms of different industry groups separately. The results of the test for both the pre and post –liberalization periods after controlling for the age is reported in table 4a & b respectively.

The results reveal that significant variation in debt-ratio exists across the mature firms of different industry groups for all the years of the pre and post-liberalization periods. The variation in debt-ratio is also significant across the young firms for all the years. Thus it seems that age of a firm does not contribute to the existing variation in capital structure across industry groups.

Section 3.2

Next, we investigate whether the firms in different industries, belonging to same size class have similar financial structure. So, here we are basically focusing on industry-specific effects. To this end, we identify the top four firms and bottom four firms by ranking the total assets of individual firms in each industry in a descending order. Firms with maximum amount of total assets are considered as top firms and those with minimum amount of total assets are considered as the bottom firms. Then, we conduct parametric test separately across the sample of top as well as bottom firms of the twelve different industries for each of the pre and post-liberalization periods. The results of the test for both the pre and post –liberalization periods are reported in table 5 a & b respectively.

The variation of capital structure across the top firms of different industry classes is turning out to be significant only for three years in the pre-liberalization period, whereas the same variation is consistently significant in all the years of the post-liberalization period. In case of the bottom firms, the significant variation in capital structure of firms is much similar to that of the top firms in the pre-liberalization period. But a shift is observed in the results of the post liberalization period, showing almost absence of any significant variation in the financial leverage ratio. To, sum up, though the variation in capital structure across the top firms of different industry classes is more prominent than that of the bottom firms across the same industry class at least in the post-liberalization period, the very fact that little variation exists after controlling for size class, it seems that size class influences the variation in financial leverage ratio and at the same time it would be unwise to disregard industry -classification in explaining the existence of difference in leverage of firms across industries.

Section 3.3

In this section we control for the industry-specific effects and investigate whether the capital structure of Indian firms varies across industries merely because some are composed of large firms and others are small firms. We explicitly consider differences in firm size by classifying firms within each industry group into three size groupings according to their ranking by total assets. The top one-third are identified as large firms, middle one-third as medium firms and bottom one-third as small firms. Then we perform one-way ANOVA for each individual year within each industry class. The results are reported in table 6.

The results show that significant variation in debt-ratio across firm size is present in the metal products industry, cotton textiles industry and automobile components industry for very few years. In the metal products industry, five and three significant variations exist in the middle years of the pre-liberalization period and later years of the post-liberalization period respectively. In case of the other two, significant variations are only present in the pre-liberalization period; the number being five and four respectively. For the remaining industries included in the sample, the variation is either insignificant for all the years of the time period under our study or at the most significant for one or two years only.

Section 3.4.1

In this section we pool together the firms, without regard to the industry class and investigate whether the capital structure of firms varies across size class, by performing one way ANOVA.

It is observed that the capital structure of firms varies significantly across large medium and small firms in all the years of the pre-liberalization period and only two years towards the end of the post-liberalization period considered.

Though there is shift in results in case of the post-liberalization period, but it is obvious that firm-size influences capital structure variations only when industry-classification is not prominent. To capture if there is consistency of direction in the existing relation between firm size and capital structure, we calculate the spearman rank correlation coefficient.

It is interesting to note that the spearman rank correlation coefficient is significant over all the years of the pre and post-liberalization period and the direction of association is positive monotonic. This implies that larger the firm more is the level of debt included in its capital structure.

Section 3.4.2

As is obvious from the previous section that large firms have more debt and small firms have less debt in their capital structure, the next question that comes to our mind is that whether the large firms demand more debt or is it the choice of the lenders, who are willing to lend more to these firms as compared to the small ones. In other words in this section we try to identify the role of credit constrains in determining the inter-industry

variation in financial leverage ratio. We carry out the analysis in two consecutive steps. First we perform one-way ANOVA to examine the variation in profitability of firms across size class for the pre and post-liberalization period. We define profitability as the ratio of EBIT to total assets. If variation is observed, then using Spearman Rank correlation coefficient we try to find out the direction of association between profitability and size. The results are reported in 7a&b and 8a&b respectively.

The results obtained from the one-way analysis of variance clearly show that profitability varies significantly across size class for almost all the years of the pre-liberalization period and also few years of the post-liberalization period and in all these years the direction of relation is consistently positive. This suggests that large firms have higher profitability as compared to the medium and small ones. If profitability is constant across firm size and at the same time larger firms have more debt in their capital structure and small firms have relatively less debt, then we can definitely argue that larger firms have better access to credit. But there remains some ambiguity regarding the role of credit constraints; it appears that it was the differences in profitability that discriminated the large firms from the small ones with respect to the supply of credit at least in the pre-liberalization period. The lenders were reluctant to lend the small firms which are less profitable as compared to the large ones. It is only immediately after the initiation of liberalization policies, in the early years of the post-liberalization period we find that though capital structure of firms still showed significant variation across firm size with larger firms having a higher debt ratio , but profitability does not . It is only during this limited span of time, credit constraints seemed to operate in the capital market and small firms were discriminated against the favored access to credit. But, such constraints were gradually removed with financial sector liberalization from ’95-’96 onwards.

If we make a comparison of the industry effect vis-a- vis the size class effect, it is obvious that industry specific effect is dominant and that it is supportive of the alternate hypothesis that firms in different industries have systematically different financial structures.

## Section 4

The previous sections provide evidence that it is the nature of the industry that plays a leading role in determining the inter-industry variation in capital structure of Indian firms. This section is an attempt to identify the one industry-specific financial characteristic that systematically differentiates the capital structure of firms in one industry from that of the other.

Rajan and Zingales (1998) provides evidence in favour of the fact that it is the relative need of external finance that results in a disproportionate development of industrial sectors, faster in countries with more-developed financial markets. Under the assumption of perfect capital market, the authors have identified the financing needs of the finance hungry industries as an industry’s technological demand for external financing. Since external fund requirement indicates the amount of desired investment that cannot be financed through the internal cash flows; external fund composition is important. In a developing country India, we are interested in finding whether the debt-ratios form a major part of the external financing by looking into the rank correlation between the two. Here, like Rajan and Zingales (1998), we define external finance as the difference

between capital expenditure and cash flow from operations scaled by capital expenditures. Then we compute the Spearman rank correlation coefficient between the debt ratios and external finance at each point of time. The results are reported in table 9. It is interesting to find that the correlations are significant in almost all the years of the pre and post-liberalization period and the direction of relation is strictly positive. This signals that higher external financing by Indian firms is reflected in a parallel increase in debt financing. The result also throw light on an the financing pattern of Indian firms; that they lend support to the pecking order hypothesis, which states that if firms take recourse to external financing they prefer debt to equity.

In this section we try to examine for the persistence of variation in capital structure of firms across different industry groups after controlling for the differences in industry-specific external fund requirement and. Due to the existence of high rank correlation between external financing and debt ratios, we express external fund requirement by industry groups in terms of their debt ratios. But here we redefine the financial leverage variable as the ratio of the debt-ratio of an individual firm over the mean industry debt-ratio. The idea is that if firms that have high leverage ratios, then the industry of which they are members should have on an average a high leverage ratio in general. So, if we scale the individual debt-ratios by their industry averages we may be able to remove the industry-specific financial effects to a large extent. Thus, we perform ANOVA on this new variable, the debt-ratios of individual firms over their respective industry averages across the pre and post-liberalization periods separately. The results are reported in table 10a&b.

From the results obtained, it is observed that excepting for two years in each of the pre and post-liberalization period, the variation in the ratio of individual firm's debt ratio to mean industry ratio across different classes is insignificant.

This seems to suggest that differences in the demand for external funds which is technology-driven and specific to an industry is a major source of inter- industry variation in capital structure.

## Conclusion

In analyzing the inter- industry variation in capital structure of Indian firms, it is evident that the capital structure of firms are systematically different across industry-classes so far as the debt financing as a proportion of total capital is concerned. Both firm size and industry-classification contribute to the existing variation in capital structure across industry classes but nature of the industry seems to dominate. More specifically, it is the differences in external fund requirement based on technology differences that play a leading role in determining the inter-industry variation in capital structure. This signals that there exists a linkage between product market and capital market. Though it seems that the relatively large firms were given more importance so far as debt financing is concerned and access to capital markets in particular, in the years immediately after the reforms, this tempo was not maintained over the years. In other words, credit constraints were present in the Indian economy just after the liberalization policies were introduced but were removed thereafter.

**Appendix**

Table1: list of industries included in the sample

| **Industry No.** | **Industry name** | |
|---|---|---|
| **1** | Cotton Textiles | TEXT |
| **2** | Breweries and Distilleries | B&DS |
| **3** | Automobile vehicles | AVEH |
| **4** | Automobile components | ACOM |
| **5** | Electrical machinery & appliances | EM&A |
| **6** | Metal products | OMPR |
| **7** | Chemical fertilizers | CFER |
| **8** | Drugs & pharmaceuticals | DP&H |
| **9** | Paints & varnishes | P&VR |
| **10** | Cement | CEMT |
| **11** | Clay products | CLPR |
| **12** | Paper | P&PR |

Table 2a&b: Descriptive Statistics ( mean debt-ratio)

| YEAR | TEXT | B&DS | AVEH | ACOM | EM&A | OMPR |
|---|---|---|---|---|---|---|
| 1980 | 0.24 | 0.14 | 0.14 | 0.14 | 0.08 | 0.16 |
| 1981 | 0.24 | 0.14 | 0.14 | 0.15 | 0.11 | 0.2 |
| 1982 | 0.24 | 0.18 | 0.15 | 0.15 | 0.13 | 0.2 |
| 1983 | 0.26 | 0.15 | 0.21 | 0.18 | 0.12 | 0.24 |
| 1984 | 0.3 | 0.16 | 0.03 | 0.19 | 0.17 | 0.29 |
| 1985 | 0.29 | 0.15 | 0.26 | 0.2 | 0.16 | 0.27 |
| 1986 | 0.28 | 0.2 | 0.22 | 0.21 | 0.14 | 0.26 |
| 1987 | 0.28 | 0.18 | 0.23 | 0.21 | 0.18 | 0.24 |
| 1988 | 0.28 | 0.2 | 0.27 | 0.25 | 0.18 | 0.31 |
| 1989 | 0.27 | 0.18 | 0.24 | 0.23 | 0.18 | 0.26 |
| 1990 | 0.27 | 0.2 | 0.23 | 0.22 | 0.18 | 0.26 |
| 1991 | 0.29 | 0.23 | 0.23 | 0.23 | 0.23 | 2.5 |
| 1992 | 0.3 | 0.23 | 0.23 | 0.25 | 0.21 | 0.24 |
| 1993 | 0.31 | 0.19 | 0.26 | 0.23 | 0.2 | 0.29 |
| 1994 | 0.27 | 0.17 | 0.24 | 0.23 | 0.13 | 0.27 |
| 1995 | 0.26 | 0.23 | 0.14 | 0.2 | 0.11 | 0.26 |
| 1996 | 0.26 | 0.19 | 0.12 | 0.2 | 0.13 | 0.23 |
| 1997 | 0.27 | 0.1 | 0.16 | 0.21 | 0.18 | 0.24 |
| 1998 | 0.28 | 0.13 | 0.18 | 0.2 | 0.19 | 0.26 |
| 1999 | 0.28 | 0.15 | 0.19 | 0.2 | 0.23 | 0.27 |

| YEAR | CFER | DP&H | P&VR | CEMT | CLPR | P&PR |
|---|---|---|---|---|---|---|
| 1980 | 0.05 | 0.09 | 0.09 | 0.19 | 0.08 | 0.28 |
| 1981 | 0.04 | 0.12 | 0.09 | 0.23 | 0.1 | 0.31 |
| 1982 | 0.25 | 1.29 | 0.13 | 0.29 | 0.12 | 0.41 |
| 1983 | 0.27 | 0.13 | 0.12 | 0.27 | 0.14 | 0.41 |
| 1984 | 0.35 | 0.15 | 0.13 | 0.3 | 0.15 | 0.42 |
| 1985 | 0.32 | 0.15 | 0.09 | 0.32 | 0.18 | 0.4 |
| 1986 | 0.28 | 0.17 | 0.12 | 0.36 | 0.18 | 0.32 |
| 1987 | 0.28 | 0.18 | 0.16 | 0.38 | 0.22 | 0.33 |
| 1988 | 0.31 | 0.18 | 0.15 | 0.45 | 0.31 | 0.32 |
| 1989 | 0.34 | 0.16 | 0.17 | 0.45 | 0.34 | 0.33 |
| 1990 | 0.42 | 0.16 | 0.15 | 0.47 | 0.31 | 0.32 |
| 1991 | 0.42 | 0.19 | 0.16 | 0.44 | 0.26 | 0.32 |
| 1992 | 0.36 | 0.2 | 0.15 | 0.39 | 0.25 | 0.31 |
| 1993 | 0.37 | 0.2 | 0.17 | 0.4 | 0.24 | 0.32 |
| 1994 | 0.38 | 0.15 | 0.17 | 0.39 | 0.26 | 0.26 |
| 1995 | 0.33 | 0.15 | 0.13 | 0.36 | 0.27 | 0.29 |
| 1996 | 0.34 | 0.13 | 0.12 | 0.32 | 0.28 | 0.26 |
| 1997 | 0.34 | 0.13 | 0.18 | 0.42 | 0.23 | 0.34 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 1998 | 0.33 | 0.13 | 0.17 | 0.47 | 0.23 | 0.33 |
| 1999 | 0.36 | 0.17 | 0.19 | 0.44 | 0.22 | 0.36 |

Table 2c: Trend in debt-ratios (pre and Post-liberalization periods).

| Industry | Co-efficient Pre-lib | F-ratio Pre-lib | Co-efficient Post-lib | F-ratio Post-lib |
|---|---|---|---|---|
| TEXT | 0.0144 | 5.09 | -0.0091 | 1.90 |
| B&DS | 0.0332 | 13.81** | -0.0735 | 7.41** |
| AVEH | 0.0790 | 1.69 | -0.0577 | 3.40 |
| ACOM | 0.0536 | 54.86** | -0.0269 | 21.12** |
| EM&A | 0.0696 | 33.78** | -0.0082 | 0.05 |
| OMPR | 0.0418 | 9.79** | -0.1518 | 2096 |
| CFER | 0.1316 | 11.64** | -0.0455 | 5.47 |
| DP&H | -0.0099 | 0.02 | -0.0187 | 5.21 |
| P&VR | 0.0525 | 15.66** | 0.0128 | 0.48 |
| CEMT | 0.0861 | 151.49** | 0.0044 | 0.35 |
| CLPR | 0.1434 | 212.11** | -0.0155 | 2.81 |
| P&PR | -0.0054 | 0.14 | 0.0127 | 0.76 |

Pre-lib: F-ratio with d.o.f (1,9); Post-lib: F-ratio with d.o.f (1,7)

Table 3a: Parametric (ANOVA) Pre-liberalization period

| **Year** | **Debt/total assets F-ratio** | **d.f** |
|---|---|---|
| **1980** | 4.212** | **11,425** |
| **1981** | 3.724** | **11,425** |
| **1982** | 5.708** | **11,411** |
| **1983** | 5.507** | **11,411** |
| **1984** | 11.004** | **11,475** |
| **1985** | 9.404** | **11,475** |
| **1986** | 10.023** | **11,475** |
| **1987** | 7.797** | **11,475** |
| **1988** | 12.941** | **11,567** |
| **1989** | 14.328** | **11,600** |
| **1990** | 10.067** | **11,567** |

Table 3b: Parametric (ANOVA) Post-liberalization period

| **Year** | **Debt/total assets F-ratio** | **d.f** |
|---|---|---|
| **1993** | 11.184** | 11,540 |
| **1994** | 11.132** | 11,549 |
| **1995** | 9.870** | 11,498 |
| **1996** | 8.536** | 11,498 |
| **1997** | 7.427** | 11,506 |
| **1998** | 6.747** | 11,505 |
| **1999** | 5.827** | 11,506 |

** implies significant at 1% level, * implies significant at 5 % level

Table 4a: ANOVA across mature firms of different industry classes

| Year Pre-lib period | Mature firms Debt/assets (F-ratio) | Year Post-lib period | Mature firms Debt/assets (F-ratio) | d.o.f |
|---|---|---|---|---|
| **1980** | 2.426* | **1993** | 3.119** | 11,77 |
| **1981** | 2.995** | **1994** | 2.329* | 11,77 |
| **1982** | 2.407* | **1995** | 3.226** | 11,77 |
| **1983** | 2.353* | **1996** | 5.298** | 11,77 |
| **1984** | 5.548** | **1997** | 4.191** | 11,77 |
| **1985** | 5.075** | **1998** | 3.964** | 11,77 |
| **1986** | 4.781** | **1999** | 2.865** | 11,77 |
| **1987** | 3.920** | | | 11,77 |
| **1988** | 3.005** | | | 11,77 |
| **1989** | 2.250* | | | 11,77 |
| **1990** | 2.147* | | | 11,77 |

Table 4b: ANOVA across relatively young firms of different industry classes

| Year | Debt/ assets (young firms) F-ratio |
|---|---|
| 1993 | 1.110 |
| 1994 | 2.222* |
| 1995 | 2.365* |
| 1996 | 2.592* |
| 1997 | 4.101** |
| 1998 | 3.924** |
| 1999 | 2.363** |

Table 5a: (ANOVA) across the top and bottom firms of different industry classes.
Pre-liberalization period

| **Year** | Top firms Debt/assets (F-ratio) | Bottom firms Debt/assets (F-ratio) | d.o.f |
|---|---|---|---|
| **1980** | 1.856 | 3.289** | 11,36 |
| **1981** | 1.713 | 2.497* | 11,36 |
| **1982** | 1.214 | 1.595 | 11,36 |
| **1983** | 1.667 | 1.716 | 11,36 |
| **1984** | 2.561* | 1.999 | 11,36 |
| **1985** | 2.050 | 1.789 | 11,36 |
| **1986** | 1.191 | 1.139 | 11,36 |
| **1987** | 0.970 | 0.897 | 11,36 |
| **1988** | 1.377 | 2.050* | 11,36 |
| **1989** | 2.885** | 2.481* | 11,36 |
| **1990** | 3.430** | 2.137* | 11,36 |

** implies significant at 1% level, * implies significant at 5 % level

Table 5b: (ANOVA) across the top and bottom firms of different industry classes Post-liberalization period

| Year | Top firms Debt/assets (F-ratio) | Bottom firms Debt/assets (F-ratio) | d.o.f |
|---|---|---|---|
| **1993** | 2.486* | 4.229** | 11,36 |
| **1994** | 2.121* | 2.408* | 11,36 |
| **1995** | 2.529* | 1.536 | 11,36 |
| **1996** | 2.660* | 1.258 | 11,36 |
| **1997** | 3.419** | 1.119 | 11,36 |
| **1998** | 3.896** | 1.083 | 11,36 |
| **1999** | 3.175** | 1.032 | 11,36 |

Table 6: ANOVA of debt-ratio across large, medium and small firms
(Pre and Post-liberalization period)

| **Industry** | **Debt/assets Pre-lib (Total 11 years) Signifiant years** | **Debt/assets Post-lib (Total 7years) Significant years** |
|---|---|---|
| **Cotton textiles** | 1(**)<br>4 (*) | 0 |
| **Breweries & distilleries** | 0 | 1 (*) |
| **Auto vehicles** | 0 | 0 |
| **Auto components** | 1(**)<br>3(*) | 0 |
| **Electrical machinery** | 0 | 0 |
| **Metal products** | 2 (**)<br>3(*) | 3(**) |
| **Chemical fertilizers** | 0 | 0 |
| **Pharmaceuticals** | 0 | 0 |
| **Paints& varnishes** | 0 | 0 |
| **Cement** | 0 | 1 (*) |
| **Clay products** | 1 (**)<br>1 (*) | 1 (*) |
| **Paper** | 1 (*) | (**) |

** implies significant at 1% level, * implies significant at 5 % leveL

Table 7a: ANOVA of debt to assets and profitability across firm size (without regard to the industry-class). Pre-liberalization period

| Year | Debt/ assets F-ratio | EBIT/assets F-ratio |
|---|---|---|
| 1980 | 5.420** | 3.092* |
| 1981 | 5.428** | 0.895 |
| 1982 | 10.984** | 2.163 |
| 1983 | 5.861** | 6.050** |
| 1984 | 10.027** | 11.040** |
| 1985 | 8.694** | 17.299** |
| 1986 | 14.540** | 4.160* |
| 1987 | 5.715** | 9.051** |
| 1988 | 6.083** | 6.797** |
| 1989 | 7.882** | 3.159* |
| 1990 | 1.903 | 1.029 |

Table 7b: post-liberalization period

| Year | Debt/assets F-ratio | EBIT assets F-ratio |
|---|---|---|
| 1991 | 0.664 | 0.609 |
| 1992 | 0.309 | 1.901 |
| 1993 | 0.889 | 1.771 |
| 1994 | 0.227 | 2.510 |
| 1995 | 0.020 | 3.914* |
| 1996 | 0.488 | 12.157** |
| 1997 | 3.335* | 3.169* |
| 1998 | 3.171* | 4.510* |
| 1999 | 2.893 | 10.173** |

Table 8a: pre-liberalization period

| Year | Spearman $r_s$ Debt/assets & firm size | Spearman $r_s$ Prof & firm size |
|---|---|---|
| 1980 | .103* | .155** |
| 1981 | .141** | .066 |
| 1982 | .262** | .146** |
| 1983 | .247** | .187** |
| 1984 | .247** | .224** |
| 1985 | .224** | .243** |
| 1986 | .204** | .145** |
| 1987 | .203** | .126** |
| 1988 | .172** | .129** |
| 1989 | .163** | .094* |
| 1990 | .119** | .028 |

** implies significant at 1% level, * implies significant at 5 % level

Table 8b: Post-liberalization period

| Year | Spearman $r_s$ Debt/assets & firm size | Spearman $r_s$ Prof & firm size |
|---|---|---|
| 1991 | .117** | .051 |
| 1992 | .160** | .063 |
| 1993 | .165** | .083 |
| 1994 | .104* | .051 |
| 1995 | .153** | .195** |
| 1996 | .170** | .240** |
| 1997 | .269** | .163** |
| 1998 | .291** | .194** |
| 1999 | .280** | .216** |

** implies significant at 1% level, * implies significant at 5 % level

Table 9 Spearman Rank Correlation between debt-ratio and external finance. (Pre& Post-lib)

| Year | Spearman $r_s$ |
|---|---|
| 1981 | .370** |
| 1982 | .352** |
| 1983 | .452** |
| 1984 | .203 |
| 1985 | .259** |
| 1986 | .215** |
| 1987 | .455** |
| 1988 | .298** |
| 1989 | .438** |
| 1990 | .442** |
| 1991 | .228** |
| 1992 | .395** |
| 1993 | .173** |
| 1994 | .132 |
| 1995 | .404** |
| 1996 | .297** |
| 1997 | .462** |
| 1998 | .228** |
| 1999 | .087 |

** implies significant at 1% level, * implies significant at 5 % level

Table: 10a Controlling for the differences in fund requirement across industry-classes ANOVA across debt-ratio of individual firm/ industry mean debt-ratio.
(Pre-liberalization period)

| Year | Debt-assets F-ratio |
|---|---|
| 1980 | 1.393 |
| 1981 | 0.850 |
| 1982 | 5.254** |
| 1983 | 1.332 |
| 1984 | 51.557** |
| 1985 | 0.341 |
| 1986 | 0.920 |
| 1987 | 0.820 |
| 1988 | 1.732 |
| 1989 | 1.133 |
| 1990 | 1.352 |

Table:10b ANOVA across debt-ratio of individual firm/ industry mean debt-ratio.
Post-liberalization period

| Year | Debt/assets F-ratio |
|---|---|
| 1993 | 2.088* |
| 1994 | 1.457 |
| 1995 | 1.089 |
| 1996 | 0.883 |
| 1997 | 1.931* |
| 1998 | 1.680 |
| 1999 | 1.690 |

** implies significant at 1% level, * implies significant at 5 % level

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