Chapter 2

Review of Literature
2.0. INTRODUCTION

Review of Literature chapter is divided into four parts:

1. Review of Literature of Financial Structure, i.e. financial variables.
2. Review of Literature of Productivity, a real variable.
3. Review of Literature of relationship between financial structure and productivity. It means that we will be discussing the studies which focus on both the real and financial variables simultaneously.
4. Conclusion

2.1. REVIEW OF LITERATURE-FINANCIAL STRUCTURE

A number of studies have dealt with the issue of financial structure over the years. Traditionalists argue that an optimal point of leverage does exist because of imperfect capital market and savings due tax on debt suggested by Durant (1952). Modigliani and Miller concluded that capital structure has no effect on company’s cost of capital so, as on the value of firm in a world of perfect markets, rational investors apart from tax consideration. In theory this controversy is not settled but in real world corporations tends to follow certain debt-equity ratio when capital is raised. Researchers have tried to reach a consensus that an optimal range of leverage may exist for a firm because of some market imperfections such as agency costs, bankruptcy costs, non debt tax shields, liquidation costs, collateral value, market power, size and asymmetric information over the years. Industry equilibrium forces are very important to firm financial structure. The industry equilibrium approach offers additional insights, namely, that firms make their individual real and financial decisions in reference to the collective decisions of their peers, and that equilibrium outcomes imply intra-industry diversity rather than industry-wide targets. Firms are assumed to choose between a safe technology with a certain marginal cost, and a “risky” technology with an uncertain cost. In partial equilibrium no debt is issued since shareholders would expropriate
bondholders by picking the risky technology. However, each firm has an incentive to finance with debt and adopt the risky technology because by raising (lowering) output in good (bad) states, the risky technology initially has greater expected profits and risk than the safe technology. As more firms adopt the risky technology, the price of output more closely tracks that technology’s marginal cost; the risky technology becomes less risky and less profitable. Equilibrium obtains when the expected value of the ex-ante safe and risky technologies is equal and firms are indifferent between high-debt, high risk and low debt, low risk configurations. Thus, in industry equilibrium, firm financial structure is irrelevant because a technology’s risk and profitability depend not only on ex-ante characteristics but also on how many firms adopt that technology.

The existence of optimal capital structure has become an issue of debate in finance area since the publication of Modigliani and Miller’s (1963). Since then, many studies have attempted to establish relationship of financial structure and some other factors. Some of the studies are discussed here.

Pritam Singh (1970) emphasized on the anatomy of cost of capital. The paper highlights the basis of determining the cost of various components of capital. The cost of capital involves:

i. Calculation of the cost of different components of capital, keeping in view the floatation charges, discounts, brokerage, premiums and tax adjustments.

ii. Weights should be assigned on the basis of optimal capital structure if possible, or on the basis of the capital structure as it would emerge after the issue of the proposed securities. He further suggested that cost of capital should be used as the critical rate for investment purposes.

Nigam (1970) has emphasized on the relationship between cost of capital and leverage. This paper discussed the relationship as was based on by Modigliani-Miller (1978) approach.

Joshi and Singh (1970) have studied the theory and applications of cost of capital. This paper examines the utility of various methods advocated for measuring the cost of new issue of equity shares. The main idea behind the discussion of the subject is to evolve a
suitable method of cost computation, which would enable at least fair approximation of
the minimum rate that must be obtained on the projects before their acceptance and
achieve full subscription of the new equity shares. This paper concluded that if the
management is able to forecast at least for a few years, the market price of the share
could be obtained from the following formula:

\[
\text{Capitalisation rate} = \frac{\text{Average EPS}}{\text{Average Market Price}} \times 100
\]

Joshi (1970) examined his study on the need for proper application of cost of capital in
Indian business. He also analyzed the factors, which govern the quantification of the
costs of funds in the Indian corporate sector. He concluded that Indian companies
should rely on the issue of debentures because of their lower cost and marketability.

Rao (1970) has discussed the cost of capital to the small sector industry and its impact
on profitability and concluded that the small industries face difficulty in procurement of
capital and in getting access to the relatively cheaper bank loans in general, resort to
private loans with their low interest rates. These factors have potential of profitability
find it hard to maintain steady profits.

Jain (1976) calculated the cost of issue of capital to determine the extent of difference
between proceeds received by the company making the issue and the amount paid by
the investing public. The analysis is done by providing about three hypothesis related to
the cost of capital. It was found that the relative stability of cost of capital is an
outstanding feature. The cost on small issue has been prohibitively high and is
indicative of the financial disadvantage to such issues, which hinders the raising of
funds by small enterprises form the new issue market in India. This study do not
support the issue by new companies receive a discriminatory treatment in the sense of
higher cost in comparison with issues by old and established companies.

Agarwal (1976) studied the capital structure in aluminium industry in India. He
calculated the D/E ratio of aluminium industry in India from 1963 to 1973. He
compared the leverage ratios of three companies Indal, Hindalco and Malco. He
concluded that as compared to aluminium industry in India, the D/E ratio was higher in
engineering, cotton textiles, paper, electricity generation and non-ferrous metal
industries while it was lower in silk, tobacco and Rayon textiles, iron and steel and mineral oil. This shows that there are differences in debt to equity ratio on account of the nature of the industry.

Pandey (1981) studied the empirical relationship between capital structure and the cost of capital in the Indian, a developing economy. In the study he tested the three Modigliani Miller propositions empirically on the cross sectional data of 131 Indian companies belonging to different industries (chemical, cotton, engineering and textiles) for three years (1968, 1969 and 1970). His study did not support the view of Modigliani and Miller that the average cost of capital is not affected by capital structure changes. Also the cost of equity increases linearly with leverage. The results also indicate that leverage could lower the average cost of capital that means results supported the traditional view of capital structure.

Chakroborty (1977) in his study tested the effect of certain measurable variable on the capital structure. The capital structure measured in terms of debt equity has been used as dependent variable while change rate of sales, total asset, retained earnings, operating profits to gross capital employed, gross fixed assets to sales, tax provisions to profit before tax and age of the firm are used as independent variable. The study has attempted to assess the nature and extent of relationship between the dependent and independent variable. The study has attempted to assess the nature and extent of relationship between the dependent and independent variable. The study concludes that the age, retained earnings and profitability have negatives, while size and capital intensity have positive relationship with capital structure ratio. However, the ratio of tax provisions to profit before tax and debt equity ratio are found to be negatively associated. This study comes close to what we propose to do.

Gangadhar (1980) studied the trends in the Indian corporate capital structure during 1960-1976. His study is divided into three sections covering the three aspects given below:

i. Trends in the capital structure as between public and private limited companies distinguishing medium and large from small companies in each case.

ii. Inter industry differences in the capital structure trends in six major industries.

iii. Inter size differences in the capital structure trends.
This paper examined that during the period (1960-1976) debt was higher in case of medium and large public limited companies as compared to private limited companies. Debt shows an increasing trend in case of small private limited companies, while in the case of small public limited companies the trend of debt was declining. There is an increasing trend in debt irrespective of public or private company in case of industry-wise analysis. The study of inter-size differences in the capital structure trends in medium and large public and private limited companies revealed that in the case of public limited companies the size groups of Rs. 25 lakhs and above had relatively higher debt proportions of above 35 per cent.

Cherukuri (1984) compared the cost of capital and financial leverage of American and Indian companies. This study make an empirical examination of the effect of financial structure on the cost of capital of a firm by employing cross-sectional analysis in less developed and developed capital markets. The results obtained showed that in less developed capital markets, moderate amounts of debt will lower the firm’s cost of capital, while in developed capital markets after allowing for the tax advantage of debt financing, the cost of capital to the firm is independent of its financial structure.

N.S. Matta has done a similar kind of study in the year 1984. His study explored the effect of three determinants: industry, size and growth on the financial structure of the manufacturing companies belonging to the private corporate sector of India. It has also analyzed the structural relationship between the financial variable of companies classified into industry, size and growth groups. The study is primarily a cross-sectional analysis for the years 1976-77 and 1977-78. The financial structure has been expressed in terms of financial ratios categorized into four broad groups: activity, profitability, liquidity and leverage. The main finding reveals that the three variables, industry, size and growth are the significant determinants of such a financial structure based on results.

Rao (1995) studied the impact of debt equity ratio of non profitability of engineering industry. The objective of this study was to observe if the profitability had any impact on the debt equity ratio in engineering companies. A random sample of 10 companies
of corporate sector engineering industry in India was selected. Data was collected from the annual reports of the selected companies and BSE official directory. Debt equity ratio was less than 2:1 except two companies. The study based on the impact of profitability on the debt equity ratio revealed a negative relation. In case of high debt equity ratio, profitability decreased due to large interest payments, whereas low debt equity ratio caused high profitability because of low interest payments.

There has been a change in the direction of research on capital structure over the years. Now, the studies are more oriented towards explaining the effects of market imperfections such as agency cost, bankruptcy cost, and asymmetric information etc. on the capital structure than on the relationship between capital structure and value of firm. These are discussed below:

Myers (1977) in his study explained ‘why tax savings generated by debt do not lead firms to borrow as much as possible’. Myers said that if firms issue risky debt then the present market value of firm declines by inducing a sub optimal strategy or it may force the firm and its creditors to bear the costs of avoiding the sub optimal strategy. The study predicts that corporate borrowing is inversely related to the proportion of market value accounted for by real options. It also rationalizes other aspects of corporate borrowing behaviour, for example the practice of matching maturities of assets and debt liabilities.

Bradley, Jarrel and Kim (1984) worked on the concept which was introduced by Miller in 1977 that under certain conditions the tax advantage of debt financing at the firm level is exactly offset by the tax disadvantage of debt at the personal level. In their study they tried to find out whether or not the leverage related costs are economically significant enough to influence the costs of economic borrowing with the help of cross-sectional, firm specific data. This study develops a model that synthesizes the modern balancing theory of optimal capital structure. The model incorporates positive personal taxes on equity and on bond income, expected costs of financial distress (bankruptcy costs and agency costs), and positive non-debt tax shields. Study reveals that optimal firm leverage is related inversely to expected costs of financial distress and to the amount of non-debt
tax shields. A simultaneous analysis also demonstrates that if costs of financial distress are significant, optimal firm leverage is related inversely to the variability of firm earnings. One of the main finding of the study was the strong direct relation between firms leverage and the relative amount of non debt tax shields which contradicts the theory that focuses on the substitutability between non debt and debt tax shields.

Kale, Noe and Ramirez (1991) studied the effect of business risk on corporate capital structure. The study revealed that under personal and corporate taxation, the relation between optimal debt level and business risk is U-shaped. This result follows from the fact that the tax liability is an option portfolio that is long in the corporate tax option and short in the personal tax option. Therefore, the net effect of a change in business risk on the optimal debt level depends upon the relative magnitudes of the resultant marginal changes in the values of these two options. Results of empirical tests offer support for the predicted U-shaped relationships.

Rajan and Zingales (1995) tested the capital structure theories originated after the seminal work of Modigliani and Miller outside the environment in they were uncovered. In their study, an attempt has been made to investigate the determinants of capital structure choice by analyzing the financing decisions of public firms in the major industrialized (G-7) countries. At an aggregate level, firm leverage is fairly similar across the G-7 countries. They find out that at an aggregate level, firm leverage is fairly similar across the G-7 countries. In particular this study reveals that agency cost, bankruptcy cost, non-debt tax shield factors are not only correlated in the cross-section with firm leverage in United States but are correlated in other countries as well.

Most of the studies including above-mentioned study discussed the theory and determinants of capital structure of firms and industries operating in developed economies. However, Booth, Aivazian, Kunt and Maksimovic (2001) studied the capital structure in developing countries. This study analyzed the capital structure choices of firms in ten developing countries, and provides evidence that these decisions are affected by the same variables as in developed countries. In particular they have tried to answer the following three questions:
i. Do corporate financial leverage decisions differ significantly between developing and developed countries?

ii. Are the factors that affect cross-sectional variability in individual countries’ capital structure similar between developed and developing countries?

iii. Are the predictions of conventional capital structure models improved by knowing the nationality of company?

The study used a basic empirical model of cross sectional regression of the three different measures of the firm’s debt ratio against the firm’s tax rate, the standard deviation of its return on assets, the tangibility of its assets, the natural logarithm of its sales, its return on assets and its market to book ratio. Basically, this model extends the model used by Rajan and Zingales (1995) for the G-7 countries to include average tax rate and business risk variables.

This study revealed that the variables that are relevant for explaining capital structures in the developed economies like United States are also relevant in developing economies, despite the profound difference in institutional factors across these developing countries. They also found out that the more profitable the firm, the lower the debt ratio, regardless of how the debt ratio is defined.

Regarding the third question this study revealed that country of origin of a company was at least as important as knowing the size of independent variables but this was not true in case of market debt ratio.

Venkatesan (1983) studied the determinants of financial leverage. This paper was a pilot scale empirical study of the determinants of financial leverage and it attempted to shed some light on the areas that could be extensively explored in order to resolve the existing contradictions among the theorists. The sample data used in the present analysis were gathered from the compustat tapes. Sample consists of sixty-six firms for four years from 1977 to 1980. The analysis attempted to analyze the relationship of 7 different variables to the financial structure of firms. Industrial influence has been examined on the basis of the grouping of firms in various leverage classes. The results indicate that the determinants of financial leverage of firms in the low leverage groups
are not constraint by any generic industry class influence. Cash flow coverage was found to be significantly related to the financial leverage at 0.5 per cent and t-values of all other variables were found insignificant in the medium leverage groups. Firms in the high leverage groups were not found to have any significant common determinant of their financial structure. The study revealed that cash flow coverage of interest expense can beneficially be included in any further analysis and perhaps the finding may lead to a unanimous conclusion. We have also modeled for ‘common determinants’ of financial structure.

Michel and Shaked (1986) grouped fortune 500 companies engaged in manufacturing as either MNC’s (Multinationals corporations) or DC’s (Domestic Corporations) on the basis of both the foreign sales ration and the number of countries in which the firms have foreign operations. They compared the financial performance of multinational corporations with those for a control group of domestic corporations with that for a control group of domestic corporations using market-based performance. Their results suggest that the domestic corporations appear to have a significantly superior risk – adjusted market based performance, less capitalized and have higher total risk as well as higher systematic risk. The study also indicated that big size of multinational corporations do not contribute much in explaining the observed difference between the two groups’ performance. We have also considered the effect of foreign ownership.

Titman and Wessels (1988) worked on the determinants of capital structure choice. Their study analyzed the explanatory power of asset structure, non debt tax shields, growth, uniqueness, industry classification, size, earnings volatility and profitability in determining the capital structure of a firm. The study made use of factor analytic technique that mitigates the measurement problems encountered when working with proxy variables. The results indicate that debt levels are negatively related to the ‘uniqueness’, size and past profitability of a firm’s line of business while transaction costs found to be an important determinant of capital structure choice. The study however, does not support for an effect on debt ratios arising from non-debt tax shields, volatility, collateral value or future growth. We have also evolved techniques for measuring some proxy variables.
Fatemi (1988) worked on the theory that MNC’s operate in a more complex finance environment as compared to the firms operating in single country. Factors complicating the financing decisions of MNC’s include:

i. Various foreign tax structure
ii. Political risk and barriers to capital flows
iii. Possible segmentation of financial markets
iv. The diversification effect.

Fatemi in particular investigated whether international operations have a discernible effect on the financing policies of United States based firms. By applying the non-parametric test on the seven measures of leverage of MNC’s as well as DC’s he indicates that firms with notable foreign involvement have target leverage ratios significantly below those of their domestic counterparts. The two groups were identified on the criterion of foreign sales ratio and were controlled for industry and size effects. The study also revealed that multinationals secure a greater portion of their borrowing from short-term sources.

Lee and Kwok (1988) suggested an analytical framework that could examine the impact of international environmental factors such as political risk, foreign exchange risk on the firm related capital structure determinants such as agency costs, bankruptcy costs. These factors in turn influence the capital structure of MNC’s. Using the foreign tax ratio to classify companies as either MNC’s or DC’s, Lee and Kwok then compared the agency cost of debt, the bankruptcy costs and the long term debt ratios of MNC’s and DC’s. Their results suggest that even after adjusting for industry and size effects, MNC’s have higher agency costs than DC’s. In contrast, they report that after controlling for the size effect, there is no difference in the bankruptcy costs of MNC’s and DC’s. Lee and Kwok also found that MNC’s were less leveraged than DC’s even when they controlled for the size effect. However, adjusting for industry rendered the difference between the debt ratios of MNC’s and DC’s insignificant. We have also included size effect.

Brugman (1996) extended Lee and Kwok’s work by directly estimating the foreign exchange risk and political risk on the capital structure of MNC’s. Using the foreign tax
ratio to classify firms as either MNC’s or DC’s and controlling for industry and size
effects, Brugman found that MNC’s had lower debt ratios and higher agency costs than
DC’s. Furthermore, international diversification did not appear to lower earnings
volatility. To estimate the sensitivity of a firm to foreign exchange risk, Brugman
conducted a regression analysis of the stock returns of each sample firm on the return of
an index of United Sates stocks and on the United States $/SDR returns. His political
risk measure is based on the ratio of the number of low political risk countries to the
total number of countries in which the firm operates. The results of a regression analysis
for his sample of MNC’s suggest that the debt ratios of these companies are positively
related to both risks. Brugman concluded that this evidence was consistent with the
hypothesis that MNC’s use debt policy as a tool to hedge foreign exchange risk and
political risk.

Fries et al. (1997) use contingent claims approach to analyze optimal financial structure
in a competitive industry equilibrium that combined features of the previous models.
Like Williams (1995), the allowed for endogenous firm entry and exit. Like
Maksimovie and Zechner (1991), the incorporated shareholder-bondholder conflicts
and corporate debt tax-shields. Fries et al. (1997) found that as a result of trade off
between tax advantages and agency costs, a firm optimally adjusted its financial
leverage upward after inception.

Banerjee, Heshmati and Wihlborg (2000) diverted themselves from the common
approach of studying the determinants of optimal leverage. They observed that first of
all leverage studied need not to be an optimal leverage and empirical evidences shown
so far do not shed any light on the nature of dynamic capital structure adjustment by
firms. They used a dynamic adjustment model and panel data methodology on a sample
of United Kingdom and United States firms to specifically establish the determinants of
a time varying optimal capital structure. Determinants studied by them are: income
variability, tangibility, expected growth, size, profitability, non-debt tax shields and
uniqueness. They also used two dummy variables one representing time and another for
industry code. This study reveals that firm’s typically have capital structures that are not
at the target and that they adjust very slowly towards the target.
Chkir and Cosset (2001) studied the effect of diversification strategy of multinational corporations on their capital structure. Authors integrate both the international market and the product dimension of switching of regression regimes methodology that accounts for bi-dimensional nature of the diversification strategy pursued by MNC’s. The results indicate that the MNC’s with a high level of international diversification face higher agency costs of debt and the combination of both types of diversification leads to lower levels of operating risk. Although the role of the determinants of MNC capital structure varies with the diversification strategy, there seems to be common determinants. In particular, profitability and operating risk found to be negatively related to the debt ratio of MNC’s.

They also examined the impact of foreign acquisitions on the capital structure of United States corporations. With the help of event study methodology authors concluded that for the acquisition year, there was a drop in the debt equity ratio but leverage increased for the following three years after acquisition. The study also examined the relationship between additional financing through long-term debt after foreign acquisitions, the acquired subsidiaries with the help of multivariate analysis. The results suggested that in addition to the size and profitability as two major determinants debt financing, can also be explained by a geographical and industrial diversification effect. Furthermore, the results show that exchange risk and political risk affect the debt financing decision.

2.2. REVIEW OF LITERATURE - PRODUCTIVITY

In this section of review of literature, we will discuss the studies related to productivity as under:

Robert Solow (1956), in the landmark article has shown that long-run growth in income per capita in an economy with an aggregate neoclassical production function must be driven by growth in TFP. He also demonstrated that cross-country differences in technology may generate important cross-country differences in income per capita.

Clark and Griliches (1982) studied the results of a study of productivity growth and R&D in the 1970s using data on narrowly defined 'business units within a firm. He
developed the estimates under different assumptions about technology, industry effects, and changes in the return to R&D over time. The R&D data was broken down into process and product expenditures, and also some information was available on past success in developing proprietary technology, and on the incidence of major changes in technology. He suggested that a significant relationship between R&D and the growth of productivity, using total factor productivity as the dependent variable. The estimated rate of return to R&D investment is about 20 percent. His study also finds the evidence that R&D has its biggest effect on productivity in those markets where major changes in technology had occurred in the recent past. The productivity of R&D declined in the 1970s finds little support in this study. The calculations suggest that reduced investment in R&D may have accounted for at least 10 percent of the decline in total factor productivity growth in the 1970s.

Nishimizu and Page (1982) in their paper states that the change in technical efficiency dominated technological progress in their relative importance in sectoral total factor productivity growth of Yugoslavia. In this paper the authors proposed a method for the decomposition of total factor productivity change into two distinct elements, technical progress and changes in technical efficiency. In the case of developing economies, that identification of total factor productivity change with technological progress neglected an important dimension of productivity gains and losses which can be summarised as changes in the efficiency with which a known technology is applied to production. Clearly, technological progress and technical efficiency change are not neatly separable either in theory or in practice. In the methodological approach technological progress is defined as the movement of the best practice or frontier production function over time. In an economy such as Yugoslavia which borrows technology extensively from abroad, failures to acquire and adapt technology to new international standards will be reflected in lack of technological progress at the frontier. The findings indicate that in half of Yugoslavia's social sector industries there was no perceptible movement of the frontier during the period 1965-78. Many of these activities are mature industries, both in Yugoslavia and internationally, in which rapid movement of the frontier is not expected. In several sectors, however, the lack of technical progress is indicative of failures in investment planning and implementation to allow for acquisition of new technology. In
others, the movement of the frontier reflects the success of explicit policies to facilitate the acquisition of foreign technology. Similarly, changes in technical efficiency across plan periods and among individual sectors indicate the success or failure of a number of important dimensions of economic policy and industrial planning. The slowdown in total factor productivity growth was a consequence of both a reduction in the rate of technological progress and of a deterioration in technical efficiency. The relative magnitude of the two, however, is such that deteriorating technical efficiency change clearly dominates technological progress.

Beeson (1987) investigated the determinants of productivity growth in the manufacturing sector of states over the period 1959-1973. Their special emphasis was placed on isolating the effects of a state’s urbanization characteristics on productivity growth. Urbanization characteristics considered included the spatial arrangement of cities along with the standard measures of urbanization. The results indicate that while both scale economies and technical change are related to urbanization characteristics the effects tend to be offsetting; no relationship is found between urbanization and overall productivity growth as measured by total factor productivity growth.

Englander, Evenson and Hanazaki (1988) in their suggested more optimism in future TFP growth than would have been appropriate in the 1970s and early 1980s. There is some evidence which was given by the authors that the effectiveness or productivity of R&D may have declined during the mid to late 1970s. Second, the decline seems to have been industry-specific, with basic metals, non-electrical machinery and motor vehicles industries showing the most decline; by contrast, the so-called high-tech industries show no evidence of decline in recent years. Moreover, this paper has found some support in both the acceleration of R&D spending at the beginning of the 1980s and in the stock market evaluation of high-tech firms for the proposition that there may be some pick up in the pace of technology generation and commercialisation over the next few years.

Provided that steady, non-inflationary growth can be maintained, the structural adjustments and tax reforms undertaken in many countries may produce both faster growth of capital and a more efficient use of both old and new capital. While the papers
did not find evidence that energy prices or demographics were major factors contributing directly to the slowdown, it is nonetheless comforting that they do not appear likely to inhibit TFP growth over the near term. Such assessments are, of course, tentative, but they represent a turnaround from the conditions of ten or so years ago. To the extent that such optimism is well founded, the years ahead may hold both increases in the rate of per capita income growth and downward pressure on inflation; and, consequently, more room to ease macroeconomic policies and reduce unemployment.

While the basic outlook seems positive, there are also factors acting in the opposite direction. The persistence of trade imbalances and various tariff and non-tariff barriers raises the possibility of increased protectionism and potentially slower growth in the future. To the extent that these reduce growth and, perhaps as importantly, the dissemination and trade in new technology, TFP growth may remain close to the stagnant rates of recent years. There are wide discrepancies in the flow of new technology into industries, with non-manufacturing benefiting less than manufacturing. However stock-market data can be interpreted as pointing towards an increased flow of new technology applications in the future, after some slowing in the early and mid-1970s.

These results are of interest because they suggest that part of the TFP slowdown may have been caused by a slowing of new technology generation, a development whose sources and remedies are poorly understood. In addition, they highlight the uneven distribution of innovation across sectors, which may partially account for the divergent trends in TFP growth and price inflation in manufacturing and service industries observed in many economies. It is unlikely that macroeconomic policies can influence these developments, although microeconomic policies to correct market failures may be appropriate in the absence of such outcomes, however, the general assessment for future TFP gains remains optimistic.

Romer (1990) and Aghion and Howitt (1992) in their paper prescribed granting the innovator monopolistic rights over his innovation, which are sustainable through the patent system. In this way, innovators can recoup the initial fixed costs of innovation through the profit margin they make from commercializing their patent. For over 30 years, the conceptual difficulty when trying to endogenize TFP growth was how to pay
for the fixed costs of innovation in a perfectly competitive economy with constant returns to scale in capital and labour. In this context, all output is exhausted by paying capital and labour their marginal products, and therefore, no resources are left to pay for the innovation costs. We can critically observe that the study fails to distinguish between disembodied and embodied technological progress.

Klenow and Rodriguez-Clare (1997) and Hall and Jones (1999) have confirmed that a majority of the gap in income per capita between rich and poor countries is associated to large cross-country differences in TFP. Cross-country differences in TFP can be due to differences in the physical technology used by countries or in the efficiency with which technologies are used.

Lusigi and Thirtle (1997) calculated the multilateral Malmquist indices of total factor productivity (TFP) for agriculture in 47 African countries, for the period 1961-91. The average rate of TFP growth was found to be 1.27 per cent, which was higher than expected. There was some evidence of convergence in productivity levels, as the countries with low starting levels grew more rapidly. Population pressure on the land also appears to be a major explanation of faster growth. However, the fitting deterministic and stochastic frontier models showed that the effect of agricultural R&D on TFP growth was also positive and significant.

Prescott (1998) in his paper evaluated the argument that differences in physical and intangible capital can account for the large international income differences that characterized the world economy today. However, the finding by the author revealed that the savings rate differences are of minor importance. What is all-important is total factor productivity (TFP). In addition, the paper presents industry evidence that TFPs differ across countries and time for reasons other than differences in the publicly available stock of technical knowledge. These findings lead me to conclude a theory of TFP is needed. This theory must account for differences in TFP that arise for reasons other than growth in the stock of technical knowledge. In this paper there is some indication of embodied and disembodied technical progress. Yet it does not bring out the difference clearly.
Balakrishnan and Pushpangadan (2000) analyzed productivity of manufacturing industry. Their opinion was that the productivity estimates are sensitive to the measure of real value added that is adopted. According to them, one the source of bias in estimation of productivity is due to the assumption often made of constancy of the relative price of material inputs. This paper provided estimates of total factor productivity for aggregate manufacturing (adjusted for changes in this relative price). The results indicates that, contrary to what is believed, productivity growth in the 1980s had been slower than in-the earlier decade. We have accounted for material price by taking a 4 input production function and deflating materials for relative price changes.

Boskin and Lau (2000) analyzed data from G-7 countries. They tried to explain the structure of economic growth in a three model input which includes tangible capital, labour and human capital. They found out that technical progress is purely tangible capital and human capital augmenting. The benefits from technical progress depend upon the levels of tangible and human capital. Companies with higher levels of capital realize higher rates of technological progress. They concluded that technical progress is capital savings and not labours savings and accounts for more than fifty percent of the economic growth of G-7 countries except Canada.

Hellwig and Irmen (2001) have contended that innovators in can obtain rents to cover innovation costs despite being perfectly competitive because they face an increasing marginal cost of producing the intermediate goods that embody their innovations.

Hulten, Dean and Harper (2001) in their paper “New Developments in Productivity Analysis” uses the concept of TFP Residual. The TFP residual captures changes in the amount of output that can be produced by a given quantity of inputs. Intuitively, it measures the shift in the production function. Many factors may cause this shift: technical innovations, organizational and institutional changes, shifts in societal attitudes, fluctuations in demand, and changes in factor shares, omitted variables, and measurement errors. The residual should not be equated with technical change, although it often is. To the extent that productivity is affected by innovation, it is the costless part of technical change that it captures. The residual is a nonparametric index number designed to estimate one parameter in the larger structure of production, the
efficiency shift parameter. It accomplishes this by using prices to estimate marginal products. The various factors comprising TFP are not measured directly but are lumped together as a “left-over” factor (hence the name “residual”). The Divisia index must be path independent to be unique. The discrete-time counterpart of the Divisia index, the Tornqvist approximation, is an exact index number if the underlying production function has the translog form. The problem of path dependence is one of uniqueness, and this is not the same thing as measurement. The conditions for path independence are (a) the existence of an underlying production function and (b) marginal productivity pricing. When the various assumptions are met, the residual is a valid measure of the shift in the production function. However, it generally understates the importance of productivity change in stimulating the growth of output because the shift in the function generally induces further movements along the function as capital increases. We have in our approach, clearly brought out the distinction between movement along the function and a shift of the production function.

Han, Singh and Kaliranjan (2002) analyzed the stochastic production frontier methodology to manufacturing sector data for Japan, Hong Kong, Singapore and South Korea. They suggested that this methodology has facilitated decomposing TFP growth into technical efficiency changes and technological progress, and concluded that in then above four economies input growth has been the major contributor to economic growth.

Abbott and Wu (2002) study has used total factor productivity measurements and DEA (data envelopment analysis) to analyse the performance of Australia’s airports since the passing of the Federal Airports Corporation Act in 1986. The results from their analysis indicated that these airports recorded strong growth in technological change and total factor productivity, but did not fare all that well in terms of growth in technical and scale efficiency during the 1990s. At the international level it appears that Australia’s largest airports fare reasonably well in comparison to airports overseas, although they still possess the potential to realise further gains. The analysis showed that since 1989 the 12 main Australian airports have improved their performance in terms of total factor productivity. This rate of growth of productivity appears to have been significantly above that of the rest of the economy. The paper also concluded that it is possible that
the price caps in some circumstances may be at levels that reduce the profitability of the airports to levels below that of alternative investments.

Jin et al. (2002) created a framework for assessing the trends of China’s national and international investment in agricultural research and to measure its impact on total factor productivity. The main methodological contribution was to provide more convincing measures of crop-specific technologies from China’s national research program and of those imported from the international agricultural research system. Their results found that from 1980 to 1995, China’s total factor productivity for rice, wheat, and maize grew rapidly and new technology accounts for most of the productivity growth.

Bhanumurthy (2002) in his paper argued that Cobb-Douglas (CD) production function is not only a simple tool which can be handled easily or remedy for estimation ills, but also possesses lots of advantages. This function can handle multiple inputs in their generalized form. In the face of imperfections in the market it does not introduce distortions of its own. Unconstrained CD-function further increases the potentialities to handle different scales of production. He also argued that serial correlation, heteroscedasticity and multicollinearity type of econometric problem can be handled adequately and easily by using it. He further argued that it facilitates computations and has the properties of explicit representability, uniformity, parsimony and flexibility. Also, the problem of simultaneity can be accounted for through the use of stochastic CD-production function. It has also been clearly shown that CD function is the best for the aggregate level production function. As Klien (1974) has stated in the work quoted above, “Good evidence has been accumulated over the years to suggest that technology on a macroscopic level can pretty well (be) described by the Cobb-Douglas production function. We recognised that technology could be plausibly explained by this function and that it fitted well with a whole system”. Thus, for the aggregate level, the clear candidate is the Cobb-Douglas production function.

Veeramani et al. (2004) investigated the influence of investment climate on the total factor productivity levels in the organized manufacturing sector across India. Analysis
of TFP in the three states (Maharashtra, Punjab and Utter Pradesh) indicate a positive relationship between market friendly Investment climate and TFP.

Han, Singh and Kaliranjan (2004) compare the sources of growth in East Asia with rest of the world. The study decomposes total factor productivity growth into technical efficiency changes and technological progress. They applied a varying coefficients frontier production function model for period 1970-1990 for 45 developed and developing countries. The results are consistent with the view that East Asian economies were not outliers in terms of TFP growth. South Korea is identified as having the highest TFP growth, followed by Singapore, Taiwan, and Japan. Also the estimated technical efficiency of the high performing East Asian economies was not out of line with rest of the world.

Goldar (2004) presents an alternative set of estimates of TFP growth in Indian manufacturing in the last two decades, which have been made by and large on input and output measurement adopted in the studies of Unel and TSL. The estimates indicate a slowdown in TFP growth in Indian manufacturing in the post reform period, and thus do not bear out the findings of the studies by Unel and TSL. To supplement the analysis of productivity trends in the pre- and post-reform periods, the paper takes a close look at growth in employment and output in India’s organized manufacturing sector in the period since the mid-1990s. The analysis reveals that the trend rate of growth in employment in the period 1997-98 to 2001-02 was significantly negative, at about –3.3 per cent per annum. The trend growth rate in real value added in the period 1996-97 to 2001-02 was very low at about 0.5 per cent per annum. This was much lower than the trend growth rates in real value of output and the Index Number of industrial production (manufacturing) in this period, both exceeding 5 per cent per annum.

Skoczylas and Tissot (2005) compare productivity development across industrial countries based on official OECD data in the business sector. This paper focuses on the uncertainties surrounding the measurement of both productivity levels and productivity growth. They analyzed the labour productivity patterns and trends of total factor productivity across countries. The labour productivity of US appears to be the highest among the major industrial countries. Productivity has accelerated in the
US but decelerated in most of the industrial economies. Moreover US performance has been associated with a higher rate of technological progress that was intact even during recession. The capital accumulation has been strong in most other industrial economies.

Wong (2006) examined the effects on productivity of countries which have opened their markets for global competition from 1997-2003. The research focuses on both own establishment productivity changes and the reshuffling of resources from less productive units to more productive units. This study suggested an evidence of positive and significant effect of trade openness on the productivity of export oriented manufacturing industries in the years after trade reforms were implemented, but decreasing productivity after year 2000.

Baier, Dwyer & Tamura (2006) examined the relative importance of the growth of physical and human capital and the growth of total factor productivity (TFP) using newly organized data on 145 countries that spans more than 100 years for 23 of these countries. For all countries, only 14% of average output growth per worker is associated with TFP growth.

Much of the importance of the variance of TFP growth across countries is associated with negative TFP growth. This conclusion, however, reflects substantial variance across countries. TFP accounts for about 34% of the average growth of output per worker in the Western Countries and 26% in Southern Europe and the NICs. Other regions have less, negligible, and even negative growth of TFP. These negative growth rates are consistent with the importance of institutional changes and conflicts. The author has found that over long periods of time, the growth of output per worker is associated with accumulation of physical and human capital and technological change. The variation of the growth in aggregate input per worker and of TFP growth are also important in accounting for variation in the growth of output per worker. The variance of the growth of aggregate input and TFP are roughly equally important for Western Europe and Southern Europe. For the regions with negative average TFP growth rates, variation in the growth of TFP is substantially more important than variation in the growth of aggregate input per worker. This result is consistent with these negative
growth rates being associated with institutional changes in some countries that have negative effects on output per worker in those countries and with armed conflicts involving some but not all countries.

Kumar (2006) measured Total factor productivity growth in manufacturing industry for 15 major Indian states from 1982-83 to 2000-01. TFP growth is decomposed into efficiency and technological changes and also measure for the bias in technical change. The technological progress in state manufacturing depicted a capital using bias during the study period. The regional differences in TFP persist, though the magnitude of variation has declined in the post reform period. Also there is a tendency of convergence in terms of TFP growth rate but only the states that were technically efficient at the beginning of the reform remain innovative.

Comin (2006) described TFP as ‘Total Factor Productivity (TFP) to be the portion of output not explained by the amount of inputs used in production’. As such, its level is determined by how efficiently and intensely the inputs are utilized in production. Comin and Gertler (2006) show that low-persistence, non-technological shocks generate pro-cyclical fluctuations in the market value of innovations. Agents’ arbitrage these innovation opportunities and generate a pro-cyclical rate of innovation development and hence, of TFP growth. The model-induced fluctuations in TFP are as large and persistent as in the data. More importantly, by linking a component of TFP to innovation activity, TFP becomes a mechanism that propagates low-persistence shocks, thus increasing its persistence, rather than a source of disturbances, as in standard RBC models. This same logic can be extended to other processes that determine the endogenous level of technology such as endogenous technology adoption processes which are more relevant in developing economies.

Comin, Hobijn and Rovito (2006) put together direct measures of technology adoption for approximately 75 different technologies and show that the cross-country differences in technology are approximately four times larger than cross-country differences in income per capita. Further, technology is positively correlated to income per capita. Thus, cross-country variation in TFP is, to a large extent, determined by the cross-country variation in physical technology.
Comin and Mulani (2006) model the development of disembodied innovations such as managerial and organizational techniques, personnel, accounting and work practices, and financial innovations. These are very different from embodied innovations in that the rents extracted by the innovators are not associated to selling the innovation per se. This has some interesting implications. First, the revenues accrued by the innovator-producer originate from the increased efficiency in producing his good or service with the innovation. If the innovator-producer has some monopolistic power in the market for his good or service, the increased efficiency from using the innovation in production yields an increase in profits that may cover the innovating costs. Second, since the innovator-producer’s gain from innovating comes from the increased efficiency of production, the marginal private value of developing disembodied innovations is increasing in the value of the firm. In the cross-section, firms with higher values (resulting from larger sizes or ability to charge higher markups) have more incentives to develop disembodied innovations. In the time series, shocks that reduce the value of the firm reduce its incentives to develop disembodied innovations.

Boldrin and Levine (2008) model innovation in perfectly competitive settings. In their model, to copy an innovation, it is necessary to purchase one unit of the good that embodies it. Hence, the innovator is the monopolist of the first unit produced, and the revenues he extracts from selling it may cover for the innovation costs, making up for a lack of patent protection.

Goldar and Mitra (2008) analysed, whether the effect of productivity increase and changing sectoral composition in India have contributed to an accelerated economic growth in the post-1980 period. Their productivity analysis revealed that a faster total factor productivity growth in the services sector in the post-1980 period had been an important contributor to accelerated economic growth. The post-1980 hike in the growth rate of productivity is found to be relatively higher in the trade, hotels and restaurants group and the public administration and other community, social and personal services group in the services sector. The policy focused on the industrial sector for boosting its growth so that the aggregate growth of the economy derives its impetus from industrialization. The productivity growth within the tertiary sector was originated from the application of IT services.
Groth and Wendner (2011) set a dynamic general equilibrium model to study ‘how the composition of technical progress affects the asymptotic speed of convergence’. It suggests that a fraction of the productivity increases as coming from learning by investing help to generate a low speed of convergence in accordance with the empirical evidence. Also, learning originates in gross or net investment. The speed of convergence is not dependent on the degree to which learning by investing takes the embodied form rather than the disembodied form. These results point to a speed of convergence on the small side of 2% per year and possibly tending to a lower level in the future due to the rising importance of investment-specific learning in the wake of the computer revolution as the empirical evidence suggests.

Lin (2011) studied the cross-sectional variation of stock returns and technological progress by using a dynamic equilibrium model with production. The technological progress is endogenously driven by research and development investment and is composed of two parts as under:

i. The R&D which is devoted to product innovation.
ii. The other is to increasing the productivity of physical investment. This is embodied in new tangible capital.

The model breaks the symmetry assumed in standard models between tangible and intangible capital, in which the accumulation processes of tangible and intangible capital stock do not affect each other.

Klien (2012) studied the dynamics of employment in South Africa and examined the factors that contributed to the job-shedding observed during the recent financial crisis. The paper finds that the rapid growth of the real wage, which outpaced the labor productivity growth in most sectors, played an important role in suppressing employment creation. The study also finds that while there is a co-integrating link between the real wage and labour productivity, the deviations from equilibrium are persistent and thus contribute to a weak link between real wage growth and labour productivity growth in the short term. The findings are also supported by a cross-country analysis, which shows that in South Africa, the link between the real wage and labour productivity is substantially weaker than in other emerging markets, even after controlling for labour market tightness indicators.
2.3. FINANCIAL STRUCTURE AND PRODUCTIVITY

Basically all the above mentioned studies test the trade-off and pecking order theories and examine whether the real and financial decisions of individual firms are related to decision of industry peers or not. The following studies deals with the importance of industry to firm financial structure and the relationship of financial and real variables which measure productivity and technological progress.

Maksimovie and Zechner (1991) show that in industry equilibrium, firm financial structure is irrelevant because a technology’s risk and profitability depended not only on ex-ante characteristics but also on how many firms adopt that technology.

Williams (1995) extends Maksimovie and Zechner (1991) model by endogenizing entry and exit and adding exogenous perks consumption. Williams assumes that firms produce a homogeneous good using either a high variable cost, labor-intensive technology with no capital outlay, or a low variable cost, capital intensive technology requiring capital-market financing. Because managers cannot credibly commit to forego their perks, capital is rationed in equilibrium even though the capital market is perfectly competitive. Even as the cost of entry converges to zero, a core of capital-intensive firms earns positive profits because this agency problem prevents the fringe of labor-intensive firms from raising capital and dissipating the core firms’ monopoly rents. Like Maksimovie and Zechner (1991), Williams (1995) characterizes the industry equilibrium distribution of debt and firms characteristics and explains firm heterogeneity within industries. By allowing for entry, Williams predicts and asymmetric equilibrium industrial structure characterized by a core of large, stable, profitable, capital-intensive, financially leveraged firms flanked by a competitive fringes of small, risky, non-profitable, labor-intensive firms.

Levine et. al. (2000) evidenced that the industries that are heavily dependent on external finance grow faster in economies with a higher level of overall financial development and with better protection of outside investors. They also suggested that overall financial development stimulates the establishment of new firms.

Peter Mackay and Gordon M. Phillips (2002) used the model extended by Maksimovie and Zechner (1991), Williams (1995) and Fries et al. (1997) and found that industry and
group factors beyond standard industry fixed effects are also important to firm financial structure. Their results supported competitive industry equilibrium model of financial structure in which debt; technology and risk are simultaneous decisions.

Scandizzo (2004) in his paper “Financing Technology: an assessment of theory and practice” emphasized on the reasons behind the special challenges posed by financing technology to economic institutions. This study shows that technology ventures appear to face a basic trade-off between profit and growth, which may be exacerbated by a difficult relationship with a credit institution.

Boyer, Jacques and Moreaux (2005) studied the interactions between debt equity financing and strategic technological flexibility choices of firms facing costly bankruptcy. They showed that a firm’s level of debt financing or financial hardship is an important determinant of the level and type of investment it chooses, either a less costly inflexible technology or a more expensive flexible technology. The study also showed that the level of external financing may be used strategically in a non-cooperative facility collusive way to increase the expected profits of both firms, a firm may use debt as a commitment device to increase its own expected profit, and higher bankruptcy costs may be beneficial to both firms.

John B. Guerard Jr. (2005) in his book entitled Corporate Financial Policy and R & D Management had analyzed the determinants of corporate research and development (R&D) expenditures in the U.S. during the 1952-2003 period and the impact that these expenditures on stockholder’s wealth. Research began with a study of the interactions among the R&D, capital investment, dividend and new debt financial decisions of major industrial corporations. They found significant interdependencies, such that, he advised to use simultaneous equation model to adequately analyze a firm’s financial decision making process.

Boyabath and Toktay (2006) in their paper analyzed the integrated operational and financial risk management portfolio of a firm that determines whether to use flexible or dedicated technology and whether to undertake financial risk management or not. In this paper the optimal risk management portfolio is considered as a functional of firm size, technology and financial risk management costs, product market (demand variability and correlation) and capital market (external financing costs) characteristics.
Aghion et al. (2004) used publicly traded U.K. firms to investigate whether financing choices differ systematically with R&D intensity. In their paper they have considered balance sheet measure of the debt/assets ratio and probability of raising finance by issuing new equity, and the shares of bank debt and secured debt in total debt. They found a nonlinear relationship with the debt/assets ratio: firms that report positive but low R&D use more debt finance than firms that report no R&D, but the use of debt finance falls with R&D intensity among those firms that report R&D. They were also able to deduce a simpler relationship with the probability of issuing new equity: Firms that report R&D are more likely to raise funds by issuing shares than firms that report no R&D, and this probability increases with R&D intensity. The shares of bank debt and secured debt in total debt are both lower for firms that report R&D compared to those that do not, and tend to fall as R&D intensity rises.

Nucci et al. (2005) have found out that firms undertaking innovative activities typically hold a larger share of immaterial assets and have a different capital structure. Differences in the propensity to innovate are likely to translate in different TFP levels. The authors have studied panel of firms to study the relationship between firms’ capital structure and TFP. They identified variations in financial structure which were induced by factors that do not directly affect the share of intangibles. The authors were able to demonstrate a negative relationship between leverage and productivity, consistently with theories of financial structure based on bankruptcy costs, control rights and ‘equity holders-debt holders’ conflicts.

Zhengfel and Landsink (2006) extend the capital structure study to the situation in agriculture, explicitly addressing the difference between family farms and corporate firms. Dynamic models were specified, using both ROE (Return on equity) and Malmquist productivity index as performance measures. The traditional model of ROE failed to provide evidence that debt level affects farm performance, whereas the productivity model proposed in this study detected a positive effect of debt.

This result suggests that financial indicators may not fully signal management effort when studying the effect of debt. Empirical results showed that long-term debt increases productivity growth.
Capital investment, often characterizing the earlier stage of the life cycle, has no effect on productivity growth, suggesting that Dutch arable farms are overinvested. The farms’ productivity improves in the later stage of the life cycle as the farmer’s goal changes and experience increases. As a priori expected, subsidization slows down productivity growth in agriculture.

2.4. CONCLUSION

After going through the review of literature we can conclude that there are few studies that actually study the relationship between financial structure and productivity. The emphasis on embodied and disembodied technological progress is very little. There is no study that develops a common set of real and financial variables that can be measured and analyzed as determinants of financial structure (FS). Also, there is very little emphasis on measurement issues and the nature of variables.

In the next chapter, we will be focusing on the conceptual framework for this thesis. It will be based on the review of literature as well as on the theories of production and financial theory.