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CORRELATES OF PROFITABILITY OF LARGE AND MEDIUM SCALE MANUFACTURING INDUSTRIES IN ETHIOPIA

By

Haftu Gebrehiwot

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Department of Statistics

Approved by the Board of Examiners:

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Department Head **Signature**

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Examiner **Signature**

___________________________ ________________________

Examiner **Signature**

Tel. 251-1-239465 P.O.Box 1176 Addis Ababa, Ethiopia

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ABSTRACT

The purpose of this study is an attempt to explore the impact of various industry market structure elements (such as: Advertising Intensity, Capital Intensity, Inventory Turnover, Firm Size, etc.) on profitability measurements of large and medium scale manufacturing industries of Ethiopia. The analysis is based on balanced panel data of 91 firms over the period 1997 to 2006. To this effect, three accounting measures of firm's profitability were utilized: Price cost margin (PCM), Before tax profit rate (BTAP) and Return on Assets (ROA). Even though the results vary according to the measure of profitability employed, these findings support those Leahy (1998), who found that the results did not vary systematically according to estimation method. The study findings generally indicate that firm size, market share, inventory turn over and relative productivity index are associated positively and significantly with firm's profitability, while a significant negative relationship is found with firm's location, depreciation rate, firm's age, firm's total asset and import intensity. Unlike those determinants, the other variables such as domestic demand rate, capital intensity and advertising intensity have significant influence on firm's profitability, but with mixed sign.

Key words: Balanced panel, industry market structure elements, firm profitability

Acronym:-

A.A.	Addis Ababa
BPD	Balanced Panel Data
BTAP	Before Tax Profit Rate
CS	Cross Sectional
CSA	Central Statistics Agency
CSTS	Cross Sectional Time-Series
EEA	Ethiopian Economics Association
FE	Fixed Effect
FEM	Fixed Effect Model
FGLS	Feasible Generalized Least Square
GDP	Gross Domestic Product
GLS	Generalized Least Square
GVP	Gross Value of Production
IBIS	Interagency Border Inspection System
ISIC	International Standard Industry Code
LMS	Large and Medium Scale
LMSM	Large and Medium Scale Manufacturing
LMSMES	Large and Medium Scale Manufacturing and Electricity Survey

LSDV	Least Squares Dummy Variable
NGO	Non-Governmental Organizations
NIC	Newly Industrialized Countries
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Square
PCM	Price Cost Margin
PIMS	Profit Impact of market strategy
PMS	Profit Margin On Sales
RE	Random Effect
REM	Random Effect Model
ROA	Return On Asset
ROE	Return On Equity
TS	Time-Series
TSCS	Time-Series Cross Sectional
UBPD	Unbalanced Balanced Panel Data
UNIDO	United Nations Industrial Development Organization

CHAPTER-ONE: INTRODUCTION

1.1. INTRODUCTION

A great deal of research has been done on the determinants of profitability in manufacturing industry (see Schmalensee, 1989). The focus of such works has generally been in shedding some light on the major factors determining industry profitability level and then to decide which among the potential determinants of profitability appear to be most important. Most of the prior work in this area has been on inter-industry studies of profitability with the exception of Leahy (1998), which scrutinizes on the inter-firm determinants of profitability of distributors.

This paper uses several measures of profitability to examine the determinants of profitability for the Ethiopian large and medium scale manufacturing (LMSM) industry. Specifically, three measures of profitability are examined and related to proxies for the functions performed and/or risks assumed by those manufacturers even though the results may vary according to the measure of profitability employed, i.e., the significance of the independent variables may depend on the profitability measure employed.

Moreover, this research paper was initiated by a series of questions: Why are some manufacturing industries more profitable than others? What are the decisive factors playing a big role for this? To what extent are discrepancies in industries' profitability due to variation in these factors impact the performance of these industries, etc? Answers to the questions would be helpful not only to identify the determinants of profitability but also to formulate policies that may render the sector to be much more profitable than contemporary scenarios of the Ethiopian manufacturing industries.

1.2 MANUFACTURING INDUSTRY

Industry sector is a motor behind many of the processes usually termed as “social transformation” and “modernization”, [UNIDO,2003]. The development of the sector is so crucial in that it contributes a significant role in supporting and meeting myriad of obsessions. Some among these are in raising income and productivity per head, in satisfying the demands for the industrial products, in removing disparity in export-import, in observing surplus labor, in employ 1 creation, in developing economies that are naturally integrated, flexible, and capable of self-generated and self-sustained, [S.K.Jain,1997,pp 85].

The industry sector in Sub-Saharan Africa has generally been stagnant or shrinking for the last three decades (Bigsten and Söderbom, 2005). From the viewpoint of poverty reduction, employment creation, supporting other non-industrial sectors, and the likes, the sectors` scenarios are still worrisome. As Collier and Gunning (1999) and Fafchamps (2004) and many others argue, industrial development in Africa has been hindered by a multifarious of problems ranging from high transportation costs, high transaction costs due to imperfect information, and imperfect contract enforcement to highly risky business and political environments. Moreover, both the provision of public services and the development of grass-roots institutions and social capital are considered to be insufficient in Africa to cope with such problems.

These are also true in the case of Ethiopia. In Ethiopia, the sector is classified as mining and quarrying, large and medium scale industries, small scale industries and handicrafts, electricity and water, and construction sectors. The share of the sector to GDP has been in the range of 9 and 11 percent since early 1960s (EEA’s Report on the Ethiopian Economy, Volume V, 2005/06), indicating the development of the sector is yet at its infancy. As a result, the sector forms only a small part of the economy; because of this, the country's industrial base is very low. Consequently, the share of intermediate and capital goods is very diminutive. Moreover, the sector is heavily dependent on imports of semi-processed goods, raw materials, spare -parts and fuel. In addition to imported inputs, the sectors also depend upon backward and subsistence agriculture for their raw material demand.

Comparatively, the contribution of the industrial sector, particularly manufacturing, to the overall national income is one of lowest in the world. In 2003/04 the industrial contribution composed of manufacturing, construction, mining and electricity, was only about 11.4% of the GDP and that of manufacturing sector was only about 6.4% of the GDP. On the contrary, the industrial sec[illegible]d an average share of about 29% and 28% from GDP of Sub Saharan African countries and the world in 2003, respectively which depicts that Ethiopia is one of least industrialized economies in Sub-Saharan Africa and the world at large, where the private sector still holds a dominant share (EEA, 2005).

As far as industrial growth is concerned over the past two decades, the trend of growth in the sector was lethargic and changing at an insignificant rate. Since 1991/92 until 2003/04 the sector was growing at an average growth rate of 6.1% annually and similar average growth rate was also recorded in the manufacturing sector, whereby it grows at an average rate of 7.1% within the specified period. Moreover, this dwarf manufacturing sector generates a value added (at factor cost) worth less than 300 million US dollars annually-the maximum recorded annually being 280 million in 2001. This implies a per capita production of less than five dollars per year, and hence the inevitable dependence on imports for even basic manufactured goods. Moreover, being dependent on agriculture and imports for its inputs, growth over the years has been marked by a cycle of variation (EEA, 2004).

Regarding the structural linkages of manufacturing with the rest of the domestic economy, internally loose as well as unbalanced forward & backward bonds between economic sectors characterizes it. In terms of raw material inputs, manufacturing is more strongly linked to the external economy rather than to its own and the rest of the domestic economy. According to EEA (2004), the degree to which manufacturing satisfies its raw material demand from internal sources is about 55 percent, depending on the external sector for nearly the remaining half. The problem is more serious and grim when we consider the linkage with agriculture in which domestic manufacturing supplies only 1.3% of the manufactured goods demand in the agricultural sector. Assessing the manufacturing sector in terms of employment creation, the sector employed about 94,310 Ethiopians in 2006, which was only 2.7 percent of the total employment in the overall manufacturing (medium and large scale, small scale, cottage and the informal) sector of the country (CSA, 2006).

1.3. LARGE AND MEDIUM SCALE MANUFACTURING INDUSTRIES

The Central Statistical Agency defines Large and Medium Scale Manufacturing (LMSM) Enterprises in Ethiopia as establishments which engage ten persons and above and uses power-driven machinery. LMSM industries employed over 109,000 employees with a Gross Value of Production (GVP) of Birr 12316.4 million (CSA, 2004/05). Compared to the performances of the previous year, the sector had 13.3% growth which, in other words, means that this sector in annually produces goods only with Birr 169 per capita (EEA, 2005/06).

This sector suffers also from declining labor productivity. Compared to China, India, and Kenya, labor productivity in Ethiopia is one of the lowest (EEA, 2005). Labor productivity as measured by value added per production worker has declined consistently on average by 2% annually form 1999/00 to 2004/04 (EEA, 2005/06). This implies that the sector is also characterized by low competitiveness and performance. The products of most enterprises in the sector appear unable to effectively compete with imports in the domestic market or as exports on the international market (Alemayehu and Tadele, 2005). Production capacity utilization of firms in this sector has been also dismal. The capacity utilization rate of this sector for instance in 2006/07 was 55.38% (CSA, 2008), the highest ever since 1999/00.

The percentage distribution of Value added, which indicates the contribution level of LMSM industries to the total value added in the manufacturing sector, reveals that food and beverages manufacturing industrial group's contribution to the value added was considerably higher than the other industrial groups throughout the period 2002/03-

2006/07. During 2006/07, about 36.4% of the total manufacturing value added was generated from manufacture of food and beverage manufacturing establishment. Manufacture of other non-metallic products, manufacture of fabricated metal products, manufacture of paper, paper products and printing contributed 22.1%, 5.5%, and 5.5% of the total value added by large and medium scale establishments, respectively. That means the share of the four of total industrial groups combined was 69.5 percent of the total manufacturing industries, which indicates that the Ethiopian Large and Medium Scale Manufacturing Industry is characterized by a high concentration of a limited range of manufacturing activities (CSA, 2008, p.6)

Large and Medium Scale Manufacturing enterprises in general are structurally distorted and unbalanced which is composed of consumption goods that can not meet its own intermediate inputs (EEA, 2005/06). This implies that the sector lack integration and is thus highly dependent on external sources for its requirements.

The low level of manufactured exports and its little contribution to the country's foreign exchange earnings is also a reflection of the inefficiency within the sector in terms of profitability. According to EEA (2004) in seven years period, from 1996-2002, the share of the manufactured export to the total exports of the country figures only about 10 percent on average. The overwhelming majority of manufacturing firms are producing relatively low quality goods for domestic consumption which is due to, at least partly, the lack of competitiveness of the sector in the international markets and hence the low level of profitability performance within the firms.

According to the same report, the productivities of labor and capital have been declining from time to time. For instance, between 2002 and 2007, labor productivity has declined from 9.2 percent to 7.1 percent (CSA, 2008). Over the same year period, it has declined on average by 3.6 percent annually. The same is true for capital productivity whereby within the same period it has declined from 1080 dollars per unit of capital to 540 dollars per unit of capital. It is obvious that at least in the case of industries where productivities are not only low but also declining, competition even in the domestic market would be relatively very difficult. This fall in productivity also implies increasing unit cost of production and thus induced further deterioration in efficiency.

Overall, the Ethiopian LMSM industry is characterized by its poor performance in terms of its employment creation, contribution to the overall national income, and the type of goods produced, among others. It is widely believed that one of the major contributing reasons for this poor performance is the low level of profitability performance existing in the sector.

One of the factors that reveals this low level of profitability performance is the change in the total number of firms after the reform in 5 According to EEA (2004), despite the fact that the total number of firms has increased by a certain amount in this period, labor employment has shown only insignificant change. The likely reason suggested for the

Currently, Ethiopian manufacturing industries are producing at half of their capacities which also leads to poor resource utilization and lower level of profitability performance (CSA, 2006).

In view of this, this study generally aims at measuring the profitability performance in each of the LMSM industries and showing if there are possibilities to increase profitability performance in the sector without changing the existing level of inputs and technological environment. More specifically, it assesses the determinants of profitability performance in the Ethiopian LMSM Industries and whether each industry improved its profitability performance overtime using a panel data of 91 firms which are categorized under fifteen industrial groups during the study period, i.e. 1997-2006.

1.4. STATEMENT OF THE PROBLEM

Three general factors- macroeconomic forces, industry factors, and the firm's market position influence profitability in varying degrees, depending on the firm's industry and sector. But in the end, competitive advantage derives primarily from the firm's ability to build and protect resources and capabilities that are more productive than those of competitors.

Global and national economies clearly have an effect on profits. When global markets are growing, firms in many industries make more money simply because the demand for their products is strong and the products can be sold at higher prices. In contrast, when global markets are stagnant, there are fewer customers for each firm, prices drop to attract them, and profits fall. Comparable scenarios for national markets follow the same logic. Industry conditions also have an obvious influence on an organization's profitability. At any moment in time, some industries are growing quickly while others are stagnant. Likewise, the customers of firms in one industry struggle to sell their products. In one industry, organizations fight each other fiercely for a share of the market, yet in other industries firms are neutral. Further, some industries are relatively cheap to enter and so are overrun with competition, driving profits down; at the same time the cost of entering other industries is prohibitive. Moreover, these industry conditions change over time, depending on technological innovation shifts in customer tastes. Each of these factors affects the level of firm performance by increasing or decreasing current profit margins and the opportunities for profitable investments.

Third, economic performance is determined by how the firm is positioned in its market and how well the firm defends itself from competition. Without a successful market positioning, there is no competitive advantage. Successful positioning is based on the firm's resources and capabilities, which determine key value and cost drivers. A superior position is achieved when higher value to the customer, through better quality or stronger technology, for example, is produced at a lower cost. Once established, the position must be defended from other firms to prevent price competition from reducing profitability.

Finally, markets are never static, so firms must adapt to shifts in competition and customer tastes. Without adaptation, profitability declines as new products invade the market with higher value or competitors invest in new processes that allow lower prices. Consequently, as they grow over the industry life cycle, successful firms maintain their high level of profitability through innovations involving changes in both value and cost drivers as the industry matures.

Which of these three contributors to profitability macroeconomic, industry, and firm specific factors, is the most important? Interestingly, in most industries, it is what the firm does to achieve profitability-more than macroeconomic or industry factors- that contributes most to long-term performance and hence profitability. A strategy is therefore most effective when it focuses on how firms develop resources and capabilities that produce superior defendable market positions 7 in Yesney, 2001).

The structure of industrialized economies reveals strong and balanced internal linkages between the manufacturing and the rest of the sectors including; agriculture, mining, construction, transport and communication. This shows the capacity of manufacturing sector to produce and supply capital, intermediate and consumption goods demanded by all other sectors of the economy. But non-industrialized economies are characterized by internally loose as well as unbalanced forward and backward linkages between economic sectors. This leads to structural dependency on external economy.

The least industrialized Ethiopian economy is a manifestation of this problem. The Ethiopian economy is one of the least industrialized and its manufacturing sector is, as stated above, least developed in many respects; in terms of volume and quality products, technology status, labor skills and export capabilities. Primarily, this is because manufacturing is not only least developed but also structurally distorted and the other reason is that the sector has few backward and forward linkage to other sectors of the economy (Urgaia, 2007).

Developing technological capability requires adequate and continuous investment not only on equipment and related assets, but also on information, labor educations and technological know-how. However, investment level in Ethiopian manufacturing is extremely low. Thus, the undeveloped nature of manufacturing is more noticeable when observed from the investment point of view.

The role of Ethiopian Industrial Manufacturing in supporting the transformation of other sectors of the economy, particularly, agriculture, is negligible. As such, the development of other sectors is victimized by lack of modernization in manufacturing; it needs to be transformed, not just for its own sake but for the development of the economy as a whole. In this view, the sector, thus, has a problem of sustainable profitability and growth because Ethiopians' individual livelihoods and aggregate economic wellbeing depend almost entirely on external economy and the subsistence agrarian economy, which absorbs more than 80% of economically active population whereas industry in general, and the manufacturing sector in particular, has very few number (Ethiopian Trade Transformation, Volume II, 2004).

Many Large and Medium Enterprises in Ethiopia that are not fully utilizing their capacities lack profitability and competitiveness. It is obvious that at least in the case of industries where profitability is not only low but also declining, competition even in domestic market would be relatively very difficult (Ethiopian Economic Association, 2005). In a study made by the Central Statistical Agency (CSA) on these firms the major reason that accounted over 55% for not working at full capacity during 2004/05 were absence of market demand and shortages of supply of raw materials. Out of the 1038 firms, 27.4% or 284 of them stated absence of market demand as the first reason for not working at full capacity. Lack of demand, of both domestic and foreign, for locally produced goods led manufacturing industries to operate below full production potential (Ethiopian Economic Association, 2005). It is not surprising to note these reasons in many firms in the industry. The important question that one has to raise should be why the performances of these firms become so poor. What could be the reasons? What are the contributing determinants? Is it because of import-export competition? Lack of working capital? Low level of technology? Could it be quality of the products, packaging, price, lack of proper marketing efforts etc?

It is obvious that many Ethiopian firms, being in their low stages of market development, lack market orientation and competitiveness. In general, low and declining productivity induce further deterioration in efficiency, hence competitiveness (EEA: Report on the Ethiopian Economy; Volume V 2005/06).

The central question of this research is therefore to identify and analyze the reasons why large and medium scale manufacturing firms were characterized by low level of profitabilities and lack of competitiveness i.e. under capacity, and low profitability through market structure elements/factors and profitability model of analysis

1.5. GENERAL PURPOSES AND SPECIFIC OBJECTIVES:

1.5.1. GENERAL PURPOSES OF THE STUI

The purpose of the study is to analyze the profitability performance of Ethiopian large and medium scale manufacturing firms by analyzing a unique firm-level panel data set of firm performance over the periods 1997 – 2006. In additions to this, it is also aimed to closely look at the relationship between profitability and industries/firms characteristics or covariates and then to decide which among the potential determinants of profitability appear to be important.

1.5.2. SPECIFIC OBJECTIVES OF THE STUDY:

The specific objective of the study is to find systematic evidence on the main determinants of firm profitability of Large and Medium Manufacturing industries in Ethiopia. This embraces to: -

1. Briefly examine the overall profitability performances of Large and Medium Manufacturing industries in Ethiopia

2. Empirically investigate the major factors that determine the profitability of Large and Medium Manufacturing industries in Ethiopia.

3. To assess which, private or public, firms are on average tend to be more profitable, or to recognize whether or not the profitability of the private- owned and public-owned firms is different.

4. To determine whether or not profitability is related or associated to firm covariates such as firm size, age, ownership, location, capital intensity, advertising intensity, domestic demand rate, import intensity, industries total asset, market share, inventory turn over, depreciation rate, etc.

5. To identify the relative significanc these selected market structure elements/factors/determinants of firm profitability**.**

1.6. APPLICATION OF THE RESULTS:-

- To provide information to the government and other concerned bodies to set polices, plan strategies, and seek out resolutions on how to improve the profitability of those firms at home.
- To provide an input for the required sector specific stress testing and shade light on policy repercussion on Large and Medium Manufacturing industries in Ethiopia
- The results help as a basis for further study in this area

1.7. SCOPE AND LIMITATION OF THE STUDY

The study encompasses all observed Large and Medium Manufacturing Industries starting from 1997/98 to 2006/07 fiscal year. However, due to the expected shortage of amicable longitudinal data, the study is compelled to limit itself mainly on officially reported accounting and major macroeconomic secondary data. By and large, the study likely faces the following problems:-

1. This research examines only the stated covariates to explain the variation in performance/ profitability across industries, while there are other variables such as management skill and luck which also have an impact on firm performance [Jacobson (1990)]

2. Lack of complete data on some variables. For example, "Research and development", which is expected to be one of the most decisive determinants of firm profitability, has been dropped from consideration because of a complete lack of data. Besides, "Export Intensity" is another essential covariate that is removed from consideration because of the fact that many of its data were missing and the variable was consistently insignificant in trial regressions.

3. Lack of empirical works or literatures on some explanatory variables such as inventory turnover, firm location, firm's asset depreciation rate and firm total asset.

4. The resulting data set may not be representative of its population because a balanced panel has been created artificially by eliminating all units of observation with missing observations

1.7. PAPER ORGANIZATION

The remaining parts of the paper are structured in the following way: chapter two presents the theoretical and empirical reviews insight regarding firm/industry profitability and these covariates of profitability specific to firm/industry. Chapter three focuses on data and econometric methodology. Chapter four deals with the statistical data analyses and discussions, and conclusions and some policy implications will be described in Chapter-five.

CHAPTER-TWO: LITERATURE REVIEW

In this literature, the following factors have been found to affect the overall level of firm profitability: Market share, Import Competition, Capital Intensity, Advertising Intensity, Firm Size, Firm Ownership, Depreciation Rate, etc. The discussion of the previous literature provides an explanation of these explanatory variables that are included in the analysis of this paper. The findings of the earlier literature are reflected in the choice of independent variables to our analysis.

2.1. MARKET SHARE AND PROFITABILITY

The relationship between market share and profitability is perhaps the most-studied single phenomenon in business policy. Although, it has been some decades since the first published studies report a positive market share profitability association (Gale, 1972, Shepherd 1972), the nature of this relationship continues to receive a great deal of attention (Buzzell and Gale, 1987, Jacobson 1988a, Cool et al., 1989, Boulding and Staelin, 1990, Venkatraman and Prescott, 1990 Schwalbach 1991, Szymannski et al., 1993, Fraering and Minor, 1994). While it is observed that many practitioners hold the view that higher market share leads to higher profits, research findings indicate that the market share-profitability association is dependent upon strategic and competitive settings, and spurious effects account for at least a sizable component of the measured association.

From all these, the following question arises: is the pursuit of market share an appropriate strategy for the increase of firms' profit? Business strategists are divided on this issue. Some studies indicate that low share businesses can be quite profitable (Woo, 1982, Schwalbach 1991). Moreover, a spurious correlation between market share and industry profitability has been found by Jacobson (1988 a), Rumelt and Wensley (1981) and Jacobson and Aaker (1985).

On the other hand, the dominant finding of prior research is a significant positive relationship between market share and profitability. O'Regan Nicholas (2002) has shown that firms with increased market share are likely to have higher performance and in particular achieve enhanced financial performance, greater customer satisfaction and retention. This applies to all firm sizes. To ensure competitive advantage, firms need to consider market share in conjunction with overall profits.

The potential role of market share in determining profitability is also discussed by Brozen (1971) and Demsetz (1973). They, and other economists, suggest that a positive relationship between profits and market share at a firm level will imply a positive profit-concentration relationship at the industry level, even if high concentration does not lead to collusion and therefore does not affect firm's performance. Scherer and Ross (1990) explain this result as follows: (1) highly concentrated industries have high profits due to individual firms having high market shares, and (2) large firm profits are assigned greater weight in calculating industry profitability.

Australian evidence for profitability and market share is very sparse due to the lack of appropriate firm level data. McDonald (1999) failed to find a positive market share profitability relationship although the result is somewhat sensitive to the econometric specification in his study using the interagency border inspection system (IBIS) dataset.

Ravenscraft (1983) carried out one of the first major studies which found price-cost margins to be positively associated with firm market share, while, if anything, negatively associated with seller concentration. Branch and Gale (1982) calculated a series of regressions using profit impact of market strategy (PIMS) data and found that market share, not concentration, is the primary structural determinant of profitability. They also found that differences in relative prices appeared to be due to greater perceived product quality of the higher share firms and that relative costs fall as market share increases. They concluded that lower costs through economies of scale, rather than higher prices, are responsible for higher profitability being associated with greater market share.

Schmalensee (1989) found that although market share is strongly correlated with profits in samples of U.S. firms that include many industries, this is not the case for particular manufacturing industries. He suggests that the positive market share profitability relationship found in many studies is due to results being dominated by a small number of industries with unusually strong positive relations between share and profitability. This proposition is supported by results from Schmalensee (1987), intra-industry studies of the UK by Clarke, Davies and Waterson (1984) and studies by Ross (1986) and Kessides (1987).

Studies carried out since the 1970s have generally found that market share is positively and significantly associated with higher rates of return and this effect dominates any concentration profitability relationship. However, as both efficiency and oligopolistic coordination (as a result of concentration) affect profitability to some extent, the task is to find the relative explanatory power of each effect. An interaction term (i.e. the product of market share and concentration) can be included in regressions to test this idea.

Feeny and Rogers (1999) outline the theory and review the empirical evidence on the rather complicated relationship between market share and profitability. In short, while the most basic theory suggests high market share raises profitability, various other considerations suggest the relationship may not be as straightforward. They also find a U-shaped relationship between market share and profitability, with higher levels of profitability associated with market shares exceeding 30%.

Studies carried out since the 1970s have generally found that market share is positively and significantly associated with a type of profit ,rates of return, and this effect dominates any concentration profitability relationship. However, McDonald (1999) fails to find any significant relationship between profitability and the market share of Australian manufacturing firms but does find a positive concentration-profitability relationship, as mentioned above.

2.2. ADVERTISING INTENSITY AND PROFITABILITY

In today's competitive era, one is constantly bombarded with advertisements. Empirical studies show that advertisements have an influence on the firm profitability.

In recent years a number of studies suggest that a firm's advertising directly affects stock returns. This is in addition to the indirect effect of advertising through increase in sales revenues and profits. Srinivasan and Hansens (2007) carried out an extensive literature survey on the impact of advertisement on firm profitability and found that advertising intensity affects financial/accounting profitability measures such as ROE and ROA.

In the past, many studies have been performed, trying to determine the major factors of influence on profitability. Early work on the advertising – profitability relationship tended to regard advertising as a barrier to entry operating through its impact on product differentiation (Kaldor, 1950). In Comanor and Wilson (1974), Williamson (1963) and more recently in Kessides (1986) and Pitelis (1991) advertisement has been studied through its role as investment in excess capacity.

Scholars support two schools of thought about the effects of advertisement as a competitive factor. In the first school of thought (industrial economics) advertisement is considered as a factor of product differentiation particularly when the latter is plasmatic. It has been proved that advertisement increases profit and reduces consumer welfare by creating product differentiation (Caves and Williamson, 1985) and barriers to entry (important sunk cost). That type of differentiation appears only in markets of imperfect competition.

Another school is focused on the informative character of advertisement, claiming that advertisement makes markets more competitive and reduces profits by supplying consumers with information about price and quality (Greuner, Kamerschen and Klein, 2000).

Graham and Frankenberger (2000) examined the asset value of advertising expenditures of 320 firms with reported advertising expenditure for each of the 10 consecutive years ending in 1994, seeking to determine the impact of advertising expenditures on the firm profitability performance. They used the changes in year to year differences in advertising expenditure to measure the impact on asset value and subsequent market value of the publicly traded firms and, eventually they found that advertisement increases firm profit.

2.3. FIRM SIZE AND PROFITABILITY:-

A good number of researchers had investigated the relationship between firm size and profitability. Most of the results come out with varying opinions. Some studies postulate negative results while some studies have evidence supporting the positive notion. Amato & Wilder (1985) conveyed that the relationship between firm size and profitability may be positive for some firm size ranges and negative for others. Again, if the size reached a threshold, additional expansion of firm size may further separate ownership from control. This suggests that the relationship between firm size and profitability can become negative beyond the threshold firm size. Fama & French (1993) captured much of the cross-section of average stock returns. If stocks are priced rationally, systematic differences in average returns are due to differences in risk. Thus, with rational pricing, size and book equity to market equity must proxy for sensitivity to common risk factors in returns. Fama & French also attributed this predictive power of size to its ability to capture risk. Again from the company's perspective, small firms apparently faced higher capital costs than larger firms. Here, we can mention (Baumol, 1959) proposition that large firms have all of the options of small firms, and in addition, they can invest in lines requiring such scale that small firms are excluded. Michaelas et al., (1999) indicated that larger firms use higher gearing ratios than smaller firms, and they suggest this is a result of smaller firms facing higher financial barriers. This view is also supported by Chittenden et. al.,(1996), Hall et. al., (2000) and Cassar & Holmes, (2001, 2003), who provided evidence suggesting that size is positively related to long term debt and negatively related to short-term debt. Romano et. al., (2001) and Gibson, (2002), also found an important relationship between size and capital structure. Lopez Garacia & Aybar–Arias (2000) suggest that size significantly influences the self-financing of smaller companies. Contrary to these studies, Berk, (1997) suggests that investor returns are positively correlated with size when size is measured with non-market measures such as employees, assets and sales. Leledakis, Davidson & Smith (2004) found that there is little correlation between firm size and profitability, while Hecht (2001) conveyed that there is no correlation between non-market measures of size and investor returns. Jordan et. al., (1998) also found that there is no relationship between financial structure and enterprise size.

Critical resource theories stress a firm industry control over the resources such as assets, technology and intellectual property as determinants of firm size, Abdussalam (2006). Legal institutions and laws improve the protection afforded the owner of the company over these critical resources when the size of the firm increases (Kumar, Rajan and Zingales, 2001). Further, Rajan & Zingales (2000) postulated a model that proper control over the intangible factors makes the firm profitable. Thus, they concluded that the greater the importance of intangible factors like fixed assets, the lesser the firm is to grow. So, firm size and profitability sometimes lead to lower profits with the increase of size. However, small firms also need not necessarily be less profitable than "large" firms within a given institutional environment.

Competency theories appeal that small firm can be just as profitable as a large firm in different competencies that leads to surplus returns. Niman (2003) described that "survival depends not on being better, but rather on being sufficiently different, so that the advantages of others do not prove fatal". Dhawan, (2001) actually did find a negative relation between firm size and profitability for U.S. firms during "1970 to 1989" but at a highly aggregated level of services and manufacturing.

The firm size can be measured in a number of ways, the commonly used measures are assets, sales, numbers of employees, and value added (Halid, 1979). Technological theories of the firm used assets or sales as a measure of firm size.

2.4. EXPORT INTENSITY AND PROFITABILITY

Many analysts believe that trade liberalization and an export-oriented strategy increase firm-level profitability (Krugman, 1987; Rodrik, 1988, 1991; Grossman and Helpman 1991). However, although this is supported by anecdotal evidence describing the association between exporting activities and profitability (Nishimizu and Page, 1982; Haddad, 1993; Harrison, 1994; Aw and Hwang, 1995), there is as yet little systematic evidence that exporting causes profitability gains. Indeed, causality may run in the other direction: profitable firms may self-select into the export market.

The first study analyzing the causal relationship between exporting and productivity at the firm level in the recent literature was on the U.S. economy (Bernard and Jensen, 1995, 1999). Using a variety of econometric methods and data from several countries, Bernard and Jensen (1999), Isgut (2001), Clerides et al. (1998), and Delgado et al. (2002) conclude in favor of the self-selection and against the learning-by-exporting hypothesis. Only the most profitable firms have a sufficient cost advantage to overcome transportation costs and compete internationally. Exporters are more profitable than non-exporters, not because there are any benefits associated with export activities, but they are simply more profitable from the outset. Only a few studies–Kraay (1999) for China and Bigsten et al.(2004) for sub-Saharan Africa–reach the opposite conclusion. Aw et al. (2000) find evidence supporting learning-by-exporting in Taiwan, but not in South Korea.

Given the remaining trade protection in Africa and the large dispersion of profitablity, potential benefits of liberalization could be substantial. Few studies investigate the link between trade and profitablity at the firm- or plant-level. Mengistae and Patillo (2004) document a positive relationship for firms in Kenya, Ghana, and Ethiopia. While they show that their findings are consistent with learning effects, they stop short of making a causal interpretation. For Cameroon, Ghana, Kenya, and Zimbabwe, Bigsten et al. (2004) find a positive coefficient on lagged export status in the production function, but only when they model firm heterogeneity with discrete support, as in Heckman and Singer (1984), or when they ignore heterogeneity. When they integrate out a random firm effect, following Clerides et al. (1998), they obtain insignificant results in each specification, which they interpret as an inability to tell causation apart from time-invariant heterogeneity. A robustness check with instrumental variable estimation also comes up with an insignificant exporting effect. More puzzling, they find no effect of lagged export status on the export participation decision and capital intensity is not correlated with export status in any specification.

2.5. OWNERSHIP STRUCTURE AND PROFITABILITY

Ownership structure defines the institutional basis for power relationships between individuals within the organization and dealings with other organizations (Bowels, 1984). Company's capital structure decision should be properly analyzed and balanced to maximize the firm profitability. In his path breaking work, Demsetz (1983) argues that a firm's ownership structure is endogenously determined to maximize its shareholders' interest. Accordingly, Demsetz concludes that there is no relation between ownership structure and profitability. Demsetz and Lehn (1985) present evidences supporting Demsetz's arguments. They regress accounting profit rates of 511 U.S. companies in 1980 on different measures of ownership concentration and they find no significant coefficient. In contrast, two subsequent papers, Morck, Shleifer, and Vishny (1988) and McConnell and Servaes (1990), report quite different findings. Morck, Shleifer, and Vishny estimate a piece-wise linear regression in which the dependent variable is a market valuation measure, Tobin's Q and the primary independent variable is the fraction of shares owned by corporate management. Using a cross-section sample of 371 Fortune 500 firms for 1980, they find that Q first rises as ownership increases to 5%, then falls as ownership increases to 25%, and then rises slightly at higher ownership levels. When they use profit rates as an alternative dependent variable they find similar piece-wise linear relationship, even though the statistical significance of the estimates is much lower.

McConnell and Servaes (1990) investigate the cross-sectional relation between profitability and firms` ownership for a sample of 1,173 firms in 1976 and for a sample of 1,093 firms in 1986 that are listed on either the New York Stock Exchange or the American Stock Exchange. For both samples, they find a significant curvilinear relation between firm profitability and the ownership structure. Profit first increases, then decreases, as the shares become concentrated in the hands of managers and members of the board of directors. They also mention that their results are consistent with neither Demsetz's (1983) theoretical arguments nor Demsetz and Lehn's (1985) empirical findings.

2.6. IMPORT INTENSITY/ IMPORT COMPETITION AND PROFITABILITY

After the important methodological contributions by Hall (1986, 1988) and Roeger (1995), several authors, (following Levinsohn (1993), who introduced the 'imports-as-market-discipline hypothesis'), have investigated the role of import competition on firms' profitability, and most of those found evidences that higher import intensities have a negative relationship with firm profitability.

In a recent multi-country study, Boulhol (2005) examines the determinants of profitability for OECD countries in 1970-2003. In particular, the main objective of his paper was to quantify the pro-competitive effects of international trade on profitability. According to his estimates, one percentage point increase in the import penetration lowers the profit, price-cost margin, by around 0.005, while on average, imports have contributed to a 0.042 decrease in profitability over the sample period.

Hansson (1992) analyses the effect of imports on profitability by distinguishing import origins by regions. He finds considerable differences in the impact of import origins on the markups by region: imports from less developed countries reduce profitability in Sweden far more than imports from developed countries. Furthermore, imports from Japan and Asian newely industrialized countries (NICs) decrease profitability more than imports from other countries. Hansson concluded that import competition significantly affects firms' profits in the Swedish manufacturing industries between 1969 and 1987.

2.7. FIRM AGE AND PROFITABILITY

The hypothesis of age influence on organizational structure is put forward in organizational theory. It is considered that the older the firm, the organization will be more stable in nature. The firm will benefit more developed activity because of its more experience business. A number of studies had been found accepting and favoring this view. The work of Chittenden et. al (1996) postulated that younger firms rely more on short term finance than more mature firms as a result of a positive relationship between age and profitability. The study furthermore suggests that the use of both short-term and long-term debt falls with age. Hall et. al. (2000) also favor this idea. Michaelas et. al. (1999) postulated that younger firms have higher average gearing ratios than older firms because of the latter being more profitable and having accumulated internal sources. Romano et. al (2001) found that business age is not a significant predictor of debt as a source of financing.

CHAPTER-THREE: DATA SOURCE AND METHODOLOGY

3.1. DATA SOURCE:-

The data used in this work are secondary and extracted from the "*Large and Medium Scale Manufacturing and Electricity industries Survey (LMSMES)*", conducted per annum by the Central Statistics Agency (CSA) of Ethiopia. This survey covers all manufacturing industries that employ at least ten (10) workers and use power-driven machineries. Thus, both public and private industries of all regions of the country, where establishments under the scope of the survey are found, have been incorporated in this survey.

This yearly survey of Manufacturing and Electricity Industries commenced in 1976 (CSA, 2004). Since then, it has been conducted for more than three decades. Although this is the case, this study focuses only on the recent decade survey data of period 1997 to 2006. The main reason behind selecting this period is due to full data availability. Table 3.1 shows the list of the number of industries by years. The average number of firms per year is about 834 firms, and the number across the 10 years are fairly evenly distributed, with 2006 having the most number of firms, at 1154 (13.83%) firms, while 1997 has the least, at 697 (8.45%) firms.

Table 3.1: Summary statistics of firms by years

YEARS	NUMBER OF	
	FIRMS	PERCENT (%)
1997	697	8.45
1998	725	8.69
1999	725	8.69
2000	739	8.86
2001	722	8.65
2002	883	10.58
2003	939	11.25
2004	997	11.95
2005	763	9.54
2006	1154	13.83
ALL YEARS	8,344	100.00

All large and medium scale manufacturing (LMSM) industries incorporated in the study period are not the principal focus of this empirical work. In particular, LMSM industries which either leave or enter the study at some 23 periods among 1997-2006 are excluded, and only those industries which are persistently observed in the entire period under study have been considered. Hence, we have what is called Balanced Panel Data Set of LMSM industries in this empirical work.

3.1.1. WHAT ARE PANEL DATA?

The term “panel data” refers to the pooling of observations on a cross-section of, say, firms, countries, etc., over several time periods (Baltagi 2005:1). In other words, if the same units of observations in a cross-sectional sample are surveyed two or more times, the resulting observations are described as forming a panel or longitudinal data set. Hence, a panel data set is a set of data which contains repeated observations over the same individuals[1] (in this particular case: over the same LMSM industries situated in the country), collected over a number of periods or times ($t \geq 2$), (which in this case is 10 years). It is not the same as a time series data nor is it cross sectional data; however, it is the combination or the marriage of both of them. In panel data, the same group of individuals are followed, assessed, examined and re-interviewed or surveyed at more than one point in time. Consequently, panel data are described as having a spatial (also called space) and temporal dimension .The spatial dimension refers to the cross-section of units, and the temporal dimension refers to the period (time) of the observations. Panel data sets

[1] *Individal: This word is used in this empirical work in its general connotation that it could mean households, persons, individuals, students, universities, states, countries, industries, etc*

for econometric research possess several major advantages over conventional cross-sectional or time-series data sets, (Hsiao, 1986). They usually give the researcher a larger number of data points, increasing the degree of freedom and reducing the collinearity among explanatory variables-hence improving the efficiency of econometric estimates. More importantly, they allow a researcher to analyze a number of important econometric questions that can not be addressed using cross-sectional or time-
series data sets.
Besides the advantage that panel data allow us to construct and test more complicated behavioral models than purely cross-sectional or time-series data, the use of panel data also provides a means of resolving or reducing the magnitude of a key econometric problem that often arises in empirical studies, namely, the often heard assertion that the real reason one finds (or does not find) certain effects is the presence of omitted (mismeasured or unobserved) variables that orrelated with explanatory variables. By utilizing information on both the intertemporal dynamics and the individuality of the entities being investigated, one is better able to control in a more natural way for the effects of missing or unobserved variables.

Panel data involve two dimensions: a cross-sectional dimension *N*, and a time-series dimension *T*. One may expect that the computation of panel data estimators would be more complicated than the analysis of cross-section data alone (where T = 1) or time series data alone (where N = 1). However, in certain cases the availability of panel data can actually simplify the computation and inference.

Panel data also provide the possibility of generating more accurate predictions for individual outcomes than time-series data alone. If individual behaviors are similar conditional on certain variables, panel data provide the possibility of learning an individual's behavior by observing the behavior of others, in addition to the information on that individual's behavior. Thus, a more accurate description of an individual's behavior can be obtained by pooling the data.

By and large, a panel data set can be classified based either on the relative size of the both temporal and spatial dimensions or using only temporal dimensions. Having used the former criterion, panel data can be subdivided into the following categories: -

(i). Time-Series dominant (TSCS) data***:*** this refers to data that are mostly time series, meaning $T > N,$ or data in which $T = N,$ or even data in which $N > T$ but T is relatively high.

(ii). Cross-sectional dominant (CSTS) data: this is a panel data which is not TSCS data. To put it differently, this refers to a panel data that are mostly cross-sectional, which arises when $N > T$ (often much greater).

Based on the temporal dimension, we can categorize panel data set into ether of the following types:

(i). Balanced Panel Data, and

(ii). Unbalanced Panel Data

Balanced Panel Data (BPD):

It is a panel data set that contains observations on N individuals, each measured at T points in time. In other words, each individual (1 through N) includes T -observations (1 through T time period). As a result, the total number of observations that can be obtained from a balanced panel data of N cross-sectional units, each observed for T periods, will be NxT .

Unbalanced Panel Data (UBPD):

In the case of BPD, it has implicitly been assumed that each cross section is observed for T periods. However, because of sample attrition, missing observation and new entry, it is common to have some unobserved cross-sectional units for a certain period. So such a kind of data is known as unbalanced panel data. Unlike to BPD, the total number of observations in this type of data set will be $\sum_{i=1}^{N} T_i$.

3.1.2. WHY ARE PANEL DATA BEING PREFERRED TO THIS STUDY?

Some of the rationale behind why panel data analyses are being used in this empirical work is that:

- ✓ To specify and estimate more realistic models of LMSM industries than purely time-series or purely cross-sectional data models, specially by identifying and measuring those industry specific effects that are simply not detectable in each of the data models..
- ✓ To increase the number of observations. Here, there are T=10 years of time periods and N=91 manufacturing industries of cross sectional units being observed over these periods. Consequently, the number of observation will be 10x 91= 910.
- ✓ To reduce multicollinearity or collinearity among the explanatory variables.
- ✓ To increase efficiency i.e. longitudinal analysis provides us unbiased estimator with smallest variance for all possible true parametric values of manufacturing industries.

In this study, there are exactly 91 pure balanced panel data of firms that were assessed yearly, starting from 1996/07 till 2006/07, where each of them is categorized into various sectors, such as Food (International Standard Industry Code(ISIC) 15), Textile (ISIC 18), Chemical (ISIC 26), Metal Products (ISIC 36) and so on. Consequently, the final data set used in the study consists of a matrix of 10 years of observations of thirteen variables for 91 companies.

3.1.3. DEFINITION AND SPECIFICATION OF VARIABLES IN THE STUDY:-

In order to address the stated objectives of this study, we utilize two variable cohorts, *Dependent Variable and Independent Variables,* along with their epigrammatic definitions and expressions.

3.1.3.1. DEPENDENT VARIABLE:

The outcome or dependent variable of the model to be employed is "***Firm Profitability***". It is a measurable quantity. Different literatures make use of this dependent variable via a variety of accounting definitions and measurements:

3.1.3.1.1. DEFINITION OF FIRM PROFITABILITY

A central idea behind this study is that there some kinds of links between firm characteristics and its profitability. A clear definition and reporting methods of profit and profitability are of great importance, because besides conventionally accepted definitions and indices, international practices of judgment of companies/enterprises create new categories from time to time, which can influence the judgment of company activities in different sectors considerably.

Profit is generally defined as the making of gain in business activity for the benefit of the owners of the business. The word comes from Latin and is meant "to make progress". Hence, profitability is the amount of profit or the excess of revenue over expense during any given fiscal period. Profitability is the primary goal of all business ventures/enterprises since without profitability the business will not survive in the long run. Profitability is often expressed and interpreted as a ratio, which expresses the rate of the profit amount benchmarked against some point of reference (%).

3.1.3.1.2. MEASURING FIRM PROFITABILITY

There are a variety of methods for measuring or calculating profitability, depending upon the data available, perspectives on the theory of profitability, and the investigative goals being pursued. Those include:

(i). PROFIT MARGIN ON SALES (PMS):

This ratio measures an important dimension of a firm's profitability. It indicates the portion of each dollar of revenue that is available to cover expenses, and offers a measure of the firm's ability to withstand either higher expenses or lower revenues. It is simply defined as net income divided by net sales i.e.

$$PMS = \frac{Net\ income}{Total\ \ Sales}$$

(ii). RETURN ON ASSETS (ROA):

The return on assets indicates a company's overall profitability. This is to say, it measures the ability of management to utilize the real and financial resources of the firm to generate income and is used to evaluate management. It relates earnings (i.e. net income) to the total assets involved in production - in other words, to the value of capital involved in the firms. It is defined as profits exclusive of extraordinary items but including net financial items and depreciation, as a percentage of total assets. Mathematically,

$$ROA = \frac{Net\ income}{Average\ Total\ \ Assets}$$

$$= \frac{Net\ income}{Total\ \ Sales} \times \frac{Total\ \ Sales}{Average\ Total\ \ Assets} = PMS \times Asset\ turnover$$

The decomposition of return on assets illustrates why some companies with relatively small profit margins can be very profitable if they have high asset turnover. Alternatively, companies with relatively low asset turnover ratios can be profitable if they are able to sustain large profit margins.

(iii). PRICE-COST-MARGIN (PCM): It is gross profits (prior to deductions for tax, interest and dividends) over turnover (sales). This profitability measure is given by

$$PCM = \frac{s + \Delta I - (w + M + K)}{s + \Delta I},$$

where

- ✓ *PCM is net industry profit*
- ✓ *s is total sales*
- ✓ ΔI *is the change in inventory*
- ✓ *w is cost of labor*
- ✓ *M is cost of materials, and*
- ✓ *K is cost of capital*

(iv). RETURN ON EQUITY (ROE).

Return on equity is another measure of profi 29 y that measures the ability of management to generate net income from the resources owners provide. The ROE of a firm indicates the rate at which a firm is increasing or decreasing the level of common shareholder equity as a percentage of total common equity. The ratio is obtained by dividing net income by average shareholders' equity, i.e.

$$ROE = \frac{Net\ income}{Average\ Shareholders`\ equity}$$

Equity is the sum of capital paid-in through primary market sales of common stock, any capital surplus, and retained earnings plus preferred stock outstanding (less any treasury stock held by the company).When the return on shareholders' equity is greater than the return on assets, management is using assets funded by debt to increase the income available for shareholders. This concept is known as *financial leverage.*

(v).INDUSTRIES BEFORE- TAX PROFIT RATE (BTAP):

$$Before - tax\ profit\ rate(BTAP) = \frac{before - tax\ profit}{Total - assets}$$

In this study, three distinct measures will be employed to measure firm profitability; namely, RETURN ON ASSET (ROA), PRICE COST MARGIN (PCM) and BEFORE TAX PROFIT (BTAP). The rationale behind adopting three separate measures in this study is twofold. The first one is to be able to compare it with the bulk of prior works. In literature, satisfactory agreement in choosing the appropriate and unique measure for profitability has not been yet reached by the empirical studies. In practice, the utilized measures have changed from study to study because of lack of availability of data on such measures and of the researcher's preference for the chosen measures. Although several profitability measures have been examined in practice, none of the measures used in the literature is found to be entirely unambiguous and satisfactory. Each of those profitability measures has their own advantages and disadvantages. For example, one of the disadvantages of using price-cost margin as acceptance profit measures has been pointed out by Weiss (1974). Weiss argued that the price–cost margin is an acceptance definition or a satisfactory measure for profitability as long as variations in the value of the capital-sale ratio are controlled. On the other hand, one of the principal advantages of using the price-cost margin measure for profitability is its availability on the firm level. In order to avoid making a biased choice among the profit measures, all three measures will be separately used.

3.1.3.2. INDEPENDENT OR EXPLANATORY VARIABLES:

Despite the fact that it is possible to mention so many explanatory variables that are supposed to have an influence on the profitability of manufacturing industries of our country in general, and that of LMSM ones in particular, this study concentrates only on the most important and common control variables, especially analyzed in most prior works. Besides this, it has also considered several other control variables which are either Ethiopian specific or significant from theoretical ground. These comprise: *import competition, firm location-dummy, ownership status-dummy, relative productive index, export intensity, firm age, depreciation rate, firm size, capital intensity, research and development intensity, advertising intensity, firm's total asset* and *market share*. Unfortunately, *research and development intensity* has been excluded from consideration, because of a complete lack of data, and also export intensity because of missing data.

To better comprehend the notion behind this work, the definition of each explanatory variable employed in this empirical work is given as follows:

(a). TIME-VARYING COVARIATES: These are covariates that do vary, change or fluctuate with time. In relation to this study, the following covariates are some among others:

(i). Firm Size (Fsize):

There are many criteria for measuring the relative size of firms, including *assets*, *output*, *value added, sales*, *paid up* and *market value of capital*, or *labor force (i.e. no. of employment)*. In this study, sales volume is used as a proxy for firm size. This has been chosen because of its feasibility, and it is, moreover, less prone to having measurement errors compared with other measures of firm sizes. Generally the effect of a growing size on profitability has been proved to be positive to a certain extent. However, for firms that become extremely large, the effect of size could be negative due to bureaucratic and other reasons. Hence, the size-profitability relationship may be expected to be non-linear. We use the firms' sales (logarithm) in order to capture this possible non-linear relationship. Hence, this is given by:

$$Fsize_i = ln\left(i^{th} \ industry`s \ total \ Sale \right)$$

(ii). Capital intensity (KI_i) : the ratio of firm capital investment to sales serves as a proxy for the firm capital intensity. That is,

$$KI_i = \frac{The \ i^{th} \ Industry`s \ total \ capital}{The \ i^{th} \ Industry`s \ total \ sales}$$

There is no certain hypothesis regarding the coefficient on capital intensity. The capital intensity is included in the models to capture for differences in firm profitability due to differences in capital intensiveness of firms.

(iii). Advertising Intensity (ADVI): Advertising can affect prices, competitions, and efficiency-both positively and negatively. It helps firms to increase output, increase profit, capture market share, reduce price, and it also helps sellers to increase demand, and to change a highest price. On contrary, advertising is disadvantageous of firms particularly when it is self-canceling and when it attempts to influence buyers rather than inform them. The rate at which a firm undergoes advertising is advertising intensity, and is defined as advertising expenses divided by sales. That is,

$$ADVI_i = \frac{The\ i^{th}\ Industry`s\ advertising\ expense}{The\ i^{th}\ Industry`s\ total\ sales}$$

(iv). Export intensity (EXPI): Export intensity defined as exports divided by apparent total sales, i.e.

$$ExpI_i = \frac{The\ i^{th}\ Industry`s\ value\ of\ export}{The\ i^{th}\ Industry`s\ total\ Sales}$$

This variable indicates, in part, if the firm belongs to a dynamic exporting sector. This variable attempts to capture the dynamic character of the industry as approximated by the export intensity of the sector.

(v). Research and Development Intensity (R&DI): It is defined as the ratio of firm's research and development expenditure to firm's sales i.e.

$$R\&DI_i = \frac{The\ i^{th}\ firm`s\ R\&D\ expenditure}{The\ i^{th}\ firm`s\ total\ sales}$$

(vi). Maturity of the firm or firm's age ($Fage_i$) : Firm Age is defined as the number of years between the observation year and the firm's incorporation year. This is the total number of years since the commencement of the firm up to the end of this study period. In mathematical language,

$$Fage_i = ln\left(The\ i^{th}\ firm`s\ age\right), \quad where$$

$$i^{th}\ firm`s\ age = \left(2007 - Year\ of\ commencement\ of\ i^{th}\ firm\right)$$

Age, a priori, has an ambiguous effect on firm profitability. Mature firm has the reputational advantage vis-à-vis new firm. The prolonged period of learning experience and absence of the liabilities of newness augur well for old firm (Majumdar, 1997).However, older firms are prone to inertia and bureaucratic rigidities. They may be less able to cope with new invention and late in adopting new technologies.

(vii). Relative Productive index (RPI): To control for efficiency across sample industries, it is worthwhile to use a relative productivity index, defined as value added per worker. That is

$$RPI_i = \frac{The\ i^{th}\ industry`s\ value\ added}{The\ i^{th}\ industry`s\ total\ number\ of\ workers}$$

If increased profitability is due to efficiency, then the *RPI* is expected to have a positive and significant impact on industry profitability.

(viii). Market share of the firm (MKS): Market share is the portion or percentage of sales of a particular product or service in a given region that are controlled by a company. It is defined as the firm's sales divided by total industry sales i.e.

$$MKS_i = \frac{The\ i^{th}\ firm`s\ total\ sale}{Total\ industry`s\ revenue}$$

If it is assumed that firms with high market share individually or collectively elevate prices by restricting output, someone could expect that the association between the profitability and market share is positive. If the sources of profitability are related more to firm-specific factors than to the size distribution of competitors, it is possible to expect an inconclusive association between the market share and the profitability (Hirschey, 1985). Therefore, the expectations on the signs of market share of the firm for all three models (PMS, PCM and BTAP) are ambiguous.

(ix). Inventory turnover (IVTO): It is defined as

$$IVTO_i = \frac{The\ i^{th}\ Industry`s\ Cost\ of\ goods\ sold}{The\ i^{th}\ Industry`s\ average\ inventory}$$

where

$The\ i^{th}\ Industry`s\ average\ inventory =$

$$\frac{(The\ i^{th}\ Industry`s\ beginning\ inventory + The\ i^{th}\ Industry`s\ ending\ inventory)}{2}$$

The ratio analyzes how many times the industry `s inventories have been sold in a year. A high value of this ratio reveals the profitability of the industry, and vice versa.

(x).Domestic Demand Rate (DDR): To control for differences across industries in demand conditions, we use the domestic demand or absorption rate as one of the explanatory variables. This domestic demand rate (*DDR*) is defined as follows:

$$DDR_i = \frac{The\ i^{th}\ Industry`s\ (Sales - Export + value\ of\ import)}{The\ i^{th}\ Industry`s\ total\ sales}$$

We anticipate *DDR* to have a positive impact on industry profitability.

*(xi). Import intensity (IMPI) :*Although we have included *imports* in the *DDR* variable, we want to isolate the effect of import competition on domestic producers` profitability. Therefore, we introduce an import competition variable defined as follows as one of the explanatory variables.

$$IMPI_i = \frac{The\ i^{th}\ Industry`s\ value\ of\ import}{The\ i^{th}\ Industry`s\ total\ sales}$$

This control variable reflects the competitive pressures from foreign products. It measures the proportion of imports in the total value of inputs of a firm. In other words, it measures the degree of dependency on materials which come from abroad as compared to domestic.

Generally, the higher import the firm systemizes the lower domestic linkage it possesses and the lower the profit it generates.

(xii). Depreciation Rate (DepR): Depreciation is the periodic, systematic expiration of the cost of a company's fixed assets (except for land). It is an annual deduction that businesses can claim for the cost of fixed assets, such as vehicles, buildings, machinery, and other equipment. According to tax law, depreciation is defined as a reasonable deduction for the wearing down and/or obsolescence of those fixed assets.

- $$DepR_i = \frac{The\ i^{th}\ \ firm`s\ total\ depreciation}{The\ i^{th}\ \ firm`s\ total\ sales}$$

(xiii). Industries total asset (lnASS) : is the total gross assets of each industry scrutinized over the study period. It is defined as :

$$ln\ ASS_i = ln\left(i^{th}\ \ industry`s\ total\ \ asset\right),$$

This variable is entered in log form since it is highly positively skewed, and it is not reasonable to expect it to have a constant marginal effect on profitability over the substantial range in which it is observed.

(b). <u>TIME-INVARIANT COVARIATES</u>: are covariates which do not vary, change or fluctuate as time changes or varies. In this particular case of study, the following explanatory variables are employed as time-constant covariates:

(i). Regional or locational dummy variable (RegD): National concentration ratios may understate actual concentration when markets are regional or local. A regional industry dummy variable is used to control for this understatement, and it is defined as:

$$REG_i = \begin{cases} 1 & \textit{if the } i^{th} \textit{ establishment is regional in nature i.e. outside of A.A.} \\ 0 & \textit{if the } i^{th} \textit{ establishment is located in Addis Ababa} \end{cases}$$

(ii).Ownership structure($OwnD_i$ *)*: This defines the institutional basis for power relationships between individuals within the organization and dealings with other organizations (Bowels, 1984). It can be classified as private firms, co-operative firms and public firms. In this study, this variable is defined as ownership dummy by

$$OwnD_i = \begin{cases} 1 & \textit{if the } i^{th} \textit{ establishment is owed by private or co-operative} \\ 0 & \textit{Otherwise (if the } i^{th} \textit{ establishment is owed by} \\ & \textit{public, public \& private, public \& co-operative)} \end{cases}$$

3.2. METHODOLOGY

In order to meet the objectives set up on this study, panel data regression analyses and tests related to it are employed as the general methodology.

3.2.1. ECONOMETRICS MODEL SPECIFICATION:-

Let y_{it} *:* the value of the dependent variable for cross-section unit i at time t, and

$X_{j\text{it}}$ *:* the value of the j^{th} explanatory variable for cross-section unit i at time t, where

i =1,2,---,N (No. of cross-sections)

t =1,2,---,T (No. of time periods)

j =1,2,---,K (No. of regressors/Controls)

The standard regression model of any panel data set is given by:

$$\begin{aligned} y_{\text{it}} &= \beta_0 + x_{1it}\beta_1 + x_{2it}\beta_2 + \cdots + x_{kit}\beta_k + u_{it} \\ &= \beta_0 + \sum_{j=1}^{K} \beta_j x_{jit} + u_{it} \\ &= \beta_0 + X'_{it}\beta + u_{it} \qquad (3.1) \end{aligned}$$

where

$$X_{it} = \begin{bmatrix} x_{1it} \\ x_{2it} \\ \vdots \\ x_{kit} \end{bmatrix}_{(Kx1)} \quad \text{and} \quad \beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_k \end{bmatrix}_{(kx1)}$$

Assumption of the model:

The panel data regression model (3.1) uses the following assumptions:

(i). The usual OLS assumptions

(ii).The constant term, β_0, is constant across different observations, different cross-sectional units and through time.

(iii). The effect of X on Y is constant across different observations, different cross-sectional units and throu me.

(iv). The error terms are homoscedastic and uncorrelated both across cross-sectional units and through time (if not, the estimates will not be biased but our inference will be inaccurate).

(v). The explanatory variables x_{jit} are exogenous *i.e.* they are uncorrelated with u_{it}.

As to this study is concerned, a panel data regression model relating the dependent variable, "*firm/industry profitability"* of each large and medium scale manufacturing industry of Ethiopia over the years 1997 to 2006, to a variety of *industry covariates or characteristics,* aforementioned in section (3.1.5.2.)*,* is given as:

$$\pi_{it} = (\beta_0) + \beta_1\ RegD_i + \beta_2 OwnD_i + \beta_3\ ADVI_{it} + \beta_4\ KI_{it} + \beta_5\ DepR_{it} + \beta_6\ RPI_{it} + \beta_7\ IMPI_{it}$$
$$+\ \beta_8 \ln ASS_{it} + \beta_9\ MKS_{it} + \beta_{10} DDR_{it} + \beta_{11} \ln Fsize_{it} + \beta_{12} IVTO_{it} + \beta_{13} \ln Fage_{it} + \alpha_i + \gamma_t + u_{it} \quad (3.2)$$

This is written as:

$$\pi_{it} = (\beta_0) + \boldsymbol{X'_{it}\beta} + \boldsymbol{\alpha_i} + \boldsymbol{\gamma_t} + \boldsymbol{u_{it}}$$

(3.3)

where

- ☞ $t = 1,2,3,\cdots,10$; the number of time periods or years in which those LMSM establishments were assessed (i.e. the no. of time period from 1997 to 2006, the temporal dimension).
- ☞ $i = 1,2,3,\cdots,91$; the number of panel LMSM industries (i.e. the no. of cross sectional units, the spatial dimension) persistently observed over the entire period under study.
- ☞ π_{it} is the profitability of the i^{th} LMSM industry at time t. This is measured by Profit Cost Margin (PCM), Return On Assets (ROA) and Before tax profit rate (BTPR).
- ☞ $\beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_{13} \end{bmatrix}$; it is a column vector of unknown parameter or a coefficient of those

industry characteristics or covariates. β_0 is a scalar, included in all except in fixed effects model.
- ☞ $X_{it} = (RegD_i, OwnD_i, ADVI_{it}, \cdots, ln\,Fage_{it},)$ is a $(91x13)$ matrix of *observed* explanatory variables likely to influence firm profitability
- ☞ $\alpha_i = (\alpha_1, \alpha_2, \alpha_3, \cdots \alpha_{91})'$ represents a (91×1) column vector of parameters, which measures *individual industry's specific effect or individual industry's unobserved heterogeneity*. It refers to all *unobserved time-invariant industry* explanatory variable which affects the dependent variable, profitability of establishments, but are not captured by *observed* explanatory variables X_{it} . This may comprise *unobserved* explanatory variables like *workers motivation, workers behavior, industries` managerial structure, industries` managerial quality, industries` managerial style, industries` managerial philosophy, industries` managerial talent, etc* which are viewed as being roughly constant overtime.
- ☞ $\gamma_t = (\gamma_1, \gamma_2, \gamma_3, \cdots \gamma_{10})'$ is a time-specific or year-specific intercept vector. It controls for common shocks to all agents at period/year. As α_i is used to control for the difference among the 91 panel industries, we can allow for *time effect (year effect)* in the sense that the profitability function shifts *overtime* because of factors such as

technological changes, changes in government regulation and/or tax policies, and external effects like war or other conflicts.

☞ u_{it} is the error term through spatial and temporal dimensions, and it is often called the *industries` idiosyncratic error* or the *industries` idiosyncratic disturbance.* Note that the sum, $\alpha_i + u_{it}$, is also called the ***industries` composite error.***

3.2.2. THE EXPECTED SIGNS OF THE COEFFICIENTS

It is difficult in most cases to say *a priori* what the expected signs of the coefficients are. This is because there exists no formal theoretic model that seeks to explain the firm profitability - firm characteristic relationship ing used this fact, the expected signs are summarized in Table 3.2.

Table 3.2. Summary of the effects of variables in the models

Firm Profitability to Firm Characteristics Equation			
S.No.	***Variable***	***Effect being Captured***	***Expected Sign***
1	Capital Intensity (KI_{it})	♠ Difference in firm's profitability due to differences in capital intensiveness of a firm	-ve or +ve
2	Import Intensity $(IMPI_{it})$	♠ The proportion of imported materials in the total value of inputs of a firm ♠ The degree of dependency on foreign materials as compared to domestic	-ve
3	Advertising Intensity $(ADVI_{it})$	♠ The degree of preference in the establishment brand ♠ degree of product differentiation & entry barriers	-ve or +ve
4	Domestic Demand Rate (DDR_{it})	♠ differences across industries in demand conditions	+ve
5	Depreciation Rate $(DepR_{it})$	♠ the proportion of expiration of the cost of a company's fixed assets (except for land).	-ve or +ve
6	Relative Productivity Index (RPI_{it})	♠ efficiency in a industry/firm	+ve
7	Market share (MKS_{it})	♠ The portion or percentage of sales of a company's product	+ve
8	Industries Total Asset $(ln\ ASS_{it})$	♠ The total value of all the belongings	+ve

		of the firm	
9	Firm/Industry Size $(ln\ Fsize_{it})$	♠ Whether the industry is a medium scaled a large scaled or neither.	-ve or +ve
10	Firm/Industry Ownership $(OwnD_i)$	♠ The institutional basis of a firm: Public or not	-ve or +ve
11	Firm/Industry Location $(RegD_i)$	♠ The degree of understatement in actual concentration when markets are regional or local	-ve or +ve
12	Inventory Turnover $(IVTO_{it})$	♠ The rate at which industry's inventory has been sold	+ve
13	Firm/Industry Age $(ln\ Fage_{it})$	♠ Experience of a firm	-ve or +ve

3.2.3. OVERVEIWS OF THE POOLED, THE FIXED EFFECTS AND RANDOM EFFECTS MODELS:

Generally, there are three types of panel data models that are predominantly used to conduct analyses of longitudinal data set. These are: -

3.2.3.1. THE POOLED MODEL OR THE CONSTANT COEFFICIENT MODEL

Model (3.1) can be written as :

$$y_i = \beta_0 + X_i'\beta + u_i \quad ,i=1,\ 2,\ 3,\text{- - -},\ N \qquad (3.4)$$

where

$$y_i = \begin{bmatrix} y_{i1} \\ y_{i2} \\ \vdots \\ y_{iT} \end{bmatrix}_{(Tx1)} \quad X_i = \begin{bmatrix} x_{i1} \\ x_{i2} \\ \vdots \\ x_{iT} \end{bmatrix}_{(TxK)} \quad \text{and } u_i = \begin{bmatrix} u_{i1} \\ u_{i2} \\ \vdots \\ u_{iT} \end{bmatrix}_{(Tx1)}$$

Likewise, if the individuals in (3.4) have further been made piled or stacked, then model eventually obtained will be: -

$$Y = X\beta + u \qquad (3.5)$$

in which case,

$$Y = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix}_{(NTx1)} \qquad X = \begin{bmatrix} X_1 \\ X_2 \\ \vdots \\ X_N \end{bmatrix}_{(NTxK)} \qquad \text{and } u = \begin{bmatrix} u_1 \\ u_2 \\ \vdots \\ u_N \end{bmatrix}_{(NTx1)}$$

and this is called *Pooled Model.* In this model, neither the cross-sectional units, i, nor the time, t, has significant effects on the coefficients or variables. Hence, both slopes and intercepts are constant across time and cross-section units. Consequently, we can first pool all of the data and then use ordinary least squares (OLS) regression so as to estimate the parameter β in the model. This regression of the column vector $Y_{(NT\times 1)}$ on the matrix $X_{(NT\times k)}$ to estimate the vector $\beta_{(k\times 1)}$ is called d OLS regression.

Assumption of the Model:

The model assumes that

(i). Correct model: $E(u_{it}) = 0$

(ii). Exogeneity: $Cov(x_{it}, u_{it}) = 0$

(iii). Homoscedasticity: $Var\left(u_{it}^2\right) = \delta_u^2$, constant

(iv). Serial Independent: $Cov(u_{it}, u_{js}) = 0 \;\forall i \neq j \text{ or } t \neq s$ (3.6)

(v). Normality: $u_{it} \sim N(0, \delta_u^2)$

(vi). Full Rank : K < N

3.2.3.2. THE FIXED AND RANDOM EFFECTS MODEL:-

A panel data regression differs from a regular time-series or cross-section regression in that it has a double subscript on its variables, i.e.

$$y_{it} = \beta_0 + X'_{it}\beta + u_{it} \quad i = 1,2,\cdots,N; t = 1,2,\cdots,T \qquad (3.7)$$

with i denoting cross-sectional units (households, individuals, firms, countries, etc.) and t denoting time. β_0 is a scalar, β is a $K \times 1$ vector of parameters, X_{it} is the $(it)^{th}$ observation on K explanatory variables, and u_{it} is an idiosyncratic error.

Most panel data applications make use of either one-way or two-way error component model for the disturbances. If the idiosyncratic disturbance term, u_{it}, is defined in such a way that :

(i). $\varepsilon_{it} = \alpha_i + u_{it}$ or $\varepsilon_{it} = \gamma_t + u_{it}$, where α_i (γ_t) is the *unobservable individual(time)-specific effect* and is independent and identically distributed (i.e. $\alpha_i \sim IID(0, \delta_\alpha^2)$ & $\gamma_t \sim IID(0, \delta_\gamma^2)$ and u_{it} is remainder disturbance term with $IID(0, \delta_u^2)$, is called *One –way error component, or idiosyncratic error* and a regression model with this type of error component is referred to *One –way error component regression model.*

(ii). $\varepsilon_{it} = \alpha_i + \gamma_t + u_{it}$, where α_i is the *unobservable individual-specific effect,* γ_t is the *unobserved time specific effect* and u_{it} is remainder stochastic disturbance term, is called *Two –way error component or an idiosyncratic error,* and a regression model with this type of error component is called *Two –way error component regression model.*

A large proportion of the empirical applications involve one of the following assumptions about the individual effect (α_i):

1. The individual effect, α_i, is correlated with the regressors, x_{it} *i.e.* $Cov(\alpha_i, x_{it}) \neq 0$. In this case, model (3.1.) reduces to

$$y_{\text{it}} = X'_{it}\beta + \varepsilon_{it} \tag{3.8}$$

where $\begin{cases} \varepsilon_{it} = \alpha_i + u_{it} \ (\text{for one} - \text{way error component}) \\ \varepsilon_{it} = \alpha_i + \gamma_t + u_{it} \ (\text{for two} - \text{way error component}) \end{cases}$ *and*

This is referred to as *The Fixed Effects Model (FEM).* Note that the constant, β_0, is omitted from this FE model because it would be collinear with α_i.

2. The individual effect, α_i, is uncorrelated with the regressors, x_{it} *i.e.* $Cov(\alpha_i, x_{it}) = 0$. Here again, model (3.1.) will be

$$y_{it} = \beta_0 + X'_{it}\beta + \varepsilon_{it} \tag{3.9}$$

where $\begin{cases} \varepsilon_{it} = \alpha_i + u_{it} \ (\text{for one} - \text{way error component}) \\ \varepsilon_{it} = \alpha_i + \gamma_t + u_{it} \ (\text{for two} - \text{way error component}) \end{cases}$ *and*

This is known as *Random Effects Model(REM).* Unlike the FE model, the constant, β_0, is rendered to be included in this model because β_0 and α_i are not correlated to one another.

3.2.4. MODEL ESTIMATION:

In this study, three different estimation techniques are employed in order to exploit the relationship between firm covariates and its profitability: pooled ordinary least squares technique, the fixed-effect technique and the random-effect technique.

3.2.4.1. POOLED ORDINARY LEAST SQUARES (POOLED OLS) TECHNIQUE

In practice, the conventional way to avoid the inherent problems associated with the use of data sets containing a smaller number of observations, and also to improve the efficiency of the cross-section estimates as well is generally accomplished by using panel data. Since the sample consists of both cross-section and time series observations, the first approach will be to apply the POOLED OLS technique to equation (3.7) under the panel data. However, it does not necessarily follow that the application of the POOLED OLS technique to panel data can always provide a perfect solution or reduction of all econometric problems. The key econometric problem would be that the estimates under the application of the OLS technique to panel data could be biased and inconsistent when α_i, the omitted (or unobserved) determinants of firm profit are correlated with the included explanatory variables in a profit equation. If this is the case, then the biased estimated coefficients would destroy the conventional b.l.u.e. (Best linear unbiased estimator) property of the OLS estimators.

In other words, in order for pooled OLS regression to produce consistent estimator of the $\beta`s$, it is necessary to assume that the composite error, $\varepsilon_{it} = \alpha_i + u_{it}$, is uncorrelated with the explanatory variables in the model. Thus, even if it is assumed that u_{it} is uncorrelated with these explanatory variables, the same cannot be assumed for the fixed effect α_i. The pooled OLS regression is biased and inconsistent if α_i and the explanatory variables are correlated. So, this is the drawback of this method of estimation.

3.2.4.1.1 WHY IS POOLED OLS TECHNIQUE USED IN PANEL DATA?

The advantages of pooling:

i. Pooling adds data! If the assumptions we are making to pool work, this means more accurate estimates.
ii. Generalizability: We want our conclusion to apply to many cases, many time periods.

iii. The theoretical claims require it: Often questions in political science involve both comparative and time series issues.
iv. Pooling provides the variation needed to answer questions we couldn't answer with TS or CS data alone.
v. Pooling can help us with the measurement error and omitted variables problems we could have if using TS or CS data alone.

3.2.4.2. FIXED EFFET (FE) TECHNIQUE

The ***Fixed Effect model*** is simply a linear regression model in which the intercept terms vary over the individual units, i, which in this case is across each of the 91 individual industry, and the model is expressed as

$y_{it} = \alpha_i + x'_{it}\beta + u_{it}$, ---for one way (cross sectional) error component (3.10a)

$y_{it} = \gamma_t + x'_{it}\beta + u_{it}$, ---for one way (time) error component (3.10b)

$y_{it} = \alpha_i + x'_{it}\beta + \gamma_t + u_{it}$, ---for two way error component (3.10c)

where

(i). $u_{it} \sim IID(0, \delta_u^2)$

(ii) All the regressors, $\boldsymbol{x_{it}}$, are independent of the idiosyncratic errors, u_{it},

$i.e., Cov(x_{it}, u_{it}) = 0$

(iii). α_i is a fixed parameter. The differences across units (i.e. industries) can be captured in differences in the intercept term, α_i.

(iv).The regressors, x_{it}, and industries specific effect, α_i ,are correlated

$i.e., Cov(x_{it}, \alpha_i) \neq 0$

To increase the likelihood of obtaining unbiased estimates, especially in the fixed-effect technique, the profitability equation is specified such as that there may be some omitted or unobserved variables whose value remains constant across individual firms at a given time, but exhibits variation through time (tir 45 ects) or whose value remains constant through time for a given individual firm but varies across individual firms (individual effects).

Obviously, here the main objective of applying the fixed-effect technique will be to capture the possible effects of omitted or mismeasured firm specific, industry specific, or economy-wide variables which are correlated with the firm covariates and profitability. Thus, under this assumption by employing the OLS technique to panel data, the following specification is estimated to allow a varying intercept over time or across individual firms and a common vector of slope coefficients over time and across individual firms.

$$\pi_{it} = \beta_1\ RegD_i + \beta_2 OwnD_i + \beta_3\ ADVI_{it} + \beta_4\ KI_{it} + \beta_5\ DepR_{it} + \beta_6\ RPI_{it} + \beta_7\ IMPI_{it} + \beta_8 \ln ASS_{it} + \beta_9\ MKS_{it} + \beta_{10} DDR_{it} + \beta_{11} \ln Fsize_{it} + \beta_{12} IVTO_{it} + \beta_{13} \ln Fage_{it} + \alpha_i + \gamma_t + u_{it} \tag{3.11}$$

The fixed-effects model (3.10) can also be written as

$$\mathrm{y} = D\alpha + X\beta + u \tag{3.12}$$

$$= [\mathrm{D} \vdots \mathrm{X}] \begin{bmatrix} \alpha \\ \beta \end{bmatrix} + u = \mathrm{Z}\eta + u \tag{3.13}$$

where,

$$\mathrm{y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_N \end{bmatrix}_{(nTx1)}, \quad D = \begin{bmatrix} i_T & 0\cdots 0 \\ 0 & i_T \cdots 0 \\ \vdots & \vdots \ \ddots \vdots \\ 0 & 0\cdots i_T \end{bmatrix}_{(nTxn)}, \quad X = \begin{bmatrix} x_{11} & x_{12}\cdots x_{1k} \\ x_{21} & x_{22}\cdots x_{2k} \\ \vdots & \vdots \ \ddots \vdots \\ x_{n1} & x_{n2}\cdots x_{nk} \end{bmatrix}_{(nTxk)}, \quad \alpha = \begin{bmatrix} \alpha_1 \\ \alpha_2 \\ \vdots \\ \alpha_n \end{bmatrix}_{(nx1)} \quad \beta = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{bmatrix}_{(kx1)}$$

Z=[D⋮X] and $\eta = \begin{bmatrix} \alpha \\ \beta \end{bmatrix}$

This is commonly referred to as the ***least squares dummy variable*** (***LSDV) fixed effects regression model,*** with

$$E(u_{it}) = 0\,, \forall i,t$$

$$Var(u_{it}) = \delta_u^2\,, \forall i,t$$

$$Cov(u_{it}, u_{js}) = 0\,, \forall s \neq t \ or \ i \neq j$$

$$Cov(x_{it}, u_{js}) = 0\,, \forall s,t\ , i, j$$

Thus, it follows that $u \sim N(0, \delta_u^2 I_{nT})$. Hence, we can apply OLS to (3.13) to estimate the parameters α and β, and the estimation gives:

$$\hat{\eta} = (Z'Z)^{-1}Z'y \qquad (3.14)$$

This is called ***LSDV estimator.*** There are, however, two problems that can be observed from (3.12) and (3.13).

(a). $n \to \infty$ implies $\alpha \to \infty$

This means if we have n individuals, then we must also have n individual-specific effects, α `s. Hence, the number of individual-specific effects, $\alpha$ `s, becomes larger and larger as n does so. As a result, we can not estimate α consistently. Therefore, it is important to use this method when n is small.

(b). $(Z'Z)^{-1}$ is $(n+k)\times(n+k)$ matrix. Similarly here, if n gets larger and larger, the possibility of inverting the $(n+k)$-matrix will be lower and lower. Even when possible it can be impracticable and/or inaccurate. Hence, like α, β will not be estimated consistently. So, to estimate both parameters, α and β, consistently, one can use the partitioned regression highlighted below.

3.2.4.2.1. ESTIMATION OF PARAMETERS (USING PARTITIONED REGRESSION)

A partitioned regression provides a simple solution to the above problem .It is basically a regression technique carried out using a two-stage estimation procedure:

Step-1: Transform the data by subtracting group means.

Step-2: Run OLS on the transformed data.

Having performed this, we get

$$\hat{\beta} = \hat{\beta}_{LSDV} = (X'M_D X)^{-1}(X'M_D Y)$$

where

$$M_D = I - D(D'D)^{-1}D' = \begin{bmatrix} I_T - \frac{1}{T}ii' & 0 & \cdots & 0 \\ 0 & I_T - \frac{1}{T}ii' & \cdots & 0 \\ \vdots & \vdots & \ddots & \vdots \\ 0 & 0 & \cdots & I_T - \frac{1}{T}ii' \end{bmatrix}$$ and i is a vector of ones,

is a symmetric, idempotent "residual-maker" matrix for the regression on the dummy variables D. Since M_D is symmetric, idempotent and premultiplication produces the average over $t = 1,2,\cdots,T$ for each i, the partitioned regression is equivalent to regressing

$$Y_* = M_D\, Y = Y - \overline{Y} = \begin{bmatrix} y_1 - \overline{y}_1 \\ y_2 - \overline{y}_2 \\ \vdots \\ y_n - \overline{y}_n \end{bmatrix}_{(nTx1)}$$

on

$$X_* = M_D\, X = X - \overline{X} = \begin{bmatrix} x_{11} - \overline{x}_{11} & x_{12} - \overline{x}_{12} \cdots & x_{1k} - \overline{x}_{1k} \\ x_{21} - \overline{x}_{21} & x_{22} - \overline{x}_{22} \cdots & x_{2k} - \overline{x}_{2k} \\ \vdots & \vdots \quad \ddots & \vdots \\ x_{n1} - \overline{x}_{n1} & x_{n2} - \overline{x}_{n2} \cdots & x_{nk} - \overline{x}_{nk} \end{bmatrix}_{(nTx1)}$$

This regression differs from the OLS regression applied to get (3.14) in that it only requires inversion of a $(k \times k)$matrix, not$(n+k)\times(n+k)$. The individual-specific constant terms can be recovered according to

$$\hat{\alpha}_i = \overline{y}_i - \hat{\beta}'\overline{x}_i \text{, for } i = 1,2,\cdots,n$$

3.2.4.2.2. VARIANCE ESTIMATION

The variance estimator for:-

(i). $\hat{\beta}$ is $v\hat{a}r(\hat{\beta}) = s^2 (X'M_D X)^{-1}$ where the appropriate estimator for δ_{ε}^2 is

$$s^2 = \frac{e'e}{nT-n-k} = \frac{\sum_{i=1}^{n}\sum_{t=1}^{T}\left(y_{it} - \hat{\alpha}_i - x_{it}'\hat{\beta}\right)^2}{nT-n-k} \text{, and}$$

(ii). $\hat{\alpha}_i$ is $v\hat{a}r(\hat{\alpha}) = \frac{s^2}{T} + \overline{x}_i'\left\{s^2 (X'M_D X)^{-1}\right\}\overline{x}_i$ [48]

3.2.4.2.3. WHY IS THE FIXED EFFECT TECHNIQUE USED IN PANEL DATA?

Some of the justifications why the fixed effects regression model analysis is implemented here is that: -

(i). One of the prime objectives of this work is that to assess, analyze, or infer the profitability of the sampled 91 panel industries. So, this model is used since our desire is to explain those industries *only*, not to conclude further about the total LMSM manufacturing industries that were in our country during the study period, 1997-2006.

(ii). Since the *unobserved firm's specific effects* are thought to have some sort of association, dependability, correlation, linkage, or relationship with at least some of the elements of the ***observed explanatory variables***, X_{it} in the model. Hence, this model must be used, particularly to obtain an ***unbiased*** and a ***consistent*** estimate of the slopes or the coefficients.

3.2.4.3. RANDOM EFFECT (RE) TECHNIQUE

In the fixed-effect estimation technique, the effects of omitted industries specific variables are treated as fixed over time. However, the case may be that the individual-effects, α_i , like u_{it} , could be random variables drawn from a distribution rather than being nonstochastic. If this is the case, then the fixed-effect estimation technique may not yield efficient parameter estimates.

Moreover, when the variables of interest (e.g. such as *Firm ownership & Regional dummy variable*, etc.) are constant for each individual, a fixed effects regression is not an effective tool because such variables are exclusively excluded from the estimation.

Hence, here the assumption is that the indust[illegible]ecific effects cannot be observed or measured and so represents 'specific ignorance' for the modeller and must be treated as part of our 'general ignorance' (Matyas and Sevestre, 1992: 50). What this means is that the large number of factors that affect the value of the dependent variable, *profitability,* but which are not explicitly accounted for in the model can be summarized by industry's idiosyncratic random error, ε_{it} . If this assumption is made then we call it *a random effects (RE) model*. Hence in addition to a non-specific error term u_{it} there is also an industry-specific error term α_i .Thus, the basic framework for random effect regression model is given by

$$y_{it} = \beta' x_{it} + \varepsilon_{it} \qquad (3.15)$$

where $\varepsilon_{it} = \alpha_i + u_{it}$ and,

$$E(\alpha_i) = E(u_{it}) = 0 \ \forall \ i,t$$

$$Var(\alpha_i) = \delta_\alpha^2 ; Var(u_{it}) = \delta_u^2 \ \forall \ i,t$$

$$Cov(\alpha_i, \alpha_j) = 0 \ \forall \ i \neq j$$

$$Cov(u_{it}, u_{js}) = 0 \ \forall \ i \neq j, t \neq s$$

$$Cov(x_{it}, \alpha_i) = 0 \ , \ Cov(\alpha_i, u_{it}) = 0$$

that is, the model error components are not correlated with each other and are not autocorrelated across both cross-section and time-series units. In modern econometric idiom, "*random effects model*" is defined as a model with *zero correlation* between the *observed explanatory variables*, x_{it}, and the *unobserved individual specific effect*, α_i i.e. $Cov(x_{it}, \alpha_i) = 0$, $t = 1,2,3,---,T$.

The RE model (3.15) can be written in matrix form as

$$Y = X\beta + \varepsilon \text{, where } \varepsilon \sim N(0, \Omega).$$

Given the assumption above, the $(nT \times nT)$ variance-covariance matrix Ω has the following structure:

$$\Omega = (I_n \otimes \Sigma_T) = \begin{bmatrix} \Sigma_T & 0 \cdots 0 \\ 0 & \Sigma_T \cdots 0 \\ \vdots & \vdots \ \ddots \vdots \\ 0 & 0 \cdots \Sigma_T \end{bmatrix} \text{, where } \Sigma_T = \begin{bmatrix} \delta_\alpha^2 + \delta_\mu^2 & \delta_\mu^2 & \cdots & \delta_\mu^2 \\ 50 \ ?\iota & \delta_\alpha^2 + \delta_\mu^2 & \cdots & \delta_\mu^2 \\ & \vdots & \ddots & \vdots \\ \delta_\mu^2 & \delta_\mu^2 & \cdots & \delta_\alpha^2 + \delta_\mu^2 \end{bmatrix},$$

3.2.4.3.1 ESTIMATION OF PARAMETERS

4.2.4.3.1.1. GLS ESTIMATION

In equation (3.15), because both ε_{it} and ε_{is} ($\forall\ t \neq s$) contain α_i, the residual will be autocorrelated. So, OLS can't be used here because though consistent, it is inefficient. An efficient estimator is therefore the generalized least squares (GLS), which is OLS estimator on transformed model. The transformation that gets rid of this serial correlation is:

$$y_{it}^* = y_{it} - (1-\theta)\,\bar{y}_{i\bullet}$$

$$x_{it}^* = y_{it} - (1-\theta)\bar{x}_{i\bullet}$$

where

$$\theta = \sqrt{\frac{\delta_u^2}{\delta_u^2 + T\delta_\alpha^2}}$$

The GLS therefore involves estimating by OLS the equation

$$y_{it}^* = \delta + \beta' x_{it}^* + \varepsilon_{it} \qquad (3.16)$$

where ε_{it} is a white noise error term.

It can be shown that the GLS estimator is given by the expression:

$$\hat{\beta}_{GLS} = (X_*' X_*)^{-1}(X_*' Y_*) = \left[(PX)'(PX)^{-1}(PX)'(PY)\right] = \left(X'\Omega^{-1}X\right)^{-1}\left(X'\Omega^{-1}Y\right) \tag{3.17}$$

where $P = \Omega^{-1/2} = \left(I_n \otimes \Sigma_T^{-1/2}\right)$, and $\Sigma_T^{-1/2} = \frac{1}{\delta_\varepsilon}\left[I_T - \frac{\theta}{T} i_T i_T'\right]$

3.2.4.3.1.2. FEASIBLE GLS ESTIMATION

To make (3.17) operational, all that is left is to estimate δ_u^2 and δ_α^2. We will do this sequentially — first we estimate δ_u^2 and then that to estimate δ_α^2.

(a). Estimation of δ_u^2

.

We begin by using the "within-groups" information given by the difference between

$$y_{it} = \beta_o + \beta' x_{it} + (\alpha_i + u_{it}) \tag{3.18}$$

and

$$\bar{y}_i = \beta_o + \beta' \bar{x}_i + (\alpha_i + \bar{u}_i) \tag{3.19}$$

This produces

$$y_{it} - \bar{y}_i = \beta'(x_{it} - \bar{x}_i) + (u_{it} - \bar{u}_i) \tag{3.20}$$

Now that the unobserved group-specific random effects are gone, we estimate (3.20) using the LSDV estimator and use the residuals to get the following estimate of δ_u^2:

$$\hat{\delta}_u^2 = \frac{\sum_{i=1}^{n}\sum_{t=1}^{T}\left(e_{it} - \bar{e}_i\right)^2}{nT - n - k} \tag{3.21}$$

:

(b). Estimation of δ_α^2

Now we use the "between-groups" information to estimate δ_α^2. Consider (3.20) again

$$\bar{u}_i + \alpha_i = \bar{y}_i - \beta_0 - \beta' \bar{x}_i$$

The variance of (3.19) is

$$\delta_{**}^2 = \frac{\delta_u^2}{T} + \delta_\alpha^2 \tag{3.22}$$

Therefore, we can estimate δ_α^2 using

$$\hat{\delta}_\alpha^2 = \frac{e_{**}' e_{**}}{n-k} - \frac{\hat{\delta}_u^2}{T}$$

Finally, insert the estimates $\hat{\delta}_u^2$ and δ_α^2 into P and calculate $\hat{\beta}_{GLS}$. This estimator is called *Feasible Generalized Least Squares, FGLS, i.e.* $\hat{\beta}_{FGLS}$.

3.2.4.3.2. WHY IS THE RANDOM EFFECT TECHNIQUE USED IN PANEL DATA?

The principal reasons for using a random effect model in this empirical work are that: -

(i). To estimate those observed explanatory variables that do not vary over time as easily as possible. One of the demerit of fixed effects models is that it does not aid us to directly estimate independent variables/ covariates that are constant within a specific industry because they are perfectly collinear with the fixed effects, α_i.

(ii). With random effects estimation we do not lose n degrees of freedom, as it is the case with fixed effects.

3.2.5 HYPOTHESIS TESTING

Hypothesis testing is central to statistical inference. In econometric modelling it is often important to distinguish between the following types of tests:

(i). Specification Tests: a test for choosing the correct model (*e.g.*, POOLED, RE, FE)

(ii).Misspecification Tests: a test for checking the violation of any of the statistical assumptions, namely *Serial independence, Homoscedasticity.*

3.2.5.1 SPECIFICATION TESTS

So far we have considered three models for panel data: FE, RE, & POOLED. The error terms in these models satisfy the OLS assumptions if the respective model is correct. To choose the correct model we use the following tests.

3.2.5.1.1. THE CHOW TEST

The chow test is employed to test the null hypothesis of pooled model against the alternative hypothesis of fixed model using the test statistic

$$F = \frac{(SSR_r - SSR_{ur})/k}{SSR_{ur}/(n-2k)}$$

The test statistic has F-distribution with k and $n-2k$ degrees of freedom.

3.2.5.1.2.THE BREUSCH-PAGAN LM TEST

The second test to be reported in the results is the Breusch-Pagan test. This tests whether for the random effects model there is any variation in the group-specific term. To test the null hypothesis H0: $\delta_\alpha^2 = 0$ the test statistic is given by

$$LM_0 = \frac{nT}{2(T-1)}\left\{\frac{\sum_i\left(\sum_t \hat{u}_{it}\right)^2}{\sum_i\sum_t \hat{u}_{it}^2} - 1\right\}$$

where $\hat{u}_{it}$ is the residual from regressing y_{it} on a constant and x_{it}. This statistic is distributed as chi-squared with one degree of freedom. Under the null hypothesis the model is a fully pooled one.

3.2.5.1.3. HAUSMAN SPECIFICATION TEST

A frequent question with panel data is which model to use — fixed or random effects. The answer boils down to whether the unobserved individual-specific effects are correlated with the explanatory variables or not. If they are, then the RE model will produce inconsistent estimates. If they are not, then the RE model may be preferable.

The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). If correlated (H_0 is rejected), a random effect model produces biased estimators, violating one of the Gauss-Markov assumptions; so a fixed effect model is preferred. The test statistic is given by

$$H = \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right)' \left(\Omega_{RE} - \Omega_{FE}\right)^{-1} \left(\hat{\beta}_{RE} - \hat{\beta}_{FE}\right)$$

The test statistic H follows the chi-squared distribution with k degrees of freedom.

3.2.5.2 MISSPECIFICATION TESTS

3.2.5.1. CHECKING FOR MULTICOLLINEARITY

When choosing a predictor variable you should select one that might be correlated with the criterion variable, but that is not strongly correlated with the other predictor variables. However, correlations amongst the predictor variables are not unusual. The term multicollinearity (or collinearity) is used to describe the situation when a high correlation is detected between two or more predictor variables. Such high correlations cause problems when trying to draw inferences about the relative contribution of each predictor variable to the success of the model. STATA provides us with a means of checking for this and we describe this in the forthcoming chapter.

3.2.5.2. CHECKING NORMALITY

Many statistical procedures work best when applied to variables that follow normal distributions. In this empirical work, we use both graphs and tests to check where this presumption is satisfied.

3.2.5.3. HETEROSCEDASTICITY AND AUTOCORRELATION

In general, there are two ways to handle nonspherical disturbances — robust estimation of the asymptotic variance-covariance matrix (e.g., White's estimator or the Newey-West estimator) or respecification of the error structure and application of generalized least squares. Here, only the former concept is discussed (see Greene section 13.7 for a discussion of robust estimation).

Robust Estimation

If the x_{it} variables in panel data model are strictly exogenous (i.e. $cov(x_{it}, u_{it}) = 0$), the presence of autocorrelation or heteroscedasticity in u_{it} does not result in inconsistency of the standard estimators. It does, however, invalidate the standard errors and resulting tests (i.e. *p-value*). Moreover, it implies that the estimators are no longer efficient.

One way to avoid misleading inferences without the need to impose alternative assumptions on the structure of the covariance matrix Ω, is the use of the pooled OLS, random effects or fixed effects estimators for β, while adjusting their standard errors for general forms of heteroscedasticity and autocorrelation. This technique of estimation is referred to as Robust Estimation.

Generally, the robust covariance matrix estimator of $\hat{\beta}$ is given by :

$$Var(\beta) = \left(\sum_{i=1}^{N} \sum_{t=1}^{T} x_{it} x'_{it} \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \sum_{s=1}^{T} \hat{u}_{it} \hat{u}_{is} x_{it} x'_{is} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} x_{it} x'_{it} \right)^{-1} \qquad (3.23)$$

where $\hat{u}_{it}$ denotes the OLS residual.

This matrix was introduced in econometrics by White (1980b), although some attribute it to either Eicker (1967) or Huber (1967), statisticians who discovered robust variance matrices. The square roots of the diagonal elements of equation (3.22) are often called the White standard errors or Huber standard errors, or some hyphenated combination of the names Eicker, Huber, and White. It is probably best to just call them heteroscedasticity-and-autocorrelation robust standard errors (since this term describes their purpose) or Newey-West standard errors.

3.4. GOODNESS OF FIT

The computation of goodness-of –fit measures in panel data application is somewhat uncommon. One reason is the fact that one may attach different importance to explaining the within and between variation in the data. Another reason is that the usual R^2 or adjusted R^2 criteria are only appropriate if the model is estimated by OLS.

In panel data, an alternative version of R^2 is defined depending on the special and temporal dimension of data. As a result we have three types of R^2 values as measures of goodness-of-fit. These are:-

(i). *Within* R^2: used to explain within variation. It is given by

$$R^2_{within}\left(\hat{\beta}_{FE}\right) = Corr^2\left\{\hat{y}_{it}^{FE} - \hat{y}_i^{FE}, y_{it} - \overline{y}_i\right\},$$

where $\hat{y}_{it}^{FE} - \hat{y}_i^{FE} = \left(x_{it} - \overline{x}_i\right)' \hat{\beta}_{FE}$ and $Corr^2$ denotes the squared correlation coefficient.

(ii). *Between* R^2: maximizes the "*Between* R^2" and is defined as

$$R^2_{between}\left(\hat{\beta}_B\right) = Corr^2\left\{\hat{y}_i^B, \overline{y}_i\right\}, \text{ where } \hat{y}_i^B = \overline{x}_i'\hat{\beta}_B .$$

(iii). *Overall* R^2: used to maximize the overall goodness-of-fit and thus the *Overall* R^2. It is defined as $R^2_{overall}\left(\hat{\beta}\right) = Corr^2\left\{\hat{y}_{it}, y_{it}\right\}$ where $\hat{y}_{it} = x_{it}'b$.

CHAPTER IV: EMPIRICAL RESULTS AND ANALYSES

4. Introduction

The purpose of this chapter is to present and examine the empirical results of the relationship between firm characteristics and profitability, and the sensitivity of this relationship to the types of firm's profitability measures (PCM, BTAP and ROA) and estimation techniques (OLS, fixed-effect and random-effect).

This section is divided into three major subsections. The first subsection starts with the results of specification tests. Then results of misspecification tests are presented in the second subsection. This is followed by the presentation and evaluation of the results of descriptive statistics and all three profitability models under the fixed-effect technique in the third and fourth subsection respectively.

4.1 Specification Tests

To check which estimation technique is most suitable for the data, the Breusch-Pagan LM Tests to asses the random effect versus the pooled model, Chow Test to assess the pooled against fixed model as well as the Hausman specification test to compare the fixed effect versus the random effect model are performed.

4.1.1 Breusch-Pagan LM Tests

As given in table 4.1, the Breusch-Pagan LM Tests indicates the rejection of the null hypothesis that H_0: $\delta_{\alpha}^{2} = 0$ (Pooled Model should be used) at the 10% significance level, which suggests that pooled regression is less suitable than random effect regression.

Table 4.1 Breusch - Pagan Lagrangian multiplier test for random effects

Models	chi2(1)	Prob > chi2
Fitted values of PCM	743.67	0.0000
Fitted values of BTAP	1.28	0.0587
Fitted values of ROA	210.64	0.0000

4.1.2 Hausman Specification Tests

The above results suggest that a feasible generalized least squares (FGLS) estimator might be more appropriate. Nevertheless, a random effects model has the disadvantage of assuming that the error associated with each cross section unit is uncorrelated with the other explanatory variables; if this assumption is not satisfied the FGLS estimator is not relevant at this junction. Hence, Hausman's test to specify whether a fixed or a random effects model is more appropriate is employed. Based on the Hausman test, the null hypothesis that H_0: $Cov(\alpha_i, x_{it}) = 0$ (i.e. RE model is appropriate) is rejected at the 5% significance level, as shown in the table given below.

Table 4.2 Hausman specification test for FE verse RE model

Models	chi2(9)	Prob > chi2
Fitted values of PCM	13.67	0.0008
Fitted values of BTAP	16.87	0.0492
Fitted values of ROA	21.86	0.0093

4.1.2 Chow Tests

The other test performed was a Chow (F-test) of the null hypothesis that all the coefficients of cross section dummies/ time dummies are jointly equal to zero. As shown in table 4.3, the results suggest that fixed effect model with time dummies is more appropriate.

Consequently, for all discussions that follow (empirical analyses and interpretations), fixed effect model with time dummy (LSDV) regressions will be employed.

Table 4.3 **Results of Chow tests for firm/time effects of profitability models**

Models	Chow`s statistic test result, F_{cal}	$F_{critical}$
PCM with individual firm specific effect, α_i	0.3637	$F_\alpha(90,715)\approx 1$
PCM with firm time specific effect, γ_t	2.1236	$F_\alpha(90,795)\approx 1$
PCM with both effects , α_i and γ_t	0.2891	$F_\alpha(90,705)\approx 1$
BTAP with individual firm specific effect, α_i	0.0474	$F_\alpha(90,715)\approx 1$
BTAP with firm time specific effect, γ_t	2.5728	$F_\alpha(90,795)\approx 1$
BTAP with both effects , α_i and γ_t	0.1296	$F_\alpha(90,705)\approx 1$
ROA with individual firm specific effect, α_i	0.6235	$F_\alpha(90,715)\approx 1$
ROA with firm time specific effect, γ_t	8.5545	$F_\alpha(90,795)\approx 1$
ROA with both effects , α_i and γ_t	0.3298	$F_\alpha(90,705)\approx 1$

4.2 Misspecification Tests

4.2 1.Collinearity Diagnosis

One obstacle that presents difficulty in rendering analysis is the existence of multicollinearity. The standard statistical method for testing data for multicollinearity is analyzing the control variables` variance inflation factor (VIF). Table 4.4 displays the condition of VIF of exogenous variables in the model. As can be seen from the table, the VIF of each of these variables is far less than 10, which indicates that the associated regression coefficients will not be poorly estimated because of multicollinearity (Montogomery and Peck, 1991).

4.2.2 Normality Assumption and Transformation

In order to have valid hypothesis testing, efforts have been made to assure the normality assumption. Having checked the normality of the residuals, the appropriate data transformations, particularly on independent variables such as *Fsize*, *Fage*, and *Fasset*, have been made.

Table 4.4 Condition of multicollinearity of explanatory variables in the model

Variable	VIF	1/VIF
LnFsize	4.58	0.218342
LnASS	3.01	0.331922
IMPI	2.25	0.444592
DDR	2.16	0.463164
DepR	2.07	0.482717
MKS	1.9	0.52613
OwnD	1.65	0.604574
RPI	1.6	0.625118
LnFage	1.44	0.696148
RegD	1.4	0.716571
KI	1.38	0.727093
ADVI	1.16	0.861784
INVTO	1.01	0.985591
Mean VIF	1.97	

Then, both tests and plots have been used to ascertain whether the assumption is fulfilled. The test used to evaluate the null hypothesis that the sample at hand comes from a normally-distributed population is that the *skewness-kurtosis test*. From Table 4.5 we can conclude that the assumption of normality is satisfied.

Table 4.5 Skewness/Kurtosis tests for Normality

Variable	Pr(Skewness)	Pr(Kurtosis)	joint: adj chi2(2)	joint: Prob>chi2
PCM	0.042	0.002	2.89	0.5376
ROA	0.235	0.000	7.51	0.1000
BTAP	0.584	0.026	12.16	0.3723

Figures 4.1-4.3 show the standardized normal probability plot (P-P plot) of the residuals of each model. The plots indicate no violation of the assumption of normality in each model as all points lie (approximately) on the 45^0 line.

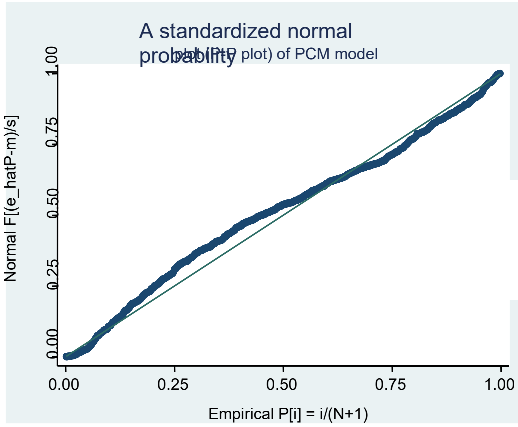


Fig-4.1

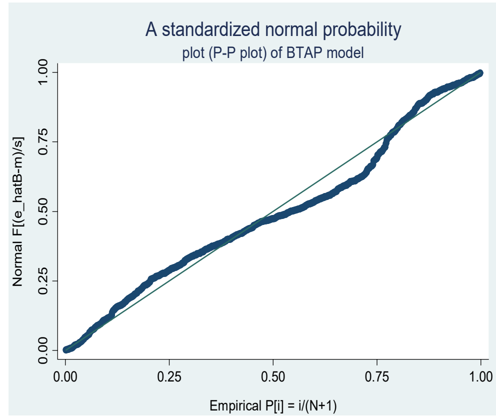


Fig-4.2

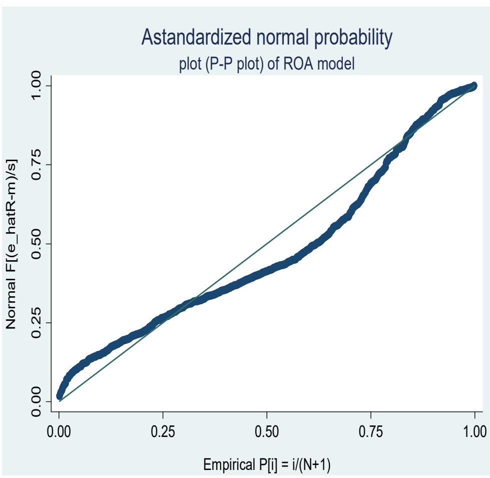


Fig-4.3

4.2.3 Spherical Assumptions (Heteroscedasticity and Autocorrelation)

Using the Breusch-Pagan/Cook-Weisberg test and Goldfeld-Quandt test procedure, all specifications of the three models are tested to confirm whether the LSDV fixed effects regressions suffer from heteroscedasticity and autocorrelation. Not surprisingly, the results confirmed that all specifications of the three models suffered from those problems. Therefore, the White correction technique to the standard errors is applied for all reported specifications of the three models to handle nonspherical disturbances.

4.3 Descriptive Statistics of Variables

Table-4.6 presents the descriptive statistics of the dependent and independent variables used in our empirical model. Included are the mean, median, variance, 25th percentile and 75th percentile values for all variables. For instance, firms` advertising intensity has a C.V. of 2.737652 indicating that there is a considerable variation in advertising intensity among firms. The 75th percentile value of 0.00608 also tells us that the advertising expense of 75% of the sample firms was less than 1%. Size of the firm has been measured by natural logarithm of sales for which the mean is 16.74 and median 16.85. We also find that capital intensity has a mean of 1.20 and median of 0.41. The large deviation between the mean and median shows that some firms` capital intensity is quite high in comparison to other firms in the sample. A C.V. of 1.875 for market share also reveals such a huge gap among firms. To avoid the impact of extreme values, we have taken the natural logarithm of age to measure the age of firms. The mean and median age is 3.68 and 3.76, respectively.

Table 4.6 Descriptive Statistics of variables

Variables	N	Mean	Medium(P_{50})	Variance	C.V.	sd	P_{25}	P_{75}
LnFsize	910	16.74021	16.84703	2.093856	0.08644	1.447016	15.9348	17.64808
DepR	910	0.0982	0.052231	0.026883	1.669643	0.163959	0.02544	0.09661
DDR	910	0.691449	0.752451	0.078033	0.403999	0.279344	0.514436	0.932913
KI	910	1.197244	0.405735	12.69887	2.97646	3.563548	0.134014	1.156923
INVTO	910	92151.84	9.365627	7.56E+12	29.84614	2750377	-20.1834	63.37163
ADVI	910	0.006615	0.002144	0.000328	2.737652	0.01811	0.000859	0.00608
RPI	910	43871.4	26900.68	3.32E+09	1.312714	57590.58	10376.81	55296.32
IMPI	910	0.258308	0.204343	0.052224	0.884699	0.228525	0.059095	0.435301
MKS	910	0.005191	0.002144	9.47E-05	1.874981	0.009732	0.000794	0.004983
LnASS	910	15.7349	15.7515	2.621898	0.102907	1.619228	14.69981	16.74271
LnFage	910	3.675365	3.7612	0.222103	0.128226	0.471278	3.295837	3.988984
PMS	910	0.026432	0.013719	0.002319	1.821886	0.048157	0.004854	0.03413
ROA	910	0.065469	0.036691	0.004715	1.048852	0.068668	0.01325	0.111916
PCM	910	0.286735	0.305343	0.07519	0.956314	0.274209	0.172841	0.432071
BTAP	910	0.017611	0.009472	0.23306	27.41286	0.482763	-0.24276	0.267471

Figures 4.4-4.6 show the effect of market position (Addis Ababa or Out of A.A.) on the three profitability measures. The PCM of firms situated in the capital is nearly 7 times the

average PCM of those firms found out of A.A. With respect to regions[2], it is also observed that firms located in Tigray earn the least PCM where as those firms situated in Oromia region earn the highest PCM, next to those in Addis Ababa. Similarly, firms in the capital earn nearly 9 times as large average ROA as those found out of it. Here again we see that firms in Tigray regional state generate less ROA than firms in the other regions covered in this study.

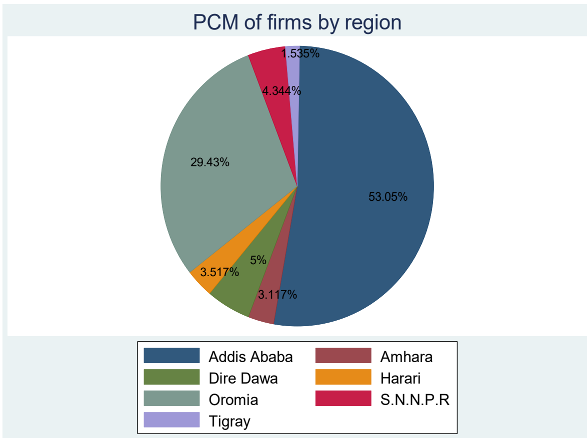


Fig-4.4

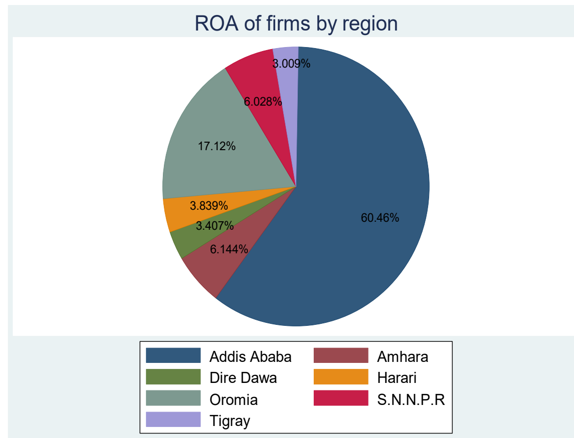


Fig-4.5

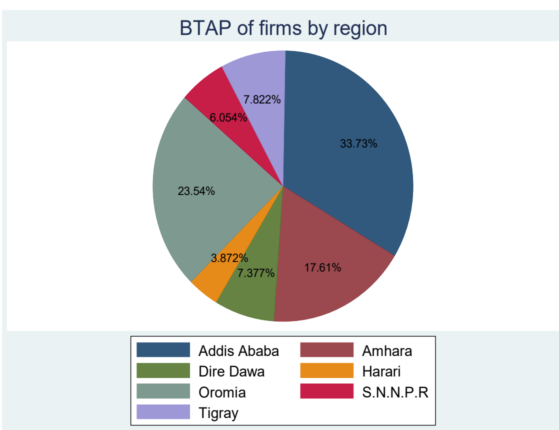


Fig-4.6

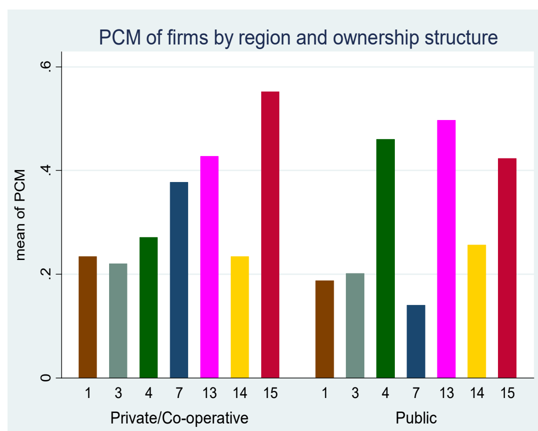
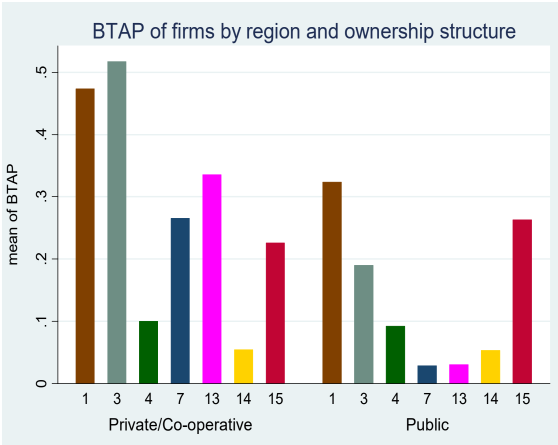


Fig-4.7

2 In this study region stands for Tigray (region 1), Afar (region 2),Amhara (region3),Oromia (region 4),Somalie (region 5), Benshangul (region 6), S.N.N.P.R (region 7), Gambela (region12), Harari (region 13), Addis Ababa (region 14) and Dire Dawa (region 15)



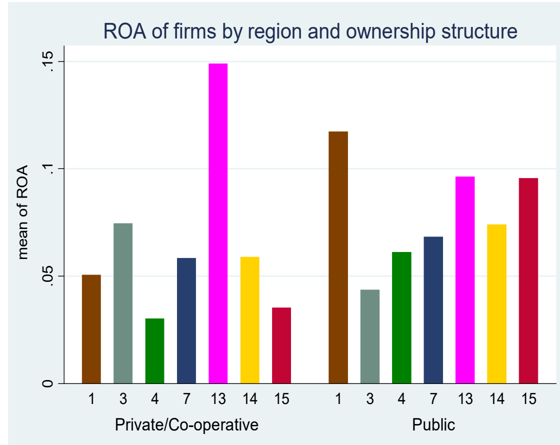
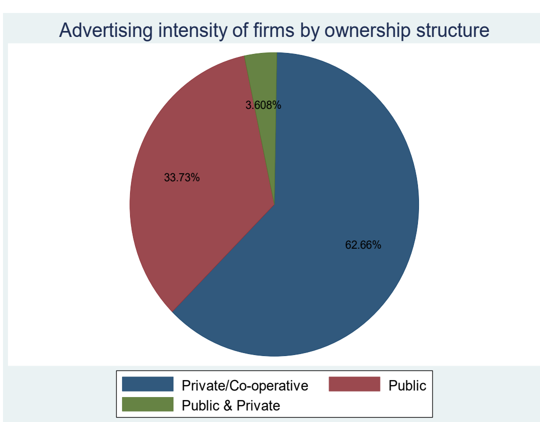


Fig-4.8 Fig-4.9

Figures 4.7-4.9 show both regional and ownership effects on profitability. While private firms of Dire Dawa, Amhara and Harari as well as public firms of Harari, Dire Dawa and Tigray earned higher PCM, BTAP and ROA than all firms of the country, respectively, private firms of Addis Ababa and public firm of S.N.N.P.R. earned lower PCM and BTAP respectively. In addition, public firms of Oromia and private frims of Amhara had earn lower ROA than any other firms.

As to the relation between advertising, capital intensity and ownership structure is concerned, we observe from figures 4.10-4.11 that private/co-operative firms had greater ADVI even if they were not capital intensive as compared to public firms.



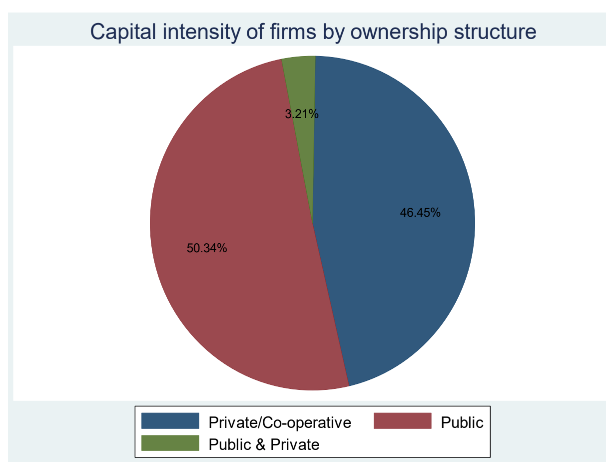


Fig-4.10 Fig-4.11

4.4 The Results of the Fixed-Effect Regressions over The 1997-2006 Periods

In this subsection, the results of PCM, BTAP and ROA models under fixed-effect technique over the 1997-2006 periods are discussed. Here, only the estimations of all three models under the fixed-effect technique with time effects are presented. To correct heteroscedastic and autocorrelated error terms a method suggested by white (1980) is applied. This involved a simultaneous correction of the problems of heteroscedasticity and autocorrelation.

The estimation results of all PCM, BTAP and ROA models under the fixed-effect technique are shown in Tables 4.8-4.10, respectively. Specification (1) of each table presents the estimation results of each of three models with all of the explanatory variables whereas specification (2) reports the estimation results of the same model with explanatory variables which remain after stepwise variable selection.

4.4.1 Estimation Results of the PCM model

Estimation results when PCM was used as a measure of profitability are presented in table 4.7. As can be seen from the results, the estimated coefficient of RegD, which indicates whether a firm is in Addis Ababa or in regional towns, is negative and statistically significant at the 1 percent level. The estimated coefficient of RegD (-0.06164) reveals that the PCM of a firm declines by 6.2% if it is located in the region (i.e. out of Addis Ababa).

Like RegD, firm size (LnFsize) has strong impact in determining firms' PCM. It is statistically significant at 1% level in determining PCM. Put differently, a 1% proportional increase in the size of a firm would lead to 0.04% proportional rise in PCM. Surprisingly, firm's ownership structure does not have a statistically significant influence on PCM. The effect of DepR on firm PCM profitability measure was found to be negative and statistically significant. The same is true about the effect of advertising intensity. The coefficient estimate of DepR indicates that an increase of DepR from by one percent is associated with a decrease of 0.42 percent in PCM. Our result also shows that higher domestic absorption or demand (DDR) would significantly increase firm profitability. This finding shows the importance of marketing strategies that aim at expanding domestic consumer demand.

TABLE 4.7

Fixed Effect Results of PCM, 1997-2006

Independent Variable	1				2			
	Coef.	Robust Std. Err.	t	P>|t|	Coef.	Robust Std. Err.	t	P>|t|
RegD	-0.07083	0.017476	-4.05	0.000	-0.06164	0.015012	-4.11	0.000
OwnD	0.016853	0.019365	0.87	0.384	-------	-------	-------	-------
LnFsize	0.049123	0.014849	3.31	0.001	0.037502	0.007473	5.02	0.000
DepR	-0.45524	0.096523	-4.72	0.000	-0.42419	0.079649	-5.33	0.000
DDR	0.26327	0.045906	5.73	0.000	0.223124	0.032527	6.86	0.000
KI	0.005171	0.003094	1.67	0.005	0.003876	0.002147	2.04	0.002
INVTO	1.74E-09	3.93E-10	-4.43	0.000	-------	-------	-------	-------
ADVI	-1.7268	0.56087	-3.08	0.002	-1.73645	0.570493	-3.04	0.002
RPI	1.38E-06	2.03E-07	6.78	0.000	1.42E-06	1.82E-07	7.76	0.000
IMPI	0.062548	0.050438	1.24	0.215	-------	-------	-------	-------
MKS	-1.20636	1.265238	-0.95	0.341	-------	-------	-------	-------
LnASS	-0.00255	0.008909	-0.29	0.775	-------	-------	-------	-------
LnFage	-0.00325	0.017334	-0.19	0.851	-------	-------	-------	-------
N	910				910			
R^2_{within}	0.3051				0.3024			
$R^2_{between}$	0.3564				0.3411			
$R^2_{overall}$	0.3286				0.3154			
R^2_{LSDV}	0.7257				0.7228			

Similar to the findings of Kambhampati and Parikh (2003), capital-sales ratio (KI) appeared with a positive and highly significant coefficient (at 1% level) suggesting that firms with higher capital intensity earn higher PCM. A positive and significant productivity index (RPI) signals an increase in profitability due to an increase in productivity, i.e., increased performance. Although this finding supports the well-known Demsetz hypothesis, an increased productivity may have created some kind of entry barriers, thereby allowing existing firms to earn higher profit.

Table 4.7 also shows that market share, used to measure the portion or percentage of sales of a particular product or service in a given region controlled by a company, has no significant influence on PCM. It also shows that those industries with high advertising intensity (ADVT) would have a lower PCM. Although advertising potentially has salutary (e.g., raising consumer awareness) and detrimental effects (e.g., creating entry barriers), high profitability is more likely to arise from creation and maintenance of brand loyalty among consumers and thereby shut off potential entrants into the market.

In general, the beta coefficients (table 4.7) show that firm's market location, size, depreciation rate, domestic demand, advertising intensity, relative productivity index and capital intensity are the most important variables in influencing firms` profit cost margin in the our country's LMSM industrial sector.

4.4.2 **Estimation Results of the BTAP model**

Table 4.8 reports the LSDV fixed effects results of BTAP model. Like the PCM model, RegD has a negative and significant impact on BTAP, and its estimated coefficient is -0.08463. This result, once more, reveals that BTAP decreases in those firms situated in regional towns as compared to those in Addis Ababa. This result also shows that BTAP of a firm has no relationship with ownership structure of a firm. DepR, which is designed to capture the proportion of expiration of the cost of company's fixed assets (except land), has as similar influence on BTAP as is on PCM. This is to say, depreciation rate has a negative and statistically significant effect on BTAP. The statistically significant coefficient of DepR (-0.53936) indicates that an increase in the firm depreciation rate 1% implies 0.54 percent decline in BTAP.

The capital intensity (KI) variable is negative and significant indicating that capital intensive industries were more likely to incur loss than those that were not capital intensive, possibly reflecting decreasing capacity utilization. Thus, a one percentage point increase in capital intensity leads to a decrease of 0.0034 percentage points in BTAP.

This finding rejects the idea that highly capital intensive firms are more profitable since they create entry barriers by requiring higher capital for entry (Allon, 1987).

Inventory turnover (INVTO), which indicates how quickly inventories are sold, appears to be an important determinant of before tax profit rate (BTAP). The coefficient estimate of this variable is positive and statistically significant at the 1 percent level. This suggests that higher inventory turnover leads to generate higher BTAP.

TABLE 4.8

Fixed Effect Results of BTAP, 1997-2006

Independent Variable	1				2			
	Coef.	Robust Std. Err.	t	P>|t|	Coef.	Robust Std. Err.	t	P>|t|
RegD	-0.073453	0.033359	-2.2	0.028	-0.08463	0.031326	-2.7	0.007
OwnD	0.039725	0.035919	1.11	0.269	-------	-------	-------	-------
LnFsize	0.109227	0.024921	4.38	0.000	0.111274	0.018745	5.94	0.000
DepR	-0.52584	0.129601	-4.06	0.000	-0.53936	0.126624	-4.26	0.000
DDR	-0.0527	0.08114	-0.65	0.516	-------	-------	-------	-------
KI	-0.00339	0.004154	-0.82	0.014	-0.00341	0.003871	-0.93	0.002
INVTO	9.76E-09	6.74E-10	14.47	0.000	9.84E-09	5.97E-10	16.49	0.000
ADVI	0.942462	0.737263	1.28	0.201	-------	-------	-------	-------
RPI	1.83E-07	3.13E-07	0.59	0.559	-------	-------	-------	-------
IMPI	-0.33177	0.09758	-3.4	0.001	-0.25842	0.068691	-3.76	0.000
MKS	0.054923	1.699172	0.03	0.974	-------	-------	-------	-------
LnASS	-0.08515	0.019919	-4.27	0.000	-0.08539	0.01867	-4.57	0.000
LnFage	-0.04786	0.034868	-1.37	0.070	-0.06777	0.027596	-2.46	0.014
N	910				910			
R^2_{within}	0.3378				0.3302			
$R^2_{between}$	0.4427				0.3865			
$R^2_{overall}$	0.4578				0.4146			
R^2_{LSDV}	0.4856				0.4805			

As expected, import intensity reduces the before-tax profit rate, as it lowers the market power of domestic producers. Based on the model, a 1 percentage point increase import intensity reduces the before-tax profit rate by 0.26 percentage points .Firm age is significant but with a negative sign, implying that newly established firms are more likely to earn higher BTAP than older firms. Firms` total asset is significantly negatively related with profitability.

4.5.3 **Estimation Results of the ROA model**

Table 4.9 reports the LSDV fixed effects estimates of ROA model of all expected determinant variables. RegD, unlike to the two previous models, has no significant relationship with ROA. In spite of its insignificant influences on the BTAP and PCM, ownership structure (OwnD) appears to be an important determinant of firm's ROA. However, its negative effect means that private or co-operative firms earn less ROA than their counter parts.

TABLE 4.9

Fixed Effect Results of ROA, 1997-2006

Independent Variable	1				2			
	Coef.	Robust Std. Err.	t	P>|t|	Coef.	Robust Std. Err.	t	P>|t|
RegD	-0.00353	0.004848	-0.73	0.467	-------	-------	-------	-------
OwnD	-0.02351	0.005007	-4.69	0.000	-0.02389	0.004471	-5.34	0.000
LnFsize	0.008867	0.003126	2.84	0.005	0.007806	0.002256	3.46	0.001
DepR	0.012828	0.01785	0.72	0.473	-------	-------	-------	-------
DDR	-0.02297	0.01609	-1.43	0.154	-0.03619	0.009504	-3.81	0.000
KI	-0.00022	0.000332	-0.65	0.513	-------	-------	-------	-------
INVTO	6.67E-11	1.09E-10	0.61	0.540	-------	-------	-------	-------
ADVI	0.595197	0.121678	4.89	0.000	0.62325	0.12498	4.99	0.000
RPI	9.77E-08	4.38E-08	2.23	0.026	8.31E-08	4.30E-08	1.93	0.054
IMPI	0.02463	0.018698	1.32	0.188	-------	-------	-------	-------
MKS	0.414541	0.208788	1.99	0.047	0.41444	0.207913	1.99	0.047
LnASS	-0.0219	0.002562	-8.55	0.000	-0.02144	0.001775	-12.08	0.000
LnFage	0.00049	0.004554	0.11	0.914	-------	-------	-------	-------
N	910				910			
R^2_{within}	0.3404				0.3317			
$R^2_{between}$	0.3002				0.2639			
$R^2_{overall}$	0.4043				0.3776			
R^2_{LSDV}	0.6910				0.6890			

As found in the previous two profitability model estimation result, firm size (LnFsize) has a positive and significant impact on ROA. ADVI is highly statistically significant at the 1% level and positively associated with ROA, which suggest that ROA will increase by nearly 0.62% when the variable increases by one percentage point.

A positive and significant productivity index (RPI), here too, signals an increase in profitability due to an increase in productivity or performance. Similar to RPI, market share (MKS) has a positive and significant impact on firms' ROA. It is statistically significant at 5% level in determining ROA. Thus, if the proportional change in market share surges by 1%, it will have positive significant effect of 0.41% on ROA. Fixed asset investment is also significant at 1% level. Based on the model, a one percentage change in firm's asset reduces ROA by 0.021 percentage points.

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1 CONCLUSIONS

LMSM industries have an important role to play in the economic development of a country. They are essential in raising income and productivity per head, in satisfying the demands for the industrial products, in poverty reduction, employment creation, supporting other non-industrial sectors, etc. Despite their role, there is no study on the profitability of these industries to date. This paper should be seen as a first step, not the last in this direction.

The main purpose of this study is to provide empirical evidence on the determinants of profitability performance of the Ethiopian LMSM industries over the period between 1997 and 2006. As already stated, the study utilized panel data on 910 sampled LMSM industries in Ethiopia. Three profitability models were used, one that defines the firms management ability to generate profit in terms of assets (ROA), a second defining it gross profit in terms of turnover, i.e., sales (PCM), and the third that defines the profit as a ratio between before tax profit and total asset (BTAP). A fixed effect with time dummies panel data model estimation method has been employed to address these study objectives.

In this empirical work we found U-shaped relationship between time and ROA of LMSM industries. ROA had been decreasing till 2000-2003 but kept on increasing since then. In contrast, BTAP seemed increasing only until 1999 and PCM had unstable increment and decline over the study period. Moreover, we observe that public firms in Ethiopia had incurred better profit as compared to private industries. They had an average profit of 24% percent higher than their counter part-private firms. (you can see the annex for detail information, figures 12-16)

Findings of this research on a sample of LMSM firms for the 1997-2006 periods are consistent with most of previous studies in terms of supporting the hypothesis of a firm characteristic effect on profitability despite differences among analysis in methodology, measures of profitability and size, time period, data sources and unit of observations.

The main conclusion of this study is that the effect of size on firm profitability is positive and substantial regardless of different profit measures. An explanation for this may be that the larger a firm, the greater diversification opportunity it has and hence, the more profit it is able to earn.

In contrary to the effect of size, as in Leahy (1998), the result or effect of all other variables varied according to the different measure of profitability being utilized i.e., the significance of the independent variables may depend on the profitability measure employed. This has happened so owning to the different notions and expressions associated with the profitability measurements. Owning to this fact, the ownership structure of Ethiopian LMSM industries appears to have insignificant influence on those profitability measures, except ROA. The coefficient of firm location is negative and insignificant in the ROA models, but turned out significant with the same sign in both PCM and BTAP models at 10 percent level, which signifies that profitability is lower for firms that are located outside of Addis Ababa, capital of Ethiopia. Similar to effect of firm's location, the coefficient of depreciation rate is negative and strongly significant in all of the profitability models, except ROA model. This suggests that the higher the level of depreciation, the higher the cost of the company and therefore, the lower the expected profitability. The empirical result also shows that even though both advertising intensity and relative productivity rate have significant influence in determining both PCM and ROA, their effect is contradictory. Put differently, when ADVI negatively affects PCM, RPI affects it positively, and vice versa. Turning to import competition variable, we see that the import intensity has a negative and significant impact only on before- tax-profit rate.

Finally, we observe that firms` total asset (LnASS) and age (LnFage) have a negative coefficient for all profitability equations although the influence for PCM is insignificant. The negative sign coefficients of a firm age indicate that the older the firm is, the lower BTAP and ROA it earns.

To sum up, the overall result indicates that firm size, market share, inventory turnover and relative productivity index directly contribute to firms` profitability w 74 as firm location, depreciation rate, import intensity, firm's age and firm` total asset inversely affect firms` profitability. All other variables have mixed effect or impact.

5.2. RECOMMENDATIONS

As matter of policy implications, we need to draw several proposals at both the firm/industry and national levels:

1. At firm level, the improvement of profitability of LMSM industries need to be addressed through:
   - ☞ reducing the depreciation rate of the technology employed by the manufacturer through national regulation programs

- ☞ reducing the proportion of firm assets to optimal levels
- ☞ increasing the size of medium firms to optimal levels, and
- ☞ strengthening their efficiency or performance

2. At national level, we need to
   - ☞ reduce import intensity
   - ☞ consolidate regional firms
   - ☞ private or co-operative firms should get some support and motivation from concerned bodies.

As a caveat, this study is not aimed at tackling the issues,"which profitability measures of manufacturing industries is the most appropriate to address the study objectives?" .This issue is left for future research.

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APPENDIX /ANNEX:

STATA OUT PUTS

(1). Heteroscedasticity and Autocorrelation tests

(i).Test for existence of heteroscedasticity

```
. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of PCM

        chi2( 1)      =    100.32
        Prob > chi2  =     0.0000

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of BTAP

        chi2( 1)      =     12.92
        Prob > chi2  =     0.0003

. hettest

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: fitted values of ROA

        chi2( 1)      =    106.07
        Prob > chi2  =     0.0000
```

(ii).Test for existence of autocorrelation

```
gen e_hatPCM1= e_hatPCM[ _n-1]
(1 missing value generated)

. reg  e_hatPCM e_hatPCM1

      Source |       SS       df       MS              Number of obs =     909
-------------+------------------------------           F(  1,   907) =  336.45
       Model |  10.7987491     1  10.7987491           Prob > F      =  0.0000
    Residual |    29.11117   907  .032096108           R-squared     =  0.2706
-------------+------------------------------           Adj R-squared =  0.2698
       Total |  39.9099191   908  .043953655           Root MSE      =  .17915

------------------------------------------------------------------------------
    e_hatPCM |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   e_hatPCM1 |   .5201565   .0283579    18.34   0.000     .4645019    .5758112
       _cons |    .000051   .0059422     0.01   0.993    -.011611    .0117129
------------------------------------------------------------------------------

. predict e_hatBTAP2,resid

. gen e_hatBTAP3= e_hatBTAP2[ _n-1]
(1 missing value generated)

. reg  e_hatBTAP2 e_hatBTAP3

      Source |       SS       df       MS              Number of obs =     909
-------------+------------------------------           F(  1,   907) =   40.00
       Model |  7.23957317     1  7.23957317           Prob > F      =  0.0000
    Residual |  164.166451   907  .180999395           R-squared     =  0.0422
-------------+------------------------------           Adj R-squared =  0.0412
       Total |  171.406024   908  .188773155           Root MSE      =  .42544

------------------------------------------------------------------------------
  e_hatBTAP2 |      Coef.   Std. Err.      t    P>|t|    [illegible]% Conf. Interval]
-------------+----------------------------------------------------------------
  e_hatBTAP3 |   .2053262   .0324658     6.32   0.000    [illegible]16093     .269043
       _cons |  -.0006795    .014111    -0.05   0.962    [illegible]33734    .0270145
------------------------------------------------------------------------------
```

```
predict e_hatROA2,resid

. gen e_hatROA3= e_hatROA2[ _n-1]
(1 missing value generated)

. reg  e_hatROA2 e_hatROA3

      Source |       SS       df       MS              Number of obs =     909
-------------+------------------------------           F(  1,   907) =   86.59
       Model |  .256920905     1  .256920905           Prob > F      =  0.0000
    Residual |  2.69129537   907  .00296725            R-squared     =  0.0871
-------------+------------------------------           Adj R-squared =  0.0861
       Total |  2.94821628   908  .003246934           Root MSE      =  .05447

------------------------------------------------------------------------------
   e_hatROA2 |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   e_hatROA3 |    .276003   .0296614     9.31   0.000     .2177901    .3342159
       _cons |  -.0007109   .0018067    -0.39   0.694    -.0042568     .002835
------------------------------------------------------------------------------
```

(2). ***Breusch and Pagan Lagrangian Multiplier Test For Pooled Vs Random Effects***

Table-10: for PCM model

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        PCM[EID,t] = Xb + u[EID] + e[EID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     PCM |   .0751904       .2742087
                       e |   .0244248       .1562845
                       u |   .0204432       .1429797

        Test:   Var(u) = 0
                             chi2(1) =     743.67
                         Prob > chi2 =     0.0000
```

Table-11: for BTAP model

```
xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        BTAP[EID,t] = Xb + u[EID] + e[EID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                    BTAP |     .23306       .4827629
                       e |    .185596       .4308085
                       u |   .0047021       .0685722

        Test:   Var(u) = 0
                             chi2(1) =       1.28
                         Prob > chi2 =     0.0587
```

Table-12: for ROA model

```
. xttest0

Breusch and Pagan Lagrangian multiplier test for random effects

        ROA[EID,t] = Xb + u[EID] + e[EID,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     ROA |   .0047152       .0686676
                       e |   .0028201       .0531047
                       u |   .0009394       .0306491

        Test:   Var(u) = 0
                             chi2(1) =     210.64
                         Prob > chi2 =     0.0000
```


.

(2). ***Hausman Specification Test For Fixed Effects Vs Random Effects***

Table-13: for PCM model

```
. estimates store fixed

. quietly xtreg PCM  RegD - LnFage,fe

. estimates store fixed

. quietly xtreg PCM  RegD - LnFage,re

. hausman fixed

Note: the rank of the differenced variance matrix (9) does not equal the number of coefficients being
        tested (11); be sure this is what you expect, or there may be problems computing the test.
        Examine the output of your estimators for anything unexpected and possibly consider scaling
        your variables so that the coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
     LnFsize |    .0896173     .0747691        .0148482        .0074705
        DepR |   -.4362229    -.4465696        .0103467        .0162184
         DDR |     .221735     .2427212       -.0209862        .0362286
          KI |    .0030636      .002735        .0003286        .0006268
       INVTO |    3.86e-10     3.03e-10        8.33e-11        1.37e-10
        ADVI |   -.6157498    -.8105872        .1948375        .0946717
         RPI |    5.97e-07     7.38e-07       -1.41e-07        5.12e-08
        IMPI |    .0713561     .0846072       -.0132511         .047396
         MKS |   -1.126753     -1.04531       -.0814429        .4464983
       LnASS |   -.0076005    -.0084175        .0008169        .0030492
      LnFage |   -.1387426    -.0123281       -.1264144        1.178421
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
            B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       13.67
                Prob>chi2 =      0.0008
```

Table-14: for BTAP model

```
. quietly xtreg BTAP  RegD - LnFage,fe

. estimates store fixed

. quietly xtreg BTAP  RegD - LnFage,re

. hausman fixed

Note: the rank of the differenced variance matrix (    9) does not equal the number of coefficients being
      tested ( 11); be sure this is what you expect, or there may be problems computing the test.
      Examine the output of your estimators for anything unexpected and possibly consider scaling
      your variables so that the coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
     LnFsize |    .1171351     .1012747        .0158604        .0311787
        DepR |   -.6545048    -.5285184       -.1259864        .0915249
         DDR |   -.0581507    -.0290708       -.0290799        .1535391
          KI |    -.006547    -.0066982        .0001512        .0033141
       INVTO |    1.04e-08     9.40e-09        9.74e-10        1.46e-09
        ADVI |    1.979152     1.003623        .9755292        .6034778
         RPI |   -1.04e-06    -5.88e-07       -4.56e-07        2.79e-07
        IMPI |    -.286544    -.3010585        .0145145         .197669
         MKS |    12.08495     5.639572        6.445376        2.354821
       LnASS |   -.0589298    -.0919825        .0330527        .0151888
      LnFage |   -1.179423    -.0694218       -1.110002        3.249904
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2( 9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =       16.97
                Prob>chi2 =      0.0492
```

(c).

Table-15: for ROA model

```
. quietly xtreg ROA  RegD - LnFage,fe

. estimates store fixed

. quietly xtreg ROA  RegD - LnFage,re

. hausman fixed

Note: the rank of the differenced variance matrix (    9) does not equal the number of coefficients being
      tested ( 11); be sure this is what you expect, or there may be problems computing the test.
      Examine the output of your estimators for anything unexpected and possibly consider scaling
      your variables so that the coefficients are on a similar scale.

                 ---- Coefficients ----
             |      (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
             |     fixed          .          Difference          S.E.
-------------+----------------------------------------------------------------
     LnFsize |    .0047206     .0084833       -.0037627        .0030847
        DepR |   -.0139162     .0013458        -.015262        .0074271
         DDR |   -.0277637    -.0243051       -.0034586        .0153112
          KI |   -.0016997    -.0010249       -.0006748        .0002777
       INVTO |   -1.17e-10    -8.99e-11       -2.71e-11        8.16e-11
        ADVI |    .1929375     .3375532       -.1446157        .0456165
         RPI |   -5.89e-08    -7.71e-08        1.83e-08        2.32e-08
        IMPI |    .0014294     .0127362       -.0113068        .0199083
         MKS |     -.10564     .1444397       -.2500796        .2031353
       LnASS |   -.0251326     -.022832       -.0023005        .0013361
      LnFage |   -.2044653     -.001201       -.2032643        .4005359
------------------------------------------------------------------------------
                          b = consistent under Ho and Ha; obtained from xtreg
           B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2( 9) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                           =       21.87
                Prob>chi2 =      0.0093

.
```

(2). **LSDV fixed effect results**

Table 4.16. ***Creating Time dummmy***

```
tabulate Time, gen(dmmy),
```

Time	Freq.	Percent	Cum.
1997	91	10.00	10.00
1998	91	10.00	20.00
1999	91	10.00	30.00
2000	91	10.00	40.00
2001	91	10.00	50.00
2002	91	10.00	60.00
2003	91	10.00	70.00
2004	91	10.00	80.00
2005	91	10.00	90.00
2006	91	10.00	100.00
Total	910	100.00	

Table 4.17 ***LSDV robust regressions***

(i). For PCM model

```
reg PCM RegD- LnFage dmmy97 - dmmy2006 ,noconstant robust

Linear regression                                      Number of obs =     910
                                                       F( 22,   887) =  409.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.7257
                                                       Root MSE      =   .2104
```

PCM	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
RegD	-.070834	.0174756	-4.05	0.000	-.1051324	-.0365355
OwnD	.0168525	.0193651	0.87	0.384	-.0211542	.0548592
LnFsize	.0491227	.0148486	3.31	0.001	.0199803	.0782651
DepR	-.455241	.0965234	-4.72	0.000	-.644682	-.2658001
DDR	.2632695	.0459061	5.73	0.000	.1731722	.3533669
KI	.0051708	.0030944	1.67	0.005	-.0009023	.0112439
INVTO	1.74e-09	3.93e-10	-4.43	0.000	-2.51e-09	-9.69e-10
ADVI	-1.726799	.5608704	-3.08	0.002	-2.827586	-.6260108
RPI	1.38e-06	2.03e-07	6.78	0.000	9.79e-07	1.78e-06
IMPI	.0625477	.0504382	1.24	0.215	-.0364443	.1615398
MKS	-1.206358	1.265238	-0.95	0.341	-3.689569	1.276852
LnASS	-.0025493	.0089092	-0.29	0.775	-.0200349	.0149364
LnFage	-.0032511	.0173342	-0.19	0.851	-.0372719	.0307698
dmmy97	-.6095947	.1931206	-3.16	0.002	-.9886213	-.2305682
dmmy98	-.6416852	.193856	-3.31	0.001	-1.022155	-.2612152
dmmy99	-.6110669	.1944757	-3.14	0.002	-.992753	-.2293808
dmmy2000	-.6346009	.1965913	-3.23	0.001	-1.020439	-.2487626
dmmy2001	-.6530934	.1967545	-3.32	0.001	-1.039252	-.2669348
dmmy2002	-.6219437	.2004603	-3.10	0.002	-1.015376	-.2285119
dmmy2003	-.6582922	.1942684	-3.39	0.001	-1.039571	-.2770129
dmmy2004	-.681891	.1963573	-3.47	0.001	-1.06727	-.296512
dmmy2005	-.687177	.1950511	-3.52	0.000	-1.069992	-.3043616
dmmy2006	-.6797337	.1977658	-3.44	0.001	-1.067877	-.2915903

(ii). For BTAP model

```
reg BTAP RegD- LnFage dmmy97 - dmmy2006 ,robust noconstant

Linear regression                                      Number of obs =     910
                                                       F( 22,   887) =       .
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4856
```

Root MSE = .41334

BTAP	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
RegD	-.0734527	.0333591	2.20	0.028	.0079807	.1389246
OwnD	.0397252	.0359188	1.11	0.269	-.0307706	.110221
LnFsize	.1092268	.0249205	4.38	0.000	.0603169	.1581367
DepR	-.5258392	.1296008	-4.06	0.000	-.7801993	-.2714792
DDR	-.052696	.0811397	-0.65	0.516	-.2119441	.1065521
KI	-.0033919	.0041538	-0.82	0.414	-.0115444	.0047606
INVTO	9.76e-09	6.74e-10	14.47	0.000	8.44e-09	1.11e-08
ADVI	.9424624	.7372634	1.28	0.201	-.5045218	2.389447
RPI	1.83e-07	3.13e-07	0.59	0.559	-4.31e-07	7.97e-07
IMPI	-.3317723	.0975799	-3.40	0.001	-.5232867	-.1402579
MKS	.0549229	1.699172	0.03	0.974	-3.279943	3.389789
LnASS	-.0851512	.019919	-4.27	0.000	-.1242451	-.0460574
LnFage	-.0478641	.0348681	-1.37	0.170	-.1162977	.0205695
dmmy97	-.0168467	.3039862	-0.06	0.956	-.6134629	.5797694
dmmy98	-.0353809	.3045388	-0.12	0.908	-.6330816	.5623198
dmmy99	.0189167	.3077261	0.06	0.951	-.5850395	.6228729
dmmy2000	.0029801	.300104	0.01	0.992	-.5860166	.5919768
dmmy2001	-.2800962	.3041343	-0.92	0.357	-.8770029	.3168106
dmmy2002	-.2934597	.3010379	-0.97	0.330	-.8842892	.2973699
dmmy2003	-.3309867	.3027507	-1.09	0.275	-.9251779	.2632046
dmmy2004	-.3394023	.3007182	-1.13	0.259	-.9296044	.2507998
dmmy2005	-.3263357	.3031699	-1.08	0.282	-.9213498	.2686784
dmmy2006	-.3649888	.3024682	-1.21	0.228	-.9586256	.2286479

(iii). For ROA model

```
reg ROA RegD- LnFage dmmy97 - dmmy2006 ,robust noconstant

Linear regression                                      Number of obs =     910
                                                       F( 22,   887) =       .
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.6910
                                                       Root MSE      =  .06144
```

ROA	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf.	Interval]
RegD	-.0035277	.0048483	-0.73	0.467	-.0130432	.0059878
OwnD	-.0235059	.0050067	-4.69	0.000	-.0333322	-.0136797
LnFsize	.008867	.0031257	2.84	0.005	.0027323	.0150017
DepR	.0128281	.0178503	0.72	0.473	-.0222057	.047862
DDR	-.0229741	.0160896	-1.43	0.154	-.0545522	.008604
KI	-.0002171	.0003315	-0.65	0.513	-.0008678	.0004335
INVTO	6.67e-11	1.09e-10	0.61	0.540	-1.47e-10	2.80e-10
ADVI	.5951974	.121678	4.89	0.000	.3563871	.8340076
RPI	9.77e-08	4.38e-08	2.23	0.026	-1.84e-07	-1.17e-08
IMPI	.0246301	.0186981	1.32	0.188	-.0120674	.0613277
MKS	.4145409	.208788	1.99	0.047	.0047649	.824317
LnASS	-.0219018	.002562	-8.55	0.000	-.0269301	-.0168735
LnFage	.0004902	.0045537	0.11	0.914	-.0084472	.0094275
dmmy97	.2834006	.0503072	5.63	0.000	.1846655	.3821357
dmmy98	.282981	.0467926	6.05	0.000	.1911439	.3748182
dmmy99	.2769743	.0465424	5.95	0.000	.1856283	.3683203
dmmy2000	.2738248	.0471103	5.81	0.000	.1813641	.3662855
dmmy2001	.2735844	.047075	5.81	0.000	.181193	.3659758
dmmy2002	.2778386	.0474784	5.85	0.000	.1846555	.3710216
dmmy2003	.2705587	.0469193	5.77	0.000	.178473	.3626444
dmmy2004	.2802629	.047021	5.96	0.000	.1879775	.3725483
dmmy2005	.2803188	.0466374	6.01	0.000	.1887863	.3718513
dmmy2006	.2891853	.0473443	6.11	0.000	.1962654	.3821053

Table 4.17 ***LSDV stepwise robust regressions***

(i). For PCM model

```
stepwise,pr(0.1): reg PCM   RegD OwnD LnFsize DepR DDR KI INVTO ADVI RPI IMPI MKS LnASS LnFage
>  dmmy97 dmmy98 dmmy99 dmmy2000 dmmy2001 dmmy2002 dmmy2003 dmmy2004 dmmy2005 ,robust noconstant
                      begin with full model
p = 0.9871 >= 0.1000  removing dmmy2003
p = 0.9558 >= 0.1000  removing IMPI
p = 0.8581 >= 0.1000  removing dmmy2001
p = 0.6981 >= 0.1000  removing dmmy98
p = 0.6664 >= 0.1000  removing LnASS
p = 0.4704 >= 0.1000  removing dmmy2000
p = 0.3712 >= 0.1000  removing MKS
p = 0.2329 >= 0.1000  removing OwnD
p = 0.2229 >= 0.1000  removing INVTO
p = 0.2317 >= 0.1000  removing LnFage
p = 0.2224 >= 0.1000  removing dmmy2004
p = 0.2461 >= 0.1000  removing dmmy2005
```

```
Linear regression                                      Number of obs =     910
                                                       F( 10,   899) =  399.41
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.7228
                                                       Root MSE      =  .21231

------------------------------------------------------------------------------
             |               Robust
         PCM |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        RegD |  -.0616411   .0161002    -4.36   0.000    -.1017195   -.0385228
    dmmy2002 |   .0400604   .0230349     1.74   0.082    -.0051479    .0852688
     LnFsize |   .0375022   .0037889     4.88   0.000     .0110402    .0259122
        DepR |  -.4241913   .0829248    -5.82   0.000    -.6457549   -.3202577
         DDR |   .2231241   .0334102     6.40   0.000     .1482085    .2793507
      dmmy97 |   .0449249   .0236637     1.90   0.058    -.0015177    .0913675
       INVTO |   1.40e-09   3.27e-10    -4.28   0.000    -2.04e-09   -7.56e-10
        ADVI |  -1.736451   .6090257    -3.18   0.002    -3.133719   -.7431637
         RPI |   1.42e-06   1.78e-07     8.44   0.000     1.15e-06    1.85e-06
          KI |   .0038761   .0021473     2.04   0.204    -.0727207   -.0048156
      dmmy99 |   .0462141    .023551     1.96   0.050    -7.28e-06    .0924354
------------------------------------------------------------------------------
```

(ii). BTAP Model

```
stepwise,pr(0.1): reg BTAP   RegD OwnD LnFsize DepR DDR KI INVTO ADVI RPI IMPI MKS LnASS LnFag
> e dmmy97 dmmy98 dmmy99 dmmy2000 dmmy2001 dmmy2002 dmmy2003 dmmy2004 dmmy2005 ,robust noconstan
> t
                      begin with full model
p = 0.7297 >= 0.1000  removing dmmy2004
p = 0.7157 >= 0.1000  removing dmmy2003
p = 0.6600 >= 0.1000  removing dmmy2005
p = 0.5065 >= 0.1000  removing OwnD
p = 0.5071 >= 0.1000  removing MKS
p = 0.2304 >= 0.1000  removing RPI
p = 0.1801 >= 0.1000  removing dmmy2002
p = 0.2235 >= 0.1000  removing dmmy2001
p = 0.1849 >= 0.1000  removing DDR
p = 0.1299 >= 0.1000  removing ADVI

Linear regression                                      Number of obs =     910
                                                       F( 10,   899) =  289.03
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.4805
                                                       Root MSE      =  .41291

------------------------------------------------------------------------------
             |               Robust
        BTAP |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
        RegD |  -.0846316   .0313262     2.70   0.007     .0216495    .1446018
      dmmy98 |   .2795368   .0541188     5.17   0.000     .1733229    .3857508
     LnFsize |   .1112741   .0187451     5.94   0.000     .0633859    .1391195
        DepR |  -.5393631   .1266242    -4.26   0.000    -.8145699   -.3136111
      LnFage |  -.0677717   .0275962    -2.46   0.014    -.1458146   -.0376232
    dmmy2000 |   .3231429   .0565596     5.71   0.000     .2121386    .4341472
       INVTO |   9.84e-09   5.97e-10    16.49   0.000     9.31e-09    1.13e-08
       LnASS |  -.0853905   .0186706    -4.57   0.000    -.1255551   -.0508558
      dmmy99 |   .3348473   .0642093     5.21   0.000     .2088297    .4608648
        IMPI |  -.2584251   .0686913    -4.57   0.000    -.4149347   -.1503154
      dmmy97 |   .2962098   .0538411     5.50   0.000      .190541    .4018787
          KI |  -.0034114   .0034134    -0.93   0.002      .312587    .4732677
------------------------------------------------------------------------------
```

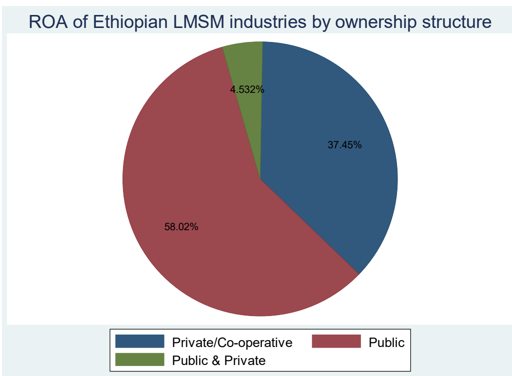
(iii). For ROA model

```
stepwise,pr(0.1): reg ROA    RegD OwnD LnFsize DepR DDR KI INVTO ADVI RPI IMPI MKS LnASS LnFage
>  dmmy97 dmmy98 dmmy99 dmmy2000 dmmy2001 dmmy2002 dmmy2003 dmmy2004 dmmy2005 ,robust noconstant
                      begin with full model
p = . >= 0.1000       removing INVTO
p = 0.9122 >= 0.1000  removing DepR
p = 0.9216 >= 0.1000  removing dmmy2005
p = 0.8305 >= 0.1000  removing dmmy99
p = 0.7977 >= 0.1000  removing IMPI
p = 0.5289 >= 0.1000  removing dmmy97
p = 0.5349 >= 0.1000  removing dmmy98
p = 0.4360 >= 0.1000  removing KI
p = 0.2988 >= 0.1000  removing dmmy2002
p = 0.3110 >= 0.1000  removing dmmy2000
p = 0.3424 >= 0.1000  removing LnFage
p = 0.1699 >= 0.1000  removing dmmy2003
p = 0.1297 >= 0.1000  removing RegD

Linear regression                                      Number of obs =     910
                                                       F(  9,   901) =  124.18
                                                       Prob > F      =  0.0000
                                                       R-squared     =  0.6890
                                                       Root MSE      =  .06262

------------------------------------------------------------------------------
             |               Robust
```

ROA	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
DDR	-.036191	.0095041	-3.81	0.000	-.0755952	-.0567191
dmmy2001	.2315457	.0162346	1.31	0.000	.0164778	.2893652
OwnD	-.0238939	.0044714	-5.34	0.000	-.0211476	-.0006602
LnFsize	.0078062	.0022563	3.46	0.001	.0162383	.0256754
LnASS	-.0214402	.0017754	-12.8	0.000	-.0264885	-.017412
MKS	.4144413	.2079134	1.99	0.047	-.7465967	-.0101979
dmmy2004	.0126637	.0465277	2.21	0.034	.1834632	.2473163
ADVI	.6232503	.1249777	4.99	0.000	.3686284	.8559722
RPI	8.31e-08	4.30e-08	1.93	0.054	-2.33e-07	-5.91e-08

Figure-12

Figure-13



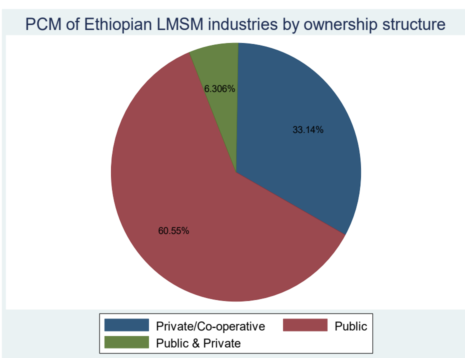


Figure-14

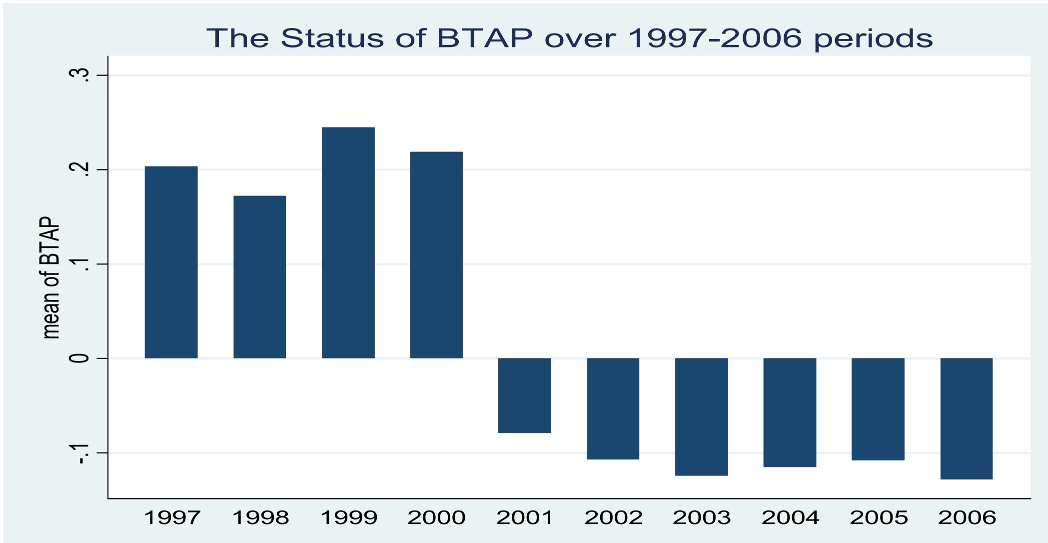


Figure-15

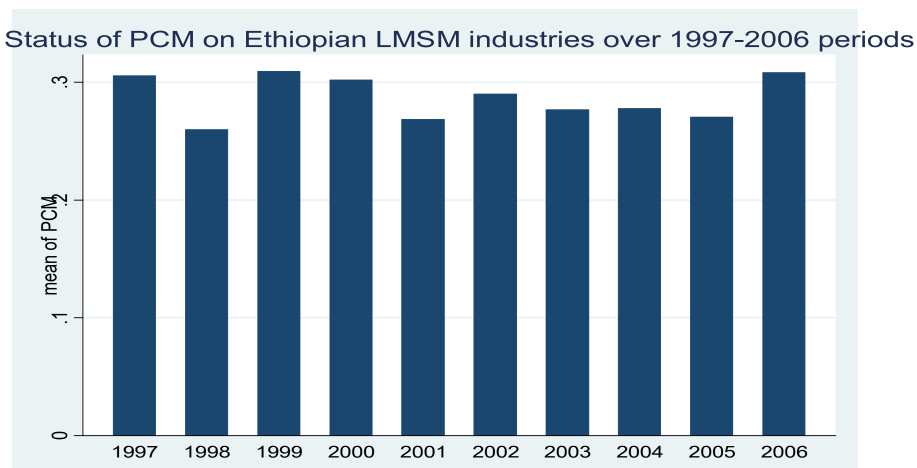
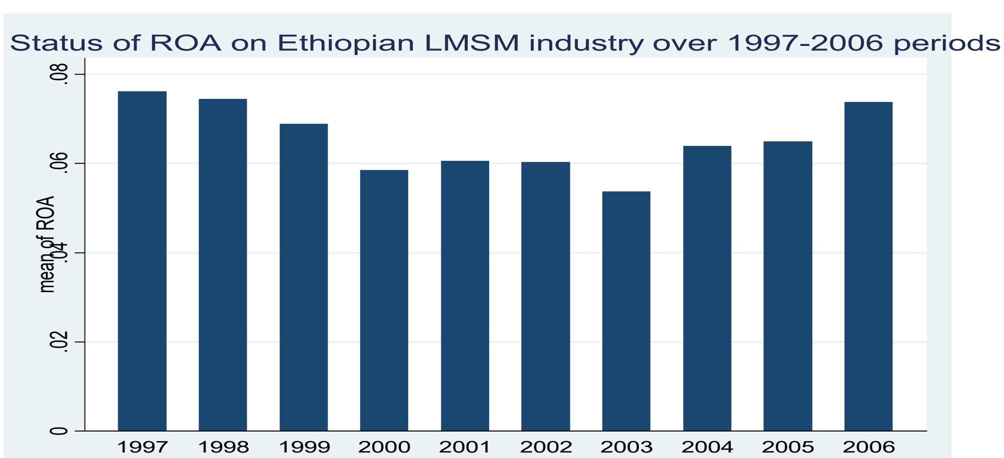


Figure-16



DECLARATION

I hereby declare that this thesis work is entirely my own work and it has never been submitted as an exercise for a degree of any other university and that all sources of materials used for it have been duly acknowledged.

Name: Haftu Gebrehiwot

Signature: _______________

Place: Faculty of Science, Addis Ababa University

Date: June, 2009

This thesis has been submitted for examination with my approval as a university advisor.

____

Emmanuel G/Yohannes (Ph.D)