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THE DETERMINANTS OF FIRM GROWTH FOR ETHIOPIAN LARGE AND MEDIUM SCALE MANUFACTURING INDUSTRIES: A DYNAMIC PANEL STUDY

By

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ACRONYMS

ACP- African, Caribbean, and Pacific

COMESA- Common Market for Eastern and Southern Africa

CSA- Central Statistics Agency

EC-European Community

GDP- Gross Domestic Product

GMM- General Moment of Methods

GNI- Gross National Income

GSP- Generalized System of Preference

GTP- Growth and Transformation Plan

IFC - International Finance Corporation

ISIC- International Standard Industrial Classification

ISO- International Organization for Standardization

LPE- Law of Proportionate Effect

MES- Minimum Efficient Scale

OLS- Ordinary Least Squares

SSA- Sub Saharan Africa

SMEs- Small and Medium Enterprises

WTO- World Trade Organization

ABSTRACT

In this dynamic panel study, the determinants of growth of Ethiopian large and medium scale surviving manufacturing firms' growth is analyzed from year 1992 to 2000 (E.C) using System GMM estimation. Estimations are done for the whole surviving firms, and at cohorts of size and age. Incorporating lag of growth, size and other firm attributes as explanatory variables in all estimations, Gibrat's stochastic growth theory is rejected. The persistence of growth is significant for all specifications except for medium and young firms. In cases persistence is significant; lag of growth affects current growth negatively except for smaller firms. Similarly, negative-significant size effect of growth is found for all cases except for adult and mature firms. With regard to other firm attributes, labor quality, asset, productivity, and leverage are found to positively affect growth but insignificant except labor quality for the whole surviving firms. Negative and significant relationship is found between capital intensity and growth for the whole surviving sample. For the size cohort, variables with significant effect includes productivity, labor quality and capital intensity. Productivity is significant for smaller and medium firms' growth. It has positive impact on growth for the medium firms and it confirms the Jovanovic's (1982) hypothesis while the effect is negative for smaller firms. Labor quality is positive but significant only for smaller firms, whereas, capital intensity is negative but significantly affects growth only under medium firm cohort. Similarly, under age cohort, age, quality, capital intensity and asset are found to be significant variables in different cases. From policy perspective, the government should give attention for the development of human power with industry-driven skills. Further, privileged treatment should be given for smaller and younger firms which are key labor employers.

Key words: Ethiopian manufacturing firms, growth determinant, dynamic panel study, and SystemGMM.

CHAPTER ONE

1. INTRODUCTION

1.1. Background of the study

With 73,918,505 people (CSA's 2007 third population and housing census report), Ethiopia is the third most populous country in Africa, with a rapidly growing young population (growth rate of 2.6%). According to the World Bank's report (2008), it is one of the world's least developed countries, ranking 171 out of 178 countries on the Human Development Index. Ethiopia's Gross National Income (GNI) per capita is as low as US$ 170 (World Bank, 2008). World Bank (2008) also reported that the national poverty rate as percentage of the population was 44%. Lack of basic education is a big problem, but, again, the government is undertaking strong efforts to improve this situation (for example, the primary completion rate and the gross secondary enrollment rate increased from 22% and 13 % to 49% and 27% respectively from 2000 to 2006 as percentage of relevant age group).

The Ethiopian economy is largely agrarian[1]. About 47% of GDP is contributed by agriculture in 2006 (World Bank, 2008). Agriculture is dominated by smallholders, the majority cultivating less than 0.5 hectare and producing mostly basic staples for the subsistence of their households. Despite some geographical disadvantages due to dependence on irregular rainfalls, increasing soil erosion, and aridity in some regions and pervasive tropical diseases in others – many regions of Ethiopia have substantial agricultural potential, with different climate zones and relatively

[1] According to the World Bank 2008 report, percentage of male employment in the agricultural sector to total male employment is about 84% while 76% of the total female employment is engaged in the agricultural sector in the year 2003-2006. The same source also reported that 83.7% of the total population lives in the rural Ethiopia in 2006.

good availability of water. Agricultural productivity, however, is stagnating, and food security is a major concern. Several million people are once again dependent on food aid.

Manufacturing has stagnated for a long period. It is not a surprise given the overall low growth of the industrial sector for long time. For example, from the total contribution of the industrial sector of 13% to Gross Domestic Product, it is only 5% that comes out of the manufacturing sector in 2006 (World Bank, 2008). Manufacturing industry is largely limited to simple agro-processing activities (sugar, grain milling, edible oil production, leather tanning) and production of basic consumer goods (beer, footwear, textiles and garment). Industries that might help accumulate technological capabilities and create dynamic inter-industry linkages – such as chemical, electrical and electronics, metal-processing and other engineering industries – are almost non-existent. The technological level of firms is very low, even by regional standards; e.g. only 4% of firms use technology licensed from foreign companies, and likewise only 4% have International Organization for Standardization (ISO) certification compared to 12% in both cases in Sub-Saharan Africa (World Bank / International Finance Corporation (IFC), 2006).

According to the World Trade Organization (WTO), the manufacturing sector contributes only 10.1% of total exports in 2009 while agricultural products account for 84.8% of the export. Basically, all manufacturing exports are agriculture-based (clothing, canned and frozen meat, semi-processed hides, footwear, beverages, and oilcakes). On the import side, Ethiopia imports most capital goods and manufactured consumer goods, and the country is heavily dependent on fuel imports. WTO has also reported that the import for manufacturing products is 71.5 % of the total import of the country in 2009.

However, Investment opportunities are immense for Ethiopian manufacturing. These opportunities take advantage of the country's comparative advantage in labor intensive industries, the potentially large domestic market or the natural resource endowments of the country. Ethiopia has a large supply of cheap semi-skilled and skilled labor which can be easily upgraded to the required skill level. The accumulated manufacturing experience is also quite significant since the industrialization traced so many years back. It is to be noted that most of the manufacturing enterprises in the country are wholly run by Ethiopian managers, engineers and technicians. This engagement in the different ladders of work in the manufacturing sector provides comparative advantages and enhanced competitiveness for labor intensive industries to be developed in the country both for domestic and export markets. These advantages offer opportunities for investment especially in textile, garment and leather product industries, and possibly, in light engineering and assembly type of operations as they are assumed to be labor intensive industries.

Ethiopia's membership of the Common Market for Eastern and Southern Africa (COMESA) embracing 23 countries with a population of approximately 300 million will further help these industries. Ethiopia enjoys the benefits of preferential tariff rates on exports to these countries. Under the terms of ACP/Lome convention,[2] export products from Ethiopia to the European Union market are entitled to duty reductions or exemptions and freedom from all quota restrictions. Also under the generalized system of preference (GSP), a wide range of

[2] The first Lomé Convention (Lomé I), which came into force in April 1976, was designed to provide a new framework of cooperation between the then European Community(EC) and developing 71 African, Caribbean, and Pacific(ACP) countries, in particular former British, Dutch, Belgian and French colonies. It had two main aspects. It provided for most ACP agricultural and mineral exports to enter the EC free of duty. Preferential access based on a quota system was agreed for products, such as sugar and beef, in competition with EC agriculture. Secondly, the EC committed ECU 3 billion for aid and investment in the ACP countries.

manufactured products are entitled to preferential duty treatment in the U.S.A, Canada, Switzerland, Norway, Sweden, Finland, Austria, Japan as well as most European Union countries.

The population with large annual growth indicates the domestic market potential and its possible growth which is indeed considerable. The large and fast growing domestic market offers good prospects for investment and development of consumer goods industries such as food, beverages, tobacco, plastic products, soap and detergents, drugs and pharmaceuticals, paper and paper products as well as electrical and electronic products.

Ethiopia is endowed with a variety of natural resources which could support viable resource-based industries. Of great significance in this respect is the prospect for agro- and agriculture-based industries such as meat processing, dairy processing, sugar, edible oil, and starch and glucose. Ethiopia grows cotton and this could readily be expanded to support the development of additional textile factories. The country further possesses suitable agro-ecological zones for developing large-scale plantations for rubber and pulp processing.

Mineral-based chemical and chemical product industries also offer a great potential. The basic raw materials for these industries include fossil fuels such as crude oil, natural gas and coal; and non-metallic industrial minerals such as limestone, sodium chloride, potassium chloride, pyrite, soda ash, potash and phosphate rocks. Based on existing studies, most of these and other minerals required for industrial processing, including fertilizer production, could be developed locally.

Despite this huge potential opportunity for manufacturing industrialization and despite the government's commitment for its development (the newly developed growth and transformation plan is the case in point[3]), less is achieved in the growth and expansion of industries in general and the medium and large sized manufacturing in particular in the country. In this regard, this study will be in great help by identifying the major determinants which affect firm growth for the large and medium scale manufacturing industries in the country.

1.2. Statement of the Research Problem

It is clear that the welfare of a society depends upon the economic growth of their industries and their people. Through the creation of new firms and expansion of the existing ones, the economy generates new employment and opportunities making possible a more prosper life for the people. This importance of firms' growth urges politicians, economists and international development agencies to devote on substantial resources to the creation and implementation of programs that assist firms' growth in the way economic prosperity is ensured. To bring economic prosperity through the channel of firm growth, the programs designed for the improvement of firm growth must be highly effective and efficient.

However, bringing industrialization and then enormous employment and prosperity of life is not simple and a onetime phenomenon. A critical development challenge for African economies is increasing the contribution of manufacturing to GDP and world export of manufactures

[3] According to the growth and transformation plan, enabling the industrial sector to play a considerable role in the economy by promoting export oriented industrial development, attaining due attention to industries that can substitute import-trade based on free market competition, and expanding employment opportunities and addressing poverty by ensuring swift, sustainable and fair economic growth are the other goals set to register swift, sustainable and judicious economic growth.

(Shiferaw, 2007). African manufacturing has not only lagged behind other developing regions, it has also fallen behind its own recent past on both counts. Small domestic market size and poor infrastructure have long been identified as major structural problems in African manufacturing. Recently explanations give reasons of volatile macroeconomic and political environment, and corruption in Africa that render the region's investment climate too risky for the private sector. This is a valuable insight from macro level explanation by assuming firms to respond for industry/country level incentives and shocks.

Currently, using the advantage of availability of micro data, the research work on the analysis of firm growth plays an important role in the performance, dynamics and growth determinant at firm level. From a microeconomic perspective, the more continuously firms grow, the higher probability of survival they have. Furthermore, firms with positive rates of growth will reduce unemployment via creating new jobs, and even push competition in the market. Besides, market concentration is influenced by firm growth in different cohort i.e. if small/large firms grow more quickly than large/small firms, market concentration will tend to diminish/increase. Growth at a high rate will increase the share of a firm and its competitiveness in the market. Therefore, dynamic analysis of firm growth in terms of evaluating factors affecting growth becomes extremely important in microeconomics.

From a macroeconomic perspective, economic growth is mainly determined by firm growth (Ghosh, 2008). An increase in firm growth implies an increase in the firm's contribution to gross domestic product (GDP). Firm growth requires an increase in demand for production factors and, through backward and forward linkages, it boosts economic activity at regional level as well as national level. Consequently, the economic growth is improved as a whole.

In order to increase the contribution made by manufacturing firms' growth to the economy through different channels, isolating the constraining factors of firm growth and make urgent remedies for them is required. In line with this, different empirical works have been done concerning the determinants of firm growth for both developing and developed countries. Some of the studies are given in the following few paragraphs.

The empirical evidences began from the foundation of Gibrat's (1931) hypothesis. According to this hypothesis, the growth rate of a given firm is independent of its size at the beginning of the period examined. In Mansfield's (1962) word, ''the probability of a given proportionate change in size during a specified period is the same for all firms in a given industry regardless of their size at the beginning of the period." Numerous empirical studies have tested the validity of this law but find conflicting results. Some authors support the law (example, Steindl, 1965; Prais, 1976), but was rejected by others (example, Reid, 1992; Audretsch et al., 1999; Almus and Nerlinger, 2000). More recently, Gibrat's law has been tested in the presence of other potential determinants of firm growth (Higson et al., 2002, 2004; Beck et al., 2005; Bartelsman et al., 2005; Fisman and Svensson, 2007). However, all these studies rejected the law.

Empirical studies testing Gibrat's law has been conducted by different researchers for Ethiopian manufacturing in recent periods; Shiferaw (2006), Bigsten and Gebreeyesus (2007), and Gebreeyesus (2006). According to Shiferaw, small firms grow faster than large enterprises implying that Gibrat's law is not accepted. Similar results are found from the empirical studies of Gebreeyesus (2006) and Bigsten and Gebreeyesus (2007).

In fact all these studies have been devoted for the test of Gibrat's law using the static method. Previous researches give due attention for testing the Gibrat's Law of static method of analyzing firm growth. However, one branch of literature analyses the possible correlation between past and future firm growth process[4]. Thus, this study will extend the previous work by using the dynamic method. Moreover, the data set this study used is a bit longer period of time (nine years) from 1992 to 2000 E.C. This makes a significant boundary between previous and this study's dataset. In this regard, this study fills these gaps.

1.3. Objective of the Study

The main objective of the study is to empirically examine growth determinants of firms for the Ethiopian large and medium scale manufacturing industry.

The specific objectives are:

- Examine Gibrat's law for large and medium scale manufacturing firms using the recent panel dataset
- Examine the effects of firm attributes on its growth (the effect of productivity, capital intensity, leverage on firm growth)
- Show how this relation changes at different size and age cohorts of firms more rigorously
- Examine whether there exists persistence of growth among firms

[4] This possible relationship between temporal growth rates is known as the persistence of firm growth. The analysis of this persistence growth of firms is known as the dynamic method.

1.4. Significance of the Study

If the study is accomplished as intended, then it will have the following significances to policy makers, incumbent and prospective firms in the following way:

- Policy makers can wisely intervene in improving firm performance by assisting firms to tackle those factors that inhabit growth and helping them to attain those factors that positively affect employment growth. This will be a compliment to implement the newly developed government plan, growth and transformation plan (GTP).
- It will give a direction as to how the private and public large and medium scale enterprises are working and give an insight on what must be done then to improve their performance and sustenance in the market.
- It will be the guiding paper for those potential entrants by providing information on what looks like the growth of firms for the incumbent firms for this particular industry.

1.5. Organization of the Paper

This research work has five chapters for its presentation. Chapter one provides introduction part of the research while the second and the third chapters are given for the literature review and data and methodological framework respectively. The review part describes different theories concerning firm growth. Issues concerning type, source and the nature of data and the method of analysis are discussed in the third chapter. In the fourth chapter the finding of the paper (using both descriptive and econometric analysis) is presented. And, finally, the conclusions and the recommendations part is given in the last chapter of the paper.

CHAPTER TWO

2. LITERATURE REVIEW

This chapter discusses the theoretical literature on the size-growth relationship of Gibrat Law, additional determinants of firm growth, growth strategies and the persistence of growth under each section. To make evidence for each theoretical explanation, empirical works using different countries real data are also reviewed after each theory.

2.1. Gibrat's Law

After Robert Gibrat's (1931) seminal publication, Gibrat's law receives huge attention in the empirical industrial organization literature. Gibrat's (1931) theory of a 'law of proportionate effect (LPE)' was formulated when he observed lognormal distribution of French manufacturing establishments. It states that the expected growth rate of a given firm is independent of its size at the beginning of the period examined. In the words of Mansfield (1962), "the probability of a given proportionate change in size during a specified period is the same for all firms in a given industry – regardless of their size at the beginning of the period."

Thus, according to Gibrat's law, firm's growth is stochastic in nature and unpredictable. The law has three main propositions: (i) that firms of different size classes have the same average proportionate growth (i.e., small and larger firms have the same growth rate); (ii) that the dispersion of growth rates about the common mean is the same for all size classes; and (iii) that there is no serial correlation in growth rates. According to the law, growth is unrelated to firm size, so that large and small firms have equal probabilities of attaining a particular growth rate

within any given period. Over time, however, some firms will be lucky and tend to enjoy an above average share of high growth rates, while others are unlucky and tend to remain the same size or decline. Concentration can therefore be expected to increase naturally over time and skewed firm size distribution will be observed.

Gibrat's law is challenged by Bain (1956) who argues that there is a Minimum Efficient Scale (MES) [5]which is achieved when a firm attains a size corresponding with the minimum long run average cost. Firms with sizes smaller than the MES enjoy economies of scale until they reach the MES but all firms beyond the MES are characterized by constant returns to scale. Hence, firms below the MES experience growth relative to those with the optimal size, where there is no growth, contradicting Gibrat's law. According to the MES argument, there is no growth once a firm achieves its MES since sizes higher than MES are associated with loss. This is the neoclassical theory of firm growth. The dispersion of firm size will be small (due to non-optimal behavior), and this dispersion will become smaller over time, as firms converge towards the equilibrium size. Thus the prediction from the neoclassical theory of the firm is that firm size will in the long-run converge towards some optimum size.

The other theoretical work is associated with Lucas (1978) and Jovanovic (1982). Lucas's thesis is that the equilibrium size distribution of firms depends on the distribution of managerial capabilities within a population. According to this argument, any firm size may be optimal given

[5] It is important to note that the minimum efficient scale (MES) to which firms converge in the long-run varies from industry to industry. Small firms operating below the MES have to grow to be competitive and survive in that particular industry. Large firms operating above the MES tend to shrink if the advantages of exploiting scale economies are outstripped by organizational problems. The need for start-up firms to grow depends on their start-up size and how prevalent scale economies are in the firms' industry. The smaller a firm's start-up size relative to the MES, the more urgent it is for the firm to grow. And, the larger a firm's start-up size to the MES, the less urgent for the firm to grow and the lower the growth rate.

its manager's ability. Jovanovic formulate a 'learning model' based on the Lucas theory. According to him, firms learn about their efficiency levels once they are established; managers 'guess' their firms' efficiency from a distribution of efficiency rates. As managers learn from their past guesses they update their information base and formulate better guesses in the future. Jovanovic firstly developed model is called a model of passive learning which initially explores unknown, time-invariant characteristics which may affect firm's decision on its strategy exit, grow up or down. The process of learning narrows the variance between the guessed and the actual levels of efficiency as firms grow older. According to Jovanovic (1982), younger firms have more variability in their growth rates and they will grow faster than the older firms. The model, therefore, predicts a negative relationship between age and firm growth.

Jovanovic's model is not without limitation. The problem with the model is that it is static as it keeps the efficiency parameter fixed. Later on, Pakes and Ericson (1987) proposed this parameter to have some dynamic nature. According to Pakes and Ericson (1987), [6]stock of human capital is better placed to make the best guesses, implying that they are capable to run their firms more efficiently. As a result, firms with high human capital register higher rates of growth relative to those with low human capital.

In the late 1990s, some scholars like Sutton (1997) and Caves (1998) defended Gibrat's hypothesis by saying the law is a dynamic rule valid for large and mature firms that had already attained the minimum efficient scale (MES) level of output. Geroski (1995) pointed out that those well-established enterprises with random growth rates do not seem to vary with firm size.

[6] The model of active learning was proposed by Ericson and Pakes (1995) and Pakes and Ericson (1998). It focuses on the impact of uncertainty arising from investment in research and exploration-type processes. Its empirical finding is that current size was weakly increasing in initial size.

Geroski et al. (2003) support that Gibrat's law tends to be valid for large-sized enterprises only or for those that have exhausted scale economies.

Generally, recent scholars refute the law and some suggest the conditions for which the law is valid. Calvo (2006) support the proposition that small and young firms have grown more rapidly than their larger and old counter parts respectively. He also found that innovating activity has a significant positive effect in the firms' survival and growth. The implication is that the smaller and younger firms are more innovative than their larger and older counter parts. Fotopoulos et al. (2008) reject Gibrat's law for Greek manufacturing firms as a whole but accept the law for medium, large, and old firms. Lotti et al. (2009) postulate that Gibrat's law is rejected ex ante, but a significant convergence toward Gibrat-like behavior can be detected ex-post and the law is valid in the long-run. Melhim et al. (2009) found that the smallest and largest firms grow fastest. Gibrat's Law is rejected once again by Teruel-Carrizosa (2009) who concludes that small firms grow faster than large firms. He also found that small firms in service industries do not grow as fast as small firms in manufacturing industries suggesting that market structure affects the capacity of firms to grow.

In the context of Africa, Bigsten and Soderbom (2005) found mixed evidence on the Gibrat Law in Sub Saharan Africa (SSA) manufacturing. Mead and Liedholm (1998), Gunning and Mengistae (2001), and Sleuwaegen and Goedhuys (2002) reported negative relationship between firm growth and size. Teal (1998) found highest rate of growth for medium-sized firms in Ghana, while Harding et al. (2004) found no evidence of correlation between growth and size. In Ethiopia, there is evidence for a negative relationship between firm growth and size (Bigsten and Gebreeyesus (2007), Shiferaw (2006), and Gebreeyesus (2006)).

2.2. Other Determinants of Firm Growth

Theory tells us that size is not the only factor affecting firm growth. Firm growth is also determined by factors like age, innovation, labor quality, financial performance, productivity, book value of total assets, capital intensity, ownership of firms, legal form, and other industry specific factors. In the following subsections, a review is made on these factors to understand the theoretical predictions on other determinants of firm growth and empirical works so far.

2.2.1. Age

Learn-theoretic models like the one proposed by Jovanovic (1982) postulate negative relationship with firm growth. Older firms have already learned about their relative efficiency and have adapted their size accordingly – no need to grow. Returns from the process of learning are supposed to decrease over time, making it more and more difficult to enhance efficiency further as firms grow older. Life-cycle models explain the negative relationship by increasing saturation of the market for a firm's products and the expanding presence of competitors offering new or enhanced products.

Age and size are closely related, and in some cases, they are both taken to represent what is essentially the same phenomenon (Greiner, 1972). Fizaine (1968) observed a negative effect of age on the growth of establishments from the French region. Fizaine also argued that the correct causality runs from age to growth, rather than from size to growth as supposed by many investigations into firm growth based on Gibrat's law. Dunne et al. (1989) analyze US establishments and concur with Fizaine's findings. This negative relationship is testified by a number of studies– Evans (1987a, b) for US manufacturing firms, Variyam and Kraybill (1992)

for US manufacturing and services firms, Liu et al. (1999) for Taiwanese electronics plants, and Yasuda (2005) for Japanese manufacturing firms.

However, monotonous negative relationship is not always observed. Das (1995) examined the growth of firms in a young computer hardware industry in India and obtained unusual results that growth increases with age. Barron et al. (1994) found older firms to grow faster than adolescent firms, although the very young firms experience the fastest growth for New York Credit Union. For the Ethiopian Manufacturing firms, Bigsten and Gebreeyesus (2007) have found negative relation between growth and age for younger firms at the early stages of their life cycles. This means that firm age affects growth negatively, but the negative effect diminishes with age. According to them, the turning point at which the negative effect of size on growth turns positive is an age of 8.7 years for a given mean size. After this age the relationship between age and growth of the firm becomes positive. Hence, irrespective of the model the negative relation between growth and age predicted by the learning process affects only firms at the early stages of their life cycle. Shiferaw (2007) has not found significant relationship between growth and age of firms while confirming negative relationship between size and growth.

2.2.2. Innovation

Innovation is the catalyst and the driver of firm growth, and more so especially when mature phase of the industry life-cycle characterized by more scale economies and more cost cutting 'process' innovations is considered (Klepper, 1996). However, the impact of innovation on growth is different for different types of firms such as firms with a focus on product or process innovations (Brouwer et al., 1993); slow and fast growing firms (Coad and Rao, 2008; Mason et

al., 2009); firms with different levels of R&D intensity (Del Monte and Papagni, 2003); and low-tech and high-tech firms (Stam and Wennberg, 2009).

In this section, a review is made on the effect of innovation on the growth of the firm when the growth of the firm is defined and measured differently (i.e., sales growth and employment growth). The innovative difference between size class differences and within the same size class is also given attention here.

2.2.2.1. Innovation Between and Within Size Classes

Innovation may differ when one considers firms of different size. Even, the difference may come with heterogeneity of firms within the same size class. In general, small and large firms conduct different types of innovative activities that vary in scale, scope, and efficiency (Demirel and Mazzucato, 2010).

According to Klepper, (1996) small firms tend to explore more the novel technologies and concentrate on product innovations. However, large firms, in many different industries excel in process innovations and incremental changes to established technologies especially during their 'mature' phase of the industry life-cycle. With regard to persistency of innovation, small firms differ from large firms by conducting innovations on a less persistent basis (Cefis, 2003; Geroski et al., 1997) and undertaking more informal R&D that is distributed among various operational units (Santarelli and Sterlacchini, 1990). For example, in the pharmaceutical industry, small biotech companies and small pharma firms focus on niche areas of new molecular entity discovery while large pharma firms focus on the development side of the R&D equation as well as the marketing of the drugs (Demirel and Mazzucato, 2010).

Innovational difference is also observed for firms of the same size. Accordingly, some firms innovate while many others do not (Nelson and Winter, 1982). When the innovative firms are taken in to account, there is a wide range of differences in their R&D capabilities, their sources of innovation, degrees of innovativeness and innovative persistence[7] (Utterback and Suarez, 1993). Concerning to the difference in persistency, many studies have found that most innovating firms tend to innovate occasionally rather than persistently (Geroski et al., 1997).

2.2.2.2. Innovation and Employment Growth

Theoretically, the effect of innovation on employment is ambiguous at the firm level. In addition to direct effects, indirect effects depending on parameters of the production function, the respective output and labor markets and the characteristics of the innovation itself exist (Blechinger et al. 1998). Innovations can be categorized as process (producing a given amount of output with less input and affects firm's production function) or product innovations (producing quality improved and new products thus affecting the demand function).

The direct effects of process innovations involve an increase in productivity and a decrease in production costs. For a given amount of output, labor augmenting progress will have a negative impact on employment when direct effect is considered. However, the decline in marginal costs tends to reduce prices and thus increase demand and employment (indirect effect). The indirect effect will outweigh the direct effect, ceteris paribus, if demand is elastic and there is high

[7] The degree of persistence in innovative activities within an industry determines the degree to which innovations build on existing knowledge and capabilities, and consequently, whether the identity of innovators persists over time (i.e. the probability of established innovators being replaced by new ones).

elasticity of substitution between labor and capital. If this is the case, the net effect out of process innovation will increase employment.

The direct effect of product innovations is the generation of new demand and/or the conquest of market shares at the expense of other firms (if innovation is an improvement for the existing product). Consequently, firm's employment demand will rise. By offering a new or quality-improved product, a firm can obtain temporary monopolistic profits until other firms are able to imitate the product or to develop an even better one. However, the new product might replace existing products offered by the firm. Moreover, the novelty and uniqueness of the product might lead to a lower price elasticity of demand for the product, which entails an increase in price and a decrease in optimal output. As a consequence of this indirect effect, employment of the firm in question might decline (Smolny, 1998b). Thus, the net effect on employment depends on the relative strength of the positive quantity effect and the negative price effect once again.

There needs to be an empirical study therefore to settle this theoretical ambiguity regarding the effect of innovation on employment. Katsoulacos (1986) found a positive net effect of product innovations on employment while he finds the net effect of process innovations to be negative. Jaumandreu (2003) using Spanish community innovation survey data finds that process innovations are not responsible for net employment displacement and product innovations lead to a positive employment growth. Peters (2004) finds positive effects of product innovations and negative effect of process innovations on employment growth for the German For the manufacturing sector. Harrison et al. (2005) researched the same issue for France, Germany, Spain and the UK and they reported positive effects of product innovation on employment growth and negative effects of process innovations in the manufacturing sector.

2.2.2.3. Innovation and Sales Growth

Innovation plays important role for firms wishing to expand their market share. Carden (2005) presents the main results of the McKinsey Global Survey of Business Executives, and writes that "executives overwhelmingly say that innovation is what their companies need most for growth." Another survey focusing on Small and Medium Enterprises report that investment in product innovation is the single most popular strategy for expansion, a finding which holds across various industries (Hay and Kamshad, 1994). Economic theorizing also recognizes the centrality of innovation in growth of firm sales (Geroski, 2000, 2005).

However, empirical studies did not found strong link between innovation and sales growth. Indeed, some studies fail to find any influence of innovation on sales growth at all. A major difficulty in observing the effect of innovation on growth is that it takes a firm a long time to convert increases in economically valuable knowledge (innovation) into economic performance. Even after an important discovery has been made, a firm will typically have to invest heavily in product development. In addition, converting a product idea into a set of successful manufacturing procedures and routines may also be costly and difficult. Furthermore, even after an important discovery has been patented, a firm in an uncertain market environment may prefer to treat the patent as a 'real option' and delay associated investment and development costs (Bloom and Van Reenen, 2002). Therefore, there is a lag between the time of discovery of a valuable innovation and its conversion into commercial success and there is uncertainty at every stage, and that the overall outcome requires success at each step of the process.

Nevertheless, innovation is seen to be of critical importance for a handful of fast-growing firms. This emphasizes the inherent uncertainty in firm-level innovative activity – whilst for the 'average firm' innovativeness may not be very important for sales growth, innovativeness is of crucial importance for the 'superstar' high-growth firms (Coad, 2007).

2.2.3. Financial Performance

Firms may get financial means for expansion from sources like retained earnings and profits, borrowing, and new issues of stock shares. Retained earnings are one of the most important sources to finance new projects in emerging economies where capital markets are not well. However, firms in the start-up period, when initial investments have not matured yet or with investment projects substantially larger than their current earnings will not have enough financial means from retained earnings and will reach a constraint in their growth project. Firms in this situation may seek external sources of financing though the extent of borrowing could be limited by internal factors like high debt-equity ratios that would expose both borrower and lender to increased risk. In other cases, financing of growth projects may be limited by lack of development of financial markets. Rajan and Zingales (1998) found that industrial sectors with a great need of external finance grow substantially less in countries without well developed financial markets.

Traditionally the relationship between financial performance and firm expansion has taken the view that any sensitivity between financial performance and investment signals the problem of 'financial constraints' and 'information asymmetries.' Evolutionary interpretation of the relationship between financial performance and growth is given below.

Mainstream research in expansion of firms has based itself on the *q*-theory of investment.[8] If certain assumption are met (like profit-maximizing firm, and efficient financial markets), then a firm's growth prospects can be entirely summarized by the stock market's expectations concerning a firm's expected future profits. In other words, the only predictor of firm-level investment should be the marginal change in the ratio between the market value of the firm and the replacement value of the firm's existing assets. This latter ratio is known as marginal *q*. However, Tobin's q does not seem to explain a great deal of investment behavior. One possible interpretation is that profit-maximization on an infinite horizon is not a useful explanation for firm's investment decisions (Coad, 2007). Furthermore, and contrary to theoretical predictions, other variables such as lagged *q*, output, or cash flow, are significant.

Following the *q*-theory of investment, Fazzari et al. (1988) demonstrate that investment behavior of US listed manufacturing firms depends not only on *q* but also on cash-flow. Starting from the optimizer assumption of firms, they interpret any sensitivity of investment to cash flow as evidence that capital markets are imperfect, and that these 'optimal' firms cannot rely on external finance but instead they must finance their investment using internal funds. In their view, investment should not be related to cash flow, and if it is, this indicates that firms are receiving insufficient external finance for their investment plans. The 'financial constraint' interpretation of investment-cash flow has several flaws in its interpretation, however. Kaplan and Zingales (1997, 2000) examined firms that were classified a priori as financially constrained using the

[8] Note that the literature does not elaborate upon the distinction between replacement investment and expansionary investment. The Q-model of investment has proved to be a popular and powerful framework for analyzing the investment decisions of firms, linking the firm's optimal investment decisions to expected future profitability via the observable stock market valuation of the firm.

methodology of Fazzari et al. (1988, 2000), but they find that these firms are actually in good financial standing.

The main prediction for firm expansion from the evolutionary approach is that investment or firm growth can be expected to respond to financial performance. This is due to the principle of 'growth of the fitter'. In this view, firms fight for growth opportunities, they are in a continual struggle to grow, and only those with superior financial performance will be able to gain additional market share. Coad (2005) found a statistically significant relationship between financial performance and sales growth for French manufacturing firms though he concludes firm's profit rate and its subsequent growth rate as entirely independent due to the small magnitude of the coefficient.

2.2.4. Productivity

The most productive firms are assumed to grow while the least productive will decrease in size. However, a number of studies make the validity of the evolutionary principle of 'growth of the fitter' doubtful when relative productivity is taken as a proxy for fitness. The explanation may be due to differences in bringing productivity: a firm may expand or downsize to be productive. Baily et al. (1996) found a balanced growth in terms of employees observing increasing labor productivity between 1977 and 1987 as increase in employees by some firms is net out by decrease of employment by other firms. Similarly, Foster et al. (1998) also fail to find a robust significant relationship between establishment-level labor productivity or multifactor productivity and growth. In addition, Bottazzi et al. (2002, 2006) fail to find a robust relationship between productivity and growth using a database of Italian manufacturing firms.

While there is ample evidence suggesting that low productivity helps to predict exit (Griliches and Regev (1995), Foster et al. (1998)), productivity levels are not very helpful in predicting growth rates. In other words, selection only operates via elimination of the least productive firms, while the mechanism of selection via differential growth does not appear to be functioning well. Consequently, the mechanism of selection appears to be rather 'suboptimal' in the sense that its effectiveness is lower than it could conceivably be. For Baily and Farrell (2006), lack of a positive relationship between relative productivity and growth corresponds to a lack of competition. In an ideal scenario, firms would compete for growth opportunities, and selective pressures would attribute these growth opportunities discriminating in favor of the most productive firms. In this way, there would be some sort of dynamic efficient reallocation at work, whereby an economy's scarce resources are redistributed to those firms that are able to employ them most efficiently. This mechanism does not seem to be operating practically, however. Instead, the evidence is consistent with the hypothesis that many of the more productive firms may not actually seek to grow, or may be unable to grow. Therefore, it is possible to make the conclusion that there is a missed productivity growth opportunity for the economy as a whole due to absence of selection via differential growth.

2.2.5. Characteristics of the Management and Firm Activity

The 'managerial' theory suggests that managers attach utility to the size and growth of their firms such that they will pursue growth above the shareholder-value maximizing level. This leads to the hypothesis that owner-controlled firms will have lower growth rates (and perhaps higher profits) than manager controlled firms. Hay and Kamshad (1994) confirmed this hypothesis for small and medium scale enterprises whilst Radice (1971) and Holl (1975) do not support for UK

large firms. The human capital embodied in the proprietor has also been suspected of having an effect on firm growth, although the evidence is mixed. Whilst Almus (2002) identifies a positive effect of human capital (i.e. university degree or above) on growth for fast-growing German firms, Robson and Bennett (2000) fail to find a significant effect of skill level in explaining employment or profitability growth in their sample of UK small businesses.

The nature of the firm's activity also has an influence on firm growth. The level of diversification appears to have a negative overall influence on the growth of large European corporations (Geroski and Gugler, 2004) although a positive and significant influence can be detected in the particular cases of advertising intensive industries (Geroski and Gugler, 2004) and the life insurance industry (Hardwick and Adams, 2002). Advertising intensity is another factor that is associated with sales growth, according to Geroski and Toker's (1996). In addition, whilst previous firm level analyses have mainly associated exporting activity to increases in productivity, some authors have identified a positive relationship between exports and firm growth (Robson and Bennett, 2000; Beck et al., 2005). The degree of centrality or the amount of experience in a network of firms also contributes to a firm's employment growth rate (Powell et al. (1996)).

2.2.6. Legal Status

Firm's legal status can affect its growth rate. As far as the legal status is concerned, Stiglitz and Weiss (1981) emphasize that the limited liability legal form provides incentives for managers to pursue projects that are characterized by both a relatively high expected return and a relatively high risk of failure. This hypothesis has been tested empirically, for instance in Germany by

Harhoff et al. (1998), and has not been rejected. Those authors argue that the legal liability of a firm influences its growth rate. They also show that firms with limited liability have above-average growth rates. However, these firms also have significantly higher exit hazards.

2.2.7. Ownership Structure

With regard to ownership, there is evidence that multi-plant firms have higher growth rates, on average, than single-plant firms. This appears to be the case for US small businesses (Variyam and Kraybill, 1992; Audretsch and Mahmood, 1994), large European corporations (Geroski and Gugler, 2004), and also Italian manufacturing firms (Fagiolo and Luzzi, 2006). In their analysis of West German firms, Harhoff et al. (1998) identify that subsidiary firms grow faster than non-subsidiaries in construction and trade industries, although no difference can be found for manufacturing and services. Furthermore, a plant level analysis reveals that plants which belong to large companies are observed to have higher growth than stand-alone plants (Dunne et al., 1989). Whilst there is weak evidence that foreign-owned firms experience faster growth rates, government-owned firms seem to grow more slowly (Beck et al., 2005).

2.2.8. Industry Specific Factors

The variability of firm growth rates may also differ from industry to industry, depending upon the nature of the product, the character of competition, and so on. Firms in mature industries are likely to have lower average growth rates, ceteris paribus, because of lower level opportunity in mature industries. Firms in high-technology industries may have high growth rates due to rapid pace of technological progress and the apparition of new products. In addition, it is reasonable to

expect that the growth of firms is somehow linked to sector-specific degrees of competition and concentration.

Researchers have tried to identify the sources of industry wide differences in firm growth rates. Audretsch (1995) report a positive correlation between the minimum efficient scale (MES) and growth of new firms. It appears that the post-entry growth rate of surviving firms tends to be spurred on by the extent to which there is a gap between the MES and the size of the firm. Similarly, Gabe and Kraybill's (2002) found positive association between firm growth and average size of plants in the same 2-digit industry for 366 Ohio establishments. Geroski and Toker (1996) examine the growth of firms that are leaders in their respective industries and find that growth of industry sales has a positive effect on firm growth. But, total industry innovation does not appear to have a significant effect. Furthermore, Geroski and Toker observe that the degree of market concentration is positively related to the growth of these firms. Finally, Geroski and Gugler (2004) consider the impact on firm growth of the growth of rivals, where rivals are defined as other firms in the same 3-digit industry. Firm growth seems to be negatively related to rival's growth, an observation that is especially true for differentiated good industries and advertising intensive industries.

2.3. Growth Strategies

The attitudes of firms towards growth, and available means of achieving growth (such as diversification and replication strategies) are important issues to be discussed here. These are analogues to the distinction between 'demand' for growth and 'supply' of growth opportunities, respectively. Firms with strong desire to grow will find suitable growth opportunities if they search for them. Correspondingly, even firms with a marked aversion to growth will eventually

take up additional growth opportunities if these are attractive enough. This calls for the essence of appropriate strategy for growth. Actually, firms make a cost benefit analysis out of the advantages and disadvantages of growth before pursuing growth. The comparison however differs depending on the firm's or the manager's attitude towards growth.

2.3.1. Attitudes to Growth (Desirability of Growth)

Some firms may not wish to pursue growth despite the existence of its opportunity though firms generally increase in size as they get older. Firms use the existing opportunity of growth if they believe that the advantage of growth is greater than the disadvantage. The general advantages and disadvantages of growth are explained below. Notice that firms or firms' managers differ in the weight given for advantages and disadvantages and that is why while some decide to expand others downsize.

- **Advantages of growth**

According to Coad (2007), growth of an organization can be seen as a means of alleviating tensions in its internal management. Employees appreciate the opportunities for promotion as well as the higher salaries and prestige that accompany growth. Conversely, a lack of growth can create an uninspiring and stultifying business environment which depresses managerial efficiency (Hay and Morris, 1979). As a result, in growing firms it is "easier to obtain commitment to organizational goals and priorities from various factions and to resolve conflicts between those factions" (Whetten, 1987). A firm may thus seek a positive growth rate to keep its members satisfied. The extension of this line of reasoning is given by the managerial vision of the firm as managers can pursue a growth rate above the optimal level for the shareholders for

the sake of increases in compensation, power, prestige, bonuses and perquisites. But, unlike employees, managers have the power to determine a firm's growth strategy themselves.

Firms may also seek growth to attain other objectives related to its production of goods and services. Lower production costs may be achieved if expansion leads to economies of scale (due to larger scale of production), or economies of scope (due to wider range of products or services) Coad (2007). Growth may be brought by output boost to deter entry from potential competitors (Dixit, 1980). Furthermore, a larger, more diversified firm is better able to spread its risk among its various activities (growth can be considered to be a basis for security in this case).

- **Disadvantages of growth**

Despite its advantage, managers or owner-managers may be wary of increasing the size of their firm. One major reason for this is the 'control-loss' argument, which originates from the increased size or the rate of growth. As a firm increases in size, as employees are added and the number of hierarchical levels increases, the manager has less control of the firm and is less informed of its current state (Williamson, 1967).

Larger firms are less attractive working environments than smaller firms for a number of reasons. Large firms are less adaptable and less responsive than their smaller counterparts. Large organizations tend to become less motivating environments for employees. A common ideology and a cooperative working environment is substituted by an organizational culture in which employees are more concerned with personal and self-centered goals. However, it should be emphasized that distaste for organizations of large size does not necessarily preclude a firm's growth. Because of 'economies of growth', firms may still benefit from taking up marginal

growth opportunities even if there are diseconomies of large size (Penrose, 1959). Indeed, growth should not be seen as merely a means of attaining a larger size.

A firm's attitude to growth may also be influenced by the existence of a certain size threshold. Schivardi and Torrini (2004) demonstrate that Italian firms close to the threshold of 16 employees are reluctant to expand because this would be associated with an increase in their employment protection responsibilities. Tybout (2000) surveyed manufacturing firms in developing countries and found that they prefer to stay small and informal to avoid taxes. In contrast, medium sized firms have incentives to grow in order to become large enough to be able to lobby the government. It has also been suggested that large firms whose sales account for a significant fraction of the market may also restrain their own growth in order to keep prices high and avoid 'spoiling the market' (Nelson, 1987).

Negative attitude to growth is supported by studies in a number of situations. A lack of desire for growth has been found by Tether (1997) in the case of UK high-tech firms as well as by Audretsch et al. (2004) for family-owned hospitality industries in the Netherlands. Hay and Kamshad (1994) present evidence from a survey of UK SMEs. They find that many software firms encounter limits to growth imposed by the scarcity of first-class programmers. In the instruments industry, the scientists that founded the firms are often not well prepared for the management roles that larger firms require. In the printing sector, many firms choose not to grow simply because the owners use their business as a means to support a relaxed and independent lifestyle.

2.3.2. Replication Growth Strategy

Agents of the firm like managers, Shareholders, and employees are increasingly striving for sustainable profitable growth that requires a strategy for increasing revenue without sacrificing earnings or customer satisfaction.

If firms seek to grow by systematically planning ahead, what are the widely recognized strategies they should follow? Firms consider different ways of achieving growth (strategies), which they make choices by taking in to account the potential importance and the pitfalls each strategy is associated. In this subsection, the replication strategy is explained.

Unlike the traditional economic theory of demand driven decisions based on certain assumptions, significant growth events such as hiring of new employees or setting up of new production plants for the production of goods and services requires the application of a certain amount of tacit knowledge. This tacit knowledge is difficult to transfer from one individual to another or from one locus of production to another. As a firm grows, problems may arise because of difficulty in transferring this tacit knowledge. Nelson & Winter (1982) discussed the replication of routines, suggesting that a firm with a profitable routine in hand has an inherent advantage in pursuing a replication strategy, by virtue of its superior access to the successful 'template' example. This advantage is particularly significant when the existing routine involves tacit skills or otherwise resists codification. To the extent, however, that the tacitness derives from the limited 'causal depth' of knowledge or 'causal ambiguity' of the original success, contextual differences between the template and the new site may impede replication (Winter, 1995).

A firm in order to replicate its superior performance and a strategy to be successful, a few guidelines are followed or there are replication processes[9] that should be practiced genuinely (Winter and Szulanski, 2001; Szulanski and Winter, 2002). First, the template should be followed and copied as closely as possible throughout the replication process, and even after acceptable results have been obtained by the new unit (However, slight changes can be introduced after decent results have been obtained). Secondly, managerial attention is required on the activity to be replicated, rather than on what the documentation or the experts say. Finally, it is important that managers should have keenness to copy the template faithfully without improvement. Therefore, the principle of 'copy exactly!'[10] Policy must be implemented for the successful working of the replication strategy especially when manufacturing is characterized by very complex production processes in which the process steps have low tolerances and have complex interactions.

Much of the research on the replication of organizational routines was focused on factors contributing to loss of performance in the replication process (failure on how to use of organizational routines as templates). For example, Winter and Szulanski (2002) find that differential access to the template can explain the difference of relatively easy replication and low imitability (and their co-existence). The reason is that access to the template (which is given

[9] By replication process, Winter had in mind 'the set of activities that enable an organization to replicate its own routines in novel contexts without excessive losses in performance' (Zollo and Winter 2002).

[10] 'copy exactly' policy is a more extreme approach to technology transfer, and is applied by Intel in order to maintain precision during replication (MacDonald, 1998). According to this philosophy, everything affecting the process or how is run should be copied down to the finest detail. As a result of this replication strategy, it is now common for Intel's new production plants to meet best-practice performance standards from the very first day of production.

within the firm, but not from outside the firm), provides an occasion to observe the operation 'live' in action, and to offer an error-correction as well as a learning mechanism (Winter and Szulanski, 2001) as the template functions as a referent. Szulanski (2000) adds another possible use of the template, that of persuasion. He documented that 'proveness' of the knowledge (being able to show that it works), reliability of the source, and causal ambiguity of the knowledge, are the most significant predictors of stickiness in the initial stage of knowledge transfer, the stage where you would expect persuasion to have the most effect. The persuasive power of the template may be an important factor in the template's ability to aid the knowledge transfer process' (Szulanski & Jensen, 2004).

2.3.3. Diversifying Growth Strategy

To take full advantage of the scarce assets of the management, successful firms sought to spread their superior management capabilities across several different industries. According Mueller (1969), management is regarded as an amorphous substance which can be applied with equal success to totally unrelated lines of business. Thus, diversification is guided by synergies of managerial competence as opposed to synergies of a technological nature.

As a firm continues its operations, incumbent managers gradually gain experience, and new managers can be trained and integrated into the firm leading to expanded managerial resource base of the firm. This expanded managerial resource will be freed up over time as their number becomes more than required. Making use of this excess resource, new activities will be initiated anticipating generation of profits. However, Penrose also gives clear recommendations as to the direction of diversification. A firm's diversification growth is most effective when the new

activities are related to the existing resource base as firms are composed of indivisible resources, which are specialized and specific to the firm.

Ansoff (1965, 1987) advocated a prudent approach for diversification. Accordingly, firms should only consider diversification when there is no other option for a firm of realizing its growth objectives – "if a firm can meet all of its objectives by measures short of diversification or internationalization, it should do so". If firm's choice is to diversify, they can do it in one of three ways: by exporting the firm's traditional products or services into new markets (which constitutes the "highest synergy move" (Ansoff, 1987), or by diversifying according to synergies of demand or synergies of technology. In each case, attention must be paid to the coherence of the diversified firm's portfolio of activities. Candidate new businesses must display synergies with the existing portfolio of activities along dimensions such as operations, R&D, or marketing and distribution. These synergies may be due to lower expected fixed costs of starting-up, or alternatively due to anticipated operating economies. Furthermore, efforts should be made to convert the ex ante 'potential synergy' into 'realized synergy', by actively seeking to integrate the new activity alongside the firm's existing activities. If these guidelines are successfully applied, synergistic diversification allows firms to earn superior profits by leveraging their capabilities, know-how and general experience in new markets. It should be pointed out that synergistic diversification is not in compatible with corporate refocusing[11], but is instead closely

[11] Refocusing can be seen as a corrective strategic measure undertaken after excessive unrelated diversification – it is a modification (but not necessarily a reduction) in a firm's activities as the firm seeks to focus on exploiting certain specific capabilities. It should not be seen as a 'return' to the firm's previous condition, however, but as a strategic reevaluation of a firm's core competences in an ever-changing business environment (Paulre, 2000).

related (Batsch, 2003). Both of these view the firm as a coherent portfolio of related activities based on a small number of core competences.

Managerial theories of firm growth have also made a considerable impact on research into diversification. The decision to diversify is usually taken at the initiative and the discretion of managers, and managers have strong incentives to diversify even when this is not in the best interests of shareholders. On the one hand, standard economic theory predicts that diversification will be in the best interests of the firm as a whole when expansion into new activities promises relatively high profit levels. On the other hand, diversification gives at least four other advantages that are more specific to managers. First, managers of large and growing firms receive higher pay as well as increases in bonuses, 'perks', prestige, and "the pure pleasures of empire-building" (Montgomery, 1994). Second, managers who have vested interests in the performance of their firm (or who are merely concerned about their reputations) may attempt to lower the firm's volatility by spreading the risk and diversifying into new activities, even if this does not improve the firm's average rate of return (Amihud and Lev (1981)). Third, managers may diversify in order to ensure that the firm will require their personal skills and services in the future – this is known as the 'managerial entrenchment' argument (Shleifer and Vishny, 1989). Fourth, managers may be reluctant to distribute any spare cash-flow back to shareholders in the form of dividends, and instead they may prefer to spend it on pet projects even if these have a low expected return (Jensen, 1986).

Historically, diversification has got different dimensions. In the 1950s and 1960s, diversification was actually a popular strategy for several reasons. First, capital markets were relatively undeveloped and firms had incentives to organize several businesses around an 'internal capital

market'. This is also known as 'deep pockets' argument. Second, antitrust law imposed limits on the market shares of firms in specific industries, which meant that firms who were willing to grow had to do so in new industries. Third, the multidivisional or 'M-form' organization was growing in popularity. Fourth, there is evidence that early diversification announcements actually received a positive stock market reaction. As a result, the 1960s have been described as a 'wave of unrelated acquisitions' (Montgomery, 1994). The 1970s were also characterized by unrelated acquisitions and over diversification. The 1980s, however, correspond to a 'return to corporate specialization' (Bhagat et al., 1990). During this time, changes in the business environment made diversification less appealing (in particular, financial markets became more developed, and antitrust law changed its stance on measures of absolute market share).

2.4. Persistence of Firm Growth

Economic literature has analyzed the relationship between firm size and firm growth in depth in static perspective. But, dynamic questions may remain unanswered. For example, are firms that grew in the past still growing? Or is there no pattern that relates past growth to future growth? Do different patterns appear when different firms are analyzed using some common feature? The questions like these are answered by the analysis of persistence of firm growth using the dynamic models. The main contribution of growth persistence models is the introduction of dynamic firm evolution. As seen in section 2.1, the third proposition of Gibrat's law states that there is no persistence of growth. In this section, first the theoretical possibility of existence of growth persistence is examined and then empirics with dynamic model will be the focus of discussion.

Stochastic growth is the basis for the model of the evolution of industry proposed by Jovanovic (1982). Jovanovic develops special cases of his model of firm learning in which Gibrat's law holds at least for mature firms or for firms that entered the industry at the same time. In his model each firm's cost curve is subjected to randomly distributed, firm-specific shocks. Over time a firm learns about the effects of these shocks on its efficiency. Firms experiencing favorable shocks grow and survive. Others do not grow and may decline, and even leave the industry. His model also results in small firms having higher, but more variable growth rates and higher failure rates than large firms. If his theoretical model is a true reflection of the evolution of firms, then empirical studies which omit firms' deaths are likely to overestimate the growth rates of small firms relative to large firms. The most general version of his model predicts that firm growth decreases with firm age, keeping firm size constant. In conclusion, under certain assumptions concerning technology and the distribution of ability, his theory implies that firm growth is independent of firm size for mature firms or for firms in the same age cohort.

The evolutionary approach to firm growth[12] implies that there is some serial correlation in growth i.e., "success breeds success and failure breeds failure". This approach suggests that the growth of successful firms should persist over time: there should be positive serial correlation of growth between consecutive periods, and those older companies should have faster average growth than younger companies (Hart, 2000). Equivalently, this persistence of growth may also be observed for the growth of regions or nations. According to Verspagen (2004), those nations

[12] Evolutionary Economics and the principle of 'growth of the fitter' approach is a dynamic theory of competitive advantage and is more relevant to understand the economics of industrial organization than the more neoclassical concepts of equilibrium and static optimization due to turbulent competition and rapid technical change in the modern economy. Evolutionary theory has its foundations in Schumpeter's vision of capitalism as a process of 'creative destruction', and borrows the notions of diversity creation and selection to account for the dynamics of economic development. The notion of selection via deferential growth is also a central theme in this approach (Downie, 1958; Nelson and Winter, 1982). This selection mechanism sets the economy on the path of progress, as fitter firms survive and grow whilst less viable firms lose market share and exit.

(regions or agents) that are growing rapidly accumulate experience and hence learn faster than others. This leads to a better competitive position for those already ahead and enables them to move further ahead. Hence, the crucial tendency here is one of divergence, in which some nations (regions or agents) are able to grow rapidly while others are left behind. This idea contrasts with purely stochastic models of growth, such as Gibrat's (1931) law of proportionate effect, which postulate that the proportionate growth of surviving firms is random and hence independent of previous success(i.e., contradiction of the third proposition of the law above).

Formal evolutionary model of the growth of firms is proposed by Nelson and Winter (1982). According to them, decision makers operate under a scheme of bounded rationality, in which relatively simple and occasionally adaptive behavioral rules or routines are used to make decisions. The routines can be changed over time, especially so under the influence of feedback from economic performance. Thus, instead of optimizing, agents tend to adapt to changes in the market environment using routines which are often specific to the firm. The skills and experience of the managers and workers in the firm is source of the routines and this "know-how" is transferred to new members of the firm. Routines capable of producing growth in the past are likely to continue to do so in the future. Successful firms have successful routines that change previous methods to meet new market environments and responds to circumstances changes. Contrary to Jovanovic (1982), Nelson and Winter's model is based on simulation results for firms 20 years old and greater predicts that firm growth initially increases but then decreases with firm size for mature firms.

Chesher (1979) developed the analytical expression of persistence of firm growth. The persistence of firm growth is related to the temporal interrelationship between firm growth rates.

Ijiri and Simon (1977) pointed out that "in studying business firm growth, we often encounter cases where a firm suddenly acquires an impetus for growth. Perhaps by innovating in production or marketing processes, or perhaps as an effect of new management staffs or techniques, the firm grows much more rapidly than the other firms in the industry"[13]. Moreover, the evolutionary approach suggests that the growth of successful firms should persist over time. The empirical literature regarding growth persistence contains mixed results. Most studies of industrial and financial sectors have found there is no persistence of growth (Acs and Audretsch, 1990; Dunne and Hughes, 1994), or no positive persistence (Chesher, 1979; Kumar, 1985; Wagner, 1992; Tschoegl, 1996). A smaller number of researchers have found evidence of negative persistence of growth (Contini and Revelli, 1989; Almus and Nerlinger, 2000; Goddard et al. 2002).

[13] Ijiri and Simon (1977) stated that a firm that grows more than the average "is likely to grow more rapidly than the average again this year as a result of the carry-over effects of an innovation that occurred in a previous year on operations in subsequent periods".

CHAPTER THREE

3. DATA AND METHODOLOGY

3.1. Theoretical Model

In this section, the study makes linkage between the major determinants suspected to affect Ethiopian large and medium scale manufacturing industry firms with different theories developed so far. This theoretical frame work starts from the oldest popular theory of Gibrat's law and then expands to those recent ones.

In his 'Law of Proportionate Effect', Gibrat stipulates that the rate of growth of a firm is independent of its initial size or size distribution is lognormal. The implication is that large firms are more important than small firms for development as they can create more employment than small firms. From policy perspective, it means that attention should be given to large firms to raise employment. As Gibrat's law is concerned, the study provides evidence for its support or rejection.

The learning model formulated by Jovanovic (1982) contradicts Gibrat. The model stipulates that younger firms learn over time, which helps them improve their performance as they accumulate market knowledge, which enables them grow faster than their counter old ones. Jovanovic also deduces that small firms grow faster than large ones assuming younger firms are usually smaller than older businesses. This is a convergence process where small firms will eventually become as large as any other large firm in the same sector over time. According to the other version of Jovanovic (1982) hypothesis, the potential entrants are assumed to know the

efficiency or the costs of all firms, but not of their own cost condition. However, firms update their prior expectations through experience after entry and become certain about their true situation. Firms experiencing high costs (low efficiency) decide to exit and those experiencing low costs (high efficiency) decide to expand. To test these two versions of Jovanovic passive learning process, firm's age in terms of years since its commencement (to test the first version) and productivity (to test the second version of firm efficiency) variables are chosen.

Another key determinant of firm growth is financial performance. Slow growth of firms in Africa has been explained as being the result of lack of access to financial resources (McCormick et al. 1997; Biggs and Srivastava, 1996). This is particular to developing economies where financial markets are under-developed. In a study on investment behavior in Cameroon, Ghana, Kenya and Zimbabwe it was found that firms in these countries rely heavily on retained earnings to finance investments, even the most crucial (Bigsten et al. 1999). In this light, firms without the required internal capital abandon or postpone their investments. Not being able to invest when needed limits a firm's growth opportunities. In order to study financial resources on firm growth, different proxies can be taken. For example, Becchetti and Trovato (2002) tested the effect of two proxies of the financial variable on growth: leverage ratio and the dummy whether the firm's loan request is rejected or not[14]. In this study, the proxy of leverage ratio[15] is used in order to see the effect of financial performance on the growth of firms.

[14] While the effect of the leverage ratio was found not significant, the qualitative dummy variable proved to be an important restraint of growth (Becchetti and Trovato, 2002).

[15] Chen, Babb and Schrader (1985) used profitability of the firm as a proxy of financial resources of the firm instead of availability of external sources of financing (proxied by leverage ratio). A profit of the firm is important since it is simultaneously a source of internal financing and also the basis to get external sources of financing so that a profitable firm would have more financial resources available to boost growth.

In addition, firm growth is influenced by the availability of stock and quality of human capital within a firm. Human capital variables were found to be important determinants of firm growth in Botswana, Lesotho and Zimbabwe (McPherson, 1996). Here the quality of labor will be an important variable which the model of the study will include.

Location could also be an important determinant of growth in economies characterized by regional specializations. In Ethiopia firms around and at the capital might grow faster than elsewhere apriori. Gebreeyesus (2006) confirmed this result with an earlier data. He reasoned out better demand and infrastructural facilities at and /or around Addis Ababa than firms elsewhere. In this study, the annual average growth rate is calculated in the descriptive part of this study classifying the firms at/around Addis Ababa together and others as the other group. Then, this information is taken to have an idea whether the situation is changed or not. In the descriptive case, an assessment is also done how important are the ownership and legal status of the firm on it growth.

The other determinant is the persistence of growth itself. As the analyses of firm growth and size have had an emphasis of static perspective so far, dynamic questions remain unanswered for Ethiopian manufacturing case. The starting point for analyzing persistence is Chesher's (1979) model, which is based on Gibrat's (1931) Law[16]. Chesher (1979) developed the analytical expression of persistence of firm growth. The persistence of growth will be added as one variable in my regression analysis.

[16] Formally, Gibrat's Law can be derived from Chesher's model. The basic difference between these models is the static-dynamic dimension. In Gibrat's model, firm growth rate depends on a static variable such as size, while in Chesher's model it depends on past rates. Chesher's model, therefore, emphasizes the dynamic perspective in order to explain the firm growth process.

3.2. The Dataset and Definition of Variables

3.2.1 The Dataset

The dataset used in this analysis is a census of large and medium scale manufacturing conducted annually by the Ethiopian Central Statics Agency from 1992 to 2000 E.C. Each firm is identified by a unique identification code. The census provides information for all of the firms in the large and medium scale manufacturing. Regarding Scope and Coverage, the annual data on Large and Medium Scale Manufacturing covers only those enterprises which engaged 10 persons and above and are using power driven machines to produce their goods. Both public and private holding manufacturing industries of all regions were covered by this annual census. A range of basic information on firms such as total sales value, total value of production, exports, investment, number of permanent and temporary workers, costs and quantities of raw materials, type and value of fixed assets, wages and salaries, type of ownership, year of establishment, legal status and town of existence is obtained from the census.

It should be clear that within this census period considered, firms may exit out of the industry or they may enter to the market. To enable for the study of persistence of growth, the dataset only includes surviving firms. The dataset is organized in an unbalanced panel (i.e., some of the observations have been omitted, mainly because of lack of information on some of the chosen variables). For the purpose of the study, some computations are done to create some variables which are not explicit from the census data. Further, in order to change nominal values for some variables, simple conversions will be made using the conversion factors so that the variables will be in real quantities. However, there are limitations in making proxies out of the basic variables in this dataset. For example, leverage ratio is assumed to proxy the ratio of total liability of the

firm to the total assets. But, bank loan is found to be the only explicit total liability from the data set used.

3.2.2. Variables of the Model

I. The Dependent Variable

Firm growth can be measured in different ways the main indicators being asset growth, employment growth and sales growth. However, as many empirics are done using the growth rate of employment, this study also defines firm growth in terms of the growth of permanent employment between two consecutive periods. More particularly, the dependent variable is permanent employment growth rate of a firm, which is defined as the logarithmic difference of permanent employment in two consecutive years i.e., $(Growth)it = [\ln(Size)_{it} - \ln(Size)_{t-1}]$, where $\ln(Size)_{it}$ is log of number of permanent employment in the current year for firm i, and ln(Size)t-1 is log of number of permanent employment one year before for the same firm. The choice of employment growth measure helps to avoid the inflation effects and to find policy implication from the employment perspective.

II. The Independent Variables

Explanatory variables are driven from theoretical frame work. Therefore, the study includes the following firm specific independent variables.

- Number of permanent employment (size) of the firm- measured by the permanent number of employees of the firm in particular year.
- Age of the firm- measured by the number of years of the firm since its commencement

- labor quality- is the ratio of total wage of permanent employees per permanent number of employees
- Capital intensity-given by the ratio of total fixed capital divided by number of permanent employees
- Productivity-measured by total sales divided by the number of permanent employees
- Leverage-is the ratio of book values of total liabilities to total assets
- Total assets-Book value of total assets
- persistence growth rate ($Growth_{it-1}$)- is defined by lag of growth of employment

The dummy variables such as location, ownership and legal status will be incorporated as variables affecting growth for the descriptive case.

Ethiopian Central Statics Agency used the following elaborated definitions of some of the above variables for medium and large scale manufacturing industries:

Manufacturing: - According to International Standard Industrial Classification (ISIC Rev. 3) it is defined as "the physical or chemical transformation of materials or components into new products, whether the work is performed by power-driven machines or by hand, whether it is done in a factory or the worker's home, and whether the products are sold at wholesale or retail. The assembly of the component parts of manufactured products is also considered as manufacturing activities."

Employees:-Both permanent and temporary employees:[17]

- **Permanent Workers:** - these are employees, (based on the agreement between the workers and employers) engaged to work in the factory for unlimited period of time.

[17] Note that for the purpose of econometric analysis, only permanent employees are considered.

These workers are usually found regularly on the payroll of the establishment. Unpaid family workers, active partners and working proprietors are excluded.

- **Seasonal and Temporary Workers**: - these include workers who are employed for a whole or part of the year with the agreement that they work for a limited period of time. These workers are not regularly on the payroll of the establishment.

New Capital Expenditure: - is the cost of new or used capital equipment bought during the reference period by the existing establishments.

Public Sector: - Under this sector all establishments owned by the state i.e., those which were fully as well as partially (with 51% share and above) owned by the government are included.

Private Sector: - includes establishments such as individual ownership, partnership, private limited company, cooperatives and others.

Wage and salaries: - includes all payments in cash or in kind made to employee during reference year in connection with work done for the establishments.

Fixed capital asset: - are those with a productive life of one year or more which are intended for the use of the establishment and they are valued at book value of the reference year (i.e., net book value plus capital expenditure minus those disposed and sold and depreciation).

3.3. Empirical Model and Method of Estimation

3.3.1 The Empirical Model

Using the methodology of different authors for firm growth study, the regression model for testing Gibrat's law in the simple static model is given by:

$$\mathbf{Growth_{it} = lnSize_{it} - lnSize_{it-1} = \alpha + \beta * lnSize_{it-1} + \varepsilon_{it}} \quad \textbf{(1)}$$

Where, $growth_{it}$ is the growth of employment for firm i at period t. $lnsize_{it}$ is the level of employment for firm i in period t, $lnSize_{it-1}$ being its lag in logarithmic form. ε_{it} is the disturbance term assumed to be normally distributed with mean zero and possibly a non-constant variance of firm i at time t. The coefficient, β expresses the relationship between firm i's growth at time t and initial size, S_{it-1}. The first hypothesis is Gibrat's law is valid (i.e., β is equal to 0) for firms in the Ethiopian manufacturing industry. If β is positive, large firms grow faster than small ones and vice versa when β is negative. Moreover, β informs the situation of market structure and market concentration. If β is positive, market concentration tends to increase as there will be few active small and medium-sized enterprises and thus the market may be dominated by large firms. The negative value of β indicates the smaller and medium scale enterprises grow more rapidly than the larger counter parts. This is clearly an indication of less concentration and the competitive nature of the market.

Augmenting persistence of growth in equation (1) and following Goddard et al. (2002a, b), the model can be rewritten as:

$$\mathbf{Growth_{it} = \alpha + \beta * lnS_{it-1} + \gamma Growth_{it-1} + \varepsilon_{it}} \quad \textbf{(2)}$$

Where, $growth_{it-1}$ allows for persistence of growth. The firm growth function (2) considers the simple dynamic panel data model with the null hypothesis that firm growth is random with its size. Hypothesis of sensitivity of the relationship between growth and size to various firm characteristics is tested using multiple dynamic panel data model developed by Evans (1987a):

$$\mathbf{Growth_{it} = \alpha + \beta * lnSize_{it-1} + \gamma Growth_{it-1} + F\,(X_{it-1}) + \varepsilon_{it}} \quad \textbf{(3)}$$

Where, X_{it} denotes other firm determinants such as age, labor quality, productivity, capital intensity, leverage and asset which are transformed in to logs. The hypothesis is all the coefficients are zero, i.e., there is no relation with firm's growth rate and its attributes including the past growth or no systematic relationship between the growth of the firm and its attributes.

Combining the time invariant firm specific effects and time varying cyclical effects with multiple dynamic panel data model, the final model of interest will be:

$$\mathbf{Growth_{it} = \alpha_i + \delta_t + \beta * lnSize_{it-1} + \gamma Growth_{it-1} + F\,(X_{it-1}) + \mu_{it}} \quad \textbf{(4)}$$

Where, $\mu_{it} = \rho\mu_{it-1} + \varepsilon_{it}$

Where, α_i and δ_t represent individual and time effects, respectively. The unobserved time invariant firm specific effects, αi, implies that there is heterogeneity across firms. And the coefficient, ρ represents serial correlation in μ_{it} which is the disturbance term.

3.3.2. The Method of Estimation

Previous empirical works for estimating dynamic firm growth equations mostly used simple OLS regression analysis. However, this method is confronted by the endogeneity and heterogeneity problem and the estimators are biased. Current advances with the introduction of GMM System method solves the problem raised. According to Roodman D. (2006), GMM system method is appropriate for the panel analysis due to some reasons listed below. Firstly, the process may be dynamic; i.e. the current dependent variable is influenced by past ones. Some regressors may be predetermined but not strictly exogenous; the lagged dependent variable is an example. Then there may be arbitrarily distributed fixed firm-specific effects, α_i, and the idiosyncratic disturbances (μ_{it}) may have individual-specific patterns of heteroskedasticity and serial

correlation. In addition, some regressors may be endogenous[18] (for example, labor quality may be affected by firm growth). The GMM system method thus could solve those problems.

Besides, the GMM system method is suitable in case, the number of firms under study are very much greater than the time periods (i.e., N (number of firms) >>T (time period)). In this study, the number of time periods of available data, nine years, is small compared to the number of surviving firms (263 surviving firms). Other available estimation methods could not solve all above problems thus they may provide inconsistent and biased estimators (Oliveira et al., 2008).

Methodologically, GMM system estimator is developed from first-difference GMM estimator. The difference GMM estimator proposed by Arellano and Bond (1991) uses first-difference equations to eliminate firm-specific effects, αi, by transformation while endogenous lagged variables for two or more periods will be valid instruments. As a result, there is no serial correlation in the time-varying component of the error terms (idiosyncratic errors) and Monte Carlo tests give a proof that this estimator can give superior results to previously used methods (Arellano and Bond, 1991). However, this method has shortcomings if the lagged levels are weakly correlated with the differences of the explanatory variables. This makes instruments weak so large finite sample bias may occur (Coad, 2007).

Later on, an improved panel data GMM called GMM system method has been proposed by Arellano and Bover (1995) and has been fully developed by Blundell and Bond (1998) by

[18] It is important to note that Endogeneity arises when an explanatory variable is correlated with the error term. Endogeneity may be caused by simultaneity or reverse causality, omitted variables, measurement error. The dependent variable can also be an endogenous variable. A typical method in econometrics for dealing with endogenous explanatory variables is to use instrumental variables.

imposing additional moment conditions. In the System GMM, the differenced equations are combined with equations in levels, for which the instruments used must be orthogonal to the firm-specific effects. By adding the level equation, additional instruments can be obtained and the variables in levels in the second equation are instrumented with their own first differences. This usually increases efficiency (Blundell and Bond, 1998). Bun and Windmeijer (2007) showed that the system GMM estimator for dynamic panel data models that combines moment conditions for the model in first-differences with moment conditions for the model in levels improves on the GMM estimator in the first-differenced model in terms of bias and root mean squared error. The instruments used depend on assumptions, on which variables are exogenous, predetermined or endogenous[19]. The validity of instruments is tested using Sargan test of over identifying restrictions and Arellano-Bond test for autocorrelation.

Now, mathematical treatment is given to show how the system GMM is developed from the first differenced GMM and then the moment conditions are specified with the appropriate instruments. This is followed by the explanation how the moment conditions are tested and so that one is sure about the consistency of the estimators.

For the sake of convenience let the dependent variable, growth rate is denoted by Y, and let size and other determinants of growth are pooled together in vector X. Doing so equation (4) in section 3.3.1 becomes

$$\mathbf{Y_{it} = \gamma Y_{it-1} + \beta^* \ln X_{it-1} + \delta_t + \alpha_i + \mu_{it}} \quad \textbf{(5)}$$

[19] There are Instruments available for the system of equations in the System GMM estimation depending on the nature of $\mathbf{x_{it}}$ variables; 1)If $\mathbf{x_{it}}$ are endogenous and there exist both contemporaneous correlation between the current shock and $\mathbf{x_{it}}$, and feedbacks from past shocks to the current value of $\mathbf{x_{it}}$, 2) f $\mathbf{x_{it}}$ are predetermined with respect to the idiosyncratic error (which rules out contemporaneous correlation but not feedbacks from past shocks) or strictly exogenous with respect to the idiosyncratic error (which rules out correlation between $\mathbf{x_{it}}$ and the error at any dates).

Where, $\mu_{it} = \rho\mu_{it-1} + \varepsilon_{it}$

Taking the first difference of equation (5), we have

$$\mathbf{\Delta Y_{it} = \gamma\ \Delta Y_{it-1} + \beta^{*}\Delta lnX_{it-1} + \Delta\delta_t + \Delta\mu_{it}} \quad \textbf{(6)}$$

Where $i = 1, 2, \ldots, 263$ and $t = 3, ..., 9$

All lagged values of both the dependent and the independent variables dated from t-2, and earlier are suitable instruments for the differenced values of the original regressors, ΔY_{it-1}, and ΔlnX_{it-1}. The moment conditions for errors in differences, on which the first-differenced GMM estimator is based, can be written as,

$$\mathbf{E}\left[\begin{pmatrix} Y_i^{t-2} \\ X_i^{t-2} \end{pmatrix} (\Delta Y_{it} - \gamma\Delta Y_{it-1} - \beta^{*}\Delta lnX_{it-1} - \Delta\delta_t)\right] = 0 \quad \textbf{(7)}$$

Where $t = 3\ldots..9$, $i = 1\ldots263$

$Y_i^{t-2} = (Y_{i1}, Y_{i2}, \ldots, Y_{it-2})'$, $X_i^{t-2} = (X_{i1}, X_{i2}, \ldots, X_{it-2})'$

According to Blundell and Bond, in the standard AR(1) model, when the time series becomes highly persistent (γ approaches unity) or the variance of the individual effects increases relative to the variance of the disturbances, the lagged values of the series (dependent variable) may be weak instruments for first differences. The first differenced GMM estimator employing these weak instruments has been found to have poor finite sample properties in terms of bias and precision.

To circumvent weak instruments problem, System GMM estimator is developed. Mean stationarity assumption on initial conditions are considered in the sense that the mean of the distribution of the initial observations coincides with the mean of the steady-state distribution of the process. For the multivariate autoregressive model, Blundell and Bond show that a sufficient

condition for the additional moment conditions to be valid is the joint mean stationarity of the series.

For this context, additional mean stationarity condition of (Y_{it}, X_{it}) enables the lagged first-differences of the series (Y_{it}, X_{it}) dated t-1 as instruments for equations in levels (equation 4 or 5 above). In addition to the moments for errors in differences described eq.(7), the system GMM estimator is also based on the additional moments for errors in levels as follows,

$$E\ \left[\begin{pmatrix}\Delta Y_{it-1}\\ \Delta X_{it-1}\end{pmatrix}(Y_{it} - \gamma Y_{it-1} - \beta * \ln X_{it-1} - \delta_t)\right] = 0 \quad (8)$$

t = 3… 9

As suggested by Blundell and Bond, using both sets of moment conditions, the System GMM estimator is expected to have much smaller finite sample bias and greater precision in the presence of persistent data. Apart from the orthogonality conditions stated above (equation 7 and 8), the System GMM estimator also makes use of the following moments for the period-specific constants due to the existence of idiosyncratic shocks:

$$E\ (\Delta Y_{it} - \gamma \Delta Y_{it-1} - \beta * \Delta \ln X_{it-1} - \Delta \delta_t) = 0 \quad (9)$$

t = 3….9

To avoid the possible over fitting bias associated with using the full Arellano and Bond instrument set, Bowsher proposes to selectively reduce the number of moment conditions for each first-differenced equation. More specifically, lagged values of Y_{it} and X_{it} from $t-2$ to $t-4$ are used as instruments. In this study, the possible number of instruments is reduced to t-2 and t-1 values of Y_{it} and X_{it} in the differenced and level equations respectively.

Two specification tests are conducted to address the consistency of System GMM estimator, which mainly depends on the validity of instruments. The first is a serial correlation test, which tests the null hypothesis of no second or higher-order serial correlation in the residuals in the first-differenced equation. Because the first difference of independently and identically distributed idiosyncratic errors will be autocorrelated, rejecting the null hypothesis of no serial correlation at order one in the first-differenced errors does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders implies that the moment conditions are not valid. The second is a Sargan test of overidentifying restrictions, which is used to examine the joint validity of the instruments by comparing the moment conditions with their sample analogue. Thus, joint validity of the instruments is tested using Sargan test under the null of valid overidentifying restrictions.

CHAPTER FOUR

4. DATA ANALYSIS AND PRESENTATION

4.1. Descriptive Analysis

4.1.1. General Overview of the Dataset

The study considers a total of 263 surviving firms (N) for the nine year period (from 1992 to 2000 E.C) with 2367 observations (NT). The dynamic nature of the study necessitated the area of interest to be only surviving firms in the large and medium scale manufacturing industry so that firms that exited from and entered to the market in the industry after the first period of study are excluded. Fortunately, the aggregation of firms based on survivality contains fifteen of seventeen manufacturing industries at two digit level industrial classification with the exception of Manufacture of tobacco and Manufacture of battries. Table 1 below provides summary statistics of main variables (firm attributes) for surviving firms.

Table1 Summary statistics of main variables

Variables	Obs.	Percentile			mean	std.dev	min	max
		50th	75^{th}	90th				
Growth	2342	0	0.1392622	0.4989913	-.0004745	.6742254	-4.671443	5.939645
Employment	2354	62	194	492	184.9618	336.8962	1	4454
Age in years	2341	17	34	46	22.70184	17.87317	0	91
Labor Quality	2297	6198.408	9418.495	12758.68	7260.917	7084.794	31.5964	251584.9
Productivity	2328	66088.18	144044	293296.1	153424.5	890949.8	1107.736	4.14e+07
Cap. intensity	1473	8220.071	27316.31	70975.62	35070.21	108701.1	0	1799329
Leverag ratio	2346	0	0	0.982	0.61897	5.4615	0	234.8183
Real assets	2349	2438953	1.01e+07	3.48e+07	1.44e+07	4.59e+07	0	1.02e+09

Note that all the summaries indicate the values for the total observations i.e., across all surviving firms (N) and the nine year period (T)

On average, annual growth rate of large and medium scale manufacturing surviving firm is nearly nil (-0.0004745), the median taking zero value. A typical surviving firm employed an average of 185 permanent workers. When quality of employees is proxied by the permanent employee benefit received by workers, a representative firm's employee receives an average of 7260.917 Ethiopian Birr per year. There is huge deviation (7084.794) of per real annual wage benefits showing total payment differential among the permanent workers of large and medium scale manufacturing industries' firms. This may indicate skill difference in employees.

The maximum age among surviving firms is 91 years, the mean age being approximately 23 years for a particular firm. Table 1 also shows productivity of employees measured by the per employee real sales volume. It is 153424.5 Ethiopian birr in average terms. Here again, productivity difference is observed for firms in large and medium scale Ethiopian industry, the maximum and the minimum respectively being 41400000 and 1107.736 Ethiopian birr. This is not a great surprise as firms staffed with more qualified employees will be more productive compared with firms staffed with less qualified employees.

Moreover, per employee fixed investment (capital intensity) of the industry's surviving firms averaged about 35070 Birr. There is also wide difference among firms in terms of accumulation of fixed capital investment. This mean value is by far greater than the median value, which is about 8220 Birr per employee telling something about high concentration of capital intensity by few manufacturing firms. With regard to the total asset holding, averagely a typical surviving firm accumulates a total of 14,400,000 Ethiopian Birr. External financial resource availability may bring a contribution for firms' growth if it is not constrained and this financial resource can

be measured by leverage ratio[20], which is the ratio of total liability to total asset holding of the firm. Looking at the table, this ratio's average value is approximately 0.6.

Now, it is turn to see the growth of firms by disaggregating firms in to different cases to have an insight whether firms' location, ownership and legal status are important for its growth. Table 2 reports a statistics in row-wise along with different cases in the column.

Table2 Summary statistics of firm growth rate by location, ownership and legal status

	Case					
	Location		Legal form		Ownership	
Statistics	Around AA	Away from AA	Limited	Unlimited	Private	public
Obs.	1463	738	967	653	1598	706
Mean	-0.0048791	0.0170195	0.0059786	-.0809468	-0.0283465	0.0613274
Std.dev.	0.6280248	0.7511137	0.5943711	0.7548226	0.6681405	0.6970682
Min.	-4.671443	-4.169246	-4.276666	-4.671443	-4.671443	-4.169246
Max.	4.510859	5.939645	4.510859	3.634291	4.510859	5.939645

Theoretically, firm growth is affected by the place the firm is located. It is assumed that firms at or around huge market for its products and markets for the raw materials grow faster than the corresponding firms away from such a market place. For the Ethiopian manufacturing case, firms residing in cities like Addis Ababa, Burayu, Sululta, Debreziet, Kality, Akaki, Sebeta, Alem Gena, and Sendafa are assumed to have higher growth rate than other firms situated some other towns.[21] Surprisingly, contrary to this firms away from Addis Ababa (with an average of annual

[20] Previous empirical works measure the leverage ratio as proxy of total liability to total asset value of the firm. However, due to data problem to isolate the loan received by the firm other than bank loan, only bank loan is taken as the proxy of total liability of the firm. So, the ratio of bank loan to total asset holding of the firm is assumed to represent the leverage ratio in this study.

[21] To be consistent firms with in 50 KM from Addis Ababa are included together as firms at/or around Addis Ababa. For towns such as Kality, Akaki, Alem Gena, and Sendafa no firm is found sustaining for the period 1992-2000.

growth 0.0170195) grow faster than firms at /or around Addis Ababa (the average annual growth rate being negative, -0.0048791). The reason might be the existence of large number of mature[22] firms at or around Addis Ababa compared with younger and adult surviving firms as mature firms have less average growth rate compared to young and adult firms. The other feature of looking at location case is the existence of much higher observations at /or around Addis Ababa. This is due to the concentration of a lot of firms at/ or around Addis Ababa.

However, legal status [23]of the firm is in conformity with the theoretical expectation that growth of firms is positively influenced by its limited nature. Firms legally limited have mean annual growth rate of about 0.0059786 while those unlimited firms growth rate is annually -0.0809468. This is in agreement with the hypothesis suggested by Stiglitz and Weiss (1981) as managers in those limited liability firms have the freedom of pursuing those high risky projects with high expected return. The implication is legalizing those unlimited liability firms to limited legal status is good from employment growth view point. Table 2 also shows an observation that the publicly owned firms grow better than the privately owned firms for the Ethiopian large and medium scale manufacturing firms. This might be due to the better access to the external finance[24] and other crucial services like preferences in foreign exchange services, and un-delayed

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[22] Calculating the average growth rate at different cohort of firms' age, the average growth rate of a typical mature firm is found to have less growth rate (average growth rate for younger firm =0.1253505 , for adult =-0.0682338 and for mature = -0.0717779). This might cause, firms at/around Addis Ababa to have higher average growth rate.

[23] Different types of groupings are given for the purpose of the data set collected by Central Statistics Agency on Ethiopian large and medium scale industries: Individual proprietor, Partnership, Share Company, Private limited company, Co-operative, Joint venture and others. However, despite their differences in other features, the unlimited liability is applicable for the first two categories, i.e., the individual proprietor and partnership.

[24] Taking the proxy of leverage ratio to see the situation of external finance, mean leverage ratio is high for the publicly owned firms (0.8390958) as compared to the privately owned surviving firms for the nine period (0.5206274). This might suggest the better availability of bank loan to the publicly owned firms.

services at the customs and revenues authority. All in all, there are variations in the growth rate of large and medium scale manufacturing firms depending on the town they are located, the type of ownership and their legal form.

4.1.2. Nonparametric Testing of Log-Normality of Size

Gibrat's Law of stochastic firm growth or the Law of Proportionate Effect states that firm size is determined by a first order autoregressive growth process – a random walk – in which firm growth rates are randomly drawn from a normal distribution. Consequently, firm size in logarithmic terms then becomes equal to the logarithm of the initial size plus the sum of the growth rates since birth. Hence the size distribution of a given industry tends unavoidably toward the log-normal distribution. Using the methodology of previous empirical works, it is possible to challenge the stochastic approach by applying both parametric analysis (preferably regression analysis testing the independency of firm growth rates against a range of variables) and nonparametric analysis by questioning the distributional characteristics referred to by the stochastic approach of the hypothesis. In this section the non-parametric test is given and the parametric test is given next to this section.

In order to see the log-normality of size, different normality tests are provided using two alternative approaches: the graphical approach and the numerical approach. In the first approach an eye-view based analysis is made using a tool of plots of normal and kernel density estimations. For the latter approach, among others the skewness/ kurtosis, Shapiro-Francia and Shapiro-Wilk normality tests are examined.

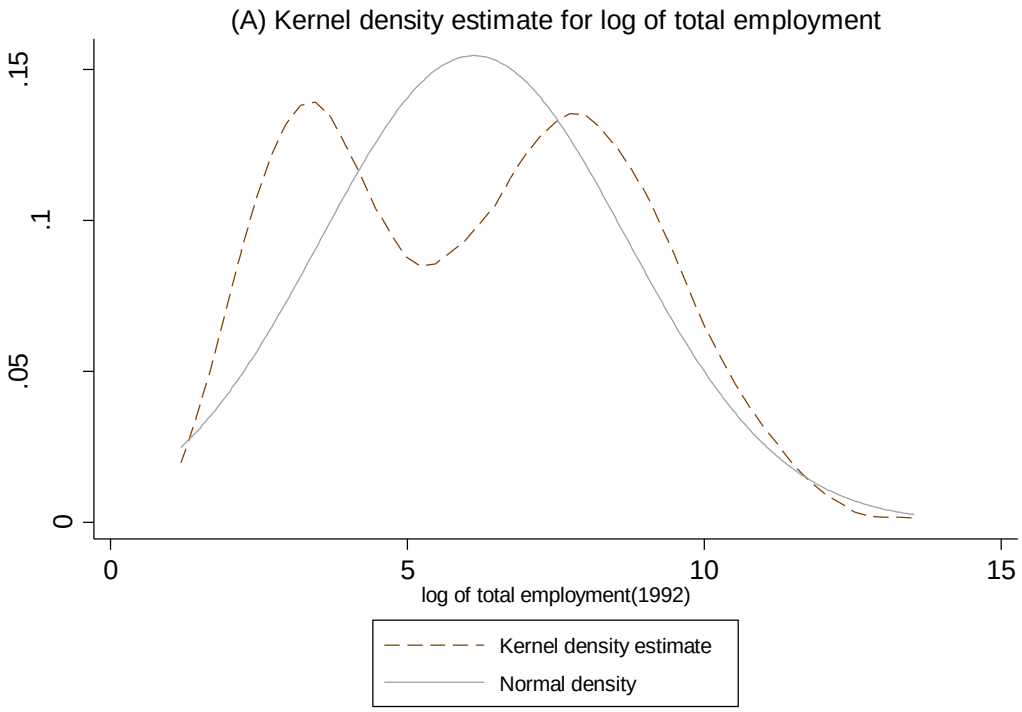
I. Graphical approach

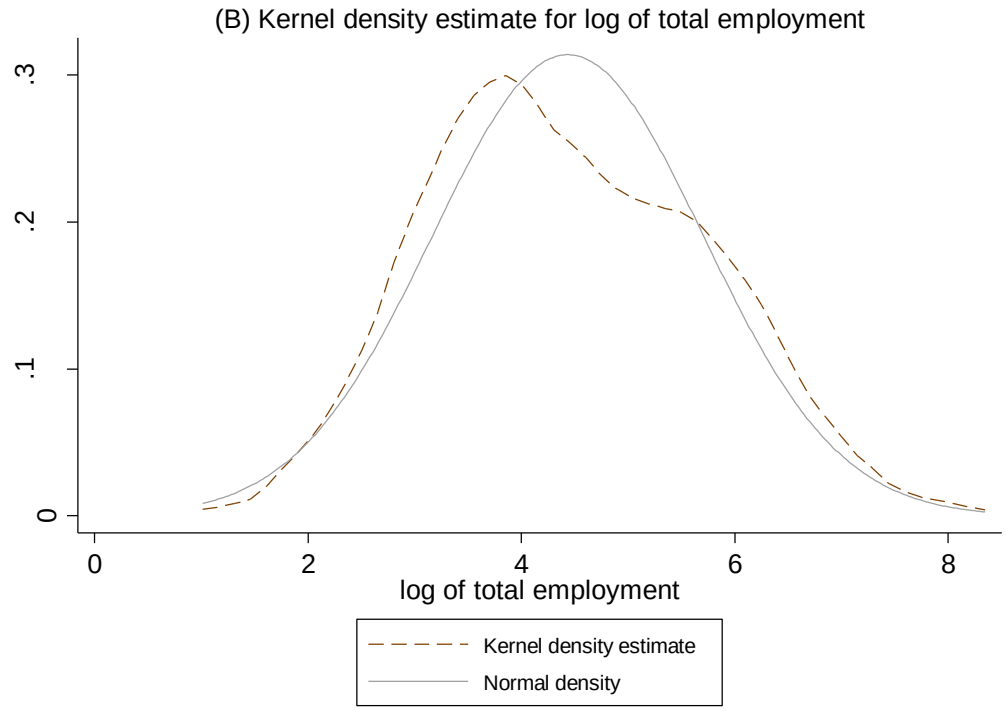
As a starting point for the test of log-normality of size, a comparison of the plots of normal distribution and a smooth approximation of histograms, the kernel curve[25] are used to get an insight on skewness, behavior in the tails and the presence of multi modal behavior. Usually, for the log-normality distribution, the kernel curve should resemble the normal curve. These plots are given below for both log- normality of permanent employment and total employment taking the initial and the last period of the study.

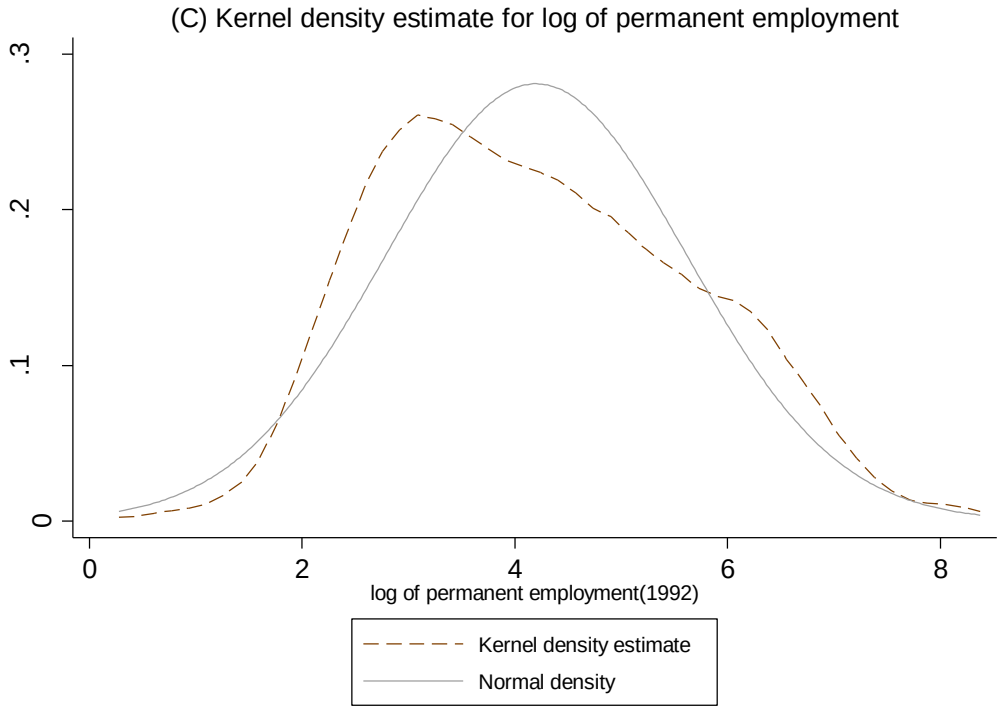
The graphical approach to test the normality of log-size or log of employment is to use different plots of normal distribution and give an eye view or subjective conclusion about the hypothesis of Gibrat i.e., whether growth of firms is independent of size for the Ethiopian large and medium scale manufacturing firms. Under the following successive panel plots (A-D), the estimates of normal density and kernel density estimations are sketched together followed by the descriptive about their shapes.

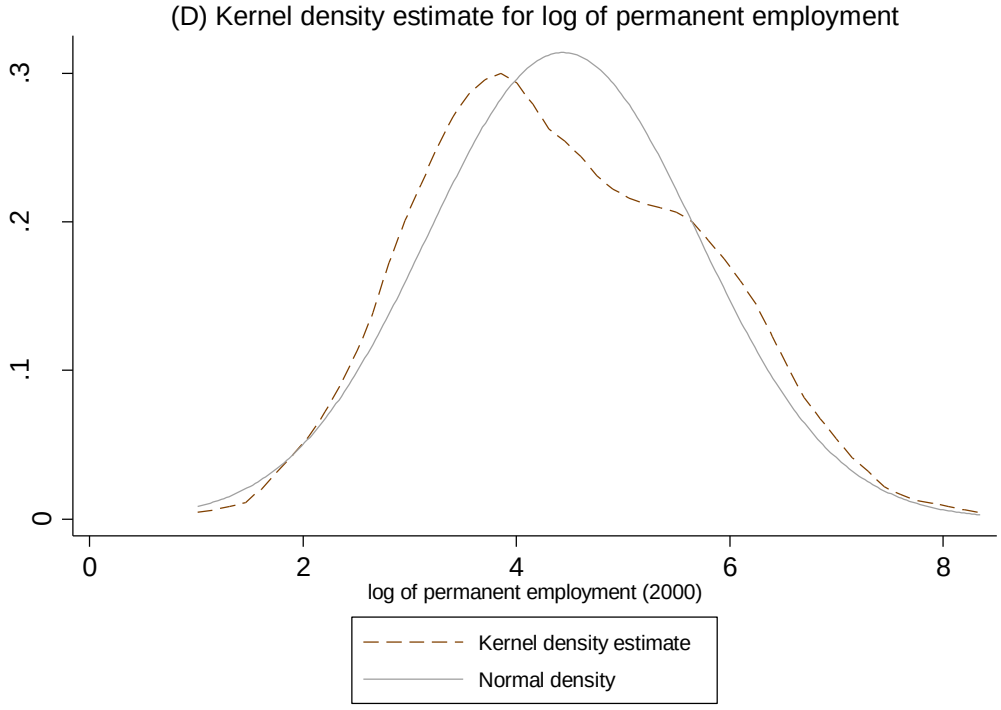
[25] Histograms are sensitive to the number of bins or columns that are used in the display. An alternative to histograms is the kernel density plot, which approximates the probability density of the variable. Kernel density plots have the advantage of being smooth and of being independent of the choice of origin, unlike histograms.

Figure 1 Firms' log-size distribution for years 1992 and 2000






(C) Kernel density estimate for log of permanent employment
0
.1
.2
.3
0
2
4
6
8
log of permanent employment(1992)
Kernel density estimate
Normal density


(D) Kernel density estimate for log of permanent employment
0
.1
.2
.3
0
2
4
6
8
log of permanent employment (2000)
Kernel density estimate
Normal density

As seen in the above successive panel graphs, the log of employment is not normal for selected years both for total (A and B) and permanent employment (C and D). Especially, log of total employment is very irregular having two-humps for the period 1992. This clearly indicates that employment growth whether it is defined in terms of logarithmic difference of total employment or permanent employment in two successive years, is not independent of employment size. More particularly, the shape of the distribution is obviously irregular though it seems symmetric. This is the other way of saying Gibrat's hypothesis does not work for the Ethiopian large and medium scale firms. However, this only provides an eye view judgment against Gibrat's law. Therefore, a more consistent and a bit general criterion based on the statistical test is required. This is done using the numerical approach.

II. Numerical approach

In the following table, different normality tests are provided along with other moment conditions for both logs of permanent and total employees for the three different years (1992, 1995 and 2000) and for the overall study period. These years are chosen because the interest is to show normality at the beginning, mid and the last of the study period and as a whole. As criteria of decision, skewness of value zero and kurtosis of value three indicate state of log-normality. A positive value of skewness indicates right skewness and a more than three value of kurtosis reveals peakdness in the distribution of employment. To facilitate generalization using this approach the other tests, the Shapiro-Francia and the Shapiro-Wilk normality tests are given in the last columns. If a test statistics is significantly different from one, the null of log-normality assumption will be rejected for the latter two tests.

Table3 Skewness/Kurtosis, Shapiro-Francia and Shapiro-Wilk tests for normality

Log normality test of total employment

Year	mean (sd)	median	skewness pr(skwns)	kurtosis pr(ktsis)	Shapiro-Francia(W') (prob>Z)	Shapiro-Wilk(W) (prob>Z)
1992	6.12304	6.35437	0.1065315	1.841982	0.95265	0.94909
	(2.580734)		(0.470)	(0.0000)	(0.00001)	(0.00000)
1995	6.590037	6.841616	-.0971615	1.874242	0.95836	0.95570
	(2.457824)		(0.510)	(0.000)	(0.00001)	(0.00000)
2000	4.43585	4.317488	0.2362646	2.462303	0.98872	0.98754
	(1.271058)		(0.113)	(0.023)	(0.03805)	(0.02246)
overall	5.547879	5.159055	0.5262514	2.32773	0.95258	0.95203
	(2.278844)		(0.000)	(0.000)	(0.00001)	(0.00000)

Log normality test for permanent employment

Year	mean (sd)	median	skewness pr(skwns)	kurtosis pr(ktsis)	Shapiro-Francia (prob>Z)	Shapiro-Wilk (prob>Z)
1992	4.43585	4.317488	0.2362646	2.462303	0.97810	0.97650
	(1.271058)		(0.035)	(0.003)	(0.00083)	(0.00025)
1995	4.209236	4.094345	0.2477773	2.577131	0.98584	0.98467
	(1.362976)		(0.097)	(0.109)	(0.01224)	(0.00641)
2000	4.200623	4.042897	0.3184695	2.353723	0.98872	0.98754
	(1.419332)		(0.113)	(0.023)	(0.03805)	(0.02246)
overall	4.283382	4.127134	0.2167918	2.607184	0.98761	0.98738
	(1.361803)		(0.000)	(0.000)	(0.00001)	(0.00000)

Note: numbers in parenthesis under the mean column are standard deviations, and numbers in parenthesis of other columns indicate the p- value of the respective test statistics. Compare the p values with the standard errors (at 1%, 5% and 10% significance levels) the standard being 5%. If The p-value is higher than significance levels usually used to test statistical hypotheses, then accept the null hypothesis, otherwise one fails to accept it. Ho: the log-size distribution is normal, Ha: log-size is not normally distributed.

As reported in table 3, the values of skewness for log of total employment are positive except for 1995 suggesting right skewness but it is not statistically significant even at 10% taking the three years individually. This means that the log size distribution is symmetric for these year considered separately. However, considering the entire period, one cannot deny positive skewness of total employment which is statistically significant at 1% level. Contrary to

skewness, kurtosis, Shapiro-Francia and the Shapiro-Wilk normality tests all signify that size distribution is not log-normal for both year level and entire period level as the test statistics on these tests is significant commonly at 5% level. A less than three kurtosis shows that the size distribution is less peaked than expected from the normal distribution.

Similarly, skewness is not significant for log of permanent employment at 10% level for the year 2000 indicating symmetric distribution of permanent employment for this period. However, all the other tests are statistically significant at 5% level denoting the null of log-normality of permanent employment is not accepted. One shouldn't wait for all the statistics to be significant simultaneously in order the variable not to be log-normal. Therefore, the result out of the above analysis indicates that both logs of permanent and total employment are not log-normal and the null of log-normality hypothesis should be rejected. Thus, the Gibrat's stochastic approach is not supported by large and medium scale manufacturing firms' employment data.

4.2. Econometric Analysis

In this section, system GMM estimation results for dynamic firm growth equation with serial correlation and covariates of growth, is presented. The system GMM estimations reported are computed by Stata software with option of one-step GMM estimator, along with standard errors that are asymptotically corrected to general heteroskedasticity (using Arellano-Bond robust estimator). First, estimations are done for multiple dynamic model for the whole sample. Then an extended estimation will be provided for testing the strength of Gibrat's law and determinants of firm growth for portions of cases (for cohorts of size and age). For multiple dynamic GMM system estimation, firm specific effects and industry dummies are removed while the right hand variables like productivity, capital intensity, leverage, labor quality, size all with log-

transformations and year dummies[26] are included. All the right hand side variables except age and leverage are assumed to be endogenous and so that appropriate instruments are defined accordingly. However, strict exogeneity is assumed for age and leverage of the firm.

And finally as the system GMM estimation is based on initial assumptions on the validity of the instruments used both for the level and difference equations, under each estimation instrument validity tests are provided using the Arellano-Bond autocorrelation test and Sargan test of overidentifying restrictions. In the first-step default GMM, the Arellano- Bond test is a direct test for the Arellano-Bond corrected estimation results. The method of estimation employed being first-step GMM, the direct Sargan test is inconsistent (Roodman (2006)). As a result, consistent Sargan test is obtained by conducting the test for the two-step un-robust estimation result.

4.2.1. Analysis for the whole Sample of Large and Medium Scale Manufacturing Firms

According to the hypothesis forwarded by Gibrat, the expected growth rate of a given firm is stochastic in nature and cannot be explained by other variables (its size at the beginning of the period examined, its persistence and other systematic factors) so that the growth rate of firms is unpredictable. In effect this means that industries may tend to become more concentrated even in the absence of efficiency advantages, market power and regulatory interventions[27]. However, results from dynamic model estimation shows that the coefficient of size is negatively related with growth of the firm taking all surviving firms together. Table 4 below reports the system

[26] Note that the time dummies are incorporated to control for the business cycle fluctuations, and makes it easier to capture the relationships of interest.

[27] According to Blandina Oliveira and Adelino Fortunato (2005), these random influences may include managerial talent, innovation, changes in demand or taste, organizational structure, and luck.

GMM estimation results along with the Arellano-Bond robust standard errors and other test statistics.

Table 4 System GMM regression results for the determinant of growth of Surviving firms

dependent var.: $Growth_{it}$	(1)
$(Growth)_{it-1}$	-0.1319073**
	(0.0673964)
$Ln(Size)_{it-1}$	-0.2409022***
	(0.0857556)
$Ln(age)_{it-1}$	-0.0066612
	(0.0522916)
$Ln(quality)_{it-1}$	0.1539757*
	(0.087939)
$Ln(produc)_{it-1}$	0.0411127
	(0.0504351)
$Ln(asset)_{it-1}$	0.0681343
	(0.048216)
$Ln(capintensity)_{it-1}$	-0.0290464 *
	(0.0158216)
$Ln(leverage)_{it-1}$	0.0015754
	(0.0266665)
Constant	-1.372491*
	(1.373411)
W_{JS}	29.90
	(0.0123)
Sargan test	78.38739
	(0.6228)
A-B test AR(2)	0.02778
	(0.9778)
No of instruments	99
Instruments	
Instruments for differenced equation	
GMM-type: L(2/2). [growth, lncapintensity_1, lnsize_1, lnproduc_1, lnasset_1, lnquality_1]	
Standard: D. [lnage_1, lnleverage_1, lnproduc_1, lncapintensity_1, lnsize_1, lnquality_1, lnasset_1]	
Instruments for level equation	
GMM-type: LD. [growth, lnleverage_1, lncapintensity_1, lnsize_1, lnproduc_1,lnquality_1,lnasset_1]	
Standard: _cons	

Note: The numbers with brackets under coefficient of each variable indicates the standard errors where as under each test statistics shows p-values. Estimated coefficients with asterisk ***, **, and * refer the coefficients are significant respectively at 1%, 5% and 10% level of significance. The validity of moment conditions of System GMM estimation method is tested using the Arellano-Bond second order test (AR (2)) and the Sargan test of over identifying restrictions in the differenced equation which has an asymptotic chi square distribution with degrees of freedom equal to the number of over identifying restrictions (number of moments minus parameters estimated). The overall joint significance of the estimators is tested using the Wald Joint test (W_{JS}) except time dummies and the constant. For the Sargan test of over identifying restrictions, the null hypothesis (H0) is: over identifying restrictions are valid. For the Arellano-Bond test for zero autocorrelation in first-differenced errors, the null hypothesis (H0) is no autocorrelation.

The results from table 4 reveals that four variables; persistence of growth, size, labor quality, and capital intensity are statistically significant and explain the variation in firm growth for the surviving large and medium scale manufacturing firms as a whole. As shown in table 4, size has a negative and statistically significant (at 1% level) impact on growth of the firm. This is contrary to the hypothesis forwarded by Gibrat the implication being smaller firms to have higher growth rate than larger firms. It is similar with recent empirical works in Ethiopia by Bigsten and Gebreeyesus (2007), Gebreeyesus (2006), Shiferaw (2006). The argument behind higher growth rate for smaller firms for the whole surviving manufacturing firms might be traced with the minimum efficient scale argument which is predicted by Bain (1956) and so that smaller firms might be far below from their respective industries' optimum size and enjoy economies of scale and thus higher growth.

On the other hand, theoretically it is argued that increase in asset size of the firm may facilitate growth. In line with this, table 4 shows that the coefficient of asset is positive but not statistically significant. Capital intensity has a negative and significant effect on growth. Thus, higher capital intensity in the form of higher fixed assets last year has a negative growth effect this year. This means that firms' capital accumulation as a result of their long term fixed capital investments does not help employment growth for the surviving firms as a whole.

Financial resources are important in allowing investment in new equipment, development of new products and promotions in new geographic markets that will translate into higher rates of growth. The source of this finance may include profits and retained earnings, equity financing or borrowing from formal or informal sources (Rajan and Zingales (1998)). Leverage ratio as a proxy gives information whether the external source of finance is constrained or not. If this ratio has a negative impact on growth, then the finance source in this case the bank loan is constrained. Table 4 shows that leverage ratio has positive impact on growth but not significantly. This means that firms' growth is independent of bank loan[28].

Moreover, in principle quality of labor improves growth. If 10% significance level is assumed, labor quality is significant and positively affects growth as previous year's labor quality acts as a catalyst for current growth. This is not surprising because firms having better qualification of labor will grow faster than firms with less qualification of labor the assumption being highly qualified labor are highly rewarded. This result is plausible as labor is the most important factor for the manufacturing firms in the country and creativity and learning are better practiced if the quality of this factor is kept.

The negative and significant persistence effect of growth at 5% level is in line with the works of Contini and Revelli (1989), Almus and Nerlinger (2000) and Goddard et al. (2002). As a result, last year's growth is followed by retarded growth this year. Coefficients on age and productivity lack significance but are in compatible with the Jovanovic's (1982) hypothesis in terms of their sign. The positive effect of productivity is expected and in agreement with positive and

[28] When the firm/year average of leverage ratio is calculated for the whole firms partitioned by size, average of leverage for the small firms is 0.5300746, where as the nine year average leverage ratio for the medium and large firms is respectively 0.6438706 and 0.685644. This indicates collaterals might be important to get access to credit the assumption being large firms have luxurious of collaterals.

significant effect in the research works by Bigsten and Gebreeyesus (2007) and Gebreeyesus (2006) but contrary to insignificant negative effect by Shiferaw (2006) for Ethiopian data. The positive sign in productivity parameter is in conformity with Jovanovic's hypothesis. But, productivity-growth effect lacks significance. In addition, the negative age effect (though insignificant) confirms the Jovanovic's learn-theoretic model so that younger firms grow faster than their counter parts as they are capable of learning and improving their efficiency. The negative and insignificant result of age-growth relation repeats Shiferaw's (2006) finding.

All the above analysis should be supported with specification tests that are the tools to detect whether the instruments used are valid which in turn indicate consistency of the estimates. The bottom of table 4 shows that both null of no autocorrelation and valid overidentifying restrictions are not rejected using the Arellano-Bond and joint Sargan tests respectively. This means that endogenous variables dated t-2 and t-1 are valid instruments respectively for the differenced and levels equation while exogenous variables instrument themselves in the differenced equation. Thus, both tests provide an efficient message that the instruments used are valid and the estimations are consistent with the moment conditions.

4.2.2. Comparative Analysis for Cohorts of Size and Age

Now it is a good idea to classify the whole sample of manufacturing firms based on some common criteria and examine the behavior of firm growth determinants at each category more rigorously. The need to classify firms based up on age and size arises because of wide variety of manufacturing firms. Accordingly, in the next section the analysis will be at different cohorts of size and age. The tercile classification is used for both age and size cohorts. When firms are divided according to their size, identifications like small, medium and large are used for

simplicity respectively for the lower, medium and upper terciles. And cohorts like young firms, adult firms and matured firms are used for age categorization. A robust estimation results from one-step System GMM are reported in table 5 and table 6.

Table 5 System GMM regression results for determinant of growth of Surviving firms (size cohort)

Dependentvar.: $Growth_{it}$	(1)	(2)	(3)
$(Growth)_{it-1}$	0.1234336***	-0.0895253	-0.1819568**
	(0.0385505)	(0.0842669)	(0.0841978)
$ln(Size)_{it-1}$	-0.6457697***	-0.5014113***	-0.2510052**
	(0.1308456)	(0.0577775)	(0.1137731)
$ln(age)_{it-1}$	-0.0734792	-0.0184966	0.0459265
	(0.0621631)	(0.050828)	(0.0788585)
$ln(quality)_{it-1}$	0.4128736***	0.0463178	0.0855604
	(0.1299183)	(0.0652623)	(0.0857354)
$ln(produc)_{it-1}$	-0.1986523**	0.0457674*	0.0217195
	(0.0831028)	(0.0243448)	(0.0350261)
$ln(asset)_{it-1}$	-0.0615562	-0.0198023	-0.0279035
	(0.0501308)	(0.0482038)	(0.0508966)
$ln(capintensity)_{it-1}$	-0.0300527	-0.0245285*	-0.004413
	(0.033069)	(0.0151748)	(0.0111822)
$ln(leverage)_{it-1}$	0.0300682	-0.0087231	-0.0259836
	(0.0495501)	(0.0277709)	(0.0302957)
Constant	1.52515	1.840423	0.7998752
	(1.257354)	(1.230079)	(0.8817102)
W_{JS}	138.83	152.25	29.77
	(0.0000)	(0.0000)	(0.0128)
Sargan test	14.06496	34.15195	44.67173
	(0.9867)	(0.9997)	(0.9991)
A-B test AR(2)	1.1727	0.62263	-0.2959
	(0.2409)	(0.5335)	(0.7673)
No of instruments	44	83	94

Instruments

Instruments for differenced equation

GMM-type: L(2/2). [growth, lncapintensity_1, lnsize_1, lnproduc_1, lnasset_1, lnquality_1]

Standard: D. [lnage_1, lnleverage_1, lnproduc_1, lncapintensity_1, lnsize_1, lnquality_1, lnasset_1]

Instruments for level equation

GMM-type: LD. [growth, lnleverage_1, lncapintensity_1, lnsize_1, lnproduc_1,lnquality_1,lnasset_1]

Standard: _cons

Note: The numbers with brackets under coefficient of each variable indicates the standard errors where as under each test statistics shows p-values. Estimated coefficients with asterisk ***, **, and * refer the coefficients are significant respectively at 1%, 5% and 10% level of significance. The validity of moment conditions of System GMM estimation method is tested using the Arellano-Bond second order test (AR (2)) and the Sargan test of over identifying restrictions in the differenced equation which has an asymptotic chi square distribution with degrees of freedom equal to the number of over identifying restrictions (number of moments minus parameters estimated). The overall joint significance of the estimators is tested using the Wald Joint test (W_{JS}) except time dummies and the constant. For the Sargan test of over identifying restrictions, the null hypothesis (H0) is: over identifying restrictions are valid. For the Arellano-Bond test for zero autocorrelation in first-differenced errors, the null hypothesis (H0) is no autocorrelation.

Columns 1, 2, and 3 of table 5 report one step- system GMM results on the size split for the same growth specification in question respectively for small, medium and large firms. For small firms (column 1 of table 5 results), Gibrat's law is rejected using the joint Wald test at 1% significance level as a first impression. Looking at the individual variables, size, persistence of growth, quality, and productivity are individually significant and have an influence on growth in either direction. But, there is no any statistical significance effect of age, asset, capital intensity and leverage on growth (column1 of table 5). For medium firms (result in column 2 of table 5), the variables determining firm growth significantly are only size, productivity and capital intensity. The significant variables decline dramatically to size and persistence of growth when the large firms are considered in column 3 of table 5.

As shown in table 5 (columns 1, 2, and 3), the coefficient of size is negative and significant. This means that whatever be the size cohort, Gibrat's law of independent size is not obtained. Thus, Gibrat's law is inappropriate even for large scale manufacturing firms as size has a negative significant effect on growth. However, there is tremendous decline in the magnitude of the size coefficient from small firms (column 1) to medium firms (column 2) and to large firms (column3). This makes similarity of this finding with the works of Sutton (1997), (1998), Geroski et al. (2003) and Fotopoulos et al. (2008)). For the persistence term, it is statistically

significant both for small and large firms (positive persistence for small firms and negative persistence for large firms). In this regard, small firms' last year growth effect spills over to this year as the last year growth is an 'impetus' for this year's growth. Contrary to this, for larger firms, last year growth has hindrance effect on their current growth. But, persistence of growth is independent for medium firms (column 2 of table 5).

For the productivity variable, the results are mixed. When small firms are considered, last year's productivity has a negative and significant effect on current growth. In this scenario, small firms prefer to downsize this year to maintain and improve their efficiency if they are productive last year. This means absence of selection via differential growth and cause inefficiency in resource allocation. Contrary to this result, there is positive productivity effect on growth for medium firms and these firms want to expand employment this year if they are productive last year. As a result, there is full selection as it works through both differential growth and difference in productivity leading to efficient resource allocation. That is what the Jovanovic hypothesis predicts. Results are positive but insignificant for larger firms. The other version of the Jovanovic hypothesis is confirmed in sign (not significant) for small and medium firms but not for larger firms for the age-growth relationship.

Table 5 also shows the positive labor quality effect which is only significant for the smaller firms. As depicted in column1 of table5, labor quality is crucial at least for smaller firms. The unexpected result is the negative and insignificant effect of firms' asset on growth in all cohorts of size. Similarly, capital intensity is negatively related with growth but significant only for medium firms. For medium firms, higher capital intensity in the last year is followed by less expansion in employment. Finally, leverage ratio has insignificant effect on firm growth. Directional wise, the effect of bank loan is positive only for the smaller firms. Still, the external

finance has not a statistically significant effect for all size cohorts. Thus, categorization of surviving firms with size does not change the effect obtained for the whole surviving firms.

Turning to the age cohort, system GMM estimation results are reported in table 6 for the same growth specification.

Table 6 System GMM regression results for determinant of growth of Surviving firms (age cohort)

Dependentvar.: $Growth_{it}$	(1)	(2)	(3)
$(Growth)_{it-1}$	-0.0063067	-0.2989183**	-0.3105675**
	(0.0807364)	(0.1358651)	(0.1454574)
$ln(Size)_{it-1}$	-0.3682235***	-0.0803226	-0.0104654
	(0.1219355)	(0.0508557)	(0.0871445)
$ln(age)_{it-1}$	0.0371691	-0.2124444**	-0.0608367
	(0.0698045)	(0.1027669)	(0.0738966)
$ln(quality)_{it-1}$	0.0845326	0.1036544 *	0.1982041**
	(0.0834075)	(0.0639397)	(0.091517)
$ln(produc)_{it-1}$	-0.0428716	0.0034734	0.0829364
	(0.0650887)	(0.0634536)	(0.0584896)
$ln(asset)_{it-1}$	0.106202**	0.0314451	-0.0262384
	(0.0465215)	(0.0403331)	(0.0533751)
$ln(capintensity)_{it-1}$	-0.0533687*	0.0139557	0.0171976
	(0.0286445)	(0.0149208)	(0.017641)
$ln(leverage)_{it-1}$	0.0746236	0.0181349	-0.0370845
	(0.0533018)	(0.0344863)	(0.0354044)
Constant	0.279421	-0.4380319	-2.205863***
	(0.9398564)	(0.6955846)	(0.7969827)
W_{JS}	53.40	37.65	78.74
	(0.0000)	(0.0010)	(0.0000)
Sargan test	67.6977	32.53382	30.8227
	(0.1799)	(0.9993)	(0.9996)
A-B test AR(2)	-0.78246	-0.89322	-0.80717
	(0.4339)	(0.3717)	(0.4196)
No of instruments	74	78	77

Instruments

Instruments for differenced equation

GMM-type: L(2/2). [growth, lncapintensity_1, lnsize_1, lnproduc_1, lnasset_1, lnquality_1]

Standard: D. [lnage_1, lnleverage_1, lnproduc_1, lncapintensity_1, lnsize_1, lnquality_1, lnasset_1]

Instruments for level equation

GMM-type: LD. [growth, lnleverage_1, lncapintensity_1, lnsize_1, lnproduc_1,lnquality_1,lnasset_1]

Standard: _cons

Note: The numbers with brackets under each coefficient of the variables indicates the standard errors where as under each test statistics shows p-values. Estimated coefficients with asterisk ***, **, and * refer the coefficients are significant respectively at 1%, 5% and 10% level of significance. The validity of moment conditions of System GMM estimation method is tested using the Arellano-Bond second order test (AR (2)) and the Sargan test of over identifying restrictions in the differenced equation which has an asymptotic chi square distribution with degrees of freedom equal to the number of over identifying restrictions (number of moments minus parameters estimated). The overall joint significance of the estimators is tested using the Wald Joint test (W_{JS}) except time dummies and the constant. For the Sargan test of over identifying restrictions, the null hypothesis (H0) is: over identifying restrictions are valid. For the Arellano-Bond test for zero autocorrelation in first-differenced errors, the null hypothesis (H0) is no autocorrelation.

In the first place, failure of Gibrat's hypothesis is shown by the Wald joint significance test at 1% level in all age cohorts. Considering the results for young firms in column 1 of table 6, size, assets and capital intensity significantly affect growth. For adult firms (in column 2 of table 6), the statistically significant variables include persistence of growth, quality of labor and age of the firm. Only two variables are found statistically significant for mature firms. These are lag of growth and quality of labor. But, while keeping the negative effect, the coefficient of size is not found statistically significant for the adult and mature firms. Then, shall we conclude that Gibrat's law is accepted for adult and mature firms due to weak coefficient of size?

[4]

Still Gibrat's law is rejected as far as there is negative and significant effect of last year's growth on current growth. However, stochastic like feature seems to be observed for adult and mature firms if the traditional size-growth relationship is only considered. This inclination towards the Gibrat's like structure is also predicted for the mature firms by Sutton (1997) and Caves (1998) who consider the law as dynamic rule valid for large and mature firms that had already attained the minimum efficient scale (MES) level of output. With regard to age, it is found that it has negative and significant effect for adult firms and this confirms the Jovanovic's learning hypothesis for this particular age cohort (column2 of table 6) ,whereas, age lacks significance for young and mature firms. The other version of learning hypothesis is only confirmed for the

positive (but insignificant) effect of productivity for the adult and mature firms. Insignificant productivity-growth relation does not imply there is full selection mechanism which is dictated by the positive-significant effect of this efficiency parameter.

Like the results for the size cohort and the whole sample, leverage ratio is found to be insignificant. As expected, labor quality is found to be vehicle for the growth of adult and mature firms (column2 and 3 of table 6) but insignificant for the younger firms. Interestingly, the asset holding of the firm positively affects the growth of young firms where as capital intensity limits growth for these firms. Asset accumulation has positive but insignificant effect for the adult firms while the effect is negative and insignificant for the mature firms. However, the negative sign for capital intensity turns to positive for the adult and mature firms though the effect is insignificant. The implication is that as firms get transferred to their adult hood and mature stages, the importance of capital intensity grows (however, the relationship is not significant).

As a true confirmation of what is said in the analysis of the two cohorts above, specification tests should be checked once again. Accordingly, as shown in the bottom of the two tables (table 5 and 6), both the null of no autocorrelation and valid overidentifying restrictions are not rejected. This demonstrates that the instruments used are appropriate and the estimation results are consistent with the moment conditions.

CHAPTER FIVE

5. CONCLUSIONS AND RECOMMENDATIONS

The study has analyzed the determinants of growth for surviving large and medium scale manufacturing firms using the dynamic panel data from 1992 to 2000 E.C. The System GMM estimation result of the analysis can be concluded in the following points:

(1) Gibrat's law is not supported for large and medium scale surviving firms. However, some inclination to the law is found for the medium and large firms using tercile size categorization and tercile age split of adult and mature firms if we only look for the simple size-growth relationship.

(2) Growth persistence effect is found for surviving firms as whole, small and large firms, and adult and mature firms. In all these cases, last year's growth is found to have a negative influence on current employment growth rate except for the small firms. This adds input for the conclusion that giving attention is vital for smaller firms that might solve the problem of unemployment which is a major challenge for the country nowadays.

(3) Looking at the asset and capital attributes of the firm as its growth determinant, asset does not seem to have a significant influence except for younger firms. Capital intensity is negatively and significantly associated with growth for the whole surviving firms, and for younger and medium firms. In all other cases, the effect is negative except for adult and mature firms though it is insignificant. Looking at the effect of asset for younger firms, it is possible to conclude that short run asset accumulation in the form short run fixed investment has employment expansion effect.

(4) Labor quality is found to be the driving force for the growth of firms despite its statistical insignificance in some of the age and size cohorts.

(5) External finance in the form of bank loan has no role for the growth of firms as leverage ratio is found to be insignificant for the growth of firms.

(6) Productivity has positive effect for firm growth except for small and young surviving firms. However, its effect on growth is significant only for smaller (negative) and medium (positive) firms. Jovanovic's (1992) hypothesis fails to work for smaller surviving firms as they respond by downsizing their employment this year for the last year's productivity.

(7) Age has a negative-significant effect only for the growth of adult surviving firms. But, negative age-growth relationships are found for all cases except for young and large firms. This implies Jovanovic's passive-learning hypothesis works only for adult firms.

The following suggestions are forwarded in order to boost employment growth of large and medium scale manufacturing firms and alleviate the problem of unemployment:

- Privileged treatment should be given for smaller and younger manufacturing firms that are supposed to be the remedial for the fastest growing number of unemployment. This treatment may be in the provision of services like credit, subsidy and exchange access.
- In order to implement the newly developed government plan, 'Growth and Transformation Plan', as intended, the government and firm managers should give due attention for development of human resource. This human capital can be manufactured through formal university education and technical and vocational training in the chosen field which industries are in need. Firm managers can also give on the job or formal education to increase their manpower pool which is capable of creating and learning fast.

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APPENDICES

Appendix 1. Summary Statistics of Main Variables

Variables		Mean	Std.dev.	Min	Max	Observation
Growth	overall	-.0004745	.6742254	-4.671443	5.939645	N= 2342
	between		.1634992	-.6123064	.6782111	n = 263
	within		.6544481	-4.120611	5.260959	T-bar = 8.90494
Employment	overall	184.9618	336.8962	1	4454	N = 2354
	between		325.9817	4.555556	2520.222	n = 263
	within		84.45931	-871.2605	2465.073	T-bar = 8.95057
Age	overall	22.70184	17.87317	0	91	N=2341
	between		16.61815	2.333333	82	n = 263
	within		6.59472	-42.96483	60.25739	T-bar = 8.90114
Quality	overall	7260.917	7084.794	31.5964	251584.9	N = 2297
	between		4220.17	1336.804	35148.67	n = 263
	within		5732.234	-27360.26	223697.2	T-bar = 8.73384
Productivity	overall	153424.5	890949.8	1107.736	4.14e+07	N = 2328
	between		352113.6	5995.731	4895074	n = 263
	within		818031.7	-4580511	3.66e+07	T-bar = 8.85171
Cap.intensity	overall	35070.21	108701.1	0	1799329	N = 1473
	between		94874.23	0	927573.7	N=257
	within		90625.74	-697983.1	1473220	T-bar = 5.73152
Real asset	overall	1.44e+07	4.59e+07	0	1.02e+09	N = 2349
	between		4.02e+07	14525.57	5.28e+08	n = 263
	within		2.20e+07	-4.10e+08	5.10e+08	T-bar = 8.93156
Leverage ratio	overall	.6189642	5.460959	0	234.8183	N = 2346
	between		1.915638	0	26.09092	n = 263
	within		5.11397	-25.47196	209.3464	T-bar = 8.92015

Appendix 2. System GMM Estimation Results for the Whole Surviving Firms

For appendixes 2 to 8, the terms with y1, y2…y9 are the year dummies. Here the year dummies are assumed to be exogenous and instrument themselves. The more detailed System GMM results are given (appendix 2 to appendix 8) for different cases.

System dynamic panel-data estimation			Number of obs =	356	
Group variable: estid			Number of groups =	152	
Time variable: year					
			Obs per group: min =	1	
			avg =	2.342105	
			max =	7	
Number of instruments = 99			Wald chi2(15) =	29.90	
			Prob > chi2 =	0.0123	
One-step robust results					
growth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
growth _1	-.1319073	.0673964	-1.96	0.050	-.2640019 .0001872
lnquality_1	.1539757	.087939	1.75	0.080	-.0183814 .3263329
lncapintensity_1	-.0290464	.0158216	-1.84	0.066	-.0600561 .0019633
lnasset_1	.0681343	.048216	1.41	0.158	-.0263674 .1626359
lnage_1	-.0066612	.0522916	-0.13	0.899	-.1091509 .0958285
lnleverage_1	.0015754	.0266665	0.06	0.953	-.05069 .0538408
lnproduc_1	.0411127	.0504351	0.82	0.415	-.0577384 .1399637
lnsize_1	-.2409022	.0857556	-2.81	0.005	-.4089801 -.0728244
y2	-.2527838	.1486581	-1.70	0.089	-.5441483 .0385808
y3	-.2423283	.1254793	-1.93	0.053	-.4882631 .0036065
y4	-.0576322	.1009037	-0.57	0.568	-.2553997 .1401354
y5	-.0308887	.1057158	-0.29	0.770	-.2380879 .1763106
y6	-.0368664	.1053977	-0.35	0.727	-.2434421 .1697093
y7	-.1402593	.1137148	-1.23	0.217	-.3631363 .0826177
y9	-.0405644	.0884827	-0.46	0.647	-.2139872 .1328584
_cons	-1.372491	.7406822	-1.85	0.064	-2.824201 .0792197

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnprodu_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 3. System GMM Estimation Results for Surviving Firms (Size in the First Tercile i.e., Smaller Firms)

System dynamic panel-data estimation			**Number of obs**	**=**	**57**
Group variable: estid			**Number of groups**	**=**	**38**
Time variable: year					
			Obs per group: min =		**1**
			avg =		**1.5**
			max =		**5**
Number of instruments =	**44**		**Wald chi2(15)**	**=**	**138.83**
			Prob > chi2	**=**	**0.0000**
One-step robust results					

growth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Growth_1	.1234336	.0385505	3.20	0.001	.0478759 .1989913
lnsize_1	-.6457697	.1308456	-4.94	0.000	-.9022224 -.389317
lncapintensity_1	-.0300527	.033069	-0.91	0.363	-.0948667 .0347613
lnasset_1	-.0615562	.0501308	-1.23	0.219	-.1598108 .0366984
lnage_1	-.0734792	.0621631	-1.18	0.237	-.1953167 .0483582
lnquality_1	.4128736	.1299183	3.18	0.001	.1582385 .6675088
lnleverage_1	.0300682	.0495501	0.61	0.544	-.0670482 .1271847
lnproduc_1	-.1986523	.0831028	-2.39	0.017	-.3615308 -.0357738
y2	.4715002	.3273744	1.44	0.150	-.1701418 1.113142
y3	.0142639	.1427796	0.10	0.920	-.2655791 .2941068
y4	.4608367	.1824504	2.53	0.012	.1032405 .8184329
y5	.8248	.2262484	3.65	0.000	.3813613 1.268239
y6	.2330623	.1970058	1.18	0.237	-.1530619 .6191866
y7	.2257957	.1783458	1.27	0.205	-.1237555 .575347
y9	.6792788	.1588137	4.28	0.000	.3680095 .990548
_cons	1.52515	1.257354	1.21	0.225	-.9392174 3.989518

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y1 D.y3 D.y4 D.y5 D.y6 D.y7

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 4. System GMM Estimation Results for Surviving Firms (Size in the Second Tercile i.e., Medium Firms)

System dynamic panel-data estimation				**Number of obs = 137**	
Group variable: estid				**Number of groups = 65**	
Time variable: year					
				Obs per group: min = 1	
				avg = 2.107692	
				max = 7	
Number of instruments = 83				**Wald chi2(15) = 152.25**	
				Prob > chi2 = 0.0000	
One-step robust results					
growth	**Coef.**	**Std. Err.**	z	P>|z|	[95% Conf. Interval]
Growth_1	-.0895253	.0842669	-1.06	0.288	-.2546854 .0756348
lnquality_1	.0463178	.0652623	0.71	0.478	-.0815941 .1742296
lncapintensity_1	-.0245285	.0151748	-1.62	0.106	-.0542705 .0052136
lnage_1	-.0184966	.050828	-0.36	0.716	-.1181175 .0811244
lnleverage_1	-.0087231	.0277709	-0.31	0.753	-.063153 .0457069
lnproduc_1	.0457674	.0243448	1.88	0.060	-.0019476 .0934824
lnsize_1	-.5014113	.0577775	-8.68	0.000	-.6146531 -.3881695
lnasset_1	-.0198023	.0482038	-0.41	0.681	-.11428 .0746754
y2	-.0571358	.1285063	-0.44	0.657	-.3090036 .1947319
y4	-.0773751	.1119413	-0.69	0.489	-.296776 .1420257
y5	-.1612719	.0916338	-1.76	0.078	-.3408708 .018327
y6	-.1017202	.1091339	-0.93	0.351	-.3156187 .1121784
y7	-.1614232	.1072841	-1.50	0.132	-.3716961 .0488498
y8	-.2034682	.115162	-1.77	0.077	-.4291816 .0222451
y9	-.0295496	.12914	-0.23	0.819	-.2826594 .2235602
_cons	1.840423	1.230079	1.50	0.135	-.5704877 4.251333

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8 D.y9

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 5. System GMM Estimation Results for Surviving Firms (Size in the Third Tercile i.e., Larger Firms)

System dynamic panel-data estimation				**Number of obs = 162**	
Group variable: estid				**Number of groups = 72**	
Time variable: year					
				Obs per group: min = 1	
				avg = 2.25	
				max = 6	
Number of instruments = 94				**Wald chi2(15) = 29.77**	
				Prob > chi2 = 0.0128	
One-step robust results					
growth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Growth_1	-.1819568	.0841978	-2.16	0.031	-.3469814 -.0169321
lnquality_1	.0855604	.0857354	1.00	0.318	-.0824779 .2535988
lncapintensity_1	-.004413	.0111822	-0.39	0.693	-.0263297 .0175037
lnasset_1	-.0279035	.0508966	-0.55	0.584	-.1276591 .071852
lnage_1	.0459265	.0788585	0.58	0.560	-.1086334 .2004864
lnleverage_1	-.0259836	.0302957	-0.86	0.391	-.0853622 .0333949
lnproduc_1	.0217195	.0350261	0.62	0.535	-.0469304 .0903695
lnsize_1	-.2510052	.1137731	-2.21	0.027	-.4739963 -.028014
y2	.0850677	.125765	0.68	0.499	-.1614271 .3315625
y3	-.1041271	.0692195	-1.50	0.133	-.2397949 .0315407
y4	.0611127	.0682029	0.90	0.370	-.0725626 .194788
y5	.0050661	.0452549	0.11	0.911	-.0836318 .093764
y7	.0229027	.0763651	0.30	0.764	-.1267702 .1725756
y8	.138074	.0967786	1.43	0.154	-.0516085 .3277565
y9	-.040214	.0963684	-0.42	0.676	-.2290926 .1486647
_cons	.7998752	.8817102	0.91	0.364	-.928245 2.527995

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8 D.y9

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 6. System GMM Estimation Results for Surviving Firms (Age in the First Tercile i.e., Younger Firms)

System dynamic panel-data estimation			**Number of obs**	**=**	**117**
Group variable: estid			**Number of groups**	**=**	**64**
Time variable: year					
			Obs per group: min =		**1**
			avg = 1.828125		
			max =		**7**
Number of instruments =	**74**		**Wald chi2(15)**	**=**	**53.40**
			Prob > chi2	**=**	**0.0000**
One-step robust results					

growth	Coef.	Std. Err.	Z	P>|z|	[95% Conf. Interval]
Growth_1	-.0063067	.0807364	-0.08	0.938	-.1645471 .1519337
lnquality_1	.0845326	.0834075	1.01	0.311	-.0789432 .2480084
lncapintensity_1	-.0533687	.0286445	-1.86	0.062	-.1095109 .0027734
lnasset_1	.106202	.0465215	2.28	0.022	.0150215 .1973826
lnage_1	.0371691	.0698045	0.53	0.594	-.0996453 .1739834
lnleverage_1	.0746236	.0533018	1.40	0.162	-.029846 .1790931
lnproduc_1	-.0428716	.0650887	-0.66	0.510	-.1704432 .0846999
lnsize_1	-.3682235	.1219355	-3.02	0.003	-.6072126 -.1292343
y2	-.3060763	.2386685	-1.28	0.200	-.773858 .1617054
y3	-.1792518	.1627777	-1.10	0.271	-.4982902 .1397866
y4	-.136806	.1512494	-0.90	0.366	-.4332494 .1596373
y5	-.1844625	.1270415	-1.45	0.147	-.4334592 .0645343
y6	.0628649	.1246348	0.50	0.614	-.1814147 .3071446
y7	-.1041762	.1131056	-0.92	0.357	-.3258591 .1175067
y8	-.3723314	.1949568	-1.91	0.056	-.7544398 .009777
_cons	.279421	.9398564	0.30	0.766	-1.562664 2.121506

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 7. System GMM Estimation Results For Surviving Firms (Age in the Second Tercile i.e., Adult Firms)

System dynamic panel-data estimation			**Number of obs**	**=**	**117**
Group variable: estid			**Number of groups**	**=**	**68**
Time variable: year					
			Obs per group: min =		**1**
			avg = 1.720588		
			max =		**5**
Number of instruments =	**78**		**Wald chi2(15)**	**=**	**37.65**
			Prob > chi2	**=**	**0.0010**
One-step robust results					
growth	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
Growth_1	-.2989183	.1358651	-2.20	0.028	-.565209 -.0326275
lnquality_1	.1036544	.0639397	1.62	0.105	-.0216651 .2289739
lnproduc_1	.0034734	.0634536	0.05	0.956	-.1208934 .1278402
lncapintensity_1	.0139557	.0149208	0.94	0.350	-.0152885 .0431999
lnasset_1	.0314451	.0403331	0.78	0.436	-.0476062 .1104965
lnage_1	-.2124444	.1027669	-2.07	0.039	-.4138638 -.011025
lnleverage_1	.0181349	.0344863	0.53	0.599	-.049457 .0857267
lnsize_1	-.0803226	.0508557	-1.58	0.114	-.1799979 .0193527
y2	-.1830478	.17725	-1.03	0.302	-.5304514 .1643559
y3	-.1467501	.0997524	-1.47	0.141	-.3422613 .048761
y4	-.1727247	.1132986	-1.52	0.127	-.3947858 .0493365
y6	-.2698763	.1812049	-1.49	0.136	-.6250314 .0852789
y7	-.2633033	.2395184	-1.10	0.272	-.7327507 .2061441
y8	-.0546412	.1612728	-0.34	0.735	-.37073 .2614476
y9	-.2395307	.1616351	-1.48	0.138	-.5563297 .0772683
_cons	-.4380319	.6955846	-0.63	0.529	-1.801353 .9252889

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8 D.y9

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons

Appendix 8. System GMM Estimation Results for Surviving Firms (Age in the Third Tercile i.e., Mature Firms)

System dynamic panel-data estimation				**Number of obs**	**= 117**
Group variable: estid				**Number of groups**	**= 57**
Time variable: year					
				Obs per group: min =	**1**
				avg = 2.052632	
				max =	**6**
Number of instruments = 77				**Wald chi2(15)**	**= 78.74**
				Prob > chi2	**= 0.0000**
One-step robust results					
Growth	Coef.	Std. Err.	Z	P>|z|	[95% Conf. Interval]
Growth_1	-.3105675	.1454574	-2.14	0.033	-.5956588 -.0254763
lnquality_1	.1982041	.091517	2.17	0.030	.018834 .3775742
lnsize_1	-.0104654	.0871445	-0.12	0.904	-.1812655 .1603346
lncapintensity_1	.0171976	.017641	0.97	0.330	-.0173782 .0517734
lnasset_1	-.0262384	.0533751	-0.49	0.623	-.1308517 .0783749
lnage_1	-.0608367	.0738966	-0.82	0.410	-.2056714 .0839979
lnleverage_1	-.0370845	.0354044	-1.05	0.295	-.1064757 .0323068
lnproduc_1	.0829364	.0584896	1.42	0.156	-.031701 .1975739
y2	.2339232	.2177826	1.07	0.283	-.1929228 .6607692
y4	-.0726614	.0926291	-0.78	0.433	-.2542111 .1088882
y5	-.1218178	.087697	-1.39	0.165	-.2937007 .0500652
y6	.0361198	.0946873	0.38	0.703	-.1494639 .2217035
y7	-.1337942	.1078434	-1.24	0.215	-.3451633 .0775749
y8	-.0670002	.0967424	-0.69	0.489	-.2566119 .1226115
y9	.1387075	.1179734	1.18	0.240	-.0925161 .3699311
_cons	-2.205863	.7969827	-2.77	0.006	-3.76792 -.6438055

Instruments for differenced equation

GMM-type: L(2/2).growth L(2/2).lnquality_1 L(2/2).lnproduc_1 L(2/2).lnsize_1 L(2/2).lncapintensity_1 L(2/2).lnasset_1

Standard: D.lnage_1 D.lncapintensity_1 D.lnquality_1 D.lnleverage_1 D.lnproduc_1 D.lnsize_1 D.lnasset_1 D.y2 D.y3 D.y4 D.y5 D.y6 D.y7 D.y8 D.y9

Instruments for level equation

GMM-type: LD.growth LD.lnquality_1 LD.lnproduc_1 LD.lnsize_1 LD.lncapintensity_1 LD.lnasset_1

Standard: _cons