Determinants of Firm Growth: The Case of Ethiopian Manufacturing Firms

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Abstract

The unreliable contribution of the Ethiopian manufacturing firms on the economic growth is the, main headache to the policy makers in the country. The aims of the study were to identify the determinants of firm growth in Ethiopian manufacturing sector. The study based on data obtained from Ethiopian central statistics agency on medium and large firms for 2008 to 2020. OLS for comparison and System GMM developed by Blundell and Bond (1998) that uses lagged first differences of the explanatory variables and the dependent variable as instruments was used parallel to examine the relationship between size and growth as well as identify the other major determinants of firm growth. Both OLS and system GMM result indicated that age and size have negative relationship with firm growth that shows small and younger firms grow faster. This is good evidence against Gibrat law. Furthermore, the lags of firm growth have negative effect which indicates there is no persistent growth in the Ethiopian medium and large manufacturing firms. In addition export, capital intensity, human capital and location has a positive and significant effect on firm growth while labour productivity has a negative and significant effect on the firm growth. The policy perspective emphasis should be given to improve exposure of firms to foreign market, new technology, and invest on infrastructure and human power development. Small businesses that are more labor-intensive should be more concerned.

Keywords: System Generalized Method Moments, manufacturing, firm growth, size, Ethiopia

1. Introduction

This chapter introduces to the readers providing a persuading understanding of firm growth, estimation method, and the concern of the research gap. In the background, the paper justifies the reasons that make it observable to carry out this research and shows the derived objectives from the problem identified. Lastly specifies the importance, possibility, and restriction of the study.

1.1. Background of the Study

The current focuses of economic growth have been connected with the service and industrial sector. The industrial sector is the backbone of economic growth in many developed and developing countries (Pandya, 2012;Etuk, *et al.*, 2014). It is also the engines of job creation (Chirwa, 2008). Over the last four

decades, the transfer of industrialization from developed to developing countries has been an unprecedented and critical transformation in the global economy. Developing countries rely upon it for 33% of their GDP and 45% of their employment (Page*et al*. 2016).

The character of most African firms were small number of large firms producing the majority of output and a very large number of small firms operating on the periphery of the economy (Biggs and Oppenheim, 1986). Literally, the average African share of GDP in the manufacturing sector fell from 3% in 1970 to 2% in 2010, with Sub-Saharan Africa accounting for only 10% of GDP, the same as in the 1970s. (Page*et al.* 2016).

The Ethiopian manufacturing sector's involvement in the economy began in 1939 with the establishment of the Dire-Dawa textile factory (Mehari *et al*. 2015). The revolution is started recently toward a more industrial-oriented economy. In 1997 the Ethiopian government established a strategy to decrease unemployment and improve GDP by building manufacturing firms above all sectors. The intention of the building is to create a good situation for the producers, facilitate economic growth, create jobs, stimulate cooperation between enterprises, afford a base for large firms, and increase the share of the sector on exports (Berihu *et al*., 2014).

As the implementation of GTP in 2015 led to improvements in the industrial policy, many industrial parks were built in the country (Oqubay, 2018). This improves the manufacturing sector share in the GDP and employment creation of the country. The share of the manufacturing sector in GDP grows from 16.3 percent to 23.11 from 2015 to 2020 with some oscillation (World Bank, 2023). However, as its contribution to GDP and employment fluctuates, the sector is not experiencing consistent growth.

As an indicator of economic growth the study of manufacturing firm growth has recently gained global attention. The study of firm growth was popularized after the conventional study of Gibrat's (1931) "law of proportional effect" as cited bySutton, J. (1997) entitled as Gibrat's legacy. According to him, the growth rate of a given firm is independent of its initial size. (Hall 1987; Evans 1987; Bigsten and Gebreeyesus 2007 and Nichter and Goldmark 2009), find that smaller and younger firms grow more rapidly than older and larger firms. In Ethiopian context, Mengistae (2006) found small businesses are less grows in industries where the pressure of competition is stronger. (Shiferaw 2007; Bigsten and Gebreeyesus 2007; Tsaedu and Chen 2021) using Ethiopian data found that younger and smaller firms grow faster.

Even though firm growth has piqued the interest of many scholars worldwide, there is no universal agreement on the relationship between firm growth, and its attributes. In another context, the factors impeding Ethiopia's manufacturing firm growth rate and low contribution to GDP have become a major concern on this research. So, this paper will provide evidence of the relationship between a firm's growth and its attributes. And also advise policymakers regarding the uncertainty surrounding firm growth and its contribution to the nation's GDP.

1.2. Objective of the study

To identify the relationship between firm size and growth
To examine the determinants of firm growth in Ethiopian manufacturing

2. Literature Review

This chapter discusses the concept of firm growth, the theory of firm growth and size, and, empirical works using different countries' real data are also reviewed after each theory.

2.1. The concept of firm growth

Firm growth is defined as the firm's accumulation of assets, its stage advancement, and its ability to create satisfied customers (Gupta *et al.*, 2013). According to Luttmer(2011), the mechanics of firm growth state that a firm can grow through introducing new goods, building new plants, opening new sales offices, hiring new workers, winning new customers, and acquiring whole new divisions and market shares. He also states that some firms develop new ideas while others grow. The concept of firm growth was related to the performance of the firm. Vivarelli and Audretsch (1998) also strengthen the idea that the manufacturing firm's performance was connected with its growth.

(Bevan *et al.*, 1999) describe firm growth in relation to profitability growth, output growth, and productivity growth. (Penrose, 1959; O'Farrell and Hitchens, 1988) can also be defined in terms of sales growth, employment growth, and improvement in market share, asset growth, and owner transformation.

There is no common assumption derived from the literature in defining firm growth that leads to consistency in measuring firm growth. Nguyen *et al.*, (2020) stated the complexity of measuring firm growth as he also used employment growth, profit gain, value-added, turnover, and total asset growth to measure a firm's growth. Hall (1987) and Evans (1987) also used employment growth for measuring firms' growth. Scholars used different classes of firm growth measurements, such as employment growth, profit gain, value-added, and total asset growth. As previously stated, most kinds of literature use employment growth as a proxy for measuring firm growth. So we apply employment growth as a measurement of firm growth in this study.

2.2. Firm Growth and Size

In 1931, Robert Gibrat developed the law of proportionate distribution theory by observing lognormal distribution in French manufacturing industry firms. It states that the proportional change in firm size in a given industry is independent of the initial size. He elaborates on the unpredictable and stochastic nature of firm growth. He proposed average proportionate firm growth, mean growth rate dispersion, and no serial correlation among different size classes of firms. That means small, medium, and large firms have an equal probability of achieving a specific growth rate. He finally comes to the conclusion that there is no association between firm growth and firm size. Gibrat law has received great concern in many works of literature since publishing this influential journal in 1931. (Simon and Bonini, 1958; Dosi *et al.*, 2020; Tsaedu and Chen, 2021) cite the Gibrat model representation as follows:

$$\ln S_{it} = \alpha + \beta \ln S_{it-1} + \varepsilon_{it} \quad (1)$$

Where, S_{it} firm size measured by a number of employees of firm i at time t, ε_{it} is an independent and identically distributed random variable with zero mean with multiplicative growth shock. Subtracting $\ln S_{it-1}$ from both sides of equation (1) rewritten as:

$$\ln S_{it} - \ln S_{it-1} = \alpha + \beta_i \ln S_{it-1} + \varepsilon_{it} \quad (2)$$

$$\text{Growth} = \alpha + \beta \ln S_{it-1} + \varepsilon_{it}$$

Gibrat law strongly suggests that:

B = 1 for every firm (i), which shows the law of proportionate effect holds, $\beta > 1$ an evidence of a tendency towards monopoly, while $\beta < 1$ shows small firms growing fast.

Some academics advocate for the proportional effect law. Audretsch *et al* (2004) Finding from a large sample of Dutch hospitality firms suggests that, throughout many contexts, growth rates are independent of firm size. (Sutton 1997; Caves 1998; Geroski *et al*. 2003) try to convince by supported Gibrat's assumption, claiming that the law is applicable to large, mature firms that have already attained the least efficient scale level of production. Additionally, Haltiwanger *et al.* (2013) attempt to validate Gibrat's law using the

average firm size as the initial size for the beginning and end periods, to challenges the negative effect of size on growth.

However, the majority of the literature, including Fizaine (1968), Evans (1987a), Mead, and Liedholm (1998) Observing a negative relationship between firm growth and size, including more recent findings (Gunning and Mengistae 2001; Calvo 2006; Carrizosa&Blasco 2009; and Tsaedu and Chen 2021), come to the conclusion that small firms grow more quickly than large firms.

(Evans, 1987b), also in examining the dynamics of firm growth on all firms working within 100 US manufacturing Industries, state that the chance of firm growth decreased with firm size. He presents proof to reject the Gibrat law of proportional effect. Youn*et al.*, (2011) agreed with this finding, stating that firm size has a negative and decreasing effect on firm growth. Bigsten and Gebreeyesus (2007) paper on Small, the Young, and the Productive: Determinants of Manufacturing Firm Growth in Ethiopia found that firm growth has a negative relationship with firm size. This indicates small firms grow faster than large firms. As stated on many literatures the relationship between firm growth and firm size goes against Gibrat's law of proportionate change of firm growth and its size.

2.3. Firm Growth and Age

For longtime the theory of neoclassical models ignores the impact of age on the process of firms' growth. Contrarily, today's scholars are paying more attention to a firm's age as a determinant of firm growth. Researchers such as Evans (1987a, b) and Variyam and Kraybill (1992) for US manufacturing firms found that growth rates increased with age. The idea that young enterprises have expanded more quickly than elderly firms is also supported by Calvo (2006) and Carrizosa&Blasco (2009). Furthermore, Jovanovic (1982) found that older firms have lower growth rates than younger firms. As a result, the model forecasts a negative relationship between age and firm growth.

Empirical evidence from developing countries such as Ethiopia indicates a negative relationship between firm growth and age. Scholars such as Bigsten and Gebreeyesus (2007), for example, confirmed the negative correlation between firm size and growth; on the other hand, Shiferaw (2007) discovered no statistically significant relationship between firm age and growth. Tsaedu and Chen (2021) on Dynamics of firm growth in sub-Saharan Africa found that the younger survival firms grow faster than the older one. According to theoretical research published in the journal, some of the effects of age on firm growth involve selection effects, learning-by-doing effects, and inertia effects. As a result of this finding, the theory of firm growth and age has recently become the most popular concern in literature.

2.4. Firm Growth and other attributes

As several scholars are involved with the relationship between age and size with firm growth, there are numerous attributes that influence firm growth. Gupta *et al*. (2013) state in their study state that internal and environmental factors determine firm growth. All the controlled factors are internal factors, such as the human capital advancement, operational, marketing, financial, and technological capabilities. At the same time, environmental factors are beyond the firm's control, such as economic, sociocultural, regulatory and legal, political, trade, technical, demographics, and among others. In their empirical study of German small-scale businesses, Rauch *et al.* (2005) found that human capital is a determinant of firm growth. It implies that firms with higher capital investments grow faster than firms with lower capital investments, implying a difference in the fund's new capital investment. As Lee (2009) industry location and human capital has a positive and significant effect on the manufacturing firm growth.

As illustrated on most literature the firm growth determinants are included under internal and external influences. In Ethiopian context Tsaedu and Chen (2021) stated that labor productivity and capital intensity have a positive and significant correlation with firm growth. The private sector is also experiencing negative growth. Bigsten and Gebreeyesus (2007) using preferred nonparametric estimation and annual firm-level data of Ethiopian manufacturing firms from 1996 to 2003 found that capital intensity, publicly-owned, productivity, and location has a positive and significant effect on firm growth. As a result of the literature we consider size, age, human capital, labor productivity, owner type, instability, and location are factors that influence firm growth on this paper.

3. Methodology

3.1. Data source and Variable description

The research employs panel data from Ethiopian Central Statistical Agency on medium and large manufacturing firm. The data covers all the firms from 2008 to 2020. The data is covering 12 years and 29,622 observations. A few literatures likeBigsten and Gebreeyesus (2007) that used this type of data ranging from 1996-2003 and Tsaedu and Chen, (2021) used the data from 1996 to 2017. So this paper tries to include the recent data during the government transition from The Ethiopian People's Revolutionary Democratic Front (EPRDF) toProsperity Party. We also used secondary references from internet, books, journals, related studies and other sources of information for the remaining objectives.

3.2. Model specification and Estimation Technique

Both descriptive and econometric methods of data analysis were employed. Descriptive statistics such as mean, standard deviation, percentage and frequencies have been used to analyze the socio economic characteristics of the manufacturing firms. The system GMM estimation (SYS-GMM) developed by Blundell and Bond (1998) is used to examine and identify the determinant of firm growth and the relationship between firm size and growth in the study area.
The econometric model used in firm growth starts from Evans (1987a).
Firm growth model can be:
$\text{Growth} = \ln S_t - \ln S_{t-1} = \ln h\,(S_{t-1}, A_{t-1}, X_{t-1}) + \varepsilon_t$ (3)
Where, S_{t-1}, A_{t-1} and X_{t-1}denote previous time firm size, age, and other firm attributes and ε_t is the disturbance term assumed to be normally distributed with mean zero and possibly a non-constant variance. Letting for second-order expansion and considering the panel aspect of the data for firm i in year t, equation (3) give:
$\ln S_{it} - \ln S_{it-1} = \alpha_0 + \alpha_1 \ln S_{it-1} + \alpha_2 (\ln S_{it-1})^2 + \alpha_3 \ln A_{it-1} + \alpha_4 (\ln A_{it-1})^2 + \alpha_5 (\ln S_{it-1} * \ln A_{it-1}) + \sum_{j=1}^{k} \beta_j X_{it} + \varepsilon_{it}$ (4)
The coefficient α_1 is the important parameter to test the Gibrat law, if $\alpha_1 = 1$ Gibrat law holds, $\alpha_1 < 1$ small firms grow faster and $\alpha_1 > 1$ monopoly indicator.
The earlier study tested the law of proportionate effect depending on cross-sectional regression estimates using average firm growth as the initial size (Bojnec&Ferto, 2020). These simulations assume that all sources of firm heterogeneity are completely reflected in the measured variables. The size-growth relationship may be impacted by unobserved firm-specific elements, including the entrepreneurs' backgrounds, the workforce's skills the workforce, and the environment in which the enterprises operate. The growth differentials between firms may be driven by these unobserved advantages if these unobserved characteristics are associated with the model's beginning size and other variables (Mata, 1994; and Goddard *et al.*2002). As a result, the effects of explanatory variables, including initial size, will be exaggerated. Failing to control the unobserved heterogeneity will provide biased coefficients.
The panel nature of our data allows us to control for unobserved heterogeneity across firms.

$\Delta lnS_{it} = lnS_{it} - lnS_{it-1} = \alpha lnS_{it-1} + \beta X_{it-1} + \mu_i + \varepsilon_{it}$ (5)

Where, μ_i captures unobserved and time-constant firm-specific effects, X_{it-1} other covariates, and ε_{it} the pure error term.

The introduction of a lagged dependent variable creates some problems in the estimation. Since the current size lnS_{it} is a function of firm-specific factors μ_i, then lagged size lnS_{it-1} is also a function of μ_i. Therefore, the lagged size on the right-hand side of the equation is correlated with the error term. Estimating equation (5) by OLS will produce biased and inconsistent estimates of α. If we assume that the unobserved effect is fixed over time, the FE approach wipes out the omitted variable bias. However, using FE may introduce a new type of endogeneity in the presence of a lagged dependent variable as an explanatory variable.

The first difference method is also inapplicable because it is based on the strong assumption that the explanatory variables are serially exogenous. In this context, instrument variable models that account for endogeneity are required. So Arellano and Bond (1991) introduced the first differenced GMM model, which employs the lagged explanatory and dependent variables as an instrument. Due to the drawback of this model, especially in the presence of high serial correlation, Blundell and Bond (1998) proposed a system GMM that uses lagged first differences of the explanatory variables and the dependent variable as instruments. We use the system GMM estimation (SYS-GMM) developed by Blundell and Bond (1998) to estimate equation (4). The firm growth model we wish to estimate as follow:

$\Delta lnS_{it} = \alpha_0 + \alpha_1 lnS_{it-1} + \alpha_2 lnA_{it-1} \beta X_{it-1} + \upsilon_i + \mu_i + \varepsilon_{it}$(6)

Where, for i = 1... N and t = 2... T ΔlnS_{it} is the log difference employment over a given period, lnS_{it-1} and lnA_{it-1} is the logarithm of employment and age at the start of that period, and X_{it-1} is a vector of firm characteristics such as human capital, capital intensity, location, export, instability, labor productivity, and type the establishment owner measured during, or at the start of, the period.$\upsilon_i$andμ_i captures unobserved time specificand firm-specific time invariant unobserved heterogeneity effects andε_{it} idiosyncratic random term with mean zero and variance σ2.

System gmm controls:

Endogeneity of the lagged dependent variable in a dynamic panel model when there is correlation between the explanatory variable and the error term, omitted variable bias, unobserved panel heterogeneity and also measurement error.

Variable definitions:

$growth_{it}$- it is an employment growth measured by log difference employment over a given period.

$lnsize_{it-1}$: log first lag employment, measured by the number of the employment

$sqlnsize_{it-1}$: squared of first lag log employment

$lnage_{it-1}$: log first lag age, measured by the number of years since establishment.

$sqlnage_{it-1}$: squared of the log age

$lnsize_{it-1}$*$lnage_{it-1}$: Product of $lnsize_{it-1}$ and $lnage_{it-1}$

Typown- firmsowner type. If is owned by private 1 otherwise 0

lnhumnc- log of human capital measures the internal human resource of the firm such as skill of workers and managers as the decisive influential on growth. It is measured by wage per number of employment.

lnexp- log of export measured as the value of export in birr per year. Export is a source of knowledge (learning) and innovation from the interaction with buyer of export item and sellers of imports. It also enables firms to import new technology embodied capital goods that affect the growth of the firm.

lnlbprty- log of labor productivity is measured by value of total product per number of employment. It is included to examine more efficient firms grow while the less efficient ones contract.

lncpi- log of capital intensity is measured by the capital to labor ratio and is expected to capture firms' access to a wide range of resources.

Location: dummy variable that takes on if the firm found in and around Addis Ababa expected to capture access to better infrastructure and larger central market.

4. Result and Discussion

This chapter is divided into two main sections: descriptive statistics and econometric results. The first section of this chapter reports the descriptive results. Here the panel data were used to describe the relationship between age and size distribution and other attributes firm growth used in the study. The second part of this chapter presents the regression and system gmm econometric results of the determinants firm growth.

4.1. Descriptive Statistical Results

This study assesses large and medium manufacturing firms for 12 years, from 2008 to 2020, with 29,622 observations. It considers 16 manufacturing industries. As listed in table 1 below on average the Ethiopian manufacturing firms grow by 0.0023 with minimum of -7.92 and maximum of 8.02 presenting the huge variation among the Ethiopian manufacturing firms growth. A given firms able to employ on average nearly 70 workers with 283.21 variations. The average age of the firm is approximately 10.83 years with maximum 104 years and 12.58 variations which specify that most manufacturing firms were established recently. On average the efficiency wage rate or human capital of the manufacturing firm is 31,067 birr per year with a large deviation of 84,985 that shows huge difference in wage between the workers depending on work experience and education level.

Furthermore, the mean value of export is approximately 3.1 million birr with greater than median shows that the huge export investment was controlled by few manufacturing firms. There is also high labor productivity difference in the Ethiopian manufacturing industry with mean value of 677,600 birr with a large deviation of 916,000 birr indicate firms with more qualified employees are more productive than others. There are more difference in accumulation of capital among Ethiopian manufacturing firms with average value of 125,558 birr with huge variation of 14.9 million birr directs that large capital accumulation of capital by some firms. Besides, 91% of the Ethiopian firm is owned by private owners with 42% of the manufacturing firms found within and around Addis Ababa area.

Table 1.Summary statistics of the firm growth determinant variables

Variables	N	Mean	Std.dev.	Min.	p25	P50	P75	Max.
Growth_t	25287	.0023	1.76	-7.92	-1.02	0	1.02	8.02
Firmsize	29622	69.74	283.21	0	5	12	43	24134
Age	29622	10.83	12.58	0	3	7	13	104
Humn	29622	31067.05	84985.09	0	4981.875	12830.08	31313.94	7.14e+06
Exp. (000)	29622	3099.66	3.53e+04	0	2	6	16	9.04e+05
Lbprdty (000)	29622	677.6	9.16e+04	.0005	20.11	144.49	1042.68	8.20e+06
Cit. (000)	29622	125.558	1.49e+04	-3931.8	4.37	3.45	180.65	9.73e+05
Owntyp	29622	.91	.29	0	1	1	1	1
Location	29622	.42	.49	0	0	0	1	1

Own calculation depends on the CSA data

4.1.1. Firm size distribution by age group

As depicted in the table 2 below, the number of employments in the first age group 0-5 is greater than the number of employments in the other age groups. This indicates small and young Ethiopian manufacturing firms employ the majority of the labor force. This shows the majority of the country's firms are categorized under young and small firms.

Table 2:Summary statistics of employment distribution by age group

Age Group	N	Mean	SD	Min.	p25	p50	p75	Max.
0-5	12146	55.98	298.90	0	5	10	31	24134
6-10	7679	55.37	192.40	0	5	12	40	7891
11-20	6123	75.11	256.54	0	6	15	53	7909
21-30	1537	107.33	355.42	0	5	15	65	7904
31-40	764	103.22	281.88	0	6.5	20	69.5	4073
>40	1364	187.97	486.26	0	10	44	193	9125
Total	**29622**	**69.74**	**283.21**	**0**	**5**	**12**	**43**	**24134**

Source: own computation

As indicated on figure 1 below most of the employs are working in the firms under the age group of 0-5 years followed by age group of 6-10 than the other age categories. This shows most of the Ethiopian manufacturing firms were included under the small and young firms.

Fig 1: 1 Graphic representation of firm size distribution across age group

4.1.2. Firm size distribution normality test using graph

As stated by Gibrat's, the law of proportional effect reflects the log size normality assumption. As a result, our concern is testing if the size distribution is normal. If the distribution is normal, Gibrat law holds If not it is evidence to reject Gibrat law. Figure 1 shows the histogram with kernel density curves on the distribution of log employment for both the 2001 and 2012 periods. . The log employment distribution highly deviates from the normal and, the graph is highly irregular. It has a long right tail and a large spike and is highly peaked and skewed. As a result, firm growth is not independent of firm size.

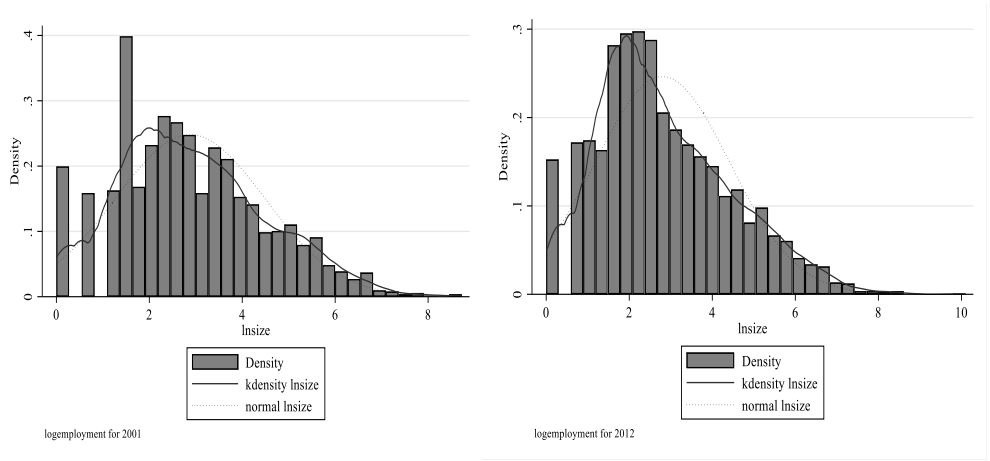

Figure 1: Normality test using graph of Kernel density and histogram

It is evidence against Gibrat law. The arithmetic test of the normality using skewness and kurtosis and Shapiro-Francia is also done to test the normality of log employment. The results indicate the rejection of the null hypothesis which states the log employment is normally distributed.

4.1. Econometric model of Firm Growth

The relationship between firm growth and its attributes is tested using Evan (1987b) can be specified as:

$lnS_{it} - lnS_{it-1} = \alpha lnS_{it-1} + \beta X_{it-1} + \mu_i + \varepsilon_{it}$ (7)

Where, E_{t-1}, A_{t-1} and X_{t-1} denote previous time firm size, age, and other firm attributes and ε_t is the disturbance term assumed to be normally distributed with mean zero and possibly a non-constant variance. Allowing for second order, the firm growth model on this paper is specified as the follow:

$Growth\_t = lnS_{it} - lnS_{it-1} = \alpha_0 + \alpha_1 lnS_{it-1} + \alpha_2 (lnS_{it-1})^2 + \alpha_3 lnA_{it-1} + \alpha_4 (lnA_{it-1})^2 + \alpha_5 (lnS_{it-1} * lnA_{it-1}) + \sum^{k}_{j=1}\beta_j X_{it} + \varepsilon_{it}$(8)

If $\alpha_1 = 1$ Gibrat law holds if $\alpha_1 > 1$ the firm characterized as monopoly and $\alpha_1 < 1$ small firms grow faster than large firms.

4.2.1. Empirical Result of Firm Growth

Table 4 contains the regression output (first column), fixed effect output (column 2), one step GMM output (column 3) and system GMM output (column 4).

Table 3:- OLS, FE, One Step GMM and System GMM result of growth model

Variable	OLS 1	FE 2	One-step GMM 3	System GMM 4
$growth_{it-1}$		.060*** (.007)	-.037*** (.013)	-.082*** (.019)
$Growth_{it-2}$				-.023*(.012)
$lnsize_{it-1}$	-.593*** (.022)	-1.090*** (.023)	-1.488* (.856)	-.907*** (.283)
$lnage_{it-1}$	- .047* (.027)	- .016 (.024)	-1.329 (2.035)	-.385 (.297)
$(lnsize_{it-1})^2$	-.009*** (.003))	.0001 (.003)	.017 (.125)	.008 (.043)
$(lnage_{it-1})^2$	.006	-.0003	.126	-.055

	(.004))	(.005)	(.399)	(.055)
$lnsize_{it-1}$* $lnage_{it-1}$	-.004 (.006))	-.006 (.005)	.293 (.297)	.051 (.064)
$lnlbpdty_{it-1}$	.004 (.004)	-.006 (.004)	-.015* (.008)	-.018*** (.005)
$lnexp_{it-1}$	.050*** (.003)	.027*** (.003)	.036*** (.008)	.039*** (.006)
$lncpI_{it-1}$	.030*** (.003)	.002 (.003)	.015*** (.006)	.015*** (.004)
$lnhumc_{it-1}$	.017*** (.003)	.003 (.004)	.059*** (.008)	.057*** (.005)
Pv.typown	.011 (.032)	- .012 (.032)	.019 (.048)	-.037 (.047)
A.A.location	.109*** (.019)	.049** (.023)	.045 (.038)	.091*** (.029)
Constant	1.152*** (.084)	3.116*** (.093)	3.569 (2.262)	1.999** (.466)
F-test	(F21, 21252) = 563.09***			
R^2	0.358			
AR1			-6.190 (000)	-27.42 (000)
AR2			.360 (.716)	-.920 (.357)
Sargan test			5.700 (.840)	97.010 (.423)
H. test (J)			4.99 (.892)	86.380 (.725)
Obs.	20,991	20,991	20,991	15,357
No. group		2856	2856	2600

1. ***p<0.01, **p<0.05, *p<0.1
2. Sargan and Hansen test over identifying restriction is robust to heteroscedasticity or autocorrelation
3. Ho is instruments are valid.
4. AR (1) and AR (2) are tests for first-order and second-order serial correlation (null: no serial correlation).
5. In the bracket robust standard error for variable coefficients and p-value for AR(1), AR(2), Sargan test and Hansen test

Source: stata output using the CSA data

On table 3 above we report the four result of the firm growth model. We put OLS, FE and one-step GMM for comparison and system GMM for analyzing the determinants of firm growth in manufacturing firm in Ethiopia. As indicated on table 4 the coefficients of size on all the four models are negative. This is an evidence to reject the law of proportional effect developed by Gibrat.

We used regression model to compare the relationship between firm size, age and firm growth. We also see the effect of other attribute such as export, capital intensity, human capital, labor productivity, type of ownership and location on firm growth.

The regression result of the firm growth model as indicated on table 4 below indicates that, firm size, square of firm size and age of the firm affects firm growth negatively and significantly. This shows small

firms grow faster. This shows that small and younger firms grow faster than large and older firms. It's also an evidence to reject the Gibrat law. This finding is consistent with scholars such as (Bigsten and Gebreeyesus 2007; Tsaedu and Chen 2021). The F-test value in this regression model, that Ho: all explanatory variables are zero is significantly rejected at the 1% level. On the other hand human capital, export, capital intensity and location affect firm growth positively and significantly which indicates that as we improve the wage of the employ, increase value of export, increase investment on capital and firm approaches to the capital city area are the central to improve firm growth in the country.

Most of the time, we understand that the variation in growth among firms determined by the observed explanatory variables included in the model. While other unobserved firm-specific heterogeneities among firms also influence firm growth. So, interpreting the results using OLS leads to biased and inconsistent estimates of the coefficients due to its limitations in controlling for unobserved specific effect and endogeneity problem. On the other hand since the lagged dependent variable and error term correlation, FE is also ineffective in interpreting the results, and one-step GMM is also ineffective in dealing with the instrument's weaknesses s (Nickell 1981; Blundell and Bond 1998). Therefore to overcome such problem the system GMM developed by (Blundell and Bond 1998) is used.

As indicated on table 3 the effect of last two years growth on present growth is found to be negative and significant at 1 percent and 10 percent level of significant. If the firm growth recorded on first and second lag shows firm growth by 1 percent, it affects the present firm growth by 7 and 2 percent respectively. It indicates that the Ethiopian manufacturing firm lacks persistent growth with much fluctuating. It is in line with (Coad *et al*. 2011; Canarella and Miller 2018; Dosi *et al*. 2019; Tsaedu and Chen 2021).

The size of the firm also affects firm growth negatively and significantly at 1 percent level of significance. This indicates as the size firm increase by 1 percent firm growth decrease by 8.4 percent. It shows that small firms grow faster. It is also less than one which contradicts Gibrat's law of proportional effect. It is consistent with the finding of (Bigsten and Gebreeyesus 2007; Coad *et al*. 2011; Tsaedu and Chen 2021). The included size square to control the nonlinearity effect of size is found to be insignificant. This shows no non-linear correlation between size and growth. It is in line with (Tsaedu and Chen 2021) who claim that as firm size rises, growth rates begin to slow while firms remain in the system. Age is found to be negative but insignificant on this model. The negative value may indicate younger firms grow faster.

The other important finding is that labor productivity is found negative and significant at 1% level of significance. It indicates that as the labor productivity increases by one percent firm growth decrease by 1.4 percent. If a firm combines a few productive labors with new technology, the firm reduces their number of workers, which affects firm growth. This finding may lead to raise a question on the measurement of firm growth with number of employment growth. (Foster *et al*. 1998; Bottazzi, *et al*. 2002) found no robust relationship between productivity and firm growth. This finding contradicts to the finding of (Bigsten and Gebreeyesus 2007).

Export is one of the important determinants of firm growth in Ethiopian manufacturing industry. It affects firm growth positively and significantly at 1% significance level. This indicates that as a given firm increases their investment on export by one percent firm growth increase by 3.6 percent. The finding is in line with (Fuertes *et al*. 2019) found that export intensify firm growth in Spanish manufacturing firms and contradicted with the finding of (Di Cintio *et al*. 2017) who found export has a negative effect on employment growth in Italian manufacturing firms.

Capital intensity has a positive and significant effect on firm growth. Showing that as the firm investment on capital increases by one percent a given firm growth increase by 1.5 percent. It shows investing on new capital rise the growth of the firms. It is in line with the finding of (Bigsten and Gebreeyesus 2007; Tsaedu

and Chen, 2021) who found the positive and significant relationship between capital intensity and firm growth.

As indicated human capital has positively and significantly affect the growth of firm growth. It is found that as wage per labour improved by one percent firm growth increase by 5.6 percent. This shows that as the firm improves wage of the skilled employees' leads to positive firm growth. As expected, the firms that pay more grow faster. Theoretical high wage payment minimizes worker turnover since consistent employees are expected to generate more output per unit of time as a result of their experience in learning by doing. It is in line with the finding of (Kor & Sundaramurthy 2009; Lafuente 2011,)

Furthermore location has a positive and significant at 1%. Which show that firms found in Addis Ababa and around Addis Ababa has high growth rate than firm far from Addis Ababa. It is attached with the availability of infrastructure and central market. It is consistent with the finding of (Bigsten and Gebreeyesus 2007).

To finalize this chapter the negative relationship between firm growth and size is robust finding. Small firm grow faster than large firm, providing evidence to reject Gibrat law. Export, capital intensity, human capital and location affects firm growth positively while lags of growth; firm size and labor productivity affect firm growth negatively.

5. Conclusion and Policy Implication

We used the firm level data of medium and large manufacturing firms from Ethiopian central statistics agency ranging from 2008/09 to 2019/20 to identify the factors that determine the firm growth in Ethiopian manufacturing firms. We measure firm growth as employment growth. We attempt to see the pattern and distribution of employment growth across age group. Then we estimate OLS, FE, One-step GMM and System GMM for comparison and interpret the result using OLS and dynamic panel model. We endorse system GMM result for policy implication for this paper since it control for the unobserved firm specific heterogeneity. From the result of system GMM we come with the following conclusion.

Most of the Ethiopian manufacturing firms are included under small firms. Small firms grow faster than larger firms in the country which is the evidence against Gibrat law of proportional effect. Age is negative and significant on OLS while negative and insignificant on system GMM. The negative value of age indicates the younger firms grow faster. Policies and strategies should also support expansion and promotion of small firms to decrease unemployment.

Labor productivity affects employment growth negatively and significantly. This may indicates the Ethiopian manufacturing firms are on substituting the number of their employ by new technology. They may on improving their technology to relate few productive labors with their technological capital. As stated on the literature theoretical and empirical literatures use employment growth to measure firm growth by indicating there is a positive relationship. But we recommend more future researches to see the relationship on this issue.

Export affects firm growth positively and significantly. This shows firms get experience and new technology from the foreign market. Capital intensity also affects firm growth positively and significantly which indicates as the firms invest on new capital it improves firm growth. Similarly human capital affects firm growth positively and significantly which shows that the firm pays better wage to decrease the loss of experienced and educated employs. Finally A.A. area location affects firm growth positively and significantly that indicates as the firm found around improved infrastructure and central market may lead

to improve the growth of the firm. Therefore, the policy makers and stakeholders should promote the exporting firms' and facilitate credit access to improve the shortage of finance to invest on new technology. The firm owners should pay salaries that will decrease experienced and technical workers' turnover and the government could improve infrastructure through the expansion of road construction and basic facilities for the industries to distribute their output to the central market.

6. References

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