

Macroeconomic Determinates of Private Fixed Investment in Large and Medium Scale Manufacturing Industries of Ethiopia: A Time Series Analysis

Berhanu Alemu

*Department of Economics, College of Business and Economics, Ambo University,
P.O.Box 19, Ambo, Ethiopia. Email: berhanuje@gmail.com*

Abstract

This study provides an empirical analysis of macroeconomic determinates of private fixed investment in large and medium scale manufacturing Industry of Ethiopia over 1979/80 to 2008/09 periods using cointegration and Error Correction Model (ECM). The objective of this paper was to determine the impact of macroeconomic variables on the level of private fixed investment in large and medium scale manufacturing industry Ethiopia. The time series characteristics showed that all variables are integrated of order 1. The long run private fixed investment in manufacturing industry in Ethiopia is affected by Real Gross Domestic product (RGDP), inflation rate and Dummy variable that capture policy change. In the long run RGDP growth and policy change variable indicated positive and statistically significant impact on private manufacturing investment. However, the effect of inflation rate on private fixed investment in manufacturing sector was found to be negative. In the short run, the coefficient of error correction term was -0.695 indicating high speed of adjustment towards the long run equilibrium. In the short run ECM, it was found that the RGDP growth and bank loan disbursement to manufacturing (BLM) industry as well as lagged value of investment in manufacturing industry have positive impact on private manufacturing investment. Based on this result it is therefore suggested that improving the productivity of economic sectors, developing basic investment projects by reducing government consumption and strengthening inflation management policies as well as establishing industrial bank should be considered to raise fixed capital investment in Ethiopia.

Keywords: Co-integration, ECM, Time series

Introduction

Ethiopian economy is dependent on agriculture. Agriculture is the largest employer of labor and source of income for the increasing population. It accounts for about 42 percent of the GDP, 63 percent of exports and 80

percent of the labor force (MoFED, 2008/09). Many other economic activities depend on agriculture; marketing, processing, and export of agricultural products. Recently, the service sector has recorded significant expansion and has since overtaken agriculture in terms of GDP contribution (Access Capital, 2010).

In recent years, emphasis has been on the development of private sector in developing countries to help boost economic growth and reduce poverty. The idea of using the development of the private sector as an alternative development strategy to boost growth in developing countries was initiated in the late 1980s (Ouattara, 2004). As a result of that, investment in capital goods plays a crucial role in both the cyclical and long run performance of any economy. Being the main components of the aggregate demand, it is considered to be one of the leading sources of economic growth in the long run (Khan, 2007). In the context of Ethiopia, the government has adopted a comprehensive package of policy reforms aimed at creating an improved business environment for private sector development from 1991 onwards. Ethiopia's development goals are laid down in the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) and its industrialization goals are set out in the Industrial Development Strategy. It has a much more explicit focus on private sector development, competitiveness, and growth than its predecessor. The Industrial Development Strategy, which was approved in 2002, is regarded as the country's first-ever comprehensive industrial development strategy (Altenburg, 2010). The Industrial Development Plan recognizes the role of the private sector as an engine of growth.

Ethiopia, has adopted a Plan for Development and Structural

Transformation which will actualize the industrialization of the country in the coming five years. Structural transformation requires movements of labor from traditional activities such as agriculture to modern industry as a driving force of economic development. Although the concept of structural change has been defined in different ways, the most common meaning refers to long-term and persistent shifts in the sectoral composition of economic systems (UNIDO, 2009). Therefore, there is a need to give due attention and special emphases on investment in manufacturing industry to bring the desired economic structure.

As it is known the Ethiopian economic composition is largely dominated by service and agricultural sectors which accounts 46.1 percent and 42 percent of GDP respectively leaving industrial sector contribution to GDP 13 percent of which 5.5 percent from manufacturing (Access capital, 2010; World Bank, 2004). The contribution of agriculture to the overall GDP amounted 47 percent in 2003/04. This share declined gradually and reached 42 percent in 2009/10. In the same period, the service sector became the dominant sector of the economy with its share increasing from 39.7 percent in 2003/04 to 46.1 percent in 2009/10. However, the share of industry has decreased from 14 percent to 13 for the past seven years (MoFED, 2009/10).

The GDP composition of industrial sector for Kenya, Tanzania, Sudan and

Nigeria is 15, 20, 33 and 46 percent respectively but Ethiopia's industrial share to GDP is the least of all (Access Capital, 2010). The dominance of

services and agricultural sector from 2000 - 2009 can be seen from the figure presented below.

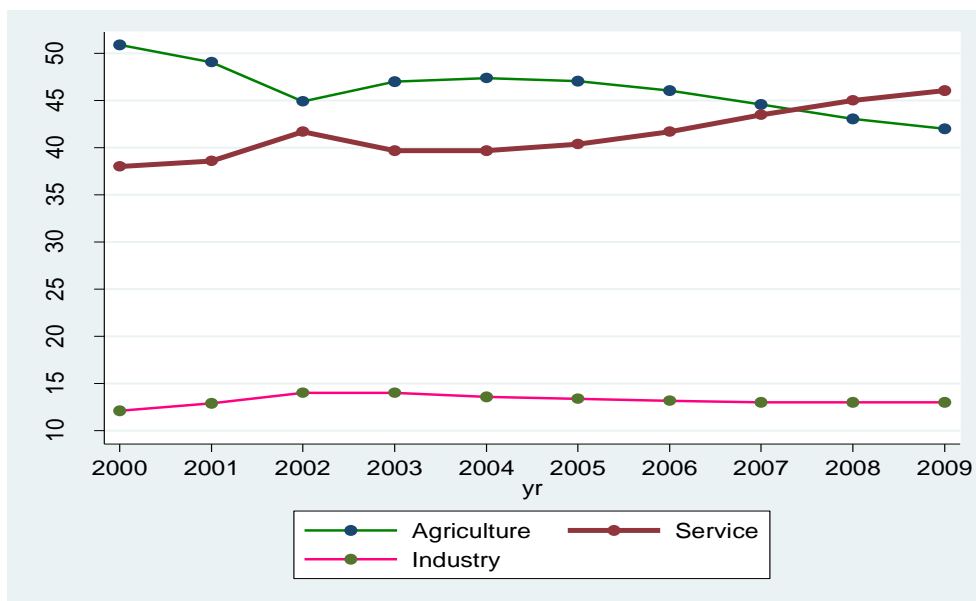


Figure 1. Percentage contribution to GDP by Economic sector (MOFED, 2000/01- 2008/09)

Service sector share has been increasing at the cost of agriculture. As showed in the graph, industry share to GDP follows a constant trend.

The industrial sector of the Ethiopian Economy is comprised of manufacturing, construction, Electricity and water and mining and quarrying. The manufacturing sector includes large and medium scale manufacturing (LMSM) and small scale and cottage industry (SSCI). These four sector composed together to add to the industrial sector of the economy.

Regional Distribution of Manufacturing Industry in Ethiopia

Large and medium private manufacturing is a diverse sector created job opportunity for a total of 107,833 workers in 2008/09 that are engaged in the production of commodities such as food, textiles, chemicals, machinery, metals, wood, papers and so on. The manufacturing industry is comprised about 15 subsectors in Ethiopia. The manufacturing sector involved establishments engaged in the mechanical, physical, or chemical

transformation of materials, substances, or components into new products. Manufacturing occurs in plants, factories, or mills but may include transformed materials or substances by hand or in the worker's home.

The distribution of Large and Medium Scale Manufacturing Industries by Regional states are shown in the following bar graph. The figures indicate that, the total number of large and medium scale manufacturing establishments for the country as a whole stood at 2075 in 2008/2009. The output by these industries among others include: glass and glass products, structural clay products, cement, lime and plaster and article of

concrete, cement and plaster which are grouped under Non-Metallic Mineral Products and account 27.6 percent of the total. Manufacture of food products and beverages and manufacture of furniture, represented 25.5 and 16.5 percent of the total number of establishments, were in second and third position, respectively. That means the share of the three industrial groups combined was 69.6 percent of the total number of manufacturing industries, which indicates that, the Ethiopian Large and Medium Scale Manufacturing Industry is characterized by a high concentration of a limited range of manufacturing activities (CSA, 2008/09).

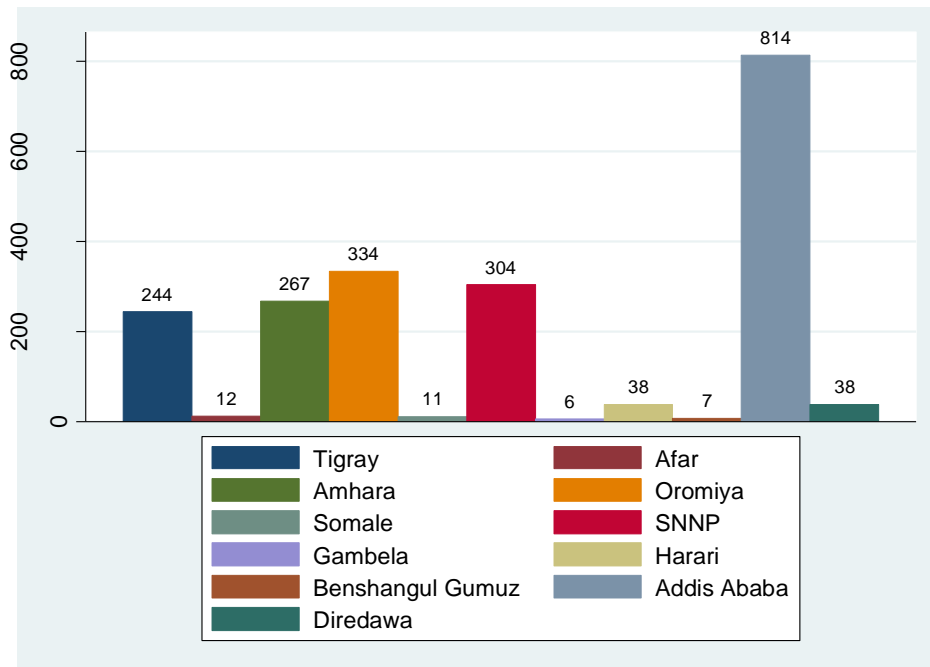


Figure 2. Number of Private investment Projects in Large and Medium Scale Manufacturing Establishemnts by Regional state in 2008/09 (Stata 10 Out put)

Statement of the Problem

One of the least industrially developed countries in Africa is Ethiopia, where manufacturing accounts for only 5 percent of total value-added. Indeed, even after more than a decade of reforms private economic activities in the Ethiopian manufacturing sector remain small, even by African standards (World Bank, 2004).

According to German Development Institute discussion paper (Altenburg, 2010 and Mulu, 2009) manufacturing has stagnated at about 5 percent of GDP over the last 20 years. Manufacturing industry is largely limited to simple agro-processing activities like sugar, grain milling, edible oil production, leather tanning and production of basic consumer goods as 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 very small (Altenburg, 2010). Because such industries require huge capital investment in machinery and equipment which is lacking in Ethiopia and therefore new capital expenditure by private firms in Ethiopia are characterized by low level of investment.

According to CSA annual reports (1979/80-2008/09 reports), the average annual private fixed investment in large and medium scale manufacturing sector in Ethiopia

since 1979/80-2008/09 is about 241 million Birr. This is so small investment for the purchase of machinery and equipments and other related capital goods. The report also identifies the major problems faced by the manufacturing industries to include shortage of raw material, absence of market demand, and lack of working capital.

Some studies have been conducted on determinants of private investment in general. However, there is less empirical research specifically on the macroeconomic determinants of private fixed investment in large and medium scale manufacturing industry in Ethiopia.

The study is expected to answer the following questions: Do macroeconomic variables affect or determine private fixed investment in large and medium scale manufacturing industry in Ethiopia? In what way those macroeconomic variables affect private fixed capital formation in manufacturing industry?

Objective of the study

The general objective of the study was to analyze macroeconomic determinants of private fixed investment in the manufacturing industries of Ethiopia.

Specific objective of the study are:

- To identify factors affecting private fixed capital investment in large and medium scale manufacturing sector;

- To conduct a co-integration test to see the long run effect of determinants of private fixed investment in large and medium manufacturing industry.

Materials and Methods

Macroeconomic variables are usually manipulated on the national level. In the same way the nature of time series data that are used for study requires consecutive observations of data set (Wooldridge, 2005). For the purpose of this particular study major national level macroeconomic variables over thirty years were identified. Hence combined large and medium manufacturing industries establishments that were measured in terms of business fixed capital investment at Ethiopia level were taken. Cointegration and error correction model was used for data analysis.

Data source

For the purpose of assessing the macroeconomic determinants of private fixed investment in manufacturing industry, time series data was collected from secondary sources. The source of data being the National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development (MoFED), and the Central Statistical Agency (CSA). The data covers macroeconomic variables that include real gross domestic product (RGDP); nominal lending rate (NLR), inflation rate (INF); bank loan disbursement to large and medium scale manufacturing sector. One dummy variable was included to capture policy changes from 1991 onwards. The data used covers the period from 1979/80-2008/2009.

Model Specification

For multiple regression model with one dependent variable and k-explanatory variables Gujarati, (2004) formulates the following model

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \dots + \beta_k X_{ki} + \mu_i \dots \quad (1)$$

Where Y= dependent variable; X= explanatory variables; i= ith observation; in the case of time series

Unit Root Test

The Dickey-Fuller test was applied to regression by employing the following equations:

data, the subscript 't' denote tth observation; μ = error term.

$$\Delta Y_t = \delta Y_{t-1} \quad (2)$$

$$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu \quad (3)$$

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \mu \quad (4)$$

where t is the time or trend variable ; β_1 and β_2 are constants; δ estimated coefficients and Y_t is variable of interest for unit root at time t . The difference between the three regressions concerns the presence of the deterministic elements β_1 and $\beta_2 t$. DF test assumes that the errors are independent and have a constant variance and a test is conducted by allowing for various possible alternative models like pure random walk model without intercept (as equation 2), random walk with drift or intercept (as equation 3) and random walk with drift around a stochastic trend (as equation 4). After regressing those individual models the computed t-value of the coefficient of variable of interest with one period lag will be compared with τ (tau) statistic which is computed by Dickey-Fuller under the null hypothesis that δ (coefficient

of one lagged value of a series) = 0 which means there is a unit root or the time series is non-stationary and the alternative hypothesis is that δ is less than zero; that is, the time series is stationary. If the null hypothesis is rejected, it means that Y_t is a stationary time series but if null hypothesis cannot be rejected the series contains unit root. However, in the case error term μ_t is correlated, DF unit root test method is not effective. In this case Dickey and Fuller have developed a test, known as the Augmented Dickey-Fuller (ADF) test (Gujarati, 2004).

ADF unit root test is a modification over the DF test. Thus, this paper used ADF unit root test given as the following test equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + v_t \quad (5)$$

Where Y_t is variables of interest to be tested for unit root; t is time trend variable; Δ is the difference operator; α is constant; m is the lag length of the augmented terms for Y_t to avoid the problem of autocorrelation in the residuals and v_t is white noise error term. The estimation strategy consists of a t-test for the OLS estimate of δ , where the null hypothesis is that the series has unit root. The null hypothesis test of DF and ADF are the

same therefore the same principle/criteria of rejection of null hypothesis can be applied.

Cointegration and Error Correction Model

The Engle-Granger approach of cointegration and error correction methods was followed in this paper. The null hypothesis of no cointegration is rejected if the residual sequence is found to be stationary at level and then the variables are

considered as cointegrated. If the variables are cointegrated, the final step is to estimate an error correction model (ECM) where the lagged residuals from the equilibrium regression are included as one of the regressors'. The principle behind ECM is that there often exists a long-run equilibrium relationship between two economic variables, but in the short-run there may be disequilibrium. A proportion of the disequilibrium in one period is corrected in the next period by the error-correction mechanism. The lagged residuals from ECM must be significantly

different from zero if the variables are cointegrated. This is involved in the fourth step, checking model adequacy, when determining whether the estimated ECM is appropriate.

Cointegration Test

Engle-Granger two step procedures are suitable for small sample data for testing cointegration. Hence this paper has employed the Engle-Granger two step procedures which is sometimes called residual based cointegration test. The long run equilibrium model according to Greene (2002) is:

$$y_t = \beta x_t + \varepsilon_t \quad (6)$$

Where y_t stands for dependent variable, x_t represents the explanatory variables and ε_t is error term which is assumed to be white noise. The residuals are retrieved from the long run cointegrating equation and it tested for unit root. where the deviation from long run equilibrium relationship was found to be stationary series, then y_t and x_t sequences is cointegrated (Enders, 1995). The Enders equation (7) was used by (Niemi, 2003) where a test of no-cointegration was found by testing for a unit root in the long run estimated residual $\hat{\mu}_t$. The procedure is essentially the same as the DF and ADF tests. The ADF regression equation is:

$$\Delta \hat{\mu}_t = \rho * \hat{\mu}_{t-1} + \rho_j \Delta \hat{\mu}_{t-1} + v_t \quad (7)$$

Where $\hat{\mu}_t$ represents predicted values of error term from long run equation and v_t is residuals from the equation. The test statistics is a t-ratio test for $\rho = 0$ (the τ -test). If this null hypotheses cannot be rejected against the alternative $\rho < 0$, then the variables are not cointegrated that is the residual contains a unit root. But given that y_t and x_t are I(1) and the residuals from their linear combination are stationary which means I(0), it can be concluded that the series are cointegrated. That is if the null hypotheses is rejected, then the conclusion would be that the

estimated $\hat{\mu}_t$ is stationary (does not have a unit root) and therefore the variables are cointegrated.

Error Correction Model (ECM)

The Granger representation theorem (1987) cited in Gujarati (2004), states that if two variables Y and X are cointegrated, then the relationship between the two can be expressed as ECM. Granger representation states that the short run dynamic model can be represented by the error correction mechanism on the assumption that the time series data are non-stationary and presence of cointegrating relationship between the variables.

In this paper, short run ECM was employed using Autoregressive

Distributive lag (ARDL) approach in which the first difference of both dependent and independent variables with respective lags are entered in the short run ECM including one period lag residuals saved from long run static level regression. The advantage of the ARDL approach is that it is possible for different variables to have different optimal numbers of lags in the ECM (Mosayeb, and Mohammad, 2009). Frimpong and Marbuah (2010), Acosta and Loza (2005), Rabbi (2011), have all used ARDL approach of error correction model. Therefore, the following short run dynamic error correction model was adopted.

$$\begin{aligned} \Delta \text{LnPIM}_t &= \alpha_0 + \sum_{i=1}^p \alpha_{1i} \Delta \text{LnPIM}_{t-i} + \sum_{i=0}^q \alpha_{2i} \Delta \text{LnRGDP}_{t-i} + \sum_{i=0}^r \alpha_{3i} \Delta \text{LnNLR}_{t-i} \\ &+ \sum_{i=0}^s \alpha_{4i} \Delta \text{LnBLM}_{t-i} + \sum_{i=0}^t \alpha_{5i} \Delta \text{INF}_{t-i} + \alpha_6 \text{Dummy}_t + \theta \text{EC}_{t-1} \\ &+ \xi_t \end{aligned} \tag{8}$$

Where Δ denotes difference operator and $\alpha_0, \alpha_1 \dots$, and α_5 are coefficients of selected time series variables and α_6 which is coefficient of policy change variable. θ is coefficient of EC_{t-1} which measures speed of adjustment towards equilibrium and it should be statistically significant to support the existence of cointegration. Where p, q,

r, s and t are the optimal number of lags included in the variables to avoid the problem of autocorrelation in residual. To determine each variable's optimal lag number to be included, Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) was used. These optimal lag lengths determined by AIC and SBC were also the same with the lag length included

in the first difference of variables up to when the variables become stationary in the ADF unit root test. EC_{t-1} is one lagged error correction term retrieved from long run cointegrating equation. ξ_t denotes white noise error term. The larger the coefficient of EC_{t-1} , the faster the speed of adjustment back to the long run equilibrium after a short run disturbance.

Results and Discussion

Unit Root Test

The result of the variables tested for unit root at their levels and first difference using ADF is presented in Table 1 and Table 2 respectively. The time series variables at level containing unit root follows upward and downward trending movement.

Table 1. Unit Root Test of Variables at their Level.

Variable at level	ADF test statistic with constant	ADF test statistic		Included lag length	Conclusion
		With constant and trend			
LnPIM	-0.0553	-2.3136		1	Non stationary at level
LnRGDP	1.5378	-0.9878		1	Non stationary at level
LnNLR	-1.6143	-1.9951		1	Non stationary at level
LnBLM	-0.3433	-3.2130		1	Non stationary at level
INF	-1.9067	-2.0335		1	Non stationary at level
Critical Values with constant		Critical Values with constant and trend			
1% = -3.6852		1% = -4.3226			
5% = -2.9705		5% = -3.5796			
10% = -2.6242		10% = -3.2239			

Where Ln represents natural logarithm and PIM = Private business fixed investment in large and medium scale Manufacturing industry; RGDP = Real Gross Domestic Product at constant price; NLR= Nominal Lending Rate; INF = Inflation Rate; BLM = Bank loan disbursement to large and medium manufacturing sector.

The result indicated that all the variables are non-stationary at their levels as evident from ADF test statistic shown in Table 1. All the series present unit roots at 1% and 5 % level of significance with both test equation including drift or constant and constant and trend. Based on the results, the null hypothesis of unit root cannot be rejected for all individual series using conventional critical values of ADF test statistic. The estimated ADF statistics for each variable is larger than the critical

values (but less than in absolute value) at all standard levels of significance. To reject the null hypothesis of unit root, the ADF test statistic should be greater than respective critical values in absolute terms. But here in the above result, criteria or condition of rejection of the null is not full field. Therefore, to avoid spurious regression all these variables have to be differenced to transform them to stationary.

In the second stage, the order of integration of the non-stationary variables were performed in the same way by means of ADF tests applied to

all series in first differenced form. The result of the test on the first differenced series was presented below.

Table 2 Unit root test at first difference of variables

Variable at First difference	ADF test Statistic with constant	ADF test statistic with constant and trend	Included Lag length	Conclusion	Order of integration
$\Delta \ln PIM$	-3.8063***	-3.7320**	1	Stationary	I(1)
$\Delta \ln RGDP$	-4.5549***	-6.0947***	1	Stationary	I(1)
$\Delta \ln NLR$	-3.5600**	-3.4834*	1	Stationary	I(1)
$\Delta \ln BL$	-4.1133***	-4.3545***	1	Stationary	I(1)
$\Delta \ln F$	-6.0268***	-6.3970***	1	Stationary	I(1)
Critical Values with constant		Critical Values with constant and trend			
1% = -3.6959		1% = -4.3382			
5% = -2.9750		5% = -3.5867			
10% = -2.6265		10% = -3.2279			

***, ** and * denotes rejection of the null hypothesis of unit root at 1%, 5% and 10% significance level respectively, Δ is first difference operator Ln and other abbreviations are already defined.

Based on the test result presented above, it was observed that all the variables in the study are non stationary at their level but after differencing once they become stationary at 1% and 5% level of significance therefore, regarded as integrated of order one symbolically presented as I (1).

Cointegration Test

The Engle-Granger approach, the static level equation developed in equation (3) regression result is shown

in Table 3. The results indicated that there is a reasonable existence of co-integration in the estimation of private fixed investment in manufacturing industry and its macroeconomic determinants of the model which confirms the long run relationship of variables. Therefore the long-run coefficients are valid for making reasonable inferences about the long run relationship among the variables involved in this study.

Table 3: Co-integration Regression Result

Dependent Variable: LnPIM			
Variable	Coefficient	t-statistic	Prob. Value
LnRGDP	4.830	5.559***	0.000
LnNLR	1.030	1.264	0.218
LnBLM	0.386	1.390	0.177
INF	-0.041	-2.459**	0.021
D	1.329	2.451**	0.021
C	-112.501	-6.1127	0.0000
R-squared: 0.9300		Durbin Watson statistic : 1.780	
Adjusted R-squared: 0.9154		F-statistic : 63.782	
Prob(F-statistic): 000			

*** and ** denotes significance of coefficient at 1% and 5% significance level and D stands for Policy (dummy variable)

The normalized coefficients of long run elasticities of cointegration regression result are as follows:

$$\text{LnPIMt} = -112.50 + 4.83\text{LnRGDPt} + 1.03\text{LnNLRt} + 0.38\text{LnBLt} - 0.04\text{INFt} + 1.32\text{Dummy}$$

(t-statistic) (-6.112) (5.559) (1.264) (1.390) (-2.459) (2.451) (9)

Most of the estimated coefficients have their expected theoretical or hypothesized signs except nominal lending rate although it is statistically insignificant. The value of intercept term (-112.5) is not very meaning full and it has no reasonable economic justification for the literary interpretation that when all variables were jointly zero, the fixed investment in manufacturing sector would be -112.5.

The estimated result of positive and significant coefficient of RGDP at 1% significance level confirms an accelerator theory on private sector investment. This means that in the long-run increase in real output or aggregate demand conditions through increased income has the potential of stimulating private fixed investment in manufacturing industry of Ethiopia. Hence, the coefficient of real GDP which is statistically significant at 1 percent significance level implies that a 1 percent increase in RGDP, on average leads to an increment of 4.83

percent of private fixed capital investment in manufacturing industry. The result was in agreement and consistent with the findings of Frimpong and Marbuah (2010); Lesotho (2006); Acosta & Loza (2005) and Khan & Khan (2007) who have all reported a positive and significant long run relationship between RGDP and private sector investment. Similarly Ahmed and Qayyum (2009) found positive and significant long run coefficient in their analysis of determinates of private investment in large scale manufacturing sector.

The coefficient of nominal lending rate is positive contrary to neoclassical user cost of capital that asserts higher lending rate raises user cost of capital and thereby discourages investment spending. The positive coefficient result may be due to consistent and the declining trend of nominal lending rate in Ethiopia or it may be attributed to high inflation rate in the economy. For instance the nominal lending interest rate was fixed at 8.8 percent

from 1971 to 1986, and in 1996 when it reaches 15.08 percent then slowly declined and fluctuates between 10.50 per cent and 11.60. Currently it is 12.25 percent. This was however, consistent with the findings of Frimpong and Marbuah (2010) in Ghana, who found a positive long run relationship between private investment and lending interest rate when it equals deposit rate. Their explanation was that higher interest rates have spurred private investment through higher domestic savings which results to increased investable funds for the private sector.

Although statistically insignificant the coefficient of bank loan disbursement to manufacturing sector (coefficient value 0.38 with t-value of 1.390) (Table 3) showed the expected positive sign in the long run estimation. The insignificance of bank loan disbursement suggests that credit availability to the manufacturing industry over the study period has not been influenced by the private sector investment in large and medium scale manufacturing in Ethiopia. In the alternative, it indicates that in the long run private manufacturing investors may not depend on bank loan to finance their investment projects rather they may become self sufficient to raise their investment capital or obtain finance from other sources.

The coefficient of inflation rate (- 0.04 with t-value -2.459) (Table 3) is negative and statistically significant at 5% showed the long run negative impact on private fixed investment capital formation. It suggests that

macroeconomic instability or uncertainty discourages level of capital formation. As the regression result above indicated, in the long run private fixed capital investment in manufacturing sector will be discouraged on average by 4 percent for every unit increment in inflation rate. That means if inflation rate goes up by 1 percent, private fixed investment capital formation in manufacturing sector on average will be reduced by 4 percent. Since the interpretation was given by the logarithm-linear relationship, the coefficient of inflation was multiplied by 100. The finding of negative relationship of inflation and private investment was consistent with the study by Khan & Khan (2007) in which they found negative coefficient of inflation rate on private investment in the long run. Ahmed and Qayyum (2009) and Erden and Holcombe (2006) also reported a negative estimated coefficient of inflation rate.

The dummy variable which captures the policy change as shown in table 3 has positive impact and was statistically significant at 5% significance level. This result highly indicates that private sector friendly and favorable economic policies especially with property right protection and stable socio-political environment has a significant and positive impact on the private sector participation in the economy. Generally, the coefficient 1.329, the significance of dummy variable shows positive responsiveness of private investors in manufacturing investment for the existence of

policies that secures privatization and property right protection in the economy.

The high R-squared shows that 93 percent of variation in private fixed capital investment in large and medium scale manufacturing industry was explained by explanatory variables in the model. So it indicates the model fits well. The Durbin Watson test statistic 1.780 which is greater than 1.5 signifies no problem of autocorrelation in the residual. While the F-statistic value of 63.782 with corresponding probability of zero indicated that the null hypothesis of all coefficients of explanatory variables are jointly zero, which means it can be rejected and therefore

the overall model fit is considered as good.

Error Correction Model (ECM)

The ECM based on ARDL approach developed in equation (8) which was estimated initially and then following the general to specific approach where insignificant variables at 5% significance level were eliminated and the final parsimonious ECM was calculated. After eliminating variables such as $DLnPIM_{t-1}$, $DLnRGDP_{t-1}$, $DLnRGDP_{t-2}$, $DLnNLR_{t-1}$, $DLnBLM_{t-1}$, $DLnBLM_{t-2}$, $DINF_t$, $DINF_{t-1}$ and $Dummy_t$ the significant variables was estimated and the final preferred result is presented below.

Table 4: Parsimonious (preferred) ECM result

Dependent Variable: $\Delta \ln PIM$

Variables	Coefficients	t-statistic	Probability value
EC _{t-1}	-0.695	-3.874***	0.001
$\Delta \ln PIM_{t-2}$	0.358	2.107**	0.049
$\Delta \ln RGDP_t$	3.289	1.866*	0.078
$\Delta \ln RGDP_{t-3}$	-2.513	-1.458	0.162
$\Delta \ln NLR_t$	-0.179	-0.260	0.797
$\Delta \ln BLM_t$	0.479	1.917*	0.071
$\Delta \ln BLM_{t-3}$	0.183	0.755	0.459
C	0.090	0.576	0.571
R-squared: 0.64		F-statistic: 4.769	
Adj. R-squared: 0.513		Prob(F-statistic): 0.003	
Durbin-Watson stat: 2.190			

***, **, and * rejection of the null hypothesis at 1%, 5% and 10* significance level respectively. Δ ' denotes difference

operator.

The speed of adjustment, EC_{t-1} is the deviation (or gap) from the long term trend in the previous period and it can be expressed as:

$$EC_{t-1} = \ln PIM_{t-1} + 112.5 - 4.83 \ln RGDP_{t-1} - 1.03 \ln NLR_{t-1} - 0.386 \ln BLM_{t-1} + 0.041 \ln INF_{t-1} - 1.32 D_{t-1} \quad (10)$$

The error correction model in equation form gives the following linear function where numbers in parenthesis are t- ratios

$$\begin{aligned} \Delta \ln PIM_t = & 0.090 - 0.695 EC_{t-1} + 0.358 \Delta \ln PIM_{t-2} + 3.289 \Delta \ln RGDP_t - 2.513 \Delta \ln RGDP_{t-3} \\ t\text{-ratio} & (0.090) \quad (-3.874) \quad (2.107) \quad (1.866) \quad (-1.458) \\ & - 0.179 \Delta \ln NLR_t + 0.479 \Delta \ln BLM_t + 0.183 \Delta \ln BLM_{t-3} \quad (11) \\ & (-0.260) \quad (1.917) \quad (0.755) \end{aligned}$$

The short run ECM indicated the two lagged value of private fixed investment in manufacturing by itself has positive impact on the current level of investment. Though, the constant elasticity is small (only 0.35 percent for a unit increment in the fixed investment in the last two lag period) it indicate positive impact. Similarly RGDP growth and Bank loan disbursement to large and medium scale manufacturing sector have positive impact in the short run and both are statistically significant at 10 percent level of significance. This indicated that RGDP growth is one of the most determining factors of fixed investment in large and medium manufacturing in both long and short run period. Even though the constant elasticity of RGDP in the short run

(3.26) is less than that of its long run (4.83), still it has considerable positive impact on the level of private fixed investment in manufacturing industry. In the short run for 1 percent increase in RGDP, on average, raises current private fixed investment by 3.28 percent other determinant factors remain constant. The growth of RGDP may results to increased demand condition due to increased income and this impact on the performance of the economy. the potential to stimulate private investment. For 1 percent increment credit allotted to large and medium manufacturing industry, private fixed investment is promoted by 0.47 percent in the short run. This result is consistent with a study conducted in Nigeria by Uдах (2010), who had

reported positive and statistically significant credit on private investment. In the short run the responsiveness of private manufacturing investment is slow as can be seen from elasticity coefficients less than 1 percent except the elasticity of Δ RGDP (3.29 percent). The coefficient of LnNLR is negative; however, there is no evidence that it has an impact on private manufacturing investment. This result is in line with Khan and Khan (2007) and Ribeiro (2001).

The R-squared, which measures the goodness of fit of the equation is satisfactory at 64.9 percent, indicating that about 65 percent of the variations in manufacturing sector investment in Ethiopia was determined by independent variables in the short run. The F-test statistic of 4.769, with a p-value of 0.003 indicates that all variables in ECM jointly determine manufacturing investment even though insignificant variables are observed in the result.

The speed of adjustment coefficient is statistically significant with correct theoretical sign. The coefficient (θ) value of error correction term (EC) is -0.695 which is highly significant at 1% significance level. This clearly shows that, the speed of adjustment is quite fast with 69.5 percent to restore to the long run equilibrium level in response to the disequilibrium caused by short run shocks of previous period which means that approximately 69.5 percent of its previous period's disequilibrium in the private fixed

investment is corrected in the next year. It suggests a high speed of convergence to equilibrium if a disequilibrium or shock appears.

Conclusion

Empirical findings obtained in the long-run model showed that there is no doubt that GDP growth is the engine of private fixed capital investment in large and medium scale manufacturing industry. This implies that economic performance has favorable impact on private capital formation in the manufacturing sector. Moreover, GDP growth results in an increase of demand conditions and income levels in the economy.

The econometric result indicated that the general rise in price level in the economy has negative impact on the private manufacturing investment levels in Ethiopia. This implies that as inflation rate in the economy rise, the cost of labor input, raw materials and capital goods may increase that may discourage potential investors to undertake additional investment capital expenditure and unattractive to new entrants. The result indicated that the positive impact due to 1 percent increase in RGDP is almost balanced by the negative impact due to 1 percent increase in inflation rate. On the other hand, the negative impact of inflation rate on the economy may be seen from the angle of decreased demand level for outputs produced by industries which

again depressed the returns of investors and thereby discourage investment level.

The findings also revealed that the dummy variable for policy change has positive and statistically significant impact on private fixed investment and capital formation in manufacturing industry in the long run. Additionally, strengthening the legislative environment and property right protection can be another strategy for stimulating and promoting private investment.

Bank loan coefficient was also positive but its positive impact will be in the short run. Therefore bank loan disbursement to large and medium manufacturing investment has positive effect at least in the short run. Therefore, to solve investors' financial problem industrial bank should be established which provides special emphases for manufacturing industry aiming at providing at lower lending rate, full technical assistance to investment projects.

Recommendation

Based on the study findings, the following recommendations are proffered; Improving the productivity of economic sectors by policy makers towards the adoption of more efficient methods of production should be given more attention.

The portion of increased income due to RGDP growth should be allotted for development of basic infrastructural investment projects by

reducing public consumption expenditures.

In order to avoid high inflation rate and control at normal condition in the economy, monetary policy should be designed periodically. Inflation management policies should be adopted and the economic experts should be capacitated to enhance their economic performance and inflation rate forecasting power to reduce the uncertainty in the economy.

Private sector friendly policies should be strengthened and special consideration should be given and provided to the manufacturing sector in order to stimulate investment in the sector. These favorable policies could be extended tax holidays, duty free importation of capital goods, subsidy to manufacturing industry, and preferential access to location of land. Moreover investment licensing policy should also be revised.

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