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Research Article

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Modeling Determinants of Profitability in Ethiopia Manufacturing Companies: A Dynamic Panel Model Approach

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ABSTRACT

Background: Profitability is the primary measure of the overall success of company. The analysis of profitability ratios is important for the shareholders, creditors, prospective investors, manufacturers and government alike.

Objective: The objective of this study was fitted a dynamic panel regression model that efficiently fit the data and further to identify the determinants contributing significantly to profitability in Ethiopia.

Methods: This study was conducted on secondary data of 32 sample manufacturing companies collected from the audited financial statements of large tax payers' office and national bank of Ethiopia. The study was covered a period of seven years from 2011 to 2017. The panel unit root test of Levin-Lin-Chu tests was made for each variable and applied first difference transformation for the variables that had unit root. A dynamic panel regression model was utilized for data handling technique using generalized method of moments (GMM) estimation.

Results: We compared the results when one unit increase in lagged profitability, managerial efficiency, capital intensity, GDP, exchange rate and one ratio decrease in leverage, ceteris paribus, turn out were found to increase the profitability of manufacturing companies by around 0.69, 0.179, 4.52E-06, 3.844, 0.04 and 0.393 ratio, respectively. The model reveled that previous profitability, leverage, capital intensity, managerial efficiency, GDP and exchange rate had a statistically significant ($P<0.05$) effect on companies' profitability in Ethiopia.

Conclusion: As per our findings, the manufacturing companies should minimize leverage financing from its capitals and should emphasize the management of appropriate financing to increase profitability. Finally, we recommended that policy makers should coming up with better policies on improvement of profitability.

Keywords: Profitability, Gmm, Dynamic Panel Data, Ethiopia, Endogenous

Acronyms and Abbreviations

GDP	:	gross domestic product
GMM	:	generalized method of moments
ROA	:	return on asset
ROE	:	return on equity
US$	:	United State of American Dollar
ETB	:	Ethiopian Birr
OLS	:	ordinary least square
ERCA	:	Ethiopian revenue & customs authority
LTO	:	large tax payer's office
NBE	:	national bank of Ethiopia
LM	:	Lagrange multiplier
MMSC	:	moment & model selection criteria
AIC	:	Akaike information criteria
BIC	:	Bayesian information criteria
HQIC	:	Hannan-Quinn information criteria
CD	:	coefficient of determination
FE	:	fixed effect
SD	:	standard deviation
MGF	:	managerial efficiency
VIF	:	variance inflation factor
HST	:	Hausman specific test

Introduction

Profitability is the earnings of a company that are generated from revenue after deducting all expenses incurred during a given period. It is one of the most important factors that signal

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management's success, shareholders' satisfaction, attraction for investors, and the company's sustainability [1]. It shows the driving force of the company as well as the survival indicator of a company. The accomplishment of its goal is entirely dependent on its profitability. Also, it is demonstrating how well a company has performed financially in previous periods and gives an insight into future outlook [2]. Thus, the measurement of profitability is crucial in defining the success or failure of a company. This measurement shows highly profitable businesses have the ability to reward their owners with large profits on their investments which, in turn, encourages additional investment and brings about economic growth on the contrary, unprofitable company can lead to failure which has negative repercussions on economic growth [3]. Since, the manufacturing sectors is one of the backbones of a country's economy, its existence is a profitable unquestionable issue.

The analysis of a company's profitability usually employs the financial ratio method, because it provides a simple description about the company profitability in comparison with previous periods and helps to improve its performance [4]. Profitability ratios are among the most commonly used measure of companies' financial performance in using their assets, equity, investment, and sales that the companies can achieve. In particular, return on asset (ROA) and return on equity (ROE) are among the most commonly used measure of profitability. The higher to these ratios implies the more the efficiency and effectiveness of the companies in using their assets and equity invested [5].

Manufacturing companies play a major role in generation of income and overall development of an economy in the developed as well as in the developing of the country. Also, it has the highest multiplier effect of any others sectors of our economy [6]. Based on the recent statistics, manufacturing contributes £6.7 trillion to the global economy. Manufacturing industries generated $2.1 trillion in GDP or 12.5 percent of total U.S. gross domestic product in 2013. In addition to that in the United Kingdom and Ireland the Manufacturing sector generated more than 12% and 46% to GDP of the country [7]. Similarly in South Africa, the sector accounts for an average of 17.4% of its GDP in 2014. Additionally in Sub-Saharan Africa, the average manufacturing firm is 3 less productive than the average firm in the best performing East Asian countries. This means the average firm in Sub-Saharan Africa produces about US$3,300 of output per worker in 2015 dollars, while East Asian produces about US$6,500 of output per worker [8]. Generally, in Sub-Saharan Africa, the contribution of the manufacturing sector to the economy by its average share of GDP was 13.23% in the years 2005-2009 [9].

In Ethiopian, the contribution of the manufacturing sector to the economy by its average share of GDP in the years 2005-2009 was 4.85% [10]. This historical event shows that the profitability of manufacturing sectors in sub-Saharan Africa especially in Ethiopia is lows as compared to other country. The relationship between profit performance and manufacturing firms is important though it has not been researched conclusively. The profitability of manufacturing companies can be affected by several firm specific and macroeconomic factors. Nowadays, there is a great interest among practitioners and academicians to find out the most important factors that determine the profitability of manufacturing company [11]. Thus, a number of studies have examined the determinants of manufacturing profitability in many countries around the world. For instance, [12] of 15 listed industry firms in Turkey, for firms listed in Indonesian Stock Exchange, for 11 publicly traded manufacturing firms in Sri Lanka, for non-financial companies in Romania Bucharest Stock Exchange, and manufacturing firms listed in Borsa Istanbul Stock Exchange and others undertook studies on the profitability of manufacturing companies [6, 12-15]. Similarly in Ethiopia the available literature is not highly focused on determinants of profitability of manufacturing companies, only a few studies in sub-sectors like [16, 17].

In case of Ethiopian a large body of research on financial institutions profitability has been undertaken in the banking industry and insurance companies in Ethiopia. The researcher's best knowledge on the studies conducted in the areas of manufacturing companies are few in number and also did not give an emphasis on determinants of profitability of manufacturing industry in Ethiopia. The studied on was attempted to examine only internal factors affecting profitability of manufacturing sector in Ethiopia [16]. But it has not considered external factors such as macroeconomic (gross domestic products, inflation & exchange rate). In addition to that the result of fixed-effects models discovered that firm size, leverage and capital intensity had statistically significant and negative impact on profitability. Meanwhile managerial efficiency has a positive and statistically significant impact on manufacturing food and beverage companies' profitability. Moreover, on studied that factor affecting manufacturing companies' profitability in Adamma city [18]. He focused on basic internal factors and revealed the results using the multiple regression model techniques that growths, volume of capital, liquidity, leverage and tangibility were statistically significant determinants whereas age was statistically insignificant. Those studies do not consider the past profitability as determinant of current profitability and used static panel data. Hence due to that static panel data are not capture effects of persistence (dynamic) property of profitability.

Therefore, the factors which affect the profitability of manufacturing companies have not been adequately investigated. Thus, current study extended prior research and contributes to the literature on the determinants of profitability in a number of ways. First, comprehensive research on profitability determinants using company specific factors and macroeconomic variables were not conducted in Ethiopian. Second, the dynamic framework of profitability by considering persistence of profitability as determinant of manufacturing profitability have not used in previous studies. This variable is the most important factor to determine the profitability of the manufacturing. Third, prior studies mostly adopted a static (OLS) panel approach only but the current study estimating the dynamic panel profitability models using a generalized method of moments approach.

However, this study seeks to fill the above-explained gap by providing information about the internal and external factors that affect profitability manufacturing companies operating in the country which have 7 years of data. To this end, the study provided insights into the profitability determinants of manufacturing companies in Ethiopian. The purpose of this study was to identify the determinants of profitability in Ethiopia

manufacturing companies. The specific objectives of this study were: i) to identify the major firm-specific and macroeconomics factors of the profitability of manufacturing companies. ii) to examine the effect of persistence of profitability in manufacturing companies.

Methods and Materials

Study Area, Data Source and Study Period

This study was used the secondary data, which is collected by Ethiopian revenue and customs authority (ERCA) large tax payer's office (LTO) for the purpose of tax revenue and National Bank of Ethiopia (NBE) for macroeconomic factors to see the effect of selected variables. Panel data, which is collect from the annual financial reports (balance sheet and income statement) of individual large tax payers manufacturing firm in business over a time of seven year from 2011 to 2017 company in Ethiopia.

Population and Sampling Procedure

The target population is manufacturing firms which were registered in Ethiopia large tax payers' office. The population inference was done based on the availability of the data necessary for the study and also most of the manufacturing firms reside in large tax payers' branch office. Therefore, there are 32 profitability manufacturing companies were considered under this study (Appendix A).

Variables Considered Under the Study

The dependent variable was profitability of manufacturing company which is the most commonly used measures of profitability were ROA and ROE. The independent variables were used in this study include leverage, capital intensity, managerial efficiency, GDP, exchange rate and annual inflation rate.

Methods of Data Analysis

The study was utilized both descriptive and econometric analysis based on a panel data from 2011 to 2017 period to examine the relationship between the profitability and its factors in large tax payers manufacturing companies found in Ethiopia.

Dynamic Panel Regression Model

Dynamic panel regressions model is used to analyze dynamic effects and also it considers the nature of panel data. Dynamic relationships are characterized by the presence of lagged dependent variable(s) among the regressors. One of the merits of panel data is that they allow the researcher to better understand the dynamics of adjustment [19]. The general dynamic panel data regression model could be expressed as follows:

$$Y_{i,t} = \alpha + \delta Y_{i,t-1} + X`_{i,t}\beta + \varepsilon_{i,t} \quad (1)$$

Where i = 1, 2, ..., N (i is number of companies up to N= 32), t = 1, 2, ..., T (t is the number of year for this study up to T=7). $Y_{i,t}$ is dependents that means for this study the profitability measurements (ROA) of each company over time t, $X_{i,t}$ and $Y_{i,t-1}$ are regressors for this study $ROA_{i,t-1}$ and leverage, managerial efficiency, capital intensity, GDP, Inflation Exchange rate . α, δ is scalar, β is L x 1 and the unobservable error term is assumed to follow a one-way error component model consisting of two components, (μ_i and $u_{i,t}$), where $\mu \sim N(0, \delta^2_\mu)$, $u_{i,t} \sim N(0, \delta^2_\mu)$ and $\delta < 1$.

Based on [20] studied stated the overall assumptions of dynamic panel model for the error term which is orthogonal to the exogenous variables that is $E(X`_{itL}\ \varepsilon_{it})=0$ and other variables might be correlated with the individual effect i.e. $E(X`_{itL}\ \mu_i)\neq 0$ and the error term is uncorrelated with the lagged endogenous variable i.e $E(Y_{it-1}\ \varepsilon_{it})=0$.

Panel Unit Root Test (PURT)

Before making estimation for the model, it needs to analyze univariate characteristics of the variables which entail panel unit root tests. It is possible to implement a variety of tests for unit roots or stationarity in panel datasets. The tests have the null hypothesis that all the panels contain a unit root [21]. The Lagrange Multiplier (LM) test has the null hypothesis that all the panels are stationary [22].

From those tests this study was employed LLC methods which assume the autoregressive parameters are common across the cross-sections that is $\delta_{i1} = \delta_1$; and vary across company. All approaches of panel unit roots test start with equation (1) that can be further simplified by subtracting $Y_{i,t-1}$ on both sides so that it becomes.

$$\Delta Y=(\rho_{il}\text{-}1)\ Y_{i,t-1}+\sum_{l=2}^{p}\rho_{il}\ Y_{i,t-1}+X`_{i,t}\beta+\mu_i+u_{i,t}$$

And also, assuming that $\delta_{il}=(\rho_{il-1})$ further simplified to ADF type-model as:

$$\Delta Y= \delta_{il}\ Y_{i,t-1}+\sum_{l=2}^{p}\rho_{il}\ Y_{i,t-1}+X`_{i,t}\beta+\mu_i+u_{i,t}$$

The hypothesis for this approach is H0: δ1 = 0 (there is a unit root) against HA: δ1 < 0 (there is no unit root). To implement LLC test statistics first the separate ADF regressions for each individual in the panel is carried out, and then two orthogonal residuals are generated, $\tilde{e}_{i,t}$ and $\tilde{v}_{i,t-1}$which is then normalized by the regression standard error $\tilde{e}_{i,t}$ and $\tilde{v}_{i,t-1}$.Then Pool all cross sectional and time series observations to estimate $\tilde{v}_{i,t}= \delta\tilde{v}_{i,t-1}+\tilde{\varepsilon}_{i,t}$ based on a total of $N\tilde{T}$ observations, where $\tilde{T}$ is the average number of observations per individual in the panel. $\tilde{T}=T-\overline{P}-1$, where $\overline{P} = \Sigma_{i=1}^{N} P_i$ is the average lag order for the individual ADF regressions. The conventional regression t-statistic for testing δ = 0 is given by:

$$t_{\tilde{\delta}} = \frac{\hat{\delta}}{SD(\hat{\delta})}, \text{where } \hat{\delta} = \frac{\sum_{i=1}^{N}\sum_{t=2+p_i}^{T}\tilde{v}_{i,t-1}\tilde{e}_{i,t}}{\sum_{i=1}^{N}\sum_{t=2+p_i}^{T}\tilde{v}^2_{i,t-1}}, SD(\hat{\delta}) = \sigma\left[\sum_{i=1}^{N}\sum_{t=2+p_i}^{T}\tilde{v}^2_{i,t-1}\right]^{-\frac{1}{2}}$$

$$\sigma^2 = \frac{1}{N\tilde{T}}\sum_{i=1}^{N}\sum_{t=2+p_i}^{T}(\tilde{e}_{i,t} - \hat{\delta}\tilde{v}_{i,t-1})^2$$. Finally, adjusted t-statistic with standard normal distribution is calculated.

Moment and Model Selection

Pre-estimation Lag Length Selection

Dynamic Panel model analysis is predicated upon choosing the optimal lag order in both dynamic panel specification and moment condition. Proposed consistent moment and model selection criteria (MMSC) for GMM models based on H-statistic of over-identifying restrictions [23]. Their proposed MMSC are analogous to various commonly used maximum likelihood-based model selection criteria, namely the Akaike information criteria (AIC), the Bayesian information criteria (BIC), and the Hannan-Quinn information criteria (HQIC) [24].

The MMSC are based on the J-test statistic for testing over-identification restrictions. They include bonus terms that reward the use of more moment conditions for a given number of parameters and the use of less parameter for a given number of moments conditions. The J-statistic is analogue of (minus) the log-likelihood function and the bonus terms are analogues of (minus) the term that penalizes the use of more parameters in a standard model selection criterion. Let Jn (p, q) denote the J-test statistic for testing over-identifying restrictions, constructed using the parameters selected by p and the moment conditions selected by q. Applying MMSC to the GMM estimator, their proposed criteria select the pair of vectors (k, p, q) that minimizes, where, k denote that number of independent variables [23].

$MSC_{BIC,n}(k,p,q) = J_n(K^2P, K^2q)-(|q|-|p|)k^2lnn$
$MSC_{AIC,n}(k,p,q) = J_n(K^2P, K^2q)- 2k^2(|q|-|p|)$
$MSC_{HQIC,n}(k,p,q)=J_n(K^2P, K^2q)-Rk^2(|q|-|p|)lnlnn$

The above MMSC are available only when q > p, by construction. As another criterion, the overall coefficient of determination (CD) may be calculated even with just-identified GMM models. Suppose it denote the (k x k) unconstrained covariance matrix of the dependent variables by Ψ. CD captures the proportion of variation explained by the panel model, and calculated as:

$$CD=1-\frac{\det(\Sigma)}{\det(\Psi)}$$

Model Specification

Dynamic panel regressions model is used to capture the effects of persistence of profits by including the lagged dependent variable in the set of explanatory variables [25]. Thus, the models for this study the dynamic panel model derived on the basis of previous studies such as [26-28]. We specify the following equation which is similar to that of to investigate the influence of firm specific and macroeconomic variable on the profitability of manufacturing company.

$$ROA_{i,t} = \alpha+\delta ROA_{i,t-1}+ \beta_1 lev_{i,t}+ \beta_2 CI_{i,t}+ \beta_3 meff_{i,t}+ \beta_4 inf_{i,t}+ \beta_5 GDP_{i,t}+ \beta_6 Erte_{i,t}+ \mu_i+ u_{i,t} \quad (2)$$

With subscript i denote the cross-section and t representing the time-series dimension. $ROA_{i,t}$ is Return on Asset, $ROA_{i,t-1}$ return on asset for firm i in year t-1, $lev_{i,t}$ is leverage for firm i in year t, $CI_{i,t}$ is capital intensity for firm i in year t,$meff_{i,t}$ is managerial efficiency for firm i in year t., $inf_{i,t}$ is inflation for firm i in year t, $GDP_{i,t}$ is Gross domestic products for firm i in year t.

This context allows us the unobserved individual-specific heterogeneity (μ_i) can be correlated with the regressors (leverage, managerial efficiency, capital intensity, among others) and it is correlated by construction, with lagged dependent variable ($ROA_{i,t-1}$). $u_{i,t}$ is the remainder disturbance term.

The coefficient of the lagged dependent variable reflects the persistence in the process of adjustment. The relationship between ROA and regressors has to be dynamically stable, so we assume the parameter of the autoregressive lag to be lower than one in absolute terms ($|\delta| < 1$). This dynamic context allows us to distinguish between the effects on the profitability rates of the variation of other regressors in our specifications and the persistence of the profitability measured by the parameter δ.

Dynamic Panel Model Estimation

The accuracy and efficiency of former classical estimators in dynamic models in (1) have been the central issue. Because of the potential problem with the estimation and testing of dynamic models is the presence of endogeneity in which an explanatory variable is correlated with the error term means $E(X`_{itL}\ \mu_i)\neq 0$ that prevent estimating the model with simple OLS regression. This could derive from two main sources for correlation in the dependent variables over time. One due to the inclusion of lagged dependent variable in the equation, since $\mathbf{Y}_{i,t}$ is correlated with μi and error term, immediately $\mathbf{Y}_{i,t-1}$ is correlated with μi and error term. Second, true state dependence (reverse causality) arises as explanatory variables in the covariate matrix are potentially influenced by the dependent variable. In this case both OLS and fixed-effects estimated coefficients will be biased [25].

To estimation and testing of dynamic models the estimators was used dynamic Fixed Effects (FE) estimator, instrumental variable estimators and GMM estimator. The dynamic Fixed Effects (FE) estimator controls for the unobserved time invariant effects by making demeaned transformation equation (3) and first difference transformation equation (4) which eliminates the time-invariant firm specific effects μ_i and its associated omitted-variable bias:

$$(Y_{i,t} - \bar{Y}_{i,t}) = \delta(Y_{i,t-1} - \bar{Y}_{i,-1}) + \beta(X_{i,t} - \bar{X}_{i,t}) + (u_{i,t} - \bar{u}_{i,t}) \quad (3)$$

Where $\bar{Y}_{i,-1}$ is mean starting from second observation. And the first difference

$$(Y_{i,t}-Y_{i,t-1}) = \delta(Y_{i,t-1}-Y_{i,t-2})+\beta(X_{i,t}-X_{i,t-1})+(u_{i,t}-u_{i,t-1}) \quad (4)$$

Moreover, in both transformations, the estimator does not address the endogeneity problem because of $E[(Y_{i,t-1}-Y_{i,t-2})(u_{i,t}-u_{i,t-1})]\neq 0$. Specifically, GMM and System GMM estimations were employed for dynamic Panel model estimation under this study.

Model Adequacy Tests

The GMM estimator was consistent even if first-order autocorrelation exists; however, second-order autocorrelation must not be present in the model. Those are Hansen-J test and Arellano & Bond test [20,29,30].

Results

Descriptive Statistics of Manufacturing Companies in Ethiopia

In this study the average profitability as measured by ROA in Ethiopian manufacturing companies during the year between 2011 to 2017. A round 0.628 with 0.242 implying the presence of good variations among the profitability across the manufacturing companies. The highest and lower values of ROA are 0.986 and -0.073 respectively. The average leverage for the observations is 0.435 as ratio of debt levels to total assets. It implying that on average 43.5% debt was used in financing total assets with a SD of 0.29 in debt levels to total assets varying from a range of lowest observation 0.007 debt levels in financing and the highest value of 3.397 of debt were used in financing total asset.

The average value for managerial efficiency (MGE) has become 0.982 with a SD of 1.187. The mean value 0.982 indicates that manufacturing companies are efficient because their operating expense per unit of operating return is high, which means a 98%

of gross profit related to operating income shows on average the company's profitability is the contribution of MGF. The mean value of capital intensity is 2.374 with the SD of 5.222 which shows high variation it implies the firm invested large amount of money in order to get one birr worth of output.

The average growth rate of real GDP of Ethiopia for the last consecutive seven years was approximately 9.1% with a minimum economic growth of 6.4% and a maximum growth of reaching 10.4%. SD was 1.47% for GDP. The value of GDP across sample of companies is the same and there is no deviation in value of GDP across the companies. However, this shows that economic growth in Ethiopia during the period of 2011 to 2017 remains reasonable stable and the result was more or less in agreement with the report that provided by the government regarding to the economic growth.

The average inflation that occurred over the years is 12.8 percent with the SD of 0.089. This indicates that there was no high variation in inflation within the study period. Lastly, the exchange rate was 1 USD exchanged on average of 19.179 birr to the local currency. Foreign exchange appeared to be the most volatile with a SD of 2.043 (Table 1).

Table 1: Descriptive statistical of manufacturing companies in Ethiopia

Variables	Mean	Standard Deviation (SD)	Minimal	Maximal
Leverage	00.435	0.292	00.007	03.397
ROA	00.628	0.242	-00.073	00.986
Managerial efficiency	00.982	1.187	00.000	09.314
Capital intensity	02.374	5.222	00.107	60.359
Annual Inflation	00.128	0.089	00.074	00.341
GDP	00.091	0.015	00.064	00.104
Exchange rate	19.179	2.043	16.118	22.414

Trend Analysis

Moving Return on Assets (ROA) of Individual Profile by Year

The result in Figure 1 indicates that the measurements for each ROA were changed with time for most companies in the study period. Most of the companies indicated increasing and decreasing trends over time. This is indicated for most of the companies there is heterogeneity across years (Figure 1).

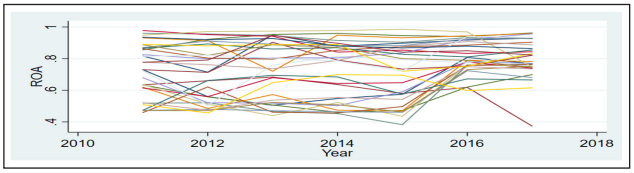

Figure 1: Individual profile of ROA over years

The Mean Distributions of Return on Assets (ROA) Trend in 2011-2017

ROA shows the average of profit a company earns in relation to its overall resources and gives an idea as to how efficient management is at using its assets to generate earnings [31]. It seems mean ROA values look like similar from the period 2011 to 2015 and it highly deviated from the period 2015 to 2016 and becomes stable from 2016 to 2017. The manufacturing profitability has been growing at a reasonably fast rate in the period 2015 to 2016. It may be the pattern of industrial development, a pattern limited to import substitution of non-durable consumer goods or an immediate consequence of the delay in the projects is a raising financial cost in the face of stressed foreign reserves in the country (Figure 2).

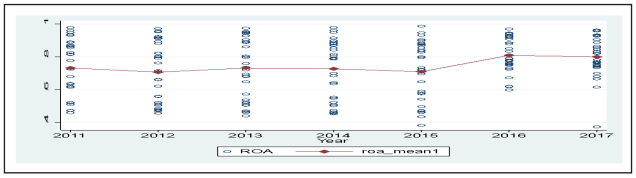

Figure 2: Mean distribution ROA over years

Diagnostic Test

Panel Unit Root Test

The variables such as ROA, capital intensity, leverage and managerial efficiency were stationary. That means the P-value of series are less than 5% level of significance indicates that the null hypothesis of unit root would be rejected and no further adjustment is needed to make them stationary. The rest of the variables were unit root and the necessary adjustments were made to avoid the problems that arise from spurious regression. Real GDP of country, inflation and real exchange rate were containing a unit root tested at each level were stationary and also tested after first difference (Table 2).

Table 2: Panel unit root test of the variables at First Difference

Variables	Statistics	P-value
RoA	-02.3e+2	0.0000
Capital intensity	-29.7505	0.0000
Leverage	-23.4545	0.0000
Managerial efficiency	-01.7e+2	0.0000
GDP*	-02.5203	0.0059
Annual inflation*	-04.5639	0.0000
Exchange rate*	00.3039	0.0003

*Shows the test at 1st difference

Granger Causality Test

It allows to analyses which variable precedes or leads the other. The Granger causality test was applied to estimate the models (Appendix-B). Its results at lag-1 in Appendix-B suggest a bi-directional relationship exit between the dependent variable as measured by ROA and measured by capital intensity. Thus, this bi-directional relationship causes of correlation in the models.

Heteroskedasticity Test

It arises when the variance of the error term is not constant. As noted in the variance of the errors is constant [32]. F and Chi-Square test statistic draw the same conclusion that there is no evidence for the presence of homoscedasticity, because the P-values is less than 0.05. This indicates that, there is enough evidence that the residuals are heteroskedasticity in sample data (Table 3).

Table 3: Heteroskedasticity Test for panel data

Heteroskedasticity Test	Statistic	P-value
White test	66.400	0.000
Wald test	79.650	0.000
Breusch-Pagan and Godfrey	10.920	0.000

Multicollinearity Test

The VIF value for variables had values below 10 with tolerance values above 0.2. The assumption of no multicollinearity between predictor variables are not rejected. Because, the results of VIF and tolerance statistics were within the accepted range concluded that there is no problem of multicollinearity (Table 4).

Table 4: Multicanonicity Test for Panel Data

Variables	Exchange Rate	GDP	Managerial Efficiency	Leverage	Inflation rate	L1 ROA	Capital Intensity
VIF	1.630	1.450	1.420	1.240	1.190	1.180	1.120
1/VIF	0.614	0.689	0.703	0.808	0.838	0.847	0.890

Lag Selection

Based on the optimal lag length of variables can be determined by statistical criteria, by applying the consistent moment and model selection criteria (MMSC) for dynamic models proposed by [23,33]. The MMSC is analogous to various commonly used maximum likelihood-based model selection criteria for this study case was proposed. The first- lag length model is the preferred model, since this has the smallest MBIC and MQIC (Table 5).

Table 5: MMSC Lag Selection

Lag	CD	J	MBIC	MAIC	MQIC
1	0.871	17.900	-32.007	-6.100	-16.306
2	0.838	10.689	-22.582	-5.311	-12.115
3	0.640	03.697	-12.938	-4.303	-07.705

Test for Random Effects

In order to estimate the panel regression models, the appropriate test used to decide whether fixed effect or random effect model is appropriate was Hausman Specification Test (HST) [34]. Thus, HST identifies whether fixed-effects or random-effect model is most appropriate under the null hypothesis that unobservable individual effects (ui) are uncorrelated with one or more of explanatory variables (Xi). As noted by fixed effect model is most appropriate when null hypothesis is rejected whereas random effect is appropriate when null hypothesis is not rejected [35].

Accordingly, to Appendix C demonstrates the HST that used to decide the best model for this study. The decision rule, for HST is rejecting the null hypothesis when the p-value is significant. The HST for this study has a P-value of 0.000 for the regression models. This indicates that P-value is significant and then the null hypothesis is rejected justifying as fixed effect model is appropriate for the given data set in this study, this means unobservable individual effects (ui) are correlated with one or more of explanatory variables (Xi) (Table 6).

Then test statistic can be used to select between fixed-effects and random-effects specifications by testing the result of Table 6 shows the fixed effects model is appropriate [34]. Even if, the result is an implication of the existence of endogeneity in equation, that is, which is related to the persistence of profitability and causal relationship between the variables explain in the model (Table 6).

Table 6: Hausman Test for panel data

Test Summary	Chi-Sq-Statistics	DF	Prob.
	42.880	6.000	0.000

Dynamic Panel Model Estimation

In Appendix D revealed that the result of two alternative linear dynamic panel models together with specification tests was provided using a system GMM estimator. The estimation of the LDP regression model for this study used the xtabond2 commands for the first differencing proposed by [30]. The robust standard errors (robust to heteroskedasticity and any arbitrary pattern of auto-correlation) are reported in parentheses using the finite-sample correction. In this case, to reduce the number of instruments and to avoid the dangers of instrument proliferation, we use dated t-1 and t-3 in the equations and "collapse" the instrument set [36,37].

Initially, the study performed panel unit root test for each variable and first difference transformation for the variables that had unit root to tackle the problem of spurious regression. In Table 7 suggested that the coefficient of the lagged value of the estimated coefficient of ROAit−1 is found to be positive and statistically significant, which implies that lagged profitability is an important determinant of the current one.

The estimated coefficient of lagged ROA was 0.691 which means that a one ratio increase in the level of profitability of a company in the preceding year will result in around 0.691 ratio increase the profitability in the current year, ceteris paribus. This finding for ROAit−1 suggests significant and persistent profits in the manufacturing industry in Ethiopia, which validates the dynamic nature of our model. We can also conclude that the Ethiopian manufacturing industry is relatively low competitive because of the high value of the coefficient of one-year lagged ROA. Our finding for past profitability is consistent with the conclusions of prior studies on 961 large Australian firms from 1995 to 2005, found that lagged profitability impacted positively on the current profit of firms and others in the literature [28, 38].

As expected, a leverage measured by the total debt to total assets ratio has a negative and statistically significant influence on profitability. The estimated coefficient of leverage was -0.395 which implies that the profitability of companies declines by 0.393 ratios as the leverage increases by one ratio, ceteris paribus. A negative association between leverage and profitability shows that a lower level of leverage is likely to contribute to the increase in profitability because the existence of a high level of

leverage results in a higher risk. Consequently, high risk leads poor Profit ratio. This finding is similar to those obtained from previous studies by examining the profitability determinants of 17 industrial firms listed on the Muscat securities market for the 2006-2013 periods [26]. The results suggest that ROA is negatively and significantly influenced by financial leverage effects. Similarly, found that firm leverage negatively impacts firm performance companies in Romania Bucharest Stock Exchange, but different from [6, 38].

In Table 7 reveled that, managerial efficiency as measured by the ratio of total revenue to total assets is statistically significant at 1 percent significant level with ROA. This means management of manufacturing companies was efficiently utilize their resources and had a great contribution to improving profitability. From the table, the regression result coefficient is 0.179 and the P-value of 0.000. For this reason, the results are reliable to the hypothesis of the study and had a similar result to on profitability in the Indian automobile industry [39].

Capital-intensive are required to take a high level of investment in fixed assets for starting up a business as well as for their overall functioning [40]. Also, the capital intensity may help a firm to be financially efficient from its already committed and expense costs for fixed assets that contribute to the firm's production during the life of those assets [41]. According to the result from Table 7, the coefficient of capital intensity was 4.52e-06 and statistically significant at 1% significance level (P-value=0.004) meaning there is a positive and statistically significant linkage between capital intensity and profitability. As noted, with empirical support, the financial economics literature suggested both benefits and drawbacks of capital intensity to firm risk and performance. This finding paralleling with on trade liberalization and price-cost margin in Indian industries suggest a positive relationship between capital intensity and profitability contrast with the findings of may reveal the importance of using assets effectively [41,42].

The expected the profitability is positively and statistically influenced by economic growth, suggesting that an improvement in economic condition enhances manufacturing firm profits. The estimated coefficient of Ethiopia's real GDP was 3.844 which implies that, keeping other variables constant, a percent increases in Ethiopia's real GDP will result roughly 3.844 percent increases in the profitability of companies. Similar findings are founded in for the EU-15 area (Table 7) [26].

The general inflation rate of the country does not show significant effect on profitability of manufacturing companies. According to the result coefficient of inflation rate is -0.715 with a t-statistics of -1.54 including a 10 % insignificance P-value of 0.134. Thus, from the result it can be concluded that there exists no relationship between inflation rate with Profitability with a 10% significant level. It is therefore consistent with the hypothesis of the study. The hypothesis of this study is not rejected. Most studies indicated that inflation have insignificant relationship with manufacturing company's profitability. To mention, on selected macroeconomic indicators on sustainable competitive advantage in food and beverage firms in Kenya: concluded that the inflation, do not have significant effect on profitability [43]. It can be concluded that from this study the general level of inflation does not have significant impact on profitability of manufacturing companies (Table 7).

The proxy for foreign exchange rate was the official exchange rate it refers to the exchange rate determined by national authorities or to the rate determined in the legally sanctioned exchange markets. The output of the regression analysis proves the existence of positive or direct and significant relationship between foreign exchange rate and profitability of manufacturing companies. The coefficient of foreign exchange rate was 0.040 and the P-value was 0.006 positive and statistically significant. This implies that, keeping other variables constant, when 1 ETB is depreciate against USD the result was 0.040 ratio increases in the profitability of companies. Hence through depreciation of domestic currency earnings are affected because with depreciation export becomes cheaper and import costlier. It is positively affecting firm's profitability if the firm exports products. The result is in line with the finding of [44].

Table 7: Dynamic panel regression model using system GMME

Variables	Coeff.	WCSE	t-Stat	P-value
L1-ROA	0.691	0.111	6.220	0.000
Capital intensity	4.5E-6	1.5E-6	3.100	0.004
Leverage	-0.393	0.141	-2.790	0.009
Managerial efficiency	0.179	0.044	4.030	0.000
Inflation rate	-0.715	0.464	-1.540	0.134
GDP	3.844	1.378	2.790	0.009
Exchange rate	0.040	0.014	2.940	0.006
Constant	-0.829	0.427	-1.940	0.061

Note: Coeff. = coefficients; WCSE=Wind Meijer's corrected standard errors; t-Stat=t-Statistics.

Model Adequacy Checking

The insignificant (P-value>0.05) of Hansen test for System-GMM estimators. This suggests the acceptance of the null hypothesis which confirms that over identifying restrictions are valid. Arellano-Bond second-order auto-correlation test indicate the P-value>0.05 shows the acceptance of the null hypothesis, suggesting the nonexistence of second-order of auto-correlation. A point estimate on the lagged dependent variable of 0.691 was lower than 1.00 is shows a credible estimate and the test is not weak in case of number of instruments is low in comparison to the number of groups [45].

The null hypothesis that claims as the addition moment restriction is valid was failed to reject it. Since the statistical tests are in line with the requirements that the GMM postulates, we can conclude that the model specification as well as all instruments are valid. Therefore, we conclude that the results of System GMM estimators are valid (Table 8).

Table 8: Adequacy Tests of the Estimators in panel data

Adequacy test	No. of instruments	AR(2) P-value	Hassen P-value	Difference Hassen P-value
System-GMM	14	0.109	0.138	0.089

Conclusion

The purpose of this study was modeling a dynamic panel model and to identify determinants of profitability using SGMME estimation. The study performed panel unit root test for each variable and first difference transformation for the variables that had unit root to tackle the problem of spurious regression. The results revealed that the profitability of manufacturing companies in Ethiopia mainly depends on previous profitability, leverage, capital intensity, managerial efficiency, GDP and the exchange rate had a statistically significant ($P<0.05$) effect on company profitability. However, the results of dynamic panel estimators revealed that insignificant effect of the inflation rate on the level of profitability of manufacturing companies in Ethiopia for the period under consideration.

We are recommended that the analyses implied the manufacturing companies should minimize leverage financing from its capitals and should emphasize the management of appropriate financing to increase profitability. Finally, policy makers should come up with better policies on improvement of profitability.

Declarations/ Ethical Standards

Ethical Approval and Consent to Participate: Ethical clearance had been obtained from Department of Statistics, Haramaya University, Ethiopia.

Availability of Data and Materials: This work is basically considered the Ethiopian revenue and customs authority (ERCA) large tax payer's office (LTO) for the purpose of tax revenue and National Bank of Ethiopia (NBE) for macroeconomic factors were included under this study.

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