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Abstract

This study provides an empirical test of the macroeconomic variables that can potentially affect private investment decisions in Malawi in a short and long run perspective using time series data. Both the theory and the empirical literature are reviewed in order to identify a private investment function for the last three decades (1979-2009). The results reveal that investment decisions seem to be determined by public investment, bank credit to the private sector and the real interest rate in the short run. Besides, there is evidence of a crowding-out effect of public investment. In the long run, the capital accumulation path seems to be closely dependent on both GDP growth and real exchange rates.

Key words*:* Co-integration, Crowding-out, Error Correction Model, Malawi, Private investment

1. Introduction

Investment is the key to any economy. It plays a crucial role in the models of economic growth. It is an essential component of aggregate demand and fluctuations in investment have considerable effect on economic activity and long term economic growth (Muhamad and Rabil, 2008). The theories of investment date back to Keynes around 1936 who first advocated an independent investment function in the economy. There is no cross-cut definition of investment however the act of investing would entail laying out money or capital in an enterprise with the expectation of profit. It is also important to note that investment does not only involve laying out money, other dimensions can also be involved. Investment may also be defined as the commitment of something other than money (time, energy, or effort) to a project with the expectation of some worthwhile result.

Econometric evidence (Beddies 1999, Ghura and Hadjimichael 1996, Ghura 1997) indicates that private investment has a stronger and more favorable effect on growth rather than government investment, probably because private investment is more efficient and less closely associated with corruption. It is estimated that the ratio of private investment to GDP in the sub-Saharan African countries which had experienced poor rates of growth in the 1990s was less than 10 percent, compared with 16 percent in Latin America, 18 percent in advanced countries and 16.5 percent in newly industrialised countries in Asia (Hernandez-Cata 2000).

Just like many developing countries, investment in Malawi is affected by different factors. These factors may impinge or facilitate the art of investment among people. A country that has a considerable amount of savings can be considered to be the one which has fewer investments. The more there are investments, the more likely profits are expected hence a modest life can follow. Mangani (2004) reports that for Malawi, total real investment declined by 1.85% annually over the period from 1990 to 2003, and most of the decline was observed four years before his study. Thus this trend implied that the gap between the desired investment and realized investment was continuously rising over the time.

Mangani (2004) continues to write that on average, the actual real investments was projected to fall short of the desired level for the attainment of a 6.0, 8.0 and 10.0 percent real output growth rate by K5, 940, K6,620, and K7,330 million respectively every year during the period from 2003 to 2018. As it can be observed, there must be factors influencing investment. Hence, a key challenge facing the country is to come up with policies that would help raise private investment in order to stimulate and sustain economic growth. Therefore, with a view to drawing some appropriate policy conclusions and implications for Malawi, it is therefore important to identify the determinants of private investment. These determinants would be of great use in the formulation of possible policy shifts to help stimulate and sustain private investment and therefore economic growth.

As far as it is to the knowledge of the researcher, no study has yet looked specifically into the determinants of private investment in Malawi, although there are studies that looked into the determinants of private investment in other countries in the sub-Saharan Africa region. Oshikoya (1994), Ghura and Goodwin (2000), Ndikumana (2000), Mlambo and Oshikoya (2001), Devarajan, Easterly and Pack (2001) carried out studies to evaluate the determinants of private investment for groups of African developing countries, with similar features to Malawi. However, it is impossible to isolate the Malawi-specific determinants of private investment from these studies.

The thrust of this paper is to find out the macroeconomic determinants of private investment in Malawi. Specifically, the study seeks to determine macroeconomic variables that influence private investment decisions in the short run and those in the long run. The hypotheses tested in this study included the following; there is no relationship between private investment and the seven identified variables including public investment, domestic credit to the private sector, real interest rate, inflation, trade, real exchange rate, and real GDP growth. Effects of public investment, domestic credit to the private sector, real interest rate, inflation, trade, real exchange rate, and real GDP growth can not be categorised into short-term and long-term effects. Public investment crowds in/out private investment.

2. Econometric Construct and Data

2.1 Data Sources and Sample

The data covers a wide range of macroeconomic variables that include GDP growth, inflation, bank credit to the private sector, fiscal variables, exchange rates and trade variables. The data used in this study is annual time series data obtained from different sources National Statistical Office Publications, Reserve Bank of Malawi's Financial and Economic Reviews, IMF's

International Financial Statistics and the Malawi government's Economic reports. The sample is for the period 1979-2009. The period was selected specifically because this is the period for which data was available for the selected variables.

2.2 Theoretical Framework of the Model

In this study, investment function is estimated based on the accelerator model as developed in Fry (1998) and subsequently used by Agrawal (2001). The accelerator model has the desired real capital stock, K*, proportional to the real GDP, y:

1 $K^* = \alpha y$

Differentiating both sides with respect to time and dividing by y, equation 1 can be expressed in terms of a desired ratio of investment to output $(I_r/y)^*$ (Fry, 1998)

2 $(I_r/y)^* = (I_n/Y)^* = \alpha G$

Where, I_r and I_n denote real and nominal gross domestic investment respectively, Y denotes nominal GDP and G is the growth of real GDP. A partial adjustment mechanism allows the actual investment rate to adjust partially in any one period to the difference between the desired investment and the investment in the previous period:

3 $(I_n/Y)_t = \lambda\,[(I_n/Y)^* - (I_n/Y)_{t-1}] + (I_n/Y)_{t-1}$

Where, λ is the coefficient of adjustment. The flexible accelerator model allows economic conditions to influence the adjustment coefficient λ (Fry, 1998 and Agrawal, 2000). Specifically it is assumed that,

4 $\lambda = \beta_0 + (\sum \beta_i x_i) / [I_n / Y - (I_n / Y)_{t-1}]$

Where, x_is *are* the variables that affect λ and β_is are their respective coefficients. The explanatory variables used here are GDP growth (GDPGR), real interest rates (RINT), public investment (I_g), credit to the private sector (PCRED), trade liberalisation (TRADELIB), real exchange rate (RER) and annual inflation (INF). The next step is to estimate the long term investment function using (3) and (4) by applying the Co-integration technique of Engle and Granger (1987) to the I(1) variables. This suggests the following long run equation to estimate;

5 $I_p = f\,(GDPGR, RINR, I_g, PCRED, INF, TRADELIB, RER)$

Where, I_p, the dependent variable is the level of private investment and the explanatory variables are; GDP growth (GDPGR), real interest rates (RINT), public investment (I_g), credit to the private sector (PCRED), trade liberalisation (TRADELIB), real exchange rate (RER) and annual inflation (INF). This specification has been used in other studies, which include Oshikoya (1994); and Mlambo and Oshokoya (2001). The lagged level of private investment is not included here because it will be captured when constructing the ECM.

3. Empirical Results and Discussion

3.1 Stationarity

The precondition to estimating an investment function is the stationarity of all variables included in the model (Harris, 2000). The first step involved examination of time series characteristics of the data in order to determine their stationarity condition to avoid spurious OLS estimates in the presence of unit root series (Gujarati, 2003). For this purpose, ADF tests for unit root were applied to each variable used in the analysis (
Table 1). A desirable feature of the ADF test is that it allows for heteroskedasticity as well as serial correlation in the error terms, thus compensating for the mis-specification of the dynamic structure of time series (Harris, 2000). The estimated ADF statistic is shown in brackets. If the estimated ADF statistic is larger (in absolute) than its critical value then the null hypothesis is rejected suggesting that the series are stationary (Gujarati, 2003).

All the series exhibited non-stationary condition as shown in column 2 of

Table 1. The estimated ADF statistics (shown in brackets) for each variable were insignificant at all the standard levels of significance. To transform them to stationarity condition, all these variables were differenced (Gujarati, 2003). In the second stage proceeding in the same way by means of ADF tests, all series revealed I(1) behavior, at 5% and 1% significance levels expect for Trade liberalization which indicated I(2) behaviour and was therefore dropped during estimation.

3.2 Co-integration Test

The next step was to estimate the long run investment function by applying the co-integration technique of Engle and Granger (1987) to the I(1) variables. This requires the application of OLS technique to the estimation of the co-integration regression. The hypothesis of long-run relationship was specified:

$$I_t = \alpha_0 + \alpha_1 GDPGR_t + \alpha_2 PCRED_t + \alpha_3 I_{gt} + \alpha_4 INF_t + \alpha_5 RINT_t + \alpha_6 RER_t + \varepsilon_t \quad (6)$$

The results for regression equation 6 are shown in Table 2. A necessary condition to conclude that a long-term relationship exists is that the series must be co-integrated.

From the co-integration regression equation 6 results in Table 2, it can be concluded that estimates of the variables reveal the long run effects of the regressors. All the variables showed positive coefficients while public investment was negatively co-integrated with public investment with a negative coefficient (-0.519). Positive coefficients show a positive long run relationship while negative coefficients show a negative long run relationship. Also, all the variables are significant at 5 percent level except for real exchange rate and public investment which are significant at 1 percent. However, this variable was not dropped at this stage since our interest here was to obtain the residuals from the co-integration regression. The residuals obtained from the co-integration regression results above, were used in the next to find evidence for co-integrationing relationship in the model.

The next step is to establish if the co-integration model is valid. This is accomplished by undertaking a unit root test for the residuals obtained from estimating equation 6, by testing their

stationarity condition. The null hypothesis of a unit root and therefore of no co-integration (H_0: $\delta = 0 = (\beta-1)$) is based on a t-test with non-normal distribution (Gujarati, 2003). Augmented Dickey-Fuller test was used to test the hypothesis of unit root in the residuals from the co-integration regression. The ADF test results revealed a test statistic of –4.973 which was significant at $p \leq 0.05$ (0.0078). Therefore, the decision rule was to reject the null hypothesis, at 1 percent level of significance, that the residuals are non-stationary. We therefore conclude that the residuals are stationary, I(0), indicating that co-integration relationship between private investment and the selected explanatory variables exists.

3.3 Error Correction Model (ECM)

Finally, it is interesting to compile the determinants of short-run private investment. For that reason, an Error Correction Model specification was used, taking into account the speed of adjustment to the long run trend of the series.The Error Correction Model was formulated using the "general to particular methodology", which starts with a general framework and narrow down to a suitably final model. In this process, the explanatory variables in equation 6 were substituted by first differences and lagged variables of the co-integrating variables so that the short and long run parameters are jointly estimated. The ECM was based specified as:

$$7 \qquad \Delta I_{p_t} = \alpha_0 + \delta Itv_{t-1} + \sum_{i=1}^{6} \alpha_{1i} \Delta x_{it} + \sum_{i=1}^{6} \alpha_{2i} \Delta x_{it-1} + \gamma \Delta Ip_{t-1} + \mu_t$$

Where; I_p = private investment; x_1 = public investment; x_2 = GDP growth; x_3 = real interest rates; x_4 = private sector credit; x_5 = real exchange rate; x_6 = inflation, and μ_t is the error term. Equation 7 states that $\Delta I_{pt,}$ depends on the first differences of the explanatory variables, (Δx_{it}), the lagged values of the explanatory variables, the lagged differenced value of the dependent variable (ΔIp_{t-1}), and also on the equilibrium error term (Gujarati, 2003). The lags, rather than contemporaneous values are included in order to avoid the possible simultaneity bias (Ndikumana, 2000). The advantage of the general to specific approach is that if the general model is rigorously tested for misspecification, the possibility of any dynamic mis-specification is reduced in the final model (Harris, 2000).

The variable ltv_{t-1} was included in equation 7 as an error correction term, which is the residual from the long run co-integration equation 6, reflecting the deviation of private investment from the long-term level in the previous period. The coefficient δ is the dis-equilibrium error correction coefficient, which represents the long-run speed of adjustment (Harris, 2000). It also measures the role such dis-equilibrium play in explaining the short run movements in private investment and it is expected to be negative (Harris, 2000). The results of the ECM model 7 are presented in Table 3.

The results in Table 3 show positive and significant coefficients for public investment, bank credit and real interest rates for the short run model. According to the results other variables do not affect private investment level in the short run as they show insignificant coefficients. GDP growth and real exchange rates are significant in the long run. Inflation was insignificant in both cases. This means that in the long run, the variations in private investment level is underpinned by; GDP growth, public investment, and the real exchange rate, while real interest rates, public

investment and the availability of credit affect investment behaviour in the short term. The long-term estimates confirm most of the empirical results found in the investment literature (e.g. Oshikoya, 1994; Mlambo and Oshikoya, 2001).

GDP growth was included to capture the accelerator effects, with faster growth expected to lead to higher investment rates (Mlambo and Oshikoya, 2001). The coefficient on GDP growth is positive and statistically significant (2.43), suggesting that output recovery will boost the share of private investment in the long run (Ndikumana, 2000). This indicates that real GDP growth is a determinant of private investment, corroborating similar results by Mlambo and Oshikoya (2001). Thus, given that investment is itself a key factor contributing to real GDP growth (Ghura and Goodwin, 2000), Malawi can indeed benefit from the virtuous cycle that links increased private investment and real GDP growth.

There is also evidence that supports the theory of a "crowding-out" effect of the public investment (The coefficient of public investment is negative and significant (-1.617) in Malawi. This suggests that there is a sort of competition for resources between the public and the private sectors in the short run in which the Government displaces the private sector when the public investment increases in a country and competes for the appropriation of scarce physical and financial resources (Everhart and Sumlinski, 2001).

The real exchange rate is significant. Devaluation seems to decrease investment substantially, as suggested by McCulloch (1989). Devaluation of the exchange rate might cause the cost of imported capital to increase, thus reducing private investment, an appreciation of the real exchange causes external competitiveness to deteriorate, which may in turn cause investment to decline. The real interest rate and its lags are also important determinants of private investment in the short run. McKinnon and Shaw (1973) reached at the conclusion that high interest rates (deposit rates) stimulate private investment by increasing the supply of domestic credit (domestic savings) in the economy. Inflation and its lag matter: while the immediate impact seems to stimulate investment, with time the effect seems to vanish and become insignificant. Financial variables are measured by the bank credit available to the private sector (Ndikumana, 2000:384). Credit availability was found to significantly boost investment only in the short run. Acosta and Loza (2004) found similar findings.

The variable ltv_{t-1} corrects for the long run equilibrium, and is significant in our case, with the expected sign (it should be negative for equilibrium to be restored). The magnitude of the coefficient of this term (-0.33) implies that after a shock is given to the system, it takes approximately three periods, which corresponds to three years in our study, for private investment to restore its equilibrium level. The significance of the coefficient associated with the error correction term further supports the acceptance of the co-integration hypothesis (Harris, 2000).

4. Conclusions and Policy Implications

This study analysed the macroeconomic variables that affect private investment in Malawi. An exploration of the determinants of private investment for the last three decades reflects that the tempo of capital accumulation from the private sector seems to have been determined mainly, in the short term, by public investment, bank credit to the private sector and the real interest rate.

The analysis shows evidence of a displacement effect crowding out coming from government investment decisions, by competing for resources that could have been utilized by the private sector. The long run variables are GDP growth and real exchange rates. This is an indication that real GDP growth leads to increases in investment. The empirical evidence provided suggests that there would be a reduction in the level of private investment with adverse impacts on the short-term productive capacity of the private sector when the sector is squeezed for credit. These results are subject to traditional measurement errors, so they should be complemented by microeconomic studies of the determinants of investment at the firm level.

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Table 1: Unit Root Tests to Determine the Order of Integration

Variables	ADF in levels	ADF in differences	Order of integration	Number of lags
Private Investment	-0.677 (-1.8446)	-2.5312* (-1.2595)	I(1)	2
Bank Credit	-2.00511 (-2.8688)	-2.8332* (-2.4182)	I(1)	2
GDP Growth	-2.4890 (-2.7568)	-3.2221* (-2.6709)	I(1)	2
Inflation	-2.3279 (-3.8767)	-2.9104* (-2.2219)	I(1)	2
Public Investment	-2.14287 (-2. 7688)	-3.8557* (-2.3217)	I(1)	2
Real Interest Rate	-1.2785 (-3.9890)	-3.4265* (-2.1270)	I(1)	2
Trade liberalization	-1.3196 (-2.4833)	-3.7843 (-3.5513)	I(2)	2
Real Exchange Rate	-2.4681 (-3.1250)	-4.3082** (-2.19722)	I(1)	2

Level of significance: * and ** are 1% and 5%, respectively. I(d): Order of integration

Table 2: Private Investment, Malawi 1979-2009 - Co-integration

Variable	Coefficient	SE	*t*-ratio
GDPGR	0.0485	0.0187	2.59**
PCRED	0.898	0.355	2.52**
INF	0.112	0.0443	2.54**
RER	0.0148	0.0043	3.44***
RINT	0.2	0.073	2.727**
Ig	-0.519	0.159	-3.260***
Const	3.76	3.91	0.9634

Notes: Adj-R^2 =0.734, DW = 1.9053, T = 31, **significant at 5%, ***significant at 1%. The specification includes all non-stationary I(1) variable of equation (7)

Table 3: Private Investment, Malawi 1979-2009 - Error Correction Model

Variable	Coef.	Std.Err.	t-statistic
$\Delta GDPGR_t$	0.187	0.122	1.53
ΔIg_t	-1.07	0.45	-2.37***
$\Delta PCRED_t$	0.198	0.11	1.8***
ΔRER_t	-0.226	0.19	-1.18
$\Delta RINT_t$	0.556	0.16	3.47**
ΔINF_t	0.063	0.023	2.7**
Ip_{t-1}	0.32	0.083	3.85
$GDPGR_{t-1}$	2.43	0.28	8.67***
Ig_{t-1}	-1.617	0.71	-2.277**
$PCRED_{t-1}$	0.581	0.371	1.56
RER_{t-1}	0.451	7.86	2.294***
$RINT_{t-1}$	0.276	0.18	1.53
INF_{t-1}	0.017	0.012	1.42
ltv_{t-1}	-0.33	0.035	-9.43***

Coefficient of estimates ***, and ** denote a t-ratio significant at the 1% and 5% respectively, Adj-R^2 = 0.5525