DOES AVAILABILITY OF CREDIT ADVANCE PRIVATE INVESTMENT?

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Abstract

The level of private investment in Kenya, Rwanda and Burundi, as a percentage of Gross Domestic Product, has been fluctuating over time since independence. Several studies have been carried out on regard to the determinants of private investment at country level, but the findings are inconclusive. However, from the empirical literature review, these studies have failed to capture the effect of availability of credit on private investment in the three countries. It is against this limitation that this study was carried in 3 countries using panel estimation method over the period 2008-2017. The study adopts Modified Flexible Accelerator model so as to show the association between private investment and explanatory variables. The study results showed domestic credit to private sector had a positive significant effect on private investment. The three countries should provide incentives to the financial institutions so as to encourage them channel more credit to the private sector.

Key words: KRB, Private Investment, Panel data, Private Credit

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1.1 Background to the Study

Private investment is one of the major contributors to economic growth in both developed and developing countries. This is because through investment, new technology can be adopted, employment opportunities can be created, incomes can grow and living conditions

of the people can improve and eventually leading to eradication of poverty (Mose and Jepchumba, 2017; Matwanga, 2000). In the recent years, emphasis has been put on the development of the private sector in developing countries to help boost economic growth and reduce poverty. This is because private investment is a crucial pre-requisite for economic growth because it allows entrepreneurs to set economic activity in motion by bringing resources together to produce goods and services.

The major concern for private investment for most Sub-Saharan Africa countries is that the level is so low compared to developed nations. This is attributable to a variety of reasons and the one critical factor is the relatively small size of the formal private sector, especially in modernization and industrialization, and the difficulty in gaining access to funds for investment. Another factor is that many SSA countries can be characterized by high levels of economic and political instability, which discourages both private domestic and foreign investments (Morrissey, 2009).

1.2 Trends in Private Investment and Economic Growth in KRB

The level of GDP growth (% annual) in Kenya in the year 2014 was US $ 4.8 while the level of private investment as a percentage of GDP was 9.63%. According to Nsanzabanwa (2009), Rwanda has experienced robust economic growth in the last decade with its GDP growth (% annual) in 2014 being US dollars 6.8 and the trend is expected to continue while the level of private investment as a percentage of GDP is 10.47%, with GDP forecasted to be higher than 7.0% in 2015, World Economic Outlook (2014). Since 1986, Burundi has adopted a program aimed at opening a new era in prosperity and development. The current GDP growth in the country is US $ 4.4 (% annual) while the level of private investment as a percentage of GDP is 11.31%. The Inter-ministerial Committee of Privatization (ICP) has been put in place and is reforming the public sector so as to create a better environment for private investments (Mose and Jepchumba, 2017).

Private investment in Sub Saharan Africa on average continued its moderate increasing trend for the third year in a row in 1999, reaching 11.3 percent of GDP. In GDP weighted terms, however, private investment declined slightly in 1999 to 10.6 percent of GDP from 11.1 percent in 1998. Public investment in Africa remained level in simple average terms and declined by almost one percentage point in weighted average terms. Private investment

increased in Cote d'Ivoire and Mauritius, but remained flat or nearly flat in Benin, Guinea-Bissau, Madagascar and Seychelles. The remaining African countries covered in the data set recorded declines in private investment to GDP ratios.

Private investment levels had been on a fluctuation trend in years between 1990 and 2000; this may be attributed to the trade barriers among member countries. Private investment started picking up from the year 2000 onwards which may have been contributed by the removal of both internal and external tariffs after the EAC was revived in 1999 and increased political stability. The levels of private investment further increased in the subsequent years after 2010 though at a slow rate (World Economic Outlook, 2014).

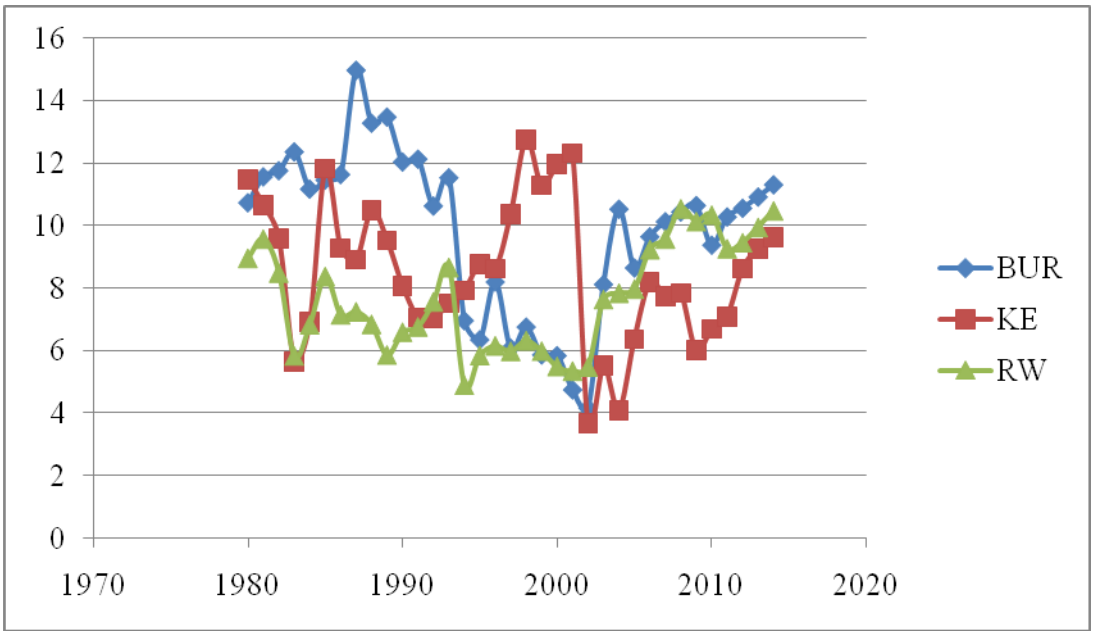

Figure 1: Private investment trends in KRB (As percentage of GDP)

Source: World Economic Outlook, 2014

2.0 Theoretical Literature

2.1 Credit Transmission Channel

According to Kahn (2010), in the context of the credit transmission channel, monetary policy affects the supply or relative pricing of loans by banks. As tighter monetary policy causes banks to lose the use of some funds which cannot be replaced with other sources of funds, then the relative cost of funds will increase, decreasing the supply of loans to bank-dependent

borrowers who are squeezed out, due to an increase in the external finance premium. In developed financial markets generally firms have access to other sources of financing, unlike in SSA where financial markets are not as well developed and only large corporate can borrow from external markets while the smaller firms have recourse only to internally generated funding and bank borrowing. In such a market the internal rate of return has a greater impact in the investment decision making then the rate of interest. On the basis of the three theories, the Keynesian view is considered to hold more general applicability for this study, although the credit channel theory seems to be valid for developing countries in SSA. The classical theory assumptions are difficult to apply to developing economies thereby limiting the use of the theory. The challenge is that an emerging economy like Kenya does not easily fit into the strict mould of credit rationing exhibiting elements of advanced financial system where a capital market has existed even prior to independence, government securities with the exception of 91 day Treasury bills are traded in secondary markets violating some of the crucial assumptions of the model. In practice, private sector investment is a dynamic process that responds to the opportunities inherent in the economy in its interaction with monetary policy. Therefore there are abstractions from all the above theories that will be found to be true in specific instances. These aspects are developed in later sections to understand clearer the individual effects on the private sector investments within KRB.

2.2 Keynesian Theory of Investment

Keynes, (1936), gave an explanation on the marginal efficiency of capital where interest rate and internal rate of return (IRR) continues to be the key determinants of investment. According to Keynes, investment by a firm occurs when the MEI (internal rate of return) on an addition to investment exceeds the rate of interest. The importance of entrepreneurs' long term expectations was also highlighted but did not provide a clear-cut explanation of how expectations are formed. However, Keynes' analysis suffers from the following limitations: it assumes that the funds used in investment have the same opportunity cost, profits are certain and assumption of no credit constraints.

2.3 McKinnon and Shaw Hypothesis

McKinnon and Shaw (1973) formulated a neoliberal approach to investment which stresses the importance of financial deepening and high interest rates as drivers of economic growth. According to them, developing countries suffer from financial suppression whereby the

interest rates are controlled in downward direction and therefore if these countries were liberated from their repressive conditions, it would induce savings, investment and hence economic growth. In their view, private investment is positively related to the real rate of interest which is made possible because an increase in deposit interest rates will lead to an increase in the volume of financial savings through financial intermediaries and thereby raises investible funds, a phenomenon that McKinnon (1973) calls the "conduit effect".

2.4 Empirical Literature

Mose and Jepchumba (2017) examined the relationship between availability of budget deficit and the private investment growth in East African Community during the period between 1981-2015 using co integration and error correction model test. The finding revealed that fiscal deficit had a negative effect on private investment in the region. Debt reduction and government expenditure scaling down strategies should also be adopted in the region so as to improve the fiscal deficit hence boosting private investment and faster real GDP growth in the long run.

Okorie (2013) conducted a study to investigate the impact of private sector credit on private domestic investment in Nigeria using the error correction model technique. The study found out that an increase in private sector credit though not statistically significant leads to increase in private domestic investment. The non statistical significance of private sector credit showed that there was need for increase in private sector credit in the Nigerian economy.

Kazeem *et al* (2012) in the study which covered the period 1970 to 2010 used advanced econometric technique of ARDL bounds testing approach in modeling long run determinants of domestic private investment. Findings from the study showed clearly that difference exist between long and short run determinants. Interest rate, real GDP, exchange rate, terms of trade, external debts, public investments, credit to the private investment and reforms dummy are the key long run determinants of domestic private investment while real GDP, public investment and terms of trade are statistically significant in the short run.

Menjo and Kotut (2012) investigated the effects of fiscal policy on private investment and economic growth in Kenya. The study employed a time series data from 1973 to 2009. The method of two stage instrumental variable estimation was employed to perform regression analysis. The results showed that fiscal policy impacts on private investment and private

investment plays a major role in the determination of the economic growth in Kenya. The recommendation from the study was that government spending be re-examined so as to eventually make it complementary to investment, more credit channeled to the private sector, and finally designing of appropriate policies that deal with the current high domestic public debt and budget deficit.

According to empirical study done by Green and Villanueva (2006) using the double logarithmic form of OLS (Ordinary Least Square), they investigated the determinants of private sector investment over a period of 1975-2005. The results from the study concluded that both the availability of credit and foreign exchange had significantly positive effects on private investments, confirming the result in most empirical studies where an increase in the real credit to private sector encourages private investment. A negative impact of exchange rate depreciation investment was also found to crowd in private investment.

Lesotlho (2006) carried out a study on the determinants of private investment in Botswana. The study used a methodology that combined the static OLS with the co-integration and error correction model procedures to establish both the short-term and long-term effects simultaneously. The results of the study showed that macroeconomic factors affected private investment both in the short-term and in the long-term. The short-run variables were public investment, bank credit to the private sector and the real interest rate while the long-run variables were GDP growth and real exchange rates. The study indicated that real output growth was positive and statistically significant determinant of private investment in Botswana in the long-run. The findings showed that public investment crowds-out the private sector investment. The real exchange rate in the research measured the effect of exchange rate policy on private investment. The results proved that an appreciation of the real exchange rate would positively affect private investment in the long-term. The real interest rate had a positive and statistically significant effect on the private investment.

The model of private investment is estimated by Blejer and Khan (1984) for 24 developing countries with pooled data over the period 1971-1979. Their study concluded that the change in bank credit to the private sector and net private capital flows is positive and significant. With more credit availability, their productivity increases and so private investment. Finally, their results show that public sector infrastructure investment is complementary to private investment; where as other kinds of public investment would tend to be substitutes for private investment.

2.5 Theoretical Framework

Following Chenery (1952), Koyck (1954) and, Mose and Jepchumba (2017) the theory of flexible accelerator was chosen as a theoretical model. The approach by Koyck was chosen for this study since it is based on the assumption that investment by firms is a fraction of the difference between the actual level of capital and the desired level of capital hence it is aligned to Jorgenson's idea on the flexible accelerator. The Koyck lag model assumes that the firm's investment level in each period is a fraction $(1-\lambda)$ of the gap between its existing level of capital and its desired level.

This approach assumes that the actual capital stock depends on all past output levels with weights declining geometrically. It can therefore be illustrated as follows:

$$K_t = v(1-\lambda)\left(Y_t + \lambda Y_{t-1} + \lambda^2 Y_{t-2} + \cdots \lambda^n Y_{t-1}\right) \quad (2.1)$$

Where, $0 < \lambda < 1$. If there is no change in income and it is equal to $\bar{Y}$ the expected volume of output also remains unchanged, then

$$\bar{K} = v\,(1-\lambda)\,(\bar{Y} + \lambda\,\bar{Y} + \lambda^2\,\bar{Y} + \ldots\ldots\ldots\ldots\ldots \lambda^n\,\bar{Y})$$

$$= v(1-\lambda)\bar{Y}(1+\lambda+\lambda^2+\ldots\ldots\ldots+\lambda^n) \quad (2.2)$$

Where $(1+\lambda+\lambda^2+\ldots\ldots\ldots+\lambda^n) = 1/(1-\lambda)$ are the weights in geometric series and equation (2.3) becomes:

$$\bar{K} = v\,\bar{Y}\,(1-\lambda) * 1/(1-\lambda)$$

Given that $\bar{K}=vY$ and if equation (2.1) is valid, then K_{t-1} is also true. Therefore we can write equation (2.1) as

$$K_{t-1} = v\,(1-\lambda)\,(Y_{t-1} + \lambda^2\,Y_{t-2} + \lambda^3\,Y_{t-3} + \ldots\ldots\ldots\ldots \lambda^n\,Y_{t,n})$$

Multiplying by λ we have

$$\lambda K_{t-1} = v\,(1-\lambda)\,(\lambda\,Y_{t-1} + \lambda^2\,Y_{t-2} + \lambda^3\,Y_{t-3} + \ldots. \lambda^{n+1}\,Y_{t,n-1} \quad (2.4)$$

Subtracting equation (2.4) from (2.1) we get

$$K_t - \lambda\,K_{t-1} = v\,(1-\lambda)\,(Y_t + \lambda^{n+1}\,Y_{t,n-1}).$$

Since the term λ^{n+1} tends to zero, the above equation becomes

$$K_t - \lambda\,K_{t-1} = (1-\lambda)\,v\,Y_t$$

$$K_t = (1-\lambda)vy_t + \lambda\,K_{t-1} \quad (2.5)$$

This process of rewriting equation (2.1) as equation (2.5) is called the Koyck transformation. Net investment is the change in the stock of capital, $K_t - K_{t-1}$. Therefore we subtract K_{t-1} from both sides of the equation to get the expression of net investment

$$K_t - K_{t-1} = (1-\lambda)\,v\,Y_t + \lambda\,K_{t-1} - K_{t-1}$$

$$I_{n,t} = (1-\lambda)\ v\ Y_t + K_{t-1}(\lambda-1)$$

$$I_{n,t}=(1-\lambda)vY_t - (1-\lambda)K_{t-1} \quad (2.6)$$

The net investment (K_t-K_{t-1}) is called the distributed lag accelerator which is inversely related to the capital stock of the previous period and is positively related to output level. To convert net investment to gross investment we add depreciation (D_t) to both sides of equation (2.6) to get,

$$I_{n,t} + D_t = (1-\lambda)v\ Y_t - (1-\lambda)\ K_{t-1} + D_t \quad (2.7)$$

Depreciation is assumed to be proportional to last year's capital stock and is estimated by $D_t = \delta K_{t-1.}$ By adding this to equation (2.7), gross investment ($I_{g,t}$) is:

$$I_{g,t}= (1-\lambda)\ v\ Y_t - (1-\lambda)\ K_{t-1} + \delta K_{t-1}$$

$$= (1-\lambda)\ v\ Y_t - [(1-\lambda) + \delta]\ K_{t-1}$$

$$I_{g,t}=(1-\lambda)vY_t-(1-\lambda\delta)K_{t-1} \quad (2.8)$$

This equation represents the flexible accelerator principle. It suggests that net investment is some fraction of the difference between planned capital stock and actual capital stock in the previous period. The coefficient (1-λ) tells us how rapidly the adjustment takes place. If λ=0, then adjustment takes place in the unit period.

3.0 Research methodology

3.1 Research Design

The study used historical research design as it seeks to establish the effect of credit on private investment in KRB over the period 2008-2017. This research design was chosen because it enabled the researcher to capture the trend in private investment among the KRB countries. The data employed in this study was collected from secondary sources such as World Development Indicators (WDI) database and specific countries statistical abstract.

3.2 Panel Unit Root Test

The unit root test was carried out to establish the stationarity of a data series. This test is necessary because failure to do this may lead to generation of spurious results. A panel unit root test for panel data developed by Levin, Lin and Chu (2002) was employed in the study since it requires that the ratio of the number of panels to time periods tend to zero asymptotically and it is suitable for data sets with small number of panels like in this study.

The null hypothesis is that each individual time series contains a unit root against the alternative that each time series is stationary. The model is specified as;

$$\Delta Y_t = \mu_i + \rho Y_{t-1} + \sum_{l=1}^{pi} \theta_{iL} \Delta Y_{it-L} + \alpha_{mi} d_{mt} + \varepsilon_{it} \qquad m=1,2,3 \qquad (3.1)$$

The panel unit root test evaluates the null hypothesis of H_0: ρ =0, for all i, against the alternative hypothesis H_1: ρ <0 for all i. The lag order ρi is unknown and is allowed to vary across individuals.

3.3 Panel Co-integration Test

Panel co-integration test was carried out to identify whether there exist a long run relationship between private investment and the availability of credit. The method suggested by Pedroni (1999) was used to run the panel co-integration test on the model. The Pedroni cointegration test was used in this study since it allows for considerable heterogeneity among the individual members of the panel in the short-run while in the long-run information is selectively pooled across the panel, Pedroni (1999). First, the regression residuals from the hypothesized co-integrating regression were computed as follows:

$$Y_{i,t} = \propto_i + \delta_i + \beta_{1i} X_{1i,t} + B_{2i} X_{2i,t} + \cdots + \beta_{Mi} X_{Mi,t} + \varepsilon_{i,t} \ldots \qquad t=1,\ldots,T: \ I \ =1,\ldots,N \qquad (3.2)$$

where;

T - is the number of observations over time

N- denotes the number of individual members in the panel

M - is the number of independent variables.

3.4 Hausman Test

The Hausman (1978) test was applied to underpin the application of the balanced panel fixed effects model in this analysis. This statistical test was generally used for deciding between applying a fixed or random effects model. The Hausman test (H) was estimated by the following equation:

$$\mathbf{H} = (\beta_{FE} - \beta_{RE}) * \mathbf{INVERSE}[V_{FE} - V_{RE}] * (\beta_{FE} - \beta_{RE}) \qquad (3.3)$$

3.5 Model Specification

The neoclassical flexible accelerator model has been the most widely accepted general theory of investment behavior, and empirical tests of the model from developed countries have been quite successful, for example, the studies by Jorgenson (1967), Mose and Jepchumba (2017), and Clark (1917). However, it has generally been difficult to test this model in developing countries, because the key assumptions such as perfect capital

markets and enormous role of government in capital formation in these countries makes the model inappropriate. In addition, data for certain variables such as capital stock and real wages are unavailable. Therefore following the review of large body of literature in this study, a modified private investment model was derived from the flexible accelerator model to include domestic credit to private sector as a factor that influences private investment growth in KRB.

A more general form of the private investment model modified specifically for this study is:

$$PI_{i,t} = \propto_i + \beta_i X_{i,t} + v_i + \varepsilon_{i,t} \quad (3.4)$$

where;

PI- is the Private investment

v_i - are the unobserved country characteristics that are constant over time and influences private investment

ε_i -is the stochastic error term with constant variance and zero mean

Subscripts i and t - denote country and time respectively

$\propto_i$ and β_i - are parameters that were estimated

X_i - stands for a vector of explanatory variables that influence private investment which include domestic credit to private sector, public investment and real GDP per capita growth.

$$X_i = f(CRP, PBI, RGD) \quad (3.5)$$

Following the earlier works of Ouattara (2004), natural logs of the variables will be taken for the estimation of the model so as to allow for regression coefficients to be treated as elasticities. Therefore the basic regression equation that was used to investigate the effects of credit on private investment in KRB is given by equation (3.6) below:

$$\ln PI_{i,t} = \alpha_0 + \alpha_1 \ln(CRP)_{i,t} + \alpha_2 \ln(PBI)_{i,t} + \alpha_3 \ln(RGDPPC)_{i,t} + \varepsilon_{i,t} \quad (3.6)$$

3.6 Panel Post Estimation Diagnostic Tests

Post-estimation panel diagnostic tests were carried out in this study before estimating the models in equation (3.6). These tests include: cross sectional dependence (Breusch- Pagan Lagrange multiplier approach test), autocorrelation (Wooldridge test) and heteroscedasticity (Modified Wald test) (Gujarati and Sangeetha, 2007).

4.0 Analysis and discussion of results

4.1 Descriptive Statistics

Table 4.1: Descriptive Statistics

Variable	***LnPI***	***LnCRPS***	***LnPBI***	***LnRGDPPC***
Obs	90	90	90	90
Mean	2.2	2.1	2.5	2.0
Std.deviation	.2	.2	.3	.2
Variance	.05	.04	.1	.1
Skewness	-.7	-.8	-.2	-.2
Kurtosis	3.3	3.3	3.7	2.7
Minimum	1.5	1.4	1.5	1.5
Maximum	2.4	2.6	3.4	2.6

The results from Table 4.1, which presents the descriptive statistics, shows that real GDP per capita has the smallest variation compared to other variables in the study. This may imply that although the growth rate of population within the 3 countries is high, its significance on private investment in the region is negligible. The domestic credit to private sector and the fiscal deficit have almost the same variation. For the credit to private sector, it may imply that most of the funds used for investment by the private sector are obtained from other sources other than the financial institutions hence not controlled by the central banking authorities of the respective governments.

4.2 Correlation Matrix

The correlation matrix presents the correlation coefficients between private investment and the explanatory variables in the study. Correlation coefficient is used to measure the degree of linear association of any two variables whereby the values ranges from -1 and 1. The results from the table shows a strong positive correlation of (0.7) between private investment and domestic credit to private sector in 3 countries and it is statistically significant at 1 percent level of significance. These results suggest that domestic credit to private sector is positively related to private investment and therefore an increase in the credit to private sector may lead to increase in private investment in the region.

Table 4.2: Correlation Coefficient Results

	ln *pi*	ln *crps*	ln *pbi*	ln *rgpc*
ln *pi*	1.0000			
ln *crps*	0.7**	1.0		
ln *pbi*	-0.6**	0.7**	1.0	
ln *rgpc*	0.8**	0.7**	0.6**	1.0

** Means that the Correlation is significant at 1% level (2-tailed test).

4.3 Panel Unit Root Test

Therefore the study employed LCC (2002) method since it is suitable for data sets with small number of panels as is the case for this study. The unit root test results are shown in Table 4.3 below.

Table 4.3: Unit Root Test Results using Levin-Lin-Chu

Variables	**LLC P-value at Level**	**LLC P-value at first difference**	**Order of integration**
Ln Pi	0.14	0.0000	I(1)
Ln Rgdppc	0.11	0.0000	I(1)
Ln Crps	0.09	0.0000	I(0)
Ln pbi	0.22	0.0000	I(1)

The results from Table 4.3 reveal that all the variables in the study except the domestic credit to private sector were non-stationary at level. The variables were then differenced once and they became stationary, meaning that the variables are integrated of order one I(1).

4.4 Co integration Test

Having conducted the panel unit root test and established that the series are non stationary that is I(1) except the domestic credit to private sector, the next step was to test whether there exist long-run relationship between the variables in the study. Therefore co integration test was carried to establish whether two or more non-stationary variables move together in the long-run. The co integration results are presented in Table 4.4 below.

Table 4.4: Cointegration Test Results

Within dimension		**Between dimension**	
Panel PP-statistics	-3.3	Group ADF statistic	-4.2
Panel ADF statistics	-3.6		

(Significance level 5%)

From the results in the table, except the variance ratio statistic test, the results of the within-group test and the between-group tests have a negative sign. Therefore the cointegration results show that all the four test statistics reject the null hypothesis of no cointegration at 5% level of significance. Hence it is established that long-run relationship exists between private investment and explanatory variables in the study for the panel of 3 countries. Both the PP (-3.3) and ADF (-3.6) statistics shows that the statistic values are higher than the critical value except the panel v-statistics. The Pedroni cointegration test results therefore indicate that there is a long run relationship between private investment and explanatory variables.

4.5 Hausman Test

Hausman (1978) proposed a test used to decide whether to use Random effect (RE) or Fixed effects (FE) model. From the Hausman test results, the p-value 0.48 which is greater than 0.05 and therefore we accept the null hypothesis and conclude that the country specific effects are uncorrelated with the regressors and hence selecting RE model.

4.6 Regression Analysis

The regression and post estimation results are presented in Table 4.5.

Table 4.5: Long-run Regression Results

Variable	**Coefficient**	**Std .Error**	**Z Statistic**	**P Value**
Ln Crps	0.3	0.02	11.8	0.000
Ln Pub	-0.4	0.08	-4.00	0.000
Ln Rgdppc	0.2	0.03	8.3	0.001
Const	0.1	0.04	3.1	0.002
Adjusted R^2 =0.7				
Breusch Pagan LM			p-value= 0.4	
Modified Wald test			p-value= 0.3	
Wooldridge test			p-value= 0.6	

4.7 Effect of Domestic Credit to Private Sector on Private Investment

From the regression results, the sign of the coefficient of domestic credit to private sector is positive and significant at 1 percent level and this conforms to a priori expectations. An increase in domestic credit to private sector by 1 percent leads to 0.3 per cent increase in private investment in the 3 countries. This therefore implies that the monetary policies which have been put in place by the 3 countries facilitate credit to private sector have encouraged the growth of the private sector. These results are consistent with those of Mohan (2008) who found a positive correlation between credity policy and investment. An example of India was given which had low growth initially but due to increase in gross domestic savings, the loanable funds were made available leading to increased private investment. According to the bank lending channel, it is assumed that monetary contraction decreases bank reserves and deposits and hence lowers the quality of bank loans available for investment.

According to Onodugo *et al.* (2013), most developing countries have limited access to credit facilities which may have been contributed by the inconsistent and inefficient government policies regarding the administration of credit to the private sector. Therefore KRB being in the category of LDCs means that the private sectors in the region do not have access to adequate funds to finance its investments. This calls for policies that can accelerate lending.

Cross-sectional dependence refers to interaction between cross-sectional units and this can lead to efficiency loss for least square estimators. This test was done using the Breusch Pagan LM test of independence. The test's null hypothesis is that residuals are not correlated across entities. From the results, the p-value is 0.4 which is greater than 0.05 and therefore the null hypothesis is accepted meaning that cross-sectional dependence is not present in the study.

4.8 Effect of Public Investment on Private Investment

The regression results show a negative significant relationship between public investment and private investment with the coefficient being (-0.4). This implies that 1 percent increase in public investment leads to 0.4 percent decline in private investment. The empirical literature gives inconsistent results concerning the effect of public investment on private investment. However, the results are consistent with the findings of Erenburg (1995), Jepchumba (2017) and Wai and Wong (1982).

According to Gwartney& Samida (2000), the negative impact of public investment on private investment is due to the effect of larger public sector size which tends to lower the productivity of private sector. This may also be explained by the increase in government consumption expenditure in the region given that infrastructural development by the government complements private investment.

The undesirable impact of public investment on private investment may have been contributed by the budget constraint in the region which makes the cost of inputs to increase hence decline in the growth of output in the private sector since they compete for investment resources. The crowding out may be more significant if public investments are made in state corporations that produce output complementary with the goods and services provided by private sector.

The Keynesian school of thought argues that the provision of public goods whereby no competition is expected from the private sector can lead to faster economic growth. On the contrary, the government expenditure on public goods may crowd out private sector investment hence may result in low levels of economic growth in the region.

Test for heteroscedasticity was carried out in the study so as to establish whether the error terms exhibit constant variance across observations or not. The study employed the Modified Wald test for Groupwise Heteroscedasticity. The test's null hypothesis is that variance of error terms is constant. The results for Heteroscedasticity test are presented in Table 4.6. From the results, the p-value is (0.3) which is greater than 0.05 and therefore the null hypothesis is not rejected and the conclusion is that there was no heteroscedasticity.

4.9 Effect of Economic Growth on Private Investment

The real GDP per capita shows a positive effect on private investment and it is statistically significant at 1percent. It has a coefficient of (0.2) which implies that an improvement in the real GDP per capita by 1 percent may lead to an increase in private investment by 0.2 percent. The results obtained in this study are similar to those of Jepchumba (2017), Sakr (1993) as well as those of Green and Villanueva (1991) who found a positive relationship between GDP per capita growth and private investment.

The value of the adjusted R^2 is about (0.7) statistically significant indicating that the model had a good fit. This means that 70 percent of the variations of the dependent variable are explained by the variations in the explanatory variables.

Serial correlation test was carried out so as to establish whether the error terms of different time periods are correlated. The presence of serial correlation complicates the application of statistical tests because it reduces the number of independent observations and causes the standard errors of the coefficients to be smaller than they actually are. The Wooldridge (2006) test was used in this study and the results are presented in Table 4.6. From the results, (0.6) which is greater than 0.05 and therefore the null hypothesis is accepted and the conclusion is that autocorrelation was not present.

4.10 Error Correction Model

After carrying out unit root test, all the variables in the model were found to be I(1). Therefore cointegration test was conducted using Pedroni (1999) and it was established that there was evidence of cointegration. The error correction model depicts the speed of convergence to equilibrium following exogenous shock. Equation (3.6) was therefore reformulated to include the error term as shown in equation (4.1).

$$\Delta PI_{t-1} = \alpha + \sum_{i=1}^{p} \Omega_i \, \Delta p_{t-i} + \sum_{i=0}^{p} \delta_i \, \Delta \chi_{t-i} + \gamma ECT_{t-1} + \varepsilon_t \qquad (4.1)$$

Where,

ECT – is the error correction term

Δ - is the difference operator

γ – is the error correction coefficient

The short-run model shows how the adjustment mechanism works to revert the deviations in each period to long-run equilibrium when it is subjected to exogenous shock. Theoretically, the coefficient of the error correction term should be negative and significant if disequilibrium is to be corrected in subsequent period and long-run equilibrium restored. On the other hand, a positive sign indicates movement away from equilibrium. The short-run regression results are shown in Table 4.7 below.

Table 4.6: Short-run Regression Results

Variable	Coeff	Std err	Z	p>/z/
Δln Crps	0.1	0.0	2.89	0.004
Δln Pub	-0.2	0.1	-3.39	0.001
Δln Rgdppc	0.1	0.0	2.00	0.045
ECT_{t-1}	-0.4	0.1	-4.00	0.000
Constant	0.5	0.3	2.49	0.013
Adjusted R^2 = 0.6				

The regression results in Table 4.7 indicate that domestic credit to private sector is positive and consistent with the long-run results. The short-run regression result is statistically significant at one percent level with a coefficient of (0.1). Therefore an increase in the credit to private sector by one percent will lead to an increase in private investment by 0.1percent.

The regression results also show a negative and statistically significant effect of public investment on private investment at one percent level in the KRB with a coefficient of (0.2). This implies that an increase in public investment by one percent will lead to a decline in private investment by 0.2 percent. This provides evidence of public investment crowding-out private investment in the region both in the short-run and in the long-run. The real GDP per capita shows a positive effect on private investment it is statistically significant at 1 percent level. It has a coefficient of (0.1) which implies that an improvement in the real GDP per capita by one percent may lead to an increase in private investment in the region by 0.1 percent. It is now obvious from the results and existing theories that as the economy grows the new opportunities increases in country and the ability of people to save and invest also increases in such situation.

The coefficient of the ECT_{t-1} is negative and statistically significant at 1percent level with a value of (-0.4). This implies that the previous period disequilibrium is corrected at an adjustment speed of 40 percent each year and incorporated into the long-run relationship. This means the adjustment process towards equilibrium is relatively low hence disequilibrium can exist for a long time.

5.0 Conclusion and recommendation

5.1 Conclusion

From the regression results, the domestic credit availability to private sector had a positive and significant effect on private investment. This implies that the availability of credit for private sector investment leads to an increase in the level of private investment in the KRB region both in the short-run and in the long-run. Given that public investment crowds-out private investment in the KRB, then for the region to attain high levels of private investment there is need for respective KRB member governments to invest in infrastructure and this may increase the productivity of private sector capital. Therefore the KRB region countries should encourage both private and public investment such that the investments undertaken by the public sector are those that have positive externalities such as infrastructural development. This can be done through harmonization of regulatory framework so as to come up with a common investment platform that promotes both public and private investment.

5.2 Recommendations

For private investment to remain as engine of growth in the region, it is necessary that the amount of domestic credit to private sector be increased in the KRB since the regression results show that it has a positive effect on private investment. The credit to private sector is a constraining factor to the growth of private investment in KRB and this may be because of less developed financial institutions and stringent financial regulations. Therefore the region should put in place measures that ensure an increase in the domestic credit to the private sector, for example the provision of incentives to financial institutions by the respective governments. This will enable them to channel more credit to the private sector at affordable rates and this may improve the private investment levels and hence contribute to overall economic growth of the KRB.

The KRB regulatory body should devise methods of encouraging the financial institutions within the region to channel credit facilities to the private investors so as to promote private investment. The lending rates should also be regulated by the KRB central Bank authority to enable easy access to loanable funds by prospective investors. Given the low levels of savings in the region, the citizens should be encouraged to save more in the banks through increasing the interest rate on savings hence making available the credit for investment purposes. Therefore the respective governments of KRB should put in place measures to

ensure that potential private investment can easily access credit to undertake investments in the region.

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