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Capital Goods Imports, Physical Capital Formation and Economic Growth in Sub-Saharan Africa Countries

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ABSTRACT:- This study investigated the effects of capital goods imports on physical capital formation and Economic growth in sub-Saharan Africa countries from 1985 to 2018. Thirty three countries were selected. Data for the study were sourced from various publications, such as United Nations Conference on Trade and Development Statistics (UNCTADSTART) world Economic outlook, world Development indicator (WDI) and Central Banks of Selected countries. The study employed Descriptive statistics, panel Granger Causality Test and panel co-integration as estimation techniques. Results from our various estimations showed that the contributions of capital goods imports to both economic growth and physical capital formation though positive and significant but not large enough as it contributes little to economic growth and to physical capital formation in the analysis. Also, the findings from panel Granger causality tests showed bi-directional relationship between economic growth and capital goods imports but uni-directional relationship between capital goods imports and physical capital formation. The study therefore, concludes that the contributions of capital goods imports are not large enough to effectively influence physical capital formation and economic growth in sub-Saharan Africa countries. The study recommends that governments in sub-Saharan Africa countries need to formulate policies to encourage manufacturing sector of their economies so that they can really make effective use of capital goods. Such policies may be in form of friendly tariff policy and review of bureaucratic process in ports.

Keywords: Capital Goods Import, Physical Capital Formation, Output Growth, Panel co-integration and Panel Granger Causality.

I. INTRODUCTION

Sustainable economic growth is essentially required for the attainment of real and sustainable economic development. To have sustainable growth, both human and material resources are required to be properly and effective annexed. Every country developed and developing is blessed if not with these resources (human and materials) but with either. However, when developed countries are able to annex these resources effectively to move their countries to a better a economic positions, developing countries are either miz- priotize or underutilize these resources. Majority of Sub-Saharan African countries are richly blessed in both human and material resources but very unfortunate that they have not been able to utilize this so that it can translate into rapid economic growth.

The gap between developed and developing countries in term of economic growth and level of human capital development is widening every year. This is however evident in the share of GDP in terms of purchasing power parity (PPP) of both the rich countries and the poor countries of the world. In 1980, the world total GDP stood at US $13,054.6 billion with USA taken $2.862.5 billion which represents about 21.9 percent while the contribution of Sub-Saharan Africa countries was around 2.3 percent of component of the total world GDP. The total world output steadily increased in the same trends and patterns, take for instance, in 2000, the total world GDP was around US $49,541.5 billion of which Sub-Saharan Africa contribution was around $1,187.9 billion which was less than ten percent of United States of America contribution, IMF World Economic Outlook (2016). This continues in patterns and trends till the moment. However, the contribution of other developing countries particularly, Asian countries to world GDP increased tremendously around these periods. Take for instance, as at 2015, the emerging Asia's share of global GDP stood at 30.6 percent. while that of Sub-Saharan Africa was about 3.9 percent IMF world economic outlook, (2016).

Several efforts have been made both by policy makers and academics researchers to identify the reasons for this wide variation in the growth process between developed and developing countries, the level of capital formation has been identified as one of the major factors responsible for this. Capital formation is an important indicator useful for measuring economic development of a nation, Sharan, (2000). It is an essential condition for formation of future development programs and is equally required to access the investment made in the state in public and private sectors.

Since positive and significant relationship exists between assets and production, therefore, better and high physical capital formation is always connected with better and higher levels of both economic growth and economic development.

Furthermore, it is not controvertial that one of the ways to close the gap between capital formation and economic growth is importation of capital goods. This has been well established by endogenous growth models that presents the relevance of imports in the process of physical capital formulation and as well as an essential channel for foreign technology and knowledge to flow into the domestic economy. Grossman and Heipin An, (1991), Lee, (1995), Mazumdar, (2001). There is consensum among academic researchers, Esfahani, (1991) Serletis, 1992, Riezman, whiteman, and Summers (1996) that imports is required by countries whose manufacturing base is built on export oriented industries. As noted by Baharumshah, (1999), if foreign exchange accumulation is sufficient, the economic growth is accelerated through importation of high quality goods and services which in turn expand the production possibilities.

Additionally, most of the countries in Sub-Saharan Africa particularly net oil exporting countries depend heavily on the revenues from oil and therefore grossly neglect other viable sectors. Even those that are not oil producing among them depend also on income from their primary and intermediate products.

In most of the African countries, the increase in revenues from oil and other products led to massive importation of consumable products. On the average, the value of imports increased in most of Sub-Saharan Africa countries within a few period particularly 1990s, and 2000s. Take for instance, the importation of manufactured goods increased by 105 percent, food import increased by 91 percent and around the same period, imports of beverages went up by 434%. with this, it became extremely impossible to separate luxurious goods from necessity goods, Lewis, (2007). With this, it became imperative for governments to map-out strategies to reduce importation of goods that are not essential. However, achieving this became so controversial.

Theoretically and empirically, the issue of the relationship between capital goods imports and economic growth has been so contentious. Take for instance, Rebelo, (1991), Savvides and Zachariadis, (2003), Behbudii, Mamipour and Karami (2010) conclude in their various studies that importation of capital goods stimulate capital accumulation and business expansion. Some were of the views, Stephen, (2016), Godwin (2017) and Wilinton, (2015) that high level of import exert a drag on overall GDP growth. These diverge views are yet to be resolved.

Despite the fact that it is not controversial that the two major determinants of growth as identified by Solow, (1956) are labour and capital, there is a controversial as regards the relevant of capital accumulation as a crucial factor in the growth of an economy. This is on the basis that data do not provide reliable and strong support that factor accumulation stimulates growth in output per worker. See Solow, (1956), Abramovitz, (1956), Denison (1967), Carroll and Weil (1994), Godwin, (2016), Liberty, (2015) and Sherif, (2017). Besides this, in Sub-Saharan Africa countries, most of the studies conducted on the impact of capital goods imports on physical capital formation and economic growth have been country specific, see Godwin, (2016), Liberty, (2015) and others. It is therefore, essential to consider the effects of capital goods imports on physical capital formation and economic growth through a panel study. Therefore, the broad objective of this paper is to examine the effect of capital goods imports on both economic growth and physical capital formation.

The rest of the paper is structured thus; this introductory section is followed by section two that presents literature, section three centers on methods and materials. Section four deals with results and discussion while section five concludes the paper.

II. EMPIRICAL LITERATURE

Bond and Leblebicioglu (2009) employed panel co-integration to examine the relationship between capital accumulation and economic growth in Nigeria between 1960 to 2000. Findings from this study showed that there was positive and significant response of economic growth to capital accumulation which was measured by domestic investment as a share of gross domestic product. In the same line of study, Dike (2008) investigated the sources of Nigerian economic growth between 1950 to 1991. The study employed co-integration and error correction as estimation technique. Finding showed that labour force expansion and capital accumulation played major role in driven economic growth in Nigeria while improvement in total factor productivity (TFP) played a marginal role in driven economic growth in Nigeria during the study period. Also, Bakare (2011) studied the relationship between capital formation and economic growth in Nigeria between 1980 and 2009. In this study, ordinary least square was employed as estimation technique. Finding revealed that growth rate of national income directly and positively related to saving ratio and capital accumulation. Chew GingLee (2010) investigated both short-run and long-run dynamic interaction among exports, imports and income in Pakistan. The study made use of multivariate co-integration as estimation technique. The empirical result from this study revealed that in the short-run, there was no evidence of export led to economic growth. Herrerius and Orts (2009) investigated the imports as a strong source of long-run growth to stimulate productivity and economic development in China between 1964 to 2004 using co-integration and error

correction as estimation technique. Findings showed that imports and investment encouraged output and labour productivity in the long-run but did not find any significant relationship between imports and investment in short-run. Mazumdar (2001) investigated the relationship between capital goods imports and economic growth in some selected developing countries between 1980 to 1999. The study employed panel co-integration as estimation technique. Finding from this study showed that the import of machinery goods stimulate economic growth positively and significantly. Baharumshah and Rushid (1999) studied the relationship between export growth and income growth in Malaysia between 1980 and 1997. The study made use of Johansen vector error correction method as estimation technique. Result from this study showed that export really impacted Malaysian economy during the study period. Damilola, (2014) investigated the nexus between capital goods imports and economic growth in west African monetary zone between 1970 to 2012 using panel ARDL as estimation technique. Finding from this study showed that capital goods imports have positively and significantly impacted economic growth both in the short-run and long-run. Rerd wani, (2016) studied the effects of physical capital formation on economic growth in Nigeria between 1990 to 2014. The study employed VAR as estimation technique Result from the study showed that physical capital formation impacted economic growth in Nigeria during the study period but the effect was not significant. In advancing literature, Gidson (2017) examined interactions among investment, poverty reduction and economic growth in Nigeria. The study covered period between 1995 to 2015 using multiple regression as estimation technique. Finding from this study showed that economic growth and investment did not significantly reduce poverty rate in Nigeria. Also, Gabriel (2015) investigated the relationship between investment and economic growth in selected African countries. The study made use of panel granger causality as estimation technique. Result showed bi-directional relationship between investment and economic growth. Michael (2018) examined the relationship between economic growth and capital goods import in African countries between 1990 to 2916. The study employed panel structural VAR as estimation technique. Finding revealed that the response of economic growth to shocks emanated from capital goods was only positive but not significant. Monica (2017) studied the impact of capital goods imports on investment in some selected developing countries using panel co-integration as estimation technique. Finding showed that impact of capital goods import on investment was positive and significant in the selected countries.
Conclusively, from empirical literature presented above, as regards the connection among capital goods imports, economic growth and physical capital formation, agreement is still far from being reached. The capital goods imports was much more considered in time series data being displaying positive and significant impact on economic growth and gross fixed capital formation. However, such evidence may be difficult to accept. This is to avoid fallacy of composition. That is, using country specific studies to conclude for panel studies. Therefore, it is essential to use panel data. This is because since most of the studies on cross-country and panel data analysis were inconclusive and widely varied interms of their conclusion and policy implications.

III. THEORETICAL UNDERPINNING

There are theories discussing the relationship between economic growth and technological progress. However, endogenous growth model, particularly AK model which is an improvement on other growth models is used as foundation for the model employed in this study. Endogenous growth model suggests that one rout to endogenising the growth rate is to dispense with the diminishing marginal returns assumption. Simultaneously, the simplicity of the models comes in this form
α=1 which produces
$y_t = A_tK_t$----------(1)
Equation (1) shows that getting returns to capital accumulation has a dramatic influence on the models predictions for as a source of economic growth. The model states that steady state growth rate depends positively on the savings rate and negatively on the depreciation rate. However, none of these has effect on long-run growth based on the Solow growth model. In this regards, the AK model can be extended to a case in which there is labour input as well as physical capital. The effect of labour input is determined by the stock of human capital which can be accumulated through education. Therefore, both types of capital can be accumulated model to be in the form;
$Y_t=A_tK_t^{\alpha}H_t^{1-\alpha}$---------- 3.2
Where K_t is physical capital
And H_t is human capital

Model Specification

In this study, the relationship among capital goods imports, physical capital formation and economic growth is considered. Therefore, in reference to theoretical underpinning and empirical literature equation 3.3 is specified to achieve objective of this paper.
$Rgdp_{it}= \theta_0+\theta 1GFCFit+\theta_2NE_{it}+\theta_3PRV_{it}+\theta_4PVR_{it}+\theta_5CGIM_{it}+\theta_6FEE_{it}+ \theta_7HC_{it}+\varepsilon_{it}$-----3.3
Where Rgdp stands for output growth rate

GCFF is gross fixed capital formation
NE stands for Trade openness
PRV stands for Private Investment
PVR stands for public investment
GIM stands for capital goods imports
FEE represents foreign exchange earning
HC = stands for human capital
ε_{it} stands for white noise
This model is estimated by Panel cointegration and panel Granger causality tests.

IV. TABLE

Table 4.1: Descriptive statistics for pooled sample

Mean	Std Dev	Skewness	Kurtosis	J - b	Prob
842.3	1674.4	6.08	54.0	156721.2	0
83.54	32.33	0.19	3.01	8.02	0.03
0.16	0.15	2.83	21.03	17610.6	0
0.05	0.13	12.11	163.8	16434462.1	0
3.82	33.72	32.54	1044.5	6674562.3	0
0.71	0.34	1.08	4.1	284.8	0
51.09	648.19	33.04	1142.2	6743446.0	0
0.30	0.16	2.98	18.4	145622.1	0
2030000.0	873000.0	9.47	116.5	17374562.3	0

In order to further provide a wide outlook for the data set, we report the descriptive statistics for the model. This result however includes the second movement characteristics of the data that may provide information on the use of panel data analysis technique. The average income proxed by RGDP value $842.3 for the period which was relatively high across the sections in the study (country groups) and over time for each of the countries. This result is demonstrated by the high standard deviation value of 1674.4. The skewness is also highly positive at 6.08 and indicates that real gross domestic product figures for most of the countries lie to the left of (are less than) the mean value. The kurtosis value was extremely high and this indicates the presence of extreme values which may generate heteroscedasticity variations in the data. The data set is highly leptokurtic and shows that the extreme outliers in the real gross domestic product values may generate heterogeneity issues in the analysis. The J – B value is very high 156721.2 and it passes the significance test at 1 percent level, which shows that the series is non-normally distributed.

The series for other variables in the model, gross fixed capital formation, trade openness, private investment, public investment, capital goods import foreign exchange earnings and human capital each seem to have rather less variable distribution judging from its low standard deviations and skewness values. However, the J – B value for these series indicates that the series are not normally distributed. This is also the case for all other variables in the sample for this study. This outcome clearly indicates that the use of panel data analysis procedure for the estimation of the relationship in this study stems from heterogeneity in all the data series.

Table 4.2 Correlation matrix for variables

Variables	RGDP	NX	PRV	PUV	CGI	FEE	HC
RGDP	0.023						
NX	0.006	0.733					
PRV	0.108	0.0193	0.063				
PUV	0.105	0.008	0.456	60.093			
CGI	0.043	0.623	0.712	0.436	0.0941		
FEE	0.032	0.462	0.0034	0.067	0.0432	0.432	
HC	0.048	0.345	0.006	0.0622	0.622	0.023	0.936

To further examine the background behavioral patterns in the data series in the model (unconditional and ordinary) correlation analysis was carried out. However, the test is reported in table 4.2. The square of all variables of interest gross fixed capital formation, trade openness, private investment, public investment, capital goods import, foreign exchange earnings and human capital show positive relationship with output growth rate. These shows that private investment, public investment human capital and foreign exchange earnings and capital goods import may serve to improve economic growth.

PANEL UNIT ROOT TESTS

To confirm the order of integration of the variables used in the panel model is very important to provide a direction for the foam of long-run estimation technique to be employed. This requires using more than one method of panel unit root test. In this regards, the IM Peresan and Shin, IPS, The Livin-Lin Chu, LLC and the Augmented Dickey Fuller (ADF) tests were employed to achieve this. Results obtained from various methods of panel unit root tests used in this study showed at 10% level of significance, all the series are non-stationary at their levels but became stationary at their first difference.

Table 4.3 Panel Unit Root Test

Variables	t-stat IM	Order of integral IP	t-stat	Order of integral	t- stat ADF	Order of integral
$RGDP_{gr}$	-5.6243	I(1)	611.03	I(1)	-18.3214	I(1)
GFCF	-6.2434	I(1)	521.345	I(1)	-21.8211	I(1)
PRIV	-5.6214	I(1)	431.431	I(1)	-14.5214	I(1)
PUV	-6.7241	I(1)	341.114	I(1)	22.11314	I(1)
CGI	-6.344	I(1)	352.331	I(1)	18.13332	I(1)
FEE	-5.3311	I(1)	4.562	I(1)	11.52114	I(1)
HC	-6.3114	I(1)	6.456	I(1)	16.55231	I(1)
NE	-5.4221	I(I)	5.232	I(I)	148.66211	I(I)

COINTEGRATION TEST RESULTS

Table 4.4 shows the outcomes of Pedroni's and Kao panel cointegration tests on the series that is between the dependant variable and the explanatory variables in the model. We use four within dimension and three between – group dimension tests to check whether the panel data are cointegrated. The columns labeled within-dimension contain the computed value of the statistics based on estimators that pool the autoregressive coefficient across different countries.

The columns labelled Between-dimension report the computed value of the statistics based on the estimators that averagely calculated coefficient for each country selected. Besides the value for the V-statistics from the results of the within-group tests hypothesis of no cointegration can be rejected. This is also complemented by another residues based (Kao) Panel cointegration test. This shows that the null hypothesis of no cointegration can be as well be rejected.

Table 4.4 Panel Cointegration Test Result

Series for co integration test: RGDRgr, GFCF, PRIV, PUIV, CGI, YCE, NE , HC					
Within- Dimesion			Between dimension		Kao(ADF)
	Statistics	Weighted Statistics		Statistics	
Panel v	-3.73***	-4.49***	Group rho	-3.57***	-1.62*
Panel rho	-2.91***	-2.84**	Group PP	-3.74***	---------
Panel PP	-0.86	-3.44***	Group ADF	-2.14**	---------
Panel ADF	12.44	1.28			
Series for co integration Test: RGDPGR, GFCF, PRIV, PVIV, CGI FEE, NE, HC					
Within- Dimension			Between- dimension		KAO(ADF)
	Statistics	Weighted Statistics		Statistics	
Panel v	-1.35	-3.12**	Group rho	1.12	-1.50*
Panel rho	1.70	0.50	Group PP	-3.63***	-----
Panel PP	-1.50*	-3.36***	Group ADF	0.62	------
Panel ADF	0.84	0.14			
Series for cointegration Test: RGDPgr, PRIV, PUIV, NE, FLL, HC, GFCF, CGI					
Within- Dimension			Between- dimension		KAO(ADF)
	Statistics	Weighted Statistics		Statistics	
Panel v	0.60	-1.77*	Group rho	-0.38	-1.50*
Panel rho	0.20	-1.11	Group PP	-4.66***	----------
Panel PP	-2.52***	-4.42***	Group ADF	-0.69	----------
Panel ADF	-0.31	-1.45*			

Note: ***,**,* are the level of significance for 1%, 5% and 10% respectively. The T-statistics is written in brackets as stated in each cell.

Panel pairwise Granger causality Test Results

Table 4.5 shows the results obtained from panel pair wise Granger causality test among gross fixed capital formation, capital goods import and economic growth.

Summary of the Granger – causality Result

Null Hypothesis	F-Statistics	Probability	Decision
GDPgr does not Granger-cause GFCF	342	0.62	Do not reject
GFCF does not Granger cause GDPgr	4.10	0.06	Reject
GFCF does not Granger cause CGI	4.10	0.03	Reject
CGI does not Granger cause GFCF	5.20	0.04	Reject
GDPg does not Granger cause CGI	6.12	0.03	Reject
CGI does not Granger cause GDP	4.12	0.04	Reject

From panel pairwise granger causality test results showed on table 4.5, gross domestic product growth rate did not granger cause gross fixed capital formation with high probability of 0.62 but gross fixed capital formation granger caused real gross domestic product with the probability value of 0.06 while capital goods imports and gross fixed capital formation show bi-directional relationship. Also real gross domestic product and capital goods import exhibit bi-directional relationship. the implication the these results is that both capital goods imports and gross fixed capital formation are required for economic growth.

Table 4.6: Economic Growth is used as dependent variable

Regressors	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
C	0.44 (0.03)	0.22 (0.12)	0.62 (0.03)	0.62 (0.03)	0.41 (0.03)	0.29 (0.03)	0.29 (0.03)
D(NX)	0.66 (0.87)	0.22** (2.14)	0.22 (-1.05)	0.13 (-1.05)	0.03 (-0.91)	0.06 (-2.31)	0.07 (-2.66)
D(PRV)	0.12** (2.16)	0.11* (1.95)	0.07** (2.34)	0.07** (2.25)	0.05** (3.24)	3.67 (2.34)	3.62 (2.34)
D(PUV)	0.80** (-2.11)	0.23* (-1.77)	-0.15** (-3.15)	-0.31** (-3.16)	-0.13** (-1.33)	0.06 (2.04)	0.04 (2.05)
D(CGI)	751*** (3.46)	_____	0.06*** (3.01)	0.05*** (3.06)	0.09*** (2.00)	0.03 (-1.63)	0.08 (-1.90)
FE	0.31 (0.12)	0.62 (0.45)	0.13 (0.46)	0.62 (0.34)	0.72 (0.41)	_____	_____
HC	0.62 (0.02)	0.12 (0.05)	0.07 (0.04)	0.92 (0.08)	0.81 (0.09)	0.034 (-2.51)	-0.21 (-0.32)
PECM(-1)	- -0.133*** (-9.03) (-0.007)	- -0.12*** (-8.07) (0.04)	- -0.122*** (-8.58) (0.03)	- -0.122*** (-8.58) (0.03)	- -0.123*** (-8.60) (0.04)	_____	- -0.13*** (-8.78) 0.05
R^2	0.67	0.81	0.92	0.92	0.94	0.87	0.81
N	1250	1250	1250	1250	1250	1250	1250
Durbin-Watson	1.91	1.91	1.93	1.91	1.91	1.91	1.91

Note: ***,**,* are level of significant for 1%, 5%, 10% respectively. The T-statistics is written in brackets as stated in each cell. PECM= panel error correction mechanism.

In this model, economic growth proxed by GDPgr is used as dependent variable. From table 4.5, it is clear that all the estimated models are devoid of serious econometrics problems. This is shown by their Durbin-Watson statistics values which range from 1.90 to 1.92 in all the models. This implies that the results are not associated with serial correlation problems which invariably mean that there is no auto correlation in the results. Also, the R squared values in each of the estimated models are high which implies that the models display effective explanatory abilities to really show the effects of all the explanatory variables on output growth rate.

In order to establish the individual effects of the explanatory variables on output growth rate, we consider the estimated coefficient for the variables in terms of their signs and significance. From the results on table 4.6, gross fixed capital formation has positive and significant effects on sub-Sahara Africa economic growth during the period under review but not a large significant. The magnitude of the positive effect as evident in all the models ranges from 3.22 to 4.13. However, the increase in the magnitude is explained by controlling for other

variables in the models, such as capital goods imports, human capital and private investment. The coefficient of trade openness as a measure of participation in the international trade has positive impacts on the output growth though not significant across the models. This however, support the fact that most of what is imported into sub-Sahara African countries are majorly consumable items while the bulk of our export are primary and intermediate products. The coefficient of private investment is positive and significant across sub-Sahara Africa countries. The coefficient of public investment displays positive influence on economic growth but not a significant ones across all the models. This might have shown evidence of wasteful, corruption and illicit transfer of money in most of the sub-Saharan Africa countries.

Table 4.7 Explanatory variables GDPgr, NX, PRV, PUV, FEE and HC Dependent Variable GFCF

Regressors	Model 1	Model 2	Model 3	Model 4
C	0.0003 (0.18)	0.0003 (0.18)	0.004 (0.18)	0.002 (0.18)
D(GDPgr)	2.18E-05 (0.07)	2.19E-05 (0.04)	2.18E-06 (0.06)	2.19E-06 (0.03)
D(NX)	0.12 (-1.32)	0.15** (-2.19)	0.12 (1.32)	0.134* (-1.67)
D(PRV)	0.07* (1.67)	1.36E-06 (0.66)	0.00 (0.64)	0.00 (0.64)
D(PUV)	0.18*** (11.58)	0.18*** (11.64)	0.18*** 12.58	0.18*** (11.57)
D(FEE)	0.003 (0.16)	0.3 (0.13)	0.42 (0.14)	0.03 (0.17)
D(HC)	0.04 (0.02)	0.02 (0.04)	0.041 (0.06)	0.04 (0.07)
PECM(-1)	-0.11*** (0.02)	-0.11*** (0.06)	-0.10*** (0.04)	-0.11*** (0.04)
R^2	0.82	0.65	0.73	0.81
N	1260	1251	1250	1261
Durbin – Watson	1.91	1.90	1.90	1.94

Note: ***, **,* are the level of significance for 1%, 5% and 10% respectively. The T-statistics is written in brackets as stated in each cell. PECM = panel error correction mechanism.

In this models, gross fixed capital is used as dependent variable while other variables served as explanatory variables across the models.

From table 4.7, it is evident that all the estimated models are devoid of serious econometric problems as in the case of the growth models. This is shown by their Durbin – Watson statistics values which ranges from 1.90 -1.97 in all the models and this implies that the results are not associated with serial correlation problem which invariably mean that there is no autocorrelation in the results. This is collaborated with the coefficients of the panel error correction mechanism (PECM) in all the models, which passed all the expected characteristics. It is significant; less than one and it is negative. This implies that it can act to correct any short run deviation of SSA.

From the results on the table 4.7, output growth rate was found to be positively and significantly impacted gross fixed capital formation in SSA. The effects however, ranges from 0.02 – 0.04 in all the models trade openness is discovered to have positive but insignificant effect on gross fixed capital formation. The coefficient of capital goods imports is positive but not significant across the model. The reason for these low coefficients and insignificant values of capital goods imports across models might be attributed to the fact that huge capital is required for the importation of capital goods. Also, currency devaluation policy in most of the sub- Saharan Africa countries which makes import to be expensive and the tariff policies and bureaucracy in clearing at ports are some of the likely reasons for low coefficients and insignificance values of capital goods imports across models. The coefficient of human capital shows positive and significant values across the model. This shows that human capital is one of the determinants of economic growth across countries under review.

Table 4.8 Sub regional Analysis of the relationship among capital goods imports, gross fixed capital formation and economic growth in sub-Saharan Africa

From results on table 4.8, it is evident that all the estimated models across the four regions are devoid of serious econometrics problems. This reflects from results obtained from Dubin-Waston statistics values range from 1.85 to 2.04 across the models. The implication of this is that results obtained from every model in the

analysis is not associated with serial correlation problems which simply indicates that there is no autocorrelation in the result. This is equally supported with the coefficients of the panel error correction mechanism (PECM) in all the models which scape-through all the requirements. That is it is significant, less than one and negative. This shows that it can act to correct any short run deviation of the various sub-regional groups on both economic growth. From results obtained on table 4.8, it could be deduced that physical capital formation proxed by gross fixed capital formation and capital goods imports have positive but insignificant effects across the regions. This results support the results obtained from panel data that both physical capital formation and capital goods imports are important determinants of economic growth but they are not enough to improve economic growth in sub-Saharan Africa countries. Also, private investment exerts positive and significant effects on economic growth in West Africa, East Africa and South Africa but insignificant effects in central Africa. The reason for insignificant effects of private investment on economic growth in central Africa might be attributed to harsh economic policies that are not in favour of private sector.

It could be deduced from the results on table 4.8 that human capital captured by enrolment rate produced positive but insignificant effects on economic growth in West Africa and East African during the period under review. This result does not produce any surprise since there is low level of human capital development coupled with low absorptive capacity due to very low literary rate in these regions. The effect stock of human capital for South African region was found to be positive and significant and this is due to the fact that South Africa is better placed above West Africa and East Africa in turns of human capital development and literacy rate and as well productive capacity.

Table 4.8

Results	**West Region**	**Africa**	**East Region**	**Africa**	**South Region**	**Africa**	**Central Africa**	**Africa**
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
C	13.52 (3.91)	13.50 (3.83)	21.13 (3.53)	2.80 (1.30)	2.81 (1.30)	3.10 (1.31)	0.72 (2.85)	0.63 (2.81)
D (GFCF)	0.21 (4.42)	0.30 (4.07)	0.07 (1.91)	0.25 (2.31)	0.31 (2.41)	0.92 (1.60)	0.65 (6.46)	0.80 (6.70)
D (CGI)	1.45 (1.72)	13.14 (4.61)	23.15 (3.12)	14.51 (0.62)	3.14 (1.40)	3.12 (1.40)	0.62 (4.50)	0.90 (3.45)
D (PRV)	0.32 (0.46)	14.12 (0.61	0.62 (0.91)	11.40 (0.93)	4.21 (0.63)	3.14 (0.72)	1.40 (1.21)	14.21 (1.71)
D (PUV)	14.31 (1.42)	13.14 (3.14)	14.22 (0.61)	3.14 (0.31)	11.22 (0.71)	0.65 (0.71)	11.22 (1.14)	12.14 (2.50)
D (FEE)	13.22 (1.31)	12.14 (2.41)	16.22 (1.46)	2.21 (1.45)	1.30 (0.41)	0.68 (0.92)	14.14 (3.62)	8.05 (1.46)
D (NE)	0.62 (1.21)	14.41 (1.31)	13.22 (3.45)	12.14 (2.92)	13.04 (0.91)	3.01 (0.63)	11.05 (1.31)	20.14 (3.21)
D (HC)	21.06 (0.91)	11.42 (0.65)	0.72 (0.91)	21.14 (0.92)	7.04 (0.92)	11.22 (0.66)	11.22 (0.71)	12.14 (0.65)
P ECM(-1)	-0.02 (-3.14)	-0.01 (-4.61)	-0.04 (-3.22)	-0.6 (-1.15)	-0.03 (-14.2)	-0.04 (-3.45)	-0.03 (-4.31)	-0.05 (-4.22)
R^2	0.66	0.68	0.71	0.68	0.72	0.61	0.72	0.68
N	501	501	391	281	270	391	118	118
Dubin-Waston	2.01	2.03	2.01	1.91	1.85	2.04	1.95	1.90

Oil and Non-oil countries of Sub-Saharan Africa Analysis of the relationship among capital Goods Import, gross fixed capital formation and Economic Growth

Fundamentally, sub-Saharan Africa countries are endowed with natural resources and therefore depend mostly on returns from these natural resources which make them expose to resource course and Dutch disense due to mismanagement of their both human and materials resources. From the results on table 4.9, there is a wide evidence that in all the models, both in oil and non oil countries are devoid of serious econometrics problems. This is confirmed with results obtained from Dubin-Waston values which range from 1.73 to 2.01. This shows that the results are devoid of serial correlation problems which invariably indicates that there is no autocorrelation in the results. This is as well supported by the coefficient of the panel error correction mechanism (PECM) across the models that scape through all the expected features. That is, it is significant, less than one and it is negative. This shows that it can act to correct any short run deviation of the oil and non-oil countries on economic growth in the long-run. From results on table 4.8, foreign exchange earnings exerts

positive and significant effects on economic growth while it exerts positive but insignificant on economic growth in non-oil countries. This might be attributed to better performance of oil producing countries in terms of revenue generation and foreign exchange earning more than non the non-oil countries. Human capital captured by enrolment rate and private investment have positive and significant effect on both oil and in non-oil exporting countries in sub-Saharan Africa. However, the magnitude of the effect is higher in non oil exporting countries than oil exporting countries. This shows that the stock of human capital in non-oil exporting countries performs better in contributing to growth than that of oil exporting sub-Saharan Africa countries. This reveales the level of attention giving to human capital development in these two groups. Public investment as shown in the table 4.9, is found to have positive but insignificant effects on economic growth in oil exporting countries in Sub-Saharan Africa but positive and significant effects in non-oil exporting countries. As earlier stated, this is not unconnected with rent seeking behaviour and mismanagement of oil revenue as exposed from their public investment spending having no desired effect on growth in these countries. Capital goods import and gross fixed capital formation are found to have positive and significant effect on economic growth in both oil and non oil exporting countries. However, the effect is larger in oil exporting countries. The larger effects on economic growth might be attached with the to higher foreign exchanging earning in oil producing countries.

Table 4.9: Sub regional oil and Non-oil Exporting countries Analysis of the relationship among capital Good imports, physical capital formation and economic growth in Sub-Saharan Africa.

Table 4.9 Result for oil Result for non-oil exporting countries

Repressors	Model (1)	Model (2)	Model (1)	Model (2)
C	0.65 (0.36)	0.67 (0.46)	3.13 (4.52	3.04 (4.40)
D (GDPgr(-1)	0.09 (2.08)	0.07 (1.82)	0.32 (7.08)	0.32 (8.02)
D (GFCF)	0.07 (7.40)	0.06 (5.21)	2.32 (1.81)	3.02 (1.81)
D (NE)	0.42 (3.24)	0.52 (3.16)	0.52 (0.84)	0.52 (0.71)
D (PRV)	0.61 (3.22)	0.61 (4.14)	3.14 (0.62)	2.14 (0.62)
D (PVR)	-4.14 -(3.18)	0.24 (5.15)	4.14 (0.61)	3.15 (0.52)
D (GIM)	5.12 (0.45)	3.4 (0.62)	5.14 (0.05)	3.22 (0.04
D (FEE)	0.32 (0.056)	3.01 (0.02	2.06 (0.15)	3.06 (0.10)
D (HC)	2.04 (0.03)	2.04 (0.06)	1.15 (0.03)	2.04 (0.06)
PECM (-1)	0.18 (-3.62)	-0.19 (-4.66)	-0.06 (-4.66)	-0.05 (-5.51)
R^2	0.83	0.62	0.64	0.64
N	118	118	1182	1182
Dubin-Waston	1.92	1.84	1.82	1.94

Note x x x x xxx are the level of significance for 1% , 5% and 10% respectively. The T-statistics is written in brackets as stated in each cell. PECM = panel error correction mechanism.

V. DISCUSSION OF FINDINGS

In order to avoid spurious regression in this study, the level of stationarity of all the variables of interest was tested by IM test, IPS, and ADF unit root tests. Results from the tests confirmed that all the variables of interest became stationary at first difference i.e they are integrated of order one I(1). Thereafter, long-run relationship among the variable of interest was confirmed through Pedron's and Kao panel co-integration. Finding from this showed that the null hypothesis of no co-integration can be rejected. The results from this further showed that the coefficient of capital goods import was positive and significant but not large enough. This findings is in tandem with the finding Co et al,(1997) on gross fixed capital formation and economic growth, Dike, (2008) Eaton et al, (2001) in a related study that the contribution of capital goods import was positive but neither large on gross fixed capital formation non on economic growth. From the model, the coefficient of private investment was positive and significant on gross fixed capital formation; this finding is

also compatible with the discovery of Stephen, (2016) in a related study that private investment plays an important role in the process of gross fixed capital formation.

VI. SUMMARY AND CONCLUSION

This study investigated the effects capital goods import on physical capital formation and economic growth is Sub-Saharan Africa countries. The study employed descriptive statistics, panel granger causality and panel co-integration as estimation techniques. Results from our various estimations showed that capital goods imports Produced positive and significant effect on both economic growth and gross physical capital formation. However, the effect was not large enough to really influence gross fixed capital formation and economic growth. The study therefore, concludes that capital goods import did not produce expected impact on gross fixed capital formation and economic growth in sub-Saharan African countries during the study period. The study recommends that regulations and policies are required to reduce importation of consumable items that could be produced by domestically owned factors of production and encourage importation of capital goods that are needed to produce consumable goods.

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