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Socio-Economic, Demand and Supply-Driven Determinants of Health Care Expenditures in Sub-Sahara Africa

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Abstract
This study examined the real determinants of health care expenditure in Sub-Sahara Africa. Considering the determining factors from socio-economic, demand and supply sides, data for the study were sourced from World Health Organization and World Development indicators published by World Bank. The study employed Westerlund Error-correction Based Panel Cointegration test to examine the relationship between the determining factors of health expenditure and the health expenditure itself. Findings from the study confirmed that there are long-term co-movements between the determining factors of health expenditure and health expenditure itself. Also, the study revealed that all variables from socio-economic, demand and supply sides have significant impacts on health expenditure in both short and long- run. In addition, most variables in the demand and supply sides have negative and significant impacts on health expenditure while all variables from socio-economic side have positive and significant impacts on health expenditure in both short and long-run in the selected Sub-Sahara African countries.
Keywords: Health Expenditure, Socio-economic Side, Demand Side, Supply Side, Panel Unit Root test, Error Correction Based Panel Cointegration.
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1. Introduction

An appropriate and sustainable model for improvement in health system performance has been adjudged as the impetus to reverse the declining trends in health and development status and breaking the vicious cycle of poverty and ill-health in Africa (Kaseje, 2006). Improved and robust health status bring about increased productivity, educational performance, life expectancy, savings and investments and decreased debts and expenditure on health care. Ultimately, these would lead to greater equity, economic return, social and political stability.

Bloom and Canning (2003) have shown that healthier individuals might affect the economy in four ways: (a) They might be more productive at work and so earn higher incomes, (b) They might spend more time in the labour force, as less healthy people take sickness absence or retire early (c) They might invest more in their own education, which will increase their productivity; and (d) They might save more in expectation of a longer life. More reasons why World Bank (2017) and World Health Organization (2016) emphasized that healthy citizen is one of the critical ingredients of economic growth that developing countries should pursue. This implies that health is a capital good and its enhancement is an important driver of efficient human capital and economic growth.

However, a robust health outcome has not been termed plausible for Sub-Sahara Africa as they have failed to provide satisfactory health care to its inhabitants. The SSA region lags behind in achieving the health-related Millennium Development Goals (MDG) targets, with most countries in the region unlikely to achieve these targets. HIV/AIDS, Malaria and Tuberculosis remain the major causes of mortality and morbidity in the region. Sub-Sahara African countries experience lowest average life expectancy at birth, highest infant and mortality rates compared to other region (Novignon, 2015). Apart from the high disease burden in the SSA region, the region also lacks health workforce and infrastructure necessary to improve the health status of the population (WHO, 2016).

Apparently, all the health care challenges ravaging the SSA are associated with the poor health care funding. Most of the successes recorded in high income countries for better health status are resulted from the impressive level of health care expenditure which is majorly prioritized in their budgets (Deaton and Tortora, 2015). The justification for higher government expenditure on health in high income countries is often based on individual's lifetime incomes, economic growth, fostering economic growth and poverty reduction (levine and Renelt, 1992). Given the trend and pattern of the performance of health care expenditure across regions of the world, it was actually confirmed in 2015 that SSA relative to other regions of the world recorded the lowest public health expenditure as the percentage of GDP with just 2.9% while North America, East Asia and Pacific spent 8.2% and 4.6% respectively. In the light of the above, it is therefore pertinent to understand the factors that really determine health care expenditure in SSA. Gaining a robust understanding of the determining factors of health care expenditure, will be an important component of making effective policy decision and formulating appropriate strategies in the health care system.

Several studies have examined the relationship between health care expenditure and economic growth of Africa. But just a few studies in the past have worked on the determinants of health care expenditure in the SSA. Though, there are handful studies on few countries in the SSA while there are some countries with none. For instance, Anyanwu and Okeke (2016), Bakare and Olubokun (2011), Bichaka and Paulos (2008), Micheal, Mensah and Iddrisu (2014), among others, concentrated on different countries in the SSA like Nigeria, Ghana, Tanzania, South Africa, Cameroun, among others and came up with different results on what constitute the determinants of health care expenditure. The most common thing to these studies is the fact that they concentrated more on the supply side of the health expenditure which has to do with health facilities both human and capital, neglecting the demand side which has to do with the nature of disease prevalence, mortality rate, among others and the socio-economic side which has to do with unemployment rate, women labour force participation rate and economic growth rate. The empirical work of Paskawych (2014) on USA emphasized the need for developing countries to also examine determinants of health care expenditure by considering both demand and supply areas if the structure of health care expenditure in this region is to be thoroughly examined. This study therefore contributes to the literature by incorporating socio-economic, demand and supply side variables in determining the real factors that affect health care expenditure in Sub-Sahara Africa.

2. Literature Review

Zahra and Somaye (2012) investigated the causality and co-integration relationships between economic growth and health care expenditures in developing countries between 1990 and 2009. The study employed panel co-integration and Vector Error Correction Model (VECM). The findings revealed that there was a short-run causality from GDP to health care spending, while it is not observed any short-run causality from health spending to economic growth. Likewise, there was a bilateral causality and long-run relationship between economic growth and health spending.

Anyanwu and Okeke (2016) examined government health expenditures and per capita income to two health outcomes: infant mortality and under-five mortality. This relationship was examined, using data from 47 African countries between 1999 and 2004. They observed that health expenditures have a statistically significant effect on infant mortality and under-five mortality. They also found only that for African countries, the total health expenditures (as well as the public component) are certainly important contributor to health outcomes. In addition, both infant and under-five mortality are positively and significantly associated with Sub-Saharan Africa.

Baltagi and Moscone (2010) reconsidered the long-run economic relationship between health care expenditure and income using a panel of 20OECD countries between 1971 and 2004. They also studied the non-stationary and co-integration properties between health care spending and income. Their result showed that health care is a necessity rather than a luxury, with elasticity much smaller than that estimated in previous studies. Parkin, McGuire and Yule (1987) studied cross-sectional data of 23 OECD countries in 1980 and found that the purchasing power index of medical care could reduce the income elasticity of medical care.

Michael et al (2014) examined the determinants of public healthcare expenditure in Ghana using annual time series data from 1970 to 2008. They found out that the real GDP is impacted positively by the public health expenditure in Ghana. Fatima, Enarson and Basalis (2014) investigated the causality and co-integration relationships between public spending on health and economic growth in Algeria during 1974-2014 using annual data. Their findings revealed that there is a long-run causality from public spending on health to economic growth while it was observed that there was no short-run causality from public spending on health to economic growth.

Bakare and Olubokun (2011) investigated the relationship between health care expenditures and economic growth in Nigeria using ordinary least square multiple regression analytical method. Their results showed that there exists a significant and positive relationship between health care expenditures and economic growth. Apanisile and Akinlo (2014) applied Panel data of 30 countries from the sub-region during the period of 1995 to 2011 using dynamic Generalized Method of Moment (GMM) modeling framework in examining the contribution of health inputs and outcomes to growth process in the Sub-Saharan Africa. The result showed that education has statistically significant positive effect on economic growth while both government expenditure on health and mortality rate have statistically significant negative effects.

Liya (2018) investigated health and economic growth in selected low-income countries of African South of the Sahara using Granger causality test between 1970 and 2009. The result revealed that mortality rate has a significant and negative impact on real per capita income. The Granger causality test showed that real GDP per capita and mortality rate have causal or bidirectional relationship. On the other hand, real GDP per capita does not granger cause life expectancy, but life expectancy granger cause real GDP per capita.

Bichaka and Paulos (2008) estimated a health production function for Sub-Saharan Africa. The study employed method of one-way and two-way panel data analyses. The results obtained from two-way random effect model suggested that an increase in income per capita, a decrease in illiteracy rate, an increase in food availability are well associated with improvement in life expectancy at birth. Overall results suggested that a health policy, which may focus on the provision of health, services, family planning programs, and emergency aids to the exclusion of other socioeconomic aspects, may do little in efforts directed toward improving the current health status of the region.

Paskawych (2014) applied a cross sectional data set from the years 2004 and 2005 of 50 States in the United States and the District of Columbia and the ordinary least squares procedure this paper estimates the determinants of healthcare expenditures in the United States. He found out that the proportion of population under the age of 15 years is found to be the largest determinant of healthcare expenditures in the United States.

3. Methodology

3.1 Theoretical Framework

The analysis of the implication of the determining factors of health expenditure on health care expenditure itself in this study is adapted from Wagner's Law hypothesis (1958). In the model of public expenditure growth introduced by Wagner (1958), some reasons were given to support the hypothesis. Firstly, as nations develop, their legal relationship and communication increase become complex as a result of immense division of labour that increases with industrialization. In this regard, states need to increase their role in terms of public, regulatory and protective activity. Moreover, the predictions about the increase in cultural and welfare expenditures are mainly based on the presumption that as society experience higher income, they would demand for more education, entertainment, health facilities, a more equitable distribution of wealth, income and generally more public services. The main notion of Wagner's law points out that industrialization, urbanization and increased population density will lead to an increase in public expenditure as a share of GDP due to the increasing need for public facilities such as housing, hospitals and other infrastructure.

3.2. Model Specification

From the theoretical proposition of Adolf Wagner's hypothesis (1958) analyzed in this study, the model for this research work is explicitly specified as follows:

$$Hex_{it} = \propto_{it} + \propto_1 IMR_{it} + \propto_2 \mathrm{HIV}_{it} + \propto_3 LEB_{it} + \propto_4 EDU_{it} + \propto_5 \mathrm{HBEDS}_{it} + \propto_6 \mathrm{ISF}_{it} + \propto_7 \mathrm{IWS}_{it} + \propto_8 GDPgr_{it} + \propto_9 WLFP_{it} + \propto_{10} UNEMPL_{it} + \mu_{it} \ldots\ldots\ldots 1$$

Where:

HEX is the Health Expenditure which represents the dependent variable

IMR is the Infant Mortality Rate

HIV is the prevalence of Human Immunodeficiency Virus

LEB is the Life Expectancy at Birth

EDU is the Education which is proxied by Secondary School Enrolment

(NOTE: IMR, HIV, LEB and EDU capture the demand side variables of the determinants of Health Expenditure)

HBEDS is the Hospital Beds

ISF is the Improved Sanitation Facilities

IWS is the Improved Water Source

(NOTE: HBEDS, ISF and IWS capture the supply side variables of the determinants of Health Expenditure)

GDPgr is the Gross Domestic Product Growth Rate

WLFP is the Women Labour Force Participation Rate

UNEMPL is the Unemployment Rate

(NOTE: GDPgr, WLFP and UNEMPL capture the Socio-economic variables of the determinants of Health Expenditure)

(i) Denotes the country while (t) represent the time
μ_{it} is the vector of error term.

Table 1: Description of Variables

S/N	VARIABLES	DESCRIPTION
1.	Health Expenditure (HEX)	This is the sum of public and private health expenditure. It covers the provision of health services, family planning activities, nutrition activities and emergency aid.
2.	Hospital Beds (HBEDS)	These are hospital beds per 1,000 people which include patient's bed available in public, private, general and specialized hospitals
3.	Improved Sanitation Facilities (ISF)	This refer to the percentage of the population using improved sanitation facilities. These facilities are likely to ensure hygienic separation of human excreta from human contact.
4	Improved Water Source (IWS)	This refers to the percentage of the population using an improved drinking water source. The improved drinking water source includes piped household water connection located inside the user's dwelling.
5.	Infant Mortality Rate (IMR)	This is the number of infant dying before reaching one year of age per 1, 000 live births in a given year.
6.	Prevalence of HIV (HIV)	This refers to the percentage of people 15 to 49 who are infected with HIV.
7.	Life Expectancy at Birth (LEB)	This refers to the number of years a new born infant would live if prevailing patterns of mortality at the time of his birth were to stay the same throughout his time.
8.	Education (EDU)	This is proxied by secondary school enrolment which is the percentage of the population (both boys and girls) enrolled at secondary school levels in public and private schools.
9.	Unemployment Rate (UNEMPL)	This is the share of labor force that is without work but available for and seeking employment.
10.	Women Labour Force Participation (WLFP)	This is the proportion of women population ages 15 and older that is economically active
11.	Gross Domestic Product Growth Rate (GDPgr)	This is the annual percentage growth rate of GDP at market prices based on constant local currency.

3.3 Sources of Data

Data on core health variables such as health care expenditure, Infant mortality rate, Prevalence of HIV, Life expectancy at birth, Hospital beds, Improved sanitation facilities and Improved water facilities were sourced from

World Health Organization (WHO). In addition, other macroeconomic variables such as Education enrolment, Unemployment rate, Women labour force participation and Gross Domestic product growth rate were sourced from the World Development Indicator (WDI) published by World Bank.

3.4 Estimation Techniques

Traditional Panel model often rests on micro panels that include large cross-sectional dimension (large N) and small time series dimension (small T). This study, however, uses health and macroeconomic variables that are collected for twelve Sub-Sahara African countries over a significant number of twenty-seven years (1990-2017). The use of micro panels with the characteristics meant for this study are subject to spurious relationships, especially, since macroeconomic variables are often characterized by non-stationarity (Baltagi, 2008). In order to guide against this limitation, this research work makes use of panel cointegration techniques (macro panels) proposed by (Westerlund, 2007). Panel cointegration which can handle both large cross-sectional dimension (large N) and large time series dimension (large T) has the capability of eliminating spurious regressions and cointegration (Baltagi, 2008). This robust estimation technique is used for cross-section data for twelve selected Sub-Sahara African countries. Three countries represent each of the four major regions in Sub-Sahara Africa. Nigeria, Ghana and Cote D'Ivoire represent West Africa, Botswana, South Africa and Swaziland represent South Africa. Kenya, Tanzania and Ethiopia represent East Africa while Equatorial Guinea, Gabon and Congo represent Central Africa. Countries under each bloc were selected based on their progressive and sound economic base. In the light of this, findings from this study in respect of these twelve selected African countries are capable of serving as a full generalization for the entire Sub-Sahara African countries.

4 Result and Discussion

4.1 Results of Panel Unit Root Tests

Since it is very important to determine the order of integration before embarking on the panel cointegration test, this research work therefore estimate the stationarity of the variables which is also known as the unit root test. This is due to the fact that a non-stationary variable contains unit root and such variable has the potential of sustaining shocks. This is different in the case for a stationary variable, that is, a variable that does not contain unit roots. It is also very important that all the variables are integrated of the same order before proceeding to error correction-based panel cointegration. Therefore, in a bid to perform the unit root test and determine the order of integration of all variables, this study employs the Im Pesaran and Shin (IPS) unit root test as follows:

Table 2: Im Pesaran and Shin (IPS) Unit Root Test

Variables	IPS Unit Root Test		
	t-statistics	P-value	Order of Integration
HEX	-2.5728	0.0001**	I(1)
IMR	-4.2747	0.0000**	I(1)
HIV	-3.7844	0.0014**	I(1)
LEB	-2.5552	0.0012**	I(1)
EDU	-3.3657	0.0000**	I(1)
HBEDS	-2.4824	0.0004**	I(1)
ISF	-3.6003	0.0000**	I(1)
IWS	-4.6624	0.0000**	I(1)
UNEMPL	-3.4335	0.0000**	I(1)
WLFP	-2.7423	0.0005**	I(1)
GDPgr	-4.7386	0.0000**	I(1)

Source: Author's Computation
(***) represents statistical significance at 1%. Each model includes trend and constant term.

The results in table 2 above indicate that at 5% level of significance, all the variables are non-stationary at levels but are stationary at their first difference. The implication of this is that any disturbance or shock to the variables

will not be sustained for a long period of time, that is, shocks to the variables will die out over time. In this regard, the qualities shown by the time series variables in the model create the necessary condition for panel cointegration test. We therefore proceed to the error-correction based panel cointegration test.

4.2 Results of Error-Correction Based Panel Cointegration Test

The panel cointegration test model designed for this study makes Health Expenditure (HEX) the dependent variable while the independent variables comprises of Infant Mortality Rate (IMR), Prevalence of HIV (HIV), Life Expectancy at Birth (LEB), Education Enrolment (EDU), Hospital Beds (HBEDS), Improved Sanitation Facilities (ISF), Improved Water Source (IWS), Unemployment Rate (UNEMPL), Women Labour Force Participation Rate (WLFP), Gross Domestic Product growth rate (GDPgr). In this particular section, four basic types of test are designed for the purpose of testing for panel cointegration. The tests are conducted based on both asymptotic distribution and cross-sectional dependence, that is, bootstrapping. Results of the asymptotic distribution for the four tests are shown in table 3 below:

Table 3: Westerlund Panel Cointegration Test: Asymptotic Distribution Value

Statistics	Value	Z-value	P-value
Gt	-3.142	6.414	0.001
Ga	-1.304	4.217	0.003
Pt	-4.319	6.118	0.000
Pa	-0.141	5.416	1.000

Source: Author's Computation

Each test includes trend and constant terms. The lag and lead lengths are selected based on AIC and Bartlett Kernel Window. Width is set according to $4\left[\frac{T}{100}\right]\frac{2}{n}$ which gives approximately 3 in this study.

From the results of table 3 above, the null hypothesis of no long-run relationship between the Health Expenditure (HEX) which is the dependent variable and the other independent variables is rejected. This therefore implies that there is long-run co-movement between the health expenditure and its determining factors (i.e IMR, HIV, LEB, EDU, HBEDS, ISF, IWS, UNEMPL, WLFP, GDPgr). We therefore proceed to error-correction model using fixed effect within regression.

Table 4 shows the error-correction based panel cointegration regression results using the fixed effect model. The results are divided into two segments, that is, the long and short-run relationships. The first segment shows the variables in their non-differenced forms, therefore implying long-run relationship, while the second segment exhibits the variables in their differenced form indicating the short-run relationships. As regard to the long-run relationship segment, the results therein indicate that all the explanatory variables (i.e IMR, HIV, LEB, EDU, HBEDS, ISF, IWS, UNEMPL, WLFP, GDPgr) have significant impacts on Health Expenditure (HEX) in the selected Sub-Sahara African countries during the period under review. For the demand side variables, IMR, HIV and EDU have negative and significant impacts on Health Expenditure (HEX) while only LEB has positive and significant impacts on HEX. In the case of supply side variables, ISF and IWS have negative and significant impacts on HEX while only HBEDS has positive but insignificant impacts on HEX. All the variables under the socio-economic factors (i.e UNEMPL, WLFP, GDPgr) have positive and significant impacts on HEX

However, the case is quite different in the short-run relationship segment, as all the explanatory variables except LEB do not have significant impacts on HEX. The overall R-squared of the results implies that 89 percent variation in the Health Expenditure (HEX) is explained by all the explanatory variables. The fixed effect estimated model is also statistically significant when considering the F-statistics of 9.09 at 1% level of significance and the F-probability value of 0.0000. The indication of this result is that the explanatory variables may jointly have a significant effect on the Health Expenditure (HEX) in the selected Sub-Sahara African Countries during the period under review. We proceed to testing cross-sectional dependence. This is very necessary because there may be possibility of cross-sectional dependence among the cross-sectional units. The results of the cross-sectional dependence test which is based on the correlation matrix of the residual and Breusch-pagan LM test of independence are presented in the table 5 below:

Table 4: Fixed Effects (Within) Regression Results of Health Expenditure and Determining factors Variables.

Variables	Long-run Model		
HEX	Coefficient	Standard Error	Probability
IMR	-2.070506	0.1500702	0.0045
HIV	-1.676519	0.9507234	0.0091
LEB	3.432102	0.6085588	0.0121
EDU	-1.204348	1.7614621	0.0152
HBEDS	0.0946706	0.1556804	0.5542
ISF	-1.526597	0.7820462	0.0062
IWS	-2.434152	0.2410887	0.0035
UNEMPL	1.294452	0.1302499	0.0157
WLFP	2.526365	0.6639137	0.0034
GDPgr	1.804143	0.1349188	0.0214
	Short-run Model		
DIMR	-0.3299242	0.2731538	0.2381
DHIV	-0.0329568	1.405861	0.9812
DLEB	3.545378	1.172724	0.0062
DEDU	-0.441606	0.270372	0.1204
DHBEDS	0.0975874	0.1198596	0.4231
DISF	-0.6305227	0.375083	0.1052
DIWS	-0.5525746	0.3472541	0.1242
DUNEMPL	0.1110385	0.1383664	0.4301
DWLFP	0.8361062	1.55199	0.5953
DGDPgr	0.0013951	0.020338	0.9461
Constant	-1.591649	0.652398	0.0784
Sigma-u	0.19107767		
Sigma-e	0.34987264		
rho	0.99966484		

Source: Author's Computation
F(23,25) = 9.09, Prob>F = 0.0000, R-Squared: Within = 0.87, Between = 0.43, Overall = 0.89

Table 5: Correlation Matrix of Residuals

	-e1	-e2	-e3	-e4	-e5	-e6	-e7	-e8	-e9	-e10	-e11
-e1	1.0000										
-e2	-0.0470	1.0000									
-e3	0.1413	0.0421	1.0000								
-e4	-0.2017	-0.1783	-0.3210	1.0000							
-e5	-0.1063	-0.2093	-0.1379	0.1341	1.0000						
-e6	0.3418	0.3176	0.2980	-0.0982	-0.5254	1.0000					
-e7	0.0148	-0.2482	0.3214	-0.1348	0.1273	0.6241	1.0000				
-e8	-0.2743	0.1018	0.1972	0.4381	0.3102	0.0317	0.6141	1.0000			
-e9	-0.1405	0.0196	-0.3408	0.2094	-0.1021	-0.4392	0.3982	0.4210	1.0000		
-e10	0.2601	0.3214	0.0419	0.1962	-0.5321	-0.8414	0.0143	0.3271	0.2342	1.0000	
-e11	0.3620	-0.2414	0.2357	0.3471	0.4210	0.1234	0.3210	0.1078	0.4132	0.4201	1.0000

Source: Author's Computation
Breusch-Pagan LM test of Independence: Chi 3(32) = 241.341, Pr = 0.0000, Ho: There is no Cross-sectional dependence.

The results from table 5 above shows that the null hypothesis of no presence of cross-sectional dependence is rejected as the probability value (0.0000) is less than 5% level of significance. The results therefore indicate the

presence of common factors affecting the cross-sectional units. These results therefore warrant the testing for bootstrapping in order to obtain a reliable result. Persyn and westerlund (2008) explain the bootstrapping option as a means of getting a robust P-value even in the presence of cross-sectional dependence. In this regard, the results of panel cointegration test taking into consideration cross-sectional dependence are presented in table 6 below:

Table 6: Panel Cointegration Test with Cross-Sectional Dependence

Statistics	Value	Z-Value	P-Value	Robust P-Value
Gt	-3.142	6.414	0.001	0.001
Ga	-1.304	4.217	0.003	0.002
Pt	-4.319	6.118	0.000	0.000
Pa	-0.141	5.416	1.000	0.001

Source: Author's Computation
Each test includes trend and constant terms. The lag and lead lengths are selected based on AIC and Bartlett Kernel Window. Width is set according to $4\left[\frac{T}{100}\right]^{\frac{2}{n}} = 3$. We allow for 400 bootstrap replications.

The results in table 6 above shows that when consideration is given to cross-sectional dependence, the cointegration test results now came out in a more robust form. The cointegration test now rejects the null hypothesis of no cointegration in all the four tests. This now strongly confirms that there is long-run co-movement between the determining factors of health expenditure and the health expenditure itself.
Moreover, based on the results from the fixed effect regression in which apart from LEB, none of the explanatory variables has significant impacts on health expenditure in the short-run relationship segment; it is therefore pertinent to employ dynamic panel regression which is able to yield a more efficient, consistent and on the whole a more reliable estimator than the fixed effect model (Mitze,2011). The results of the dynamic panel data estimation which is based on the Blundell-Bond SYS-GMM is therefore presented in the table 7 below:

Table 7: Dynamic panel Data Estimation of the Relationship between Health Expenditure and Explanatory Variables Using SYS-GMM.

Variables	Coefficients	Standard Error	Probability
DIMR	-1.1769588	0.1276355	0.016
DHIV	-1.165441	0.6104356	0.056
DLEB	1.451309	0.4331546	0.001
DEDU	-4.881846	1.813974	0.007
DHBEDS	2.1736086	0.1027763	0.009
DISF	-2.2710254	0.2358085	0.025
DIWS	-3.0592636	0.1415799	0.067
DGDPgr	1.0288277	0.0151938	0.058
DWLFP	2.1011973	0.7978305	0.008
DUNEMPL	1.0822346	0.0984919	0.004
Constant	-5.035283	3.883177	0.195

Source: Author's computation
Wald Chi 2(22) = 293.13, Prob > Chi 2 = 0.0000

Table 7 above shows the results of dynamic panel data estimation. The SYS-GMM results which indicate the short-run relationship shows that all the explanatory variables now have significant impacts on Health Expenditure (HEX) as compared to the fixed effect regression in which apart from LEB, none of the explanatory variable has significant impacts on Health Expenditure. Moreover, like the fixed effect regression, the dynamic model is also statistically significant when we consider the F-probability value of (0.0000). this indicates that with focus on short-run effects only, all the explanatory variables used in the model jointly have significant impacts on health expenditure in the selected Sub-Sahara African countries.

4.3 Discussion of Findings

Considering the findings from the results of Westerlund Panel cointegration test with and without cross-sectional dependence, there is a long-term co-movement between the determining factors of health expenditure and the health expenditure itself in the selected Sub-Sahara African countries. Also, findings from this research work shows that variables (i.e IMR, HIV, EDU and LEB) from the demand side of the Health Expenditure determinants have significant impacts on Health Expenditure. From this finding, Infant Mortality Rate (IMR) has negative and

significant impacts on Health Expenditure (HEX). This finding implies that an increased health status inform of low Infant Mortality Rate will translate into healthy human capital formation with its attendant multiplier effect on growth and development which will later enhance adequate budgetary allocation to health care system (Khan,2015).

Finding from this same aspect of the research work shows that prevalence of HIV (HIV) has negative and significant impacts on Health Expenditure. The possible reason for this finding might be attributed to the fact that an increase in the rate of HIV widespread might not likely raise health expenditure but rather reduce direct efficacy of health care spending. This is hinged on the evidence provided by Thornton (2006) that the only successful efforts to combat the epidemic of HIV are majorly attached to the use of condom and discouragement of sexual promiscuity in Sub-Sahara Africa. In addition, finding from the results equally shows that Education (EDU) as one of the demand side variables of health expenditure determinants has negative and significant impacts on Health Expenditure (HEX). This report is in line with the findings of Schulz (2004) who confirmed that individuals with higher levels of education show healthier behavior, tend to consult a doctor more often (probably for prevention) and have fewer hospital admissions thereby reducing a huge spending on critical illness. From the same demand side of health expenditure determinants, finding reveals that Life Expectancy at Birth (LEB) has positive and significant impact on Health Expenditure (HEX). The implication of this finding is that an increase in life expectancy leads to a rise in GDP per capita thereby enhancing per capita spending on health. Moreover, findings from this research work show that two variables (i.e ISF and IWS) from the supply side have negative and significant impacts on Health Expenditure. The implication of this finding is that when there is an improvement in Water and Sanitation facilities, direct expenditures on the treatment of diarrhea-related disease will be avoided as a result of less illness from infectious diarrhea.

Another very important finding in this research work is the positive and significant impacts of all the variables (i.e UNEMPL, WLFP and GDPgr) under the socio-economic factors on Health Expenditure (HEX). The finding reveals that Unemployment Rate (UNEMPL) has positive and significant impacts on Health Expenditure. This finding might be attributed to the fact that a prolonged period of unemployment could lead to an adverse effect on health behavior (for instance depression and higher level of alcohol consumption) thereby resulting to an increased use of emergency rooms and intensive care beds, thus increasing the total health expenditure (Breyer, 2006). Likewise, finding from this socio-economic aspect shows that Women Labour Force Participation rate (WLFP) has positive and significant impact on Health Expenditure. This findng might be hinged on the fact that care givers are majorly common among women and it can be expected that a high level of women's labour force participation increases professional care givers among women at home and institutions, thereby increasing health care expenditure (Schulz, 2004). Lastly, finding from the results equally reveals that economic growth (GDPgr) has positive and significant impact on Health Expenditure. The implication of this finding is that high economic growth rates would facilitate the purchase of new technical equipment for the expansion of health care services.

5 Conclusion

Based on the results and findings of this research work, the study therefore concludes as follows:
First, there is a long-term co-movement between the determining factors of health expenditure reviewed in this study and health expenditure itself in the selected Sub-Sahara African countries. Second, all the variables embedded in the three sides of economics mentioned in this study (i.e Demand, Supply and Socio-economic sides) have significant impacts on Health Expenditure in both the long and short-run. Third, most variables in the demand side (i.e IMR, HIV, EDU) and supply side (i.e ISF, IWS) have negative and significant impacts on Health Expenditure both in the long and short-run. Lastly, all the variables under the socio-economic side (i.e UNEMPL, WLFP, GDPgr) have positive and significant impacts on Health Expenditure both in the long and short-run in the selected Sub-Sahara African countries.

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