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Does External Trade Improve Life Expectancy? A Long Run Equilibrium Analysis on English Speaking West African Countries

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***Abstract*—** It is incontrovertible that a key index for measuring welfare, living standard and societal development, is life expectancy. Consequently, there has been a plethora of studies that focused on examining how various aspects of human endeavour impact life expectancy. This study specifically examined the relationship between external trade and life expectancy among English speaking West African Countries (EsWACs). Prior studies on this subject concentrated on structuring predictive models using mortality trend or building parameter life expectancy with samples of individuals; but none has considered the vestiges of underdevelopment that have led to reduced life expectancy overtime in the developing economies even in the face of increase in the volume of trade. It therefore departs methodologically from the classical ordinary least square (OLS) and 1st generation panel econometric techniques in constructing balanced panel data structure then employed second generation panel data econometric techniques. The results show that external trade has not improved life expectancy in EsWACs. This therefore infers that the impact of external trade on healthcare is negligible and has infinitesimal effect on life expectancy in the sub-region. The study recommends inter alia, that countries should pay more attention on variables that improves human capital significantly as they will help improve longevity.

Keywords- *Long Run Equilibrium; External Trade Benefits; Life Expectancy; Panel Data; Healthcare*

I. BACKGROUND TO THE STUDY

The subject of human longevity or life expectancy remains a pertinent issue and has been the focal point of vigorous debate in the literature among scholars like Schultz (1960); Becker (1962, 1964); Barro (1996); Bloom & Sachs (1998); Bloom, Canning & Sevilla (2002); Acemoglu & Johnson (2007); Lorentzen, McMillan & Wacziarg (2008). World Health Organization (WHO, 2017) reported that for more than four decades now, average life expectancy at birth has increased worldwide by nearly 20 years, from 46.5 years within 1950-1955 to 65.2 in 2002. This represents a global average rise in life expectancy of four months per year across the period. The WHO document further disclosed that on the average: there was nine years gain in life expectancy in relatively developed economies like Australia, Japan, New Zealand and those in North America and Europe; there was seventeen gain in life expectancy in high-mortality developing economies of Africa, poorer countries of Asia, Eastern Mediterranean region and Latin America; twenty-six year in low-mortality developing economies.

Similarly, as indicated in WHO (2015) data, there appears to be an overall rise in average life expectancy in Sub-Saharan Africa from 37.32 in 1960 to 46.17 years in 1980 and from 47.93 years in 1990 to 49.86 years in 2000. However, the sub-Saharan African region, starting from the third millennium, has been experiencing decline in longevity from 48.77 years in 2005 to 46.95 years in 2011.This trend seems ironical, given the fact that the data from WHO (2015) show an overall rise in life expectancy in the region between 1960 (37.32 %) and 2000 (49.86%). This then begs the question: why the fall at the beginning of the third millennium despite the rise in the trend from 1960 to the end of the second millennium?

Available data from the World Bank (2013) on economic growth differentials between developed and developing nation suggest that fifty percent of the gap is attributable to health and life expectancy factors. Longevity inherent in a healthy life is one of the principal determinants, alongside physical, human and natural capital that influence economic growth and development. Given the fact that development is human-centered, living a long and healthy life becomes increasingly important as the economy grows to afford labour the opportunity to enjoy its output. A healthy population, and by extension, healthy workforce is critical for competitiveness, trade expansion and economic development (USAID, 2015). Theoretically, life expectancy through its effects on workers' productivity and competitiveness is expected to have direct significant effect on trade as well. As the world becomes increasingly integrated via globalization, the linkage between trade and health outcomes begins to assume center stage in development discourse as scholars search for clarity between their relationships.

The theoretical case for the link between external trade and economic development dates back to Smith (1776), who argued that international trade is imperative in ensuring sustainable economic growth. Ricardo (1817) supported Smith's view and maintained that external trade is a positive-sum game because gains from specialization improves efficiency of resource utilization, which leads to more productivity such that every nation achieves a higher level of national wealth than would have been the case without trade. Kaberuka, Rwakinanga and Tibesigwa (2014) argued that economic growth has been influenced by factors such as exports, imports, gross fixed capital formation, labour force and degree of openness. By implication, there is a presumed positive relationship between external trade and economic growth which suggests that expansion of external trade should lead to improved economic conditions.

Benefits derivable from external trade are regarded as part of the comparative advantages countries derive from and enjoy for engaging in exchange of products and services with the rest of the world. International trade as a major factor of openness has made remarkable contributions to economic growth of countries (Sun & Heshmati, 2010). This has been the basis for the support of the relationship between external trade and economic growth/development which has been theoretically analyzed and established to be positive (Oviemuno, 2007; Anatonio, 2012; Ezenwe, 1979; Iqbal & Zahid, 1998). Trade policies have been on the front burner of national issues throughout much of history; its economic, social and political importance has been on the rise and it has been an area of interest to policy makers, economic managers, entrepreneurs and venture capitalist as well as analysts (Anowor & Agbarakwe, 2015). Correspondingly, external trade benefits are expected to strengthen the ties between nations by bringing people together in peaceful and mutually beneficial exchanges and as such contribute to peace and stability, increase expenditure in education and health thus improving livelihoods of the citizenry in terms of real per capita gross domestic product. In this context therefore, external trade should provide a platform for longevity to thrive in the less developed countries (LDCs) like the English speaking West African Countries (EsWACs).

Earnings from external trade relations recorded by EsWACs have appreciated overtime and are expected to have contributed in addressing development issues. For example, combined average exports earnings of EsWACs increased from $14 million in the 1990s to $16 billion in 2000s (Gbosi, 2011). The aggregate

export earnings for EsWACs in 2011 was $92.866 billion, this also increased to $98.598 billion in 2012 and maintained an increasing trend up to 2016 to the tune of $121.533 billion. This increase in export earnings of these countries boosted the general government revenue as a percentage of GDP by 26%, 27% and 29% in 2011, 2012 and 2016 respectively. Similarly, same increase in export earnings respectively raised government expenditures as a percentage of GDP by 27.34%, 38.38% and 47.46% in 2011, 2012 and 2016. In addition, this increase in external trade benefits resulted in the expansion of markets with increase in GDP growth to the tune of 6.34%, 6.40% and 7.6% in 2011, 2012 and 2016 respectively, thereby suggesting higher degree of trade or economic openness within the same period (see WAIFEM, 2018).

Expectedly, engaging in external trade relations by EsWACs with the rest of the world should contribute positively (through increase in per capita income) towards extending life expectancy within the region. However, the key pertinent questions that beg for answers are; to what extent have benefits from external trade improved the longevity of people of EsWACs? In what ways have external trade benefits impacted on life expectancy rate at birth in the EsWACs?

The EsWACs include: Gambia, Ghana, Liberia, Nigeria and Sierra Leone. The EsWACs were selected on the bases of language, political history, membership to General Agreement Trade and Tariff (GATT), World Trade Organisation (WTO), Economic Community of West African States (ECOWAS), and West African Institute for Financial and Economic Management (WAIFEM) which was established by the Central Banks of the English speaking West African Countries (EsWACs).

The import of this study to the ensuing academic discourse on the subject matter is to determine the effect of external trade benefits on life expectancy at birth within the EsWACs. Against this backdrop, this study subscribes to the basic tenets of trade-oriented theories which endorses the view that nations of the world (whether developed, developing or underdeveloped) benefit more from one another by engaging in trade with a view to reaping the gains of comparative cost and advantage, which are expected to address the fundamental development issues of participating countries.

II. REVIEW OF LITERATURE

There seem to be good reasons to assume that external trade goes with positive economic outcomes as it tends to upgrade industrial structure, facilitate capital accumulation, and enhance technological progress and institutional advancement (Sun & Heshmati, 2010; Wagner, 2007). External trade exists when buying and selling of goods and services take place across the boundaries of different countries and regions. It is exchange of capital, goods, and services across international borders or territories. Generally, external trade becomes imperative because no country or region is self-sufficient. Apparently, every bloc (be it country or region) has to depend upon others for importing the goods and services which are either non-available within her jurisdiction or are available at higher costs or in insufficient quantities. As a result, such nations can export goods and services they have in abundance which are in high demand by others. This position aligns with the submission of Frankel and Romer (1999) that see international trade as an instrument and driver of economic growth. Therefore, the basis of external trade rests on the fact that economies differ in human and physical endowment, preferences, technology, scale of production and capacity; they are better off specializing in their areas of comparative advantage while leveraging on other economies for other needs via trade relations (see: Acemoglu & Johnson, 2007; Anatonio, 2012; Sergio, 2014)

Life expectancy literally represents the probable number of years remaining in the life of an individual or persons often determined by such factors as nutrition, heredity, physical conditions, lifestyle, access to healthcare, occupation, economic status, gender and geographical locations (Rosen & Haglund, 2005; WHO, 2015; Alamgir, Salahuddin & Manzoor, 2016). Simply put, it represents the number of years that one is

expected to live base on statistical average. Life expectancy at birth according to WHO (2015) represents a summary indicator of mortality (health condition). It is a summary of mortality risks and trends across all age group. Evaluating life expectancy at birth allows the reporting of life expectancy at other ages to keep track of health improvements for specified age groups in the populations.

There has been no trade theory according to Anowor, Ukwueni and Ikeme (2013) that can be said to supersede the others among all trade theories even though the concept is an age-long phenomenon. Accordingly, some other schools of thoughts have their own bases to support and/or criticize external trade. The classical and neo-classical economists attach so much importance to international trade in a country's development that they regarded it as an engine of growth (see: Hogendorn, 1996, Cypher and Dietz, 1997).

The most important means as argued by the mercantilist theorists for an economy to prosper is to export more than she imports to enable her improve on the welfare (development) status of her citizens. Tamuno (2006) in this light pointed out that mercantilism as an economic thought proposed that national wealth can only expand if a nation increases production and export through external trade relation while domestic consumption decreases. This occurs when such country is able through trade policies encourages exports and through restrictions discourages imports. Hence, mercantilists never favour free trade in the assumption that wealth was fixed and therefore a country's gain from trade is at the expense of her trading partners.

Absolute Cost Advantage Trade Theory of Smith (1776) was necessitated as a result of the dissatisfaction with the Mercantilist Trade Theory, which Smith (1776) perceived to prohibit economic growth. Smith (1776) argued that with free trade each nation could specialize in the production of those commodities in which she could produce more efficiently than the other nations, and import those commodities in which she could produce less efficiently. In this context, Gbosi (2011) argues that under the trade theory of absolute cost advantage, if countries specialize in the production of commodities in which they have absolute advantage, a wide range of goods will be available in the world market and the over-all result will be increase in the standard of living and settlement of some development worries (in this case, extending the life expectancy) of such countries.

The theory of Comparative Advantage states that a country will gain from trade if she specializes in the production of a specific commodity in which she uses a lower opportunity cost than their trading partners (Gbosi, 2011). Ricardo (1817) being the propounder of this theory points out that in the context of a model of two countries, two commodities and one factor of production (2 x 2 x 1), a country would tend to export the commodity whose comparative cost is lower in production and comparative cost is higher in pre-trade isolation. The relevance of this theory to this study is founded on the argument that when a country enters into trade with some other countries, she stands to reap some benefit which may include longevity.

The Productivity Theory of Trade as reported in Eberhardt and Francis (2011) points at indirect dynamic benefits of a high order form of international trade as it enlarges the size of the market and the scope of specialization, international trade makes a greater use of machinery, encourage inventions and innovations, overcomes technical indivisibilities, raises labour productivity (employment generation) which generally enables the trading country to enjoy increasing returns and lower costs that leads to economic development for the domestic economy. Evans (2007) maintains that trade according to Production Trade Theory results in a more efficient employment of the productive forces of the world which is to be considered the direct economic advantage of foreign trade. He further asserts that this guarantees some indirect benefits which have the tendency of even extending the market to improve the process of production in our domestic economy. This proposition supports export promotion policy but since international trade is beneficial in raising productivity and encouraging economic development, therefore, there is need for every country to be part of the international market. That justifies the inclusion of this theory in this study as the theory that

supports the optimistic trade school of thought which prescribes that external trade benefits are sensitive to economic development issues in countries.

Review of Empirical Literature

Anand and Ravallion (1993), as reported in Roland, Shane and Danielle (2011), with a sample of 86 developing countries utilized a graph of life expectancy against consumption per capita to investigate the correlation between human development (life expectancy at birth) and aggregate affluence (gross national production). The relationship is interpreted in three ways: The first is that the public provision of essential goods and services like health care leads to improved social outcomes. The second view holds that economic growth is directly responsible for the improvement of other life outcomes. For instance, as average income rise people can purchase relevant social goods and services which enhance health and nutrition, lower mortality rates and expand life expectancy. It also revealed that economic growth only matters if used to finance suitable public services such as provision of health care services, education and other social services which suggest economic growth leads to better provision of social services. The final explanation is that social outcomes are strengthened once income and poverty are reduced.

In order to assess the social outcomes of government spending on health status, Rajkumar and Swaroop (2008) use annual data for 1990, 1997 and 2003 and an ordinary least square regression for 91 developed and developing countries. The results from the cross-section of countries indicated that public expenditure on health has a negative impact on child mortality in countries with good governance, high quality of bureaucracy and low corruption levels. Therefore public spending on health care alone does not guarantee improved social outcomes, hence good quality governance tools such as well- functioning budget formulation, execution and monitoring are essential in order to produce a better health position.

Greenidge and Stanford (2007), using panel data of 37 countries from 1994 to 2005 attempted to identity the variables that are statistically important in determining health status in Latin America and the Caribbean. The results imply that increases in health expenditure as a ratio of GDP per capita calorie availability (calorie intake) and literacy rate and urbanization rate add to a population's health status as measured by life expectancy, while per capita carbon dioxide emissions reduce longevity. Using the two stage least squares method on 50 developing and transition countries it was concluded by Gupta, Verhoeven and Tiongson (2001) that government spending on health care strengthens a country's health status. Accordingly, the authors stipulated that policy makers need to assign resources in health care liberally and efficiently to advance economic growth and strengthen the well-being of the poor. They found out that health care is also affected positively by per capita income, urbanization, adult literacy, access to sanitation and water and private spending. They found out that government spending on education aids in the improvement in literacy levels. Consequently, the authors stipulate that policy makers need to assign resources in education liberally and efficiently to advance economic growth and improve the well-being of the poor. However, they acknowledged that though public spending is necessary to increase education attainment, the marginal costs of expanding education are substantial. They also show that education attainment is also directly affected by per capita income, urbanization, adult literacy, access to sanitation and water and private spending.

Literature gap

Panel data are rarely used in modeling the relationship between external trade benefits and economic development in developing and underdeveloped countries. Consequently, there is paucity of studies that define how benefits from external trade relation have affected life expectancy at birth. It is this gap that this study sets out to fill. The important advantage of panel data model is that it avoids the sample selection bias as noted in Pesaran and Pick (2004). In this study therefore, the panel database is large enough to be able to

specify a lengthy duration over which the relationship between the independent and dependent variables are estimated. Dirk and Renee (2006) in supporting the use of panel data models advanced that it is also worth emphasizing some additional features of the panel data model. It is multivariate in nature, and is thus able to model global interdependencies (spillover effects) better than the popular correlation and traditional ordinary least square based approaches.

III. METHODOLOGY

The aim of this study is to investigate the effects of external trade benefits on life expectancy rate at birth in English speaking West African countries (EsWACs). Further, the nature of the study allows for the collection of data on the study variables without manipulating or controlling them.

Model Specification

In consideration of the relationship between the dependent variables and the independent variables, it is important to state that the analytical framework adopted in this study leans on the work of Sun and Heshmati (2010) in estimating international trade and its effects on economic growth in China as below:

$Uit=\lambda 0 +\lambda 1(NEXPRit) +\lambda 2(HTEXPRit) +\lambda 3(TelRit) +\lambda 4(East) +\lambda 5(West) +\lambda 6Year +\omega it$ ……. (1)

Where technical efficiency (*U*) is a liner function of net export ratio (*NEXPR*), high tech export ratio (*HTEXPR*), capacity of local office telephone exchanges per labour (*TelR),* two dummy location variables as east (*East*) and west (*West*), and years (*Year)*; and ω is the random error.

With considerable modification to capture the objectives of this study, we proceeded to specify the functional relationship of the panel data regression using pool data technique; hence, the panel data regression model is specified in a functional relationship as follows:

LEP= f (EXE, TOP, TGE, FER) …….... (2)

Based on the functional relationships as in above (2), the econometric form of the model is specified as follows:

$LEP_{it} = \psi_0 + \psi_1 \ln EXE_{it} + \psi_2 \ln TOP_{it} + \psi_3 \ln TGE_{it} + \psi_4 FER_{it} + \varepsilon_{it}$…… (3)

In equation 3 above,

i = 1, 2, 3, 4, 5 (The five English speaking West African countries – The Gambia (code 1), Ghana (code 2), Liberia (code 3), Nigeria (code 4) and Sierra Leone (code 5).

t = 1, 2, 3, 4, 5 … 34 = 170 (i.e. 5 x 34) observations

Where:

Subscript i (ith subject) and t denote the cross section of the five countries and time period for the variables (34 years) respectively. This therefore suggests that the data were pooled together to produce a total observation of 170, with different constant regression coefficient for all the five countries. Where:

LEP= Life Expectancy at Birth
EXE = Export Earnings
TOP = Degree of Trade Openness [(Export + Import)/GDP].
TGE = Total Government Expenditure
FER = Foreign Exchange Rate (expressed as official exchange rate against US Dollar)
ε = Stochastic Terms. The error term is assumed to be different over time and countries.

IV. DATA

This study used secondary data on time series (1985 – 2018) and cross-sectional bases for the five EsWACs. Data on the following variables were used:

(i) export earnings of each of the EsWACs;

(ii) volumes of exports and imports of each of the EsWACs;
(iii) life expectancy at birth of each of the EsWACs;
(iv) volume of Gross Domestic Products of each of the EsWACs;
(v) foreign exchange rate of each of the EsWACs;
(vi) total government expenditure of each of the EsWACs; and
(vii) trade openness was derived from data on export, import and GDP.

Methods of Data Analysis

After structuring the data in panels using pool data technique, we adopted an up-to-date method known as 2nd Generation Panel Data Econometric using Crossectional-augmented Im, Pesaran and Shin(CIPS) Unit Root Test, ECM Panel Co-integration, Pedorni Dynamic Ordinary Least Square (PDOLS) and Fully Modified Ordinary Least Square (FMOLS), Common Correlation Effects Mean Group (CCEMG), Augmented Mean Group (AMG), Average Correlation Coefficient (ACC) estimators as proposed by Pedroni (2004), Westerlund (2005) and Pesaran (2006). Before these main tests, descriptive and correlation matrix statistical tests were diagnostically conducted and the results were reported before the results of the main tests.

Table 1: Baseline Model of Descriptive Statistics of Balanced Panel Data Structure of EXE, TOP, TGE, FER, and LEP

Statistics	EXE	TOP	TGE	FER	LEP
Mean	1.71E+10	1.031657	2.05E+09	335.0835	50.08994
Median	4.75E+08	0.580000	90500000	12.79000	50.61000
Maximum	8.26E+11	10.92000	3.92E+10	4349.160	67.88000
Minimum	6000000.	0.040000	8000000.	0.000000	35.79000
Std. Dev.	9.10E+10	1.605835	6.01E+09	896.7903	6.879905
Skewness	7.481467	3.728874	3.977523	3.143675	-0.213928
Kurtosis	59.72400	18.32525	19.29695	12.10557	2.394833
Jarque-Bera	24233.90	2045.473	2315.816	862.1974	3.867895
Probability	0.000000	0.000000	0.000000	0.000000	0.144576
Sum	2.89E+12	174.3500	3.47E+11	56629.11	8465.200
Sum Sq. Dev.	1.39E+24	433.2225	6.07E+21	1.35E+08	7951.959
Observations	170	170	170	170	170

Source: An extract from the result output using Stata Software Package

Life expectancy rate at birth (LEP), in table 1 above, as a dependent variable has the values of mean, median and standard deviation as 50.09, 50.61 and 6.88 respectively. A high value of median just like what we have in the case of other dependent variables, shows that life expectancy rate at birth is a central issue in the EsWACs, and it is averagely distributed as evidenced in the value of the mean. The values of skewness and Jarque-Bera are -0.21 and 3.87 respectively. This means that LEP is normally distributed among the EsWACs and is equally significant at 0.05 alpha level. Therefore, LEP does not require transformation though it has long tail because of its negative sign.

Table 2: Inter Variables Panel Data Structure Correlation Matrix, 1985 - 2018

	EXE	TOP	TGE	FER	LEP
EXE	1.000000	0.326313	0.741987	-0.040527	0.027546
TOP	0.326313	1.000000	0.292393	-0.149622	0.185221
TGE	0.741987	0.292393	1.000000	-0.071258	-0.027132
FER	-0.040527	-0.149622	-0.071258	1.000000	-0.379018
LER	0.027546	0.185221	-0.027132	-0.379018	1.000000

Source: An extract from the result output using Stata Software Package

From the results on table 2 above, there is no suspicion of co-linearity between any pair of the choice variables because none of the pair-wise correlation coefficients is greater than 0.8. This implies that there is no danger of the existence of multi-collinearity as such the choice of the variables (EXE, TOP, TGE, FER and LEP) is in order.

The equation for Westerlund error correction model panel data co-integration is cast thus:

Life Expectancy (LEP) Error Correction Model

$$\Delta Ln\ (LEP_{it}) = \alpha it\rho_i(Ln(\emptyset_{it} - 1) - \beta_i(Y_{it} - 1)) + \sum_{s=1}^{p_i} \delta_{is}\Delta ln(\varphi_{it} - 1)\ \lambda is\ is\ \Delta\ Y_{it} = s) + \ e_{it}$$

…….. (4)

Where:

*ln*LEP = log life expectancy at birth

pi = coefficient of gross sectional dependence for log variables

ai = country-specific intercept and trend terms

$ln\emptyset_{it}$ = all the logged explanatory variables except FER, across cross sectional and time dimensions.

Y_{it} = FER for the cross-sectional and time dimensions

B_i = coefficient across cross sectional for non-log variables (FER)

e_{it} = serially correlated error terms or random disturbances

λis = Country specific slope parameters

Thus, we can state the null hypothesis of no co-integration as Ho: $a_i = 0$ for all *i*. The alternative depends on what is being assumed about the homogeneity of a_i. Two of the tests, called group-mean tests, do not require the a_is to be equal, which means that H_o is tested against H_1^g: ai< 0 for at least one *i*. The second pair of tests, called panel tests, assume that a_i are equal for all *i* and are, therefore, designed to test H_o versus H_1^p: $a_1 = a <$ for all *i* (Babayemi, *et al.*, 2013).

Group Statistics

$$Gt = \frac{1}{N}\sum_{i=1}^{N}\frac{\hat{a}i}{SE(\hat{a}i)} \quad and \quad Ga = \frac{1}{N}\sum_{i=1}^{N}\frac{T\hat{a}i}{(\hat{a}i)}$$

Where, SE $(\hat{a}i)$ is the conventional standard error of a_i

Panel Statistics

$$Pt = \frac{\hat{a}i}{SE(\hat{a}i)} \quad and \quad Pa = T\hat{a}i$$

Table 3: Result of the panel co-integration based Westerlund (2007) test for life expectancy at birth.

Life Expectancy at Birth Model (Equation 4)

Results for H_0: no cointegration

With 5 series and 4 covariates
Average AIC selected lag length: 1.8
Average AIC selected lead length: 1

Statistic	Value	Z-value	P-value
G_t	-0.529	3.153	0.999
G_a	-0.473	2.958	0.998
P_t	-0.639	2.349	0.991
P_a	-0.142	1.826	0.966

Note: *Without constant and constant and trend terms.*
Source: *An extract from the result output using Stata Software Package*

The Westerlund (2007) test conducted on null hypothesis of no co-integration is documented in table 3. The result reveals that the *p-values* of the group (G_t and G_a) and panel (P_t and P_a) statistic are 0.999, 0.998, 0.991 and 0.966 respectively. From the result, it is evidenced that the *p-values* are greater than the default 5% level of significance (0.05). This result strongly supports the non-rejection of the null hypothesis of no co-integration between the dependent and independent variables of the balance panel data structure in EsWACs. Having established that the null hypothesis of no co-integration exists between the dependent and independent variables, we proceed to confirm this position with the test of Pedroni (2004).

Pedroni (2004) Panel Co-integration Test

The Pedroni panel co-integration test is another 2nd generation test that is residual-based which was adopted in this study. Pedroni (2004) proposes seven tests of which three are group-mean test and the remaining four are pooled tests (with the respective differing alternative hypotheses). Hossfeld (2010) supporting the use of this method, notes that Pedroni (2004) allows for country-specific short run effects and different lag-lengths in the test regression (in contrast to the formerly heavily applied test by Kao (1999). In general, it can be regarded as a sign of robustness if several of the different test statistics lead to the same test decision.

In line with this, Babayemi, *et al.*, (2013) point out that Pedroni (2004) explored the small sample performances of the seven different statistics to test panel data co-integration. Four of the seven statistics are based on pooling the data and are referred to as "within dimensions" (panel) test and the last three is "between dimensions" (group) test. These tests are based on the assumption of heterogeneous co-integration relationship between individual members.

Table 4: Result of the Panel Co-integration based Pedroni (2004) for life expectancy rate equation

2nd Generation Test Model	**Statistic**	**Value Panel**	**Z-value (Group)**
Ala Pedroni (2004)			
	Panel $_v$	1.118	0.0000
Within Statistics:	Panel $_{rho}$	0.6972	0.6686
	Panel $_{PP}$	0.9696	-1.014
	Panel $_{adf}$	0.7195	1.263
Between Statistics:	Group $_{rho}$	0.2828	-4.656

Group $_{pp}$	0.06577	13.86
Group $_{adf}$	-0.0000	-2.447

Note: Equation 4 is the conventional econometric specifications for panel co-integration.

The result of the Pedroni's test is time demean. Time demean is used to mitigate the impact of cross-sectional dependence. It is a transformational technique in unit root used to subtract the cross-sectional averages for each period from the original data.

Source: An extract from the result output using Stata Software Package

Table 4 presents the result of panel co-integrated based Pedroni (2004) test for life expectancy rate equation. The result of the test reveals that the seven statistics (four within and three between statistics) have panel values that are greater than 5% level of significance, except for group$_{adt}$ whose panel value is less than 0.05 level of significance. Since one out of the seven statistics of Pedroni test have panel value less than the default level of significance 5%, we should not reject the null hypothesis of no co-integration. This is in line with the result of Westerlund test reported in table 3. This therefore implies that long run equilibrium did not exist between the dependent and independent variable. This implies that positive changes in external trade benefits have not increased life expectancy rate at birth in EsWACs within the period of study.

Having established that we cannot reject the null hypothesis of no co-integration, we proceed to test for the coefficient estimation of the co-integration. The result is reported below.

Table 5: Results of DOLS and FMOLS test for coefficient estimation of co-integrating relationship (long-run equilibrium for life expectancy rate at birth).

DOLS Hom.Panel data Coint. Estimation results — Number of obs. = 170
Group variable: countryid — Number of groups = 5
Wald chi2(4) = 5.77 — Obs per group: min = 34
Prob> chi2 = 0.217 — avg = 34
max = 34
R-squared = 0.8729
Adj R-squared = -2.7880

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
lnexe	.0026049	.0071005	0.37	0.714	-.0113118	.0165215
lntge	-.0080287	.0080318	-1.00	0.317	-.0237708	.0077134
fer	.0000391	.000021	1.86	0.063	-2.19e-06	.0000803
lntop	.0139954	.0092084	1.52	0.129	-.0040527	.0320436

Source: An extract from the result output using Stata Software Package

As presented in table 5, the dynamic OLS (DOLS) and fully modified OLS (FMOLS) tests conducted in the manner of Pedroni (2004) reveals that the values of the coefficients (ψ_{1it}, ψ_{2it}, ψ_{3it} and ψ_{4it}) of the parameters of EXE, TOP TGE and FER are less than the 0.05 level of significance. This means that EXE, TOP, TGE and FER are statistically significance in addressing the problems of life expectancy at birth in ESWACS. Although the sign of EXE and TOP are consistent with the fundamentals of economic theory, while the sign of TGE and FER are not consistent with fundamentals of economic theory. This shows that some of the coefficients are inconsistent with the fundamentals of economic theory. It is also revealed in the result that even the TGE that appears with the theoretical expected sign is still grossly insignificant; hence

we report that the null hypothesis should not be rejected because the values of the coefficients of the parameters are not statistically significant. As a result, external trade benefits did not significantly increase life expectancy rate at birth in EsWACs within the review period. Given this result, we proceed to conduct and report the result of the ECM co-integration test (in the manner of) Westerlund (2007).

In view of this, we re-paramaterized panel co-integration error correction model as:

$\Delta_{1\ln LER}r_{it} = h_0^{LER}0\ ^{LER}\ (h_1^{INEXE}$ I,t-i $-h_2^{LER} InTOPi,t-5\ h_3^{LER} InTGEi,tjh_4^{LER} FERi,$t-1) $+\sum_{j-1}^{n} 0^{LER}$ $\Delta LERi,t-j+\sum_{j=1}^{a} \emptyset_{DEXE+;,t-;}^{LER} + \sum_{j=1}^{h} \sigma^{LER}\Delta TOP;,t;\ \sum_{j=1}^{K} \infty^{LER}\Delta$ TG $E_{;,t=j} + \sum_{j-1}^{h} \infty^{LER}\Delta FER_{i,t-;} +$ uij

Table 6: Mean group panel co-integration error correction model without a constant and a constant and trend for life expectancy rate at birth equation.

Calculating Westerlund ECM panel cointegration tests.....

Mean-group error-correction model

Short run coefficients apart from the error-correction term are omitted as lag and lengths might differ between cross-sectional units

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnexe						
L1.	.0019441	.0018899	1.03	0.304	-.00176	.0056482
lntop						
L1.	-.0110718	.0116387	-0.95	0.341	-.0338832	.0117396
lntge						
L1.	.0198896	.0199271	1.00	0.318	-.0191667	.0589459
fer						
L1.	-.0002758	.0003005	-0.92	0.359	-.0008648	.0003131
lnler						
L1.	-.0956544	.0956104	-1.00	0.317	-.2830473	.0917384

Estimated long-run relationship and short run adjustment

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
ec						
lnexe	.1053644	.0397037	2.65	0.008	.0275466	.1831822
lntop	.0373741	.1854235	0.20	0.840	-.3260492	.4007975
lntge	.1920908	.0087104	22.05	0.000	.1750187	.209163
fer	-.0059364	.0044622	-1.33	0.183	-.0146822	.0028094
SR						
_ec	-.0956544	.0956104	-1.00	0.317	-.2830473	.0917384

Source: An extract from the result output using Stata Software Package

The result of the estimated long-run relationship and short run adjustment as reported in table 6 shows that the value of error correction model (ECM) is -0.0956544. This result appears with the right negative sign suggesting low possibility of adjustment to the equilibrium point at the short run. In absolute terms, the value of ECM suggests that the speed of adjustment of the study variables or convergence to the point of long run equilibrium position is about 10%. This implies that ability of the EsWACs to correct the inherent errors that may have been necessitated by common factor of global shocks is relatively low. This perhaps is partly responsible for low life expectancy rate at birth that characterized the economies of the English-speaking West Africa. In view of this result, we proceed to test for the common correlation effects using the mean group estimator.

Pesaran (2006) Common Correlation Effects Mean Group Estimates (CCEMG)

Pesaran (2006) developed an estimator that accounts for cross-sectional dependence (CSD) known as common correlated effects mean group (CCEMG) estimator.

The combination of the development and individual variables can account for the un-observed variation of cross-sectional dependency known as common factor. This is usually inherent in cross sectional dependence relationship and often been taken care of augmented mean group estimator in the panel data structure as used in this study.

According to Pesaran (2006), common correlation effects (CCE) estimator specification in the Mean Group version, the specification is cast thus:

i. $\Delta y_{it} = b^1 \Delta x_{it} + \sum_{t=2}^{t} c_t DD_t + e_{it} \rightarrow \hat{C}_t \equiv \hat{u}_t$

ii. $y_{it} = a_i + b_1{}^1 x_{it} + C_{it} + d_i \hat{\mu}_t = e_{it} => \hat{b}_{AMG} N^{-1} \sum_I \hat{bi}$

According to Eberhardt (2000) the 2nd generation common correlated effects mean group (CCEMG or CMG) is further augmented in the following ways:

Major insight: $f_t = \bar{r}^{-1} (\bar{y}_t - \bar{a} - \bar{\beta} \bar{x}_t)$ for $N \rightarrow \infty$

Since $\bar{\varepsilon} = 0$ (iff $\bar{r} \neq 0$)

Augmentation: $y_{it} = a_i + b_i{}^i x_{it} + d_{1i} \bar{y}_t + d^1{}_{2i} \bar{x}_t + e_{it} => \hat{b}_{cma} = N^{-1} \sum_i \hat{b}_I$ (can apply weights)

Where the cross section means $\bar{y}_t$(T x 1) and $\bar{x}_t$ (T x K) proxy for f_t (f_t is a common factor that could be in form of recessions or spill over or global shocks (Eberhardt, 2000).

Table 7: Result of common correlation effects mean group estimation for life expectancy rate equation

Pesaran (2006) Common Correlated Effects Mean Group estimator
All coefficients present represent averages across groups (countryid)
Coefficient averages computed as outlier-robust means (using rreg)
Mean Group type estimation — Number of obs. = 170
Group variable: countryid — Number of groups = 5
Obs. per group: min = 34
avg = 34.0
max= 34
Wald chi2(4) = 12.86
Prob> chi2 = 0.0120

lnler	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
lnexe	.0024828	.0026709	0.93	0.353	-.0027521	.0077177
lntop	.0079504	.0026191	3.04	0.002	.0028171	.0130837

lntge	-.0063482	.0038703	-1.64	0.101	-.0139339	.0012374
fer	-.0000929	.0003052	-0.30	0.761	-.0006911	.0005053
_cons	.3321956	.9260159	0.36	0.720	-1.482762	2.147153

Root Mean Squared Error (sigma): 0.0246

Source: An extract from the result output using Stata Software Package

Table 8: Result of the common correlation effects mean group estimation for life expectancy rate equation.

Average correlation coefficients and Pesaran (2004) CD test
Residual series tested: cce_res4

Group variable: countryid
Number of groups: 5
Average # of observations: 42.50
Panel is: unbalanced

Variable	CD-test	p-value	corr	abs(corr)
cce_res4	-3.14	0.002	-0.170	0.350

Notes: Under the null hypothesis of cross-section independence CD ~ N (0,1)

Source: An extract from the result output using Stata Software Package

Tables 7 and 8 reveal that the value of the constant is 0.3321956 while that of the root mean squared error is 0.0246. This means that the constant value is significant at 5% level of significance while that of root mean square error is not significance. This means that the result of CCEMG favours our specification that points to the absence of cross-sectional correlation across the series in the equation. This sufficiently accounts for the common effect in form of global shocks that could affect trade activities in the EsWACs.

Further, the result of the correlation coefficient of the residual series for life expectancy-external trade benefit reveals that the *p-value* of the coefficient correlation effect (CCE) is -3.14 for CD-test which is less than the default 5% level of significance thereby suggesting that it is statistically significant. This means that the null hypothesis of cross-sectional independence should be strongly rejected, thereby suggesting that the assumption of cross-sectional dependence across the cross sectional and time dimensions is confirmed. This therefore implies that there is the presence of cross-sectional dependence in EsWACs.

V. Summary of Results

External trade benefits could not lead to positive and significant changes in life expectance rate at birth in English speaking West African Countries (EsWACs) within the review period. The test revealed that it would be about 10% possible for life expectancy rate at birth to be adjusted to long run equilibrium relationship with external trade benefits in the sampled countries within the period of study. Also, there is a strong and obvious cross sectional dependence found in all the series of the five countries and the panel equation of LEP_{it} does not have cross sectional correlation across the series (the five countries) and they also established the presence of cross sectional dependence in the panels; thereby justifying the use of the 2nd generation panel data econometric method.

Specifically, in Gambia (coded 1) the life expectancy rate ranged from 46.35% to 67.88%, within the range of 21.53%. In Ghana (coded 2), the maximum life expectancy rate is 60.79% while the minimum life

expectancy rate is 54.60% within the range of 6.19%. In Liberia (coded 3), the life expectancy rate equally ranges from 46.02% to 60 21% with range of 14.19%. In Nigeria (coded 4), the case is somewhat different with life minimum life expectancy rate of 45.55% and maximum value of 52.11% and a smaller range of 6.56%. And that of Sierra Leone (coded 5) maintained the value of 35.82% on a minimum scale and 44.84% as a maximum value. But the result of the descriptive statistics of the balanced panel data structure in Table 1 shows that the maximum value of life expectancy rate is 67.88% while at the minimum scale it is 35. 79% and the range is 32.09%. This strongly suggests that there are inherent differences in the life expectancy rate of the EsWACs therefore implying the presence of cross section dependency. This is confirmed by the result in Table 6 that strongly informed the rejection of the null hypothesis of cross-sectional independence across the countries in English Speaking West African Countries and this accounts for why there is relatively low coefficients of variation in life expectancy at birth.

Discussion of Empirical Results

In explaining this result, it is important to keep in mind that external trade benefits are proxied by export earnings, degree of trade openness, total government expenditure, and foreign exchange rate was introduced as a control variable. The major finding under this model reveals that positive changes in external trade benefits could not lead to positive changes in life expectancy rate in EsWACs within the study period. It is also revealed in Table 6 that external trade benefits in forms of EXE, TGE, FER, and TOP have very low and insignificant percentage variability of 0.3%, 0.8%, 0% and 1.3% that could be responsible in the prediction of increase in life expectancy rate of EsWACs respectively.

The same tables also show that the speed of adjustment of life expectancy rate at birth from the short-run to the point of long run equilibrium position is about 10%. This means that it will take these countries a reasonable time to be able to stimulate external trade activities that could spur increase in life expectancy rate. This is empirically logical, though the coefficients of the parameters are positive, but statistically impotent and as such each of these parameters cannot stimulate an increase in life expectancy rate at birth. Worthy of mention is the value of total government expenditure (TGE) by EsWACs on health is 0.8% which is relatively low. This is an abysmal situation that is capable of stultifying the length of life of the inhabitants of these countries.

Simply put, the meaning of this result is that in EsWACs, the number of years a new-born infant would live and the prevailing patterns of mortality at the time of his/her birth were to stay throughout his/her life are marginal and very far below the world acceptable standard. As a matter of fact, this goes a long way to suggest that the theoretical postulations of our study are not in tandem with this finding. This is because theoretically, the prior expectation is that increase in external trade benefits would lead to increase in life expectancy rate of EsWACs within the period of study. In this circumstance, the theories in our study provide a more general analysis of the development - through – trade-model which lays more emphasis on the use of earnings from external trade to stimulate economic development in the participating countries. But our result based on data analysis fails to validate this.

In the stream of agreeable studies that are related with these results, Ahmed (2007) and, Ahmed and Qayyum (2008) who examined the effect of government spending and export earnings on macroeconomic uncertainties with health care delivery in Pakistan from 1972 to 2005. They reported that export earnings and government spending have not significantly informed an improved health care situation in the country. In essence, in the face of this situation, a very long financial outlay and commitment to the operation of an effective health care delivery system would be required in an era of dwindling attention to the real sector of the economies of EsWACs. One of the suspected factors that could lead to low status of life expectancy at

birth is disequilibrium between the demand for and supply of healthcare services. The reason for this result could be that at times the general economic status of these countries will make demand for healthcare services to significantly outweigh that of supply of healthcare services; other reasons could be policy instability, corruption and inappropriate macroeconomic environment among others.

However, this finding disagrees with that of Gupta, Verhoeven and Tiongson (2004) who conducted a study on 50 developing and transition countries and report that government spending on health care strengthens a country's health status. Also, Greenidge and Stanford (2007), using panel data of 37 countries from 1994 to 2005 attempted to identify the variables that are statistically significant in determining health status in Latin America and the Caribbean. The results imply that increases in health expenditure as a ratio of GDP, per capita income and literacy rate and urbanization rate add to a population's health status as measured by life expectancy, while per capita carbon dioxide emissions reduce longevity.

A negative and weak relationship exists between life expectancy rate and external trade benefits in the countries under investigation and as such external trade benefits did not significantly increase life expectancy rate at birth within the time and countries in our study. From these revelations, the minimum life expectancy in Ghana (coded 2) and Nigeria (coded 4) are greater than that of other countries, yet the other analyses showed that the region has a very low life expectancy. This is particularly attributed to the reality of cross-sectional dependence in the panel structure of the variables used in the study across the five countries. The unfavourable economic implications of this insufficient increase in life expectancy rate are pervasive, more so, the dissatisfaction that people derive from shorter life expectancy contribute to the short life span of the people

Policy Implications of the Results

External trade benefits did not significantly and positively impact life expectancy rate at birth. The implication is that increase in external trade benefits did not lead to increase in life expectancy rate at birth in EsWACs over the period of study. The economic policy implication of this finding is that increase in economic benefits from external trade has not led to significant increase in budgetary provision for the health sector through government expenditures of the five countries. Consequently, if there is adequate budgetary provision for the health sector and efficient utilization of the budgeted resources, all other variable remaining constant, then life expectancy rate at birth will likely improve.

VI. CONCLUDING REMARKS AND RECOMMENDATIONS

This study empirically tested the long-run equilibrium relationship between external trade benefits and life expectancy at birth in English speaking West African Countries. The cross-sectional dependence test reveals that the common factors stresses the relevance of dynamic feedback effects or international business cycle shocks in explaining the long run equilibrium relationship in cross-sectional studies as we have in this case. Thus, there is no evidence of long-run equilibrium relationship between external trade benefits and life expectancy rate at birth. Nevertheless, the study also recognizes the presence of heterogeneity, cross sectional dependence and differentials in the series among the EsWACs. Our findings are related to extant literature on external trade and establish a balance between the optimistic and pessimistic trade theories or schools of thought in explaining the impact of external trade benefits on economic development in EsWACs. This means that external trade partly serves as an engine of growth and propeller of development among developing countries, as evidenced in the results of the study.

Finally, after summing up the findings, the study submits that external trade benefits did not significantly and positively impact life expectancy rate. Hence, the study concludes that there is no long run equilibrium between external trade benefits and life expectancy at birth, so the impact of external trade benefits on life

expectancy rate is of little consequence among EsWACs within the period of study. Also, the study established that 2nd generation panel data econometric method developed by Pesaran (2004), Pedroni (2004) and Westerlund (2007) are valid in cross sectional dependency studies.

In line with the findings, the following recommendations are advanced for proper policy measures to be taken in order to improve the status of life expectancy via the benefits accruable from external trade in English Speaking West African Countries. First, conscious efforts should be made by governments to fine-tune the various indices of external trade benefits in order to exert some influence that could stimulate economic development. The governments of EsWACs should direct their total expenditures to the provision of economic, social and physical infrastructural facilities that could improve the standard of living and life expectancy of citizens. Appropriate domestic policies should be implemented by aiming at efficient resources allocation to both internal and external opportunities so that export diversification could be complemented by import substitution. And the governments of EsWACs should pay more attention to investment in human capital as this is expected to help improve the standard of education and health status of the citizens (See: Onodugo, Kalu and Anowor, 2013). This will in turn improve literacy rate and the life expectancy rate in their countries

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