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Research article

Causal Relation between Insurance and Economic Growth in selected Sub-Saharan Africa: A Heterogeneous Panel Causality Approach

Taiwo AKINLO

Department of Economics, Adeyemi College of Education, Ondo

E-mail: taiwoakinlo@yahoo.com, +23408030624692

Abstract

The causal relationship between insurance and economic growth in sub-Saharan Africa from the period of 1995 to 2011 was the focus of this study. The annual data for a panel of 30 sub-Saharan Africa Countries was used. We conducted Granger causality test in heterogeneous panels by testing first for Homogeneous Non-Causality and Homogeneous Causality hypotheses. The non-homogeneous test which test the hypothesis that GDP does not granger cause insurance and insurance does not granger cause GDP was rejected meaning that there is bidirectional causality between economic growth and insurance in sub-Saharan Africa. The homogeneous causality tests which test the hypothesis that GDP granger cause insurance and insurance granger cause GDP was accepted. Itmeans that causality is homogeneous across all member of the panel.

Key words: Economic growth, insurance, causality, unit root, panel data, sub-Sahara Africa

Jell Classification: 04, G40, C13, C82, C33, F01

1.0 Introduction

The relationship between economic growth and financial development has being a subject of controversy in the literatures. Essentially, the debate among the researchers has focused on which leads to other between financial development and economic growth. While some studies found financial development leading to economic growth some found economic growth leading to financial development Levine (1993a). This financial development-economic growth nexus is convoluted by another view that the relationship is dynamic in nature. Till today, there has been no precise solution on which policy makers could possibly rely upon. Asides, we find that the related studies done in the past four decades mostly focused on the role of financial development in stimulating economic growth, without taking into consideration the influence of insurance development (Arena, 2006).

The importance of insurance in trade and development was recognized during the first conference of UNCTAD (1964) and a statement that "a sound National Insurance and reinsurance market is an essential characteristic of economic growth'' was made(Akinlo and Apanisile 2014). The significance of the relationship between financial development and economic growth has been a subject of discussion for a while in the field of economic development (Yousuf 1998). In fact, financial development is considered an essential ingredient in any conscious effort to enhance economic development and growth. According to Yousuf (1998) there seem to be consensus in the recent studies on this subject as most of the studies are now accepting the hypothesis that financial development is very important and crucial for success of economic growth.

According to Beck and Webb (2003)there have being a significant growth in the insurance sub-sector worldwide in the last few years. The contribution of the insurance sector to the financial sector has been outstanding in the past years. Also over the years according to Skipper (2001) a lot of studies have identified "mobilization of domestic savings, more efficient management of different risks, mitigation of losses, more efficient allocation of domestic capital and promotion of financial stability" as some of the various channels through which insurance is positively influencing economic growth in the literatures.

In the past few years, there are many studies that have examined and pointed out the precise contributions of insurance to the economic growth processes and also to the welfare development of the poor. Both empirical and theoretical studies has shown that insurance contributes to economic growth by providing conducive investment climate and also the alternative efficient mix of activities than would be undertaken when risk management is not available. These contributions are more visible through the various activities of banks and other financial institutions.

Few recent studies on the insurance sector either explore its importance to the economy or analyze the impact of insurance on the economic growth neglecting the possibility of feedback effect. Indeed, only few known studies to our knowledge have been published on the causal relationship between insurance and economic growth in sub-Saharan Africa. It is expedient to inquire not only into the growth of the insurance sector in sub-Saharan Africa but also the nature of the relationship between the sector and economic growth. In particular, it is important to know the precise direction of causality between insurance and economic growth. This is why the main focus of this article is to examine the causal relationship between insurance and economic growth in sub-Saharan Africa. Also in this study we will use innovative econometric methodology to study the

direction of causality between economic growth and insurance sub-Saharan Africa. This methodology to the best of our knowledge has not been used to examine this topic in the existing literature. Many studies have used traditional Granger-causality test to determine the direction of causality between economic variables but the major deficiency of this methodology according toNdoricimpa (2009) is that it ignore heterogeneity problem in the cross-sections. Therefore, in this study we adopt Heterogeneous Panel Granger causality tests developed byHurlin and Venet(2001, 2003) and Hurlin (2004, 2007 and 2008) which addressed heterogeneity problem in the cross-sections.

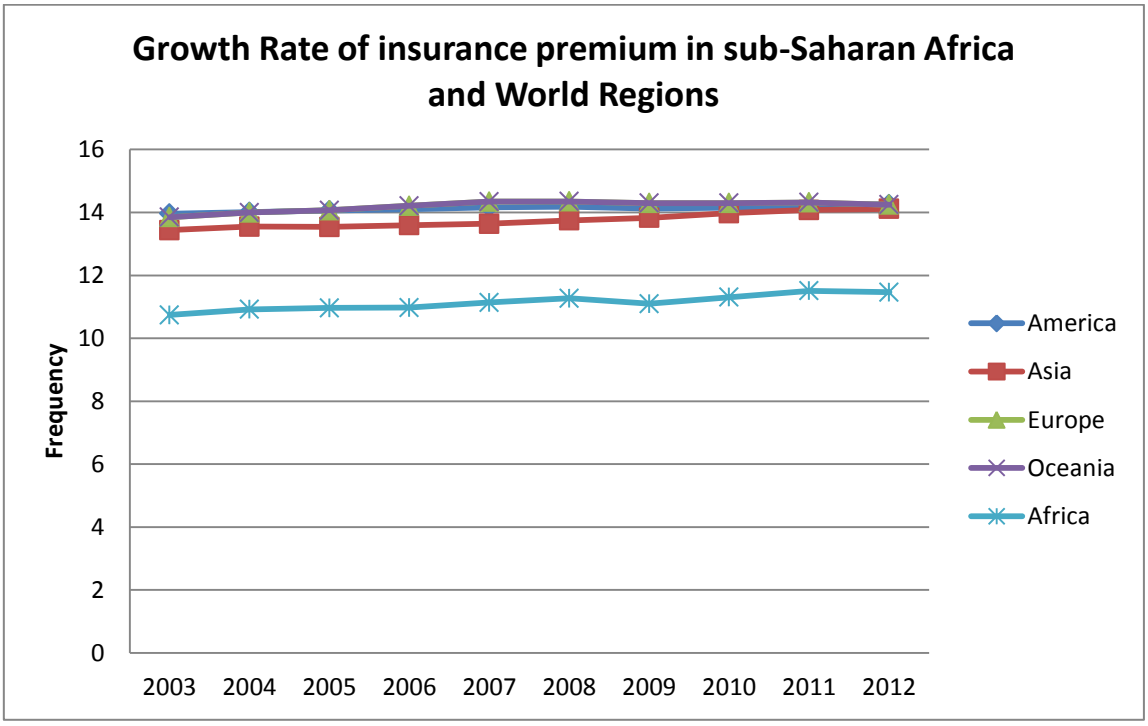
The remainingpart of this paper is structured as follows: next to the introduction above, we provide an overview of the insurance sub-sector in sub-Saharan Africa. Next is the summary of the empirical studies on the causal relationship between insurance and economic growth. After the summary of empirical studies we discuss the methodology adopted in the work and then provide the empirical results while the concluding remarks form the last section.

2.0 Development of Insurance in sub-Saharan Africa

The insurance market in sub-Saharan Africa faces challenges ranging from current economic and political environment. The economic weakness and fiscal tightening of sub-Saharan Africa countries have been limiting the growth of insurance sub-sector over the years. The Sub-Saharan Africa insurance markets are in a typical early stage of development, where the major business is taking place in non-life and group business in life. The insurance industry in Africa has been experiencing constant and steady growthin comparing to other sectors of the financial services industry. Between 2000 and 2012 the premium was growing at average of 7% annually in Sub-Saharan Africa and reached 8.9billion USD in 2011. The Premium growth was highest in the oil producing and middle income countries. Nigeria, Kenya, Angola, Namibia and Mauritius are the five largest market of insurance and they have a combine markets share of 59%. The Non-life premium account for two-thirds of the total market which is high compare to other emerging region.

The penetration of insurance in sub-Saharan Africa is very low comparing to other emerging market average. The penetration of insurance in sub-Saharan Africa generally, is roughly one per cent apart from South Africa and only 7 countries have penetration that is above 2 per cent. Different stages of development and offering of relatively diverse product is one of the major noticeable features of insurance sector in sub-Saharan African countries. The non-life insurance dominated insurance industry in sub-Saharan Africa while life insurance is still in early stage of development. In many countries Life insurance is relatively undeveloped as they lack sufficient data on mortality and longevity as well as shortage of specialised skills they needed. South Africa accounts for 93 percent of life business and over 50 percent in non-life business in sub-Saharan Africa. The figure I below shows the growth rate of insurance premium in sub-Saharan Africa and the other region of the world.

Figure I: Insurance Premium growth rate in sub-Saharan Africa from 2003 to 2012



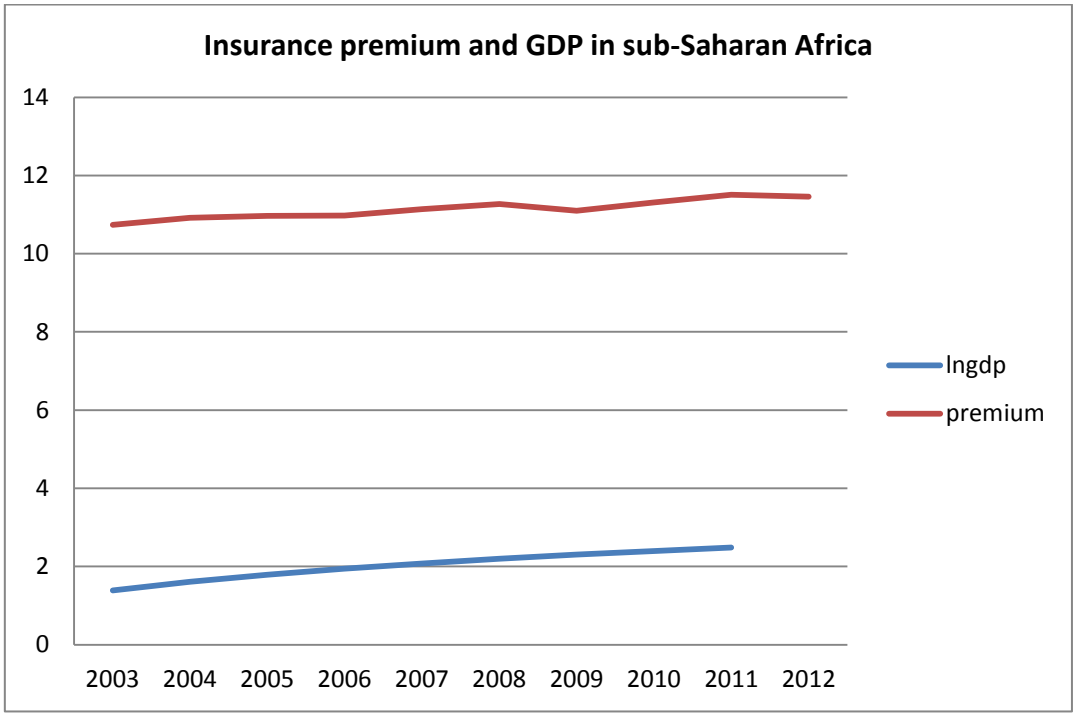
Source:Authors computation based on Swiss RE 2012

The figure I above shows that growth rate of insurance premium in sub-Saharan Africa compare with other regions of the world. From the above figure the growth rate of insurance premium in sub-Saharan Africa is far below the other regions of the world from 2003 to 2012. Regions like America, Europe and Oceanic are almost experiencing the same level of growth while Asia is little behind. Also from the above figure it shows that from the same period of 2003 to 2012 the growth rate of insurance premium in sub-Saharan is increasing faster than any other regions of the world which means that if this growth rate continues like this sub-Saharan Africa might catch up with other regions of the few years to come. From 2010 to 2012 there is clear evidence that Asia region almost catch up as it experiencing higher increasing insurance premium than Europe, America and Oceanic. In summary, almost all developed economies experienced decrease in premium market growth since the financial crisis, declining on average by 0.3% per year since 2008. The decline was more noticeable in America, Europe and Oceania regions.

In comparing the growth rate of insurance premium with that of GDP in sub-Saharan Africa,on average premium growth was stronger than economic growth in sub-Saharan Africa and this is quite different from what is happening in advanced economies where until 2012 the economic growth rate always outpaced insurance premium growth. This can be seen from the figure II below. This implies that insurance penetration is increasing steadily in sub-Saharan Africa and this is a sign that insurance has a future in sub-Saharan Africa. This is also in line with Swiss Re (2013) that African insurance market has very strong growth potential, particularly in sub-Saharan Africa, driven by economic activity which will boost demand for insurance. According to Swiss Re

(2013) insurance penetration is very low in sub-Saharan Africa but the trend and pattern in the recent years shows that there is lot of improvement as the awareness of the usefulness of insurance is increasing through the introduction of new products such as micro-insurance and Takaful by the insurance companies in an attempt to expand and boost their market penetration.

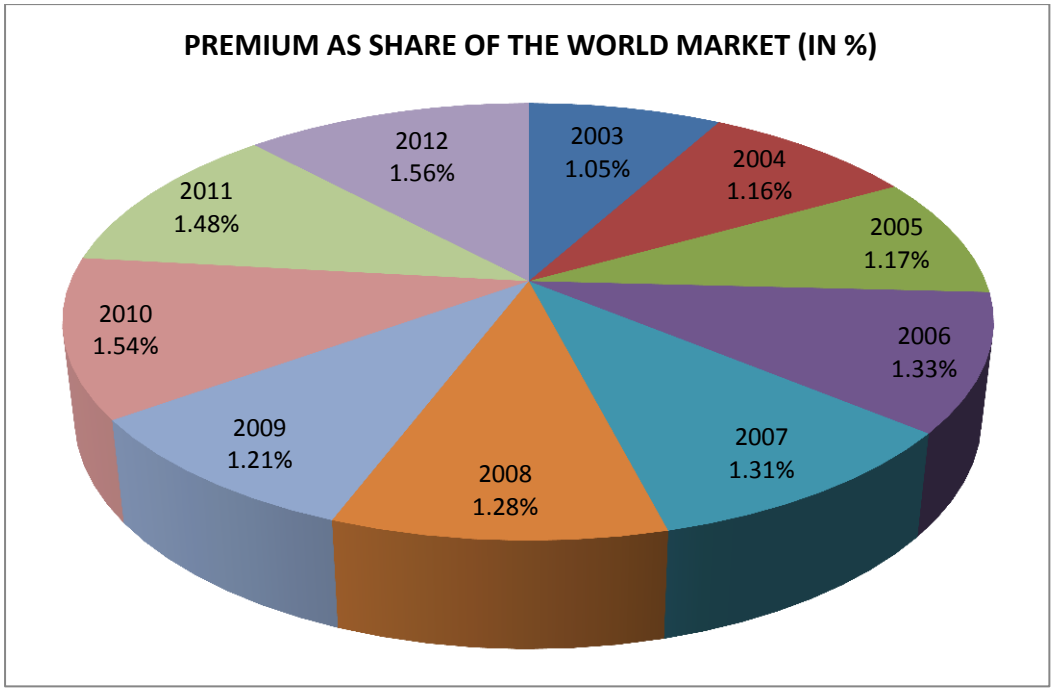
Figure II: Insurance and GDP in sub-Saharan Africa



Source: Authors computation based on Swiss RE 2012

The figure III below shows the Africa premium share of the world market from 2003 to 2012. This figure reveals that Africa insurance premium share of the world total market is very low; it ranges from 1.05% to 1.56%. This figure also shows that there is inconsistence in the contribution of insurance in Africa to the world market. There was an increase in the share of insurance to the world market from 2003 to 2006 but in 2007 there was decline in the share of Africa premium as it falls below the share of 2006 and this decline continues till 2009. In 2010, Africa premium recorded the highest share of 1.54% at this particular time the share of America was 32.49% while that of Europe was 37.35%.

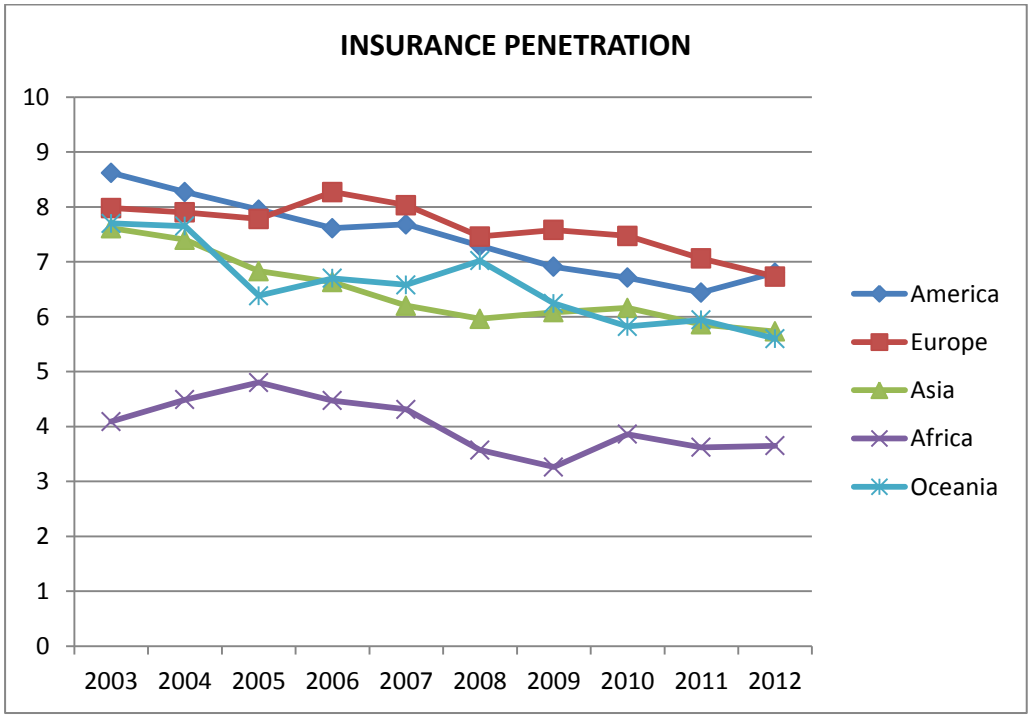
Figure 3: Premium as share of the world market (in %)



Source: Authors computation based on Swiss RE 2012

As regarding insurance penetration in sub-Saharan Africa, there is still long way to go for this region to catch up with the rest of the world. The figure IV below show the insurance penetration in sub-Saharan African compared to other regions of the world.

Figure IV: Insurance penetration from 2003 to 2012



Source: Authors computation based on Swiss RE 2012

The figure IV above shows that insurance penetration in sub-Saharan Africa is the least compare to other regions of the world. In the last ten years sub-Saharan Africa recorded the highest insurance penetration in 2005 in which total insurance premium was is 4.80% of GDP and recorded the lowest penetration in 2009. Following the figure above the insurance penetration was steadily growing from 2003 and reached its peak in 2005. After 2005 the insurance penetration started falling and reached the minimum level in 2009 and started picking up in 2010. The falling of insurance penetration in 2009 is not strange as all other region also experienced decline in insurance penetration apart from Oceania region that experienced increase in penetration during the period. The decline in insurance penetration during 2008-2009 throughout the region can be linked to the economic melt down in 2008.

From the review of the insurance in SSA so far it shows clearly that insurance sector still has a long way to go compare to other regions of the world. But with the vast population of Sub-Saharan Africa over 780 million the hope of insurance is very high if the regulatory oversight can be improved and regulatory and supervision strengthen these can lead to consolidation, a better capitalized industry that can increase consumers confidence in insurance services.

3.0 Review of Empirical literature

Hak(1996) investigated the relationship between life insurance and economic growth both theoretically and empirically.The author in this study examines what could be the implication of increase in the life insurance premium tax on saving and consumption, the impact of life insurance on productivity and the causality between life insurance and economic growth.The author developed a dynamic optimization model to in an attempt to determine the effect of life insurance in an individuals' attempt of maximizing their expected life-time utility.Theoretically the author shows that the availability of tax-loaded life insurance has an impact on the accumulation process of individual wealth, but not aggregate wealth. The theoretical model of the author suggests that a permanent increase in the annuity premium tax rate in a lending economy decreases the steady state aggregate consumption and aggregate wealth. However, the dynamic effect of a permanent increase in the insurance premium tax rate in a borrowing economy on the steady state equilibrium is undecided. Empirically, the author found that the growth in the life insurance industry has positive impact onboth productivity growth and economic growth. And finally, the author found a unidirectional causality running from life insurance to economic growth.

Boon (2005)investigated the growth supportive role of commercial banks, stock markets and the insurance sector. The results of the author show that there is unidirectional causality running from bank loans to economic growth both in short and long run.Also the author found a bidirectional relationship between capital formation and loans. In the short run economic growth improvedthe stock market capitalization while in the long run market capitalization enters significantly when determining the capital formation. Total insurance premiumhas positive effect on economic growth in the long run and capital formation in both the short and long run.

Arena Arena (2006)tested the causality relationship between insurance market activity (life and non-life insurance) and economic growth. The author adopted generalized method of moments for dynamic models of panel data for 56 countries from the period of 1976-2004.In his results, the author found that there is causal relationship between insurance market activity and economic growth. The impact of both life and non-life

insurance on economic growth are positive and statistically significant. The author stated that high-income countries steer the results in the case of life insurance while on the other hand, both high-income and developing countries steer the results in the case of non-life insurance.

Adam, Andersson, Anderson and Lindmark (2009)analyzed long run historical relation between banking, insurance and economic growth in Sweden using time-series data from 1980 to 1998. The authors used econometric tests for cointegration and Granger causality to determine the conjoint effects of banking and insurance on economic growth. In addition to the whole period, they tested for the causal relationship among the variables over the sub period (1830-1988, 1889-1948 and 1949-1998). The authors found that there was development of the bank lending activity before the economic growth and increase in demand for insurance in Sweden in the nineteenth century.But in the twentieth century there was a reverse in the Granger causality. In addition to this, the authors found that in later sub periods insurance development boost the demand for banking services but only in times of economic prosperity. The authors results for the entire period show that it was the banking that had the major influence on both economic growth and the demand for insurance while insurance market appeared to be driven more by the pace of economic growth rather than leading economic development.

Table I:Summary of some empirical papers examined the causality links

Author (s)	Year	Countries	Methodology	Results
Hak	1996	US	Dynamic optimization	Life insurance granger cause economic growth
Catalan, Impavido and Musalem	2000	14 OECD, 5 emerging countries	Granger equations-causality tests	Absence of causality in many OECD countries, while the results of emerging countries are mixed, when causality does exist, it runs from contractual savings to market capitalization.
Webb, Grace, and Skipper	2009	55 countries	Simultaneous equations	Supply-leading
Boon	2005	Singapore	Cointegration tests and Granger equations	Supply-leading: insurance to GDP
Arena	2006	56 countries	GMM dynamic panel estimations	Insurance market activities Granger cause Economic growth
Arena	2008	56 countries	GMM dynamic panel estimations	Supply-leading
Adams, Andersson, Andersson, and Lindmark	2009	Sweden.	Granger equations-causality tests	Supply-leading for insurancewhile insurance or economic growth are not granger cause by bank lending.
Curak, Loncar and Poposki	2009	10 EU countries	OLS and 2SLS estimations	Supply-leading
Han, Li, Moshirian, Tian	2010	77 countries	GMM dynamic panel estimations	Supply-leading

Author (s)	Year	Countries	Methodology	Results
Ching, Kogid, Furuoka	2010	Malaysia	Cointegration tests	Demand following: GDP to life insurance.
Avram, Nguyen and Skully	2010	93 countries	OLS and GMM panel estimations	Supply-leading
Chen, Lee and Lee	2011	60 countries	GMM dynamic panel estimations	Supply-leading: life insurance market to economic growth.
Ward and Zurburegg	2011	9 OECD countries	Cointegration and Granger causality	Insurance Granger cause economic growth in some countries and no causality in other countries.
Ming-Sun, Yung-Wang and Ting-Yi	2012	Taiwan	Vector Autoregressive (VAR) model	Short run unidirectional causality from economic growth to insurance demand andfrom financial development to economic growth.
Hussels, Ward and . Zurbruegg	2012	Nigeria	Cointegration, OLS, and variance decomposition techniques	Unidirectional granger causality from investment in cash deposit and hand (IVCD) to GDP
Nwinee, and Torbira	2013	41 countries		Short run bidirectional causality

Ching, Kogid and Furuoka(2010) examined the causal effect of life insurance assets on economic growth. This was experimented using the co-integration analysis with quarterly data drawn from Malaysia for the period 1997 to 2008. On the whole, the evidence, particularly from the regression result seems to suggest that there is a one way relationship flowing from real GDP to life insurance sector. No causal relationship flowed from life insurance to GDP. This shows that the response by the economy growth indicators to life insurance sector variables like savings mobilization, risk management and investment do not completely grow the economy.

Chen, Lee and Lee (2011) focused on the relationship between life insurance market development as well as stock market operations and the implication for economic growth using data from1976 to 2005 for 60 countries. A derivative of the endogenous growth model was employed to analyze the relationship. The generalized method of moments (GMM) technique was used in estimating the equations that link life insurance and stock market with growth. The result from the study shows that the development of the life insurance market leads economic growth. The results further showed some evidence that stock market and the life insurance market are substitutes rather than complements. The results imply that causality runs from life insurance market to economic growth.

Ming, Yung and Ting (2012) examined the dynamic relationship among insurance demand, financial development and economic growth in Taiwan between 1961 and 2006. The authors adopted a three-variable

Vector Autoregressive (VAR) model; the authors tested two hypotheses empirically. The two hypotheses are the demand-following andthe supply-leading.The authors extended the conceptual link among these variables proposed by Hussels, WardandZurbruegg(2005). In there results, they found symmetry relationship between insurance demand, financial development and economic growth. The authors show that economic growth Granger causes insurance demand while financial development Granger causes economic growth in the short run. In other words, the financial development positively and significantly impact economic growth, and a change in real GDP leads to deviation in real insurance demand in Taiwan.

Nwinee and Torbira (2012) investigated the empirical relationship between components of insurance investment and economic growth indicator (GDP) of the Nigerian economy as well as the direction of causality between them. They also examined the impulse response function of the insurance investment variables to shocks in the economic system. The authors used data which covered the period 1980 to 2010 and co-integration, OLS, and variance decomposition techniques were employed. Long run positive and significance relationship was found between GDP and insurance investment in government securities (IVGS), stocks and bonds (IVSB), real estate and mortgage (IVRM) and cash deposit and hand (IVCD) and a unidirectional granger causality from investment in cash deposit and hand (IVCD) to GDP. In the short run,insurance investment in stock and bonds (IVSB) positively and significantly correlate with GDP while IVGS and IVRM negatively but significantly correlate with GDP. The relationship between IVCB and GDP in the short run is positive but insignificant. The results of the impulse response and variance decomposition of GDP to shocks emanating from IVGS, IVSB, IVRM and IVCD show that own shocks remain the dominant source of total variations in the forecast error of the variable.

Lee, Lee and Chiu (2013) examine the link between life insurance activities and economic growth in 41 countries from 1979 to 2007. The panel seemingly unrelated regressions augmented Dickey-Fuller (SURADF) were adopted to re-investigate the stationarity properties of real life insurance premiums per capita and real gross domestic product (GDP) per capita. Based on the seemingly unrelated regressions augmented Dickey-Fuller (SURADF) test the variables are a mixture of I(0) and I(1). Therefore, using the traditional panel unit-root tests will produce misleading inferences. The result of the estimated half-lives shows that in high income countries the degrees of mean reversion are greater. When heterogeneous country effect is allowed, the results show that there is long-run equilibrium relationship between real GDP and real life insurance premiums. The long-run estimated panel parameter results indicate that a 1% increase in the real life premium raises real GDP by 0.06%. Finally, they found bidirectional causalities between economic growth and the development of life insurance markets in both long-run and short-run.

4 Methodology

4.1 Panel unit root test

According to Maddalla and Wu (1999)the use of panel data unit root test has being suggested that it will increase the low power of unit root tests based on single country time series.The panel data unit roottests such as Levin, Lin and Chu (2002), Breitung (2000) and ImPesaran and Shin (2003), Fisher-type tests using ADF and PP tests Maddalla and Wu (1999) and Choi (2001), Hadri (2001) and others has been proposed. These tests are generally based on the AR (1) processes:

$$\Upsilon_{it} = \mu_i + r_i t + \sigma_i \Upsilon_{it-1} + \varepsilon_{it} \quad (1)$$

where t = 1,…, T is the number of periods and i = 1,…, M is the number of countries, r_i represents individual trend, μ_i represents the country specific fixed effect, ρ_i represents an autoregressive coefficient, and the error term is ε_{it}. If $|\sigma_i| < 1$, Υ_{it} is said to be weakly (trend-) stationary. On the other hand, if $|\sigma_i| = 1$ then Υ_{it} contains a unit root. The assumptions that σ_i is constant or varyingled to the classification of panel unit root into two. The Levin, Lin and Chu (2002),Breitung (2000) and Hadri (2000) are the tests that assume that the autoregressive parameter ρ_i is constant across the countries.While Maddala and Wu (1999), Choi, (2001)andIm, Pesaran, Shin, (2003) and Fisher-ADF and Fisher-PP assume that ρ_i varies across the countries. Both the two types of panel unit root test has the same null hypothesis,in other words there is a unit root in all series while the alternative hypothesis varies depending on whether σ_i is assume that σ_i is constant, the alternative hypothesis is there is stationarity of all the series. This is shown below:

H_0: $\sigma_i = 0$ for all i

H_A: $\sigma_i = \sigma < 0$ for all i

The other group of tests which assume that ρ_i varies across countrieshas the alternative hypothesis that there are unit roots in some (but not necessarily all) of all series. This is stated below.

H_0: $\rho_i = 0$ for all i

H_A: $\rho_i < 0$ for all i

Levin, Lin and Chu (2002) and Im, Pesaran and Shin (2003) are the two panel unit root tests we adopted and these two tests have alternative hypothesis. In the Levin, Lin and Chu (2002) test it is assumed that the autoregressive coefficient (which indicates whether or not unit roots are presents) is homogeneous. Despite the assumption of homogeneous of autoregressive coefficient, the Levin,Lin and Chu (2002) testmade provision formake heterogeneitythrough the allowingof fixed effects and country-specific time trends. Inthe Im, Pesaran and Shin (2003) test, ADF test or regression for each individual country's will be clearly stated and specified. The overall t-test statistics are also given by ADF.

4.2 Panel cointegration test

In order test for cointegration in this study we adopted Pedroni (2004)for the panel cointegration test. The term of cointegrationmeans thereis long-run relationship between two or more economic variables. The cointegrating equation takes the form:

$\lambda_{it} = \lambda_i + \kappa_{it} + \lambda_i \chi_{it} + \varepsilon_{it}$ (2)

For t = 1…, T and i = 1…., N. The fixed effects, λ_i and slope coefficients γ_i are allowed to vary across individual countries.

$\varepsilon_{it} = \psi_i \varepsilon_{it-1} + v_{it}$(3)

whereψ_i is the autoregressive coefficient of the residual ε_{it} from equation 2.

Seven panel cointegrationtest were developed by Pedroni(2004)these tests are based on the estimated residuals from the long run model below:

$\gamma_{it} = \alpha_i + \sum_{j=1}^{m} \beta_{ij}\, x_{ijt} + \Sigma_{it}$

where$\Sigma_{it} = \rho_i \Sigma_{it-1} + w_{it}$are the estimated residuals from the panel regression.

The first four of these cointegration tests are within-dimension statistics which are obtained by pooling the autoregressive coefficient acrossmany countries for the unit root tests on the estimated residuals. The first four statistics includes panel v-statistics, panel rho statistics, "panel non-parametric statistics and panel-ADF-statistic. The within-dimension statistics test the null hypothesis of no co-integration, H_0: ψ_i = 1 for all i against the alternative, H_A: ψ_i = ψ < 1 for all i. The next three tests are obtained by pooling the residuals along the between-dimension of the panel and they are termed group mean statistics. These three statistics includes group rho-statistics, group pp-statistic, and group ADF-statistic. The null hypothesis of the between-dimension statistics is given byH_0: ψ_i = 1 for all i and the alternative is H_A: ψ_i< 1 for all i. Hsiao (1986)revealed that the panel v-statistics is a one-sided test where large positive value rejects the null hypothesis of no cointegration. For the other statistics large negative values rejects the null hypothesis of no cointegration. In this study all the seven statistics as proposed by Pedroni to test for cointegration will be used.

4.3 Panel causality test

This study makes use of the panel causality testing proposed byHurlin andVenet (2001). There are two crucial inferential issues that are normally generated while conducting granger test with panel data. Both the two inferential issues are dealing with the potential heterogeneity of the individual cross-sections. The first type of variation occurred as results of the differences in intercepts of different countries. Country specific fixed effect in the model can be used to controlthis type of heterogeneity. The causal variation across units is noted as the second source of heterogeneity. There is clear evidence in the literatures that this type of heterogeneity has being ignored and therefore give false information that normally lead to wrong conclusions about causality. Traditional panel causality such as Hsio (1986, 1986) and Holtz-Eakin (1988) ignore this type of heterogeneity problem in the cross-sections. Thus, it was due to this type of heterogeneity that led to the development of the tests by Hurlin and Venet (2001),Hurlin (2004) and Hurlin (2007)so as to deal with this type of heterogeneity.

Hurlin and Venet(2001)make use of a panel Granger model where for each individual i and for all t in [1, T] we have:

$$y_{i,t} = \sum_{k=1}^{r} \lambda^{(k)} y_{i,t-1} + \sum_{k=0}^{r} \Gamma_i^{(k)} y_{i,t-k} + v_{i,t} (4)$$

where autoregressive coefficients (k) and the regression coefficients slopes i(k) are assumed to be constant for all k in [1, r].The autoregressive coefficients are also assumed to be the same for all units while the regression coefficients slopes can vary across individuals. Due to this, there were four types of causality relationships proposed by Hurlin and Venet (2001) to take care of the heterogeneity of the underlying processes. The testing procedure involves the combination of various set of tests that makes use of the F-test and when the null hypothesis of the first case is rejected we could then proceed to second case and even further depending on the results. But when the null hypothesis for any case could not be rejected the tests can then be ended. The 4 causality tests are therefore stated below. Homogenous Non Causality (HNC) is the first test which implies testing weather a particular variable is not causing other i.e. variableA is not causing B in all the cross-sections of the samples. If theF-statistic computed is significant, the Homogenous Non-Causality Hypothesis is rejected (that means there is existence of causality in at least one member of the panel), and we go on to test the Homogenous Causality Hypothesis (HNC). On the other hand, if the Homogeneous Non Causality Hypothesis is accepted i.e. if the F-statistics is not significant, it means that there is no causality relationship among any member of the panel and the testing process will not proceed further.

The second case is the testing for Homogenous Causality (HC) and testing under this implies testing weather one variable is causing other i.e. variable A is causing B in all the countries of the sample. If the F-statistic is not significant, the Homogenous Causality Hypothesis will be accepted and this means that there is a causality relationship in all members of the panel and further testing will not be necessary. But when Homogeneous Causality (HC) Hypothesis is rejected it means there is no causality relationship in at least one member of the panel and we ensue to the third case. When Homogeneous Causality (HC) hypothesis is rejected it means there isno homogenous causality and we then move on to the heterogeneity tests to determine which of the members of the panel exhibits a causal relationship. Heterogeneous Causality (HEC) is the third case and the implication of this is that there are causal relationships that exist in at least one individual, and causality could rise to a maximum of N. The fourth case which is the last one is Heterogeneous Non Causality (HENC) which means thatnot less than one individual, and at most N-1 individuals, there is causality relationship that exists among them.The rejection of HENC hypothesis means that the statistic is significant; therefore, there is causality relationship that exists for the individual under consideration. In the second test the joint hypothesis of no causal relationship for a subgroup of individuals in the panel is tested. In this case, the slope coefficients of all lags for the individuals of the subgroups are constrained to zero. If the F-statistic is significant, this implies rejection of the HENC for the sub-group under consideration and concluding that causality exists for this subgroup of panel membersBabajide (2010).

5 Data

We estimate panel data of 30 selected sub-Saharan Africa countries over the period of over 1986-2011. All the countries in the sample are listed in the Appendix 1while the appendix 2 contains the full definitions and all the sources of the variables used in the study.

6 Empirical results

Our empirical investigationinto whether there is causal relationship between insurance development and economic growth in sub-Saharan Africa started with unit root test where we test for the stationarity of all the variables. The results of panel unit root are presented in Table II below. The results show that apart from GDP and PREM under Levine et al. statistics with trend all other variables are stationary at levels. We can therefore conclude that all the variables are integrated of order 1 and we can progress to panel cointegration test.

Table II: Panel unit root tests

Variables	Levine et al		Im et al	
	without trend	with trend	without trend	with trend
GDP	3.21*	0.67	7.63*	2.48
	(0.9993)	(0.7497)	(1.0000)	(0.9934)
PREM	-6.39*	1.39	-6.27*	2.71*
	(0.0000)	(0.9139)	(0.0000)	(0.9189)
INT	-1.59*	-3.70*	-1.72*	-3.45*
	(0.0552)	(0.0001)	(0.0431)	(0.0003)
INF	-7.75*	-8.11*	-8.61*	-7.24
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
OPEN	-1.74*	-4.33*	-1.46*	-2.68*
	(0.0406)	(0.0000)	(0.0406)	(0.0037)

Note: *, ** and *** indicates statistical significance at the 1%, 5% and 10% level respectively.
Values in () are p-values. All the variables are in logarithm apart of interest rate.

In order to test and ascertain whether long-run relationship exists between Economic growth and insurance in our panel of sub-Saharan Africa Countries. We start with bivariate cointegration test. Table III below shows the results of Pedroni's panel cointegration tests between economic growth and insurance. The panel co-integration test results are presented in Table III below. The results shows that all the test statistics, panel cointegration tests and Group mean cointegration tests, except the panel v-Statistic with trend, strongly accept the null hypothesis of no cointegration. Base on Pedroni (2004)cointegration tests, we hence conclude

that there is no long-run relationship between economic growth and insurance in the sample of sub-Saharan Countries.

Table III: Bivariate Panel co-integration

	without trend	with trend
Panel v - stat	-1.64 (0.9501)	1.65 (0.0493)
Panel rho - Stat	2.33 (0.9903)	1.77 (0.9616)
Panel PP -stat	3.06 (0.9989)	0.25 (0.5991)
Panel ADF	5.08 (1.0000)	2.07 (0.9809)
Group rho - stat	4.99 (1.0000)	2.46 (0.9931)
Group PP - stat	6.23 (1.0000)	0.08 (0.5350)
Group ADF - stat	5.08 (1.0000)	1.30 (0.9043)

After examining the bivariate case we now moved to multivariate cointegration by testing the cointegration among all the five variables, economic growth, insurance premium, interest rate, inflation and openness for the case of sub-Saharan Africa Countries. Table IV below presents the Pedroni (2004) panel cointegration test results.

Table IV: Multivariate Panel co-integration

	without trend	with trend
Panel v - stat	-7.96 (1.0000)	-11.65 (1.0000)
Panel rho - Stat	7.27 (1.0000)	8.31 (1.0000)
Panel PP -stat	4.33 (1.0000)	3.41 (0.9947)
Panel ADF	6.42 (1.0000)	5.23 (1.0000)
Group rho - stat	9.93 (1.0000)	10.31 (1.0000)

Group PP - stat	6.62	3.16
	(1.0000)	(0.9997)
Group ADF - stat	9.19	6.28
	(1.0000)	(1.0000)

The results show that all the statistics do accept the null hypothesis of no cointegration. Since the majority of the test statistics shows that there is no cointegration, we therefore conclude that there is no cointegration between insurance and economic growth in sub-Saharan African. This means that there is no long run relationship between insurance and economic growth in sub-Saharan Africa. Evidence has shown from the past that even if there is no cointegration between two variables causality might still exist between them. Toda and Philips (1993)stated that if variables are I(1) but not cointegrated, causality could still exist between them. We can continue Granger causality test by estimating Vector Auto Regression (VARs) but error correction will be excluded. This implies that the short-run causality tests can be obtained.

After the panel unit root and panel cointegration tests, we now look at the panel causality tests using the methodology that takes into consideration the possible presence of heterogeneity in the panel. We follow Hurlin and Venet(2001, 2003), Hurlin(2004, 2007 and 2008)as presented in the methodology and assess the hypotheses of Homogeneous Non-Causality and Homogeneous Causality. The equations we are to be estimated take the form stated below:

$$\Delta PREM_{it} = \sum_{k=1}^{p} \alpha^k \, \Delta PREM_{it-k} + \sum_{k=0}^{p} \beta^k \, \Delta GDP_{it-k} + v_t \quad (5)$$

$$\Delta GDP_{it} = \sum_{k=1}^{p} \lambda^k \, \Delta GDP_{it-k} + \sum_{k=0}^{p} \varphi^k \Delta PREM_{it-k} + v_t (6)$$

Where ,$v_{it} = u_i + \varepsilon_{it}$, $u_i$are the individual effects and , $\varepsilon_{it}$are the disturbance terms and are i.i.d. (0, $\sigma^2{}_{\varepsilon}$). Unlike the previous Panel models, the model Hurlin and Venet (2001) assumes that the autoregressive coefficients ($\alpha^k$and λ^k) and the regression coefficients slopes (β^k and φ^k) are constant k [1, p]. It also assumes that parameters ($\alpha^k$and λ^k) are the same for all individuals, while the regression coefficients slopes (β^k and φ^k) can have an individual measurement.

The equation 5 and 6 are the two hypotheses to be tested and illustrated as follows: the null hypothesis of no causality from insurance to economic growth is tested by H_0: = β^k and the acceptance of H_0 means that insurance premium does not cause economic growth. Follow this is the test of null hypothesis of no causality from economic growth to insurance using H_0: φ^k = 0, and by accepting H_0it means that economic growth does not cause insurance.

The panel causality tests results are presented in Tables V and VI below. As we said earlier, Hurlin and Venet (2001) first stage of panel causality test is the Homogenous Non Causality Test. Testing for Homogeneous Non-Causality (HNC) hypothesis implies testing whether the variable A is not causing B in all the N cross-sections of the sample. If the HNC hypothesis fails to be rejected, this means that the non-causality

is homogeneous and testing procedure will not continue. The results of non-homogeneous causality are presented in Table V.

Table V: Panel Non-homogenous causality tests

H0: GDP does not Granger cause PREM	
Lags	F_{hnc}
1	75.75*
2	67.53**
3	67.22**

H0: PREM does not Granger cause GDP	
Lags	F_{hnc}
1	0.12
2	0.21
3	0.50

Note:
*, ** indicates statistical significance at the 1% and 5% level respectively.

In Table V above the first part tests the hypothesis that GDP does not cause premium and homogenous non causality hypothesis is rejected in all the lags i.e. lags 1, lags 2 and 3 which means that GDP granger causes insurance premium for at least one member of the panel. The second part of Table V above, the non-homogeneous causality hypothesis is not rejected in any of the lags which means that insurance premium does not granger cause GDP. The implication of this finding is that there exists unidirectional causality running from economic growth to insurance.

Since the HNC is rejected when the direction of causality is from GDP to insurance, we proceed and test for Homogeneous Causality hypothesis. The testing for the Homogeneous Causality (HC) hypothesis implies testing whether the variable A is causing B in all the N cross-sections (countries) of the sample. If the HC hypothesis fails to be rejected, this means that the causality is homogeneous and testing procedure goes no further. Table VI presents the test results for Homogeneous Causality hypothesis.

Table VI: Panel homogenous causality tests

H0: GDP Granger cause PREM	
Lags	F_{hnc}
1	0.51
2	0.05
3	0.18

H0: PREM Granger cause GDP	
Lags	F_{hnc}
1	0.25
2	0.42
3	0.99

Note:
*, ** indicates statistical significance at the 1% and 5% level respectively

The results of Table VI show that the hypothesis that causality is homogenous across all members of the panel is accepted. We therefore found that causality runs from both economic growth to insurance, and from insurance to economic growth. Our results are therefore in support of feedback hypothesis.

Conclusion

In this study we conducted an empirical investigation into the causality relationship between insurance and economic growth in 30 Sub-Sahara African countries for the period 1986 -2011.Panel unit root and co-integration tests were conducted to tackle the low power criticism of single country tests while we also conducted panel causality tests so that we can obtain reliable and efficient results. The result shows that there is no stable long-run relationship between insurance and economic growth. Regarding the results of the panel causality tests, we found a bi-directional causal relationship between insurance and economic growth for all members of the panel. This implies that our results supported the feedback hypothesis.This result is consistence

with Kugler and Ofoghi (2005) that found bi-directional relationship between insurance and economic growth and is also a confirmation of Outreville (2011) statement that insurance development is very important for the economic development, as it makes long-term investments available for economic growth, and also concurrently reinforcing the risk-taking abilities.

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Appendix 1: List of the countries

Benin	Gabon,	Niger,
Botswana	Gambia,	Nigeria,
Burkina Faso	Ghana,	Rwanda,
Cameroun	Guinea-Bissau,	Senegal,
Cape verde	Kenya,	Swaziland,
Central Africa Republic	Lesotho,	Sierra Leone,
Chad	Mozambique,	South Africa,
Congo	Malawi,	Togo,
Cote d' ivore	Mali,	Uganda
Democratic of Congo	Namibia	Zambia

Appendix 2: Definitions and Sources of Variables Used in the Regression Analysis

Variables	Definition of variables	Sources
GDP	GDP measured at current US dollars across the sample.	World Development Indicators(WDI), The World Bank.
Grosspremium	Gross premium income which is measured by total sum of premium income from life and non-life insurance business	World Development Indicator (WDI), The World bank
Inflation	Inflation is the log difference of composite consumer price indices.	World Development Indicator (WDI), The World bank
Interest Rate	Interest rate (INT) is proxies by deposit interest rate	World Development Indicator (WDI), The World bank
Openness	Openness is measured by the sum of import and export as percentage of GDP.	World Development Indicator (WDI), The World bank